

**Sinton Road and Clarks Lane, Whenuapai
Whenuapai East - Proposed Plan Change**

Integrated Transportation Assessment

8 November 2024





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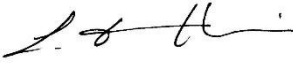
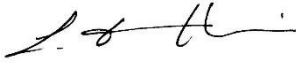
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1 INTRODUCTION

Commute Transportation Consultants (“**Commute**”) have been commissioned to assess the transportation effects of a Proposed Plan Change (PPC) at 10 - 16 Sinton Road and 15, 17 and 17a Clarks Lane in Whenuapai (“**the Site**”).

The PPC is in the form of a new precinct to be known as Whenuapai East Precinct and cover some 16.65 hectares that will provide approximately 9.6ha of Residential - Mixed Housing Urban zone, 3.8ha of Residential - Mixed Housing Suburban zone and 2.9ha Open Space - Informal Recreation zoned land (including future esplanade reserve) and has an estimated yield of 500-600 dwellings.

The internal road network will connect to Clarks Lane and Sinton Road via a number of new intersections and connect to the wider network at Brigham Creek Road to the west.

This report also reviews the traffic engineering components of the proposal and provides an assessment against the relevant provisions of the Auckland Unitary Plan (“**AUP**”). In particular, this report reviews the following:

- A description of the sites and their surrounding transport environment;
- A description of the key transport-related aspects of the proposed development;
- Intersection design;
- Ability of the network to accommodate the estimated dwelling yield;
- Proposed road cross sections and long sections;
- The proposed form of access and egress arrangements for vehicles and pedestrians;
- Parking and access provisions; and
- The adequacy of the proposed servicing arrangements.

By way of summary, it is considered that the PPC, as detailed in this report, will have minimal traffic effects on the function, capacity and safety of the surrounding transport network. The development has good accessibility to various transport modes: walking, cycling, bus (assuming the recommended upgrades occur with public transport), and private vehicle. The effects of the proposed increase in vehicles are expected to be minimal and intersections are capable of accommodating this additional traffic. The proposed precinct standards will deliver an internal transport network that will be appropriately designed and will operate safely and efficiently.

Overall, it is concluded that there is no reason from a traffic engineering or transportation planning perspective to preclude approval of the PPC.

2 EXISTING ENVIRONMENT

2.1 SITE LOCATION

The sites have an approximate combined size of 16.65ha. All are located on the northern side of Sinton Road / Clarks Lane.

The site is currently zoned Future Urban Zone in the Unitary Plan.

Figure 2-1 shows the proposed Plan Change area and site locations within this, with respect to the existing road network and Figure 2-2 shows the existing Unitary Plan zoning map.

Figure 2-1: Site Locations

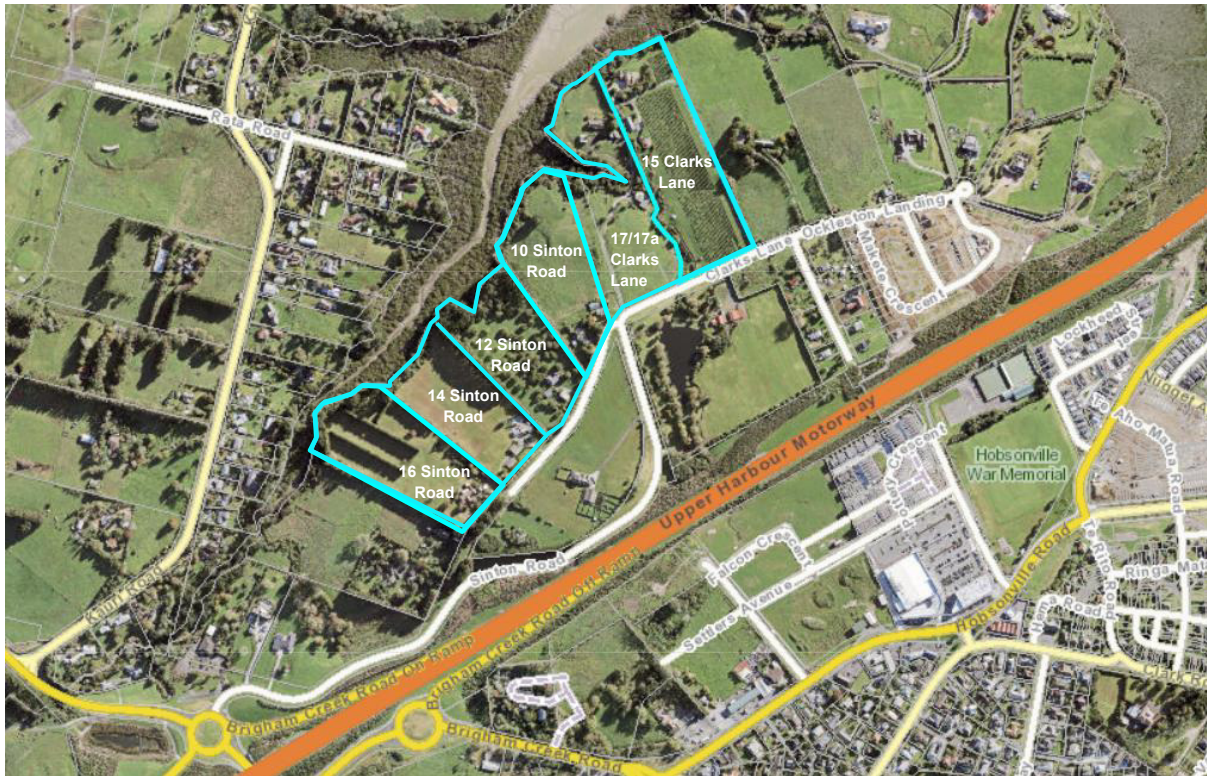
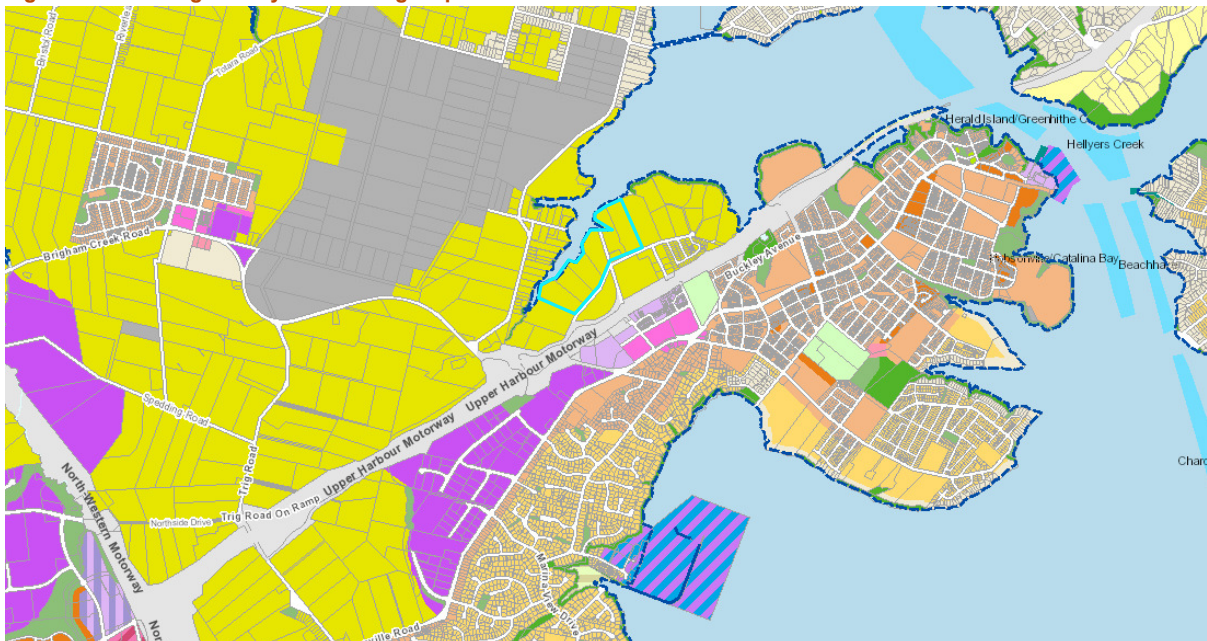


Figure 2-2: Existing Unitary Plan zoning map



2.2 EXISTING ROAD ENVIRONMENT

Neither Sinton Road nor Clark Lane are classified as arterial roads by the AUP. Both roads have a 50km/hr posted speed limit.

Sinton Road extends to the east from the western roundabout in the SH18 / Brigham Creek Road interchange. For the first 800m it has two lanes, and an overall carriageway width of 9.5m with kerbs

either side. It then narrows to 5m and takes on a more rural form. There are currently no pedestrian paths along its length.

Photograph 1 shows Sinton Road near the Site.

Photograph 1: Sinton Road looking west



Clarks Lane extends to the east from Sinton Road. Between Sinton Road and Ockleston Landing it has a carriageway width of 5.5-6m with a rural form, no kerbs or pedestrian paths are present. At its intersection with Ockleston Landing, Clarks Lane extends towards SH18 where a 2.0m wide pedestrian / cyclist overbridge is provided which connects with Memorial Park Lane in Hobsonville Point, and the Hobsonville Town Centre and the arterial Hobsonville Road to the south (including bus stops).

Photograph 2 shows Clarks Lane near the Site.

Photograph 2: Clarks Lane looking east.



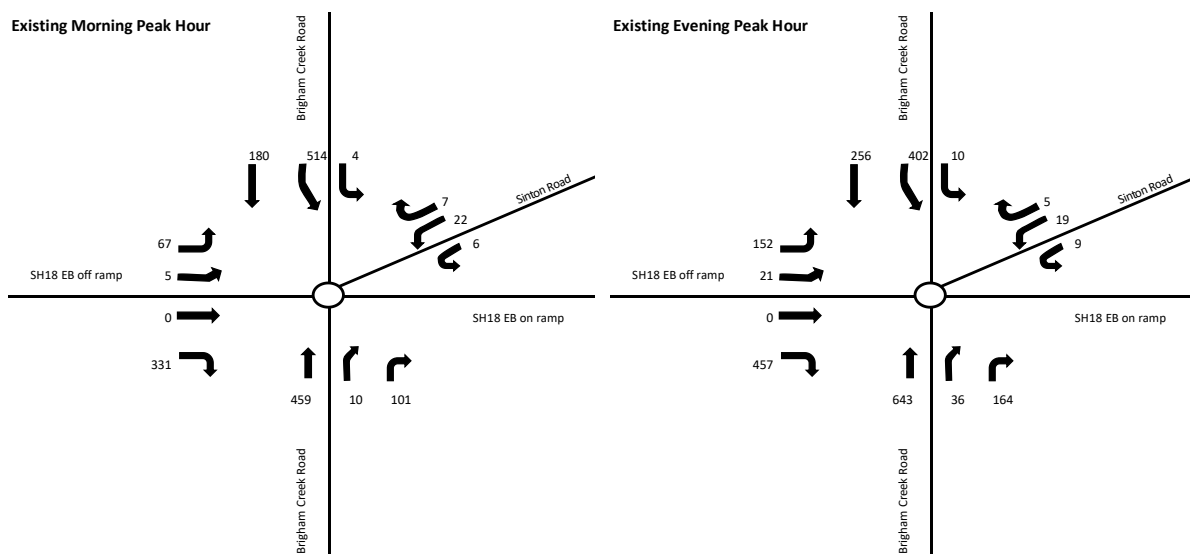
2.3 CURRENT TRAFFIC VOLUMES

No traffic volume data was available for either Sinton Road or Clarks Lane on the Auckland Transport traffic count database.

Traffic surveys were undertaken by Commute at the Brigham Creek roundabout in March 2022. These showed that Sinton Road carried 57 vehicles per hour (vph) in the AM peak and 100 vph in the PM peak.

Figure 2-3 below shows the surveyed peak hour volumes at the Sinton Road / Brigham Creek Road / SH18 on and off ramps roundabout.

Figure 2-3: Survey results Brigham Creek / SH18 EB ramps / Sinton Road



2.4 ROAD SAFETY ASSESSMENT

An assessment of the surrounding area's safety record has been carried out using the Waka Kotahi's CAS database for all reported crashes near the site between 2018 and 2022, as well as any available data for 2023. The search focused on all reported crashes occurring on Sinton Road, Clarks Lane and at the Brigham Creek / Sinton Road roundabout.

Seven crashes were reported within the search criteria, one on Sinton Road, four on the Brigham Creek SH18 offramp and two on the Brigham Creek SH18 onramp.

The crash which on Sinton Road, occurred when a driver under the influence of alcohol was speeding and lost control of their vehicle. This resulted in serious injuries.

Of the two crashes at the SH18 EB onramp one resulted in no injuries and the other in minor injuries. The no injury crash occurred when a driver accelerated too hard and lost control in the wet whilst travelling along the onramp, and the minor injury crash occurred when a vehicle did not give way when changing lanes to enter the on-ramp.

Of the four crashes that occurred on the SH18 EB offramp three resulted in minor injuries and one in no injuries. Of the minor injury crashes, one was a rear end type crash, one occurred when a vehicle failed to stay within its lane as it entered the roundabout from the offramp and the other was a head on type crash which occurred when a vehicle turning left from the offramp took the corner too wide and

hit oncoming traffic. The non injury crash occurred when a vehicle failed to give-way whilst entering the roundabout from the off-ramp.

No crashes occurred involving vehicles turning into or out of vehicle crossings on Sinton Road and Clarks Lane or involving vehicles turning into or out of Sinton Lane from the Bringham Creek roundabout. It is not expected that the crash record. Therefore, from the assessment of the crash history, there is no indication of any significant safety concerns from the subject site.

It is noted however, that there is notable growth forecasted in this area, and as part of the growth and development the road environment is expected to change.

2.5 SITE ACCESSIBILITY

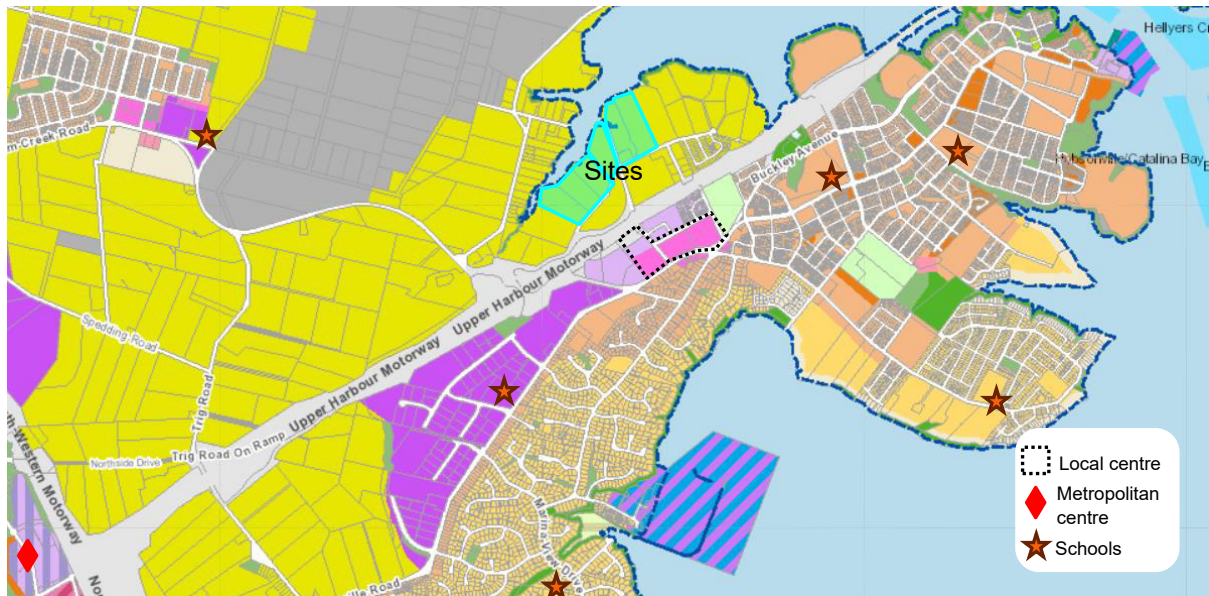
2.5.1 PRIVATE VEHICLES

The local area features many attractions for residents of the site. The site is well connected to the local shopping and employment centre at Hobsonville Road, which are located 2.7km drive away (5 minutes) via Bringham Creek Road / Hobsonville Road. The local town centre constitutes a few supermarkets, retail stores and restaurants which is considered to satisfy the day to day needs of residents. There are also a number of schools located within Hobsonville and Whenuapai for children of all ages. Given the amenities in the local area, residents will likely conduct trips within Hobsonville for day-to-day activities (other than work commute).

The nearest Metropolitan town centre is Westgate some 5km (8 minutes) to the west of the site via SH18.

