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Huia Water Treatment Plant Replacement Technical Note

Prepared by CH2M Beca Ltd

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Revision History

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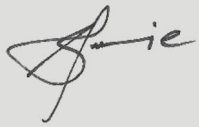
1.0	Scheepers Fourie	Sent to Client for comment	28/4/17
2.0	Scheepers Fourie	Final Report	02/5/17

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Scheepers Fourie**		02/5/17
Reviewed by	**Kara Hartshorne**		02/5/17
Approved by	**Kara Hartshorne**		02/5/17
on behalf of	CH2M Beca Ltd		

Executive Summary

This technical note provides an overview of the traffic and transportation considerations for each of the shortlisted options for the replacement of the Huia Water Treatment Plant (WTP). The intention of this report is to enable a comparison between the short-listed sites and therefore should be read in its entirety to appreciate the relative differences between sites.

Each site option is reviewed with consideration of existing transport conditions, construction traffic implications, as well as traffic and transportation effects of the Water Treatment Plant once operational.

The final section provides a multi criteria scoring of the site characteristics in terms of the aspects mentioned above.

The key site characteristics from this technical note is highlighted below:

Existing Site

- Good road and site access.
- Trenching and construction traffic are proposed to be on separate corridors and consequently less impact on the road network.
- Trenching and construction traffic can be safely accommodated on the road network with appropriate Traffic Management.

Manuka Site

- Good road access.
- Sight distances a concern into the site from Woodlands Park Road, can be mitigated by an alternative route (Manuka Road).
- Trenching and construction are on separate corridors, less adverse effect on the road network.
- Trenching and construction traffic can be safely accommodated on the road network with appropriate Traffic Management.

Parker North Site

- Constrained road access due to Parker Road geometry (e.g. narrow in some road sections).
- Site access acceptable.
- Trenching and construction traffic on Parker Road would need to be managed as a one-way road due to geometrical and capacity constraints. This will impact on the construction programme.

Parker South Site

- Constrained road access due to Parker Road geometry (e.g. narrow in places).
- Site access more constrained than Parker North due to access via narrow driveway.
- Trenching and construction traffic on Parker Road would need to be managed as a one-way road due to geometrical and capacity constraints. This will impact on the construction programme.

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1 Introduction

1.1 Background

Watercare are looking to identify a site for the replacement of the existing Huia Water Treatment Plant and has identified four shortlisted sites. CH2M Beca has been engaged to undertake a traffic and transport assessment of the shortlisted sites.

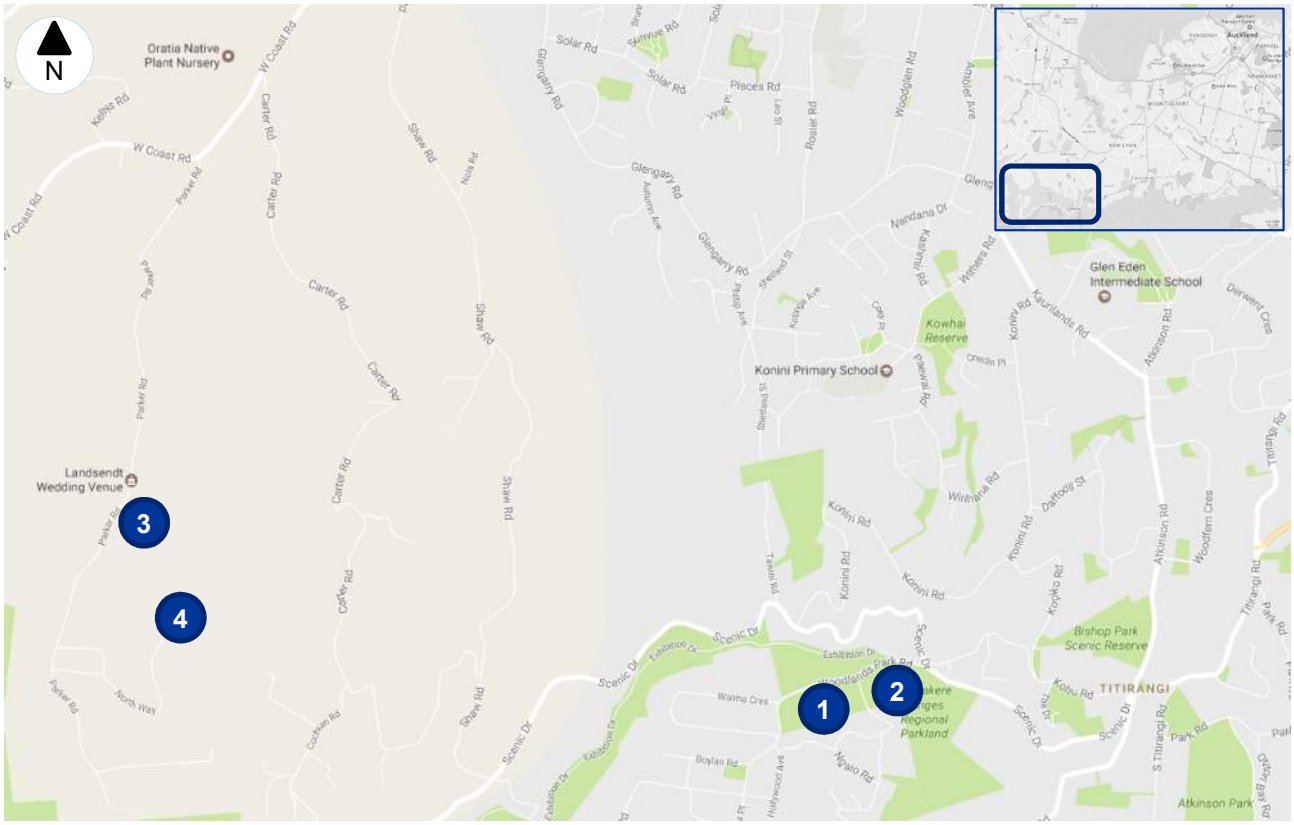
The traffic and transport considerations have been investigated for each of the following sites:

1. **Existing Huia WTP – Woodlands Park Road**
2. **Manuka Road Site**
3. **Parker North Site (near 128 Parker Road)**
4. **Parker South Site (near 152 Parker Road)**

The construction activities will involve truck movements during trenching, tunnelling and WTP construction on the road network. The impact of the operational plant on the road network is also considered.

The four shortlisted Huia Water Treatment Plant replacement sites are shown in **Figure 1-1** below;

Figure 1-1: Location Map



1.2 WTP Construction Methodology

A detailed account of the construction methodology is contained in the "Huia Site Options Constructability Report" prepared by CH2M Beca. This section provides a high level overview of the report and includes key data that was used in this assessment.

1.2.1 Construction Elements

Table 1-1 describes each site's construction elements and construction period:

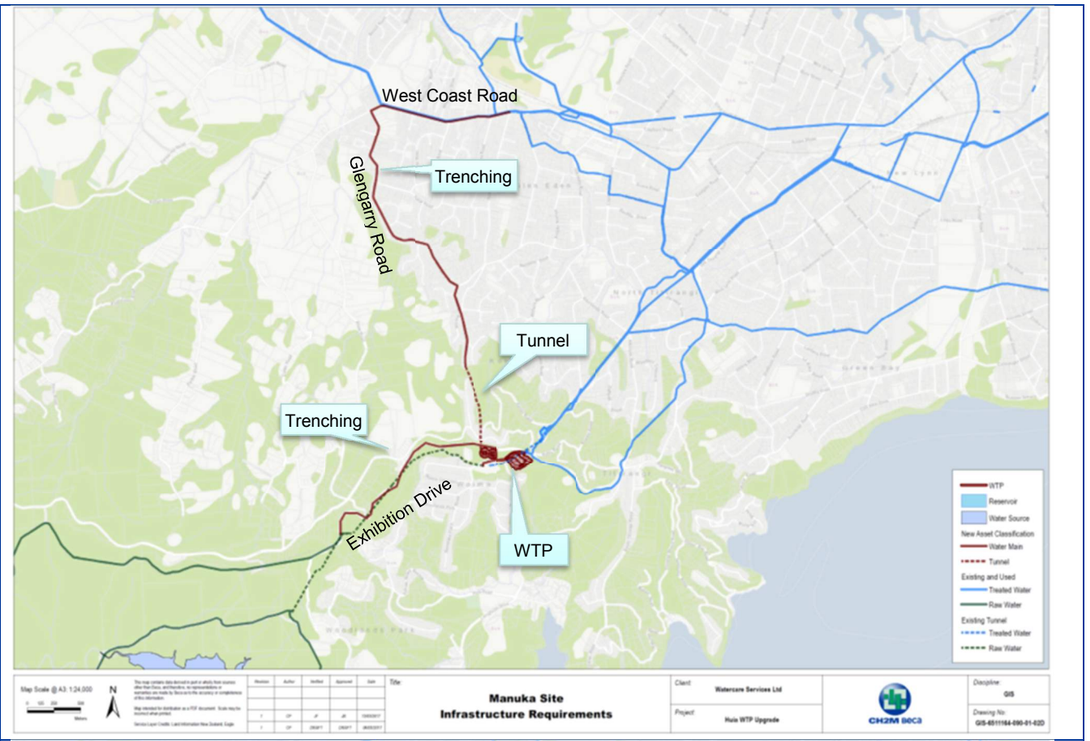
Table 1-1: Construction Elements

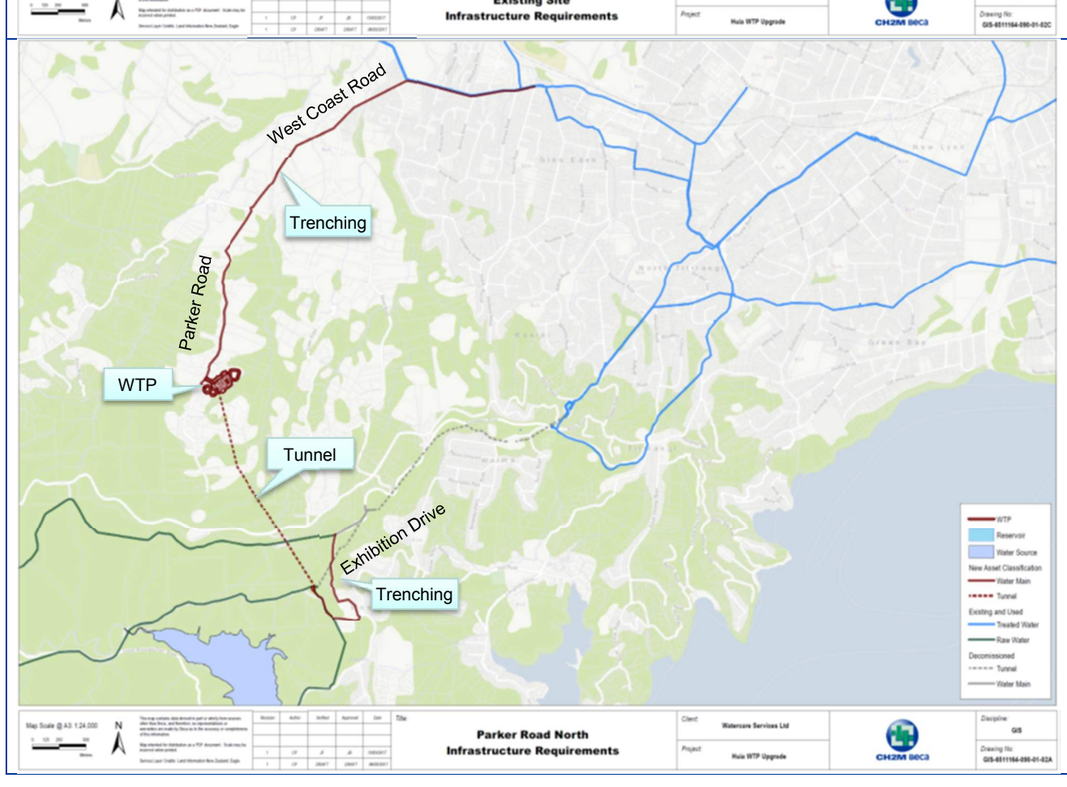
Site	Construction Elements	Construction Period
Existing Huia WTP	Water Treatment Plant	39 months – full time
	Off Spec Water	9 months – full time
	Reservoirs	39 months – full time
	Treated Water Tunnel	27 months – On/Off
	Treated Watermain	24 months – On/Off
		Total – 3 years 6 months
Manuka Road	Raw Water Infrastructure	9 months – full time
	Upper Nihotupu Raw Watermain Extension	9 months – full time
	Water Treatment Plant	36 months – On/Off
	Off Spec Water	9 months – On/Off
	Reservoirs	39 months – full time
	Treated Water Tunnel	27 months – full time
	Treated Watermain	24 months – On/Off
		Total – 4 years
Parker North	Raw Water Tunnel	33 months – full time
	Upper Nihotupu Raw Watermain Extension	6 months – full time
	Water Treatment Plant and Reservoirs	30 months – full time
	Treated Watermain	18 months – On/Off
		Total – 3years 3 months
Parker South	Raw Water Tunnel	30 months – full time
	Upper Nihotupu Raw Watermain Extension	6 months – full time
	Water Treatment Plant and Reservoirs	30 months – full time
	Treated Watermain	21 months – On/Off
		Total – 3years 6 months

