Viva Energy Australia

Technical Report K

Transport impact assessment

Prepared for
Viva Energy Gas Australia Pty Ltd
ABN: N/A

AECOM

Technical Report K: Transport Impact Assessment

Viva Energy Gas Terminal Project Environment Effects Statement

25-Feb-2022
Viva Energy Gas Terminal Project

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Viva Energy Gas Terminal Project Environment Effects Statement

Client: Viva Energy Gas Australia Pty Ltd

ABN: N/A

Prepared by

AECOM Australia Pty Ltd
Level 10, Tower Two, 727 Collins Street, Melbourne VIC 3008, Australia
T +61 3 9653 1234 F +61 3 9654 7117 www.aecom.com
ABN 20 093 846 925

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Executive summary

This technical report provides a transport impact assessment (TIA) conducted to support the Environment Effects Statement (EES) for the Viva Energy Gas Terminal Project (the project).

In December 2020, the Victorian Minister for Planning determined that the project requires assessment through an EES under the *Environment Effects Act 1978* (Vic). The reasons for the decision were primarily related to the potential for significant adverse effects on the marine environment of Corio Bay and the potential for contributing to greenhouse gas emissions. Secondarily, the EES was required to assess the effects of the project on air quality, noise, land use, Aboriginal and historic heritage, native vegetation, groundwater, traffic and transport as well as visual amenity.

In January 2021, the project was also determined to require assessment and approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to the potential for the project to have a significant impact on wetlands of international importance, listed threatened species and communities, and listed migratory species. The EES process is the accredited environmental assessment process for the controlled action decision under the EPBC Act in accordance with the bilateral agreement between the Commonwealth and Victorian governments.

Overview

Viva Energy Gas Australia Pty Ltd (Viva Energy) is planning to develop a gas terminal using a ship known as a floating storage and regasification unit (FSRU), which would be continuously moored at Refinery Pier in Corio Bay, Geelong. The key objective of the project is to facilitate supply of a new source of gas for the south-east Australian gas market where there is a projected supply shortfall in coming years.

The FSRU would store liquefied natural gas (LNG) received from visiting LNG ships (that would moor directly adjacent to the FSRU), and regasify the LNG as required to meet industrial, commercial and residential customer demand. A 7 kilometre gas transmission pipeline would transfer the gas from the FSRU to the Victorian Transmission System (VTS) at Lara.

The gas terminal would be located adjacent to, and on, Viva Energy's Geelong Refinery in a heavily industrialised setting and would benefit from Viva Energy's experience and capability as an existing Major Hazard Facility (MHF) operator and potential synergies between the two facilities such as reuse of the FSRU seawater discharge within the refinery operations.

Methodology

The methodology for this Transport Impact Assessment comprised a systematic, risk-based screening and impact assessment approach. This has been designed to provide an understanding of the existing conditions and an assessment of the potential project impacts, and to propose mitigation measures to avoid, minimise and manage potential adverse impacts.

The existing conditions assessment included an initial desktop study, on-site road assessment including traffic surveys, data investigation and review of relevant policies and legislation. The nature of the expected traffic generating activities was reviewed to approximate the number of vehicle trips potentially associated with the project during both the construction and operational phases. This assessment was undertaken to consider network capacity, both road link and intersection (using SIDRA modelling software), intersection safety, network infrastructure, public transport impacts, pedestrian and cyclist impacts and residual impact.

Existing conditions

The road network around the project area is comprised of declared and local roads. Traffic surveys of roads within the study area showed relatively low existing traffic volumes operating on the local road network. The SIDRA modelling of existing key local intersections demonstrated that they are all predicated to be operating well within capacity.

A crash analysis within the study area has led to the identification of several recorded crashes along roads anticipated to be utilised by project traffic. Re-occurring locations for the crashes were found along Princes Highway which runs on the western side of the study area. Other safety considerations

include the presence of three level crossings within the study area along the rail corridor which runs across the study area.

Observed pedestrian and cyclist activity was found to be mostly located south of the study area with a pedestrian footpath located on School Road and shared use paths along Seabeach Parade and Corio Quay Road. However, no pedestrian or cyclist activity was observed along most of the roads within the immediate vicinity of the proposed pipeline.

Corio Station and North Shore Station are located within the study area and provide V-Line services. Three bus routes were identified located to the south of the proposed pipeline alignment. School bus routes (such as those servicing Geelong Grammar School) are expected to be operating along School Road**.**

Construction impact assessment

During construction, potential impacts on the transport network include temporary road and lane closures, increased traffic delays and impeded access. These would be managed through the implementation of standard traffic management measures typically applied for projects of this scale and nature and incorporated into the projects Traffic Management Plan (TMP). The key findings of the construction phase impact assessment are summarised below:

1. Intersection capacity: the analysis included anticipated traffic generated by the proposed TT-Line Spirit of Tasmania ferry relocation, located at Corio Quay and the projected project construction traffic. All intersections across all time periods are predicted to operate well within the defined capacity metrics.
2. Road closure: A single road closure on Shell Parade could occur during construction of the aboveground pipeline as part of the project. This would be dependent on whether trenchless construction (thrust-boring) or trenching is used to create a new culvert under Shell Parade next to the existing culvert for the aboveground pipeline. If trenching is selected as the preferred method, a temporary road closure would be required for a maximum duration of approximately 4 days. Any changes in project construction scope and associated road closures would be outlined as part of the projects TMP, and specific road closure traffic management requirements detailed in subsequent work TMPs by the nominated works contractor in agreement with key stakeholders. This includes traffic detours and traffic management measures such as traffic controllers and signage. No impacts to public transport services are expected to occur and local property access is expected to be maintained during the road closures.
3. Lane closure: A single traffic lane closure is proposed on Macgregor Court during construction of the underground pipeline. The construction method that would be used in the northern section of Macgregor Court, adjacent to the rural residential properties, would either be trenching with a construction right of way of approximately 15 metres or Horizontal Directional Drilling (HDD) with appropriate HDD entry and exit points. Construction in this area is anticipated to take up to 11 days to complete if trenching is selected and up to 50 days if HDD is selected. Although a single traffic lane closure is required, access to properties would be maintained during the construction time period. Viva Energy would consult with residents and provide appropriate notification prior to the lane closure and impacts would be minimised and managed through implementation of appropriate traffic management measures such as signage and traffic controllers as required.

   It is noted that traffic management to permit vehicles to enter and exit the HDD workspace area via Rennie Street, located to the immediate west of the Macgregor Court / Princes Freeway off-ramp / Rennie Street / Shell Parade roundabout. This would be to permit the movement of trenchless construction equipment (HDD) to be moved in and out of the workspace via a semi-trailer vehicle which is anticipated to require both sides of the road to enter and exit the works access point. It is understood that access to the site would occur outside of peak traffic operating hours, on an as needed basis and are not expected to be frequent.
4. Over dimensional (OD) loads: the swept path analysis indicates that traffic management may be required as OD vehicles may encroach into adjoining lanes, shoulders and roundabouts. Traffic management would be required and should be investigated as part of a TMP. OD transport route assessments are also recommended to be undertaken prior to the commencement of construction by the nominated transportation contractor.

Overall, impacts to the transport network during construction are expected to be relatively minor and can be managed through measures outlined in a TMP for the project with agreement by key stakeholders, with the road network found to be sufficient to accommodate anticipated traffic volumes.

Operation impact assessment

Transport impacts identified in the operational phase of the project are considered to be negligible with a maximum of up to eight nitrogen delivery trucks per day. This activity should be managed in accordance with recommended mitigation measures to ensure that safety on the road network is maintained.

Decommissioning impact assessment

Potential impacts associated with decommissioning works for the project are expected to be the same or similar to those associated with the construction phase. However, the overall level of impact would be lower due to the nature of decommissioning activities with a number of the facilities such as the pier and underground pipeline expected to remain in situ. These impacts should also be managed with the implementation of the same mitigation measures as those proposed for construction impacts and in accordance with all regulatory requirements at the time of decommissioning.

Cumulative impact assessment

Construction of the project is expected to coincide with three other projects which are anticipated to generate traffic movements within the study area:

- Diesel Storage Project
- GeelongPort TT-Line
- Boral Clinker Grinding Facility

Overall, potential cumulative impacts associated with these projects are anticipated to be relatively minor as the local road network was found to have sufficient capacity to accommodate the traffic movements anticipated to be generated by these projects in addition to the Gas Terminal Project.

Summary of mitigation measures and residual impacts

Mitigation measures have been developed in response to the identified project impacts to minimise these during the project phases, these are detailed in Section 11.0 of this TIA and summarised below:

1. MM-TP01 – Stakeholder consultation
2. MM-TP02 – Traffic Management Plan (TMP)
3. MM-TP03 – Road safety audit(s)
4. MM-TP04 – Access strategy and design
5. MM-TP05 – Sub-TMPs
6. MM-TP06 – OD transport route assessments
7. MM-TP07 – Operational transport plan

Abbreviations

Abbreviation/Term	Definition
AADT	Average Annual Daily Traffic
AECOM	AECOM Australia Pty Ltd
CoGG	City of Greater Geelong
EES	Environment Effects Statement
FSRU	Floating storage and regasification unit
Km	Kilometre
Km/hr	Kilometres per hour
LOS	Level of Service
LNG	Liquified natural gas
MHF	Major Hazard Facility
NHVR	National Heavy Vehicle Regulator
OD	Origin to Destination
OSOM	Oversize and Overmass
ROW	Right of way
SISD	Safe Intersection Sight Distances
SWP	South West Pipeline
TMP	Traffic Management Plan
VTS	Victorian Transmission System

1.0 Introduction

This technical report provides a Transport Impact Assessment (TIA) conducted to support the Environment Effects Statement (EES) for the Viva Energy Gas Terminal Project (the project).

Viva Energy Gas Australia Pty Ltd (Viva Energy) is planning to develop a gas terminal using a ship known as a floating storage and regasification unit (FSRU), which would be continuously moored at Refinery Pier in Corio Bay, Geelong. The key objective of the project is to facilitate supply of a new source of gas for the south-east Australian gas market where there is a projected supply shortfall in coming years.

The FSRU would store liquefied natural gas (LNG) received from visiting LNG carriers (that would moor directly adjacent to the FSRU) and would convert LNG back into a gaseous state by heating the LNG using seawater (a process known as regasification) as required to meet industrial, commercial, and residential customer demand. A 7-kilometre gas transmission pipeline would transfer the gas from the FSRU to the Victorian Transmission System (VTS) at Lara.

The project would be situated adjacent to, and on, Viva Energy's Geelong Refinery, within a heavily developed port and industrial area on the western shores of Corio Bay between the Geelong suburbs of Corio and North Shore. Co-locating the project with the existing Geelong Refinery and within the Port of Geelong offers significant opportunity to minimise potential environmental effects and utilise a number of attributes that come with the port and industrial setting.

In December 2020, the Victorian Minister for Planning determined that the project requires assessment through an EES under the *Environment Effects Act 1978* (Vic). The reasons for the decision were primarily related to the potential for significant adverse effects on the marine environment of Corio Bay and the potential for contributing to greenhouse gas emissions. Secondarily, the EES was required to assess the effects of the project on air quality, noise, land use, Aboriginal and historic heritage, native vegetation, groundwater, traffic and transport as well as visual amenity.

In January 2021 the project was also determined to require assessment and approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to the potential for the project to have a significant impact on the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site (a wetland of international importance), listed threatened species and communities, and listed migratory species. The EES process is the accredited environmental assessment process for the controlled action decision under the EPBC Act in accordance with the bilateral agreement between the Commonwealth and Victorian governments.

1.1 Purpose

This transport impact assessment identifies, assesses, and characterises potential transport impacts associated with the construction, operation and decommissioning stages of the project to inform preparation of the EES required for the project.

The report identifies and recommends mitigation measures to avoid, minimise and manage potential impacts which will inform the development of an Environmental Management Framework (EMF) for the project. The mitigation measures listed in the EMF would be implemented in the approvals and management plans for the project.

1.2 Why understanding transport is important

Project activities and vehicles have the potential to impact the surrounding transport network during the construction, operation and decommissioning stages of the project. Transport impacts can include impacts to network infrastructure condition and level of service and safety, which can ultimately affect network users, the surrounding community and local businesses.

Understanding how the project would impact the transport network is important to inform the development of effective and appropriate mitigation measures to optimise the functionality, operation and safety of the transport network during the project construction, operation and decommissioning.

1.3 Project area

The project would be located adjacent to, and on, the Geelong Refinery and Refinery Pier in the City of Greater Geelong, 75 kilometres (km) south-west of Melbourne. The project area is within a heavily developed port and industrial area on the western shores of Corio Bay between the Geelong suburbs of Corio and North Shore. The Geelong central business district is located approximately 7km south of the project.

Corio Bay is the largest internal bay in the south-west corner of Port Phillip and is a sheltered, shallow basin at the western end of the Geelong Arm with an area of 43 square kilometres (km^2). The Point Wilson/Limeburners Bay section of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site is located along the northern shoreline of Corio Bay approximately one kilometre to the north-east of the project.

The Port of Geelong has been in operation for over 150 years and is the largest industrial bulk cargo port in Victoria attracting over 600 ship visits and handling more than 14 million tonnes of product annually. Geelong's shipping channels extend 18 nautical miles through Corio Bay from Point Richards through to Refinery Pier. Ports Victoria (formerly Victorian Regional Channels Authority) manages commercial navigation in the port waters in and around Geelong and is responsible for the safe and efficient movement of shipping, and for maintaining shipping channels and navigation aids. The channels are man-made having been deepened and widened through periodic dredging to support port trade development.

Refinery Pier is the primary location within the Port of Geelong for movement of bulk liquids. Vessels up to 265 metres in length currently utilise the four berths at Refinery Pier which service Viva Energy refinery operations. The majority of ship visits to the port are to Refinery Pier, with Viva Energy accounting for over half of the trade through the Port of Geelong.

The Geelong Refinery has been operating since 1954 with both the refinery and the co-located LyondellBasell plant being licensed Major Hazard Facilities (MHFs). A range of industrial activities are situated in the Port environs including wood fibre processing and chemical, fertiliser and cement manufacture.

To the north of the Geelong Refinery along the proposed pipeline corridor, the area is predominantly rural. There are several other existing Viva Energy-owned underground pipelines running between the refinery and the connection point to the South West Pipeline (SWP) at Lara. The proposed pipeline route follows already disturbed pipeline corridors, where possible, through a mix of land uses.

The project area is shown in Figure 1-1.

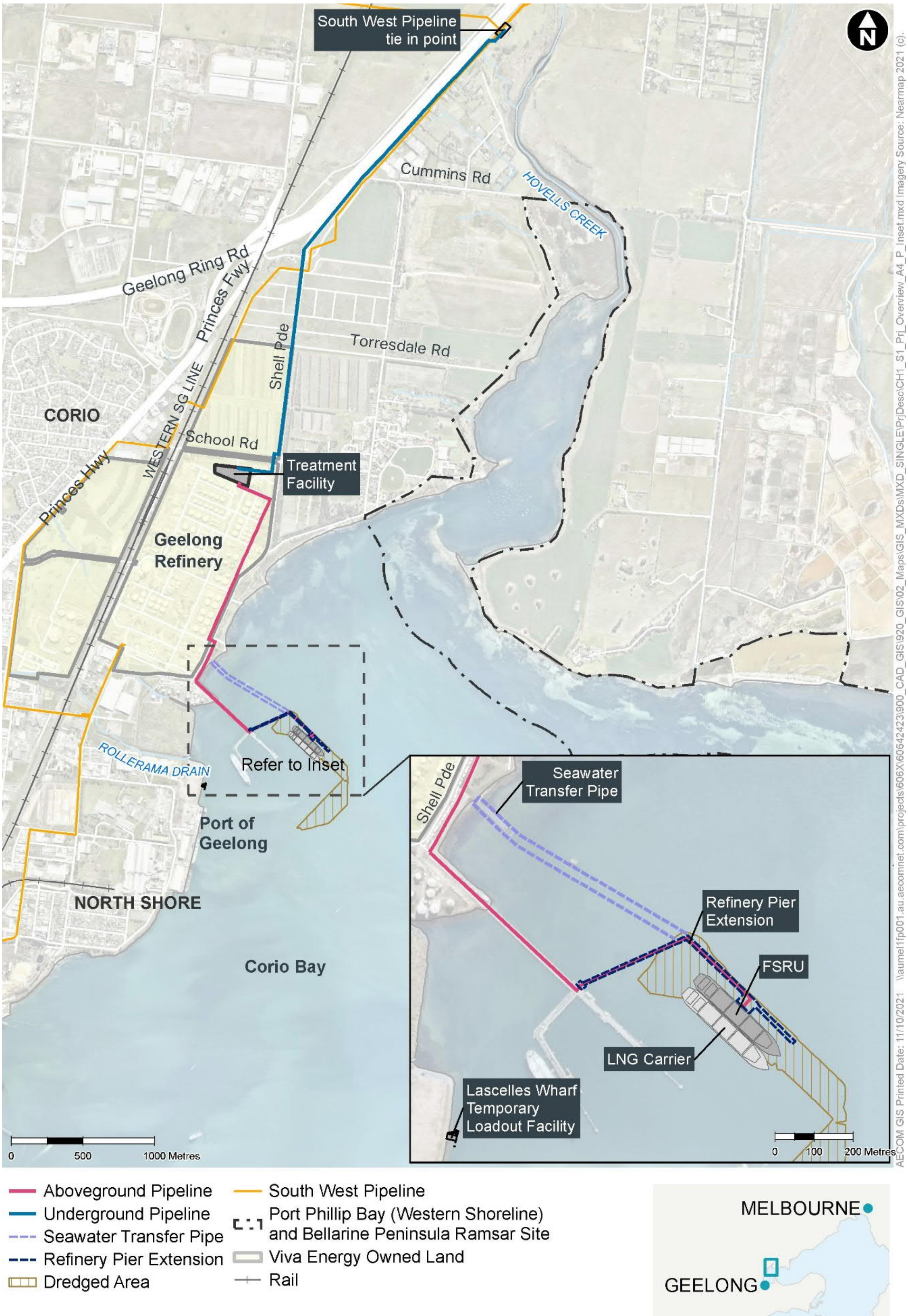


Figure 1-1: Project overview

1.4 Project description

This section summarises the project as described in Chapter 4: *Project description*. Key components of the project include:

- Extension of the existing Refinery Pier with an approximately 570 metre (m) long angled pier arm, new berth and ancillary pier infrastructure including high pressure gas marine loading arms (MLAs) and a transfer line connecting the seawater discharge points on the FSRU to the refinery seawater intake.
- Continuous mooring of an FSRU at the new Refinery Pier berth to store and convert LNG into natural gas. LNG carriers would moor alongside the FSRU and unload the LNG.
- Construction and operation of approximately 3km of aboveground gas pipeline on the pier and within the refinery site connecting the FSRU to the new treatment facility.
- Construction and operation of a treatment facility on refinery premises including injection of nitrogen and odorant (if required).
- Construction and operation of an underground gas transmission pipeline, approximately 4km in length, connecting to the SWP at Lara.

The Refinery Pier extension would be located to the north-east of Refinery Pier No. 1. The new pier arm would be positioned to allow for sufficient clearance between an LNG carrier berthed alongside the FSRU and a vessel berthed at the existing Refinery Pier berth No. 1. Dredging of approximately 490,000 cubic metres of seabed sediment would be required to allow for the new berth pocket and swing basin.

The FSRU vessel would be up to 300m in length and 50m in breadth, with the capacity to store approximately 170 000 cubic metres (m^3) of LNG. The FSRU would receive LNG from visiting LNG carriers and store it on board in cryogenic storage tanks at about – 160 °C.

The FSRU would receive up to 160 PJ per annum (approximately 45 LNG carriers) depending on demand. The number of LNG carriers would also depend on their storage capacity, which could vary from 140,000 to 170,000 m^3.

When gas is needed, the FSRU would convert the LNG back into a gaseous state by heating the LNG using seawater (a process known as regasification). The natural gas would then be transferred through the aboveground pipeline from the FSRU to the treatment facility where odorant and nitrogen would be added, where required, to meet Victorian Transmission System (VTS) gas quality specifications. Nitrogen injection would occur when any given gas cargo needs to be adjusted (diluted) to meet local specifications. Odorant is added as a safety requirement so that the normally odourless gas can be smelt when in use. From the treatment facility, the underground section of the pipeline would transfer the natural gas to the tie-in point to the SWP at Lara.

1.4.1 Key construction activities

Construction of the project would occur over a period of up to 18 months. The key construction activities relate to:

- Localised dredging of seabed sediments to enable the FSRU and LNG carriers to berth at Refinery Pier and excavation of a shallow trench for the seawater transfer pipe
- Construction of a temporary loadout facility at Lascelles Wharf
- Construction of the new pier arm and berthing infrastructure, and aboveground pipeline along Refinery Pier and through the refinery
- Construction of the treatment facility on a laydown area at the northern boundary of the refinery site
- Installation of the buried pipeline
- Construction at the tie-in point to the SWP at Lara

There are no construction activities required for the FSRU component of the project. The vessel would be built, commissioned and all production and safety systems verified prior to being brought to site.

An estimated 490,000 cubic metres (m^3) of dredging would be required, over an area of approximately 12 hectares (ha), adjacent to the existing shipping channel to provide sufficient water depth at the new berth and within the swing basin for visiting LNG carriers to turn. Dredging within the new berth would be undertaken to a depth of 13.1 metres and the swing basin would be dredged to a depth of 12.7 metres. The dredging physical footprint is shown in Figure 1-1. It is planned to deposit the dredged material within the existing dredged material ground (DMG) in Port Phillip to the east of Point Wilson, approximately 26 km from Refinery Pier.

The temporary loadout facility at Lascelles Wharf would be the first construction activity to take place in order to facilitate the Refinery Pier extension. This would involve the installation of 10 piles using hydraulic hammers.

Construction of the pier arm would be carried out once dredging was complete, primarily from the water using barge-mounted cranes. Steel piles would be driven into the seabed by barge-mounted cranes and pre-cast concrete and pre-fabricated steel components would be transported to site by barge and lifted into position. The installation of pier infrastructure such as the marine loading arms (MLAs), piping from the FSRU to the existing refinery seawater intake (SWI) and aboveground pipeline would also be undertaken from the water using barge-mounted cranes and construction support boats.

Installation of the 3 km above ground pipeline along the pier and through the refinery is anticipated to take 3.5 months to complete. The above ground pipeline would run along the pier to the existing pipe track east of Shell Parade within the pier foreshore compound. It would then pass through a road under-crossing to the existing refinery pipe track. The pipeline would then run north along the existing refinery pipe track to an existing laydown area where the treatment facility would be located.

The treatment facility would be located within an existing laydown area and cover an area of approximately 80m x 120m. Construction of the treatment facility would take up to 18 months and would be undertaken by specialist crews across distinct phases of work. These would include initial earthworks and civil construction, mechanical installation and electrical and instrumentation works.

The 4 km underground pipeline would be installed in stages over a 4-month period within a corridor which has been selected so as to avoid watercourses or other environmental sensitivities, where possible. Firstly, a construction right of way (ROW) would be established, clearly identified and fenced off where required. Typically, this would be between 15m and 20m wide, and minimised where possible to reduce disturbance. Once the construction ROW is established, vegetation would be removed, and a trench excavated to a maximum depth of 2m and a maximum width of 1m for the pipeline to be placed. Following the placement of the pipeline, the construction ROW would be rehabilitated to its pre-existing condition as far as practicable for the purposes for which it was used immediately before the construction of that part of the pipeline.

Trenchless construction (including thrust boring or horizontal directional drilling (HDD)) would be used to install the underground pipeline in areas that are not suited to open trenching techniques, such as at intersections with major roads. Trenchless construction would involve boring or drilling a hole beneath the ground surface at a shallow angle and then pushing or pulling a welded length of pipe through the hole without disturbing the surface. It is anticipated that the maximum depth of the trenchless section would be 25 m.

The anticipated trenching, HDD and thrust bore locations are presented in Figure 1-2. It is possible that along the northern section of Macgregor Court the pipeline would also be constructed using HDD, however, this would be confirmed during detailed design.

Construction at the tie-in point to the SWP at Lara would be undertaken by specialist crews across the distinct phases of works, as with the treatment facility.

Figure 1-2: Proposed location of trenching construction techniques for the underground pipeline including open trenching, HDD and thrust boring

1.4.2 Key operation activities

The project is expected to be in operation for approximately 20 years. Key activities relating to project operation include:

- receipt of up to 45 LNG carriers each year at Refinery Pier – the number and frequency of LNG carriers arriving each year would depend on their storage capacity and gas demand
- regasification of LNG onboard the FSRU using seawater as a heat source, which would then be reused within the refinery as cooling water
- injection of nitrogen and odorant into the gas prior to distribution via the VTS
- monitoring and maintenance of the pipeline easement.

1.4.3 Key decommissioning activities

The FSRU, which continues to be an ocean-going vessel throughout the operation of the project, would leave Corio Bay on completion of the project life to be used elsewhere.