Figure 2-4 shows the location of the site in relation to the local centre, metropolitan centre and local schools (including both primary and high school).

Figure 2-4: Local Attractions



In addition, the site is well located with regards to road connectivity to the wider Auckland Region. The site is located 1km from the SH18 east and west bound on/off ramps, which now links with both SH16 and SH1 connecting the site with the wider Auckland Region.

2.5.2 PUBLIC TRANSPORT

The closest bus stops are located on Hobsonville Road near the intersection with Memorial Park Lane. These are 800m – 1.3km from the site (depending on which part of the site you are travelling to / from) or a 10-20 minute walk via the pedestrian overbridge on Clarks Lane.

There are currently no available cycle parking spaces adjacent to the existing bus stops. However, there is provision available at the adjacent commercial area (corner of Memorial Park Lane and Hobsonville Road) or residents are able to walk here if they know they are catching a bus.

The bus stops serve the following routes:

- Bus route 120 (Constellation Station, Greenhithe, Hobsonville Rd, Westgate, Don Buck Rd, Henderson)
- Bus route 112 (Hobsonville Point, West Harbour, Westgate)
- Bus route 114 (Hobsonville Point, Whenuapai, Westgate).

Routes 120 and 112 are classified as a connector route with services running at least every 30 minutes between 7am and 7pm, seven days a week. Route 114 is classified as a connector route with services running at least every 60 minutes, seven days a week.

Figure 2-5 shows the public transport provisions in the local area, as well the location of the nearest bus stops in relation to the site and the walk route.

Figure 2-5: Public transport provisions in the area



From Westgate residents can use a number of different bus routes to various areas throughout Auckland (CBD, Kumeu, Henderson and Albany) and in particular the express bus service known as WX1 which links to Auckland CBD which leaves every 10 minutes.

2.5.3 CYCLING

Given the site's location in a semi-rural area, bounded by the State Highway, there are limited cycling routes available immediately adjacent to the sites.

However, the speed limit around the site is 50 km/hr and therefore on road cycling is a viable mode of transport between the site and local attractions using the pedestrian and cycle connection across SH18 at Clarks Lane which crosses SH18 and connects with Memorial Park Lane. The overbridge provides a good connection both to local shopping, employment and schools in Hobsonville as well as to the shared and on road cycle facilities in Hobsonville and Hobsonville Point via a series of local and low volume roads. From here routes further afield such as to the North Shore via Upper Harbour Bridge and Greenhithe are available.

There are no cycle lanes, shared paths, or grade separated footpaths within the peninsula, resulting in a poor environment for cyclists.

The overbridge provides 3m wide approaches at each end suitable for sharing between cyclists and pedestrians. However, the bridge itself is some 2.0m wide. While this is narrower than desirable, it is existing infrastructure (which is currently under utilised) and cyclists can dismount when passing a pedestrian if need be. Photographs 3 and 4 show the bridge and the approach.

Photograph 3: Motorway walking / cycling overbridge.



Photograph 4: Clarks Lane looking east.



Based on NZTA's Research Report 426, the average cycling trip length is approximately 3 kilometres. Figure 2-6 shows an approximate cycling catchment for the site based on a 3.0km radius, on the Auckland Regional Cycle Network Map.

Figure 2-6: Cycling Catchment



2.5.4 WALKING

There are no existing pedestrian footpaths on either Sinton Road or Clarks Lane.

Within the wider area, in the short to medium term pedestrians are likely to focus on amenities and facilities to the south of the site, on the other side of SH18 in Hobsonville.

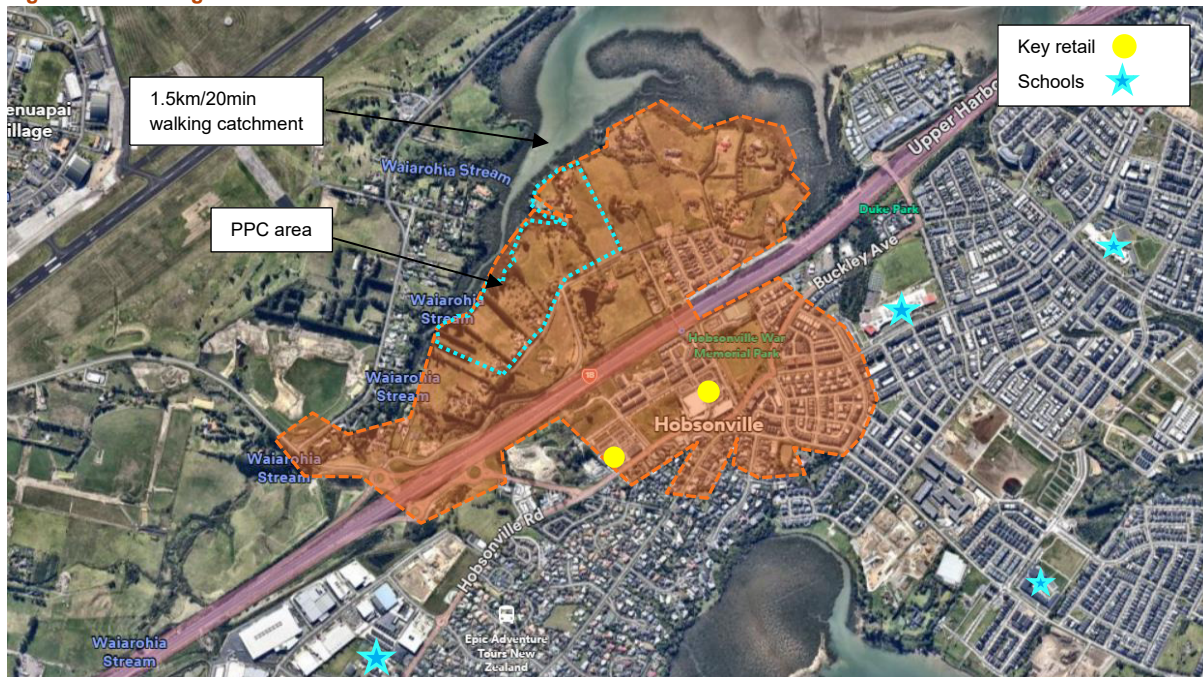
Pedestrian access to the north is limited by the Waiarohia Stream directly to the north of the plan change area. There is potential for a bridge over this stream to provide an alternative access to the Sinton Peninsula as identified in the Whenuapai Structure Plan 2016, however the need for, and exact timing and nature of this is unknown. Without a bridge (or similar here) pedestrian walk times and distances are substantially greater to the north (with residents having to travel west to Brigham Creek Road in order to travel north).

Both Clarks Lane and Sinton Road in the vicinity of the Site do not currently provide pedestrian footpaths, however there is an existing 2m wide pedestrian overbridge at the southern end of Clarks Lane, as described above.

Using a practical walking distance of 1.5 kilometres and the 15th percentile walking speed of a typical fit, healthy adult of 1.2 m/s, a practical journey time is approximately 20 minutes.

Based on this the primary walking catchment area for the site is shown in Figure 2-6 below.

Figure 2-7: Walking Catchment



As shown above, the local schools are located just outside of the practical walking distance, with two key retail areas located within walking distance of the site.

The PPC introduces improvements to pedestrian and cycle connectivity and safety that are expected to deliver good walking connections within the Site, to the wider area and the Clarks Lane overbridge.

3 PLANNING POLICY

3.1 GENERAL

This section provides a review of the PPC in relation to established policy and plans. The review focuses on the transportation components of the following documents:

- Auckland Plan 2050;
- Auckland's Climate Plan and Transport Emissions Reduction Pathway;
- Auckland Regional Land Transport Plan;
- Auckland Transport Alignment Project 2021-2031;
- Auckland Regional Public Transport Plan 2018-2028;
- Unitary Plan;
- Auckland Design Manual 2014; and
- Auckland Transport Design Manual.

3.2 AUCKLAND PLAN 2050

The Auckland Plan 2050 sets the direction for how Auckland will grow and develop over the next 30 years. It responds to the key challenges Auckland faces today – high population growth, sharing prosperity among all Aucklanders, and reducing environmental damage. The key transport related outcome is detailed below:

“Aucklanders will be able to get where they want to go more easily, safely and sustainably”.

The Auckland Plan 2050 details seven focus areas in order to achieve this outcome:

- Make better use of existing transport networks;
- Target new transport investment to the most significant challenges;
- Maximise the benefits from transport technology;
- Make walking, cycling and public transport preferred choices for many more Aucklanders;
- Better integrate land-use and transport;
- Move to a safe transport network, free from death and serious injury; and
- Develop a sustainable and resilient transport system.

It is considered that the development of the PPC Site aligns well with the Auckland Plan 2050, as it will provide additional housing in close proximity to the Hobsonville local centre and the Westgate Metropolitan Centre. Further, it is located in close proximity to the future Upper Harbour Rapid Transit route (SH18) which will assist with making the best use of existing corridors and infrastructure.

The development of the PPC Site will also result in upgrades to existing corridors on Sinton Road and Clarks Lane which will improve safety and provide alternative modes of travel for residents and visitors.

3.3 AUCKLAND CLIMATE PLAN

Published in December 2020, the Auckland Climate Plan outlines the City's strategic plans and goals to work towards a region that is resilient and well connected to the environment. One of the primary targets of the plan is to halve the region's emissions by 2030 and to achieve net zero emissions by 2050.

The plan highlights that transportation is the single biggest contributor to emissions in Auckland, accounting for nearly 44% of all emissions in the region. To reduce transportation related emissions, the plan outlines the following targets:

- Reduce private vehicle kilometres by 12% through avoided motorised travel such as remote working;
- Increase in public transport usage from 7.8% in 2020 to 24.5% in 2030, and 35% in 2050;
- Increase in cycling as a mode of travel from 0.9% in 2020 to 7% in 2030, and 9% in 2050;
- Increase in walking as a mode of travel from 4.1% in 2020 to 6% in 2030.

The development of the PPC Site will provide housing within walking and cycling distance of existing education, employment and retail areas in Hobsonville. Furthermore, the PPC Site has access to an existing bus service within walking and cycling distance on Hobsonville Road (which provide access to the Hobsonville Ferry Terminal and the Westgate express bus services to the City Centre), and is in close proximity to the future Upper Harbour Rapid Transit route. As such, the PPC is considered to be aligned with Auckland's Climate Plan as it provides resilient land use where future residents have travel choice options available.

3.4 TRANSPORT EMISSIONS REDUCTION PATHWAY

The Transport Emissions Reduction Pathway ("**TERP**") is Auckland Council's and Auckland Transport's pathway to reducing Auckland's emissions. The document sets Auckland's target of emissions, with the goal of halving Tāmaki Makaurau's emissions by 2030 and net zero emissions by 2050.

Four broad objectives are identified in the TERP, each with a subset of objectives as summarised in Table 1 below.

Table 1: TERP Objectives

Broad Objectives	Sub-objectives
Reduce reliance on cars and support people to walk, cycles and use public transport	1. Supercharge walking and cycling
	2. Massively increase public transport patronage
	3. Prioritise and resource sustainable transport
	4. Reduce travel where possible and appropriate
	5. Safe low-traffic neighbourhoods for people
	6. Build up not out
Rapidly adopt low-emissions vehicles	7. Electrify private vehicles
	8. Enable new transport devices
Begin work now to decarbonise heavy transport and freight	9. Low emissions public transport
	10. Efficient freight and services
Empower Aucklanders to make sustainable transport choices	11. Empower Aucklanders to make sustainable transport choices

Achieving these objectives will be the responsibility of central government, local government, developers, and the general public. The underlying direction and goals are to improve access to and the use of sustainable travel.

The following sections summarise the proposed and possible transport infrastructure within the PPC that will assist in achieving the TERP goals.

3.4.1 MODAL ASSESSMENT

A modal assessment has been undertaken by comparing the target mode splits of the TERP against the 2018 census data, to understand if the targets are currently achieved in any suburbs within Auckland. Figure 3-1 below summarises the TERP mode split targets.

Figure 3-1: TERP Mode Split Targets

Mode (rounded)	Trip share		Mode share by distance	
	2019	2030	2019	2030
Walking	11%	22%	1%	3%
Cycling	1%	8%	<1%	5%
Micromobility	<1%	9%	<1%	8%
E-motos, e-mopeds	<1%	4%	<1%	4%
Microcar	<1%	3%	<1%	4%
Train	1%	9%	1%	15%
Bus	3%	13%	3%	12%
Ferry	<1%	1%	<1%	2%
Light Vehicle	83%	32%	94%	47%

The census data is specific to journey to work information, however it is recognised that commuter trips are a good starting point for change given:

- The trips are regular and therefore habits can be formed,
- The trips are routine, with many jobs having constant start and end times, and
- The trips are typically of notable distance (compared to retail and entertainment trips where the closest attraction can be utilised).

It is also noted that the 2018 census data included slightly different mode categories to that in the TERP, including travel as a passenger and excluding micromobility, e-motos/e-mopeds, microcar. For the purpose of this assessment, passenger trips have been classified as bus trips as it is seen to be a form of shared transport.

3.4.1.1 WALKING

The suburbs that currently achieve 22% of commuter trips via walking are either located in Auckland's City Centre or on the fringe of Auckland's City Centre. It is thought that the decision-making process behind these trips is likely to be a combination of convenience, cost of parking, and access to a vehicle.

These areas are not comparable to the PPC Site, with Auckland's City Centre being the primary employment area of Auckland, and the site located a notable distance from the City Centre. Recognising that the PPC is for a predominantly residential purpose, the following infrastructure and policies are proposed / recommended to be incorporated:

- New footpaths will be provided on all public roads within the PPC Site and footpath upgrades will be taken between the PPC site to the nearby overbridge on Clarks Lane. These will connect the PPC site internally, as well as externally to existing nearby attractions such as the local schools, employment areas, public transport routes and parks.

3.4.1.2 CYCLING

As per the 2018 census data, there is not one suburb in Auckland that is shown to achieve 8% of commuter trips travelling via cycling. This suggests that there is a notable barrier discouraging people from choosing this mode of travel which could be infrastructure, education, access to equipment, or other.

The suburbs with the greatest percentages of commuter cyclists were generally located next to separated cycle facilities and located in central Auckland. In particular, suburbs located along the north-western cycleway from Point Chevalier to the city were recognised.

Whilst the PPC Site is not located within Central Auckland and the extent of cycle infrastructure in the vicinity of the site is limited, to help improve cycling numbers the following infrastructure and policies are proposed/recommended to be considered:

- New shared path to be provided between the PPC site and the nearby overbridge on Clarks Lane. These will connect the PPC site internally, as well as externally to existing nearby attractions such as the local schools, employment areas, public transport routes and parks.
- Consideration should be given to providing infrastructure on individual properties that ensures public and private bicycle parking is accessible, sheltered from the weather, and can be secured by more than a bicycle chain lock (to be designed at resource consent stage as required by Chapter E27 of the AUP).

3.4.1.3 MICROMOBILITY

Micromobility as a specified mode of transport is a relatively new concept, however the human-powered forms of micromobility transport have been around for a long time. It refers to small, lightweight wheeled vehicles and includes the likes of scooters and skateboards both electric and kick powered.

To encourage the option of micromobility travel within the PPC Site the following considerations are recommended:

- Stairs in public places should be avoided to improve accessibility via micromobility transport.
- It is anticipated that, through designing to current standards, the roading and infrastructure (in particular the shared paths) will accommodate the needs of these.

3.4.1.4 E-MOTOS / E-MOPEDS AND MICROCAR

These modes of travel are only starting to increase in popularity in New Zealand, with a very small ownership rate. It is anticipated that, through designing to current standards, the roading and infrastructure will accommodate the needs of these vehicles.

3.4.1.5 TRAIN

The target model split for train travel is 9% which is currently only achieved for commuter travel in suburbs that are located on the train line. Travel via train is likely to be most attractive during commuter periods, with the mode split likely to drop outside of these times.

The PPC Site is not located within the vicinity of a railway line and this is not a viable mode of transport from this location. As such, no incentives are proposed to encourage this mode of travel for the PPC.

3.4.1.6 BUS

The commuter data shows that 39% of suburbs achieve the bus target currently. As mentioned above, the census data is swayed through counting passengers as a shared/bus trip, however the discrepancy is still large whether the passengers are included or excluded.

The majority of suburbs that achieve the 13% mode split target are located in Auckland City Centre, North Shore, or central Auckland suburbs. It is thought that high uptake in these suburbs is likely to represent a strong correlation between residence and employment in the City Centre or along the Northern Busway. It is also noted that there are also a large number of services connecting these suburbs, with many of these being frequent services.

To encourage residents of the PPC Site to consider travelling via bus the following infrastructure and policies are proposed/recommended to be considered:

- Provision of footpaths on all existing or proposed new roads and between the PPC site and the Clarks Lane overbridge, to enable walking to existing bus routes on Hobsonville Road which link to Hobsonville Ferry and Westgate which in turn links to wider areas on Auckland including the CBD.