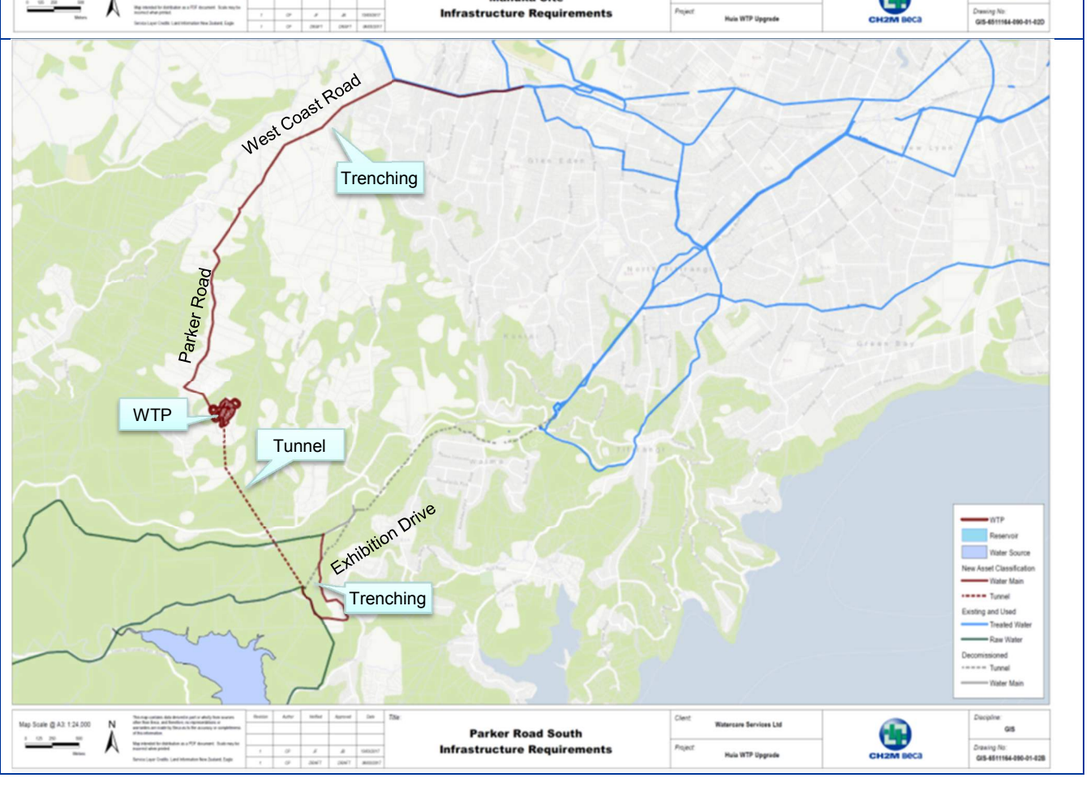
Note: The WTP earthworks phase is expected to last around 3 years. Of the 3 years, a 6 month busy period is expected surrounding the WTP earthworks phase.

The construction elements are illustrated on **Figure 1-2** on the next page for ease of reference.

Figure 1-2: Construction Element Locations







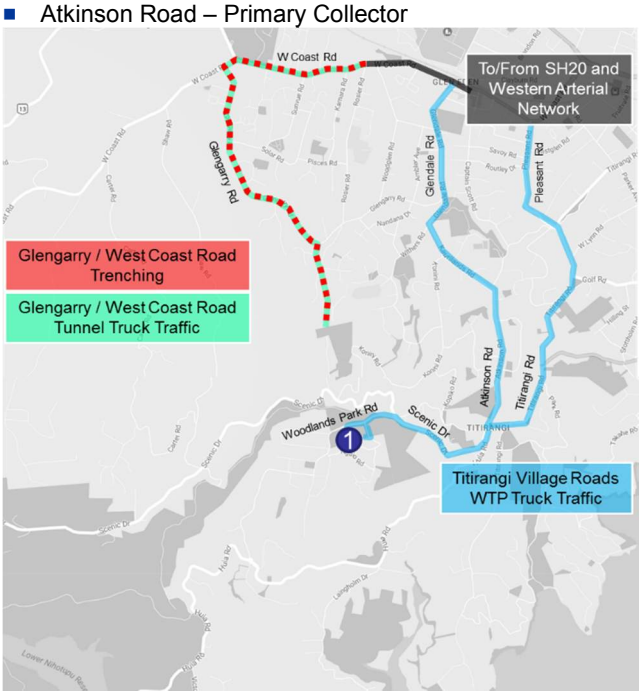
2 Existing Transport Environment

2.1 Road Network and Access Locations

The road network for the four sites are detailed in **Table 2-1** below, which includes a brief description surrounding each site. Site visits were conducted to each shortlisted site to document road conditions and geometric details.

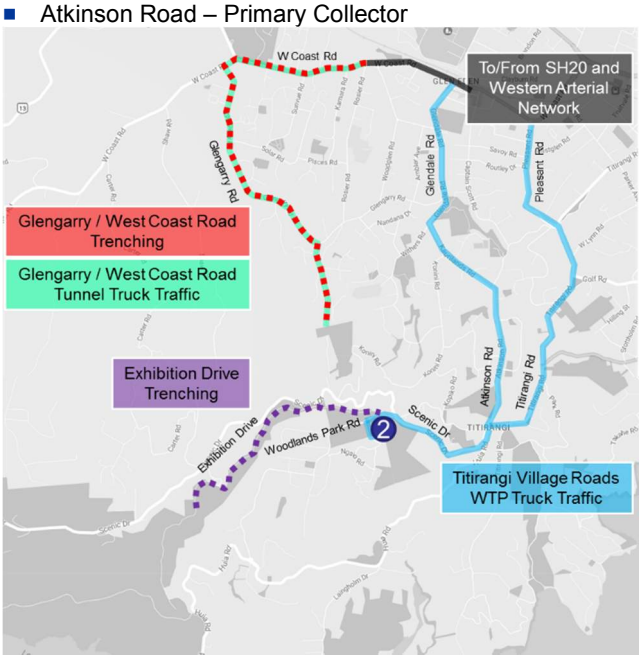
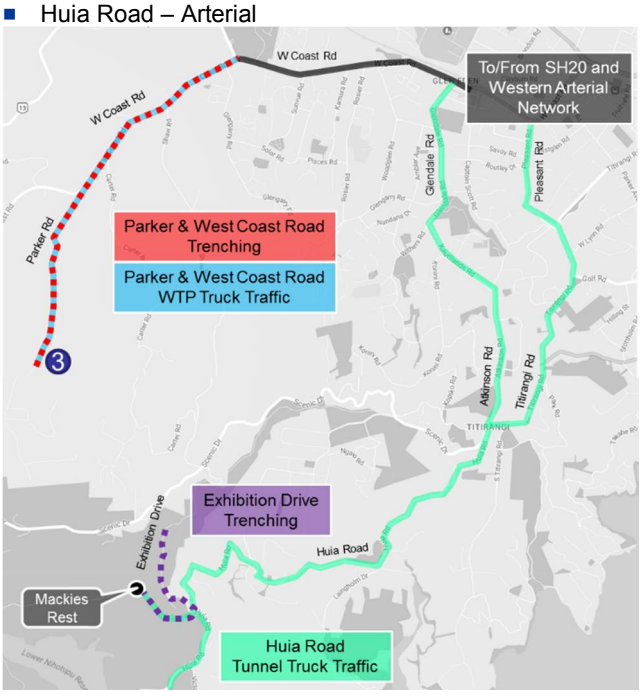
The road network classification was obtained from the One Network Road Classification (ONRC).

Table 2-1: Access to Site and Road Network Affected

Site Road Conditions	Roads Impacted
Existing Huia WTP  ■ Woodlands Park Road – Primary Collector ■ Access road layout – one lane each direction. – 3.6m lanes, formal footpath 1.3m (one side) – 50km/h ■ Road condition – paved, good condition, limited shoulder. ■ Steep embankments, tight corners ■ Site access – Relatively good sight distances for existing/ main access location. ■ Secondary access - Possible through Manuka Road.	■ Woodlands Park Road – Primary Collector ■ Scenic Drive – Primary Collector ■ Manuka Road – Primary Collector ■ Glengarry Road – Primary Collector ■ Titirangi Road – Arterial ■ Atkinson Road – Primary Collector 

Notes: The roads shown in blue for the existing WTP and Manuka Road sites are anticipated routes that construction traffic could use to access the WTP site to/from SH20.

A description and geometric characteristics of the road conditions are only for the immediate road access to the sites.

Site Road Conditions	Roads Impacted
Manuka Road  ■ Woodlands Park Road – Primary Collector ■ Access road layout – one lane each direction. – 3.2m lanes with formal footpath 1.3m (one side) – 50km/h ■ Road condition – paved, good condition, limited shoulder. ■ Steep embankments, tight corners ■ Sight access - some sight distance issues due to potential entry/exit on the corner on Woodlands Park Road. ■ Secondary access - Possible mitigation through Manuka Road access, subject to other design / engineering constraints.	■ Manuka Road – Primary Collector ■ Woodlands Park Road – Primary Collector ■ Scenic Drive – Primary Collector ■ Exhibition Drive – Secondary Collector ■ Glengarry Road – Arterial / Primary Collector ■ West Coast Road – Arterial ■ Titirangi Road – Arterial ■ Atkinson Road – Primary Collector 
Parker North  ■ Parker Road – Secondary Collector ■ Access road layout – one lane each direction. – 2.5m lanes, no footpath – 70km/h ■ Road condition – paved, good condition, no formal shoulder. ■ Steep embankments, ditches and tight corners ■ Site access - Good sight distances likely to be achieved. Access directly from Parker Road. Parker Road narrow and effectively 'one way' in places for large trucks, possible localised road widening necessary. ■ No secondary access route alternatives available.	■ Parker Road – Secondary Collector ■ West Coast Road – Arterial / Primary Collector ■ Exhibition Drive – Secondary Collector ■ Huia Road – Arterial 

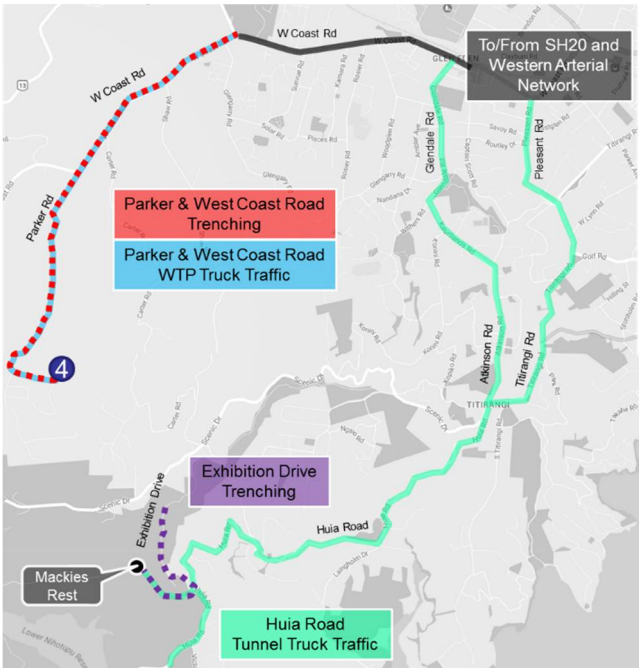
Site Road Conditions

Parker South

- Parker Road – Secondary Collector
- Access road layout
  - one lane each direction.
  - 2.5m lanes, no footpath
  - 70km/h
- Road condition
  - paved, good condition.
- Steep embankments, ditches and tight corners
- Site access - Local access road (North Way) narrow and passes multiple rural residential properties. Some sight distance issues due to potential entry/exit on the corner on Parker Road.
- Parker Road narrow and effectively 'one-way' in places for large trucks, possible localised road widening necessary.
- No secondary access route alternatives available.