It is anticipated that the Refinery Pier berth and facilities would be retained for other port related uses. The underground pipeline would likely remain in situ subject to landholder agreements and either decommissioned completely or placed into care and maintenance arrangements.

Decommissioning activities may be subject to change, subject to legislative requirements at the time and potential repurposing of the infrastructure at the end of the project.

1.4.4 Project activities relevant to the assessment

During construction, the following activities would generate light and heavy vehicle movements in and around the study area:

- Pipeline construction (above and underground)
- Treatment facilities
- Brownfield modifications.

The dredging and pier construction are not expected to generate material traffic during their respective construction phases, with workers, plant and materials primarily transported via boat. A portion of the crew would however, reside in hotel-type accommodation in the Geelong region.

During the operational phase, the main traffic generation would come from trucks visiting the facility to deliver nitrogen (sometimes added to the gas to ensure compliance with local standards) and from periodic maintenance activities.

2.0 Scoping requirements

The scoping requirements for the EES set out the specific environmental matters to be investigated in the EES. The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the Project.

The following evaluation objective is relevant to the transport impact assessment:

1. **Social, economic, amenity and land use –** To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

The scoping requirements of relevance to this transport impact assessment and where they are addressed in the report are shown in Table 2-1.

Table 2-1 Scoping requirements relevant to transport

Aspect	Scoping requirement	Section addressed
Key issues	Potential for project works and operations to affect business operations or other existing or approved facilities or land uses.	Technical report M: *Land use impact assessment* Section 7.0 Construction impacts Section 8.0Operational impacts Section 9.0 Decommissioning impacts
	Potential for temporary or permanent changes to use of or access to existing infrastructure in the project area and in its vicinity.	
Existing environment	Identify existing and reasonably foreseeable land uses and businesses occupying land to be traversed by, adjacent to, or otherwise affected by impacts from the project.	Technical report M: *Land use impact assessment* Section 5.0 Existing conditions Section 6.3 Traffic generation and distribution Section 6.0 Project works, traffic generation and capacity analysis 6.0
Likely effects	Assess likely noise, vibration, traffic, lighting and visual impacts at sensitive receptors adjacent to the project during project construction and operation (both with and in the absence of the proposed mitigation measures), relative to standards.	Section 7.0 Construction impacts Section 8.0Operational impacts Section 9.0 Decommissioning impacts
	Describe the likely extent and duration of temporary disruption to existing land uses arising from project construction.	Technical report M: *Land use impact assessment* Section 7.0 Construction impacts
	Describe potential impacts on public infrastructure including roads resulting from construction or operations activities.	Section 7.0 Construction impacts Section 8.0Operational impacts
	Assess potential safety hazards to the public arising from project construction and operation.	Section 7.0 Construction impacts Section 8.0Operational impacts

Aspect	Scoping requirement	Section addressed
Mitigation measures	Identify potential and proposed design responses and/or other mitigation measures to avoid, reduce and/or manage any significant effects for sensitive receptors during project construction and operation arising from specified air pollution indicators, noise, vibration, traffic and lighting, in the context of applicable policy and standards.	Section 11.0 Mitigation measures 11.0 7.08.011.0
Performance objectives	Measures to manage other potentially significant effects on amenity, environmental quality and social wellbeing (including access to open spaces) should also be addressed in the EES, including a framework for identifying and responding to emerging issues, as part of the EMF.	Section 11.0 Mitigation measures

3.0 Legislation, policy, guidelines and approvals

3.1 Legislation, policy and guidelines

Table 3-1 summarises the relevant legislation and policies and guidelines that apply to the project in the context of this TIA, as well as their implications for the project and the required approvals (if any).

Table 3-1: Primary legislation and associated information

Legislation/policy/ guidelines	Key policies/strategies	Implications for the Project	Approvals required
State			
City of Greater Geelong – Planning Scheme	Notable planning clauses relating to traffic and transport, include: 0. 18.01-2S transport systems 1. 18.02-4S car parking 2. 52.06 car parking	Ensuring project meets required planning application standards with regards to traffic and transport. This includes: 3. Maintaining a safe and efficient road network 4. Ensuring adequate supply of car parking during both construction and operational phases of the project	Planning Scheme Amendment
Road Management Act 2004 (Victoria)	Road Management Act (General) Regulations 2016. Road Management Act (Works and Infrastructure) Regulations 2015. Code of Practice – Worksite Safety Traffic Management.	This Act and associated Regulations must be complied with for all public roads of the Victorian road network. The Act sets out general principles and obligations for which the road authority is responsible for administering. The Road Management Act requires approval for any construction project that may impact or change access of a controlled access road.	No approvals required

Legislation/policy/ guidelines	Key policies/strategies	Implications for the Project	Approvals required
Department of Transport (VicRoads) – Road Management Plan	The VicRoads Road Management Plan details the management and maintenance of roads registered under the VicRoads register of public roads. VicRoads manages its infrastructure in five phases: development of standards and guidelines, development of a maintenance program, implementation of the management program, auditing and review. The VicRoads road management plan also details maintenance inspection and response schedules.	Ensuring site access and maintenance of the road network is to the satisfaction of the Department of Transport (VicRoads) in terms of its own road assets impacted by the Project.	No approvals required
Transport Integration Act 2010	The Act provides a legislative framework for transport in Victoria. The Act seeks to integrate land use and transport planning and decision-making by applying the framework to land use agencies whose decisions can significantly impact on transport. The Act requires agencies, including the Department of Transport and Planning Authorities, to consider the potential impact of land use planning proposals on transport.	This Act sets out six transport system objectives and eight decision-making principles. These objectives include triple bottom line assessment: economic prosperity, social and economic inclusion and environmental sustainability. Other objectives include: • Integration of transport and land use • Efficiency, coordination and reliability • Safety and health and wellbeing These objectives and principles need to be considered in the evaluation of this project.	No approvals required
Road Safety Act 1986	Road Safety Road Rules, 2017.	These Rules provide road rules that are substantially consistent across Australia. They also specify behaviour for all road users. This framework is used in this assessment as the basis to assess safe and efficient traffic movements on roads.	No approvals required
	Road Safety (Traffic Management) Regulations, 2009.	These Regulations set out requirements for authorisation for implementing traffic control devices on roads (including for traffic management for worksites) This assessment uses this	No approvals required

Legislation/policy/ guidelines	Key policies/strategies	Implications for the Project	Approvals required
		framework as a reference to prescribe traffic management requirements.	
Towards Zero 2016-2020 – Victoria's Road Safety Strategy & Action Plan	This strategy aims to reduce fatalities and serious injuries by 15 per cent, with the ultimate aim of bringing the annual road toll under 200 per year by 2020.	This strategy references making local and busy places safer and using roads more safely. Safety considerations represent a critical focus of this assessment.	No approvals required
Victorian Road Safety Strategy 2021 - 2030	This strategy commits to the ambitious target of eliminating death from Victorian roads by 2050, with the first step of halving road deaths by 2030.	Safety considerations represent a critical focus of the transport impact assessment.	No approvals required
AS1742.3 2009 – Traffic control for works on road		This standard sets out all matters to be considered as being essential to a Traffic Management Plan (TMP) such as traffic demand, traffic routing, traffic control, special vehicle requirements and over-dimensional vehicles which will be developed at later stage of the Project following this TIA.	No approvals required
Austroads – Guide to Road Design Part 3: Geometric Design	The Guide to Road Design is one of a set of comprehensive Austroads Guides developed to provide a primary national reference for the development of safe, economical and efficient road design solutions.	AGRD Part 3 provides guidance on geometric requirements for Australian Roads. This guide shall be used to determine likely impacts of changes to road profiles and characteristics resulting from the Project and its associated traffic.	No approvals required
Austroads – Guide to Road Design Part 4: Intersections and Crossings		AGRD Part 4 provides guidance on intersection design such as design considerations, design process, choice of design vehicle, pedestrian and cyclist crossing treatments, provision for public transport and property access. This is particularly relevant to the Project as it is anticipated to potentially impact road access.	No approvals required

3.2 Transportation approvals

Access for B-double and higher mass limits (HML) trucks on the road network is regulated by the National Heavy Vehicle Regulator (NVHR).

HML classification enables particular heavy vehicles to access additional mass entitlements and allows for a significant increase in the productivity of road freight transport vehicles. Operators of vehicles or combinations running HML on tri-axle groups are accredited under the National Heavy Vehicle

Accreditation Scheme (NHVAS). Vehicles must be fitted with certified road friendly suspension and must be on an authorised HML route.

Operators of HML and B-Double vehicles need to obtain permits from the relevant road manager to operate on any roads which are not part of the approved networks. Typical B-Doubles range from 19 to 25 metres in length depending upon the number of axles. Once the final vehicle specifications have been established for the construction and operational phases of the project, subsequent transport impacts for this project would be analysed as part of the Traffic Management Plan (TMP) discussed in further detail in subsequent sections of this report.

Oversize Overmass (OSOM) vehicles are exempted from permitting requirements if they travel on the designated roads and approved routes and comply with the National Heavy Vehicle Regulator (NHVR) requirements. This is typically applicable to low loader/dolly combinations that operate up to 100 tonnes gross mass, five metres high, five metres wide, and 30 metres long. Access permits are required for non-approved roads or roads approved with conditions.

Permits can be applied for through NHVR which must seek consent from all road managers involved in a proposed permit route. Councils would generally allow the gazetted pre-approved local road network to be used by various types of heavy vehicles. Pre-approved local routes for each type of vehicle are outlined by VicRoads which maintains a list of the B-Double and HML network in Victoria. Final approvals required for the project would be identified and incorporated into the TMP.

4.0 Methodology

This section describes how the TIA was conducted to characterise the existing environment and identify potential impacts of the project. The following sections outline the study methodology.

4.1 Study area

The study area for the TIA includes the transport network within and around the onshore section of the project area as described in Section 1.3 and shown on Figure 1-1, including all of the roads and intersections used by light and heavy vehicles, cyclists and pedestrians. This TIA report has assessed the potential impacts of project activities within this area.

The study area does not include the offshore section of the project area.

4.2 Stakeholder consultation

Stakeholders and the community were consulted to support the preparation of the project's EES and to inform the development of the project and understanding of its potential impacts. During the EES process Viva Energy conducted a number of Community Information Sessions at local Geelong venues. Traffic and transport impacts were discussed in a Community Information Session on 12 August 2021. Due to COVID19 restrictions on public gatherings, the August 2021 Community Information Session was conducted as a webinar. Technical specialists provided an overview of the amenity studies conducted to support the EES (including the transport impact assessment) and were available to answer questions. Potential cumulative impacts of the project and other nearby projects was raised and has been considered in this report. Further information is provided in EES Chapter 6: *Stakeholder and community engagement.*

In accordance with the scoping requirements, a Technical Reference Group (TRG) was convened and chaired by DELWP on behalf of the Minister for Planning. The City of Greater Geelong is represented on the TRG. The TRG has provided input throughout the EES process. EES Chapter 6: *Stakeholder and community engagement* provides a summary of the project's key engagement activities and includes a full list of TRG members.

Following the TRG meeting held on Wednesday 21 July 2021 the Department of Transport (DoT) was also consulted (via virtual meeting on Wednesday 28 July 2021) to discuss the overall project and key findings from the TIA. Initial feedback from DoT suggested that there were no major issues of note that the TIA needed to address.

Key findings from the TIA were presented to GeelongPort and Geelong Grammar School (via virtual meetings) on 30 and 31 August 2021 respectively. No concerns were raised which the TIA needed to further address.

A number of attempts were made to obtain information related to the Boral Clinker Grinding Facility following the August Community Information Session as there is potential for cumulative impacts with the project due to its proximity. However, these attempts have been unsuccessful.

4.3 Existing conditions assessment method

The existing transport conditions assessment comprised the following tasks:

0. Review of the site location, key local land uses and the local road network.
1. Site visit and assessment of the roads within the study area, particularly at key intersections and site access points, undertaken by AECOM on 13 May 2021 (undertaken when traffic surveys for the project were being conducted).
2. Analysis of traffic survey data (sourced from project specific traffic surveys and DoT open source information).
3. SIDRA traffic modelling undertaken for local key intersections to understand the existing local key intersection capacities.

4. Investigation of road safety data (sourced from Department of Transport CrashStats), bus routes (sourced from Public Transport Victoria) and designated heavy vehicle routes and restrictions (sourced from VicRoads website).
5. Review of local sustainable transport mode provisions.

4.4 Risk screening method

A risk-based screening approach has been used for the EES assessment in accordance with the requirements outlined in the 'Ministerial guidelines for assessment of Environmental Effects under the *Environment Effects Act 1978'* (page 14). The risk screening is undertaken to ensure that the level of investigation conducted in each technical study is adequate to inform an assessment of the significance and acceptability of the project's potential environmental impacts.

An environmental, social and economic issues risk screening tool has been used to prioritise and focus the proposed investigations, assessments and approaches to avoiding, minimising or managing potential impacts. The issue screening process involved an evaluation of the potential environmental, social and economic issues associated with the project based on the information collected through a series of initial assessments undertaken into the potential effects of the project. A risk workshop convened by a qualified risk practitioner and comprising technical specialists from the proponent, project design team and EES team conducted the initial risk screening. The risk screening process utilised knowledge of the project infrastructure and design, existing environment and land use setting to assess potential risks based on the specialised knowledge of the technical experts. The purpose of the issues screening approach was to assist in identifying:

0. Significant issues, uncertainties and/or potential impacts that require more detailed characterisation and/or assessment within the EES
1. Matters or potential impacts considered to be already well understood or less significant.

A high, medium, or low screening value was assigned to potential issues to determine the level of assessment required to identify and investigate impacts.

Each potential issue was given a score (1, 2 or 3) against the categories of:

2. Community and stakeholder interest
3. Significance of assets, values and uses
4. Potential impact (spatial, temporal and severity).

The scores were added together, or the highest score across the three contributing categories was used, to give a 'screening value' of high, medium or low, which gives an indication of the level of impact assessment that is required. Issues that were assigned a screening value of high or medium required detailed assessment in the EES at a level commensurate with them being considered primary level issues.

Issues that were assigned a screening value of low were proposed to be documented and managed with some investigation and assessment in the EES at a level commensurate with them being considered secondary level issues.

4.4.1 Criteria and consequence ratings

Risks, issues, and potential impact pathways were identified for both construction and operation of the project. Table 4-1 defines the criteria and consequence ratings for each of the three categories that have been used to inform the issues screening. The sum of the scores against each of the three categories or the highest rating across any of the three contributing categories gives the 'screening value'.

Table 4-1 Issues screening criteria and consequence ratings

Rating	Community and stakeholder interest	Significance of assets, values and uses	Potential impact (spatial, temporal and severity)
1	Low interest and perceived impact	Locally significant asset, value or use	Potential for localised, temporary impact
2	Some interest and targeted perceived impacts	Regionally significant asset, value or use	Potential for significant temporary, or localised permanent impact
3	Broad community and stakeholder interest or impacts	State or nationally significant asset, value or use	Potential for significant permanent impact

The screening values are then used to determine the level of assessment required as shown in Table 4-2.

Table 4-2 Issue investigation categories

Screening score	Screening value	Potential consequences	Complexity of mitigation	Level of assessment
7, 8 or 9 or the highest rating across any one of the three contributing categories is 3	High	Potential for elevated, longer term impacts, significant assets or values may be affected with enduring changes. Considers both impacts and benefits, or Issue may not be well defined and insufficient information is available for the impact assessment, or High level of community interest.	Stringent management measures may be required	Detailed assessment required
4, 5 or 6 or the highest rating across any one of the three contributing categories is 2	Medium	Potential for moderate level impacts, significant assets or values may be affected over an extended time frame with some resultant changes. Considers both impacts and benefits, or Issue may be moderately understood, and some information is available, however more is required for the impact assessment, or Medium level of community interest.	Standard management measures are available that can be adopted with some modification	Moderate assessment required
3 or the highest rating across any one of the three contributing categories is 1	Low	Potential for short term and localised impact. Asset or values may be temporarily affected but recovery expected, or Issue is well understood and there is enough information available for the impact assessment, or Low level of community interest.	Standard management measures are available.	Some assessment required

Further information about the risk screening process is detailed in Chapter 7: *Assessment framework.*

Outcomes from the risk screening process are outlined in Section 4.4.2 below.

4.4.2 Risk screening results

Table 4-3 provides the key potential issues related to changes in traffic and transport identified as part of the risk screening process for the project and presents the screening value for each issue which indicate that risks were rated as medium for issues such as safety, access and amenity during construction and operation and disruption to local road users during construction.

Table 4-3 Transport issues screening results

Aspect	Issue	Community & stakeholder perceived impacts	Significance of assets, values & uses	Potential impact (spatial, temporal & severity)	Screening Score	Screening Value
Construction						
Traffic and transport	Changes to access, safety and amenity from increased heavy and light vehicle movements during construction.	2	1	1	4	Medium
Traffic and transport	Disruption to local road users due to temporary road closures.	2	1	1	4	Medium
Operation						
Traffic and transport	Changes to access, amenity, safety or road operability from operational heavy and light vehicle movements	2	2	2	6	Medium

4.5 Project works, traffic generation and capacity analysis

4.5.1 Project works

A summary of the proposed project works during the construction, operation and decommissioning stages is outlined in Section 6.0.

The preliminary vehicle access strategy has been developed as follows:

1. Based on discussions with Viva Energy, workers are anticipated to be travelling to and from two locations:
   - the construction laydown area at Nerita Gardens located south of School Road within the refinery premises
   - the marine construction laydown area located near Madden Avenue (Lascelles Wharf)
1. The location of the site access points has been used as a basis for route planning and the likely roads anticipated to be utilised by project generated traffic during construction and operation phases of the project.
2. An existing conditions assessment, including a site visit and review of past crash history (detailed above) has also been undertaken to help inform the review of the vehicle access strategy.

4.5.2 Traffic generation and distribution

A detailed review of the project activities during the construction and operation phases was undertaken. The transport specific elements of the project (traffic generating activities and activities that could potentially impact the local transport network) were extracted and used to inform the impact assessment.

For each project stage, plant and equipment (including the size and volumes of vehicles), and workforce numbers were determined and provided by Viva Energy.

The traffic generation and distribution assumptions have been based on the following data sources:

1. Information and knowledge of previously derived estimations from other similar developments with consideration of the road links to and from the project worksites.
2. Estimations have been crossed checked with the project team, including Viva Energy and a potential contractor for the works.
3. For known committed developments, in particular, the relocation of the TT Line Tasmanian ferry operation from Melbourne to Geelong, publicly available information has been utilised to help inform the potential local traffic generation and distribution analysis noting that AECOM did not have access to specific data for this project

4.5.3 Transport impacts

Following identification of the magnitude of impacts on the site access and traffic routes to and from the worksites that could be impacted by the project, an assessment was undertaken which considered:

1. Network capacity, both road link and intersection (using SIDRA modelling software).
2. Intersection safety.
3. Network infrastructure.
4. Public transport impacts.
5. Pedestrian and cyclist impacts.
6. Residual impact and legacy.

On completion of the impact assessment, various mitigation measures were recommended to avoid, minimise and manage the potential impacts.

4.6 Preliminary construction traffic route assessments methodology

It should be noted that the traffic route assessments undertaken as part of the TIA are preliminary and subject to appointment of project construction and transport contractors who would undertake their own logistical reviews and develop appropriate TMPs for the transport of construction and plant vehicles to the project site. However, due to the limited number of access routes in and around the project site, it is considered that the analysis in this report has adequately predicted potential traffic and transport impacts.

Preliminary construction traffic route assessments have been undertaken as follows:

1. Desktop analysis and review of the NHVR route planner.
2. Site visit undertaken by AECOM at all key site access points.
3. Swept path analysis of worst-case construction vehicles requiring access.
4. Road safety and sight distance checks at all arterial linked site access intersections.

4.7 Mitigation measures methodology

Following the project impact analysis undertaken as detailed above, mitigation measures were identified and recommended. The development of these mitigation measures was informed by the following:

5. The construction, operational and decommissioning activities of the project.

6. Likely modifications to the road network and associated consequences assessed against relevant design guidelines, road safety data and stakeholder inputs.
7. Potential mitigation measures were identified with reference to relevant design guidelines including: AustRoads Guides to Road design, VicRoads design supplements, and reference to measures used on similar projects.

4.8 TIA assumptions and limitations

It should be noted that this TIA has been based on the best available data on construction and operational activities for the project at the time of conducting the study. A detailed review of the project was conducted by Viva Energy and data pertaining to aspects such as construction and operational workforce, vehicle movements and type, construction equipment and the like was derived. Information was also crosschecked against other developments of a similar type and scale. This assessment also considered potential cumulative transport impacts from local infrastructure and development projects planned in the area based on publicly available information.

It is anticipated that as the detailed design of the project progresses, some changes to the facility design and layout, construction methods and construction scheduling may occur. Where possible, conservative estimates have been adopted throughout the study, and as such, the findings outlined in this report are conservative and are expected to remain valid should minor changes to the project arise.

It is noted that this document will form an input into a subsequent TMP, which should be developed to reflect the final detailed design and construction methodology for the project once verified. The TMP should be able to accommodate any potential changes in transport implications for the project resulting from design refinements.

4.9 Linkage to other technical reports

This TIA should be read in conjunction with other relevant technical reports conducted to support the project EES. Other potential impacts relating to air quality and greenhouse gas emissions, as well as potential social and business, and land use impacts have been considered in detail in other technical reports.

The outcomes of this TIA were used as inputs to:

- Technical Report C: *Greenhouse gas impact assessment*
- Technical Report H: *Air quality impact assessment*
- Technical Report L: *Social and business impact assessment*
- Technical Report M: *Land use impact assessment*

Where relevant to transport, other technical reports are considered and referenced.

5.0 Existing conditions

5.1 Site location and local land use

The project would be located adjacent to, and on, the Geelong Refinery and Refinery Pier in the City of Greater Geelong, 75 kilometres (km) south-west of Melbourne. The project area is within a heavily developed port and industrial area on the western shores of Corio Bay between the Geelong suburbs of Corio and North Shore. The Geelong central business district is located approximately 7 km south of the project.

Refinery Pier is the primary location within the Port of Geelong for movement of bulk liquids. Vessels up to 265 metres in length currently utilise the four berths at Refinery Pier which service Viva Energy refinery operations. The majority of ship visits to the port are to Refinery Pier, with Viva Energy accounting for over half of the trade through the Port of Geelong. To the north of the Geelong Refinery, along the proposed underground pipeline corridor, the area is predominantly rural. Geelong Grammar School Corio campus which provides both day school and boarding accommodation for students is accessed from School Road, to the north east of the refinery,

Currently, no notable change in land use within the study area is expected to occur. However, the existing Spirit of Tasmania ferry passenger terminal at Station Pier in Port Melbourne is being relocated to the Port of Geelong on Corio Quay Road to the south of the study area, to provide a large-scale passenger and freight terminal. The new terminal is expected to be completed in 2022 and would be fully operational by the time construction for this project commences.

5.2 Local road network

Table 5-1 summarises the existing conditions of key roads to and from the project area. The local road network and the B-Double, over-dimensional and oversize and over mass (OSOM) vehicle routes are shown in Figure 5-1.

A more detailed summary of key local roads, including photographs taken during site inspections, is provided in Appendix A.