The presence of the PPC will also increase the viability of the future Upper Harbour Rapid Transit route (buses) and a potential station in the area.

3.4.1.7 FERRY

The nearest ferry transport is at Hobsonville Point and can be reached via a connecting bus route (routes 112 and 114) along Hobsonville Road.

To encourage residents of the PPC Site to consider travelling via ferry the following infrastructure and policies are proposed/recommended to be considered:

- Provision of footpaths on all existing or proposed new roads and between the PPC site and the Clarks Lane overbridge, to enable walking to existing connector bus routes on Hobsonville Road.

3.4.1.8 LIGHT VEHICLE (CARS)

The only suburbs that currently achieve the light vehicle target (less than 32% travel via private vehicle) are in the City Centre. As per the walking mode split in this area, it is thought that the decision-making process behind these trips is likely to be a combination of convenience, cost of parking, and access to a vehicle.

There are two ways to reduce light vehicle trips, being to:

1. Incentivise non-light vehicle trips by making alternate modes more attractive and accessible, and
2. Disincentivise light vehicle trips through making these trips challenging by the addition of parking restrictions.

The above sections have detailed the incentives that are recommended to be undertaken in and around the PPC Site to encourage travel via modes other than light vehicle. Some additional consideration to disincentivise light vehicle travel include:

- Parking and housing could be decoupled such that those who do not need a parking space do not find themselves paying for an unused parking space (i.e. through parking in COALs). This may lead to operational challenges with people parking illegally which would then require enforcement.

It is noted that NZTA has indicated a target for a 20% reduction in Vehicle Kilometres Travelled (VKT) by 2035. The PPC will provide approximately 500-600 houses within walking and cycling distance of the Hobsonville including nearby bus feeder routes. As such, the PPC is considered to be aligned with targets in that it provides residential land use where residents have travel choice options available.

3.5 AUCKLAND REGIONAL LAND TRANSPORT PLAN 2024 – 2034

The Auckland Regional Land Transport Plan (“**RLTP**”) forms part of the National Land Transport Programme and represents the combined intentions of NZ Transport Agency Waka Kotahi (“**Waka Kotahi**”), Auckland Transport (“**AT**”), and KiwiRail to respond to growth and other challenges facing Auckland in the next 10 years.

The general surrounding area is currently rural in nature, located approximately 23km northwest of the Auckland City Centre. In the general PPC area, the RLTP includes upgrades to the Squadron Drive interchange walking and cycling provisions, the provision of the Upper Harbour Rapid Transit route, and Northwest growth improvements.

The proposed development of the PPC Site is considered to be compatible with the surrounding and proposed transport environment and offers alternative travel modes to private vehicle, with the options of walking, and cycling between the site and key local attractions. The Site is well-located to access and utilise transport upgrades in the vicinity as they come online over time.

3.6 AUCKLAND TRANSPORT ALIGNMENT PROJECT 2021 – 2031

On 12 March 2021 the Minister of Transport released the Auckland Transport Alignment Project 2021-2031 (**“ATAP”**) programme which will invest approximately \$31.4 billion into critical transport infrastructure and services throughout Auckland. The ATAP is focused on encouraging the shift from private cars to public transport, walking and cycling and addressing Auckland’s longer-term challenges of climate change and housing development.

The development of the PPC Site will help address Auckland’s housing challenges by providing additional housing supply. Furthermore, the PPC Site is located within walking distance of community parks and a number of employment opportunities and within cycling distance of four schools. As such, the PPC allows for additional residential development within walking and cycling distance of community amenities, and therefore provides the opportunity for walking and cycling to be used as a mode of transport.

3.7 AUCKLAND REGIONAL PUBLIC TRANSPORT PLAN 2023-2031

The Auckland Regional Public Transport Plan 2023 – 2031 (**“RPTP”**) seeks to deliver an improved public transport network in Auckland by increasing public transport frequency along key transport corridors.

The vision of the RPTP is to *“massively increase public transport use to reduce congestion, improve access for Aucklanders, support the economy and enhance the environment”*. To achieve this vision, the RPTP features five goals:

1. Services providing an excellent customer experience;
2. Enhancing the environment and tackling the climate emergency;
3. Safe and accessible transport for everyone;
4. Integrating public transport into a growing Auckland;
5. Funding and delivering public transport transparently.

The development of the PPC Site will increase the number of residents that are located near the existing bus routes on Hobsonville Road, which improves the patronage and viability of the existing bus routes, including the newly operational express services from Westgate to the City Centre, and the future Upper Harbour Rapid Transport route (being the number of services and their frequencies).

3.8 AUCKLAND UNITARY PLAN

The Unitary Plan has the following objectives (updated to take account of PC79) with regard to the region’s transport infrastructure under Chapter E27 (Transport):

- 1) *Land use and all modes of transport are integrated in a manner that enables:*
 - a. *the benefits of an integrated transport network to be realised; and*
 - b. *the adverse effects of traffic generation on the transport network to be managed.*

- 2) An integrated public transport network, including public transport, walking, cycling, private vehicles and freight, is provided for.
- 3) Parking, including accessible car parking and loading supports urban growth, and a quality compact urban form
- 4) Parking, including accessible car parking, loading and access is safe and efficient and, where parking is provided, it is commensurate with the character, scale and intensity and alternative transport options of the location.
- 5) Pedestrian safety and amenity along public footpaths is prioritised.
 - a. *Safe, direct, and continuous on-site access for pedestrian and other users is provided to dwellings, in residential zones*
- 6) Road/rail crossings operate safely with neighbouring land use and development.
- 7) Electric Vehicle Supply Equipment is enabled to facilitate use of electric vehicles.

3.9 AUCKLAND DESIGN MANUAL

The Auckland Design Manual 2014 sits alongside the Unitary Plan and provides practical advice, best practice processes and detailed design guidance to enable informed choices, to help build houses and develop streets and neighbourhoods that not only look good but are built to last, are sustainable and give the best return on investment. Section '3. Movement networks', a subsection of the 'Subdivision and Neighbourhood Design' chapter, specifically seeks the following transport-based design outcomes:

- **Connections and connectivity** - Subdivisions that provide movement choice and connectivity, while balancing costs, safety, and privacy;
- **Walkable neighbourhoods** - Prioritisation of pedestrian convenience and access to destinations in the design of subdivisions;
- **Legible hierarchies** - A clear and consistent road hierarchy to create accessible, legible and safe subdivisions and help people understand how to get to, and when they are on, main routes;
- **Managing speed and modes** - Subdivision design ensures the safety of pedestrians and cyclists by managing vehicle travel speed, and provides equally for the four major modes (walking, cycling, passenger transport, vehicles) in a way that will appeal to the users of each;
- **Vehicle emissions and road layout** - Movement networks are designed to minimise the costs and environmental impacts of unnecessary travel;

The development of the PPC Site will follow these design guidelines, and will promote connectivity with the existing residential, employment, retail and recreational activities in the local and wider community.

3.10 AUCKLAND TRANSPORT DESIGN MANUAL

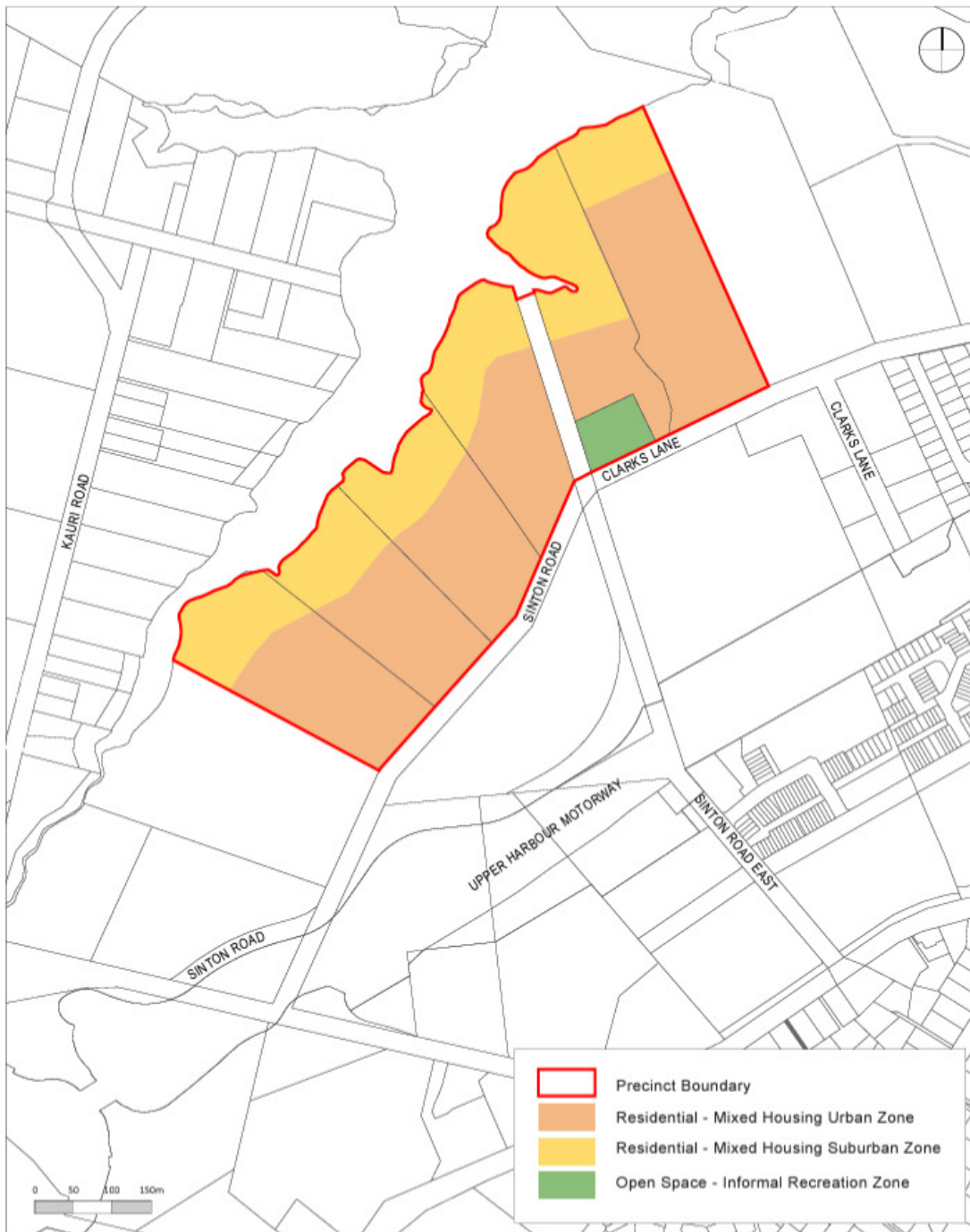
All road improvements undertaken as part of the development of the PPC will follow approved standards namely the Auckland Transport Design Manual ("**TDM**"), Austroads and NZS4404. These documents supersede Auckland Transport's Code of Practice ("**ATCoP**") and provide the current best practice design requirements for road, intersection, and access designs.

[AT have advised already that the 3m shared path is a departure from the TDM – can we flag and address the benefits arising from the departure, and explain it is for a short-medium term until the southern side of Sinton Road is developed or the collector is built – i.e. iterative upgrade of the cycle network as development occurs and demand requires it]

4 PROPOSED DEVELOPMENT

Figure 4-1 below shows the proposed new zoning to be enabled as a part of the proposed Plan Change.

Figure 4-1: Proposed new Plan Change zoning



An indicative yield study has been carried out by Boffa Miskell (refer to the Urban Design Assessment) across the precinct, which indicates that 500 – 600 dwellings are envisaged, including allowance for some up-take of MDRS density.

To establish an anticipated yield, the study undertaken by Boffa Miskell considered:

- Housing typology and density that would best respond to the proposed zoning, market demand in this location, and partial up-take of MDRS.
- Constraints as a result of the intersecting stream at 17 Clarks Lane.

- Constraints as a result of the 20m esplanade reserve along the MWHS and from the top of the stream bank.

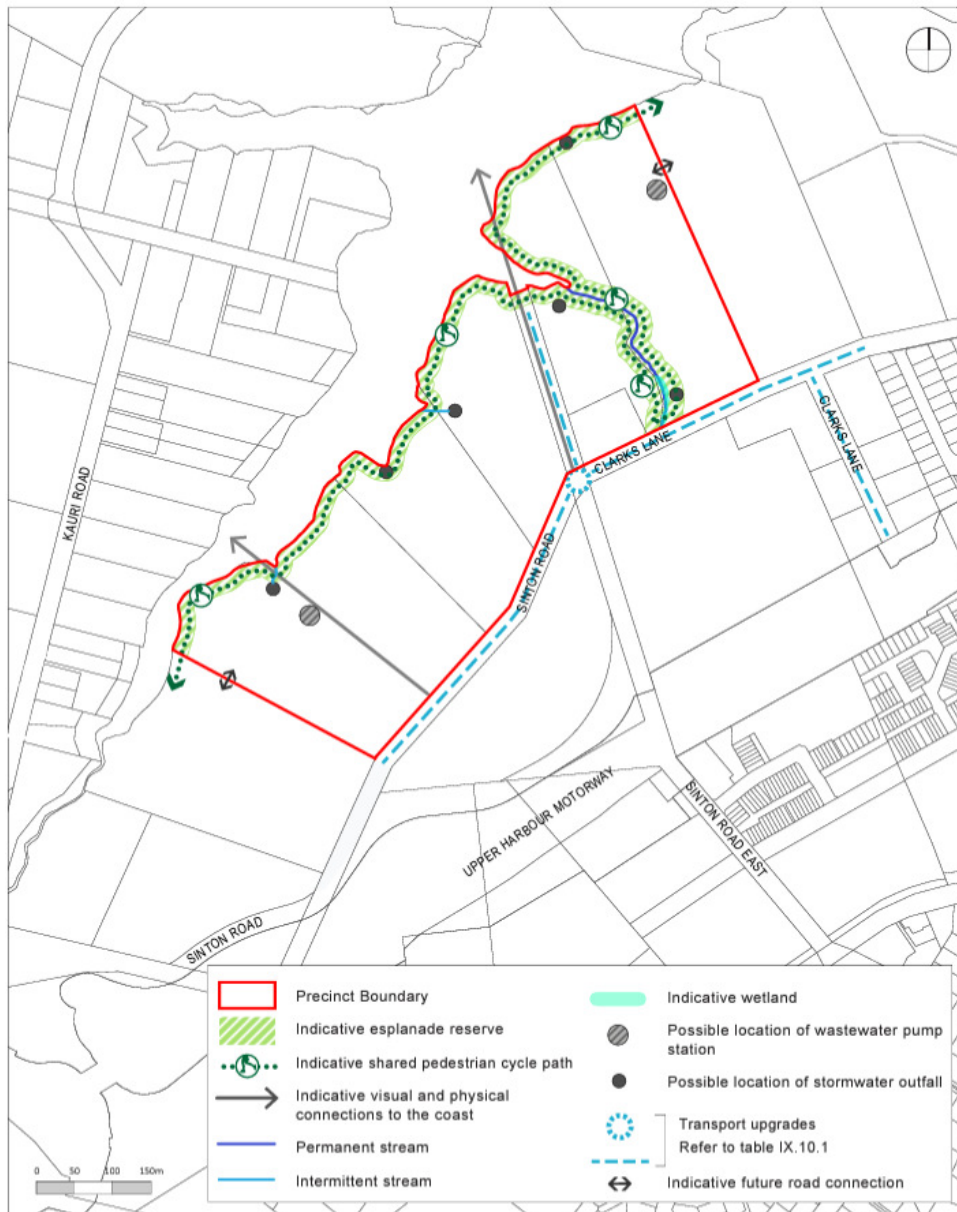
Based on these, a yield of 500-600 dwellings is anticipated across the full plan change area.

The precinct plan indicates proposed new roading and roading upgrades to be provided to support the Plan Change. This includes:

-
- a new roundabout control at the Sinton Road / Clarks Lane intersection;
- urbanisation of both Sinton Road and Clarks Lane along the Plan Change area frontage;
- pedestrian improvements between the site and the existing overbridge at Clarks Lane;
- a 3m shared path to be provided along the site's frontage to enhance cyclist safety; and
- indicative road connections to the south east and west.

Figure 4-2 shows the precinct plan, including location of transport upgrades and future road connections to the east and west.

Figure 4-2: Proposed extent of roading upgrades to support the Plan Change



5 FUTURE ROADING NETWORK

5.1 PLAN CHANGE 5

The site is part of the land area previously encompassed by the Whenuapai Structure Plan (Plan Change 5). PC 5 has since been withdrawn by the applicant (Auckland Council), however the modeling and structure planning undertaken is still considered to show an appropriate representation of the future development here and within the northwest.