Roads Impacted

- Parker Road – Secondary Collector
- West Coast Road – Arterial / Primary Collector
- Exhibition Drive – Secondary Collector
- Huia Road – Arterial

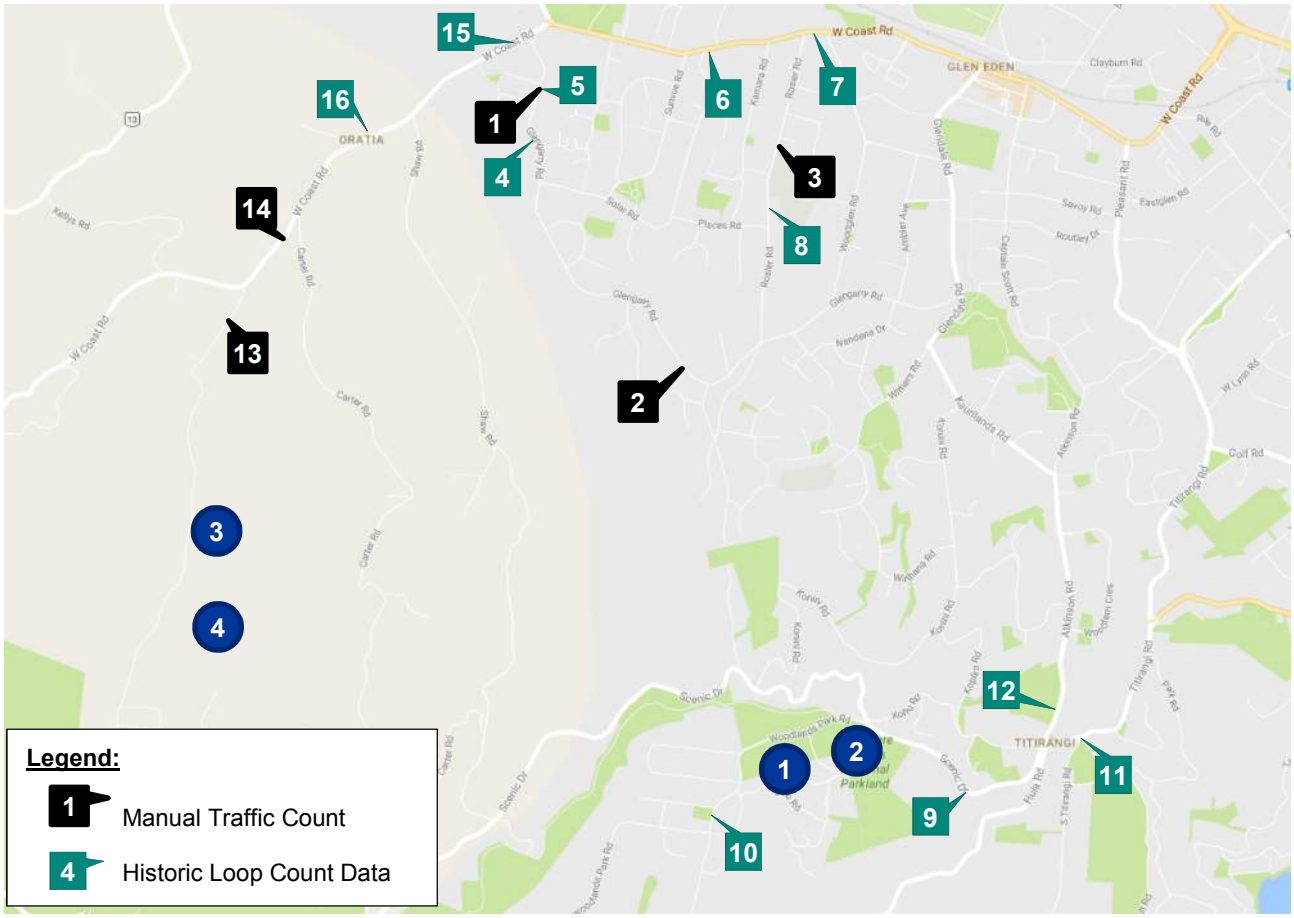


2.2 Traffic Volumes

Weekly traffic data was collected for a 24 hour period at the two locations on Parker Road South and West Coast Road (11 February 2017 to 17 February 2017) and three locations on Glengarry and Rosier Road (18 March 2017 to Friday, 24 March 2017).

Additionally historic Average Daily Traffic (ADT) loop count data was obtained from Auckland Transport (AT) to provide coverage of the surrounding road network. All traffic count locations are shown in **Figure 2-1**.

Figure 2-1: Traffic Count Location



The traffic count data is summarised in **Table 2-2** below and attached in **Appendix A**. From the traffic data the following observations were made in terms of peak hour periods AM Peak (08:00-09:00) and PM Peak (16:00 – 17:00). The Average Daily Traffic (vehicles per day) based on a Monday – Friday week (5 day ADT), centred around construction days.

Table 2-2: Traffic Count Data

Count Area	Count No	Road Name	Start	End	ADT (5Day)	AM Peak	PM Peak
Existing WTP and Manuka Road	1	Glengarry Rd	Meynell Cres	Nicolas Ave	6,078	612	629
	2	Glengarry Rd	Autumn Ave	Phillip Ave	5,486	604	582
	3	Rosier Rd	Lasque Pl	Claridge St	5,019	530	379
	4	Glengarry Rd	Solar Rd	Meynell Cres	4,755	516	593

Count Area	Count No	Road Name	Start	End	ADT (5Day)	AM Peak	PM Peak
	5	Glengarry Rd	Meynell Cres	Nicolas Ave	5,678	516	593
	6	West Coast Rd	Waikaukau Rd	Glen Close	27,971	2,216	2,465
	7	West Coast Rd	Woodglen Rd	Rosier Rd	29,968	2,332	2,534
	8	Rosier Rd	Lasque Pl	Pisces Rd	3,890	407	384
	9	Scenic Dr	Titirangi Rd Roundabout	Woodlands Park Rd	6,652	558	671
	10	Woodlands Park Rd	Boyland Rd	Rimutaka Pl	3,514	379	383
	11	Titirangi Rd	South Titirangi Rd	Scenic Dr Roundabout	16,054	1,543	1,519
	12	Atkinson Rd	Woodfern Cres	Titirangi RAB	7,536	902	694
Parker North and South	13	Parker Rd	Parker Rd	West Coast Rd	1,090	92	96
	14	West Coast Rd	Parker Rd	Carter Rd	4,323	405	369
	15	West Coast Rd	Glengarry Rd	Shaw Rd	7,655	852	745
	16	West Coast Rd	Shaw Rd	Carter Rd	5,310	539	520

From the traffic volumes above, the following important issues are raised:

- Titirangi Road and Atkinson Road are expected to be impacted by existing WTP and Manuka Road construction traffic and have high traffic volumes.
- AM and PM Peaks for Glengarry, Rosier and Woodlands Park Roads are expected to be impacted by existing WTP and Manuka Road trenching range around >500 vehicles in the peak periods.
- Parker Road has a low peak hour traffic for AM and PM in comparison at 92 and 96 vehicles/hour respectively.
- Glengarry Road has higher weekly ADT traffic than Rosier Road, both AM and PM peaks are also higher for treated watermain trenching consideration.
- West Coast Road will require trenching for all four sites regardless from Parrs Cross Road to Rosier Road. This section has a high amount of traffic in both the peak periods as well as weekly ADT volumes.

3 Construction Traffic Generation

3.1 Construction Methodology

Table 3-1 provides the estimated construction traffic based on the high level construction methodology as outlined in **Section 1.2.** The estimated construction traffic volume for the existing WTP and Manuka Road site was not available at the time of this report. It is anticipated that these volumes would be less than those estimated for the Parker Road sites. However, for calculation purposes the Parker Road sites construction traffic has been used as a worst case scenario for the existing WTP and Manuka Road sites.

It is assumed that once a shortlisted site is chosen the final construction traffic numbers will be provided, this will be assessed in the Transportation Assessment report in more detail.

It has been assumed that construction/trenching would be for 5days Monday to Friday and include 9 working hours from 08:00 – 17:00. Construction traffic presents the biggest impact on the road network, particularly during a busy 6 month period when 180 trucks a day are expected, albeit on different parts of the road network.

Table 3-1: Estimated Truck Traffic

Site	Construction Element	Truck Movement Estimate
Existing Huia WTP	Water Treatment Plant and Reservoirs *Woodlands Park Road*	As per Parker Road Sites
	Off-Spec Water *Ngaio/Tanui and Huia Road*	
	Treated Watermain *Glengarry Road* *West Coast Road*	
	Treated Water Tunnel *Shetland Park Road*	
Manuka Road	Raw Watermain Infrastructure *(Woodlands Park Road)*	
	Upper Nihotupu Raw Watermain *Exhibition Road*	
	Water Treatment Plant and Reservoirs *Woodlands Park Road*	
	Treated Water Tunnel *Shetland Park Road*	
	Treated Watermain *Glengarry Road* *West Coast Road*	
TOTAL Truck Movements per day (in and out)		**As per Parker Road Sites**
Parker North and Parker South	Tunnel Huia Road / Exhibition Drive	Slurry - 15 to 20 trucks a day. Equipment and materials – 10 trucks per day **Total – 30 truck movements per day**
	Raw Watermain Extension Huia, Shaw Road / Exhibition Drive	**Total – 20 truck movements per day**
	Water Treatment Plant and Reservoirs Parker Road	12,000 trucks in earthworks phase (for a 6 month busy period) **Total - 100 truck movements per day**.
	Treated Watermain Parker Road	Construction phase - 20-40 trucks per day, **Total – 30 truck movements per day**
TOTAL Truck Movements per day (in and out)		**Total 180 truck movements per day**

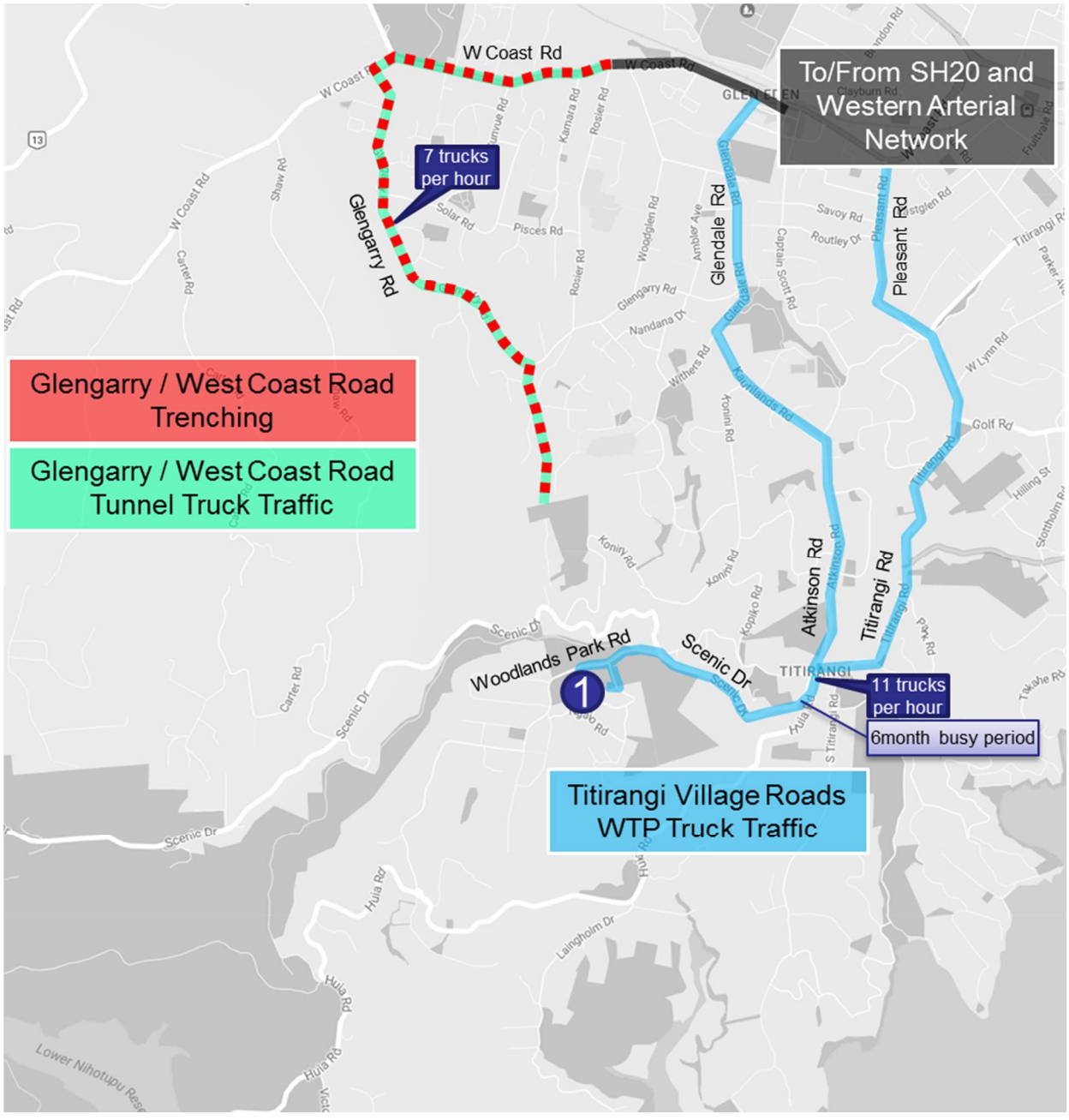
3.2 Construction Traffic Routes

Arterial routes from motorways should be able to accommodate the addition truck volumes without affecting capacity significantly. Likely routes that trucks will take during trenching, tunnelling and WTP construction are highlighted in **Figure 3-1**. These routes are the ones identified to be most affected.