Table 5-1 Existing road conditions

Transport element	Corio Quay Road / Seabeach Parade	Station Street	Rennie Street	Macgregor Court	Shell Parade	School Road	Princes Highway
Speed Limit (kph)	60 / 80	60	60	60	60 / 80	60	80
Classification	Arterial	Arterial	Local	Local	Arterial	Local	Arterial
Managed by	DoT	DoT	CoGG	CoGG	DoT	CoGG	DoT
Carriageway Width (m)	10-23	11.5-21	6.5 - 7	5.5 - 6	8-14.5	6.5 - 7	36
Total number of lanes	Two to four	Two to four	Two	Two	Two to four	Two	Four to Five
Traffic Control	Give way intersections at local roads. Roundabout at intersection with The Esplanade/Station Street.	Roundabout at intersections with Corio Quay Rd, St Georges Rd and Refinery Rd. Give way intersections at local roads. Signalised intersection at Princes Highway. Level crossing south of North Shore Station.	Roundabout at intersection with Macgregor Court / Princes Freeway off-ramp / Shell Parade. Give way intersections at local roads.	Roundabout at intersection with Rennie Street / Princes Freeway off-ramp / Shell Parade.	Roundabout at intersection with Macgregor Court / Princes Freeway off-ramp / Rennie Street. Give way intersections at local roads.	Roundabout at intersection with Shell Parade. Signalised intersection at Princes Highway. Level crossing north of Corio Station.	Major signalised intersections. Service roads with give way entry/exits.
Road user hierarchy*	Other	Bus priority route along entire length.	Other	Other	Other		Bus priority route south of St Georges Road and

Transport element	Corio Quay Road / Seabeach Parade	Station Street	Rennie Street	Macgregor Court	Shell Parade	School Road	Princes Highway
		Principle pedestrian network between Northshore Rd and Sparks Rd.					between Station St and School Rd. Bike priority route Preferred traffic route
On the Principal Bicycle Network?	Yes	Yes	No	No	Yes	No	Yes
On a Strategic Cycling Corridor?	Yes	No	No	No	Between St Georges Road and Foreshore Road	No	South of St Georges Road
Bicycle facilities	No	Yes, cycling lanes either side south of St Georges Rd.	No	No	No	No	No
Pedestrian facilities	Footpath along eastern/south side between McLeod St and Langdon. Separated path north from Langdon St (including pedestrian level crossing) until after Cowies Creek Bridge where it becomes adjacent to the road.	Southern end two pedestrian level crossing points on north-east side. Pedestrian path on both sides North Shore Road to Sparks Rd. West side only Sparks Road to St Georges Rd	No	No	Pedestrian footpath west side south of School Road, flips to east side just before Foreshore Rd. Bay Walk shared path on south side separated from the road, from	Pedestrian footpath along south side between Shell Parade and Princes Highway. Formal crossing point at level crossing	

Transport element	Corio Quay Road / Seabeach Parade	Station Street	Rennie Street	Macgregor Court	Shell Parade	School Road	Princes Highway
	No formal pedestrian crossing points	North of St Georges Rd, pedestrian path on east side only No formal pedestrian crossing points			Foreshore Rd which become pedestrian footpath until St Georges Road.		
Bus facilities	None	Bus routes 1, 22 and 23	None	None	None	School buses	Bus routes 20, 22, stops in service roads
B-Double Approved Route?	Yes	Conditional, no trucks are permitted 9pm to 6am 7 days a week south of St Georges Road.	Yes	No	Yes	No	Yes
Truck Over-Dimensional Route?	No	No	No	No	No	No	No
Over size and over mass (OSOM) route	No	No	No	No	No	No	Yes
On-street parking facilities	No	Yes, both sides	No	No	No	Yes	In service roads only

*VicRoads Road Use Hierarchy is a set of guiding principles that allocates priorities for road use by transport mode, place and time of day. The Road Use Hierarchy is a key component of the SmartRoads approach to prioritising the use of arterial roads in Victoria. Road use type categories include Bicycle, Proposed Bicycle, Bus, Proposed Bus, Freight, Local Primary Access Route, Local Secondary Access Route, Proposed Other, Other, Pedestrian, Principal Pedestrian Network, Preferred Traffic Route, Proposed Preferred Traffic Route, Tram, Proposed Tram.

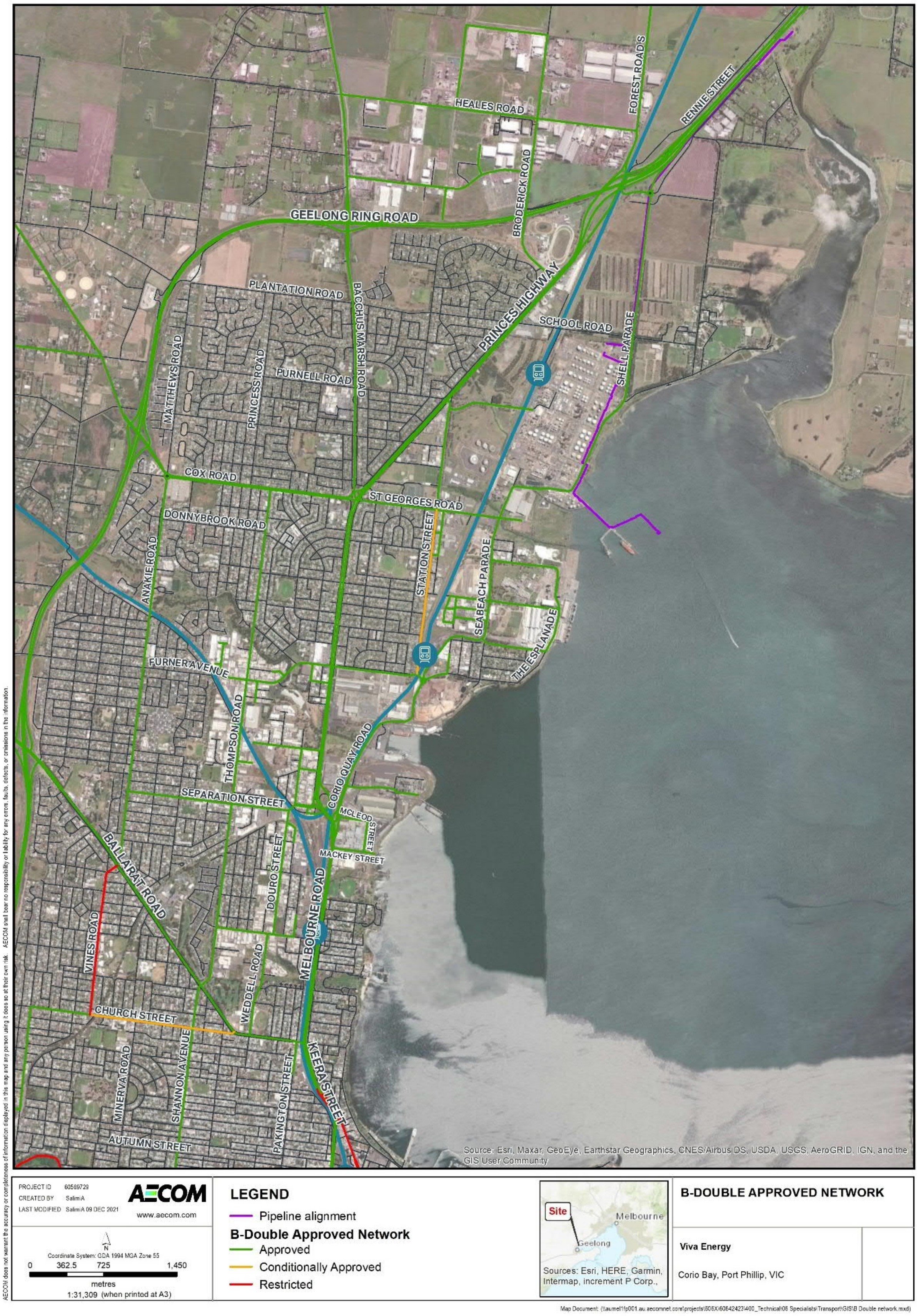


Figure 5-1: B-Double approved roads in the study area

5.3 Traffic data

5.3.1 Traffic surveys

Traffic surveys were undertaken as part of the TIA to gain an understanding of existing traffic conditions which are outlined in the subsequent subsections.

5.3.1.1 Fully classified intersection counts

AECOM commissioned Matrix Traffic and Transport Data to undertake fully classified intersection count surveys (in 15-minute internals) for the peak travel periods for the project between 5 am to 6 am (1 hour) and 530 pm to 630 pm (1 hour) on Thursday 13 May 2021. The peak travel periods were derived in consultation with Viva Energy and reflect likely peak times for construction and operational phases of the project.

The scope of intersections surveyed are as follows and shown on Figure 5-2:

1. Rennie Street and Geelong Ring Road on-ramp priority intersection
2. Shell Parade, Rennie Street and Macgregor Court Roundabout
3. Shell Parade and Bell Road priority intersection
4. Shell Parade and Torresdale Road priority intersection
5. Shell Parade and School Road Roundabout
6. Shell Parade and Wharf Road priority intersection
7. Seabeach Parade, St Georges Road and Lowe Street Roundabout
8. Seabeach Parade and Madden Avenue priority intersection
9. Seabeach Parade and Abery Road priority intersection
10. Corio Quay Road, The Esplanade, Abery Road and Station Street Roundabout
11. Station Street and North Shore Road priority intersection
12. Station Street level crossing.

5.3.1.2 Traffic queue surveys

Traffic queue surveys were also undertaken for the above intersections. The survey methodology involved:

1. Queue lengths recorded for each approach by lane.
2. One surveyor covering all legs recording 5 minutes of data per approach and rotating in a sequence.
3. At signalised intersections, the queue length was measured at the start of the green traffic light phase.
4. At non signalised intersections, the maximum queue length was recorded every 5 minutes.

5.3.1.3 Level crossing survey

The level crossings located between the Corio Quay Road and The Esplanade roundabout and the Station Street and North Shore Road priority intersection were surveyed during the survey time periods.

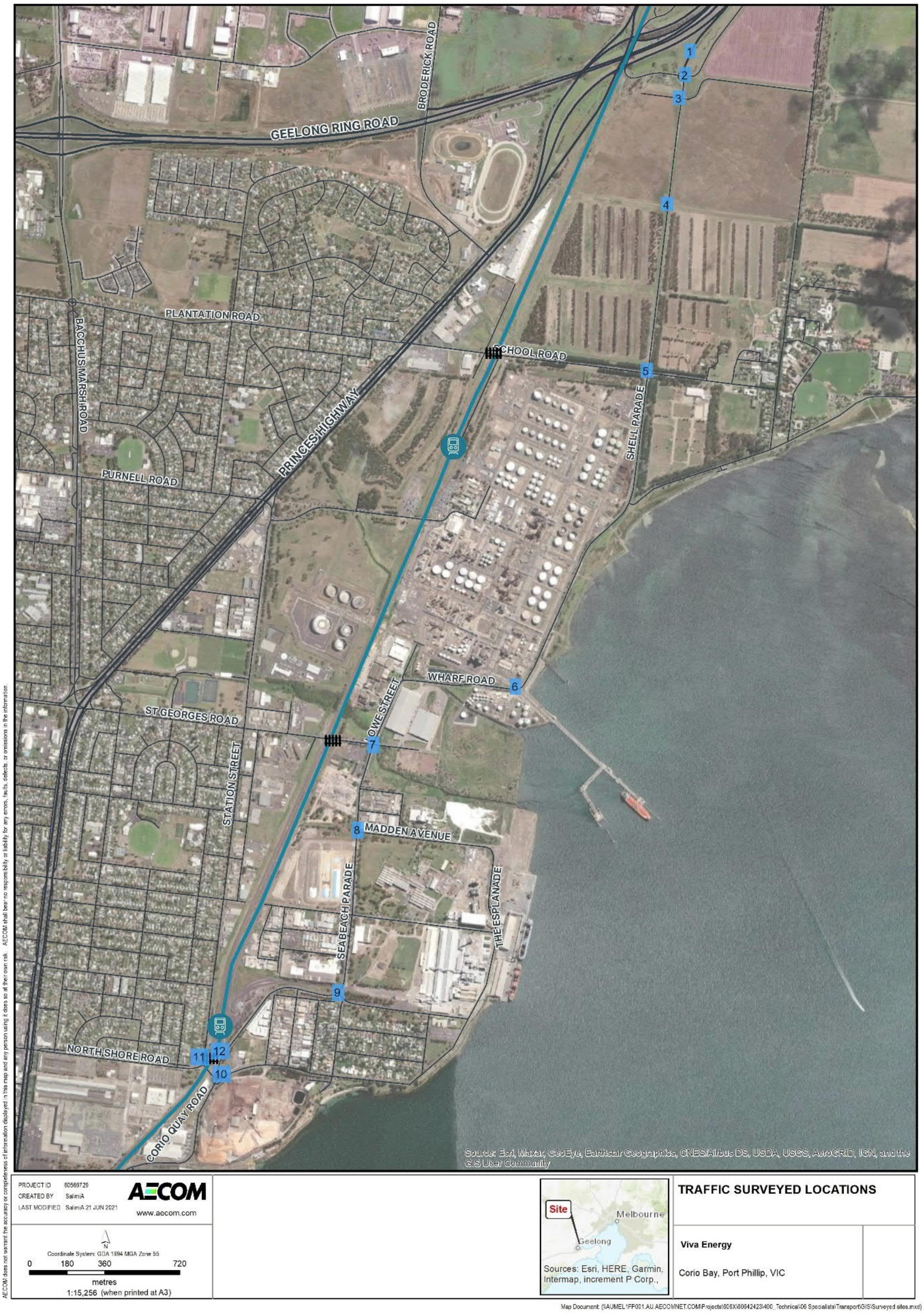


Figure 5-2: Traffic survey locations

5.3.2 Department of Transport (DoT) (VicRoads)

AECOM obtained the following information for the Princes Highway and School Road signalised intersection from DoT via both open source data. The data was selected to coincide with the commissioned traffic survey date.

1. SCATS intersection count data.
2. Signalised intersection operation sheet.

5.4 Traffic survey analysis

A review of the intersection count surveys has been undertaken to provide consolidated traffic flow diagrams for the surveyed road network, as provided in Appendix **B**, for the following time periods:

1. *Sheet number 60642434_TFD_001 - 2021 - Morning time periods, 5 am to 6 am*
2. *Sheet number 60642434_TFD_002 - 2021 - Evening time periods, 530 pm to 630 pm*

For the Princes Highway and School Road signalised intersection, some assumptions with regards to turning movement volumes were made due to shared detectors, these were weighted according to the respective traffic volumes from each approach arm.

5.5 Existing intersection capacity

The following key intersections that are expected to be impacted by the project construction vehicles were modelled in SIDRA intersection 9 during the peak time periods outlined in subsection 5.4.

1. The following intersections were modelled in isolation:
   - Shell Parade, Rennie Street and Macgregor Court Roundabout
   - Shell Parade and School Road Roundabout
   - Seabeach Parade and Madden Avenue priority intersection
   - Princes Highway and School Road signalised intersection

The models have been developed as follows:

1. All measurements taken from Google earth aerial imagery.
2. Network modelling only considered if intersections are within 200 metres of each other.
3. Signalised intersections have signal phases adopted from operation sheets, however for this assessment, SIDRA has been allowed to optimise the cycle time and phase time allocations, rather than checking IDM data (averages).
4. In terms of model calibration, the Basic Saturation flows was kept as per SIDRA default at 1950 tcu/h as it is considered that the intersections investigated are in an ideal area type.

The following outputs are produced by SIDRA:

1. Degree of saturation (DoS). This is the ratio of demand to capacity. A DoS of 1.0 or more in theory represents saturated conditions, but, a lower practical DoS is used. For priority-controlled intersections, a DoS of 0.8 is the desired upper limit; for roundabouts, it is 0.85; and for signals it is 0.9.
2. Average delay. This is the average amount of time it takes a vehicle to negotiate an intersection, including the time to negotiate corners and the time stopped in queues or waiting for a green signal. This parameter is the most tangible to drivers.
3. Level of service (LoS). This is an alpha-numeric rating of the overall performance of an intersection, ranging from LoS A (very good) to LoS F (very poor). It is directly related to the average delay. The desirable target is generally LoS C or above, but in congested urban environments the realistic target is usually taken to be LoS D. Level of service is not reported for priority-controlled intersections, as major road movements have zero delay, which skews the results.
4. 95th percentile back of queue (95% Q). This is the queue length that is not exceeded 95 percent of the time. Ideally, queue lengths should not exceed the turning lane storage or block back into upstream intersections.

The above core performance outputs are provided in Table 5-2 and Table 5-3 for the morning (5 am to 6 am) and evening (5:30 pm to 6:30 pm) peaks assessed. In summary, the findings of the analysis are that:

5. All intersections across all time periods are predicted to be operating well within the defined capacity metrics.
6. Overall, the intersections are shown to validate very well against surveyed traffic queues, given there is no, or little queueing at the surveyed intersections.

The modelling and analysis undertaken for the four key intersections that are anticipated to be used by project construction vehicles, found that all intersections are able to easily accommodate existing traffic volumes and currently operate well within defined capacity metrics. Additional traffic generated by the project is discussed in Section 6.0 and the potential impacts of this additional traffic on intersection capacity is discussed in Section 7.1.

Table 5-2 Results of existing intersection –SIDRA analysis – 2021 Morning 0500-0600

Intersection	Approach Lane	Morning Peak Period (0500-0600)			
		DoS	Ave. Delay (s/veh)	95% Queue (veh)	LOS
1. Shell Pde / Rennie St	South: Shell Parade	0.029	3.8	0.1	LOS A
	East: McGregor Ct	0.005	4.8	0.0	LOS A
	North: Off Ramp	0.028	3.4	0.1	LOS A
	West: Rennie St	0.015	9.1	0.1	LOS A
	All Vehicles	**0.029**	**4.9**	**0.1**	**LOS A**
2. Shell Pde / School Rd	South: Shell Parade	0.032	4.2	0.2	LOS A
	East: School Road	0.006	5.6	0.0	LOS A
	North: Shell Parade	0.043	3.9	0.3	LOS A
	West: School Road	0.018	6.5	0.1	LOS A
	All Vehicles	**0.043**	**4.6**	**0.3**	**LOS A**
3. Seabeach Parade / Madden Avenue	South: Shell Parade	0.045	3.9	0.3	LOS A
	East: School Road	0.010	6.5	0.1	LOS A
	North: Shell Parade	0.045	2.0	0.0	LOS A
	All Vehicles	**0.045**	**1.8**	**0.6**	**NA**
4. Princes Highway / School Road	South: Shell Parade	0.261	13.3	42.5	LOS B
	East: School Road	0.051	33.7	4.7	LOS C
	North: Shell Parade	0.098	7.4	13.3	LOS A
	West: School Road	0.264	35.4	14.3	LOS D
	All Vehicles	**0.264**	**13.4**	**42.5**	**LOS B**

Table 5-3 Results of existing intersection –SIDRA analysis – 2021 Evening 0530-0630

Intersection	Approach Lane	Evening Peak Period (1730-1830)			
		DoS	Ave. Delay (s/veh)	95% Queue (veh)	LOS
1. Shell Pde / Rennie St	South: Shell Parade	0.070	3.6	0.3	LOS A
	East: McGregor Ct	0.007	4.5	0.0	LOS A
	North: Off Ramp	0.026	3.5	0.1	LOS A
	West: Rennie St	0.031	9.1	0.2	LOS A
	All Vehicles	**0.070**	**4.9**	**0.3**	**LOS A**
2. Shell Pde / School Rd	South: Shell Parade	0.104	4.2	0.6	LOS A
	East: School Road	0.038	4.1	0.2	LOS A
	North: Shell Parade	0.068	4.8	0.4	LOS A
	West: School Road	0.038	6.0	0.2	LOS A
	All Vehicles	**0.104**	**4.6**	**0.6**	**LOS A**
3. Seabeach Parade / Madden Avenue	South: Shell Parade	0.080	0.0	0.1	LOS A
	East: School Road	0.021	5.0	0.4	LOS A
	North: Shell Parade	0.080	1.1	0.0	LOS A
	All Vehicles	**0.080**	**1.0**	**0.4**	**NA**
4. Princes Highway / School Road	South: Shell Parade	0.357	17.7	78.7	LOS B
	East: School Road	0.316	45.1	22.9	LOS D
	North: Shell Parade	0.450	11.5	62.4	LOS B
	West: School Road	0.450	11.5	62.4	LOS B
	All Vehicles	**0.450**	**17.3**	**78.7**	**LOS B**

5.6 Crash history review

DoT CrashStats was interrogated for the last five years of crash data (available data between 2015 to 2020) for the roads within the study area. A summary of the recorded crashes is provided below, with the relevant location of each crash identified shown on Figure 5-3.

In summary, the following has been found:

- A total of 98 crashes were found to occur within the study area - 47 'other', 48 'serious' and three 'fatal' crashes recorded in terms of severity. Most of these crashes (67) were recorded along the Princes Highway between the Princes Freeway and North Shore Road.
- Overall, most crashes within the study area occurred during the daytime.
- All three recorded fatal crashes occurred on the Princes Highway between School Road and North Shore Station, two of which involved pedestrians.
- Seven crashes (split between four serious and three other injury crashes) were recorded along the length of the C115 Road which includes Shell Parade, Seabeach Parade and Abery Road between the Princes Highway off-ramp and The Esplanade.
- Three crashes occurred at the Seabeach Parade and Seebreeze Parade priority intersection, all caused by a collision with a fixed object, with a single crash involving a cyclist being struck.
- Analysis of local roads shows that only two crashes occurred in the immediate vicinity of the proposed School Road site access: these were both 'serious injury' crashes due to an overturned vehicle (no collision).
- Several intersections along the Princes Highway from between its signalised intersections with Broderick Road to North Shore Road were recorded to have more than three to five crashes in one location. This includes the intersection of Princes Highway and St Georges Road where four 'serious injury' and four 'other injury crashes were recorded. Two collisions with vehicles were also recorded at the intersection of Princes Highway and School Road signalised intersection of which one was a 'serious injury' and one was recorded as 'other injury'
- Most crashes involving pedestrians occurred along the Princes Highway. Notably seven crashes involving struck pedestrians were recorded along the Princes Highway between Rennie Street and North Shore Road, of which only two occurred at an intersection.

The crash analysis shows that crash density and frequency varied across the study area depending on the types of incident, road hierarchy, the time of day, and the day of the week. Whilst there is a higher concentration of crashes along the Princes Highway, this can be attributed to increased traffic volumes and additional exposure of motorists to conflicting movements at intersections. This is typical along arterial roads in developed and urban areas. There were no blackspots (three or more crashes in the last five years) identified at any single point along roads within the immediate vicinity of the proposed pipeline alignment and where proposed construction laydown areas are expected to be located and accessed.

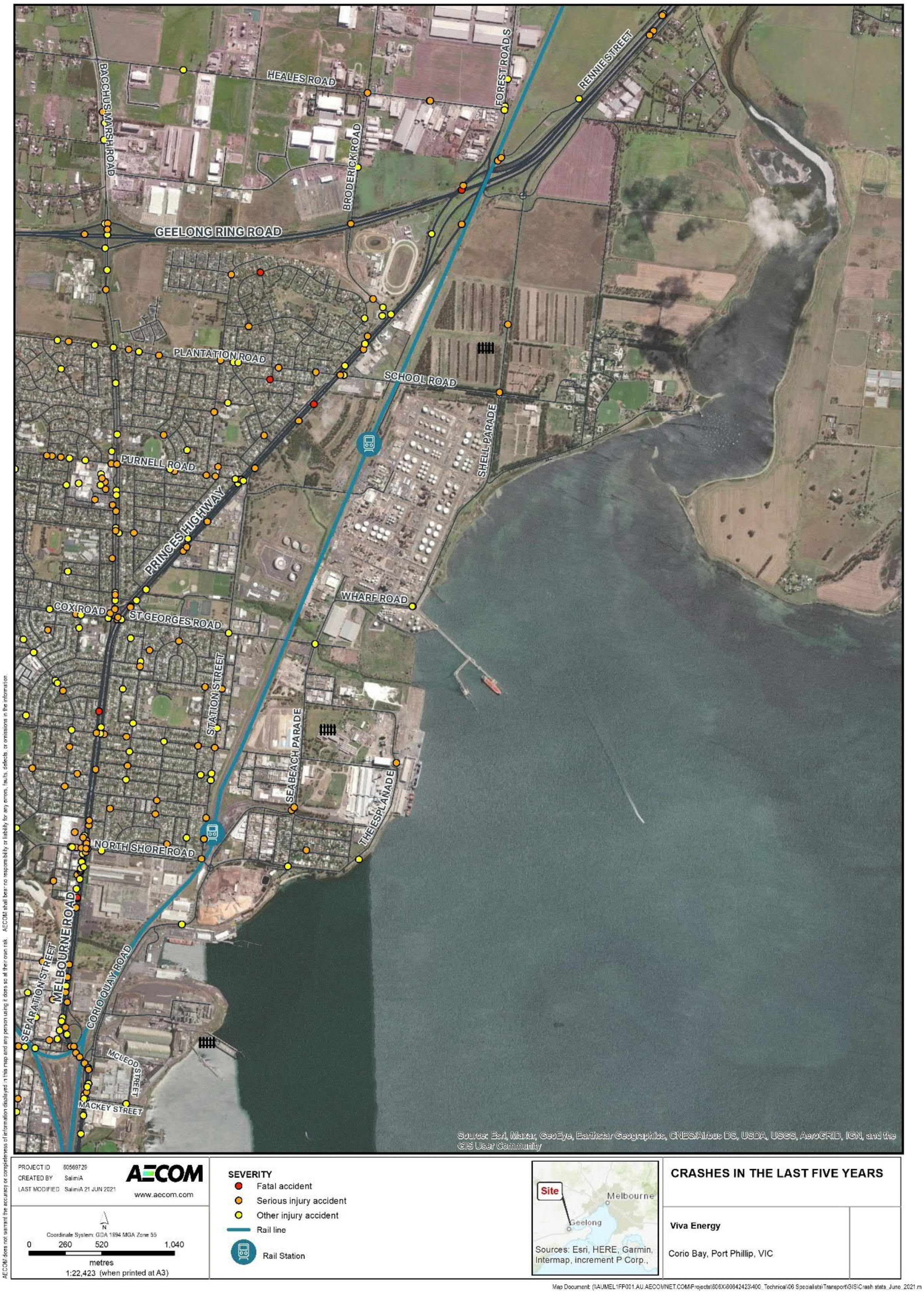


Figure 5-3: Crashes in the last five years (2015-2020) recorded within the study area

5.7 Sustainable transport

5.7.1 Active transport

Several pedestrian and bike paths are located within the study area as shown in Figure 5-4, and include the following:

- A pedestrian footpath is present along School Road in the immediate vicinity of the proposed entry to the laydown area.
- A shared use path (SUP) along the eastern side of Seabeach Parade between Sea Breeze Parade and St Georges Road. This shared path is part of the Bay Trail which continues along Madden Avenue and The Esplanade before continuing along Corio Quay Road, south of the study area.
- A SUP on the eastern side of Corio Quay Road, with no foot or cycle paths provided on its western side. The SUP runs on the eastern side to the Corio Quay Road and The Esplanade roundabout to the north and onwards south to the Langdon Street priority intersection.