Staging work undertaken as a part of the PC5 Integrated Transport Assessment (prepared in April 2016 by Flow) indicated that, at the full build out of the development envisaged by PC5, the operation of the Brigham Creek Road / Sinton Road / SH18 eastbound ramps roundabout would reach capacity, once development on the Sinton Road peninsula reached 550 dwellings.

An alternative route was originally proposed through the reconnection of Sinton Road into Hobsonville local centre (via a new overbridge). In 2021 Flow carried out options testing for the removal of this bridge, replacing it with a new link from Sinton Road to Kauri Road, with a new signalised intersection to be provided at Brigham Creek Road / Kauri Road. This option would require significant land acquisition to achieve when compared to a new overbridge at Sinton Road.

It is noted that the modelling undertaken during Plan Change 5 also accounted for substantial future development within the wider Whenuapai area, north and west of the site, which would have a significant contribution to the capacity of the roundabout. As such the operation of the roundabout may differ dependant on the scale of any development that takes place within the wider area. I.e. if development greater than anticipated by the staging analysis occurs within the wider Whenuapai area, the roundabout may reach capacity earlier than 550 households, conversely if development within the northwest is slower than anticipated by the model staging (which it has been), the roundabout may continue to operate suitably beyond the provision of 550 dwellings on the Sinton Road peninsula.

The proposed development may reasonably add 500-600 additional dwellings on the peninsula, if 50% of the MHU zone delivers MDRS density outcomes. When combined with the estimated number of existing dwellings on the peninsula (100 dwellings), Sinton Road would provide access to a total of 600-700 dwellings. This is more than the 550 dwellings identified in the PC5 modelling as able to be accommodated at the SH18 eastbound ramps roundabout with the full build out of PC5 (which has not occurred).

5.2 OTHER PLAN CHANGES

Since PC5 was withdrawn, a small number of other Plan Changes have been approved within the Whenuapai Structure Plan area. These include:

- PC69: The plan change rezoned approximately 52 hectares of land at 23-27 & 31 Brigham Creek Road and 13 & 15-19 Spedding Road, Whenuapai from Future Urban Zone to Business – Light Industry Zone. This included a Traffic assessment undertaken by Stantec including “Spedding Block Plan Change Traffic Modelling Report dated July 2020 (Specifically Appendix C)
- PC86: This private plan change rezoned 5.2 Hectares of land at 41-43 Brigham Creek Road, Whenuapai from Future Urban Zone (FUZ) to Residential Mixed Housing Urban (MHU). This included a Traffic assessment undertaken by TPC dated November 2021.

5.3 FUTURE DEVELOPMENT STRATEGY – WHENUAPAI EAST

5.3.1 GENERAL

The sites are included within the Future Urban Area of Whenuapai East in the Council's Future Development Strategy (FDS).

The FDS identifies timing for development as 'Not before 2035+' and lists the prerequisite transport projects. These are based on the work undertaken for PC5 and are outlined in Table 2 below.

- Brigham Creek Road upgrade
- SH16 to SH18 Connections
- Hobsonville Road Upgrade
- Upper Harbour (SH18) Rapid Transit.

Table 2: FDS projects

Project	Comment
Brigham Creek Road upgrade	General arterial road upgrade including active modes
SH16 to SH18 Connections	Motorway to motorway connections
Hobsonville Road Upgrade	General arterial road upgrade including active modes
Upper Harbour (SH18) Rapid Transit.	Previous work done on the SH18 Rapid Transit project identified a potential location for a stop / station that would service the Sinton Road Peninsula. Public Transport access to this site may improve in the future if a new Rapid Transit corridor is implemented along the motorway. However, no certainty can be provided about alignment, future stations or connecting services. This assessment assumes a worst case in that the provision of public transport does not substantially increase in the area (including the Rapid Transit), but rather the proposed links to the existing PT to Hobsonville Road is the key improvement in PT provided as a part of this Plan Change.

5.3.2 UPPER HARBOUR (SH18) RAPID TRANSIT

The FDS identifies Upper Harbour (SH18) Rapid Transit as one of the prerequisite transport projects for the Future Urban Area of Whenuapai East.

Rezoning land for medium density residential development ahead of this prerequisite being in place may compromise a future option of providing for intensive development within the walkable catchment of a rapid transit stop.

- Depending on the location of stops / stations, this project is likely to change the level of development that can be supported on the Peninsula.
- Public Transport access to this site *may* improve in the future if a new Rapid Transit Corridor is implemented along the motorway, however no certainty can be provided about alignment, future stations or connecting services.

This assessment has essentially assumed a worst case that PT does not substantially increase including the Rapid Transit, but rather the proposed links to the existing PT to Hobsonville Road is the key improvement in PT.

Any Rapid Transit facility would only reduce traffic generated and thus effects of the proposal.

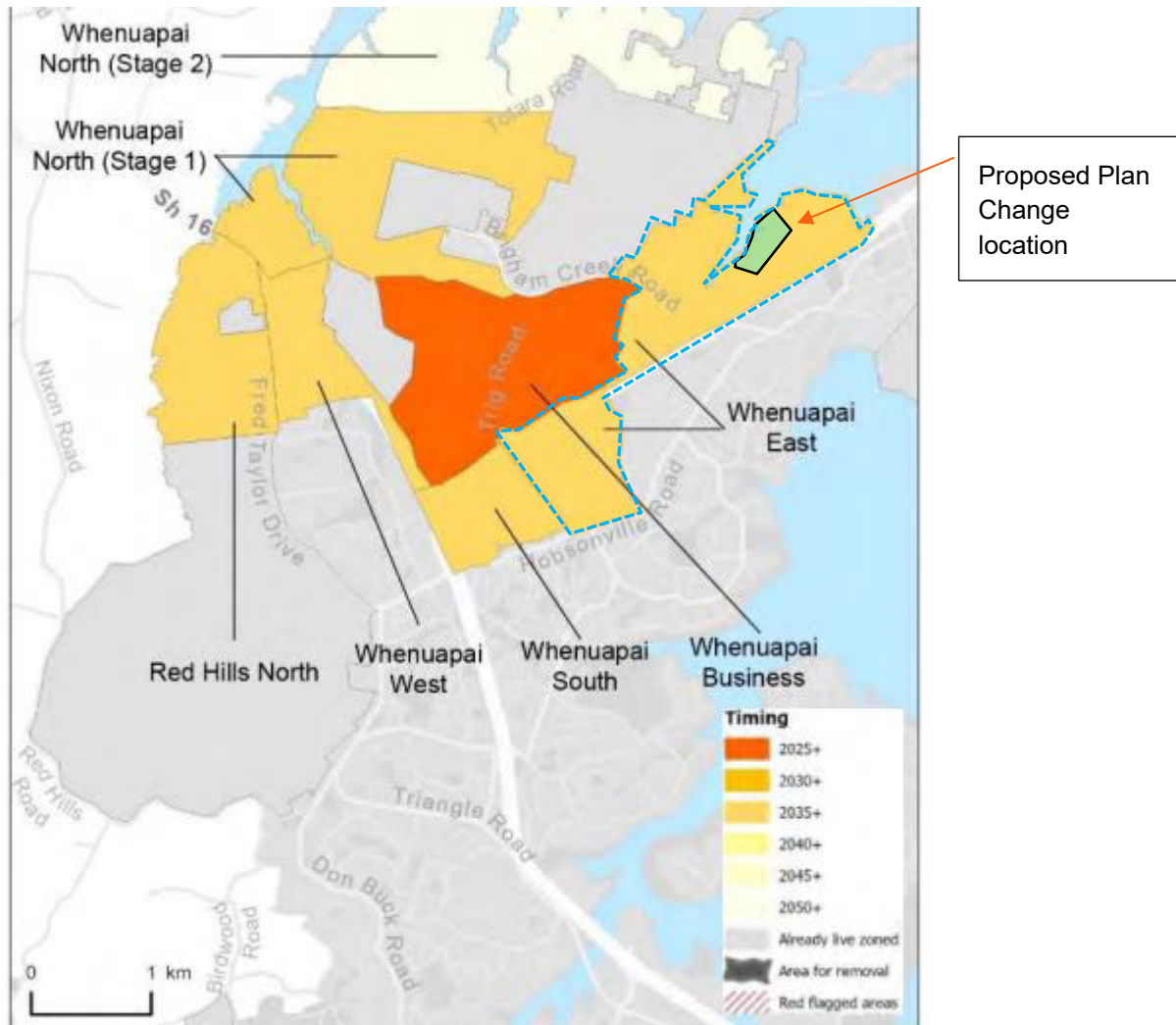
5.3.3 DISCUSSION

It is noted that the FDS of Whenuapai East is a large area. This PPC site is only a small fraction of the size of Whenuapai East (see Figure 5-1 below) and is unique in that it is on a peninsula which has only one key intersection / interchange where access/egress occurs, and given the interchange is fairly new, it is able to cater for the additional traffic generated (both our assessment and Council's previous assessment).

The PPC site is also unique when compared to the rest of Whenuapai (and even when compared with the wider Whenuapai East area), that the site is located within close proximity to Hobsonville Town Centre (via the overbridge) which, combined with the proposed improvements in cycling / footpath connections, will reduce reliance on private car travel. For these reasons there is less reliance on the upgrades specified in the FDS. Further, the additional traffic generated by the proposal does not rely

on the upgrades being in place to mitigate the effects of traffic generation, and the Plan Change will not preclude these upgrades from occurring.

Figure 5-1: Approximate location of the Plan Change sites within the Whenuapai East Future Urban Area



Notwithstanding the above, the ITA will provides an assessment of effects on the Brigham Creek interchange.

6 TRIP GENERATION

6.1 TRIP GENERATION OF PPC

6.1.1 GENERAL

The RTA Guide¹ is commonly used by traffic engineering practitioners in Australasia to assess the traffic generating potential of various land uses. In New Zealand, the RTA Guide is frequently used for assessing residential developments such as that proposed.

As discussed previously, the site is located in close proximity to local attractions and there are viable active mode routes between the site and these attractions. Where there are deficiencies in walking and cycling provisions to these attractions, the PPC involves improving walking and cycling connectivity prior to development or subdivision occurring. As such, the site is expected to have viable alternative transport modes to private vehicle transport to nearby attractions.

6.1.2 TRIP GENERATION RATES

The RTA Guide suggests that trip rates for “medium density residential flat buildings”² is applicable where there is adequate public transport accessibility and connectivity to local shopping, schools and local social visits. Therefore, the trip generation of the proposal is considered to be best represented by the ‘medium density residential flat building’ RTA rate.

For medium density residential flat buildings, the conservative rate for “larger units and town houses (three or more bedrooms)” has been used, which is 0.65 trips per dwelling for peak hour trips and 6.5 trips per dwelling for daily trips. This rate has been agreed with Waka Kotahi and AT/Auckland Council in pre-application discussions.

6.1.3 DEVELOPMENT SCENARIOS

The traffic generation effects arising from three different scenarios is considered within the proceeding assessment:

Scenario 1: Under the MDRS density standards there is an expectation that urban land shall be optimally used and the new permitted baseline for development is considered to be 3 dwellings per each 300m² vacant lot in the MHU zone (being the Council planner’s suggested rationale for calculating potential MDRS yield). Based on this it is understood the Plan Change area could accommodate up to 878 dwellings in the (unlikely) event the plan change is developed to this density. This would generate 571 peak hour trips and 5,707 daily trips. This represents the maximum theoretical yield.

Scenario 2: A more reasonable approach is set out in the yield study prepared by Boffa Miskell which assumes that around half of the MHU zoned land may be developed utilising the MDRS density

¹ The Roads and Traffic Authority of New South Wales – Guide to Traffic Generating Developments (RTA), Version 2.2, October 2002

² The RTA definition states “A medium density residential flat building is a building containing at least 2 but less than 20 dwellings. This includes villas, town houses, flats, semi-detached houses, terrace or row houses and other medium density developments. This does not include aged or disabled persons’ housing”

provisions. This is consistent with the applicant's understanding of the market demand in the area. Such an outcome would deliver 500-600 dwellings across the precinct area and generate 325-390 peak hour trips and 3250-3900 daily trips.

Scenario 3: A third scenario is considered, having regard to Cabra's intended typologies in the MHU zone which comprise lots circa 200m² in area across four of the six development sites in the plan change area (being the largest landholder). This outcome would generate a yield of around 26 dwellings / ha (being circa 390 dwellings when extrapolated to include the two properties not owned by Cabra) generating 253 peak hour trips and 2535 daily trips.

Scenario 3 is considered to be the most likely yield outcome for the reasons set out above, and therefore this has been used to provide the detailed traffic analysis as follows, however the worst-case scenario (Scenario 1) is also assessed as a 'sensitivity test'.

In summary, the following analysis confirms that the Brigham Creek Road interchange does not fail from a safety or operational perspective for Scenario 3, including taking into account the inputs agreed with Waka Kotahi and Brigham Creek Road (PC69, PC86 and 2% background growth). On this basis, Scenarios 2 and 3 will also generate acceptable level of effects on the Brigham Creek Road interchange.

6.2 RECEIVING ENVIRONMENT FOR TRIP GENERATION MODELLING

6.2.1 APPROVED PLAN CHANGES

Following pre-application discussions with Waka Kotahi and Flow Transportation (acting on behalf of Auckland Transport and Auckland Council traffic peer reviewers), the trip generation as a result of both Plan Changes 69 and 86 (PC69 and PC86) has also been included in the analysis of the 'receiving environment'.

Both PC69 and PC86 have been approved and their Traffic Assessments have been reviewed, being:

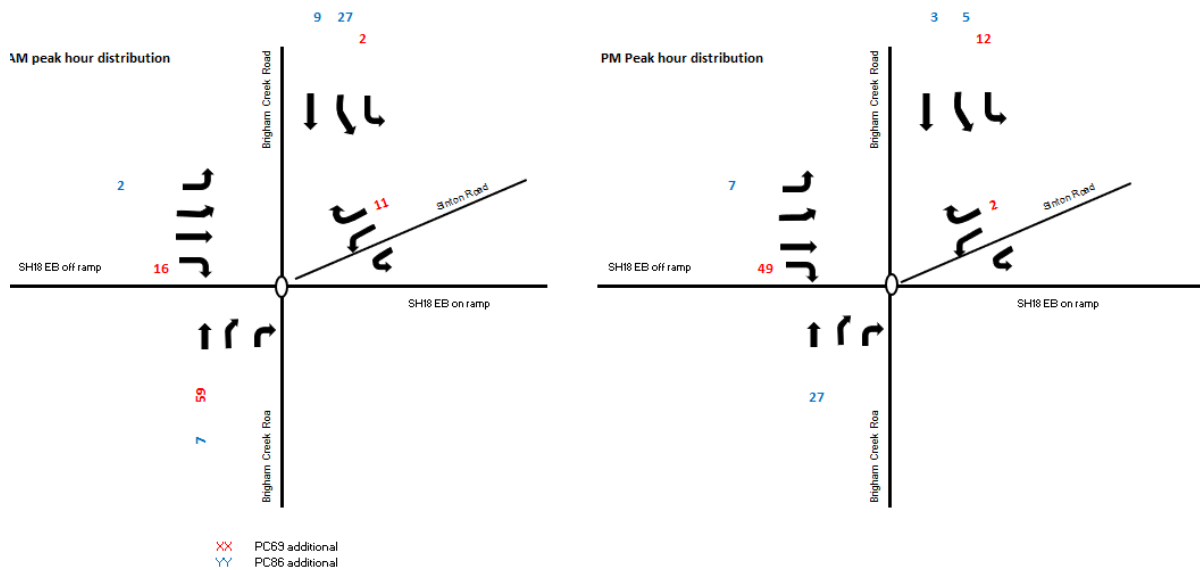
- PC69: Traffic assessment undertaken by Stantec including "Spedding Block Plan Change Traffic Modelling Report dated July 2020 (Specifically Appendix C).
- PC86: Traffic assessment undertaken by TPC dated November 2021.

For PC69, the additional traffic expected at the critical Brigham Creek Road / Sinton Road roundabout is shown in the "*Development Traffic Distribution*" SATURN difference plots in Appendix C of the Stantec report.

For PC86, no detailed analysis or traffic generation predictions at the Brigham Creek Road / Sinton Road roundabout is provided in the TPC report. Rather additional volumes along Brigham Creek Road are provided in the report. As such, additional traffic volumes at the Brigham Creek Road / Sinton Road roundabout have been distributed based on existing volume distributions.

The following diagram outlines the additional volume expected at the Brigham Creek Road / Sinton Road roundabout when the data from these reports is incorporated.