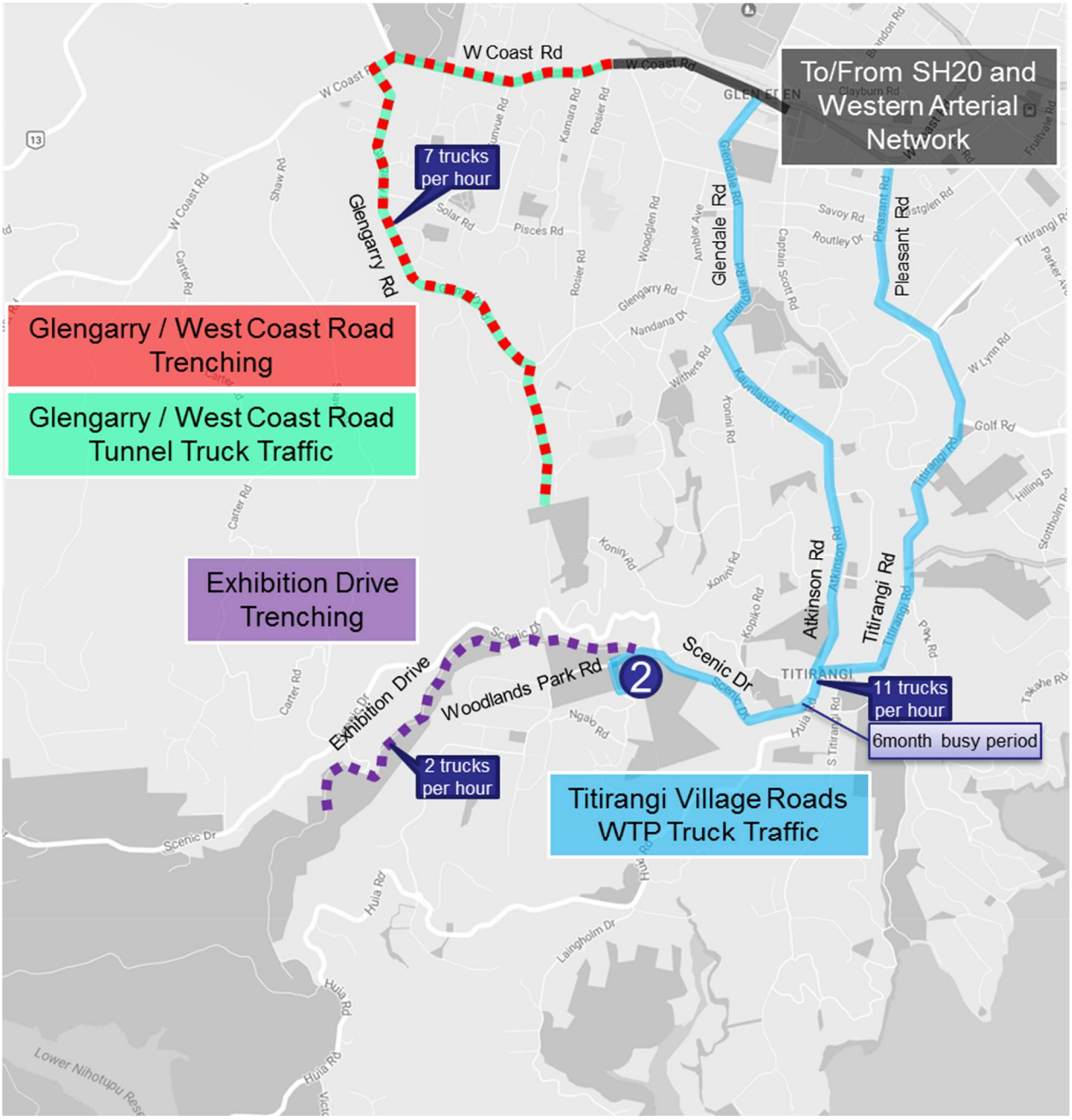
The number of trucks per hour have also been estimated. However, it is noted that these are high level estimates and Parker Road site estimates have been used for the existing WTP and Manuka Road sites as a worst case scenario.

Figure 3-1: Construction Traffic Routes

Existing WTP

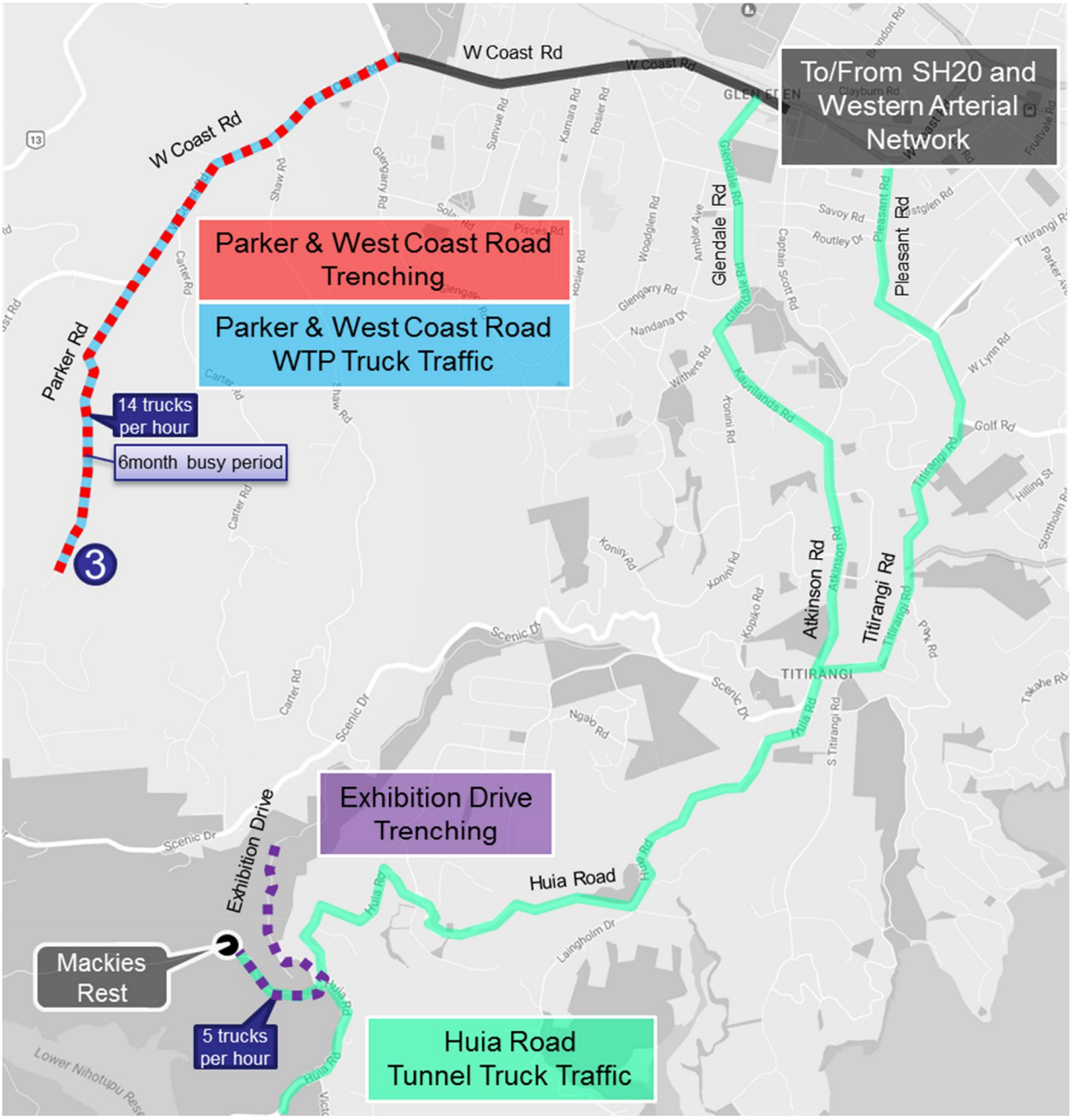


Manuka Road



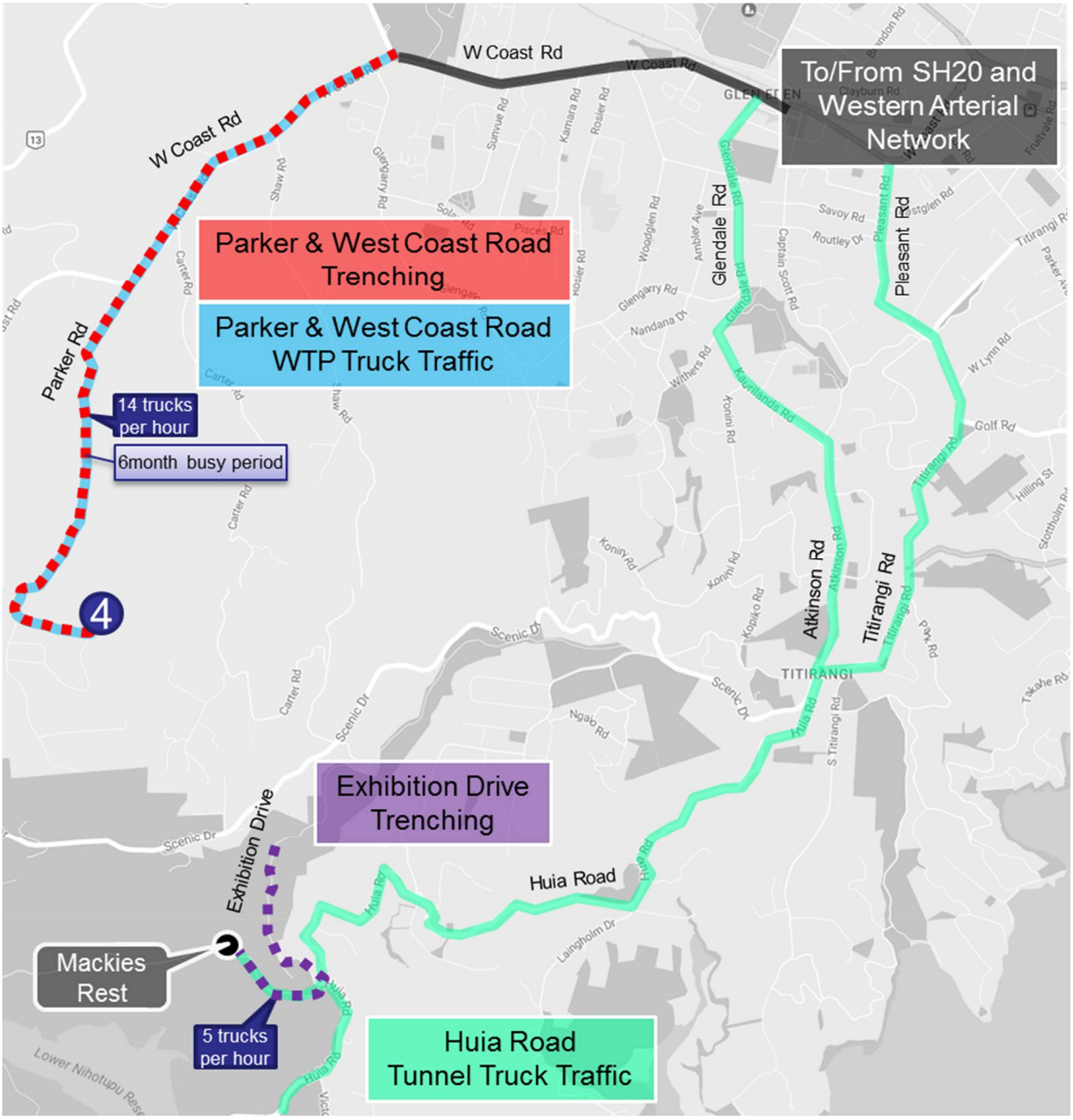
Note: The roads shown in blue for the existing WTP and Manuka Road sites are anticipated routes that construction traffic could use to access the WTP site to/from SH20.

Parker North



Note The roads shown in green for Huia Road are anticipated routes that construction traffic could use to access the trenching and tunnelling (at Mackies Rest) to/from SH20.