Source: City of Greater Geelong – Geelong walking and cycling shared paths map

Figure 5-4: Geelong walking and cycling paths

The potential implications of the project on pedestrian and bike paths are discussed in the impact assessment section of this report noting that these facilities are not located within the project area and unlikely to be impacted by the project.

5.7.2 Public transport

The local train stations, level crossings and bus routes in the local area are shown in Figure 5-5 and discussed in the following subsections.

5.7.2.1 Trains

Corio Station is located approximately 700m northeast of the proposed laydown area while North Shore Station is located approximately 3km southwest from Corio Station. These stations provide the following rail services:

- V/Line services from Melbourne to Warrnambool via Colac and Geelong
- V/Line services from Melbourne to Geelong and Waurn Ponds
- the Overland train which operates between Southern Cross and Adelaide Parklands.

The frequencies of services are shown in Table 5-4.

Table 5-4 Corio and North Shore Stations train frequencies

Direction	AM Peak (5:30-6:30am)	Inter peak	PM peak (5:30-6:30pm)	Saturday & Sunday
To Warrnambool (V-Line)	45	20	30	45
To Geelong (V-Line)	30-60	20-40	18-35	36-45
To Melbourne (V/Line)	18-27	17-25	26-43	30-60
To Melbourne (Overland – Monday and Friday only)*	No services	No services	5:38pm only	5:21pm only
To Adelaide (Overland – Tuesdays and Saturdays only)*	No services	9:35am only	No services	No services

** The Overland train stops only at North Shore Station*

5.7.2.2 Level-crossings

Locations and details of level crossings present within the study area are provided in Table 5-5 and shown in Figure 5-5.

Table 5-5 Location of level crossings within the study area

Level Crossing	Location	Type of Protection	Sight Distance	Protection Equipment
School Road	Between Railway Reserve and Shell Parade	Active	Clear with no obstructions Approx.	Roadside warning equipment with boom and lights
St George Road	Between Seabeach Parade and Station Street	Active	Sight distance restricted due to crest in the road at level crossing location	Roadside warning equipment with boom and lights
Station Street	Between The Esplanade and North Shore Road	Active	Clear with no obstructions	Roadside warning equipment with boom and lights Automatically controlled gates on pedestrian foot paths

The location of level crossings within the study area need to be considered in the context of project generated traffic, in particular the presence of heavy or over-dimensional (OD) vehicles. If OD vehicles greater than 4.9 metres in height, 3.0 metres wide, or 26.0 metres in length are required to cross railway lines, then approval is required from the DoT. It is therefore important to consider the presence of level crossings within the study area and the potential for project related OD vehicles to cross any level crossings.

5.7.2.3 Buses

The current bus routes identified within the study area are located near North Shore Station as follows:

- Bus route 1 (North Shore Station – Deakin University via Geelong City)
- Bus route 22 (Geelong Station – North Shore Station via Anakie Road)
- Bus route 23 (Corio SC – North Shore Station)

Route 1 runs every 20 minutes on average during weekdays in both directions, 30 minutes on weekends. Route 22 runs every 15-20 minutes on average during weekdays in both directions, 30 minutes weekends. Route 23 runs every 20 minutes on average during weekdays in both directions, 30 minutes on weekends. Bus routes locations are shown in Figure 5-5.

School buses are also expected to operate within the study area in particular along School Road and generally operate from 7:30 am to 9:00 am and 3:20 pm to 5:00 pm on school days. School bus routes and timetables will be confirmed prior to construction commencement by the works contractor as part of the subsequent project TMP.

It is important to consider bus routes that operate within the study area in order to assess the potential interactions with project generated traffic. Understanding how bus routes operate within the study area can allow for the project to consider potential disruptions or safety implications that may arise from additional traffic generated by the project.

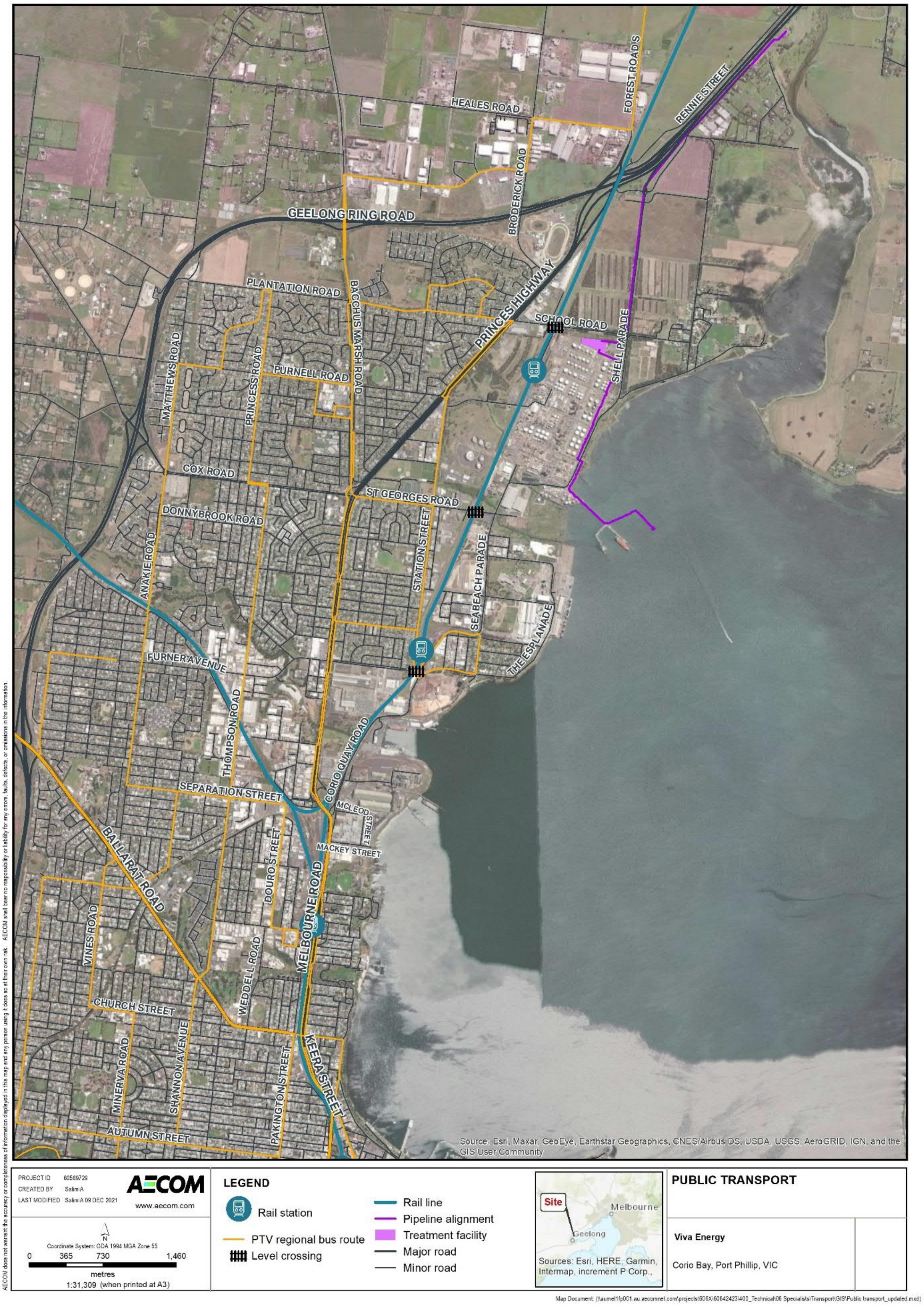


Figure 5-5: Public transport within the study area

6.0 Project works, traffic generation and capacity analysis

6.1 Project works

The construction works and operation of the project are detailed in Section 1.4 of this TIA. Table 6-1 provides a summary of the key works and anticipated timeframes.

Table 6-1 Summary of project works and timeframes

Project period	Activities	Time period
Construction	Localised dredging of seabed sediments totaling approximately 490,000 cubic metres (m^3) to enable the FSRU and LNG carriers to berth at Refinery Pier.	5 months
	Construction of the new pier arm and berthing infrastructure, and aboveground pipeline (3km) along Refinery Pier and through the refinery.	Above ground pipeline – 3.5 months
	Construction of the treatment facility on a laydown area (Nerita Gardens) at the northern boundary of the refinery site.	Treatment facility – 18 months
	Construction of the buried pipeline (4km). The pipeline would be predominantly installed via trenching, however trenchless construction (including boring or horizontal directional drilling (HDD)) would be used to install the underground pipeline as per Figure 1-2.	Underground pipeline – 4 months
	Total construction timeframe	up to 18 months.
Operation	Receipt of up to 45 LNG carriers each year at Refinery Pier – the number and frequency of LNG carriers arriving each year would depend on their storage capacity and gas demand	Operational for approximately 20 years
	Regasification of LNG onboard the FSRU using seawater as a heat source, which would then be reused within the refinery as cooling water	
	Injection of nitrogen and odorant into the gas prior to distribution	
	Monitoring and maintenance of the pipeline easement.	
Decommissioning	The FSRU, which continues to be an ocean-going vessel throughout the operation of the project, would leave Corio Bay on completion of the project life to be used elsewhere. It is anticipated that the Refinery Pier berth and facilities would be retained for other port related uses. The underground pipeline would likely remain in situ subject to landholder agreements and either decommissioned completely or placed into care and maintenance arrangements. Decommissioning activities may be subject to change, subject to legislative requirements at the time and potential repurposing of the infrastructure at the end of the project.	To occur after the operational period. The time frames to complete decommissioning would be confirmed subject to detailed planning for such works.

6.2 Site access strategy

6.2.1 Construction stage

Based on discussions with Viva Energy, workers and associated construction vehicles are anticipated to be travelling to and from the following site access points during the project (as also shown on Figure 6-1):

1. The construction laydown area located at Nerita Gardens to the south of School Road within the refinery premises.
2. The marine construction laydown area located near Madden Avenue (Lascelles Wharf).
3. HDD construction area located off Rennie Street, approximately 55 metres west of the Macgregor Ct / Princes Freeway off-ramp / Rennie Street / Shell Parade roundabout.

Workers travelling to and from the work site for the required dredging and offshore works are likely to travel via boat to and from these worksites.

Figure 6-1: Proposed construction laydown areas

6.2.2 Operations stage

During operation, FSRU workers are anticipated to be travelling to and from Melbourne and Geelong and would utilise onsite parking next to the Refinery Pier gatehouse.

Nitrogen trucks are expected to access the treatment facility within the refinery using the existing access point located on Refinery Road.

The final project site layout is shown in Figure 1-1.

6.2.3 Decommissioning stage

Access requirements for the decommissioning stage are expected to be the same as the construction stage of the project.

6.3 Traffic generation and distribution

6.3.1 Construction stage

The traffic estimates detailed in this section for the construction phase traffic generation for the project may change to some degree once a construction contractor is commissioned later in the project process and a subsequent TMP is developed based on the contractors proposed construction methodology.

However, the volumes in this study have been calculated to represent a conservative estimate of the maximum traffic generated by the project's construction at any given point. In addition to conservative maximum traffic estimates, the estimates are considered additionally conservative as some works are unlikely to occur simultaneously following further refinement of the construction program for the project.

The traffic generation estimations have been based on the following:

1. Information provided by Viva Energy.
2. Advice and review by a potential project contractor.
3. Assuming a 18-month construction program, 11-hour (7am to 6pm) working weekday and 24 working days in a month (noting the final working hours for the project are yet to be determined).

A summary of the estimated construction traffic generation over the project lifecycle by task is provided in Appendix **C**. This information has been utilised to summarise the peak construction workforce totals during the project and split by the nominated access points as shown in Table 6-2.

Table 6-2 Workforce totals over construction period

Work Activity	2022				2023				2024				Notes
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Dredging				32	28								Workforce stationed on vessels, not at site. Will mob/demob from proposed marine yard (Lascelles Wharf)
Pier				35	74	60	60	60	40	30			
Underground Pipeline				10	50	50	20		5				Workforce are stationed at refinery on-site temporary construction worker facilities and will travel to/from work site each day.
Aboveground Pipeline						25	50	20	5				
Treatment Facility				25	30	30	40	40	40	30			
Brownfield tie-ins					10	15	15	10					Impact insignificant.
Project totals	0	0	0	102	192	180	185	130	90	60	0	0	
Refinery temporary construction work activities	0	0	0	45	90	105	100	60	50	30	0	0	Access via School Road
Lascelles Wharf marine yard	0	0	0	10	10	15	15	10	0	0	0	0	Access via Madden Avenue

The anticipated construction plant vehicles and totals is shown in Table 6-5. The following should be noted from the construction phase traffic generation:

1. The pipeline, treatment facility and brownfield construction activities would be the only works that would generate workforce traffic, due to the dredging and pier construction workers travelling via boat.
2. The peak construction personnel movements are anticipated to occur during Q2 of the construction program in 2023, with the following estimated (assuming a worst-case single worker travels via private vehicle with no car share or mini-bus worker transfer):
   - 105 workers (vehicle trips) to the construction laydown/car parking area located off School Road.
   - 15 workers (vehicle trips) to the marine construction laydown/car parking area located near Madden Avenue.
3. The above construction workers are expected to travel to and from these locations each day during construction. It is estimated that 45 per cent of the workforce will come from Melbourne, 40 per cent from the Geelong area, with the remainder expected to come from interstate, but are assumed to be either living locally or staying at short-term accommodation during construction. Table 6-3 outlines the assumed distribution of the workforce on the local road network, with the resultant traffic flow diagrams for the morning (arrival between 5am to 6am) and evening (departure between 5:30 pm and 6:30 pm) provided in Appendix **B**.

Table 6-3 Construction workforce traffic distribution during peak period

Location	Origin	Distribution
Main laydown area off School Road	Melbourne	Via Princes Freeway off-ramp, Shell Parade and School Road
	Local	Via Princes Highway and School Road
Marine construction laydown area off Madden Avenue	Melbourne	Via Princes Freeway off-ramp, Shell Parade, Wharf Road, Madden Avenue/The Esplanade
	Local	Princes Highway, Melbourne Road, Corio Quay Road, Seabeach Parade, The Esplanade/Madden Avenue

4. Most of the plant, materials and equipment movements are expected to occur prior to construction. Should some of those movements occur during construction, it is expected that they would occur sporadically and, on an ad-hoc basis outside of the local road network peak traffic periods. Accordingly, the respective impact of plant and deliveries as part of the project are expected to be negligible and have not been subsequently assessed as part of any network capacity analysis (where it has been found that the local network has more than adequate operational capacity to facilitate project workforce traffic volumes).
5. Plant, materials and equipment for the project are anticipated to be mobilised from Melbourne and transported to the proposed laydown areas located on School Road and Madden Avenue. An additional construction workspace and laydown area is also proposed to the northwest of the Shell Parade / Rennie Street and Macgregor Court roundabout intersection, which would be accessed via Rennie Street. (location shown in Figure 6-1). HDD equipment movements from this workspace and laydown area are expected to be on an as needed basis, outside of peak traffic operational time periods. The largest construction related vehicle is anticipated to be associated with the nitrogen sStorage tanks, with a maximum heavy vehicle length of 36m. Most of the larger and heavier equipment is anticipated to be transported by water. Roads anticipated to be utilised are outlined in Table 6-4.

Table 6-4 Plant and equipment movements distribution on the road network

Location	Origin	Distribution
Main laydown area off School Road	Melbourne	Via Princes Freeway off-ramp, Shell Parade and School Road
Marine construction laydown area off Madden Avenue	Melbourne	Via Princes Freeway off-ramp, Shell Parade, Wharf Road, Madden Avenue/The Esplanade
HDD construction area	Melbourne	Via Princes Freeway off-ramp

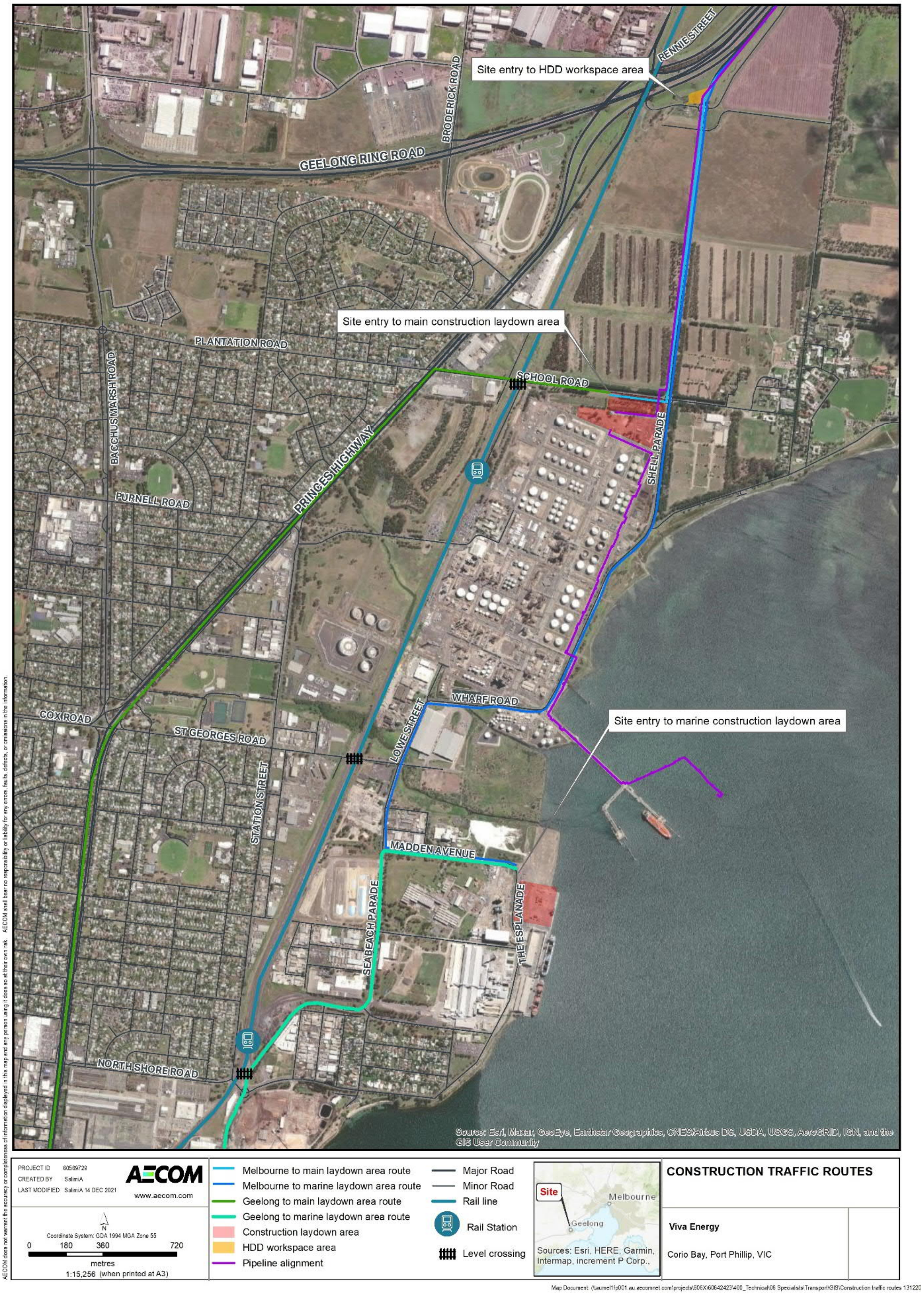


Figure 6-2: Anticipated construction traffic route

Table 6-5 Construction plant

SCOPE OF WORK	No.	Comments
PIPELINES	67	
Fork lift / Telehandler	1	
Tractor post driver	1	
Excavator (20T - 36T)	5	
Backhoe	1	
Mulcher	1	
Grader (12M or 14M)	1	
Pipe bending machine	1	
Compressor	2	
Drying unit	1	
Pumps (Fill & Dewater for Hydro)	2	
Sideboom – for installing the pipe in the trench	2	
Water cart (15,000 L)	1	
Generator system	1	
Mud system	1	
Guidance system	1	
HDD rig	1	
Street sweeper	1	Adhoc
Compactor	1	
Padding machine – to backfill the trench	1	
Loader	1	
Piling rig to drive poles into soil as foundation support	1	Dependent on existing foundation supports for above ground
Road roller	1	
Light vehicles (4x4 wagons or utes)	20	
Hiab truck (truck-mounted forklift/crane)	3	
Fuel truck	1	
Float (50T)	1	Adhoc
Semi-trailer 10T truck	1	Adhoc
Crew cab truck	3	
Tip truck	2	
Extendable trailer	1	
Spray truck 4x4	2	
Vacuum truck	1	Adhoc
Welding truck	2	
Concrete trucks	1	Adhoc
DREDGING	12	max.based on estimates
Backhoe Dredge	1	
Hopper barges	2-4	
Tugs	2-3	
Hydrographic Survey / Crew vessel	1	
Telehandler	1	Adhoc
Forklift	1	Adhoc
Crane	1	Adhoc
JETTY CONSTRUCTION	65	max.based on estimates
Floating / Jackup barge with crawler crane (400 - 700MT?)	1	
Piling Barge with impact hammer	1	
Heavy Lift Vessel	1	Adhoc (if required)
Materials barge	2	
Franna crane (20T)	1	
Air compressor	1	
Generator (15KVA and 60KVA)	2	
Elevated work platform (20m)	1	
Scaffolding	X	Required
Pumps	2	For Hydrotesting
Angle grinder	10	
Hydraulic torque wrench	6-8	
Welding machine	8-10	
Light vehicles (4x4 wagons or utes)	2	
Supply Vessels	1	Adhoc
Tugboats / Anchor Handler (Multicat)	2-3	Multicat has a Hiab crane installed on it
Work crew boats	1-2	
Flat bed truck (8T)	2	
Waste truck	1	Adhoc
Deliveries truck	1	Adhoc
Water truck	1	Adhoc
Concrete truck	4-6	Adhoc
Semi-trailer Tractor	1	
Vacuum truck	1	Adhoc
Mannitowoc / Forklift (5MT)	1	
Diving Vessel	1	To support diving activities
Cable reelers	1-2	For cable installation scope

6.3.2 Operational stage

During the operational phase of the project, regular deliveries of nitrogen to the treatment facilty are anticipated to be required. The supply of nitrogen is expected to require truck deliveries originating from facilities in Altona, Dandenong and Port Kembla. Deliveries would occur outside business hours and trucks would enter through the existing refinery via Refinery Road. Deliveries are not expected to occur on a daily basis but would take place at regular intervals. It is estimated that when nitrogen deliveries are required, there would be up to a maximum of eight trucks per day (most likely B-Doubles) that would be required to provide the liquid nitrogen in preparation for shipments of rich LNG. As such there would be up to 16 daily return truck movements due to nitrogen delivery. Odorant delivery to the treatment facility is anticipated to be less frequent than nitrogen deliveries (10 deliveries per year), therefore potential impacts related to odorant delivery would be lower in magnitude and duration compared to potential impacts related to nitrogen delivery.

Furthermore, the FSRU is anticipated to be operated and maintained by a work crew of approximately 12, who would reside on the vessel during their roster, or undertake daily shifts. It is expected that 50 per cent of the workforce would be traveling to the FSRU from Melbourne while the remaining 50 per cent is anticipated to come locally from the Geelong or western region. Adequate car parking provisions would be provided near the Refinery Pier gatehouse. A summary of the anticipated traffic generation during operation is outlined in Table 6-6, with the distribution traffic shown in Table 6-7, Table 6-8 and Figure 6-3.

As shown, the total operational traffic generation is negligible and can be readily accommodated by the local and wider road network without any adverse impacts.