Figure 6-1: PC69 and PC86 additional traffic (Brigham Creek Road / Sinton Road roundabout)



6.2.2 BACKGROUND GROWTH

In addition to the traffic generated from the PC69 and PC89, a general growth rate has been applied to all existing movements (except for the Sinton Road leg as the proposed development is expected to be the growth over the next 10 years). A general additional growth rate based on 2% per year has been assumed to all the other existing movements (ie 20% additional for 10 years).

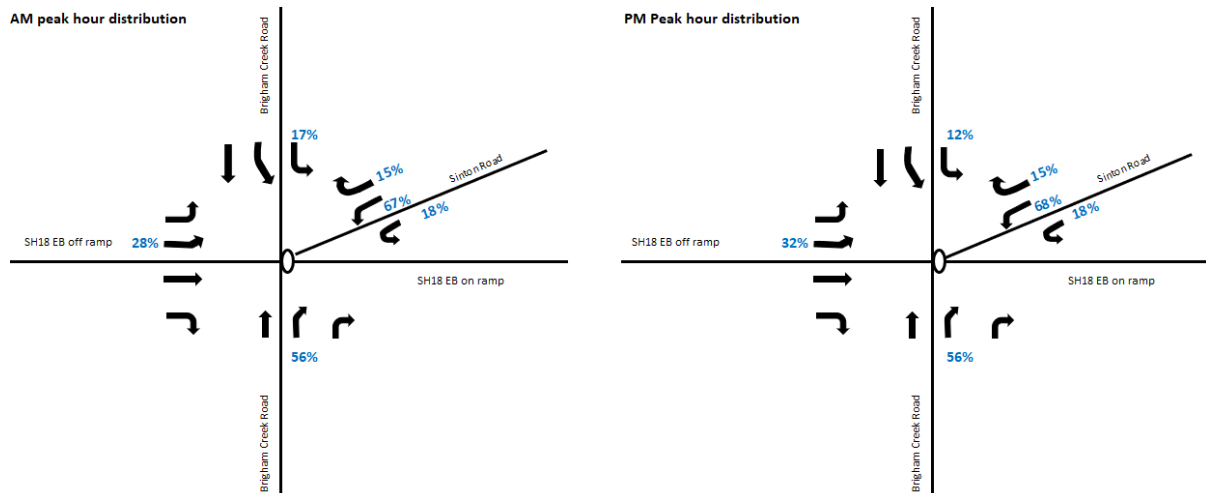
Again, this rationale was agreed with Waka Kotahi and AT/AC in pre-application discussions and forms part of the receiving environment.

6.3 TRIP DISTRIBUTION

In terms of inbound / outbound percentages to and from the site, a typical 30% inbound / 70% outbound split has been assumed in the morning peak, reversed in the evening peak.

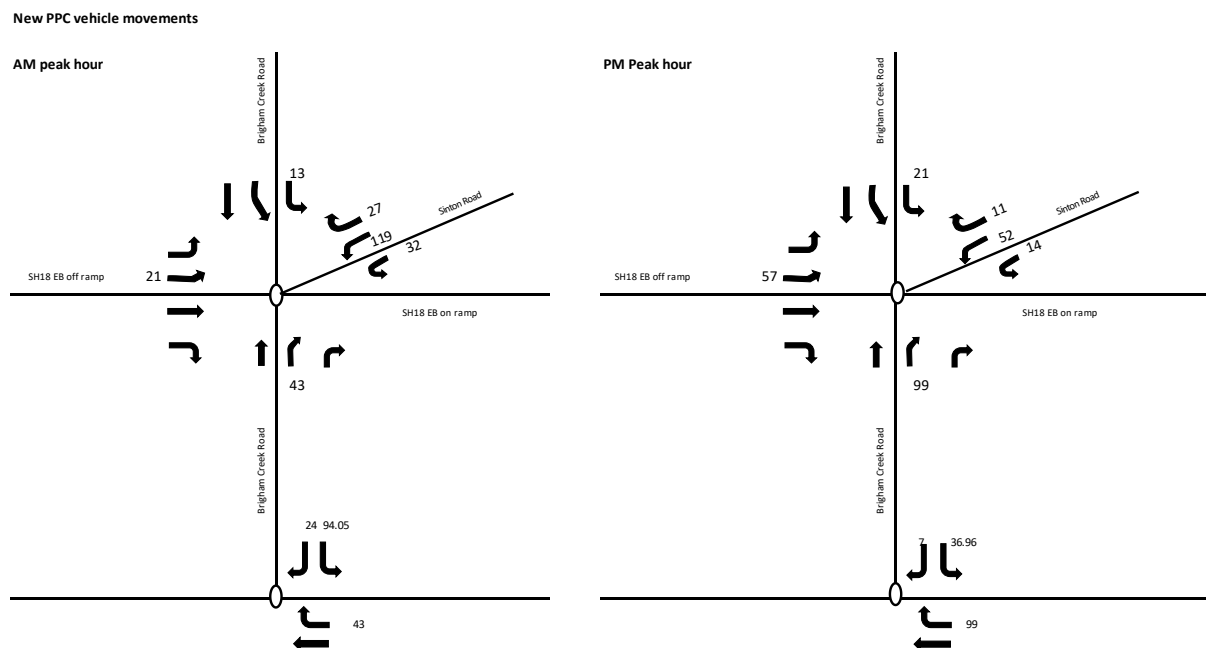
In terms of directional distribution patterns to and from the site, it has been assumed that all trips will travel via the Sinton Road / Brigham Creek Road / SH18 EB ramps roundabout. Distribution of trips here has been based off the distributions observed during the surveys, this is shown in Figure 5-1 below.

Figure 6-2: Observed movement distributions at the Sinton Road / Brigham Creek Road / SH18 EB ramps roundabout



As discussed above, the trips generated by Scenario 3 of the PPC have been distributed based on the above inbound / outbound splits and observed movement distributions at the Sinton Road / Brigham Creek Road / SH18 EB ramps roundabout. The proposed number of trips generated per direction in Scenario 3 are shown in Figure 5-3 below.

Figure 6-3: Trips generated (390 lots)



7 ASSESSMENT OF EFFECTS

7.1 GENERAL

Rule E27.6.1 (1) "Trip generation" of the Unitary Plan sets out trip generation limits, exceedance of which mean resource consent for a restricted discretionary activity is required under E27.4.1 (A3). For residential dwellings, this limit is 100 dwellings.

All development scenarios set out above exceeds this limit and an assessment of the wider effects on the network of the PPC is provided.

The site is located on a peninsula accessed only via Sinton Road, as such all trips to / from the site will travel via the Brigham Creek Road / SH18 EB Ramps / Sinton Road roundabout.

The results presented in this report include the Degree of Saturation, which is a measure of available capacity, queue length and the Level of Service (“**LOS**”), which is a generalised function of delay. In this regard, LOS is a qualitative measure used to relate the quality of traffic and ranges from LOS A to F as follows:

- LOS A: Free flow
- LOS B: Reasonably free flow
- LOS C: Stable flow however the ability to manoeuvre is noticeably restricted
- LOS D: Approaching unstable flow
- LOS E: unstable flow, operating at capacity
- LOS F: forced or breakdown flow

Typically LOS A-D is considered acceptable overall operation for an intersection.

7.2 ROAD NETWORK ASSESSMENT

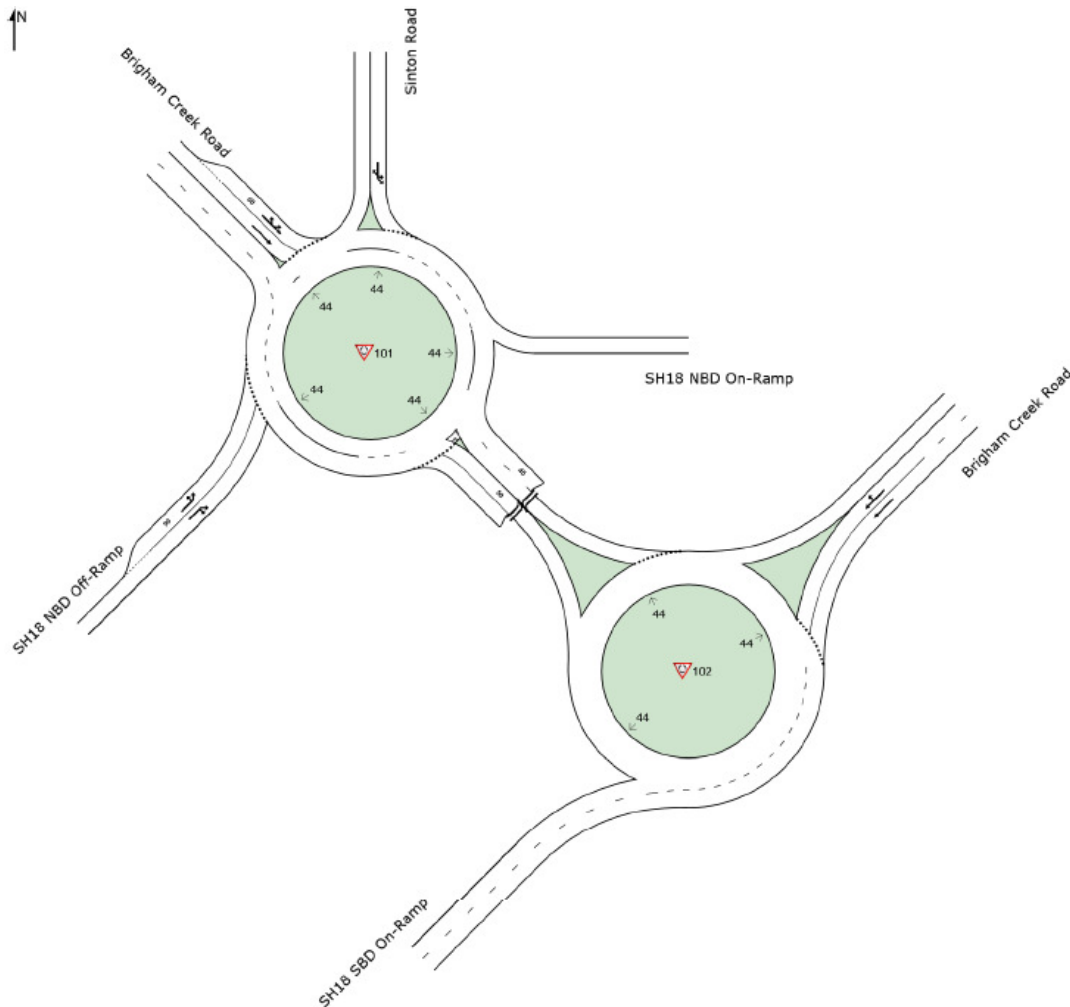
7.2.1 METHODOLOGY

As discussed, the Sinton Road / Brigham Creek Road / SH18 EB ramps roundabout will cater for all of the vehicle traffic to and from the Site. A review of the Sinton Road / Brigham Creek Road / SH18 EB ramps roundabout and the nearby Brigham Creek Road / SH18 WB ramps roundabout has been undertaken, assessing the existing performance of these intersections and the performance of the intersections after the completion of the development. The intersection review was conducted using 2022 survey data and a SIDRA intersection network analysis. For the post development scenario, all trips associated with the development have been added to the existing road network traffic volumes.

The traffic effects of the proposal have been assessed by modelling the current Sinton Road / Brigham Creek Road / SH18 EB ramps and Brigham Creek Road / SH18 WB ramps intersections during the morning and evening commuter peak hours, both with and without development traffic using the traffic modelling software SIDRA, plus trips generated by PC69, PC86 and a 2% background growth rate.

Figure 7-1 shows the intersection layout used to model the intersection performance.

Figure 7-1: SIDRA Intersection Network Layout



There are ramp metering signals on the State Highway 18 onramp that create short queues. There are two queue lanes on the onramp with a queue distance of 130 metres. Queues that form are expected to be momentary and less than the 130 metres queue distance given that typical dual lane ramp metering has cycle times of 5.5 seconds and can absorb a traffic flow rate of 1,300 vehicles per. The modelled morning and evening peak hour has a traffic flow less than this at between 1,000 and 1,100 vehicles per hour, which confirms that queues forming on the onramp is not a concern.

7.2.2 EXISTING INTERSECTION PERFORMANCE

The existing Sinton Road / Brigham Creek Road / SH18 EB ramps roundabout currently operates with an average of less than 14 seconds of delay for all approaches and a 95% percentile back of queue of no more than 3 vehicles in both the AM and PM peak periods. The degree of saturation on all approaches is well below the desired maximum of 0.85, with the worst movement being the north-west Brigham Creek Road approaches left turn on to the SH18 onramp with a degree of saturation of 0.43. The intersection operates with an overall **LOS A**.

The adjacent Brigham Creek Road / SH18 WB ramps roundabout currently operates with an average of 8 seconds of delay for all approaches and a 95% percentile back of queue of no more than 4 vehicles in both the AM and PM peak periods. The degree of saturation on all approaches is well below the desired maximum of 0.85, with the worst movement being the north-west Brigham Creek

Road approaches right turn with a degree of saturation of 0.51. The intersection also operates with an overall **LOS A**.

The detailed SIDRA outputs for the existing intersection(s) are included in **Appendix A**.

7.2.3 POST DEVELOPMENT INTERSECTION PERFORMANCE

With the traffic from development of Scenario 3 included (and taking into account the existing traffic, PC69, PC86 and 2% growth per annum over 10 years), the Sinton Road / Brigham Creek Road / SH18 EB ramps roundabout operates with less than 15 seconds of delay (a one second increase when compared to the existing) for all approaches and a 95% percentile back of queue of no more than 3 vehicles (no increase) in both the AM and PM peak periods. The degree of saturation at these approaches remains well below the desired maximum of 0.85 with the north-west Brigham's Creek Road left turn onto the SH18 onramp movement remaining the worst movement with a small increase in degree of saturation from 0.43 to 0.48. The intersection continues to operate with an overall **LOS A**.

With the traffic from development of Scenario 3 included (and taking into account the existing traffic, PC69, PC86 and 2% growth per annum over 10 years), the adjacent Brigham Creek Road / SH18 WB ramps roundabout continues to operate with 8 seconds of delay for all approaches and a 95% percentile back of queue of no more than 5 vehicles (an increase of one vehicle) in both the AM and PM peak periods. The degree of saturation at these approaches remains well below the desired maximum of 0.85 with the north-west Brigham's Creek Road approaches right turn movement remaining the worst movement with a small increase in degree of saturation from 0.51 to 0.57. The intersection continues to operate with an overall **LOS A**.

The detailed SIDRA outputs for the post development intersection(s) are included in **Appendix A**.

The results of both the AM and PM peak are shown in Table 3 and 4 below.