Parker South



Note The roads shown in green for Huia Road are anticipated routes that construction traffic could use to access the trenching and tunnelling (at Mackies Rest) to/from SH20.

4 Construction Traffic Effects

This section evaluates the impact of construction traffic on the road network for each of the four shortlisted sites.

4.1 Construction Traffic Effects

As part of the traffic and transport technical note the vehicular impacts of the planned construction have been identified surrounding each site, this is summarised in **Table 4-1** below.

Table 4-1: Construction Traffic Impact Assessment

Site	Description
Existing Huia WTP	■ There will be an increase in construction traffic on Woodlands Park Road. ■ Trenching works for treated watermain requires traffic management. May have more than localised effects, but likely can be mitigated, in part by viable diversion routes. ■ An alternative treated watermain trenching route (via Rosier Rd) may be preferable in terms of traffic impacts of trenching. ■ WTP/reservoir construction works are on different road corridors (Woodland Park Road / Exhibition Drive), so can occur in parallel and reduce duration of effects for adjacent communities. ■ Temporary adverse effect on Titirangi community (i.e. through the village and roundabout) due to construction vehicles, however the severity will be limited as no trenching is planned on these roads. – Construction traffic may pass Titirangi Primary School, Kaurilands Primary school and Glen Eden Intermediate if the Atkinson Road / Kaurilands Road route is chosen to and from SH20. This includes truck traffic around the Titirangi roundabout, interaction with school traffic, as well as pupils walking and cycling. – Existing delays on Atkinson Road are noted around school drop off and pick up times due to the location of the schools. The addition of construction traffic could add to this congestion. ■ Delays to bus operations along Woodlands Park Road
Manuka Road	■ There will be an increase in construction traffic on Woodlands Park Road. ■ Localised trenching works for raw water pipe between existing and Manuka Rd site will require traffic management with localised and mitigated effects. ■ Trenching works for treated watermain requires traffic management – May have more than localised effects, but likely can be mitigated, in part by viable diversion routes. An alternative treated watermain trenching route via Rosier Rd may be preferable in terms of traffic impacts ■ Temporary adverse effect on Titirangi community (i.e. through the village and roundabout) due to construction vehicles, however the severity will be limited as no trenching is planned on these roads. – Construction traffic may pass Titirangi Primary School, Kaurilands Primary school and Glen Eden Intermediate if the Atkinson Road / Kaurilands Road route is chosen to and from SH20. This includes truck traffic around the Titirangi roundabout, interaction with school traffic, as well as pupils walking and cycling. – Existing delays on Atkinson Road are noted around school drop off and pick up times due to the location of the schools. The addition of construction traffic could add to this congestion.

Site	Description
	■ Delays expected to bus operations along Woodlands Park Road. ■ Additional transport effects over existing site with approx. 2.4km watermain trenching works along Exhibition Drive affecting local access and recreational use, but can be mitigated. WTP/reservoir construction works are on different road corridors, so can occur in parallel and reduce duration of effects for adjacent communities. – Woodlands Park School traffic could be adversely effected with construction traffic in close proximity.
Parker North	■ There will be an increase in construction traffic on Parker Road. ■ Construction vehicles and trenching works for treated watermain pass Oratia District School and kindergarten, as well as community church and community hall, and wedding venue / plant nurseries (business) on Parker Road and along West Coast Road. Effects therefore depend on duration of construction activities and construction management, but impact could be adverse for connection of community to facilities. ■ Trenching works for treated watermain requires traffic management. ■ May have more than localised effects on West Coast Rd, but likely can be mitigated, albeit no alternative diversion routes. ■ Trenching and WTP/reservoir construction works utilise same road corridors, which is likely to extend the duration of works experienced by local and wider community. Notably greater length of concrete-lined tunnel required from site, depending on construction methodology, resulting in additional number and duration of truck movements for spoil removal / concrete delivery along Parker Road. ■ Temporary adverse effect on Titirangi community via Huia Road due to tunnel construction vehicles. ■ Delays expected to bus operations along West Coast Road due to trenching and construction vehicles
Parker South	■ There will be an increase in construction traffic on Parker Road. ■ Construction vehicles and trenching works for treated watermain pass Oratia District School and kindergarten, as well as community church and community hall, and wedding venue / plant nurseries (business) on Parker Road, and along West Coast Road. Effects therefore depend on duration of construction activities and construction management, but impact could be adverse for connection of community to facilities. ■ Trenching works for treated watermain requires traffic management may have more than localised effects on West Coast Road, but likely can be mitigated, albeit no alternative diversion routes. ■ Trenching and WTP/reservoir construction works utilise same road corridors, which is likely to extend the duration of works experienced by local and wider community. Notably greater length of concrete-lined tunnel required from site, depending on construction methodology, resulting in additional number and duration of truck movements for spoil removal / concrete delivery along Parker Road. ■ Temporary adverse effect on Titirangi community via Huia Road due to tunnel construction vehicles. ■ Delays to bus operations along West Coast Road due to trenching and construction vehicles

4.2 Road Capacity Analysis

This section looks at the predicted construction and trenching traffic in order to understand the road capacity of critical sections of road leading to and from the shortlisted sites.

The assessment takes into account the current traffic on the road network as per **Section 2.2**, including the estimated truck traffic as per **Section 3.1**.

4.2.1 Existing WTP and Manuka Road Sites

- Glengarry Road - 3km of trenching
- Woodland Park Road and Manuka Road - WTP construction traffic
- Exhibition Drive (Manuka Site only) - 2.4km of trenching
- Atkinson and Titirangi Road – WTP construction traffic

Analysis:

- Titirangi Road experiences some congestion issues at certain times during the day. The added construction traffic would have some impact on the road portion through Titirangi Village and the Titirangi Roundabout. Temporary impacts are expected for a 6 month period only (maximum of 11 trucks per hour as a worst case scenario as per **Section 3.1**).
- These two site have alternative routes available to the affected roads mentioned above, it is accepted that current traffic volumes (as per **Section 2.2**) will divert to alternative routes if delays become too great.
- The amount of truck traffic on Woodlands Park and Manuka Road can be safely accommodated as these roads will continue to operate as a two-way traffic section.
- Glengarry Road will have approximately 300m of trenching area at any one time and this trenching area will operate as one-way only section with traffic management control. There will be some adverse effects due to the trenching, a large part of the mitigation would be vehicles using alternative routes that are available.
- Exhibition Drive is a gravel service road closed to public vehicles, it will have approximately 300m trenching at any given time. The service road in its entirety will operate as one-way section due to geometric constraints. The low volumes of truck traffic can safely be accommodated.
- Exhibition Drive is a popular place for recreational users. The impact on pedestrians and cyclists will need to be managed.

Capacity analysis calculation was not undertaken for the abovementioned roads, as they are likely to have limited and temporary adverse effects. Alternative routes are also available to local traffic. Truck traffic will also be dispersed to a number of road corridors which lessens the impact on the road network. Predicted construction traffic volumes are also expected to be lower than Parker Road sites, although worst case scenario was used.

4.2.2 Parker North and South Sites

- Parker Road - 1.8km of trenching and WTP construction traffic
- West Coast Road – Trenching and WTP construction traffic
- Exhibition Road - 1.7km of trenching
- Huia Road – Tunnel construction traffic

Analysis:

- Parker Road's constrained geometry will effectively render it as a one-way road for local traffic, trenching, tunnelling and WTP construction truck traffic. This significantly inhibits the capacity of the road. Moreover, Parker Road has no alternative routes for traffic, this has resulted that a capacity analysis calculation was needed to understand the adverse effects.

- West Coast Roads geometry can accommodate two way traffic except for the 300m trenching area. The delay on this section of West Coast Road will be limited to this section alone.
- Exhibition Drive is a gravel service road closed to public vehicles, it will have approximately 300m trenching at any given time. The service road in its entirety will operate as one-way section due to geometric constraints. The low volumes of truck traffic can safely be accommodated.
- Exhibition Drive is a popular place for recreational users. The impact on pedestrians and cyclists will need to be managed.
- Huia Road is expected to carry some tunnel construction traffic located at Mackie's Rest (5 trucks per hour including Exhibition Road trenching traffic), although this would be limited volumes for a short period of time. The impact on capacity is expected to be minor.

4.2.3 Calculation Assumptions

- Capacity assessment is made assuming one-way traffic only.
- 9 Hour workday period assumed (08:00 – 17:00), 22 workdays per month
- Posted speed limits are based on lane width according to the Code of Practice for Temporary Traffic Management (CoPTTM) outlined in **Table 4-2** below.
- Distances for construction elements are approximate and will be confirmed in the detailed transport assessment.

Table 4-2: CoPTTM Speed Limit

Speed (km/h)	30	40	50	60	70
Lane width	2.75	2.75	3	3	3.25

- Based on the above, the construction vehicle speed is 30km/h based on lane widths and safe travel speeds.
- West Coast Road (Parrs Cross Road to Rosier Road) is not considered here, as it is part of trenching works for all sites.
- Parker Road cannot accommodate two way construction or trenching traffic in its entirety due several narrow road width areas. It is assumed that vehicle would need to move in an out one at a time.

Section 3.1 and **Table 3-1** has indicated what the traffic generation per construction element would entail. The truck movements per day together with the estimated construction vehicle speed provides the capacity of each road section. **Table 4-3** presents the road capacity calculations.

Table 4-3: Construction Traffic Capacity Assessment

Road Section	Estimated one-way section (m)	Estimated Vehicle Speed	Existing Demand (veh/day)	Proposed Truck Volumes (veh/workday)	Total Traffic Volumes (veh/workday)
Parker Road – North WTP and Trenching	1800	30km/h	629	130	760
Parker Road – South WTP and Trenching	2100	30km/h	629	130	760

- From the estimated construction traffic around 130 truck movements are expected on Parker Road should trenching and WTP construction occur simultaneously.
- From the capacity assessment, the road capacity is calculated at between 150-129 veh/day given that a one way Construction Traffic Management Plan would be in operation.
  - Parker North (150 veh) takes 3 minutes per vehicle one way along the 1.8km route.
  - Parker South (129 veh) takes 4 minutes per vehicle one way along the 2.1km route.

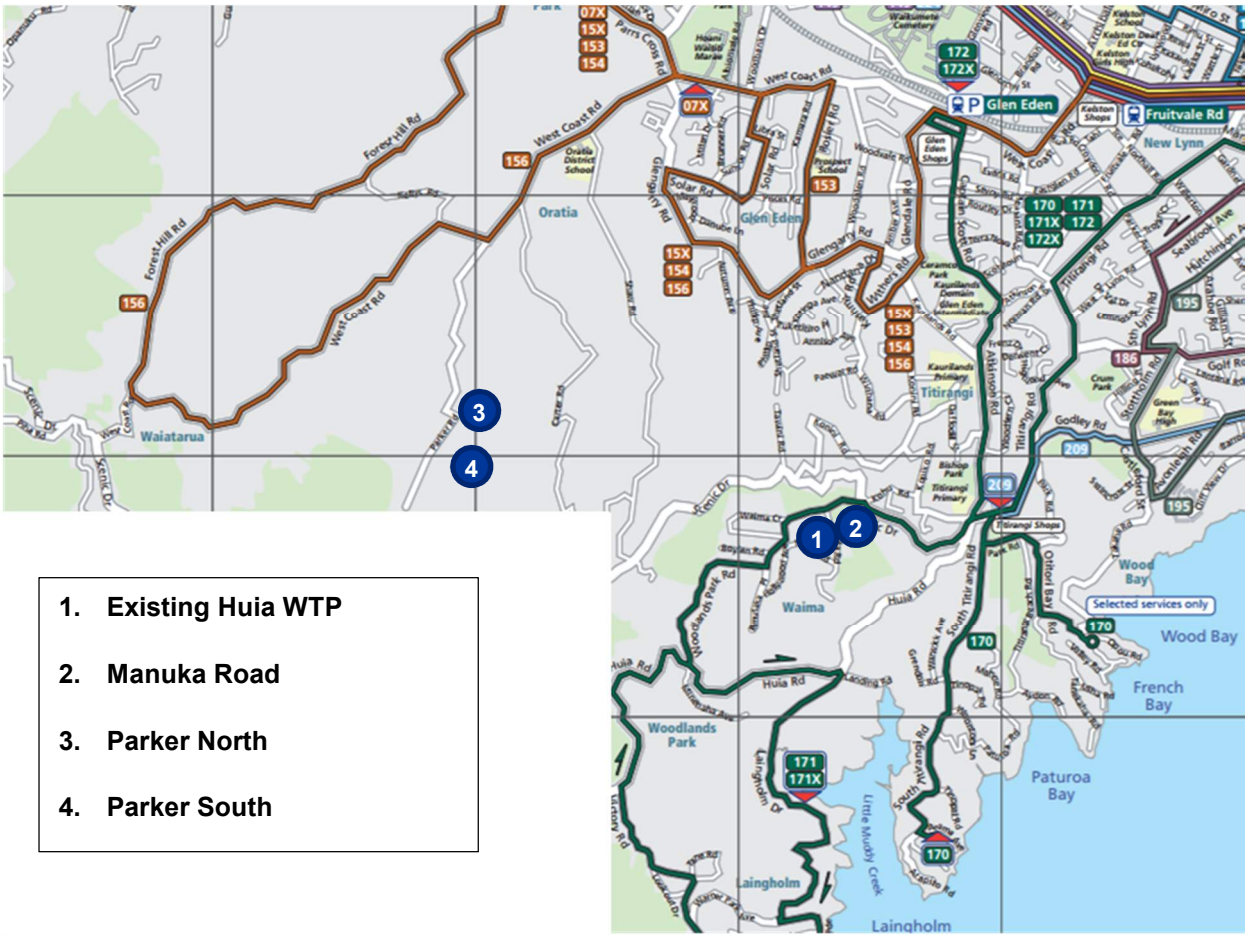
- While Parker Road is constrained in terms of road geometry and it is limited to only safely accommodate one-way traffic, construction and trenching traffic is not advised be undertaken in the same time period.
  - This will have some adverse effect on the construction programme.
- This will also impact resident accessing their properties considerably.
- Adverse effect on programme
  - Parker Road capacity highly constrained due to one way working
  - This will have a significant impact on the programme, where construction and trenching traffic would have to be dispersed over a longer period, especially surrounding the estimated 6 months busy period.