Table 6-6 Operation traffic generation

Location of works	Anticipated workforce	Workforce daily traffic generation	Maintenance daily traffic generation
FSRU	12	24	0*
Treatment facility	0*	0*	16

** Only anticipated day to day activities are included as part of this analysis*

Table 6-7 Operation workforce distribution

Activity	Location	Origin	Distribution
Workforce	FSRU	Melbourne	Via Princes Freeway, Princes Freeway off-ramp, Shell Parade, Wharf Road and Madden Avenue
		Local	Via Princes Highway, Princes Highway off-ramp, Shell Parade, Wharf Road, Madden Avenue/The Esplanade
Nitrogen deliveries	Refinery	Altona	Via Princes Freeway, Princes Highway, Station Street, Refinery Road
		Dandenong	Via the Eastlink, Monash Freeway, Citylink, Westgate Freeway, Princes Freeway, Princes Highway, Station Street, Refinery Road
		Port Kembla	Via Hume Motorway, Hume Highway, Hume Freeway, Metropolitan Ring Road, Western Ring Road, Princes Freeway, Princes Highway, Station Street, Refinery Road

Table 6-8 Operation nitrogen deliveries distribution

Activity	Location	Origin	Distribution to access via Shell Parade
Nitrogen deliveries	Refinery	Altona	Via Princes Freeway, Princes Highway, Station Street, Refinery Road
		Dandenong	Via the Eastlink, Monash Freeway, Citylink, Westgate Freeway, Princes Freeway, Princes Highway, Station Street, Refinery Road
		Port Kembla	Via Hume Motorway, Hume Highway, Hume Freeway, Metropolitan Ring Road, Western Ring Road, Princes Freeway, Princes Highway, Station Street, Refinery Road

Figure 6-3: Anticipated operation traffic routes

6.3.3 Decommissioning stage

Works associated with the decommissioning phase of the project are anticipated to be similar to, or less involved, than the construction stage works. Traffic generation and distribution would need to be verified at the time of decommissioning works, if required, after the 20-year project life.

6.4 Intersection capacity analysis

6.4.1 Construction stage

6.4.1.1 Traffic demand matrices

To undertake intersection capacity analysis of the potential impacts of the construction workforce on the local road network, traffic matrices have been developed for a worst-case construction year of 2024 as outlined below, taking into consideration background traffic growth, known committed development in the area and construction workforce volumes as part of the project:

1. 2021 baseline surveyed traffic volumes were estimated for the final construction year of 2024 using a nominal growth rate of 1.5 per cent/annum. This is deemed to be robust given the local network and local land use.
2. The derived highest construction workforce traffic volumes are expected to occur during Q2 of 2023 and have been adopted as the basis for this assessment as a worst-case scenario approach. This has been assumed to conservatively occur in 2024 to give a robust assessment as construction timeframes may change and cover all time periods of the construction phase of the project, i.e., workforce numbers are expected to reduce over time from the peak. As outlined earlier, workforce traffic is proposed to arrive in the morning peak between 5 am to 6 am and depart in the evening peak between 5:30 pm and 6:30 pm.
3. A major committed infrastructure project is proposed at GeelongPort with the relocation of the Spirit of Tasmania ferry vessels from Station Pier in Port Melbourne to Corio Quay, north of Geelong. The proposed ferry terminal at GeelongPort's Corio Quay, located south of the study area, would provide a dedicated, large scale passenger and freight terminal for Spirit of Tasmania's customers. Construction is expected to commence in 2021 and the facility is planned to be operational by 2022. Accordingly, utilising publicly available information, estimates have been made as to the expected traffic generating impact of the ferry terminal on the local road network that may coincide with the Gas Terminal project. The methodology adopted for developing the traffic generation and distribution from this development is provided in Appendix D.
4. The above derived information has allowed for the following traffic flow diagrams to be produced which are provided in Appendix **B**:
    - *Sheet number 60642434_TFD_003 – 2024 Base - Morning time periods, 5 am to 6 am*
    - *Sheet number 60642434_TFD_004 - 2024 Base - Evening time periods, 530 pm to 630 pm*
    - *Sheet number 60642434_TFD_005 - 2024 Committed Development Traffic Distribution- Morning time periods, 5 am to 6 am*
    - *Sheet number 60642434_TFD_006 - 2024 Committed Development Traffic Distribution - Evening time periods, 530 pm to 630 pm*
    - *Sheet number 60642434_TFD_007 - 2024 Committed Development Traffic Volumes- Morning time periods, 5 am to 6 am*
    - *Sheet number 60642434_TFD_008 - 2024 Committed Development Traffic Volumes - Evening time periods, 530 pm to 630 pm*
    - *Sheet number 60642434_TFD_009 - 2024 Viva Construction Stage Traffic Distribution- Morning time periods, 5 am to 6 am*
    - *Sheet number 60642434_TFD_010 - 2024 Viva Construction Stage Traffic Distribution - Evening time periods, 530 pm to 630 pm*
    - *Sheet number 60642434_TFD_011 - 2024 Viva Construction Stage Traffic Volumes- Morning time periods, 5 am to 6 am*

- *Sheet number 60642434_TFD_012 - 2024 Viva Construction Stage Traffic Volumes - Evening time periods, 530 pm to 630 pm*
- *Sheet number 60642434_TFD_013 - 2024 Base + Committed + Viva Construction Stage Traffic Volumes- Morning time periods, 5 am to 6 am*
- *Sheet number 60642434_TFD_014 - 2024 Base + Committed + Viva Construction Stage Traffic Volumes - Evening time periods, 530 pm to 630 pm*

The traffic flow diagrams have been used to establish an understanding of existing and future traffic volumes for all roads and intersections that are anticipated to be used by traffic generated from construction of the project. An analysis of trip origins and traffic profiles was undertaken to determine the roads anticipated to be used. The traffic flow diagrams were used for the traffic modelling to analyse the capacity of key intersections to accommodate additional project generated traffic for the impact assessment. The traffic flow diagrams used for this assessment are provided in Appendix B.

7.0 Construction impacts

7.1 Intersection capacity

The operation of intersections is important to consider when analysing potential traffic impacts from the project construction works. Construction activities can generate additional traffic volumes during peak periods and affect the performance of intersections. As noted in Section 5.5, and shown in the traffic flow diagrams in Appendix B, the key intersections that would be utilised by project related traffic to site access points are:

1. Shell Parade, Rennie Street and Macgregor Court Roundabout
2. Shell Parade and School Road Roundabout
3. Seabeach Parade and Madden Avenue priority intersection
4. Princes Highway and School Road signalised intersection

As detailed in Section 5.5, the above intersections operate well within capacity metrics under 2021 traffic demands during the analysed morning peak between 5 am to 6 am, and in the evening peak between 5:30 pm and 6:30 pm.

Accordingly, the above intersections have been analysed using the derived morning (5 am to 6 am) and evening (5:30 pm to 6:30 pm) 2024 Base + Committed Development + Viva Energy Construction Stage traffic demands in the SIDRA intersection 9.0 model, a lane-based congestion modelling tool. The core performance outputs are provided in Table 7-1 and Table 7-2 for the respective outlined peak periods.

The following outputs are produced by SIDRA:

1. Degree of saturation (DoS). This is the ratio of demand to capacity. A DoS of 1.0 or more in theory represents saturated conditions, but in reality, a lower practical DoS is used. For priority-controlled intersections, a DoS of 0.8 is the desired upper limit; for roundabouts, it is 0.85; and for signals it is 0.9. None of the key intersections analysed reach the upper limit of DoS.
2. Average delay. This is the average amount of time it takes a vehicle to negotiate an intersection, including the time to negotiate corners and the time stopped in queues or waiting for a green signal. This parameter is the most tangible to drivers.
3. Level of service (LoS). This is a rating of the overall performance of an intersection, ranging from A (very good) to F (very poor). It is directly related to the average delay. The desirable target is generally C or above, but in congested urban environments the realistic target is usually taken to be D. Level of service is not reported for priority-controlled intersections, as major road movements have zero delay, which skews the results. The key intersections analysed operate at LoS A or LoS B for all vehicles, however, some individual approach lanes operate at a lower level of service of C or D during peak times.

4. 95th percentile back of queue (95% Q). This is the queue length that is not exceeded 95% of the time. Ideally, queue lengths should not exceed the turning lane storage or block back into upstream intersections.

In summary, all intersections across all time periods are predicted to be operating well within the defined capacity metrics with projected and conservative traffic estimates for project construction. Therefore, the project is not expected to impact on the capacity of key intersections that would be used by construction generated traffic and have any adverse impacts on current users of these intersections. A Traffic Management Plan (TMP) should be implemented to further minimise the potential for construction traffic to impact on the capacity of these key intersections (see mitigation measure MM-TP02). Ongoing stakeholder consultation should also be undertaken to manage the capacity of key intersections during construction (see mitigation measure MM-TP01).

Table 7-1 Results of SIDRA analysis –2024 base+committed+project – 2024 Morning 0500-0600

Intersection	Approach Lane	Morning Peak Period (0500-0600)			
		DoS	Ave. Delay (s/veh)	95% Queue (veh)	LOS
1. Shell Pde / Rennie St	South: Shell Parade	0.031	3.8	0.1	LOS A
	East: Macgregor Ct	0.007	7.4	0.0	LOS A
	North: Off Ramp	0.303	3.1	1.6	LOS A
	West: Rennie St	0.015	9.1	0.1	LOS A
	All Vehicles	**0.303**	**3.5**	**1.6**	**LOS A**
2. Shell Pde / School Rd	South: Shell Parade	0.045	4.5	0.9	LOS A
	East: School Road	0.008	7.4	0.1	LOS A
	North: Shell Parade	0.323	4.2	8.6	LOS A
	West: School Road	0.018	6.5	0.3	LOS A
	All Vehicles	**0.323**	**0.3**	**8.6**	**LOS A**
2B. School Road / Site access (Network)	South: site access	0.001	5.6	0.0	LOS A
	East: School Road	0.041	4.4	0.0	LOS A
	West: School Road	0.035	4.0	0.5	LOS A
	All Vehicles	**0.041**	**4.2**	**0.5**	**NA**
3. Seabeach Parade / Madden Avenue (Network)	South: Shell Parade	0.055	0.9	1.4	LOS A
	East: School Road	0.014	6.3	0.3	LOS A
	North: Shell Parade	0.253	0.4	0.0	LOS A
	All Vehicles	**0.000**	**0.0**	**0.0**	**NA**
4. Princes Highway / School Road	South: Princes Highway	0.652	15.8	44.8	LOS B
	East: School Road	0.051	33.7	4.7	LOS C
	North: Princes Highway	0.103	7.4	14.0	LOS A
	West: Plantation Road	0.269	35.4	14.6	LOS D
	All Vehicles	**0.652**	**15.0**	**44.8**	**LOS B**

Table 7-2 Results of SIDRA analysis –2024 base+committed+project – 2024 Evening 0530-0630

Intersection	Approach Lane	Evening Peak Period (1730-1830)			
		DoS	Ave. Delay (s/veh)	95% Queue (veh)	LOS
1. Shell Pde / Rennie St	South: Shell Parade	0.489	3.4	1.1	LOS A
	East: Macgregor Ct	0.013	6.6	0.5	LOS A
	North: Off Ramp	0.276	3.3	11.9	LOS A
	West: Rennie St	0.033	9.1	1.2	LOS A
	All Vehicles	**0.489**	**3.6**	**26.9**	**LOS A**
2. Shell Pde / School Rd	South: Shell Parade	0.536	3.8	17.4	LOS A
	East: School Road	0.053	5.7	0.8	LOS A
	North: Shell Parade	0.333	4.0	9.7	LOS A
	West: School Road	0.075	11.2	1.5	LOS B
	All Vehicles	**0.536**	**4.2**	**17.4**	**LOS A**
2B. School Road / Site access (Network)	South: site access	0.075	5.7	0.6	LOS A
	East: School Road	0.046	0.1	0.0	LOS A
	West: School Road	0.057	0.1	0.0	LOS A
	All Vehicles	**0.075**	**2.1**	**0.6**	**NA**
3. Seabeach Parade / Madden Avenue (Network)	South: Shell Parade	0.436	0.0	0.1	LOS A
	East: School Road	0.070	8.1	1.3	LOS A
	North: Shell Parade	0.290	0.4	0.0	LOS A
	All Vehicles	**0.436**	**0.4**	**1.3**	**NA**
4. Princes Highway / School Road	South: Princes Highway	0.374	17.9	83.2	LOS B
	East: School Road	0.312	44.2	37.1	LOS D
	North: Princes Highway	0.466	11.5	65.9	LOS B
	West: Plantation Road	0.466	11.5	65.9	LOS B
	All Vehicles	**0.466**	**18.0**	**83.2**	**LOS B**

7.2 Road and traffic lane closures

Trenchless construction techniques (thrust boring or HDD) would be used to minimise traffic disruption and avoid road closures during the construction phase of the project where they are found to be required. At this stage of project development, the following road and traffic lane closures are anticipated:

1. A single road closure on Shell Parade (as shown in Figure 7-1) could occur during construction of the aboveground pipeline. This would be dependent on whether trenchless construction (thrust-boring) or trenching is used to create a new culvert under Shell Parade next to the existing culvert for the aboveground pipeline. If trenching is selected as the preferred method, a temporary road closure would be required for a maximum duration of approximately 4 days.
2. The northern section of Macgregor Court is proposed to be partially closed (one lane closure) during construction of the underground pipeline (as shown in Figure 7-1). Construction in this area would either be trenching with a construction right of way of approximately 15 metres or HDD with appropriate HDD entry and exit points. If trenching is selected, the partial closure would last for up to 11 days and up to 50 days if HDD is selected. Access to local properties would be maintained during that period. The duration of the lane closure would be confirmed during detailed design.
3. Some minor traffic management could occur on Rennie Street to allow for HDD equipment to be moved in and out of the HDD workspace due to the movement of semi-trailers encroaching the opposite carriageway. These closures are expected to be infrequent and would occur on an as needed basis outside of peak hour periods to limit impacts to road users. The duration of the lane closures are anticipated to last a maximum of two hours at a time.

Figure 7-1: Potential road and lane closure locations

The finalised road or traffic lane closures would be documentation and verified in the projects subsequent TMP and in agreement with key stakeholders, this would include any traffic detours (see mitigation measure MM-TP02). Further investigations will need be conducted to ensure that the proposed detour routes are suitable to accommodate detoured traffic including heavy vehicles. It is also expected that these closures would impact the traffic generated by the GeelongPort TT-Line Spirit of

Tasmania operations which is anticipated to be using Shell Parade when travelling to and from Melbourne. It is recommended that local access (including emergency) to properties be maintained during the closure where required. Other temporary traffic management measures such as signage (including VMS) and traffic controllers should also be considered as part of the TMP, and appropriate management measures implemented as part of subsequent worksite TMPs.

It is also recommended that appropriate notification is provided to residents and businesses that may be impacted by the road and/or lane closures (see mitigation measure MM-TP01).

As there is no dedicated pedestrian or cycling infrastructure located within the immediate vicinity of the proposed road and/or lane closure, no impacts are expected. However, during preparation of the TMP, on-road bicycle usage may need to be reviewed and considered to ensure cycling connectivity where required.

Table 7-3 provides a summary of the proposed road and lane closures as well as the locations where traffic management would be required.

Table 7-3 Road/lane closures during construction

Road	Location	Road classification	Existing daily traffic volumes	Timeframe	Road/lane closure impacts
Macgregor Ct	From Cummins Road to end of the road	Local	110	Up to 50 days	Local access to properties would be maintained. No anticipated impacts to motorists. To be management by TMP
Rennie Street	55m west of the Macgregor Ct / Princes Freeway off-ramp / Rennie Street / Shell Parade roundabout	Local	Rennie St 490 Off-ramp 310 Shell Parade 3,600	Approximately two hours at a time. Ad-hoc partial closure to occur outside of peak hour periods	Single lane of traffic to be maintained with motorists experiencing minor delays. Traffic control and detour of local traffic to be managed by TMP
Shell Parade	200m north of the Refinery Pier	Local	3,600	Up to four days	Alternative access available via Shell Parade, School Road, Princes Highway, Station Street and St Georges Road with motorists experiencing moderate delays (additional six km travelled). Traffic control and detour of local traffic to be managed by TMP

7.3 Impacts on public transport

Potential road closures are not expected to impact on public transport services, however, some roads that are used by public bus services would be used by construction vehicles to and from the project sites. Impacts are expected to be minimal given the low frequency of bus services and with no bus stops present within the proximity of any project site access locations.

Any construction or over-dimensional vehicle movements associated with the project would need to either not operate during these periods when public buses or school buses are operating, or suitable measures should be implemented to reduce potential impacts if conflicts cannot be suitably managed (see mitigation measures MM-TP02 and MM-TP05). Ongoing consultation with relevant stakeholders should be undertaken to manage potential impacts on public bus services and school buses during construction (see mitigation measure MM-TP01).

7.4 Other road and site users

7.4.1 Pedestrians and cyclists

Given the project is located within the rural road network, there are no dedicated pedestrian or bicycle facilities located within the immediate road networks around the project area. Reduced speed limits and general construction signage warning of the movement of heavy vehicles should be considered on C115, as this may be utilised by recreational and sport training cyclists who ride with vehicles along this road.

7.4.2 Refinery workers

To manage any on-site impacts, co-ordination between the project team and site users within the refinery and surrounding areas should be undertaken to help avoid conflicts and control accessibility to the area. This should include increased site security, signage on approach and within the project site, way-finding strategy into and out of the project site, communications planning, and other measures included in the TMP (see mitigation measure MM-TP01, MM-TP02 and MM-TP05).

7.5 General construction heavy vehicles

Construction traffic routes for heavy vehicles were assessed and the NHVR route planner was used to identify where a permit application may be required. Routes for heavy vehicle transportation are shown in Section 3.2.

As detailed in Section 5.0, and shown on Figure 5-1, the vast majority of local roads are B-Double approved on the basis of existing land uses such as the port, refinery and other industrial uses in the vicinity.

Exceptions to the above include Station Road which is conditionally restricted to heavy vehicle access between 9:00 pm and 6:00 am between North Shore Road and St George Road. Several local roads within the study area are also part of the B-Double approved network such as Madden Avenue, The Esplanade (between Madden Avenue and Seebreeze Parade) and Rennie Street.

Discussions with key stakeholders should be undertaken to understand existing condition dilapidation surveys that would be required. The use of School Road should be reviewed to understand the access road that would need to be used, between the temporary construction laydown area access point and the roundabout with Shell Parade (see mitigation measures MM-TP01 and MM-TP02).

These surveys would determine the existing conditions and extent of existing damage to the road and its ability to accommodate heavy vehicle loads on their road surface.

7.6 Over-dimensional loads

The relevant policies and guidelines for the movement of over-dimensional loads are outlined in Section 3.2.

As advised by Viva Energy, the largest construction related vehicle is anticipated to be associated with delivery of the nitrogen storage tanks with a maximum heavy vehicle length of 36m. Accordingly, this would be classified as an over-dimensional (OD) vehicle. The OD vehicle is expected to arrive via

Melbourne and the need to cross any level crossings should be negated. However, if this is unavoidable, then approval would be required from the Department of Transport (DOT) if any OD vehicles crossing a railway line are greater than 4.9 metres in height, 3.0 metres wide, or 26.0 metres in length.

Where the dimensions or mass of the vehicle/load combination require it, a route audit should be carried out to assess route options, safety, clearance to potential obstructions such as wires, structures, trees and rail crossing infrastructure (see mitigation measure MM-TP06).

To minimise disruptions or delays on regular traffic, OD vehicles should seek to avoid peak hour for traffic volumes and should avoid the school bus operation hours (see mitigation measure MM-TP01 and MM-TP02).

7.6.1 OD access via public intersections

To determine if OD vehicles can safely and successfully make the required turning movements to the construction area located off School Road, a swept path analysis was undertaken for the Princes Freeway off-ramp / Rennie Street / Macgregor Court / Shell Parade roundabout and School Road / Shell Parade roundabout, respectively shown in Figure 7-2 and Figure 7-3. As indicated, OD vehicle turning movements would require crossing into oncoming traffic lanes and onto shoulders and roundabouts which can be managed with a TMP (see mitigation measure MM-T02) to ensure safe vehicle movements to the satisfaction of the responsible road management authority. Table 7-4 summarises the proposed intersection upgrade measures for these intersections based on the constraints identified through the swept path analysis for OD transportation to the site.

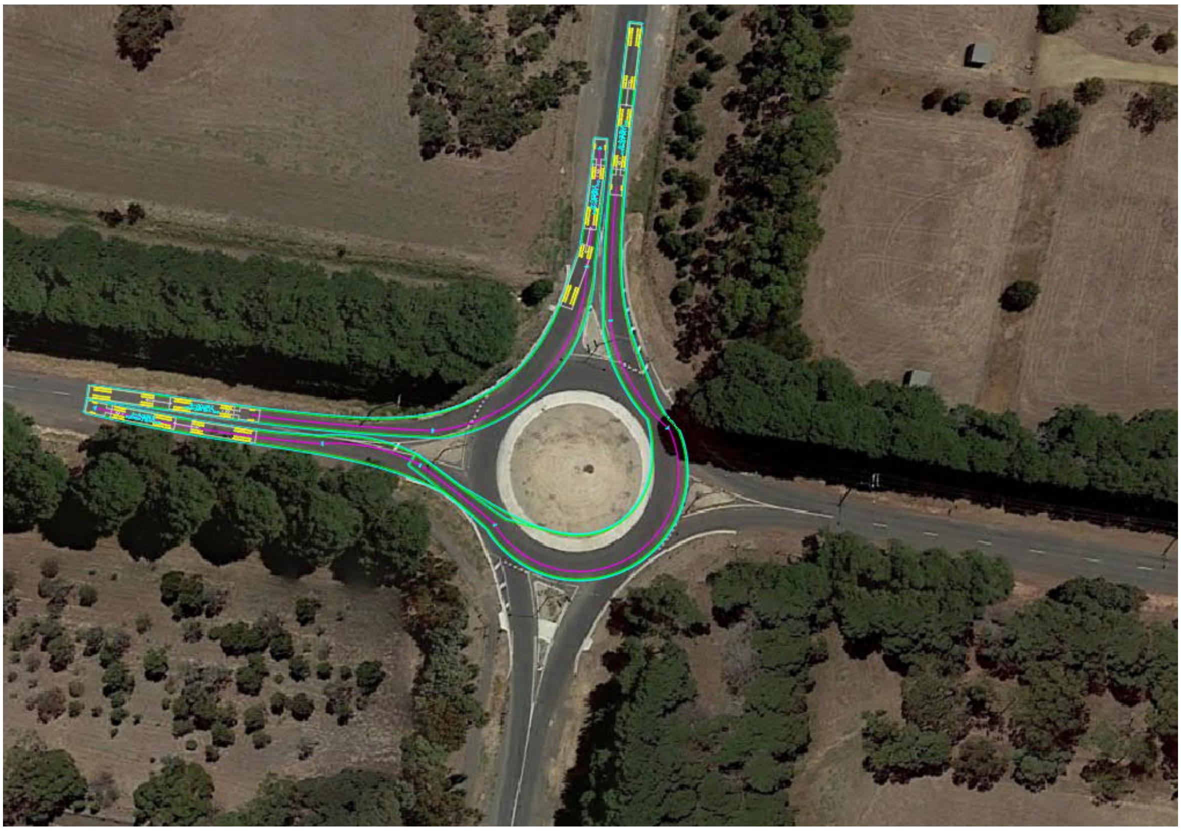
It should be noted that operational controls such as temporary speed reductions, potential OD/OSOM delivery time restrictions and additional signage may be required, in addition to the physical measures outlined below. It is expected that these measures would be developed by the project transport contractor during TMP development and reviewed by the NHVR in consultation with key stakeholders (see mitigation measures MM-TP01, MM-TP02 and MM-TP06).

Table 7-4 Identified intersection mitigation measures

Pinch Point ID	Intersection	Intersection upgrade requirements for OD / OSOM deliveries
P1	Princes Freeway off-ramp / Rennie Street / Macgregor Court / Shell Parade roundabout	• As OD vehicles may travel across the elevated roundabout, road signs may need to be made removeable on the roundabout.
P2	School Road / Shell Parade roundabout	• As OD vehicles may travel across the elevated roundabout, road signs may need to be made removeable on the roundabout. • Traffic management measures may be required as OD vehicles may be encroaching into the opposing lane while approaching/egressing the roundabout.

Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-2 Princes Freeway off-ramp / Rennie Street / Macgregor Ct / Shell Parade roundabout - 36 metre over dimensional vehicle swept paths



Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-3 School Road / Shell Parade roundabout - 36 metre over dimensional vehicle swept paths

7.6.2 Wider OD transportation impacts outside of project area

The broader impacts of the OD transportation impacts beyond the project area should also be considered by the project transportation contractor. The following measures should be considered and undertaken:

1. Agreement and finalisation of final OD transportation options (see mitigation measure MM-TP02).
2. Viva Energy and the project transport contractor preparation of relevant OD Transportation Traffic Management Plan(s) with liaison and review/input from key stakeholders to facilitate safe OD travel (e.g., road authorities, utilities etc.) (see mitigation measure MM-TP01).
3. Relevant permits from NHVR and Department of Transport for travel and any significant areas of travel that may need to be traversed (e.g., rail lines) (see mitigation measure MM-T02).
4. Depending on the OD route reviews, associated bridge assessments may also be required based on final transportation route (see mitigation measure MM-TP06).

7.7 Site access point upgrades

7.7.1 Laydown areas

Construction workers are anticipated to travel to and from two site locations during the construction phase of the project; the construction laydown area located off School Road and the marine construction laydown area near Madden Avenue.