Table 3: AM peak: Existing + 2% pa over 10 years + PC69 & 86 + 390 dwellings

Vehicle Movement Performance														
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road														
22	T1	All MCs	649	0.0	649	0.0	0.247	1.0	LOS A	1.9	13.4	0.21	0.21	46.8
23a	R1	All MCs	56	0.0	56	0.0	0.247	6.6	LOS A	1.8	12.8	0.22	0.38	44.3
23b	R3	All MCs	127	0.0	127	0.0	0.247	8.7	LOS A	1.8	12.8	0.22	0.38	44.3
Approach			833	0.0	833	0.0	0.247	2.6	LOS A	1.9	13.4	0.22	0.24	46.2
North: Sinton Road														
7	L2	All MCs	40	0.0	40	0.0	0.459	12.4	LOS B	3.2	22.3	0.90	0.93	42.5
7a	L1	All MCs	148	0.0	148	0.0	0.459	11.7	LOS B	3.2	22.3	0.90	0.93	39.1
9b	R3	All MCs	47	0.0	47	0.0	0.459	19.2	LOS B	3.2	22.3	0.90	0.93	42.1
Approach			236	0.0	236	0.0	0.459	13.3	LOS B	3.2	22.3	0.90	0.93	40.6
NorthWest: Brigham Creek Road														
27b	L3	All MCs	20	0.0	20	0.0	0.598	5.2	LOS A	4.5	31.6	0.71	0.60	46.4
27a	L1	All MCs	678	0.0	678	0.0	0.598	3.8	LOS A	4.5	31.6	0.71	0.60	46.7
28	T1	All MCs	237	0.0	237	0.0	0.288	3.5	LOS A	1.3	9.4	0.60	0.43	45.1
Approach			935	0.0	935	0.0	0.598	3.7	LOS A	4.5	31.6	0.68	0.56	46.4
SouthWest: SH18 NBD Off-Ramp														
30	L2	All MCs	86	0.0	86	0.0	0.150	4.7	LOS A	0.6	4.0	0.56	0.59	46.9
30a	L1	All MCs	27	0.0	27	0.0	0.150	3.6	LOS A	0.6	4.0	0.56	0.59	47.1
32a	R1	All MCs	1	0.0	1	0.0	0.377	8.4	LOS A	1.8	12.6	0.60	0.74	43.6
32	R2	All MCs	435	0.0	435	0.0	0.377	9.5	LOS A	1.8	12.6	0.60	0.74	41.0
Approach			549	0.0	549	0.0	0.377	8.5	LOS A	1.8	12.6	0.59	0.71	42.5
All Vehicles			2553	0.0	2553	0.0	0.598	5.3	LOS A	4.5	31.6	0.53	0.52	44.9

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	753	0.0	753	0.0	0.443	1.0	LOS A	3.1	21.5	0.38	0.14	0.38	48.2
26	R2	All MCs	713	0.0	713	0.0	0.514	8.5	LOS A	3.8	26.9	0.45	0.57	0.45	41.5
Approach			1465	0.0	1465	0.0	0.514	4.7	LOS A	3.8	26.9	0.41	0.35	0.41	45.4
NorthWest: Brigham Creek Road															
27	L2	All MCs	653	0.0	653	0.0	0.452	1.7	LOS A	0.0	0.0	0.00	0.35	0.00	46.8
29	R2	All MCs	168	0.0	168	0.0	0.452	7.4	LOS A	0.0	0.0	0.00	0.35	0.00	46.1
Approach			821	0.0	821	0.0	0.452	2.9	LOS A	0.0	0.0	0.00	0.35	0.00	46.6
All Vehicles			2286	0.0	2286	0.0	0.514	4.0	LOS A	3.8	26.9	0.26	0.35	0.26	45.7

Table 4: PM peak: Existing + 2% pa over 10 years + PC69 & 86 + 390 dwellings

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	841	0.0	841	0.0	0.349	1.0	LOS A	3.0	21.2	0.20	0.19	0.20	46.9
23a	R1	All MCs	142	0.0	142	0.0	0.349	6.5	LOS A	2.9	20.3	0.21	0.43	0.21	43.6
23b	R3	All MCs	207	0.0	207	0.0	0.349	8.7	LOS A	2.9	20.3	0.21	0.43	0.21	43.6
Approach			1191	0.0	1191	0.0	0.349	3.0	LOS A	3.0	21.2	0.21	0.26	0.21	45.8
North: Sinton Road															
7	L2	All MCs	24	0.0	24	0.0	0.298	11.4	LOS B	1.8	12.3	0.89	0.85	0.89	42.7
7a	L1	All MCs	75	0.0	75	0.0	0.298	11.3	LOS B	1.8	12.3	0.89	0.85	0.89	39.5
9b	R3	All MCs	36	0.0	36	0.0	0.298	18.3	LOS B	1.8	12.3	0.89	0.85	0.89	42.4
Approach			135	0.0	135	0.0	0.298	13.2	LOS B	1.8	12.3	0.89	0.85	0.89	41.1
NorthWest: Brigham Creek Road															
27b	L3	All MCs	45	0.0	45	0.0	0.577	6.2	LOS A	4.2	29.4	0.80	0.78	0.99	46.0
27a	L1	All MCs	513	0.0	513	0.0	0.577	4.9	LOS A	4.2	29.4	0.80	0.78	0.99	46.4
28	T1	All MCs	326	0.0	326	0.0	0.455	5.3	LOS A	2.6	18.2	0.76	0.70	0.87	44.1
Approach			884	0.0	884	0.0	0.577	5.1	LOS A	4.2	29.4	0.79	0.75	0.94	45.7
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	199	0.0	199	0.0	0.377	6.1	LOS A	1.8	12.5	0.69	0.74	0.77	46.2
30a	L1	All MCs	86	0.0	86	0.0	0.377	5.0	LOS A	1.8	12.5	0.69	0.74	0.77	46.4
32a	R1	All MCs	1	0.0	1	0.0	0.596	10.9	LOS B	4.1	29.0	0.75	0.94	1.00	43.0
32	R2	All MCs	628	0.0	628	0.0	0.596	12.0	LOS B	4.1	29.0	0.75	0.94	1.00	40.1
Approach			915	0.0	915	0.0	0.596	10.1	LOS B	4.1	29.0	0.73	0.88	0.93	42.4
All Vehicles			3124	0.0	3124	0.0	0.596	6.1	LOS A	4.2	29.4	0.55	0.60	0.66	44.5

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh]	Dist m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	659	0.0	659	0.0	0.486	1.4	LOS A	3.5	24.6	0.43	0.19	0.43	47.9
26	R2	All MCs	1164	0.0	1164	0.0	0.679	8.5	LOS A	6.6	46.1	0.49	0.58	0.49	41.4
Approach			1823	0.0	1823	0.0	0.679	5.9	LOS A	6.6	46.1	0.47	0.44	0.47	44.2
NorthWest: Brigham Creek Road															
27	L2	All MCs	861	0.0	861	0.0	0.561	1.7	LOS A	0.0	0.0	0.00	0.33	0.00	47.0
29	R2	All MCs	158	0.0	158	0.0	0.561	7.4	LOS A	0.0	0.0	0.00	0.33	0.00	46.4
Approach			1019	0.0	1019	0.0	0.561	2.6	LOS A	0.0	0.0	0.00	0.33	0.00	46.9
All Vehicles			2842	0.0	2842	0.0	0.679	4.7	LOS A	6.6	46.1	0.30	0.40	0.30	45.0

The results show the roundabouts are still under capacity with overall degree of saturation at 0.68, overall LOS A and worst 85th percentile queue of 50m or less

As such, it is considered that the interchange is capable of accommodating future development traffic generated from Scenario 3 with no further mitigation works to either roundabout necessary.

7.3 SENSITIVITY TEST (SCENARIO 1)

A sensitivity analysis was undertaken using SIDRA for the worst case scenario development yield having regard to the MDRS(Scenario 1, being circa 878 dwellings). As noted previously, this is considered a theoretical worst case rather than a realistic scenario. The results of both the AM and PM peak are shown in Table 5 and 6 below.

The results show both roundabouts are still under capacity with overall degree of saturation at 0.92, overall **LOS B** and worst 85th percentile queue of 111m or less. This confirms that the worst case (albeit unlikely) scenario will not cause the safety or capacity of the interchange to fail.

Table 5: AM peak: Existing + 2% pa over 10 years + PC69 & 86 + 878 dwellings

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	649	0.0	649	0.0	0.274	1.1	LOS A	2.2	15.4	0.30	0.21	0.30	46.3
23a	R1	All MCs	112	0.0	112	0.0	0.274	6.7	LOS A	2.1	14.6	0.32	0.41	0.32	43.5
23b	R3	All MCs	127	0.0	127	0.0	0.274	8.8	LOS A	2.1	14.6	0.32	0.41	0.32	43.5
Approach			888	0.0	888	0.0	0.274	2.9	LOS A	2.2	15.4	0.31	0.26	0.31	45.5
North: Sinton Road															
7	L2	All MCs	82	0.0	82	0.0	0.921	44.6	LOS D	16.0	111.7	1.00	1.75	2.99	31.3
7a	L1	All MCs	305	0.0	305	0.0	0.921	44.0	LOS D	16.0	111.7	1.00	1.75	2.99	25.6
9b	R3	All MCs	82	0.0	82	0.0	0.921	51.4	LOS E	16.0	111.7	1.00	1.75	2.99	31.1
Approach			469	0.0	469	0.0	0.921	45.4	LOS D	16.0	111.7	1.00	1.75	2.99	27.9
NorthWest: Brigham Creek Road															
27b	L3	All MCs	37	0.0	37	0.0	0.629	5.6	LOS A	4.9	34.2	0.74	0.68	0.90	46.3
27a	L1	All MCs	678	0.0	678	0.0	0.629	4.2	LOS A	4.9	34.2	0.74	0.68	0.90	46.6
28	T1	All MCs	237	0.0	237	0.0	0.299	3.7	LOS A	1.4	9.6	0.62	0.45	0.62	45.0
Approach			952	0.0	952	0.0	0.629	4.1	LOS A	4.9	34.2	0.71	0.62	0.83	46.3
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	86	0.0	86	0.0	0.185	4.7	LOS A	0.7	5.2	0.60	0.59	0.60	46.8
30a	L1	All MCs	56	0.0	56	0.0	0.185	3.7	LOS A	0.7	5.2	0.60	0.59	0.60	47.0
32a	R1	All MCs	1	0.0	1	0.0	0.393	8.7	LOS A	2.0	13.9	0.64	0.77	0.67	43.5
32	R2	All MCs	435	0.0	435	0.0	0.393	9.8	LOS A	2.0	13.9	0.64	0.77	0.67	40.9
Approach			578	0.0	578	0.0	0.393	8.5	LOS A	2.0	13.9	0.63	0.73	0.65	42.7
All Vehicles			2887	0.0	2887	0.0	0.921	11.3	LOS B	16.0	111.7	0.62	0.72	0.98	41.1

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	713	0.0	713	0.0	0.505	1.6	LOS A	3.8	26.3	0.48	0.24	0.48	47.6
26	R2	All MCs	808	0.0	808	0.0	0.505	8.4	LOS A	3.8	26.3	0.44	0.56	0.44	41.8
Approach			1521	0.0	1521	0.0	0.505	5.2	LOS A	3.8	26.3	0.46	0.41	0.46	44.9
NorthWest: Brigham Creek Road															
27	L2	All MCs	776	0.0	776	0.0	0.537	1.7	LOS A	0.0	0.0	0.00	0.35	0.00	46.8
29	R2	All MCs	200	0.0	200	0.0	0.537	7.4	LOS A	0.0	0.0	0.00	0.35	0.00	46.1
Approach			976	0.0	976	0.0	0.537	2.9	LOS A	0.0	0.0	0.00	0.35	0.00	46.6
All Vehicles			2497	0.0	2497	0.0	0.537	4.3	LOS A	3.8	26.3	0.28	0.39	0.28	45.4

Table 6: PM peak: Existing + 2% pa over 10 years + PC69 & 86 + 878 dwellings

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	841	0.0	841	0.0	0.402	1.1	LOS A	3.7	25.8	0.31	0.18	0.31	46.4
23a	R1	All MCs	274	0.0	274	0.0	0.402	6.7	LOS A	3.5	24.6	0.33	0.47	0.33	42.6
23b	R3	All MCs	207	0.0	207	0.0	0.402	8.9	LOS A	3.5	24.6	0.33	0.47	0.33	42.6
Approach			1322	0.0	1322	0.0	0.402	3.5	LOS A	3.7	25.8	0.32	0.29	0.32	44.9
North: Sinton Road															
7	L2	All MCs	42	0.0	42	0.0	0.571	18.6	LOS B	4.5	31.4	0.95	1.06	1.39	39.5
7a	L1	All MCs	142	0.0	142	0.0	0.571	18.5	LOS B	4.5	31.4	0.95	1.06	1.39	35.3
9b	R3	All MCs	71	0.0	71	0.0	0.571	25.5	LOS C	4.5	31.4	0.95	1.06	1.39	39.2
Approach			255	0.0	255	0.0	0.571	20.5	LOS C	4.5	31.4	0.95	1.06	1.39	37.4
NorthWest: Brigham Creek Road															
27b	L3	All MCs	74	0.0	74	0.0	0.644	7.1	LOS A	4.9	34.0	0.84	0.91	1.11	45.8
27a	L1	All MCs	513	0.0	513	0.0	0.644	5.7	LOS A	4.9	34.0	0.84	0.91	1.11	46.2
28	T1	All MCs	326	0.0	326	0.0	0.498	6.0	LOS A	2.8	19.8	0.79	0.80	0.95	43.9
Approach			913	0.0	913	0.0	0.644	5.9	LOS A	4.9	34.0	0.82	0.87	1.05	45.5
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	199	0.0	199	0.0	0.521	7.9	LOS A	3.0	20.9	0.77	0.87	1.00	45.3
30a	L1	All MCs	161	0.0	161	0.0	0.521	6.8	LOS A	3.0	20.9	0.77	0.87	1.00	45.4
32a	R1	All MCs	1	0.0	1	0.0	0.648	12.0	LOS B	4.9	34.5	0.82	1.01	1.15	42.4
32	R2	All MCs	628	0.0	628	0.0	0.648	13.2	LOS B	4.9	34.5	0.82	1.01	1.15	39.5
Approach			989	0.0	989	0.0	0.648	11.1	LOS B	4.9	34.5	0.80	0.96	1.09	41.9
All Vehicles			3479	0.0	3479	0.0	0.648	7.5	LOS A	4.9	34.5	0.64	0.69	0.81	43.5

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	659	0.0	659	0.0	0.493	1.4	LOS A	3.6	25.1	0.45	0.20	0.45	47.9
26	R2	All MCs	1296	0.0	1296	0.0	0.759	8.8	LOS A	8.9	62.3	0.57	0.59	0.57	41.1
Approach			1955	0.0	1955	0.0	0.759	6.3	LOS A	8.9	62.3	0.53	0.46	0.53	43.8
NorthWest: Brigham Creek Road															
27	L2	All MCs	909	0.0	909	0.0	0.592	1.7	LOS A	0.0	0.0	0.00	0.33	0.00	47.0
29	R2	All MCs	166	0.0	166	0.0	0.592	7.4	LOS A	0.0	0.0	0.00	0.33	0.00	46.4
Approach			1076	0.0	1076	0.0	0.592	2.6	LOS A	0.0	0.0	0.00	0.33	0.00	46.9
All Vehicles			3031	0.0	3031	0.0	0.759	5.0	LOS A	8.9	62.3	0.34	0.41	0.34	44.7

8 REQUIRED UPGRADES

From a review of the above assessment, the following infrastructure will be required to support the proposed plan change, as listed in the proposed precinct at Table IX.10.1

Appendix 1 - Road Function and Required Design Elements:

- Inclusion of a new single lane roundabout at the intersection of Clarks Lane / Sinton Road;
- Upgrade of Sinton Road along the site frontage to a Collector Road standard with cycling facility (north side). Of note, the existing road reserve in this section is 20m, which will need to be 22m to accommodate a Collector Road type standard. In this regard, given development will eventually occur on both sides of the road, 1m will need to be obtained from either side (including along the PPC site, to be designed at resource consent stage);
- Upgrade of Clarks Lane along the PPC site frontage to local road urban standard with cycling provision (north side);
- Pedestrian upgrade of Clarks Lane (east / west section) to the east of the PPC to connect with the Ockleston Landing development;
- Pedestrian upgrade of Clarks Lane (north / south section) on one side.

9 LAYOUT

9.1 CROSS SECTIONS

The cross sections of the new roads proposed will vary based on the function of the corridor. Table 7 summarises the proposed design elements for each of the roads proposed.

Table 7: Road Function and Required Design Elements

Table IX.10.1 Appendix 1 - Road Function and Required Design Elements

Road name	Proposed role and function of road in Precinct area	Minimum road reserve width ¹	Total no. of lanes	Design speed	Median	Cycle provision	Pedestrian provision	Bus route	Vehicle access restrictions
Clarks Lane / Sinton Road roundabout	N/A	N/A	1 circulating lane	30 km/h ² approach speed	N/A	Northern side (shared path)		No	Refer Chapter E27
Sinton Road upgrade	Local	No change (20m)	2	30 km/h ²	No	North western side (3m shared cycle footpath)		No	JOAL access only or where a turning circle is provided on site (forwards in / forwards out)
Clarks Lane upgrade between roundabout and eastern end of Precinct	Local	No change (20m)	2	30 km/h ²	No	Northern side (3m shared cycle footpath)		No	Refer Chapter E27
Clarks Lane between east of Precinct and Ockleston Landing (footpath upgrade only)	Local	No change (20m)	Footpath only – no change to number of lanes	N/A	N/A	No	Southern side (1.8m footpath)	N/A	Refer Chapter E27
Clarks Lane upgrade (north/south - Worker's Cottages) (footpath upgrade only)	Local	No change (20m)	Footpath only – no change to number of lanes	N/A	N/A	No	Eastern side (1.8m) to connect with Clarks Lane Footbridge	No	Refer Chapter E27
Unformed Road (north of Sinton Road)	Local	20m	2	30 km/h ²	No	Western side (3m shared cycle footpath)		No	Refer Chapter E27

9.2 ACCESS TO INDIVIDUAL SITES

The AUP encourages the number of vehicle access points to be minimised to maintain and improve pedestrian and cycle safety. Vehicle accesses would need to meet Unitary Plan requirements including:

- Minimum 10 m separation from intersections;
- Minimum 6 m separation between vehicle accesses serving the same site and 2 m between adjacent sites;
- 2.75-6.0 m maximum crossing widths depending on the number of parking spaces served;
- The total width of paired crossings should not exceed 6 m;
- 1:20 gradient, 4 m long platforms on the approach to public roads for residential sites, and 6m long platforms for non-residential.
- Access across cycling provision should be minimised and if provided provision should be made to enable vehicles to turn around on-site (forwards entry and exit).