In summary, the adverse effect of Parker Road operating as a one-way and having no alternative route option will negatively affect the construction programme. The exact amount is subjective as precise truck movements are not known, however the capacity analysis indicates the level of constraint that Parker Road poses.

4.3 Public Transportation Effects

The effect of construction, trenching and WTP operation on the public transportation network are highlighted for each site in this section. Current public transport routes are illustrated in **Figure 4-1** below.

Figure 4-1: Public Transport Routes



1. **Existing Huia WTP**
2. **Manuka Road**
3. **Parker North**
4. **Parker South**

The public transport routes, stops and impacts are summarised in **Table 4-4** below.

Table 4-4: Public Transportation Effects

Site	Description
Existing Huia WTP	■ Two public transport routes have been identified in the surrounding area of the existing WTP site, several bus stops are located along Woodlands Park Road,: – Route 171 Laingholm to New Lynn via Titirangi Rd – Route 171X Laingholm to Midtown Express ■ Adverse effect on these public transport routes would mainly include delays to services due to construction traffic. ■ Additional impacts could include adverse effects of trenching on bus stops along Glengarry and West Coast Road, mainly physical impact on bus stop access for users requiring temporary relocation. ■ Alternative route options are available.
Manuka Road	
Parker North	■ There are no public transport stops located along Parker Road. The closest bus stop is located in West Coast Road at the intersection of Parker and West Coast Road. ■ There would be no impact on public transport services along Parker Road. ■ Impacts could include adverse effects of trenching on bus stops along West Coast Road, this would include temporary relocation of bus stop. ■ No alternative route options are available to re-route.
Parker South	
Trenching Works	■ Trenching works along West Coast Road, Glengarry Road or Rosier Road will have significant impact on the following public transport routes: – Route 15x – Route 153 – Route 154 – Route 156 ■ Adverse effects include delays and temporary relocation / bus stop closures. ■ Glengarry Road has route options available to re-route.
WTP Operation	■ No adverse impacts on the bus network is expected during operation of the WTP.

In summary some bus routes and stops will be impacted by the trenching and WTP construction. However this would only be a temporary disruption and it is anticipated that bus stops could be temporary relocated and routes diverted where possible.

- All four shortlisted sites will have some extent of adverse effects on highlighted public transport routes.
- However, while the existing WTP and Manuka Road sites have the availability of alternative routes for buses.
- The Parker Road sites have no alternative route options for buses on West Coast Road.
- The lack of alternative routes makes the impact on the Parker Road sites greater for public transport users.

4.4 Key Differentiators

The following summary is made with regards to the construction and trenching period:

4.4.1 Existing WTP / Manuka Road

- Existing Woodland Park Road width is suitable to cater for opposing movement of construction vehicles.
- Trenching and construction can occur simultaneously as these elements are located on separate road corridors.
- Increase in construction traffic through Titirangi Village and potential clash with school routes, only temporary impact over 6 month period.
- Treated watermain trenching has alternative routes available for affected community.

4.4.2 Parker North / Parker South

- Parker Road not wide enough for two construction vehicles to pass each other safely, effectively operate as a one-way road.
- Parker Road needs localised widening at some specific pinch points when trenching and/or construction occurs in approximately 4-5 pinch points.
- A Temporary Traffic Management Plan would need to be setup to manage truck traffic to and from Parker Road sites for one-way working.
  - Lengthy one-way movements
  - Complex and highly managed Traffic Management Plan would be required
  - Truck layby areas would be required for waiting trucks and their locations could have social impacts.
- From the capacity analysis, trenching and construction vehicles cannot be accommodated at the same time without an increase to the construction programme as a result of the road width of Parker Road.
- Adverse effect on construction/trenching programme with additional prolonged period of one-way operation in order to accommodate local, construction and trenching traffic on Parker Road.
- Treated watermain trenching along Parker Road has no alternative route available for affected community.
- There is some overlap in terms of the social and transport impacts of the Parker Sites.

5 Operational Traffic Effects

5.1 Predicted Traffic Generation and Parking Demand

Predicted traffic generation from the operation of the WTP would be minimal. The WTP would have onsite parking to cater for employees and occasional site visits, this will be determined once final site design is confirmed but likely to be less than 20 trips a day and approximately 6 truck movements a week.

From a traffic impact perspective, the generated traffic would result in negligible effects on the road network and can be safely accommodated within the road capacity provided.

5.2 Transport Impacts and Mitigation Requirements

The transportation impact have been identified for all four sites, especially focusing around each site's operations. The summary of the transport impact are highlighted in **Table 4-1** below.

Table 5-1: Operational Transport Effects

Site	Description
Existing Huia WTP	■ Assume activities on site similar to current use of site and operations, will not be 'perceptible' change on current activities (e.g. maintenance likely to reduce with newer plant, even if larger). ■ Operational traffic demands unlikely to be noticeably different, as addition of reservoirs generates only negligible maintenance activity and overall transport effects likely to be easily mitigated (if necessary). Is a bigger catchment than Parker Road but viewed as people drive past and already used to WTP.
Manuka Road	■ Assume activities on site similar to current use of existing site and adjacent operations ■ Operational traffic demands unlikely to be noticeably different, as addition of reservoirs generates only negligible maintenance activity and overall transport effects likely to be easily mitigated (if necessary). ■ Operational transport will have no adverse effect on road network.
Parker North	■ Operational traffic demands considered unlikely to any more than slight and localised impact which could be mitigated.
Parker South	■ Operational traffic demands [but still to be confirmed] considered unlikely to any more than slight and localised impact which could be mitigated.

Summary:

- Negligible effects on road network and site access once WTP is operational.
- Road network can adequately accommodate WTP operational traffic.

6 Multi Criteria Analysis

Based on the technical note the following site summary can be drawn from a Traffic and Transportation viewpoint. This includes a Multi Criteria Analysis (MCA) scoring of each component on a range from 1-5 points, refer to **Table 6-1** below.

Scoring levels include the following:
- 1 = Significant impacts or risks,
- 2 = High impacts or risks,
- 3 = Moderate impacts or risks,
- 4 = Some identified impacts or risks but these are localised and minor,
- 5 = Relatively straightforward without any unusual impacts or risks.

Table 6-1: Multi Criteria Analysis

Traffic Analysis	Existing Huia WTP	Manuka Road	Parker North	Parker South
ROAD AND SITE ACCESS	■ **Woodlands Park Rd** geometry (7.2m) adequate for construction and **Glengarry Rd** (6.6m) trenching vehicles. ■ Access to site sufficient (existing access)	■ **Woodlands Park Rd** geometry (6.4m) adequate for construction and **Glengarry Rd** (6.6m) trenching vehicles. ■ Access to site reasonable albeit inhibited sightlines, alternative access from **Manuka Rd** with safer sight distances and access. ■ Woodlands Park School traffic could be adversely effected with construction traffic in close proximity to **Exhibition Drive**.	■ **Parker Rd** geometry (5m) constrained for construction and trenching vehicles. ■ Access to site inhibited by road geometry. ■ Adverse effects on road network. ■ Trenching and WTP construction works utilise **Parker Rd** (1.8km constrained) simultaneously, which will extend the duration of works from current estimates.	■ **Parker Rd** geometry (5m) constrained for construction and trenching vehicles. ■ Access to site inhibited by road geometry, additional parker south access driveway narrow and constrained. ■ Adverse effects on road network. ■ Trenching and WTP construction works utilise **Parker Rd** (2.1km constrained) simultaneously, which will extend the duration of works from current estimates.
	4	**4**	**2**	**2**
TRENCHING	■ Trenching works for treated watermain on **Glengarry Rd** (approx. 3km to **West Coast Rd**) requires traffic management may have more than localised effects, but can be mitigated, in part by viable diversion routes. ■ An alternative treated watermain trenching route (approx. 2.6km) via **Rosier Rd** may be preferable in terms of traffic impacts.	■ Trenching works for treated watermain on **Glengarry Rd** (approx. 3km to **West Coast Rd**) requires traffic management may have more than localised effects, but likely can be mitigated, in part by viable diversion routes. ■ An alternative treated watermain trenching route (approx. 2.6km) via **Rosier Rd** may be preferable in terms of traffic impacts. ■ Trenching works for raw water pipe between existing and **Manuka Rd** site will require traffic management with localised and mitigated effects.	■ Trenching works for treated watermain approx. 1.8km on **Parker Rd** requires strict traffic management albeit only localised effects. Trenching works approx. 1.9km on **West Coast Rd** requires traffic management, although manageable. ■ Trenching works on **Parker Rd** requires localised widening of some sections to accommodate construction vehicle movements.	■ Trenching works for treated watermain approx. 2.1km on **Parker Rd** requires strict traffic management albeit only localised effects. Trenching works approx. 1.9km on **West Coast Rd** requires traffic management, although manageable. ■ Trenching works on **Parker Rd** requires localised widening of some sections to accommodate construction vehicle movements.
	4	**4**	**3**	**3**
WTP CONSTRUCTION TRAFFIC	■ WTP/reservoir construction works occur on different road corridors (**Woodlands Park Rd / Exhibition Dr**) ■ Trenching can occur in parallel with construction and reduce duration of effects for adjacent communities. ■ Effect on Titirangi Village and roundabout at certain times of the day.	■ WTP/reservoir construction works occur on different road corridors (**Woodlands Park Rd / Exhibition Dr**), ■ Trenching can occur in parallel with construction and reduce duration of effects for adjacent communities. ■ Effect on Titirangi Village and roundabout at certain times of the day. ■ Transport impacts over existing site with approx. 2.4km watermain trenching works along **Exhibition Dr** affecting local access and recreational use, but can be mitigated.	■ Constraints of **Parker Rd** will adversely affect construction programme over a longer period due to one-way working. ■ Construction vehicles and trenching works for treated watermain on **Parker Rd** and along **West Coast Rd** will have adverse effects on local residents and business. ■ Needs complex Traffic Management and challenging truck layby area	■ Constraints of **Parker Rd** will adversely affect construction programme over a longer period due to one-way working. ■ Construction vehicles and trenching works for treated watermain on **Parker Rd** and along **West Coast Rd** will have adverse effects on local residents and business. ■ Needs complex Traffic Management and challenging truck layby area
	4	**4**	**2**	**2**
LOCAL TRAFFIC	■ Higher volumes of traffic than Parker sites. Effect lower due to alternative routes available and distributed impacts areas.	■ Higher volumes of traffic than Parker sites. Effect lower due to alternative routes available and distributed impacts areas.	■ Lower volumes of traffic albeit adverse effects on Community could be greater.	■ Lower volumes of traffic albeit adverse effects on Community could be greater.
	4	**4**	**3**	**3**
WTP OPERATION (not used for MCA scoring)	■ WTP operation not a key differentiator in terms of site operation and traffic effects	■ WTP operation not a key differentiator in terms of site operation and traffic effects	■ WTP operation not a key differentiator in terms of site operation and traffic effects	■ WTP operation not a key differentiator in terms of site operation and traffic effects
	5	**5**	**5**	**5**
OVERALL MCA	**4**	**4**	**2**	**2**