A summary of the requirements for each of the two site access points is provided in Table 7-5. Access requirements for each site entrance have been developed based on the following assumptions:

1. Largest OD vehicle requiring access via the School Road access would measure 36m in length.

2. The final transportation and access requirements would be confirmed as detailed project design and construction methodology are refined and incorporated into the project TMP including input from the project transport contractor.
3. Any vehicle that would travel from Melbourne and via Shell Parade (N) would exit in the same direction.
4. Following delivery of equipment and materials, OD or OSOM vehicle trailers compact before turning around and returning to the original component pickup site in the reverse direction.
5. Light vehicles may access site from all directions.

The locations of site access points are shown in Figure 6-1.

Table 7-5 Construction vehicle site access point requirements

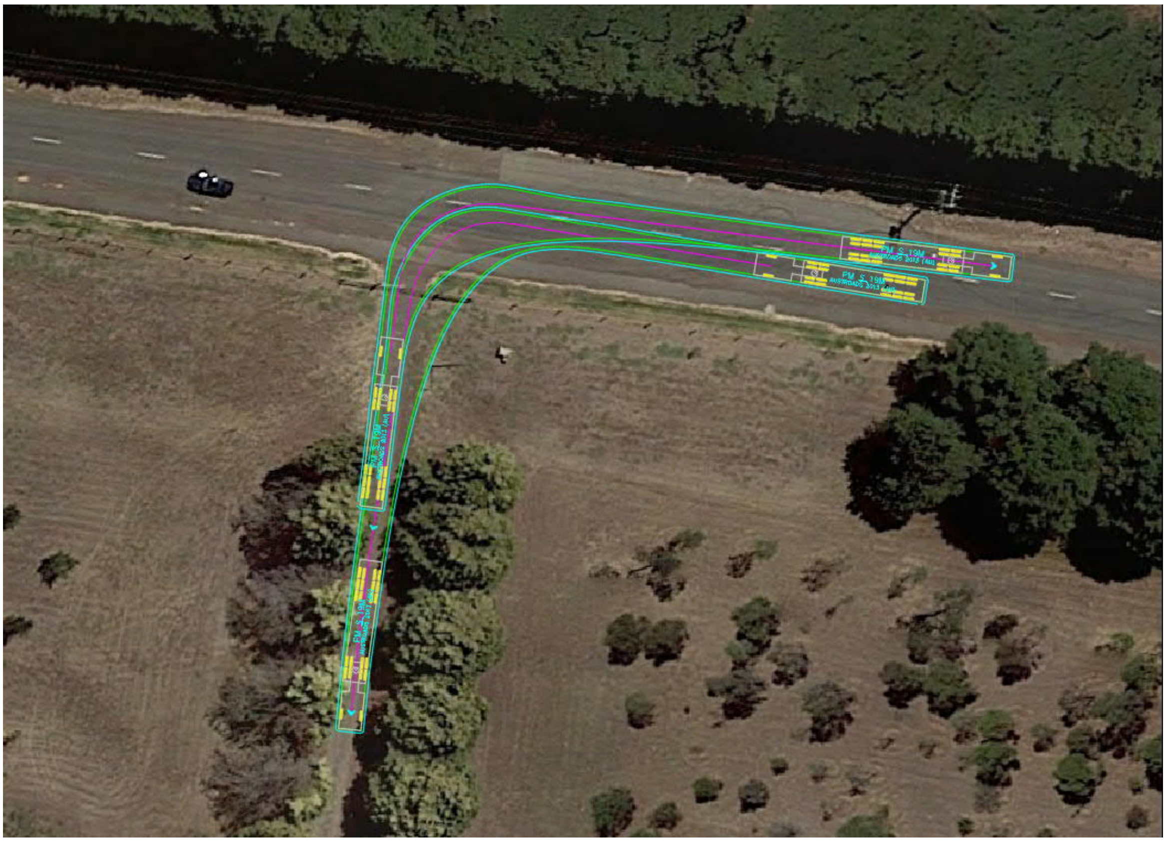
Access Point	Design Vehicle			
	Left-in	Left-out	Right-in	Right-out
School Road	OSOM	LV	LV	OSOM
Madden Avenue	OSOM (as existing permitted)	OSOM (as existing permitted)	OSOM (as existing permitted)	OSOM (as existing permitted)

Based on the above, vehicle swept path analysis was completed to determine the site access improvements required at the School Road access point, assuming the following scenarios:

1. Scenario 1 – permits two-way heavy vehicle access – 19m articulated (general construction accessibility of plant and materials), see Figure 7-4
2. Scenario 2 – permits single OD 36m vehicle access – considered to be an ad-hoc delivery occasion, accordingly access can be managed via appropriate worksite TMP means, see Figure 7-5

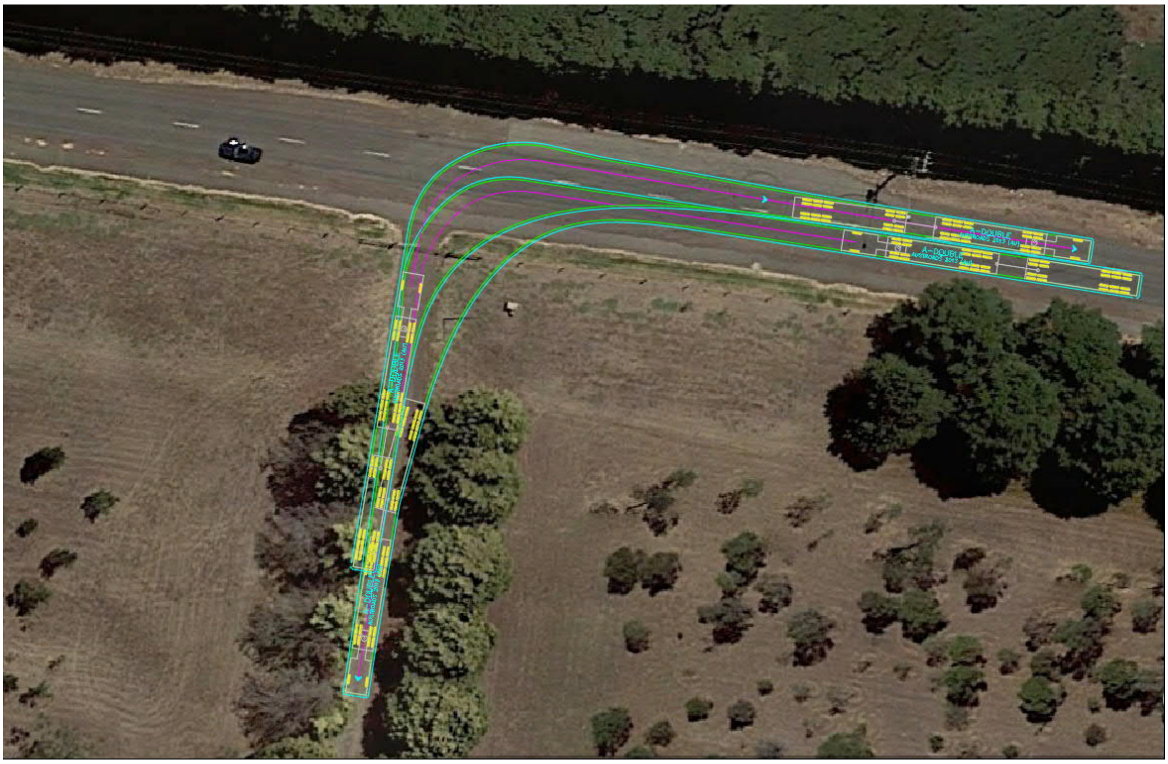
Indicative swept paths for heavy and OD vehicles show that only a single heavy vehicle or over dimensional vehicle can enter or exit via the proposed access point at one time given the existing access road width. To ensure that safe bidirectional movements can be accommodated, the construction site entrance off School Road should be reviewed as part of the TMP as it may require to be formalised (see mitigation measure MM-TP02). This includes reviewing the road surface conditions near the entry as potholes were observed near the existing entry point during the site visit. For OD movements, traffic management may be required should multiple OD vehicles require access at the same time.

As School Road is straight at this location, there are unrestricted sight distances from the proposed access point onto the road as shown in Figure 7-6.



Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-4 School Road construction laydown site access - 19 metre B-Double vehicle swept path



Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-5 School Road construction laydown site access - 36 metre over dimensional vehicle swept path

Source: AECOM, 13 May 2021

Figure 7-6 Construction site entry off School Road

In the context of the crash history of the area as outlined in Section 5.6, it is recommended that a formal Road Safety Audit (RSA) be undertaken so that any additional mitigation measures to facilitate safe access of vehicles to and from the project site can be identified (see mitigation measure MM-TP03). For completeness, the RSA should be completed for all nominated access points and internal access roads/tracks.

7.7.2 HDD construction workspace and laydown area

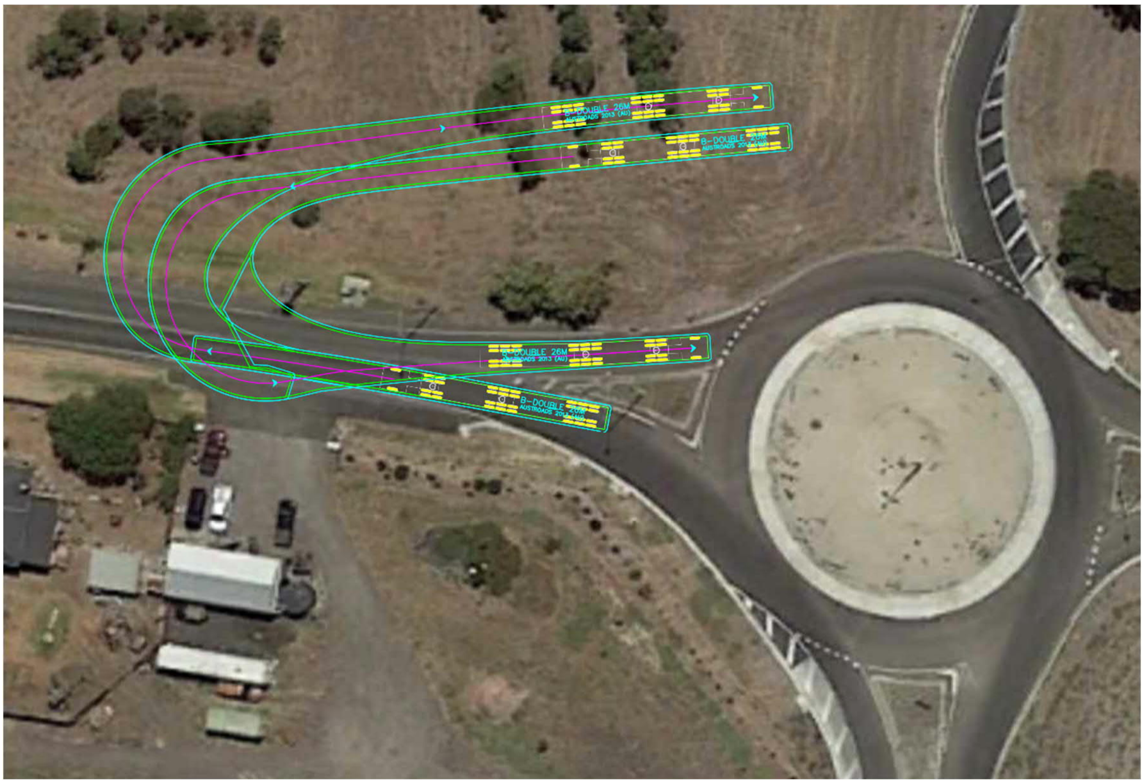
HDD equipment is expected to be stored at a construction area located off Rennie Street, approximately 55 metres west from the Macgregor Ct / Princes Freeway off-ramp / Rennie Street / Shell Parade roundabout intersection. While final transportation and access requirements would be confirmed once a works and nominated transport contractor is appointed, it is expected that semi-trailer trucks would be used to move the HDD equipment from and to the storage area to relevant construction areas along the proposed alignment. Semi-trailer trucks are expected to turn right-in and left-out via the access point located off Rennie Street before turning onto Shell Parade to travel to relevant locations along the alignment. It is assumed that the trucks would be originating either from Melbourne (right-in / right-out) or locally (right-in / left-out).

Indicative swept paths were undertaken using 26 metres B-Doubles with a 300mm body clearance and are shown in Figure 7-7, Figure 7-8, Figure 7-9 and Figure 7-10. As summarized in Table 7-6, turning movements will require the design vehicles to cross into the oncoming traffic lane and may travel onto the elevated roundabout. It is expected that traffic management would be required to manage entry and egress of heavy vehicles including measures such as temporary speed reduction, traffic controllers and advanced warning signage. It is expected that these measures would be investigated further and detailed during the projects TMP and worksite TMPs, in consultation with key stakeholders.

It should be noted that Viva Energy is currently in discussion with DoT to ensure that appropriate access requirements to and from the HDD construction area is provided as Rennie Street is managed by the Department.

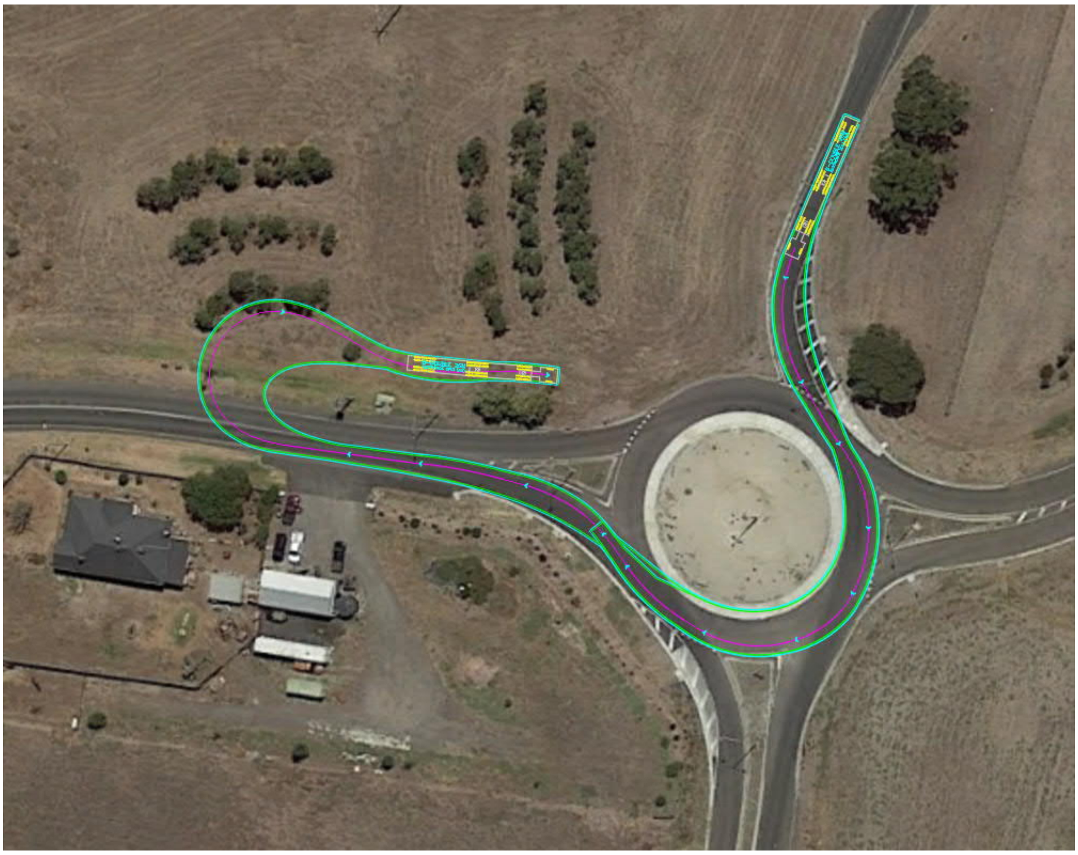
Table 7-6 Identified intersection mitigation measures

Pinch Point ID	Intersection	Intersection upgrade requirements for B-Double movements at HDD storage area
P3	Princes Freeway off-ramp / Rennie Street / Macgregor Court / Shell Parade roundabout	• As B-Double vehicles may travel across the elevated roundabout, road signs may need to be made removeable on the roundabout. • Traffic management measures may be required as B-Double vehicles may be encroaching into the opposing lane while approaching/egressing the roundabout.
P4	Princes Freeway off-ramp / Rennie Street / Macgregor Court / Shell Parade roundabout	• As B-Double vehicles may travel into incoming lane of traffic to accommodate turning movements, traffic management measures may be required as B-Double vehicles may be encroaching into the opposing lane while approaching/egressing the roundabout.



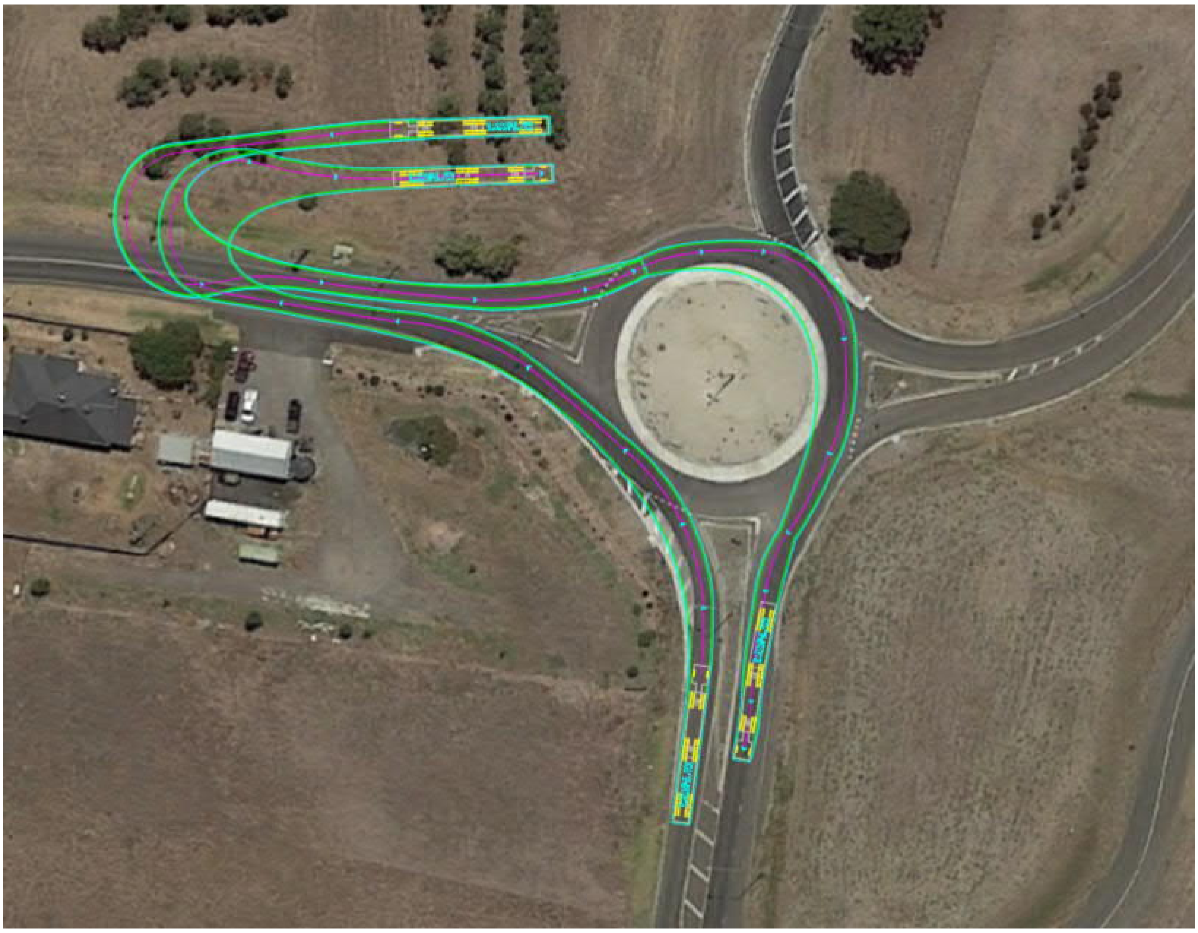
Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-7 Rennie Street - HDD construction storage site access - 26 metres B-Double vehicle swept paths



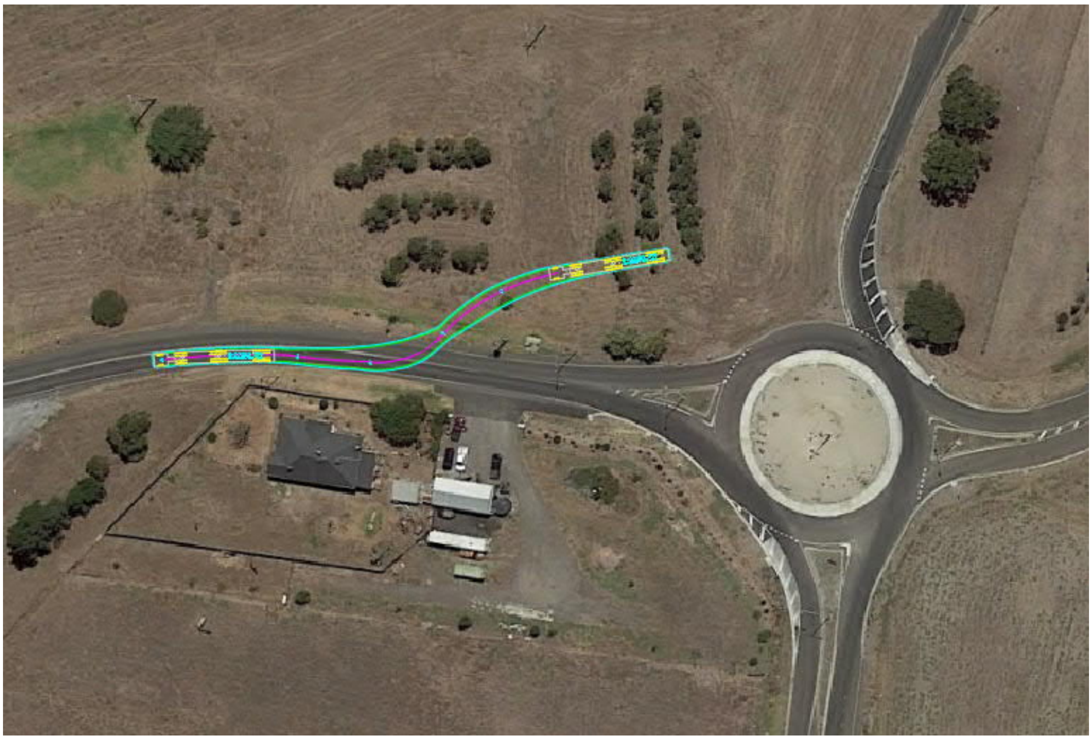
Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-8 Rennie Street - HDD construction storage site access movements from Melbourne - 26 metres B-Double vehicle swept paths



Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-9 Rennie Street - HDD construction storage site access movements from/to Geelong - 26 metres B-Double vehicle swept paths



Source: AECOM developed swept path analysis, Google Earth 2021

Figure 7-10 Rennie Street - HDD construction storage site access movements to Melbourne - 26 metres B-Double vehicle swept paths

7.8 Amenity impacts on the road network

Vehicle movements during construction works may generate dust deposition on roads and other surfaces. The deposition of dust and debris on surfaces may be considered a nuisance and could adversely affect the quality of the road network or potentially create safety hazards.

Measures to manage dust and sedimentation impacts should be included in the TMP, sub-contractor TMPs and the Construction Environmental Management Plan (CEMP) (see mitigation measures MM-TP02 and MM-TP05). These may include keeping vehicles to defined haul roads, minimising vehicle movements on exposed surfaces, using wheel washing facilities and enforcing vehicle speed limits.

Increased traffic during construction may also result in noise and vibration impacts on surrounding receptors. Measures to manage potential noise and vibration impacts include restricting vehicle movements to and from the site during normal working hours where practicable to avoid disturbance outside of standard construction hours, and no construction vehicles should be left idle with the engine running (see mitigation measures MM-TP02 and MM-TP05).

7.9 Emergency vehicle access

Emergency vehicle access protocols should be developed and agreed between relevant stakeholders, with unrestricted access always maintained, especially given the location of the project worksites, and potential on-site hazards.

Emergency access and evacuation plans should be developed in consultation with key stakeholders for all worksites as part of this project (see mitigation measures MM-TP01 and MM-T0P4). These plans should also be developed having regard for the TMP and any subcontractor TMPs (see mitigation measures MM-TP02 and MM-TP05).

7.10 Road condition and maintenance

As heavy construction vehicles have the potential to impact on road condition, road conditions should be managed throughout construction works and the responsibility of each stakeholder throughout the process should be clearly identified. The following measures should be undertaken to ensure that road conditions are managed and maintained:

1. Pre-construction road conditions should be in a suitable state to access and perform construction activities. Surveys provide a baseline for any triggers for immediate / future impacts for the upgrade or remediation of road assets (see mitigation measure MM-TP02).
2. Both public and private access roads should be in a suitable condition to transport project components / materials to the site in a safe manner (see mitigation measure MM-TP02).
3. Agreements with road asset owners, includes DoT and COGG, on the following should be in place (see mitigation measure MM-TP02):
   - Agreeing extent and form of dilapidation surveys to be undertaken prior to works commencing, either by way of photographic or more detailed survey vehicle techniques. This would provide a fair and accurate baseline of pavement conditions at the commencement of construction.
   - Road maintenance methodology, which would typically involve a drive-over inspection at a minimum frequency of one inspection per month. The checking procedures would need to be agreed with, along with the intervention criteria, treatments and response timeframes based on the pavement distress type identified (e.g., potholes, surface treatment, cleaning etc.).
   - Post construction review and identification and hand-back protocols would need to be agreed and documented.