Individual vehicle accesses will be subject to further review at resource consent stage.

9.3 ACTIVE MODES

9.3.1 PROVISIONS

The intent for the PPC is that the precinct will provide a cohesive pedestrian and cycle network that integrates with the existing network and provides residents with travel options as shown in Figure 9-1.

Figure 9-1: Indicative Pedestrian and Cycling Connections



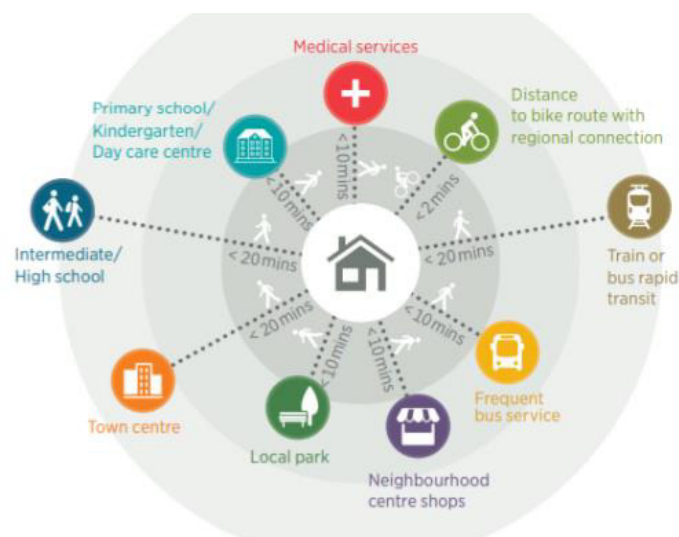
Pedestrians and cyclists residing within the Precinct will typically have desire lines to several key attractors including:

- Hobsonville Road public transport;
- Hobsonville shopping areas (eg Woolworths); and
- Hobsonville schools.

A network of cycle paths have been identified, which are considered to connect the local attractions with the rest of the Precinct. Pedestrian footpaths will generally be provided together with cycle infrastructure.

The Auckland Transport TDM Urban Street and Road Design Guide provides guidance as to the likely acceptable travel times to various activities as shown in Figure 9-2 below.

Figure 9-2: Acceptable travel times



Majority of trips from within the Precinct are anticipated to be between 1 – 1.5km which equates to approximately a 15 - 20 minute walk³ or a 5 – 10 minute cycle⁴.

9.3.2 DESIGN

It is recognised that Auckland Transport have a preference for separate cycle paths. In the case of the Sinton Road upgrade, it is noted that the final long-term upgrade requires widening and pedestrian / cycling treatment on both sides of the road (at full build out of the peninsula).

As the PPC development will occur only on the northwest side of Sinton Road, it is considered unreasonable to construct full footpath / cycling lanes on both sides of the road. As such it is proposed to:

- Construct a 3m shared path on the north side of Clarks Lane and Sinton Road along the frontage of the Site which can be converted (if required) to a separate uni-directional cycle lane and separate footpath in future if required;
- Construct a kerb / channel on the north side of the road; and
- Re-construct the carriageway to the southern edge.

10 PARKING

10.1 AUCKLAND UNITARY PLAN REQUIREMENTS

The Unitary Plan outlines the relevant rules against which potential development should be assessed. Generally, there is no minimum and no maximum parking requirements under the Unitary Plan parking for the zones proposed.

10.2 ON-STREET PARKING

Within the PPC area, on-street parking on the internal road network can be determined at future resource consent stages. However, it is generally considered that a minimum of 1 space per 10 dwellings is an appropriate design standard within the residential zoning areas.

The details of on-street parking provisions and individual development parking provisions will be worked through in the resource consent stages. Given the current greenfield scenario, it is considered that sufficient area can be provided for on-street parking.

10.3 BICYCLE PARKING

A range of land use activities are permitted and anticipated within the zones proposed, and therefore bicycle parking will be assessed at resource consent stage when the land use activities are known.

³ Adopting an average walking speeds of 1.2m/s

⁴ Adopting an average cycle speed of 15km/hr

Notwithstanding, the precinct can accommodate appropriate bicycle parking provisions, and is anticipated to do so. It is anticipated that many of the dwellings will have private internal garaging and therefore there would be no need for dedicated bicycle parking facilities for these dwellings.

The total bicycle parking provisions can be determined at subsequent resource consent stages, however the precinct is considered to be capable of accommodating the required bicycle parking spaces.

11 SERVICING

Individual loading and servicing requirements will be determined at the resource consent stage for the development.

The internal road network will be designed to accommodate a 10.3 m rear steering waste truck as required in Auckland Transport's Transport Design Manual. The precinct access intersections should feature compound kerbs to enable trucks to enter and exit the development without obstructing opposing light vehicles. Within the precinct, it is expected that trucks will be able to circulate within the development for the purposes of servicing, deliveries, relocation services and waste collection.

12 CONSTRUCTION TRAFFIC

As is typical with a development of this scale, it is recommended that as part of any resource consents, a Construction Traffic Management Plan (CTMP) should be required as a condition. It is considered that this Construction Traffic Management Plan should include:

- Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc, aligned with normally accepted construction hours in the Auckland Region;
- Truck route diagrams between the construction site and external road network;
- Temporary traffic management signage/details for both pedestrians and vehicles, to manage the interaction of these road users with heavy construction traffic;
- Details of construction site access/egress over the entire construction period and any limitations on truck movements. All egress points should be positioned to achieve appropriate sight distances; and
- Application for Traffic Management Plan approval and Corridor Access Request to Auckland Transport.

Based on previous experience, the implementation of an appropriate CTMP will ensure that construction activities of this scale can be managed to ensure any generated traffic effects are appropriately mitigated.

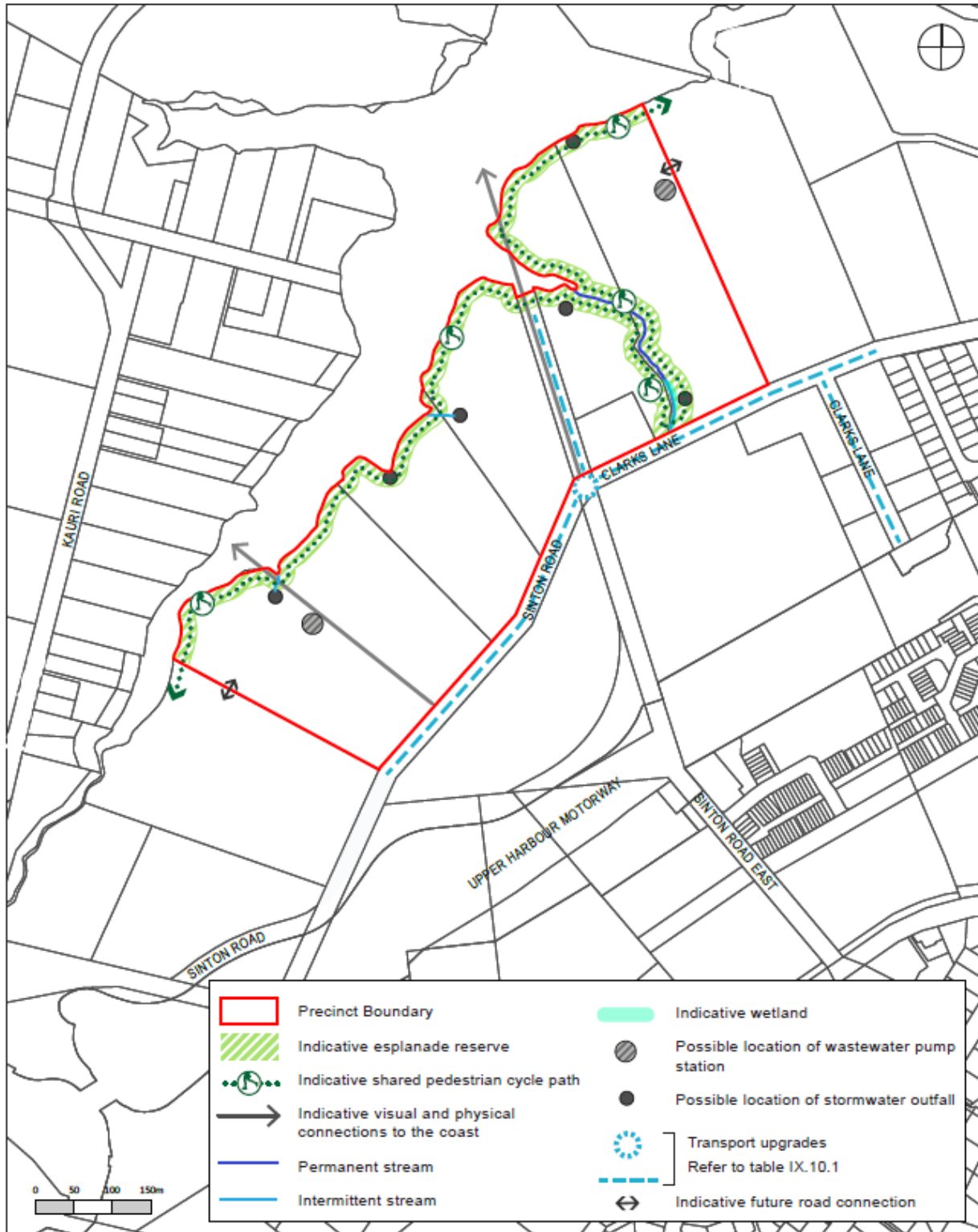
13 PRECINCT RULES / TRIGGERS

The proposed Whenuapai East Precinct includes a number of transportation upgrades. All these upgrades are required:

- (a) in the case of subdivision, prior to release of Resource Management Act 1991 section 224 certificate for any residential lots;*
- (b) in the case of land use only, prior to the occupation of any dwelling(s) or residential activities, including Integrated Residential Developments.*

Should these upgrades not occur, any application would be classified as a non-complying activity. The upgrades are included in Precinct Plan 1 in Figure 13-3 below. The details of these are also contained in the “*Road Function and Required Design Elements*” table of the Precinct.

Figure 13-3: Precinct Plan 1 upgrades



14 CONCLUSIONS

Based on the assessments undertaken in this report, it is concluded:

- The proposed rezoning of the Whenuapai East Precinct is in accordance with Auckland's planning policies, and promotes growth which has transport options available;
- The Whenuapai East Precinct, with the mitigation / improvement measures identified, has accessibility to walking, cycling, public transport, and private vehicle;
- Sufficient vehicle and bicycle parking can be provided within the Precinct.

It is anticipated that as part of future development of the Whenuapai East Precinct, the developer would be required to provide the transport network upgrades described in Section 8 of this assessment.

The traffic effects associated with the development of the Whenuapai East Precinct, with the implementation of the measures identified in Section 8, are considered acceptable and there is no reasons from a transport perspective not to approve the PPC.