Appendix A

Traffic Data

Full Hour Counts - OS # 322 GLENGARRY ROAD SOUTH OF NICOLAS AVE

Hour Intervals		Sat 18-Mar-17			Sun 19-Mar-17			Mon 20-Mar-17			Tue 21-Mar-17			Wed 22-Mar-17			Thu 23-Mar-17			Fri 24-Mar-17			AVERAGES (Veh/Hour) 5 Day Average			AVERAGES (Veh/Hour) 7 Day Average		
From	To	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes
0000	0100	20	27	47	36	37	73	4	11	15	3	7	10	7	9	16	9	9	18	13	15	28	7	10	17	13	16	30
0100	0200	11	15	26	10	17	27	2	5	7	4	3	7	3	3	6	6	9	15	5	9	14	4	6	10	6	9	15
0200	0300	7	5	12	15	13	28	1	1	2	2	2	4	3	7	10	6	5	11	5	4	9	3	4	7	6	5	11
0300	0400	8	9	17	8	9	17	7	6	13	3	1	4	9	5	14	3	9	12	4	6	10	5	5	11	6	6	12
0400	0500	13	4	17	6	9	15	5	2	7	15	6	21	12	6	18	17	5	22	16	7	23	13	5	18	12	6	18
0500	0600	23	13	36	9	4	13	51	10	61	59	16	75	55	15	70	48	7	55	52	12	64	53	12	65	42	11	53
0600	0700	38	21	59	20	10	30	138	63	201	152	79	231	151	83	234	149	79	228	141	66	207	146	74	220	113	57	170
0700	0800	90	46	136	45	35	80	280	186	466	265	182	447	237	170	407	240	162	402	262	150	412	257	170	427	203	133	336
0800	0900	171	70	241	103	57	160	316	279	595	325	268	593	322	298	620	343	309	652	322	277	599	326	286	612	272	223	494
0900	1000	207	136	343	186	108	294	173	159	332	171	153	324	171	146	317	182	147	329	194	151	345	178	151	329	183	143	326
1000	1100	226	180	406	210	156	366	124	90	214	138	135	273	142	103	245	140	115	255	140	146	286	137	118	255	160	132	292
1100	1200	233	199	432	230	206	436	118	118	236	140	119	259	117	139	256	143	164	307	107	124	231	125	133	258	155	153	308
1200	1300	197	208	405	238	226	464	129	124	253	126	132	258	120	149	269	155	142	297	150	126	276	136	135	271	159	158	317
1300	1400	190	211	401	194	192	386	140	117	257	145	126	271	149	146	295	118	154	272	143	154	297	139	139	278	154	157	311
1400	1500	199	210	409	190	223	413	170	178	348	179	203	382	157	160	317	164	197	361	177	210	387	169	190	359	177	197	374
1500	1600	183	191	374	163	212	375	205	265	470	230	279	509	204	275	479	217	273	490	236	284	520	218	275	494	205	254	460
1600	1700	165	195	360	181	190	371	199	342	541	221	324	545	213	336	549	231	338	569	210	302	512	215	328	543	203	290	492
1700	1800	157	208	365	146	221	367	261	399	660	211	378	589	254	389	643	281	350	631	255	365	620	252	376	629	224	330	554
1800	1900	160	148	308	128	164	292	174	251	425	192	263	455	218	271	489	199	270	469	210	239	449	199	259	457	183	229	412
1900	2000	101	123	224	114	126	240	128	160	288	127	149	276	143	177	320	135	166	301	172	187	359	141	168	309	131	155	287
2000	2100	88	91	179	79	100	179	73	108	181	68	115	183	92	131	223	113	123	236	104	139	243	90	123	213	88	115	203
2100	2200	53	74	127	44	63	107	46	78	124	68	79	147	56	87	143	60	95	155	62	110	172	58	90	148	56	84	139
2200	2300	51	70	121	28	41	69	26	32	58	36	47	83	31	52	83	39	74	113	59	84	143	38	58	96	39	57	96
2300	2400	40	47	87	15	12	27	9	13	22	22	19	41	20	23	43	21	37	58	44	57	101	23	30	53	24	30	54
Daily Totals																												
12hr	**07-19**	2,178	2,002	4,180	2,014	1,990	4,004	2,289	2,508	4,797	2,343	2,562	4,905	2,304	2,582	4,886	2,413	2,621	5,034	2,406	2,528	4,934	2,351	2,560	4,911	2,278	2,399	4,677
16Hr	**06-22**	2,458	2,311	4,769	2,271	2,289	4,560	2,674	2,917	5,591	2,758	2,984	5,742	2,746	3,060	5,806	2,870	3,084	5,954	2,885	3,030	5,915	2,787	3,015	5,802	2,666	2,811	5,477
18Hr	**06-00**	2,549	2,428	4,977	2,314	2,342	4,656	2,709	2,962	5,671	2,816	3,050	5,866	2,797	3,135	5,932	2,930	3,195	6,125	2,988	3,171	6,159	2,848	3,103	5,951	2,729	2,898	5,627
24Hr	**00-00**	2,631	2,501	5,132	2,398	2,431	4,829	2,779	2,997	5,776	2,902	3,085	5,987	2,886	3,180	6,066	3,019	3,239	6,258	3,083	3,224	6,307	2,934	3,145	6,079	2,814	2,951	5,765

Full Hour Counts - OS # 149 GLENGARRY ROAD SOUTH OF AUTUMN AVE

Hour Intervals		Sat 18-Mar-17			Sun 19-Mar-17			Mon 20-Mar-17			Tue 21-Mar-17			Wed 22-Mar-17			Thu 23-Mar-17			Fri 24-Mar-17			AVERAGES (Veh/Hour) 5 Day Average			AVERAGES (Veh/Hour) 7 Day Average		
From	To	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes
0000	0100	18	22	40	28	32	60	5	7	12	5	4	9	3	4	7	4	11	15	6	19	25	5	9	14	10	14	24
0100	0200	10	14	24	9	14	23	5	2	7	1	3	4	1	3	4	6	4	10	7	7	14	4	4	8	6	7	12
0200	0300	4	4	8	6	9	15	1	0	1	1	2	3	6	4	10	2	4	6	3	5	8	3	3	6	3	4	7
0300	0400	6	7	13	5	7	12	4	3	7	0	1	1	2	5	7	5	3	8	3	3	6	3	3	6	4	4	8
0400	0500	6	11	17	4	6	10	4	3	7	5	8	13	9	6	15	5	7	12	7	5	12	6	6	12	6	7	12
0500	0600	15	13	28	8	4	12	29	26	55	35	22	57	32	28	60	29	20	49	31	27	58	31	25	56	26	20	46
0600	0700	30	27	57	8	16	24	133	83	216	136	95	231	144	99	243	133	90	223	119	91	210	133	92	225	100	72	172
0700	0800	54	65	119	33	21	54	234	204	438	244	183	427	238	160	398	218	157	375	211	174	385	229	176	405	176	138	314
0800	0900	88	116	204	75	82	157	349	250	599	348	249	597	369	231	600	366	283	649	331	244	575	353	251	604	275	208	483
0900	1000	145	158	303	99	130	229	152	156	308	144	139	283	143	148	291	136	149	285	133	158	291	142	150	292	136	148	284
1000	1100	178	176	354	151	164	315	78	103	181	108	111	219	85	109	194	106	95	201	120	96	216	99	103	202	118	122	240
1100	1200	172	208	380	183	185	368	86	90	176	86	106	192	115	94	209	131	123	254	95	88	183	103	100	203	124	128	252
1200	1300	174	189	363	173	209	382	78	102	180	107	109	216	142	106	248	112	127	239	105	128	233	109	114	223	127	139	266
1300	1400	170	155	325	189	175	364	106	100	206	104	119	223	132	145	277	113	116	229	127	116	243	116	119	236	134	132	267
1400	1500	188	187	375	162	176	338	160	126	286	194	133	327	154	127	281	188	132	320	203	145	348	180	133	312	178	147	325
1500	1600	166	165	331	173	141	314	194	222	416	195	248	443	181	224	405	201	240	441	205	266	471	195	240	435	188	215	403
1600	1700	159	155	314	164	165	329	251	223	474	231	246	477	270	218	488	260	258	518	240	255	495	250	240	490	225	217	442
1700	1800	165	159	324	194	169	363	281	310	591	286	266	552	288	296	584	280	324	604	271	308	579	281	301	582	252	262	514
1800	1900	143	173	316	132	141	273	201	204	405	213	250	463	221	258	479	226	220	446	219	239	458	216	234	450	194	212	406
1900	2000	94	111	205	100	116	216	151	125	276	136	137	273	143	151	294	150	144	294	148	162	310	146	144	289	132	135	267
2000	2100	69	80	149	86	58	144	70	83	153	85	95	180	104	126	230	84	127	211	82	82	164	85	103	188	83	93	176
2100	2200	61	54	115	37	48	85	53	65	118	48	65	113	57	65	122	68	75	143	77	70	147	61	68	129	57	63	120
2200	2300	50	51	101	30	34	64	15	31	46	34	42	76	41	48	89	43	42	85	55	59	114	38	44	82	38	44	82
2300	2400	35	40	75	6	8	14	5	9	14	9	20	29	19	18	37	22	16	38	43	41	84	20	21	40	20	22	42
Daily Totals																												
12hr	**07-19**	1,802	1,906	3,708	1,728	1,758	3,486	2,170	2,090	4,260	2,260	2,159	4,419	2,338	2,116	4,454	2,337	2,224	4,561	2,260	2,217	4,477	2,273	2,161	4,434	2,128	2,067	4,195
16Hr	**06-22**	2,056	2,178	4,234	1,959	1,996	3,955	2,577	2,446	5,023	2,665	2,551	5,216	2,786	2,557	5,343	2,772	2,660	5,432	2,686	2,622	5,308	2,697	2,567	5,264	2,500	2,430	4,930
18Hr	**06-00**	2,141	2,269	4,410	1,995	2,038	4,033	2,597	2,486	5,083	2,708	2,613	5,321	2,846	2,623	5,469	2,837	2,718	5,555	2,784	2,722	5,506	2,754	2,632	5,387	2,558	2,496	5,054
24Hr	**00-00**	2,200	2,340	4,540	2,055	2,110	4,165	2,645	2,527	5,172	2,755	2,653	5,408	2,899	2,673	5,572	2,888	2,767	5,655	2,841	2,788	5,629	2,806	2,682	5,487	2,612	2,551	5,163