If impacts occur during the construction period, rectification should be implemented by the responsible party. Given that the local road network is already utilised by a number of heavy vehicle movements, this may be difficult to monitor. As impacts are expected to be minimal, a more uniform agreement may be beneficial (either by way of formal contract of specific triggers or a bond may be preferable to cover the construction phase of the project) (see mitigation measure MM-TP01).

7.11 Road section upgrades

No road upgrades are anticipated to be required because of the project. However, as noted in Section 7.2, a single road closure could occur during construction to allow for open trench construction works for the new culvert on Shell Parade. It is understood that the road would be fully remediated to its original condition following construction works (with existing road condition and remediation protocols outlined in the projects TMP in agreement with key stakeholders).

Additionally, improvements may be required at the proposed construction area access points to ensure that construction traffic can safely enter and egress from the construction areas onto the local road network. These should be reviewed during the preparation of the project TMP when greater certainty on the project construction vehicle requirements is known.

7.12 Summary of residual construction impacts

Residual transport and traffic impacts associated with construction of the project are considered to be minor and can be effectively managed through standard traffic management measures typically applied for projects of this scale and nature.

The intersection capacity analysis undertaken for the TIA found that all intersections across all time periods are predicted to operate well within the defined capacity metrics during construction and operation of the project. Implementation of a project TMP developed when the final design and construction methodology are refined would further minimise the potential for construction traffic to impact on the capacity of key intersections with the residual impact anticipated to be negligible.

One road closure, one lane closure and some ad-hoc traffic management are expected to occur during construction; however, these would be temporary. Road and lane closures should be managed through measures outlined in a TMP, including traffic detours, traffic controllers and signage, which would result in minor residual impacts on the road network and local area.

OD vehicles that visit the refinery during construction may encroach on adjoining lanes, shoulders and roundabouts which would result in safety impacts and disruptions to traffic. To manage potential impacts, an OD transport route assessment should be undertaken prior to construction to identify the most appropriate route and traffic management measures would be implemented as part of the TMP during construction works. With these measures in place, the residual impacts would be minor.

Other potential impacts that may occur during construction include impacts to other road and site users, such as public and school buses, amenity impacts and impacts to road conditions. These can all be managed with the implementation of the TMP and CEMP, resulting in negligible residual impacts.

Overall, impacts to the transport network during construction are expected to be relatively minor and mostly managed by measures incorporated into the project TMP and through ongoing stakeholder consultation, with the road network found to be sufficient to accommodate anticipated construction traffic volumes.

8.0 Operation impacts

8.1 Road network infrastructure assessment

During operation, regular deliveries of nitrogen are anticipated to be required which would result in recurring heavy vehicle movements to and from the existing Geelong Refinery. Deliveries are not expected to occur on a daily basis but would take place at regular intervals. It is anticipated that when nitrogen deliveries are required, there would be up to a maximum of eight truck deliveries per day (most likely B-Doubles), resulting in a total of 16 daily heavy vehicle two-way movements. While these visits are not expected to occur daily, but only during certain periods throughout the year, nitrogen deliveries have been assumed to occur daily for up to 20 years for the purpose of this assessment and to assess potential impacts from a worst-case scenario.

Nitrogen trucks would be entering the refinery through Refinery Road after coming off the Princes Highway. As these roads are all part of the B-Double network, no heavy vehicle permit would be required.

However, the frequency of operational traffic movements and recurring heavy loads over 20 years may augment the deterioration of pavement surface on roads anticipated to be used. Potential impacts of operational traffic on the road network would be further assessed as part of a recommended operational transport plan (see mitigation measure MM-TP07).

8.2 Site access impacts

During operation, nitrogen trucks are expected to access the refinery using the existing access point located on Refinery Road. While the size of the trucks expected to be used for these deliveries is uncertain at this stage of the project, it has been conservatively assumed that B-Double vehicles would be utilised for the purpose of this assessment. Indicative swept paths of 19 metre B-Double have been completed - see Figure 8-1 – and show that the Refinery Road site entry can safely accommodate bidirectional B-Double movements.

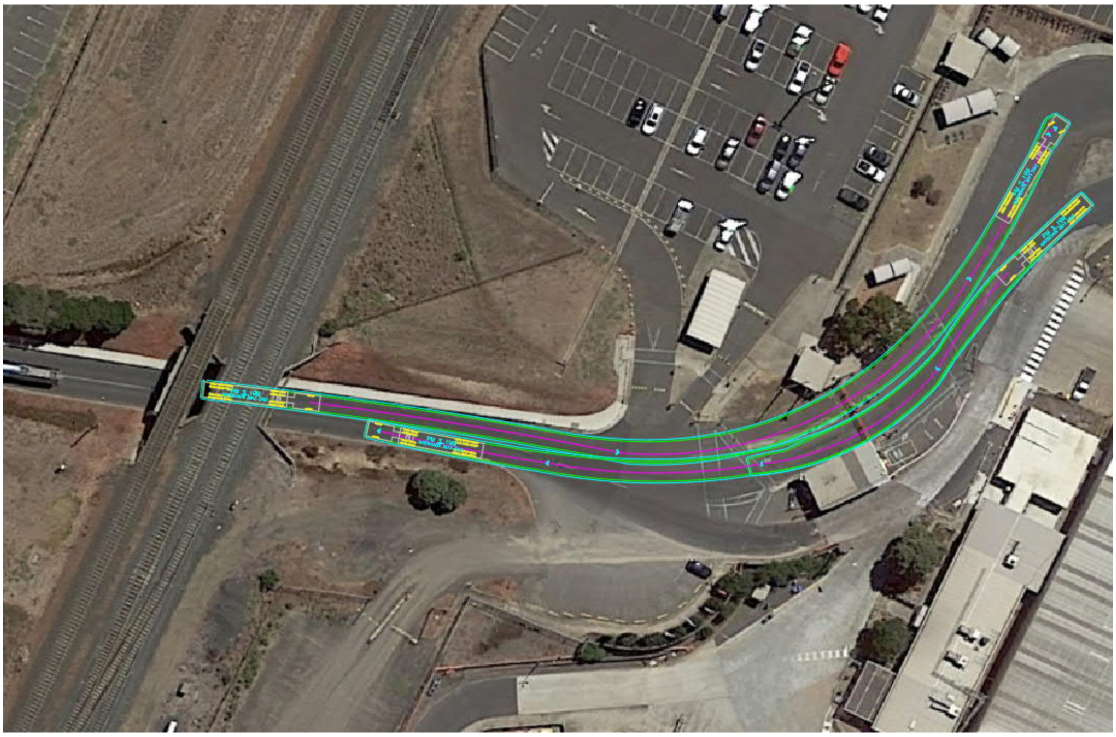


Figure 8-1 Refinery Road site entry - 19 metre B-Double vehicle swept paths

8.3 Safety impacts

On the basis that there would be up to 16 heavy vehicle movements a day for a minimum of 20 years resulting from nitrogen deliveries, there may be an increased crash risk between operational heavy vehicle movements and other road users on the road network.

Due to the long operational duration of the project, haulage routes should be further assessed, and an operational transport plan should be developed (see mitigation measure MM-TP07). This plan should include identifying the preferred route(s) from each nitrogen originating facility to the refinery and adopt management measures at key intersections if required.

8.4 Summary of residual operation impacts

Given the anticipated low level of traffic generation during operation (see Section 6.3.2), road impacts are expected to be negligible and traffic volumes are not anticipated to generate detrimental impacts to local road network operations.

The operational traffic movements associated with the delivery of nitrogen to the treatment facility are unlikely to interfere with local traffic conditions or intersection capacity, however, may result in deterioration of pavement surfaces on roads that would be used. Implementation of an operational transport plan would ensure potential deterioration impacts are minimised during project operation.

9.0 Decommissioning impacts

Decommissioning impacts are expected to be similar to the construction stage of the project. Given this stage would not occur until after the operational life cycle of the project, re-assessments would be required.

Potential impacts associated with decommissioning works of the project are expected to be the same or similar to those associated with the construction phase. However, the overall level of impact would be lower due to the nature of decommissioning activities. These impacts should also be managed with the implementation of the same mitigation measures as those proposed for construction impacts. With recommended mitigation measures in place, the potential for impacts on the local road network within the vicinity of the project from decommissioning of the project would be minor.

Given this phase would not occur for some time a reassessment would be required at the time to consider the current and future road conditions and infrastructure present.

10.0 Cumulative impacts

Construction of the project may coincide with the construction and/or operation of other projects within the study area and subsequently, potential for cumulative impacts is discussed in the sections below.

10.1 Diesel Storage Project

10.1.1 Construction phase

It is likely that construction and operation of the Gas Terminal Project would coincide with the Viva Energy Diesel Storage Project and therefore there is potential for cumulative transport impacts. The Diesel Storage Project would include the provision of additional diesel storage which is expected to be located within the Geelong Refinery. It is proposed that three diesel storage tanks of 30 million litre usable capacity are to be located in the north west corner of the Geelong Refinery, approximately 200m northwest from the proposed site entry located via School Road, as shown in Figure 10-1.

Figure 10-1 Proposed location of diesel storage (source: Viva Energy)

Construction works are anticipated to commence in March 2022 and would take place over a 24-month period. Most of the diesel storage construction workers are expected to travel to and from the project worksite simultaneously with the workers for the Gas Terminal Project.

It has been assumed that the construction peak period for the diesel storage works would occur at the same time as the Gas Terminal project construction peak period to assess a worst-case and conservative scenario. At the time of this assessment, the traffic generation estimations were based on information provided by Viva Energy but may be subject to changes once contractor(s) are nominated. Where no information was available, assumptions were made and conservative estimates based on the Gas Terminal Project construction traffic generation data were used.

The following should be noted with regards to the Diesel Storage project construction phase traffic generation:

- All construction traffic would access the diesel storage site via the dedicated site access point located via School Road, which would also be used by the Gas Terminal Project construction traffic to the access the main construction laydown area.
- 100 workers per day are anticipated to be required during construction peak.
- Workers are assumed to travel to and from the construction area each day during construction. While it is currently not known where workers would originate from, it has been assumed for the purpose of this study that 45 per cent of the workforce would come from Melbourne, 40 per cent from the Geelong area, and the remainder would come from interstate. It has been assumed that interstate workers would stay in the local area within the Geelong area or would stay in short-term accommodation during construction, north of the study area.
- As shift hours for the workforce was unknown at the time of this assessment, it was assumed that the workforce traffic would arrive at the same time than the Gas Terminal Project workers in the morning peak between 5:00 am and 6:00 am and depart in the evening peak between 5:30 pm and 6:30 pm
- Onsite car parking is expected to be provided wholly within the site compound, with no over-spill into other areas.
- Similar to the Gas Terminal Project, the majority of plant and equipment movements are expected to occur prior to construction. While some of those movements may occur during construction, they are expected to occur on an as needed basis outside of the local road network peak traffic operating time periods.
- 20 semi-trailer trucks are anticipated to be required during the peak of construction works. However, these are expected to occur outside of peak hour periods and were not considered as part of the cumulative peak hour analysis.

Table 10-1 and Table 10-2 outline the estimated Diesel Storage Project workforce related traffic distribution and generation on the local road network. Anticipated routes for construction traffic movements are shown in Figure 10-2.

Table 10-1 Diesel storage construction workforce traffic distribution during peak period

Location	Origin	Distribution
Construction area off School Road (northwest of refinery site)	Melbourne	Via Princes Freeway off-ramp, Shell Parade and School Road
	Local	Via Princes Highway and School Road

Table 10-2 Diesel storage construction traffic generation

Origin	Workforce	Workforce peak period traffic generation
Melbourne	52	52
Local	48	48

Figure 10-2 Diesel storage anticipated construction traffic routes

A cumulative summary of the anticipated Gas Terminal Project and Diesel Storage Project workforce volumes anticipated to be travelling via the School Road site access is summarised in Table 10-3:

Table 10-3 Anticipated Gas Terminal and Diesel Storage project workforce volumes travelling to and from School Road site access

Project	Workforce anticipated per day	Workforce peak hour traffic generation
Gas Terminal	105	105
Diesel Storage	100	100

Traffic volume diagrams have been developed for the morning (5 am to 6 am) and evening (5:30 pm to 6:30 pm) 2024 Base + Committed Development + Gas Terminal project Construction Stage + Diesel Storage Project Construction Stage traffic demands to be used in the SIDRA intersection 9.0 models of the local road network. The traffic flow diagrams for the above peak periods are provided in Appendix B.

SIDRA intersection capacity analysis of the potential cumulative impacts of the projects construction workforce at the following key intersections (previously assessed in Section 7.1) has been undertaken:

- Shell Parade, Rennie Street and Macgregor Court Roundabout
- Shell Parade and School Road Roundabout
- Princes Highway and School Road signalised intersection

Core performance outputs for both the AM and PM peak periods are provided in Table 10-4 and Table 10-5. The intersection capacity analysis shows that all key intersections for both the AM and PM peak hour periods would operate within the defined capacity metrics. It is noted that the Princes Highway / School Road intersection operates over DoS of 0.9 in the AM period due to the high traffic volumes on Princes Highway; however, delay and consequent level of service (LoS) are well within the capacity requirements. Therefore, the Diesel Storage Project construction traffic is not expected to impact on the capacity of key intersections that would be used by both the Gas Terminal Project construction phase vehicles and the GeelongPort TT-Line Spirit of Tasmania road users.

Table 10-4 Results of SIDRA analysis –2024 base+committed+Gas Terminal project+Diesel Storage project – 2024 Morning 0500-0600

Intersection	Approach Lane	Morning Peak Period (0500-0600)			
		DoS	Ave. Delay (s/veh)	95% Queue (veh)	LOS
1. Shell Pde / Rennie St	South: Shell Parade	0.031	3.8	0.1	LOS A
	East: Macgregor Ct	0.007	7.8	0	LOS A
	North: Off Ramp	0.334	3.1	1.9	LOS A
	West: Rennie St	0.015	9.1	1.9	LOS A
	All Vehicles	**0.334**	**3.5**	**1.9**	LOS A
2. Shell Pde / School Rd	South: Shell Parade	0.048	4.9	0.1	LOS A
	East: School Road	0.008	7.7	0.0	LOS A
	North: Shell Parade	0.356	4.8	1.2	LOS A
	West: School Road	0.018	6.5	0.0	LOS A
	All Vehicles	**0.356**	**4.9**	**1.2**	LOS A
2B. School Road / Site access (Network)	South: site access	0.001	5.6	0.0	LOS A
	East: School Road	0.063	5.4	0.0	N/A
	West: School Road	0.048	5.6	0.1	N/A
	All Vehicles	**0.063**	**5.5**	**0.1**	**N/A**
4. Princes Highway / School Road	South: Princes Highway	1.091	30.2	10.2	LOS C
	East: School Road	0.051	33.7	0.6	LOS C
	North: Princes Highway	0.103	7.4	1.8	LOS D
	West: Plantation Road	0.269	35.4	1.9	LOS A
	All Vehicles	**1.091**	**24.3**	**10.2**	**LOS C**

Table 10-5 Results of SIDRA analysis –2024 base+committed+Gas Terminal project+Diesel Storage project– 2024 Evening 0530-0630

Intersection	Approach Lane	Morning Peak Period (0500-0600)			
		DoS	Ave. Delay (s/veh)	95% Queue (veh)	LOS
1. Shell Pde / Rennie St	South: Shell Parade	0.489	3.4	3.5	LOS A
	East: McGregor Ct	0.012	6.6	0.1	LOS A
	North: Off Ramp	0.276	3.3	1.5	LOS A
	West: Rennie St	0.033	9.1	0.2	LOS A
	All Vehicles	**0.489**	**3.6**	**3.5**	LOS A
2. Shell Pde / School Rd	South: Shell Parade	0.536	3.8	2.3	LOS A
	East: School Road	0.053	5.7	0.1	LOS A
	North: Shell Parade	0.333	4.0	1.2	LOS A
	West: School Road	0.075	11.2	0.2	LOS B
	All Vehicles	**0.536**	**4.2**	**2.3**	LOS A
2B. School Road / Site access (Network)	South: site access	0.146	5.8	0.2	LOS A
	East: School Road	0.046	0.1	0.0	N/A
	West: School Road	0.057	0.1	0.0	N/A
	All Vehicles	**0.146**	**3.1**	**0.2**	**N/A**
4. Princes Highway / School Road	South: Princes Highway	0.374	17.9	10.9	LOS B
	East: School Road	0.312	44.2	5.0	LOS D
	North: Princes Highway	0.466	11.5	8.7	LOS B
	West: Plantation Road	0.457	41.2	3.2	LOS D
	All Vehicles	**0.466**	**18.0**	**10.9**	**LOS B**

10.1.2 Operational phase

Once commissioned, it is expected that existing onsite workers would be used for the maintenance of the equipment for the Diesel Storage Project. As such, no additional traffic movements are expected to be generated during the operational phase of the diesel storage tanks.

10.2 GeelongPort TT-Line

The potential for cumulative impacts to arise during operation of the project, between nitrogen truck deliveries and passenger traffic associated with the GeelongPort TT-Line was considered in this assessment. Passenger traffic would utilise Shell Parade, which may also be used by nitrogen trucks for access to refinery for deliveries. However, nitrogen trucks would predominantly use Refinery Road for access to the refinery and deliveries are expected to be occurring outside of business hours and at a very low frequency (up to a maximum of eight trucks per day). It is therefore considered unlikely for cumulative impacts to arise during operation of the project.

10.3 Boral Clinker Grinding Facility

A new grounding, storage and dispatch facility was built at GeelongPort, near Lascelles Wharf. The facility is expected to be operational soon and would generate heavy vehicle movements which may use some of the roads within the study area including Shell Parade. Traffic generation related to this project is unknown as no traffic related data was publicly available at the time of this study. Attempts to obtain information for this project were made, however, these attempts were unsuccessful.

Given the location of the facility it is assumed that heavy vehicle movements generated by this project would use the following roads within the study area:

- Seabeach Parade
- Wharf Road
- Shell Parade
- Princes Highway

As discussed in Sections 7.1 and 10.1.1, the intersection capacity analysis conducted as part of this assessment using conservative estimates of traffic, shows that key intersections within the study area are expected to be able to operate within the defined capacity metrics with traffic generated by the Gas Terminal, GeelongPort TT-Line and Diesel Storage Project. Therefore, the road network is expected to be able to accommodate the additional traffic volumes anticipated to be generated by this project.

11.0 Recommended mitigation measures

This section outlines the recommended mitigation measures in relation to transport to avoid, minimise and manage the potential impacts of the project during construction and operation., The mitigation measures are based on the findings of this TIA and discussed in this report. These recommended mitigation measures will inform the development of an Environmental Management Framework (EMF) which will be implemented through the project approvals as described in Chapter 14: *Environmental Management Framework.* The recommended mitigation measures are applicable to the construction, operation, and decommissioning phases and, if implemented, would ensure that the project minimises adverse impacts on local and wider transport networks. The mitigation measures include governance arrangements, such as the implementation and preparation of management plans, as well as actual controls that would be specified in those plans.

Table 11-1 outlines the recommended transport mitigation measures which comprise strategic and road-use management measures.

Table 11-1 Recommended mitigation measures

Mitigation measure ID	Mitigation measure	Potential impact	Implementation phase
MM-TP01	**Ongoing stakeholder consultation** A community, business and relevant authority stakeholder and communications plan should be developed for transport with ongoing stakeholder consultation to be undertaken during the lifecycle of the project. This should consider findings from this TIA and from the Traffic Management Plan developed for the project. Stakeholder consultation, including, but not limited to, DoT, CoGG and GeelongPort should be undertaken. Key notifications and agreements may include: 1. Pre-construction stage: - TMP agreement - Dilapidation surveys 2. Construction, operation and decommission or re-power stages - TMP measures and controls - Construction traffic monitoring - Road network monitoring, remediation protocols and maintenance requirements. 3. Prior to operation - Construction close-out meeting, infrastructure hand-back criteria	All potential impacts	Pre-construction Construction Operational Decommissioning
MM-TP02	**Traffic Management Plan (TMP)** Prior to the commencement of construction (excluding preparatory works), TMP(s) should be developed and implemented to minimise disruption (to the extent practicable) to affected local land uses, traffic, car parking, on-road public transport, pedestrian and bicycle movements and existing public facilities during all stages of construction. The TMP should be developed in consultation with the relevant road management authorities and be informed and supported by an appropriate level of	Intersection capacity Potential road closures Disruption to public transport Disruption to other road	Pre-construction Construction Decommissioning

Mitigation measure ID	Mitigation measure	Potential impact	Implementation phase
	transport analysis including measures outlined in this TIA. The TMP should include: 1. any required regulatory approvals conditions resulting from the EES process and other secondary approvals. 2. A review of relevant policy, regulatory and protocol requirements which have informed the TMP. 3. Existing conditions review undertaken at the time of TMP development to verify conditions. Those provided as part of this TIA can be used as a baseline. 4. Approved project scope as discussed in MM-TP01, including finalised details on construction extents, staging, vehicle types, final material sources, and peak construction impacts based on the refined detailed design and construction schedule 5. Consideration of cumulative impacts of other major projects operating concurrently in the local area, such as the traffic movements associated with the proposed relocation of the TTLine operations to Corio Quay. 6. Verification of final site access strategy, including access points and crossovers to the site. 7. Final nominated origins of any OD truck visitations for plant and equipment identified and final OD route assessments completed by the project transport contractor (see MM-T08). 8. Mitigation measures outlined, including site access point requirements (e.g., vehicle size movements facilitated and Austroads intersection type requirements according to traffic demand warrants) and any requirements for OD delivery along derived transport routes. This may need to consider road section upgrades. Design drawings would need to be prepared for the above and sent for review and agreement with the relevant road authority at concept, functional and detailed design stages. 9. Following road condition and maintenance requirements considered: - Pre-condition (dilapidation survey) to provide an existing survey of public roads that may be used for access and designated for construction vehicle routes. - Consultation with road asset owners to agree on the extent of pre-condition (dilapidation survey) survey extents and survey requirements (specialist vehicle	and site users General construction heavy vehicle road use Over-dimensional loads road use Site access points upgrades Amenity impacts on the road network Disruption to emergency vehicle access Road conditions and maintenance Road section upgrades	

Mitigation measure ID	Mitigation measure	Potential impact	Implementation phase
	condition or photographic), road maintenance criteria, treatments and response timeframes, and post construction survey and asset hand-back agreements. - Depending on stakeholder requirements, other requirements may include specific traffic monitoring (maximum daily truck volumes), and specific bond payments for remedial works. 10. TMP control measures outlined, covering the following aspects: - Roles and responsibilities, including project management, co-ordination, public consultation, advertising and complaint procedures. - Road authority notification requirements. - Training and site induction requirements. - Contractor liaison protocol. - Roadside native vegetation requirements, including identification protocols and approvals (if required). - Vehicle access measures 11. Access requirements by vehicle type, including any regulator or stakeholder permits. 12. Road closure requirements. Management of any temporary or partial closure of roads and traffic lanes to maintain existing connectivity for local access, pedestrians and cyclists, in accordance with relevant road design standards and in consultation with landholders and any other relevant third parties. Traffic counts may need to be conducted to investigate suitable times for road and lane closures. Road closures to occur in off-peak periods when demands are low where possible (notably for OD vehicle deliveries). Minimise the number and duration of road closures. 13. Development of suitable measures to ensure emergency service access is not inhibited due to project construction activities in consultation with emergency services, especially regarding any road closures on the public road network (see MM-T05). 14. Construction staging and car parking requirements to ensure no car parking occurs outside of the project boundary and affects local land use or accessibility. If required car share or shuttle bus provisions should be considered to reduce the need for single vehicle worker occupancy. 15. Signage requirements with reference to Australian Standard AS 1742. Notably for this project this would include notification of: - Movement of trucks from site access points to/from major road connections.		