APPENDIX A – SIDRA RESULTS

MOVEMENT SUMMARY

 **Site: 101 [NW Roundabout - Existing AM (Site Folder: Existing)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	483	0.0	483	0.0	0.170	0.9	LOS A	1.2	8.2	0.06	0.19	0.06	47.7
23a	R1	All MCs	11	0.0	11	0.0	0.170	6.4	LOS A	1.1	7.8	0.07	0.38	0.07	45.1
23b	R3	All MCs	106	0.0	106	0.0	0.170	8.5	LOS A	1.1	7.8	0.07	0.38	0.07	45.1
Approach			600	0.0	600	0.0	0.170	2.3	LOS A	1.2	8.2	0.06	0.23	0.06	47.2
North: Sinton Road															
7	L2	All MCs	6	0.0	6	0.0	0.055	6.1	LOS A	0.3	1.9	0.71	0.69	0.71	45.7
7a	L1	All MCs	23	0.0	23	0.0	0.055	5.3	LOS A	0.3	1.9	0.71	0.69	0.71	43.6
9b	R3	All MCs	7	0.0	7	0.0	0.055	12.9	LOS B	0.3	1.9	0.71	0.69	0.71	45.3
Approach			37	0.0	37	0.0	0.055	7.0	LOS A	0.3	1.9	0.71	0.69	0.71	44.5
NorthWest: Brigham Creek Road															
27b	L3	All MCs	4	0.0	4	0.0	0.433	3.7	LOS A	2.5	17.3	0.56	0.32	0.56	46.9
27a	L1	All MCs	541	0.0	541	0.0	0.433	2.3	LOS A	2.5	17.3	0.56	0.32	0.56	47.3
28	T1	All MCs	189	0.0	189	0.0	0.211	2.8	LOS A	0.9	6.6	0.51	0.34	0.51	45.6
Approach			735	0.0	735	0.0	0.433	2.4	LOS A	2.5	17.3	0.55	0.33	0.55	47.0
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	71	0.0	71	0.0	0.093	4.0	LOS A	0.3	2.3	0.47	0.52	0.47	47.1
30a	L1	All MCs	5	0.0	5	0.0	0.093	3.0	LOS A	0.3	2.3	0.47	0.52	0.47	47.3
32a	R1	All MCs	1	0.0	1	0.0	0.276	7.8	LOS A	1.2	8.2	0.47	0.67	0.47	43.9
32	R2	All MCs	348	0.0	348	0.0	0.276	8.9	LOS A	1.2	8.2	0.47	0.67	0.47	41.5
Approach			425	0.0	425	0.0	0.276	8.0	LOS A	1.2	8.2	0.47	0.64	0.47	42.7
All Vehicles			1797	0.0	1797	0.0	0.433	3.8	LOS A	2.5	17.3	0.37	0.38	0.37	46.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 102 [SE Roundabout - Existing AM (Site Folder: Existing)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	594	0.0	594	0.0	0.339	0.7	LOS A	2.1	14.6	0.28	0.10	0.28	48.6
26	R2	All MCs	589	0.0	589	0.0	0.408	8.1	LOS A	2.7	18.9	0.34	0.55	0.34	41.9
Approach			1183	0.0	1183	0.0	0.408	4.4	LOS A	2.7	18.9	0.31	0.32	0.31	45.7
NorthWest: Brigham Creek Road															
27	L2	All MCs	461	0.0	461	0.0	0.319	1.7	LOS A	0.0	0.0	0.00	0.35	0.00	46.8
29	R2	All MCs	119	0.0	119	0.0	0.319	7.4	LOS A	0.0	0.0	0.00	0.35	0.00	46.1
Approach			580	0.0	580	0.0	0.319	2.9	LOS A	0.0	0.0	0.00	0.35	0.00	46.6
All Vehicles			1763	0.0	1763	0.0	0.408	3.9	LOS A	2.7	18.9	0.21	0.33	0.21	45.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [NW Roundabout - Existing PM (Site Folder: Existing)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	677	0.0	677	0.0	0.250	0.9	LOS A	1.9	13.3	0.06	0.19	0.06	47.7
23a	R1	All MCs	38	0.0	38	0.0	0.250	6.4	LOS A	1.8	12.7	0.06	0.42	0.06	44.7
23b	R3	All MCs	173	0.0	173	0.0	0.250	8.5	LOS A	1.8	12.7	0.06	0.42	0.06	44.7
Approach			887	0.0	887	0.0	0.250	2.6	LOS A	1.9	13.3	0.06	0.25	0.06	46.9
North: Sinton Road															
7	L2	All MCs	9	0.0	9	0.0	0.056	6.8	LOS A	0.3	2.0	0.74	0.72	0.74	45.4
7a	L1	All MCs	20	0.0	20	0.0	0.056	6.2	LOS A	0.3	2.0	0.74	0.72	0.74	43.2
9b	R3	All MCs	5	0.0	5	0.0	0.056	13.7	LOS B	0.3	2.0	0.74	0.72	0.74	45.0
Approach			35	0.0	35	0.0	0.056	7.5	LOS A	0.3	2.0	0.74	0.72	0.74	44.3
NorthWest: Brigham Creek Road															
27b	L3	All MCs	11	0.0	11	0.0	0.384	4.1	LOS A	2.1	14.7	0.63	0.39	0.63	46.7
27a	L1	All MCs	423	0.0	423	0.0	0.384	2.7	LOS A	2.1	14.7	0.63	0.39	0.63	47.0
28	T1	All MCs	269	0.0	269	0.0	0.305	3.3	LOS A	1.5	10.3	0.62	0.41	0.62	45.0
Approach			703	0.0	703	0.0	0.384	3.0	LOS A	2.1	14.7	0.63	0.40	0.63	46.4
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	160	0.0	160	0.0	0.216	4.6	LOS A	0.8	5.9	0.56	0.60	0.56	46.9
30a	L1	All MCs	22	0.0	22	0.0	0.216	3.6	LOS A	0.8	5.9	0.56	0.60	0.56	47.0
32a	R1	All MCs	1	0.0	1	0.0	0.407	8.7	LOS A	2.0	13.9	0.59	0.75	0.62	43.6
32	R2	All MCs	481	0.0	481	0.0	0.407	9.8	LOS A	2.0	13.9	0.59	0.75	0.62	41.1
Approach			664	0.0	664	0.0	0.407	8.3	LOS A	2.0	13.9	0.58	0.71	0.60	43.0
All Vehicles			2289	0.0	2289	0.0	0.407	4.4	LOS A	2.1	14.7	0.39	0.43	0.40	45.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 102 [SE Roundabout - Existing PM (Site Folder: Existing)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	549	0.0	549	0.0	0.392	1.0	LOS A	2.6	17.9	0.34	0.14	0.34	48.3
26	R2	All MCs	883	0.0	883	0.0	0.505	8.0	LOS A	3.8	26.5	0.35	0.55	0.35	41.9
Approach			1433	0.0	1433	0.0	0.505	5.3	LOS A	3.8	26.5	0.35	0.39	0.35	44.8
NorthWest: Brigham Creek Road															
27	L2	All MCs	685	0.0	685	0.0	0.446	1.7	LOS A	0.0	0.0	0.00	0.33	0.00	47.0
29	R2	All MCs	125	0.0	125	0.0	0.446	7.4	LOS A	0.0	0.0	0.00	0.33	0.00	46.4
Approach			811	0.0	811	0.0	0.446	2.6	LOS A	0.0	0.0	0.00	0.33	0.00	46.9
All Vehicles			2243	0.0	2243	0.0	0.505	4.3	LOS A	3.8	26.5	0.22	0.37	0.22	45.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [NW Roundabout - Post-Development AM (Site Folder: Post-Development)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	649	0.0	649	0.0	0.247	1.0	LOS A	1.9	13.4	0.21	0.20	0.21	46.8
23a	R1	All MCs	56	0.0	56	0.0	0.247	6.6	LOS A	1.8	12.8	0.22	0.38	0.22	44.3
23b	R3	All MCs	127	0.0	127	0.0	0.247	8.7	LOS A	1.8	12.8	0.22	0.38	0.22	44.3
Approach			833	0.0	833	0.0	0.247	2.6	LOS A	1.9	13.4	0.22	0.24	0.22	46.2
North: Sinton Road															
7	L2	All MCs	40	0.0	40	0.0	0.459	12.4	LOS B	3.2	22.3	0.90	0.93	1.12	42.5
7a	L1	All MCs	148	0.0	148	0.0	0.459	11.7	LOS B	3.2	22.3	0.90	0.93	1.12	39.1
9b	R3	All MCs	47	0.0	47	0.0	0.459	19.2	LOS B	3.2	22.3	0.90	0.93	1.12	42.1
Approach			236	0.0	236	0.0	0.459	13.3	LOS B	3.2	22.3	0.90	0.93	1.12	40.6
NorthWest: Brigham Creek Road															
27b	L3	All MCs	20	0.0	20	0.0	0.598	5.2	LOS A	4.5	31.6	0.71	0.60	0.83	46.4
27a	L1	All MCs	678	0.0	678	0.0	0.598	3.8	LOS A	4.5	31.6	0.71	0.60	0.83	46.7
28	T1	All MCs	237	0.0	237	0.0	0.288	3.5	LOS A	1.3	9.4	0.60	0.43	0.60	45.1
Approach			935	0.0	935	0.0	0.598	3.7	LOS A	4.5	31.6	0.68	0.56	0.77	46.4
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	86	0.0	86	0.0	0.150	4.7	LOS A	0.6	4.0	0.56	0.59	0.56	46.9
30a	L1	All MCs	27	0.0	27	0.0	0.150	3.6	LOS A	0.6	4.0	0.56	0.59	0.56	47.1
32a	R1	All MCs	1	0.0	1	0.0	0.377	8.4	LOS A	1.8	12.6	0.60	0.74	0.61	43.6
32	R2	All MCs	435	0.0	435	0.0	0.377	9.5	LOS A	1.8	12.6	0.60	0.74	0.61	41.0
Approach			549	0.0	549	0.0	0.377	8.5	LOS A	1.8	12.6	0.59	0.71	0.60	42.5
All Vehicles			2553	0.0	2553	0.0	0.598	5.3	LOS A	4.5	31.6	0.53	0.52	0.58	44.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 102 [SE Roundabout - Post-Development AM (Site Folder: Post-Development)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	753	0.0	753	0.0	0.443	1.0	LOS A	3.1	21.5	0.38	0.14	0.38	48.2
26	R2	All MCs	713	0.0	713	0.0	0.514	8.5	LOS A	3.8	26.9	0.45	0.57	0.45	41.5
Approach			1465	0.0	1465	0.0	0.514	4.7	LOS A	3.8	26.9	0.41	0.35	0.41	45.4
NorthWest: Brigham Creek Road															
27	L2	All MCs	653	0.0	653	0.0	0.452	1.7	LOS A	0.0	0.0	0.00	0.35	0.00	46.8
29	R2	All MCs	168	0.0	168	0.0	0.452	7.4	LOS A	0.0	0.0	0.00	0.35	0.00	46.1
Approach			821	0.0	821	0.0	0.452	2.9	LOS A	0.0	0.0	0.00	0.35	0.00	46.6
All Vehicles			2286	0.0	2286	0.0	0.514	4.0	LOS A	3.8	26.9	0.26	0.35	0.26	45.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [NW Roundabout - Post-Development PM (Site Folder: Post-Development)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	841	0.0	841	0.0	0.349	1.0	LOS A	3.0	21.2	0.20	0.19	0.20	46.9
23a	R1	All MCs	142	0.0	142	0.0	0.349	6.5	LOS A	2.9	20.3	0.21	0.43	0.21	43.6
23b	R3	All MCs	207	0.0	207	0.0	0.349	8.7	LOS A	2.9	20.3	0.21	0.43	0.21	43.6
Approach			1191	0.0	1191	0.0	0.349	3.0	LOS A	3.0	21.2	0.21	0.26	0.21	45.8
North: Sinton Road															
7	L2	All MCs	24	0.0	24	0.0	0.298	11.4	LOS B	1.8	12.3	0.89	0.85	0.89	42.7
7a	L1	All MCs	75	0.0	75	0.0	0.298	11.3	LOS B	1.8	12.3	0.89	0.85	0.89	39.5
9b	R3	All MCs	36	0.0	36	0.0	0.298	18.3	LOS B	1.8	12.3	0.89	0.85	0.89	42.4
Approach			135	0.0	135	0.0	0.298	13.2	LOS B	1.8	12.3	0.89	0.85	0.89	41.1
NorthWest: Brigham Creek Road															
27b	L3	All MCs	45	0.0	45	0.0	0.577	6.2	LOS A	4.2	29.4	0.80	0.78	0.99	46.0
27a	L1	All MCs	513	0.0	513	0.0	0.577	4.9	LOS A	4.2	29.4	0.80	0.78	0.99	46.4
28	T1	All MCs	326	0.0	326	0.0	0.455	5.3	LOS A	2.6	18.2	0.76	0.70	0.87	44.1
Approach			884	0.0	884	0.0	0.577	5.1	LOS A	4.2	29.4	0.79	0.75	0.94	45.7
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	199	0.0	199	0.0	0.377	6.1	LOS A	1.8	12.5	0.69	0.74	0.77	46.2
30a	L1	All MCs	86	0.0	86	0.0	0.377	5.0	LOS A	1.8	12.5	0.69	0.74	0.77	46.4
32a	R1	All MCs	1	0.0	1	0.0	0.596	10.9	LOS B	4.1	29.0	0.75	0.94	1.00	43.0
32	R2	All MCs	628	0.0	628	0.0	0.596	12.0	LOS B	4.1	29.0	0.75	0.94	1.00	40.1
Approach			915	0.0	915	0.0	0.596	10.1	LOS B	4.1	29.0	0.73	0.88	0.93	42.4
All Vehicles			3124	0.0	3124	0.0	0.596	6.1	LOS A	4.2	29.4	0.55	0.60	0.66	44.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 102 [SE Roundabout - Post-Development PM (Site Folder: Post-Development)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	659	0.0	659	0.0	0.486	1.4	LOS A	3.5	24.6	0.43	0.19	0.43	47.9
26	R2	All MCs	1164	0.0	1164	0.0	0.679	8.5	LOS A	6.6	46.1	0.49	0.58	0.49	41.4
Approach			1823	0.0	1823	0.0	0.679	5.9	LOS A	6.6	46.1	0.47	0.44	0.47	44.2
NorthWest: Brigham Creek Road															
27	L2	All MCs	861	0.0	861	0.0	0.561	1.7	LOS A	0.0	0.0	0.00	0.33	0.00	47.0
29	R2	All MCs	158	0.0	158	0.0	0.561	7.4	LOS A	0.0	0.0	0.00	0.33	0.00	46.4
Approach			1019	0.0	1019	0.0	0.561	2.6	LOS A	0.0	0.0	0.00	0.33	0.00	46.9
All Vehicles			2842	0.0	2842	0.0	0.679	4.7	LOS A	6.6	46.1	0.30	0.40	0.30	45.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [MDRS NW Roundabout - Post-Development AM**
(Site Folder: MDRS - 878 du)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

MDRS 878 du
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	649	0.0	649	0.0	0.274	1.1	LOS A	2.2	15.4	0.30	0.21	0.30	46.3
23a	R1	All MCs	112	0.0	112	0.0	0.274	6.7	LOS A	2.1	14.6	0.32	0.41	0.32	43.5
23b	R3	All MCs	127	0.0	127	0.0	0.274	8.8	LOS A	2.1	14.6	0.32	0.41	0.32	43.5
Approach			888	0.0	888	0.0	0.274	2.9	LOS A	2.2	15.4	0.31	0.26	0.31	45.5
North: Sinton Road															
7	L2	All MCs	82	0.0	82	0.0	0.921	44.6	LOS D	16.0	111.7	1.00	1.75	2.99	31.3
7a	L1	All MCs	305	0.0	305	0.0	0.921	44.0	LOS D	16.0	111.7	1.00	1.75	2.99	25.6
9b	R3	All MCs	82	0.0	82	0.0	0.921	51.4	LOS E	16.0	111.7	1.00	1.75	2.99	31.1
Approach			469	0.0	469	0.0	0.921	45.4	LOS D	16.0	111.7	1.00	1.75	2.99	27.9
NorthWest: Brigham Creek Road															
27b	L3	All MCs	37	0.0	37	0.0	0.629	5.6	LOS A	4.9	34.2	0.74	0.68	0.90	46.3
27a	L1	All MCs	678	0.0	678	0.0	0.629	4.2	LOS A	4.9	34.2	0.74	0.68	0.90	46.6
28	T1	All MCs	237	0.0	237	0.0	0.299	3.7	LOS A	1.4	9.6	0.62	0.45	0.62	45.0
Approach			952	0.0	952	0.0	0.629	4.1	LOS A	4.9	34.2	0.71	0.62	0.83	46.3
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	86	0.0	86	0.0	0.185	4.7	LOS A	0.7	5.2	0.60	0.59	0.60	46.8
30a	L1	All MCs	56	0.0	56	0.0	0.185	3.7	LOS A	0.7	5.2	0.60	0.59	0.60	47.0
32a	R1	All MCs	1	0.0	1	0.0	0.393	8.7	LOS A	2.0	13.9	0.64	0.77	0.67	43.5
32	R2	All MCs	435	0.0	435	0.0	0.393	9.8	LOS A	2.0	13.9	0.64	0.77	0.67	40.9
Approach			578	0.0	578	0.0	0.393	8.5	LOS A	2.0	13.9	0.63	0.73	0.65	42.7
All Vehicles			2887	0.0	2887	0.0	0.921	11.3	LOS B	16.0	111.7	0.62	0.72	0.98	41.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 102 [MDRS SE Roundabout - Post-Development AM**
(Site Folder: MDRS - 878 du)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

MDRS 878 du
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	713	0.0	713	0.0	0.505	1.6	LOS A	3.8	26.3	0.48	0.24	0.48	47.6
26	R2	All MCs	808	0.0	808	0.0	0.505	8.4	LOS A	3.8	26.3	0.44	0.56	0.44	41.8
Approach			1521	0.0	1521	0.0	0.505	5.2	LOS A	3.8	26.3	0.46	0.41	0.46	44.9
NorthWest: Brigham Creek Road															
27	L2	All MCs	776	0.0	776	0.0	0.537	1.7	LOS A	0.0	0.0	0.00	0.35	0.00	46.8
29	R2	All MCs	200	0.0	200	0.0	0.537	7.4	LOS A	0.0	0.0	0.00	0.35	0.00	46.1
Approach			976	0.0	976	0.0	0.537	2.9	LOS A	0.0	0.0	0.00	0.35	0.00	46.6
All Vehicles			2497	0.0	2497	0.0	0.537	4.3	LOS A	3.8	26.3	0.28	0.39	0.28	45.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [MDRS NW Roundabout - Post-Development PM
(Site Folder: MDRS - 878 du)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

MDRS 878 du
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Brigham Creek Road															
22	T1	All MCs	841	0.0	841	0.0	0.402	1.1	LOS A	3.7	25.8	0.31	0.18	0.31	46.4
23a	R1	All MCs	274	0.0	274	0.0	0.402	6.7	LOS A	3.5	24.6	0.33	0.47	0.33	42.6
23b	R3	All MCs	207	0.0	207	0.0	0.402	8.9	LOS A	3.5	24.6	0.33	0.47	0.33	42.6
Approach			1322	0.0	1322	0.0	0.402	3.5	LOS A	3.7	25.8	0.32	0.29	0.32	44.9
North: Sinton Road															
7	L2	All MCs	42	0.0	42	0.0	0.571	18.6	LOS B	4.5	31.4	0.95	1.06	1.39	39.5
7a	L1	All MCs	142	0.0	142	0.0	0.571	18.5	LOS B	4.5	31.4	0.95	1.06	1.39	35.3
9b	R3	All MCs	71	0.0	71	0.0	0.571	25.5	LOS C	4.5	31.4	0.95	1.06	1.39	39.2
Approach			255	0.0	255	0.0	0.571	20.5	LOS C	4.5	31.4	0.95	1.06	1.39	37.4
NorthWest: Brigham Creek Road															
27b	L3	All MCs	74	0.0	74	0.0	0.644	7.1	LOS A	4.9	34.0	0.84	0.91	1.11	45.8
27a	L1	All MCs	513	0.0	513	0.0	0.644	5.7	LOS A	4.9	34.0	0.84	0.91	1.11	46.2
28	T1	All MCs	326	0.0	326	0.0	0.498	6.0	LOS A	2.8	19.8	0.79	0.80	0.95	43.9
Approach			913	0.0	913	0.0	0.644	5.9	LOS A	4.9	34.0	0.82	0.87	1.05	45.5
SouthWest: SH18 NBD Off-Ramp															
30	L2	All MCs	199	0.0	199	0.0	0.521	7.9	LOS A	3.0	20.9	0.77	0.87	1.00	45.3
30a	L1	All MCs	161	0.0	161	0.0	0.521	6.8	LOS A	3.0	20.9	0.77	0.87	1.00	45.4
32a	R1	All MCs	1	0.0	1	0.0	0.648	12.0	LOS B	4.9	34.5	0.82	1.01	1.15	42.4
32	R2	All MCs	628	0.0	628	0.0	0.648	13.2	LOS B	4.9	34.5	0.82	1.01	1.15	39.5
Approach			989	0.0	989	0.0	0.648	11.1	LOS B	4.9	34.5	0.80	0.96	1.09	41.9
All Vehicles			3479	0.0	3479	0.0	0.648	7.5	LOS A	4.9	34.5	0.64	0.69	0.81	43.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 102 [MDRS SE Roundabout - Post-Development PM**
(Site Folder: MDRS - 878 du)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

MDRS - 878 du
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
NorthEast: Brigham Creek Road															
25	T1	All MCs	659	0.0	659	0.0	0.493	1.4	LOS A	3.6	25.1	0.45	0.20	0.45	47.9
26	R2	All MCs	1296	0.0	1296	0.0	0.759	8.8	LOS A	8.9	62.3	0.57	0.59	0.57	41.1
Approach			1955	0.0	1955	0.0	0.759	6.3	LOS A	8.9	62.3	0.53	0.46	0.53	43.8
NorthWest: Brigham Creek Road															
27	L2	All MCs	909	0.0	909	0.0	0.592	1.7	LOS A	0.0	0.0	0.00	0.33	0.00	47.0
29	R2	All MCs	166	0.0	166	0.0	0.592	7.4	LOS A	0.0	0.0	0.00	0.33	0.00	46.4
Approach			1076	0.0	1076	0.0	0.592	2.6	LOS A	0.0	0.0	0.00	0.33	0.00	46.9
All Vehicles			3031	0.0	3031	0.0	0.759	5.0	LOS A	8.9	62.3	0.34	0.41	0.34	44.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.