Full Hour Counts - WESTCOAST RD SOUTH OF CARTER RD

Hour Intervals		Sat 11-Feb-17			Sun 12-Feb-17			Mon 13-Feb-17			Tue 14-Feb-17			Wed 15-Feb-17			Thu 16-Feb-17			Fri 17-Feb-17			AVERAGES (Veh/Hour) 5 Day Average			AVERAGES (Veh/Hour) 7 Day Average		
From	To	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes
0000	0100	21	22	43	10	26	36	2	10	12	4	7	11	1	19	20	2	12	14	3	4	7	2	10	13	6	14	20
0100	0200	7	10	17	7	10	17	6	4	10	2	1	3	5	5	10	2	4	6	2	4	6	3	4	7	4	5	10
0200	0300	4	5	9	9	7	16	1	2	3	0	2	2	3	1	4	1	2	3	0	3	3	1	2	3	3	3	6
0300	0400	5	3	8	4	5	9	3	2	5	3	4	7	2	1	3	2	1	3	7	2	9	3	2	5	4	3	6
0400	0500	5	4	9	1	2	3	11	6	17	6	2	8	6	2	8	4	4	8	7	2	9	7	3	10	6	3	9
0500	0600	20	6	26	7	5	12	56	1	57	53	1	54	60	2	62	60	2	62	50	4	54	56	2	58	44	3	47
0600	0700	43	17	60	22	9	31	173	22	195	190	26	216	183	25	208	184	22	206	156	18	174	177	23	200	136	20	156
0700	0800	96	36	132	44	21	65	248	57	305	261	62	323	253	79	332	244	56	300	211	51	262	243	61	304	194	52	246
0800	0900	129	70	199	89	48	137	318	108	426	312	98	410	320	114	434	291	80	371	282	104	386	305	101	405	249	89	338
0900	1000	161	107	268	115	113	228	167	101	268	142	101	243	153	109	262	155	100	255	130	101	231	149	102	252	146	105	251
1000	1100	178	154	332	129	105	234	108	95	203	114	73	187	123	105	228	120	77	197	151	90	241	123	88	211	132	100	232
1100	1200	202	181	383	142	140	282	114	92	206	94	102	196	119	134	253	96	99	195	123	93	216	109	104	213	127	120	247
1200	1300	173	213	386	166	167	333	109	115	224	108	119	227	112	117	229	110	88	198	111	113	224	110	110	220	127	133	260
1300	1400	155	172	327	156	169	325	121	101	222	85	115	200	113	119	232	92	111	203	139	135	274	110	116	226	123	132	255
1400	1500	156	208	364	178	166	344	174	105	279	189	112	301	181	128	309	145	110	255	195	119	314	177	115	292	174	135	309
1500	1600	142	206	348	163	163	326	131	254	385	120	219	339	130	210	340	111	207	318	141	236	377	127	225	352	134	214	348
1600	1700	173	160	333	152	161	313	115	259	374	127	270	397	135	239	374	123	230	353	112	235	347	122	247	369	134	222	356
1700	1800	153	134	287	131	135	266	126	250	376	121	221	342	122	269	391	96	216	312	119	251	370	117	241	358	124	211	335
1800	1900	155	118	273	99	97	196	89	186	275	128	227	355	112	237	349	106	172	278	104	145	249	108	193	301	113	169	282
1900	2000	98	88	186	55	86	141	61	124	185	76	148	224	57	152	209	60	156	216	69	128	197	65	142	206	68	126	194
2000	2100	79	88	167	50	51	101	46	75	121	45	80	125	90	75	165	42	89	131	54	84	138	55	81	136	58	77	135
2100	2200	56	50	106	21	39	60	32	49	81	27	71	98	34	63	97	28	69	97	47	49	96	34	60	94	35	56	91
2200	2300	43	65	108	32	31	63	11	22	33	15	45	60	16	45	61	11	36	47	22	58	80	15	41	56	21	43	65
2300	2400	29	35	64	27	13	40	9	13	22	7	29	36	9	14	23	10	14	24	21	27	48	11	19	31	16	21	37
Daily Totals																												
12hr	07-19	1,873	1,759	3,632	1,564	1,485	3,049	1,820	1,723	3,543	1,801	1,719	3,520	1,873	1,860	3,733	1,689	1,546	3,235	1,818	1,673	3,491	1,800	1,704	3,504	1,777	1,681	3,458
16Hr	06-22	2,149	2,002	4,151	1,712	1,670	3,382	2,132	1,993	4,125	2,139	2,044	4,183	2,237	2,175	4,412	2,003	1,882	3,885	2,144	1,952	4,096	2,131	2,009	4,140	2,074	1,960	4,033
18Hr	06-00	2,221	2,102	4,323	1,771	1,714	3,485	2,152	2,028	4,180	2,161	2,118	4,279	2,262	2,234	4,496	2,024	1,932	3,956	2,187	2,037	4,224	2,157	2,070	4,227	2,111	2,024	4,135
24Hr	00-00	2,283	2,152	4,435	1,809	1,769	3,578	2,231	2,053	4,284	2,229	2,135	4,364	2,339	2,264	4,603	2,095	1,957	4,052	2,256	2,056	4,312	2,230	2,093	4,323	2,177	2,055	4,233

Full Hour Counts - OS # 42 ROSIER RD BETWEEN LASQUE PL AND CARRIDGE ST

Hour Intervals		Sat 18-Mar-17			Sun 19-Mar-17			Mon 20-Mar-17			Tue 21-Mar-17			Wed 22-Mar-17			Thu 23-Mar-17			Fri 24-Mar-17			AVERAGES (Veh/Hour) 5 Day Average			AVERAGES (Veh/Hour) 7 Day Average		
From	To	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes
0000	0100	31	33	64	19	31	50	5	13	18	12	13	25	7	18	25	9	16	25	9	25	34	8	17	25	13	21	34
0100	0200	16	25	41	14	19	33	2	4	6	4	9	13	5	10	15	6	9	15	9	6	15	5	8	13	8	12	20
0200	0300	12	13	25	10	13	23	4	4	8	5	4	9	2	5	7	5	3	8	4	7	11	4	5	9	6	7	13
0300	0400	12	12	24	17	11	28	2	3	5	4	3	7	6	0	6	7	4	11	11	7	18	6	3	9	8	6	14
0400	0500	15	7	22	8	11	19	23	2	25	21	4	25	20	6	26	21	9	30	22	5	27	21	5	27	19	6	25
0500	0600	21	12	33	17	11	28	75	6	81	65	8	73	69	8	77	64	5	69	64	10	74	67	7	75	54	9	62
0600	0700	55	17	72	26	8	34	203	25	228	226	32	258	225	32	257	235	31	266	223	28	251	222	30	252	170	25	195
0700	0800	80	30	110	59	19	78	280	64	344	267	78	345	275	81	356	255	78	333	235	55	290	262	71	334	207	58	265
0800	0900	165	60	225	126	50	176	358	162	520	363	172	535	371	182	553	351	155	506	362	173	535	361	169	530	299	136	436
0900	1000	222	82	304	172	62	234	185	108	293	198	103	301	181	97	278	213	103	316	196	116	312	195	105	300	195	96	291
1000	1100	235	125	360	223	98	321	141	87	228	129	78	207	168	91	259	136	76	212	135	70	205	142	80	222	167	89	256
1100	1200	192	126	318	192	116	308	115	93	208	140	85	225	137	89	226	107	89	196	135	88	223	127	89	216	145	98	243
1200	1300	205	157	362	197	125	322	111	88	199	133	108	241	137	109	246	120	95	215	127	95	222	126	99	225	147	111	258
1300	1400	167	129	296	171	136	307	116	90	206	117	87	204	124	94	218	169	118	287	119	103	222	129	98	227	140	108	249
1400	1500	172	127	299	164	135	299	152	132	284	162	121	283	156	140	296	195	142	337	161	158	319	165	139	304	166	136	302
1500	1600	164	119	283	165	128	293	196	157	353	209	173	382	211	174	385	194	167	361	230	182	412	208	171	379	196	157	353
1600	1700	157	141	298	154	166	320	187	177	364	164	175	339	197	152	349	195	171	366	157	163	320	180	168	348	173	164	337
1700	1800	165	141	306	147	130	277	169	195	364	196	192	388	163	194	357	198	194	392	197	194	391	185	194	378	176	177	354
1800	1900	138	127	265	131	137	268	148	163	311	163	190	353	168	182	350	196	175	371	174	168	342	170	176	345	160	163	323
1900	2000	112	110	222	114	110	224	125	132	257	144	159	303	140	121	261	154	175	329	146	161	307	142	150	291	134	138	272
2000	2100	104	96	200	78	92	170	94	111	205	105	113	218	100	123	223	94	130	224	124	108	232	103	117	220	100	110	210
2100	2200	62	86	148	54	52	106	62	68	130	56	80	136	53	77	130	59	91	150	87	95	182	63	82	146	62	78	140
2200	2300	50	73	123	31	34	65	34	40	74	32	50	82	40	45	85	44	56	100	59	61	120	42	50	92	41	51	93
2300	2400	35	60	95	12	16	28	12	16	28	9	17	26	21	39	60	24	39	63	35	55	90	20	33	53	21	35	56
Daily Totals																												
12hr	07-19	2,062	1,364	3,426	1,901	1,302	3,203	2,158	1,516	3,674	2,241	1,562	3,803	2,288	1,585	3,873	2,329	1,563	3,892	2,228	1,565	3,793	2,249	1,558	3,807	2,172	1,494	3,666
16Hr	06-22	2,395	1,673	4,068	2,173	1,564	3,737	2,642	1,852	4,494	2,772	1,946	4,718	2,806	1,938	4,744	2,871	1,990	4,861	2,808	1,957	4,765	2,780	1,937	4,716	2,638	1,846	4,484
18Hr	06-00	2,480	1,806	4,286	2,216	1,614	3,830	2,688	1,908	4,596	2,813	2,013	4,826	2,867	2,022	4,889	2,939	2,085	5,024	2,902	2,073	4,975	2,842	2,020	4,862	2,701	1,932	4,632
24Hr	00-00	2,587	1,908	4,495	2,301	1,710	4,011	2,799	1,940	4,739	2,924	2,054	4,978	2,976	2,069	5,045	3,051	2,131	5,182	3,021	2,133	5,154	2,954	2,065	5,020	2,808	1,992	4,801

Full Hour Counts - PARKER RD SOUTH OF ORATIA CHURCH

Hour Intervals		Sat 11-Feb-17			Sun 12-Feb-17			Mon 13-Feb-17			Tue 14-Feb-17			Wed 15-Feb-17			Thu 16-Feb-17			Fri 17-Feb-17			AVERAGES (Veh/Hour) 5 Day Average			AVERAGES (Veh/Hour) 7 Day Average		
From	To	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes	North bound	South bound	Both Lanes
0000	0100	7	11	18	7	3	10	4	0	4	1	0	1	2	1	3	2	1	3	0	1	1	2	1	2	3	2	6
0100	0200	0	1	1	5	3	8	0	1	1	0	1	1	0	0	0	1	0	1	0	0	0	0	0	1	1	1	2
0200	0300	2	0	2	0	2	2	0	0	0	0	0	0	1	0	1	1	0	1	2	0	2	1	0	1	1	0	1
0300	0400	0	3	3	2	1	3	0	0	0	1	1	2	0	0	0	1	1	2	1	1	2	1	1	1	1	1	2
0400	0500	2	1	3	0	0	0	3	3	6	0	0	0	1	1	2	0	0	0	0	1	1	1	1	2	1	1	2
0500	0600	4	9	13	3	3	6	2	14	16	1	7	8	0	7	7	3	7	10	4	10	14	2	9	11	2	8	11
0600	0700	5	3	8	2	11	13	15	28	43	16	38	54	17	40	57	14	33	47	8	30	38	14	34	48	11	26	37
0700	0800	12	27	39	4	11	15	20	71	91	21	62	83	24	69	93	16	58	74	20	52	72	20	62	83	17	50	67
0800	0900	17	37	54	5	23	28	35	69	104	21	62	83	33	68	101	23	68	91	27	52	79	28	64	92	23	54	77
0900	1000	24	33	57	18	37	55	20	41	61	30	32	62	29	33	62	23	38	61	24	30	54	25	35	60	24	35	59
1000	1100	35	39	74	24	26	50	31	23	54	16	26	42	28	26	54	23	28	51	24	36	60	24	28	52	26	29	55
1100	1200	36	43	79	26	27	53	20	27	47	26	22	48	29	33	62	31	29	60	34	36	70	28	29	57	29	31	60
1200	1300	41	37	78	27	33	60	28	28	56	31	26	57	32	29	61	23	26	49	37	36	73	30	29	59	31	31	62
1300	1400	40	33	73	34	27	61	32	25	57	41	31	72	32	31	63	41	29	70	22	28	50	34	29	62	35	29	64
1400	1500	48	38	86	34	36	70	33	31	64	23	43	66	32	39	71	26	32	58	32	37	69	29	36	66	33	37	69
1500	1600	39	28	67	48	30	78	70	43	113	44	19	63	44	24	68	50	31	81	60	37	97	54	31	84	51	30	81
1600	1700	32	33	65	42	24	66	61	34	95	61	35	96	53	41	94	65	41	106	55	35	90	59	37	96	53	35	87
1700	1800	27	39	66	38	33	71	67	34	101	54	29	83	66	27	93	42	26	68	62	43	105	58	32	90	51	33	84
1800	1900	29	31	60	27	26	53	42	35	77	56	43	99	85	31	116	46	27	73	33	36	69	52	34	87	45	33	78
1900	2000	15	17	32	21	18	39	24	17	41	27	22	49	48	23	71	40	13	53	31	15	46	34	18	52	29	18	47
2000	2100	32	27	59	16	16	32	18	8	26	22	12	34	22	54	76	18	15	33	23	15	38	21	21	41	22	21	43
2100	2200	7	4	11	13	5	18	15	8	23	18	4	22	15	15	30	12	5	17	16	14	30	15	9	24	14	8	22
2200	2300	22	5	27	10	5	15	3	4	7	4	1	5	8	5	13	6	2	8	12	7	19	7	4	10	9	4	13
2300	2400	10	3	13	6	6	12	4	1	5	8	4	12	4	4	8	2	3	5	8	4	12	5	3	8	6	4	10
Daily Totals																												
12hr	07-19	380	418	798	327	333	660	459	461	920	424	430	854	487	451	938	409	433	842	430	458	888	442	447	888	417	426	843
16Hr	06-22	439	469	908	379	383	762	531	522	1,053	507	506	1,013	589	583	1,172	493	499	992	508	532	1,040	526	528	1,054	492	499	991
18Hr	06-00	471	477	948	395	394	789	538	527	1,065	519	511	1,030	601	592	1,193	501	504	1,005	528	543	1,071	537	535	1,073	508	507	1,014
24Hr	00-00	486	502	988	412	406	818	547	545	1,092	522	520	1,042	605	601	1,206	509	513	1,022	535	556	1,091	544	547	1,091	517	520	1,037