Mitigation measure ID	Mitigation measure	Potential impact	Implementation phase
	- No-truck access signage to ensure vehicles do not access restricted areas and to aid with wayfinding 16. Speed limits set for construction stage. Notably review of existing speeds along Shell Parade and near nominated site access points to consider safe system principles. 17. Verify operating and working hours during construction. These will need to be agreed with key stakeholders with a remit for the construction contractor to verify local bus routes/timings to ensure no conflicts occur. 18. Environmental measures considered such as (see also MM-TP07): - Management of dust / sedimentation - Noise and vibration. 19. Monitoring, inspection and auditing requirements detailed with regards to the TMP, including: - Addendum TMP triggers - Monitoring and inspection protocols outlined to ensure the integrity of the TMP given it should be viewed as a live document for the duration of the Projects construction period. Reviews are typically undertaken on monthly basis with relevant stakeholders informed of any significant changes. - Auditing can include compliance and road safety audits. The TMP would be an overarching document to inform subsequent specific work site TMPs developed by works contractors. In addition, as previously discussed, there may be a need for other specific TMPs, such as for the delivery of components via OD vehicles. Further details on approvals and control measures that should be included in the TMP are outlined in Appendix F.		
MM-TP03	**Road safety audits** Road safety audits (RSA), at various stages of project development, indicatively suggested at: 20. Existing condition and site access audits 21. Functional design stage (and/or concept stage) 22. Detailed design stage RSA's should be completed by a pre-qualified VicRoads RSA auditor and be independent to the project and notable the design team.	Site access points upgrades	Pre-construction Construction Decommissioning
MM-TP04	**Emergency access and evacuation plan**	Disruption to emergency	Pre-construction

Mitigation measure ID	Mitigation measure	Potential impact	Implementation phase
	An emergency evacuation plan should be developed outside the TMP report but reference to its production be made. It should be produced in tandem between the developer, works contractor, local business and CFA.	vehicle access	Construction Operational Decommissioning
MM-TP05	**Sub-TMPs** Sub TMPs should be completed by the relevant contractors, including for specific work activities (Worksite Traffic Management Plans). These should all consider and reference back to the overarching project TMP outlined previously. The sub TMPs should also outline more specific protocols and works contacts, for example: 23. Roles and responsibilities 24. Training 25. Incident and emergency procedures 26. Documentation and communication procedures	Disruption to public transport Amenity impacts on the road network Disruption to emergency vehicle access	Pre-construction Construction Decommissioning
MM-TP06	**OD transport route assessments** Formal OD transport route assessments should be completed by the project transport contractor from the nominated origin(s) along with all necessary mitigation measures and stakeholder approvals. Following this assessment, final routes options should be verified, and any impacts identified along with relevant stakeholders who may need to be contacted to facilitate the safe delivery of materials to the project sites. Potential impacts include clearance to potential obstructions, such as wires, structures (bridges and culverts), trees, and rail crossing infrastructure for OD vehicles.	Over-dimensional loads road use	Pre-construction Construction
MM-TP07	**Operational Transport plan** An operational transport plan should be developed. This plan should include identifying the suitable route(s) to accommodate the projected heavy vehicle movements, management measures at key intersections and permit requirements for access to roads that are not approved B-Double routes along the anticipated routes from each facility to the Refinery. Consideration to the safety and amenity impacts of proposed heavy vehicle routes during operation should be given where possible. Relevant road authorities should be consulted during the development of the Operational Transport Plan. As required, the Operational Transport Plan may be used to assess impacts to road assets and assist in	Road network infrastructure Site access disruptions Safety impacts	Operation

Mitigation measure ID	Mitigation measure	Potential impact	Implementation phase
	any potential compensation to relevant road authorities should impacts occur.		

12.0 Conclusion

This transport impact assessment has been undertaken to determine the potential impacts of the project on key intersections, road networks, transport networks and refinery site access and to identify management and mitigation measures to avoid, minimise and manage potential impacts.

Construction activities have the potential to impact on the transport network through temporary road closures resulting in increased delays and impeded access for local traffic. All road and lane closures can be managed through implementation of a project TMP. This includes traffic detours and traffic management measures such as traffic controllers and signage. Road and lane closures are not expected to impact on public transport services or local property access. However, additional traffic generated from construction activities has the potential to impact on public transport and other road users, as well as result in amenity impacts on the road network. However, this TIA has concluded that these impacts are anticipated to negligible with the implementation of the TMP and CEMP.

The intersection capacity analysis undertaken for this assessment found that all intersections across all time periods are predicted to operate well within the defined capacity metrics for the construction and operational phases of the project. Therefore, the project is not expected to impact on the capacity of key intersections that would be used by construction generated traffic. Implementation of a TMP and ongoing stakeholder consultation would further minimise the potential for construction traffic to impact on the capacity of these key intersections.

OD vehicles that visit the refinery during construction may encroach on adjoining lanes, shoulders and roundabouts which could result in safety impacts and disruptions to traffic. To manage potential impacts, an OD vehicle transport route assessment should be undertaken prior to construction to identify the most appropriate route(s). Traffic management measures would be implemented as part of the TMP during construction works such as temporary speed reductions, potential OD/OSOM delivery time restrictions and additional signage.

Access points to the refinery site may require upgrades in order to allow safe access for heavy and OD vehicles into the refinery. Indicative swept paths for heavy and OD vehicles show that only a single heavy vehicle or over dimensional vehicle can enter or exit via the proposed access point at one time given the existing access road width. To ensure that safe bidirectional movements can be accommodated, the construction site entrance off School Road should be reviewed as part of the TMP as it may require upgrades. For OD movements, traffic management may be required should multiple OD vehicles require access at the same time.

Given the low volumes of traffic anticipated to be generated during project operation, road impacts are expected to be negligible. Accordingly, the low operational stage traffic volumes are not anticipated to generate detrimental impacts to local road network operations. The operational traffic movements associated with the delivery of nitrogen to the treatment facility are unlikely to interfere with local traffic conditions or intersection capacity, however, may result in deterioration of pavement surfaces on roads that would be used. Implementation of an operational transport plan would ensure potential deterioration impacts are minimised during project operation.

Potential impacts associated with decommissioning works of the project are expected to be the same or similar to those associated with the construction phase. However, the overall level of impact would be lower due to the nature of decommissioning activities with elements of the project infrastructure such as the pier and underground pipeline left in situ. These impacts should also be managed with the implementation of the same mitigation measures as those proposed for construction impacts and in accordance with all regulatory requirements at the time of decommissioning. With recommended mitigation measures in place, the potential for impacts on the local road network within the vicinity of the project from decommissioning of the project would be minor.

The impact assessment has concluded that, with appropriate mitigation measures in place, potential transport impacts associated with the construction, operation and decommissioning of the project can be effectively managed and the EES evaluation objective can be met.

13.0 References

The following reports and / or parties have been referenced or consulted in the preparation of this report:

1. Victoria Government Gazette – *Road Management Act 2004*, Code of Practice, Worksite Safety, Traffic Management 2010.
2. *Road Management Act 2004*.
3. Department of Transport (VicRoads) – General Guidance.
4. Department of Transport (VicRoads) Heavy Vehicle Network Maps in Victoria.
5. Department of Transport (VicRoads) Road Management Plan
6. National Heavy Vehicle Regulator (NHVR) website / journey planner.
7. City of Greater Geelong – planning scheme
8. *Road Safety Act 1986*
9. Towards Zero 2016-2020 – Victoria's Road Safety Strategy & Action Plan
10. AustRoads Guide to Road Design.

Appendix A

Existing conditions

Existing local road network

A detailed overview of the existing local road network is provided in the following tables for key local roads to be utilised by the project.

Princes Freeway	
Responsible Authority: DoT Classification: Arterial – Class M Traffic Volume: 40,000 vehicles per day / 8per cent Heavy Vehicles (DoT, 2021) Location: between Princes Freeway West & Bacchus Marsh Road, Corio Configuration: Four-lane dual carriageway Additional information: high volumes of traffic and serves as a major route that intersects with key arterial roads.	
Shell Parade	
Responsible Authority: DoT Authority Classification: Arterial – Class C Traffic Volume: 3,600 vehicles per day / 19per cent Heavy Vehicles (VicRoads, 2021) Location: Corio Configuration: Two-lane carriageway Additional information: this arterial road accommodates a relatively high number of vehicles including heavy vehicles daily. The carriageway varies in width ranging between. Appropriate signage and line marking are present along the length of the road. Corrugated road surface was observed at several locations along the road length. The road passes through the Refinery and port area and is anticipated to accommodate generated traffic from both construction and operation activities.	

Seabeach Parade

Responsible Authority: DoT

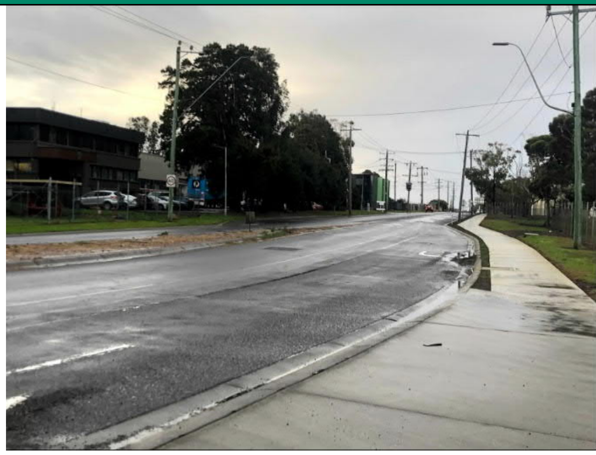
Authority Classification: Arterial – Class C

Traffic Volume: 4,600 vehicles per day / 19per cent Heavy Vehicles (VicRoads, 2021)

Location: Geelong

Configuration: Two-lane carriageway

Additional information: The road reserve typically provides a sealed pavement width of approximately 7.0 metres along its length. A short left turn lane is provided at its intersection with See Breeze Parade as well as a paved footpath of 2m in width which runs all the way to St George Road. Appropriate signage and line markings are provided along the road. Poor road surface with cracks and potholes were observed along the road length particularly near intersections with Madden Avenue and St George Road.



Station Street

Responsible Authority: DoT

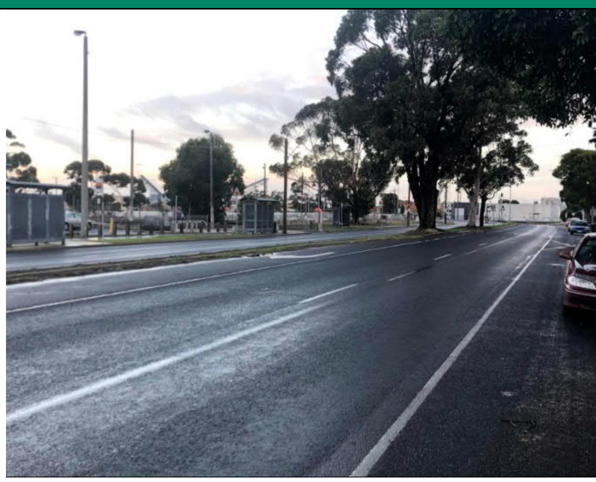
Authority Classification: Arterial – Class C

Traffic Volume: 5,800 vehicles per day / 12per cent Heavy Vehicles (VicRoads, 2021)

Location: Geelong

Configuration: Two-lane dual carriageway

Additional information: this road provides a sealed surface which varies in width from approximately 11.5 metres to 21 metres at its intersection with North Shore Road. On-street parking is available on western side of the road. It provides access to North Shore Station. A bike path is provided on both sides of the road. Appropriate signage and line markings are provided.



St George Road

Responsible Authority: DoT

Authority Classification: Arterial – Class C

Traffic Volume: 6,400 vehicles per day / 11per cent Heavy Vehicles (VicRoads, 2021)

Location: Corio

Configuration: Two-lane dual carriageway

Additional information: A level crossing is located approximately 230 metres west of Seabeach Parade with active protection. Appropriate signage and line markings are provided. Potholes and cracked road surface were observed during the site visit.

Macgregor Ct

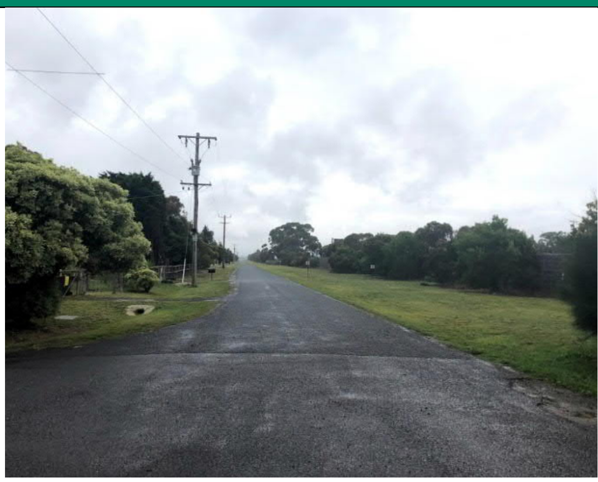
Responsible Authority: Municipal – City of Greater Geelong

Local Authority Classification: CAT 2-LOCAL ACCESS - URBAN

Location: Lara

Configuration: single carriageway

Additional information: the road reserve provides a sealed pavement width from 5.5 to 6 metres approximately along its length. There are no road shoulders or line markings along the road's length. Appropriate line markings and signage are provided at the roundabout with Rennie Street.



Rennie St	
Responsible Authority: Municipal – City of Greater Geelong Local Authority Classification: CAT 3-COLLECTOR ROAD RURAL Location: Corio Configuration: single carriageway Additional information: Paved with of approximately 6.5 metres. Sealed shoulders are provided along the length of road with a width ranging between 0.5 to 1.0 metre. Appropriate line markings and signage are provided.	
Torresdale Road	
Responsible Authority: Municipal – City of Greater Geelong Local Authority Classification: CAT 2-LOCAL ACCESS - URBAN Location: Lara Configuration: Informal dirt road Additional information: No line markings or signage observed. The road surface is in poor condition and has generally become overgrown/reclaimed by grass.	

School Rd

Responsible Authority: Municipal – City of Greater Geelong

Local Authority Classification: CAT 3-SECONDARY DISTRIBUTOR

Location: Corio

Configuration: single carriageway

Additional information: this road provides a sealed surface width of approximately 6.5 metres with appropriate line marking and signage present along the length of the road. A pedestrian pathway are present on southern side of the carriageway with an approximate width of 2.0 metres.

Madden Avenue

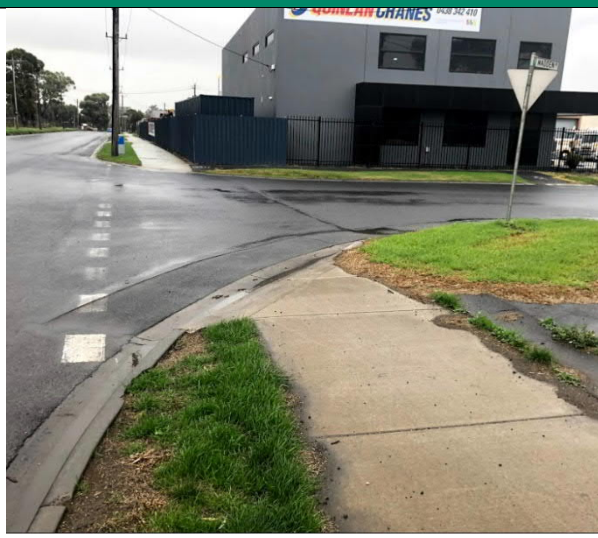
Responsible Authority: Municipal – City of Greater Geelong

Local Authority Classification: CAT 3-SECONDARY DISTRIBUTOR

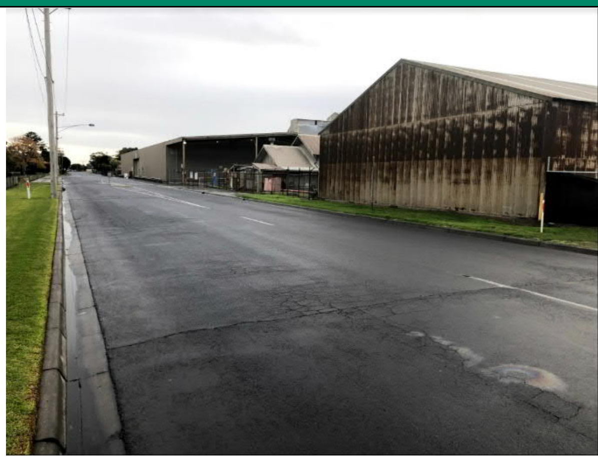
Location: North Shore

Configuration: single carriageway

Additional information: this road provides a sealed surface width of approximately 6.5m and sealed shoulders of approximately 1.05 metres are present along both sides of the road. Markings of poor quality at the road's intersection with Seabeach Parade indicate that these are used as bike paths which connect to the shared path present along Seabeach Parade. This shared path connects to the Bay trail.



The Esplanade	
Responsible Authority: Municipal – City of Greater Geelong Local Authority Classification: CAT 2-LOCAL ACCESS – URBAN Location: near Madden Avenue, North Shore Configuration: single carriageway Additional information: this road provides a sealed surface width of approximately 6.8 to 7.3 metres. Cracks on the road surface were observed during the site visit along certain sections of The Esplande Sight distance is slightly limited due to the bend of the road at the located where the proposed entry to the marine laydown area is located.	

Sea Breeze Parade	
Responsible Authority: Municipal – City of Greater Geelong Local Authority Classification: CAT 2-LOCAL ACCESS - URBAN Location: Geelong Configuration: single carriageway Additional information: this road provides a sealed surface width of approximately 11.5 metres. Appropriate line markings and signage are provided along the length of the road. Project-generated traffic is generally not expected to use Sea Breeze Parade during construction. Pavement defects (e.g. cracks) were observed on the road surface.	

Appendix B

Traffic flow diagrams

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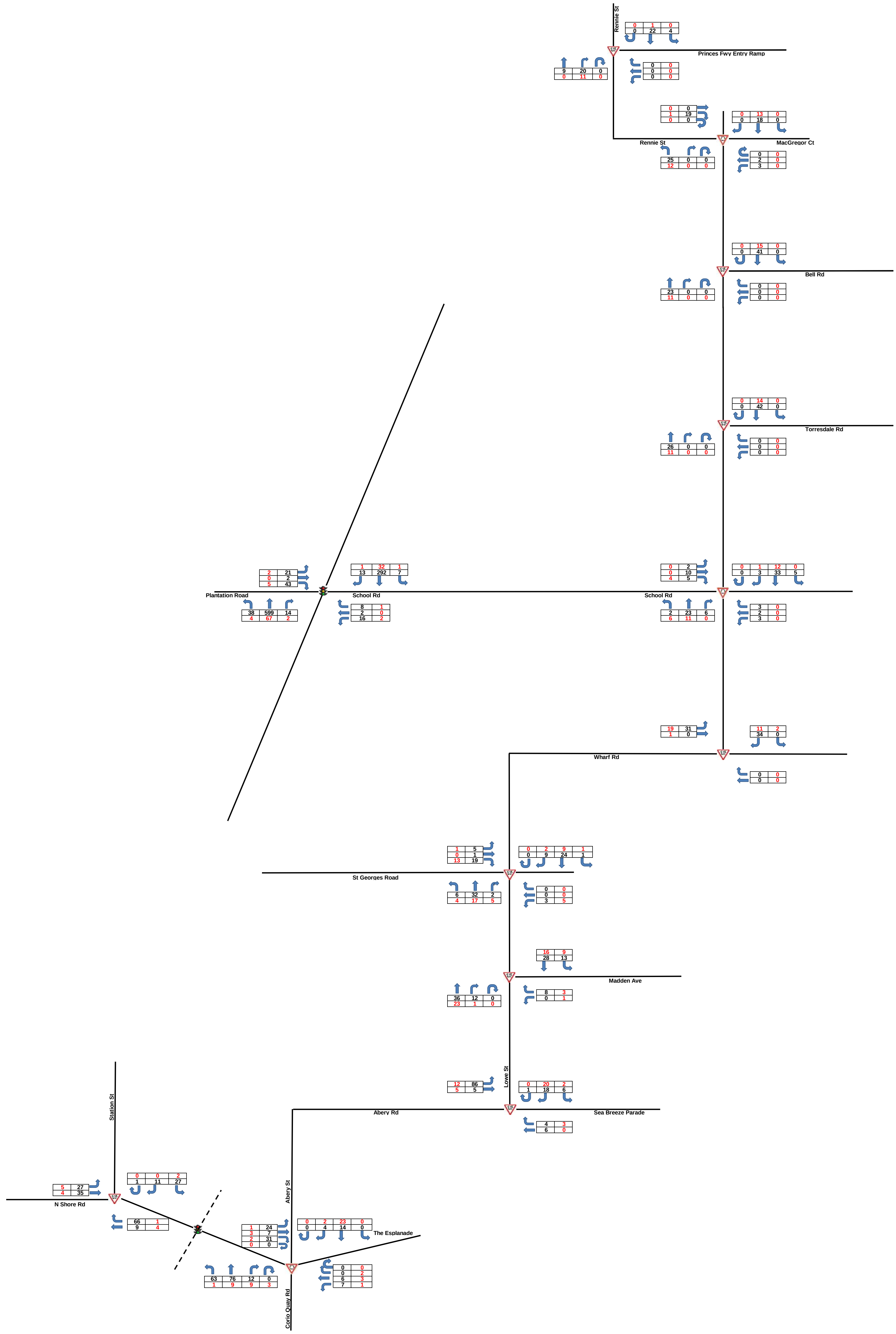

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CLIENT	ISSUE / REVISION				CONSULTANT	SHEET TITLE
VIVA ENERGY	I/R	DATE	DESCRIPTION		AECOM Australia Pty Ltd A.B.N 20 093 846 925 www.aecom.com	2021 BASE TRAFFIC FLOWS - 5AM TO 6AM
		7/06/2021	Draft v.1			SHEET NUMBER
						60642423_TFD_001

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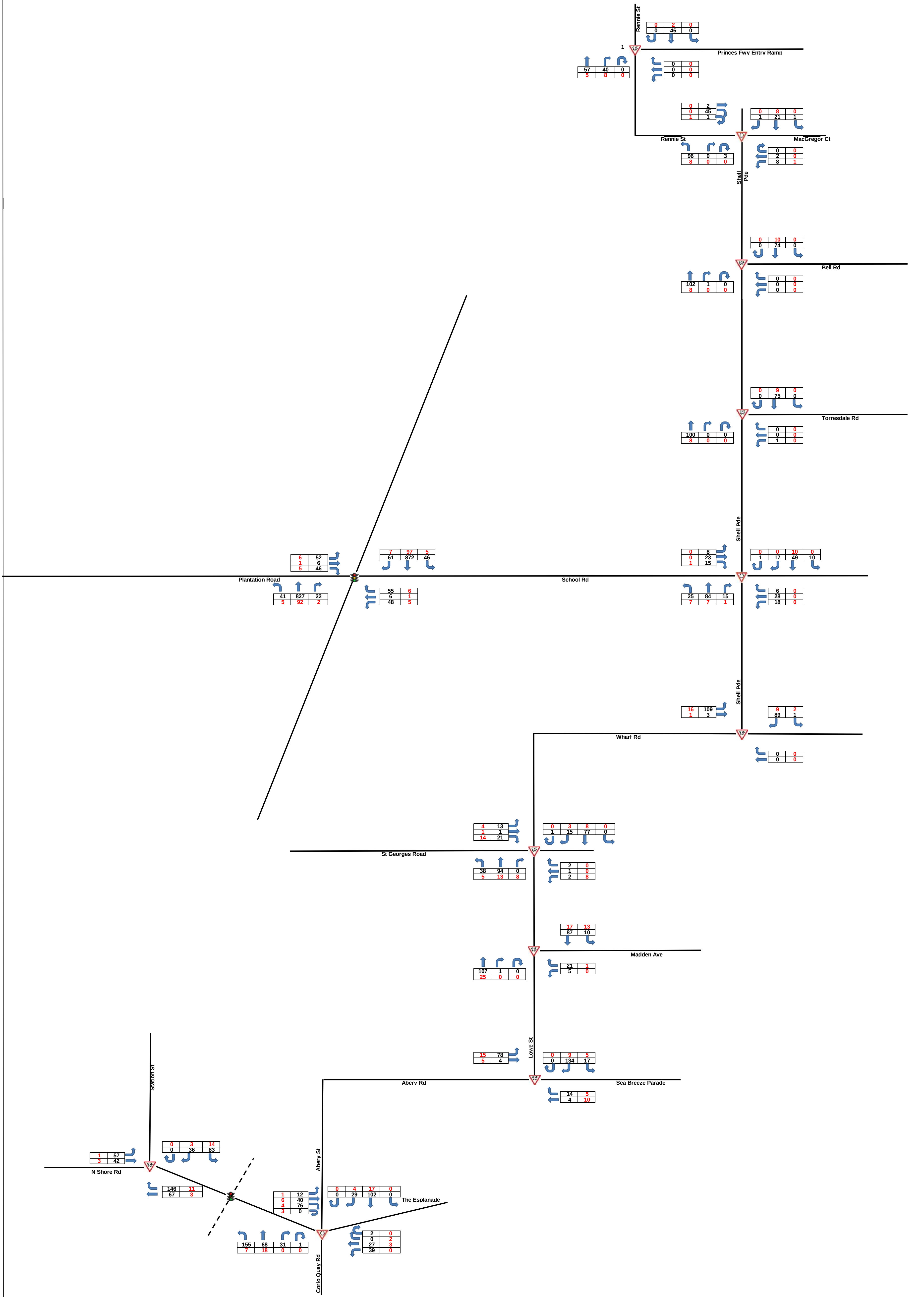

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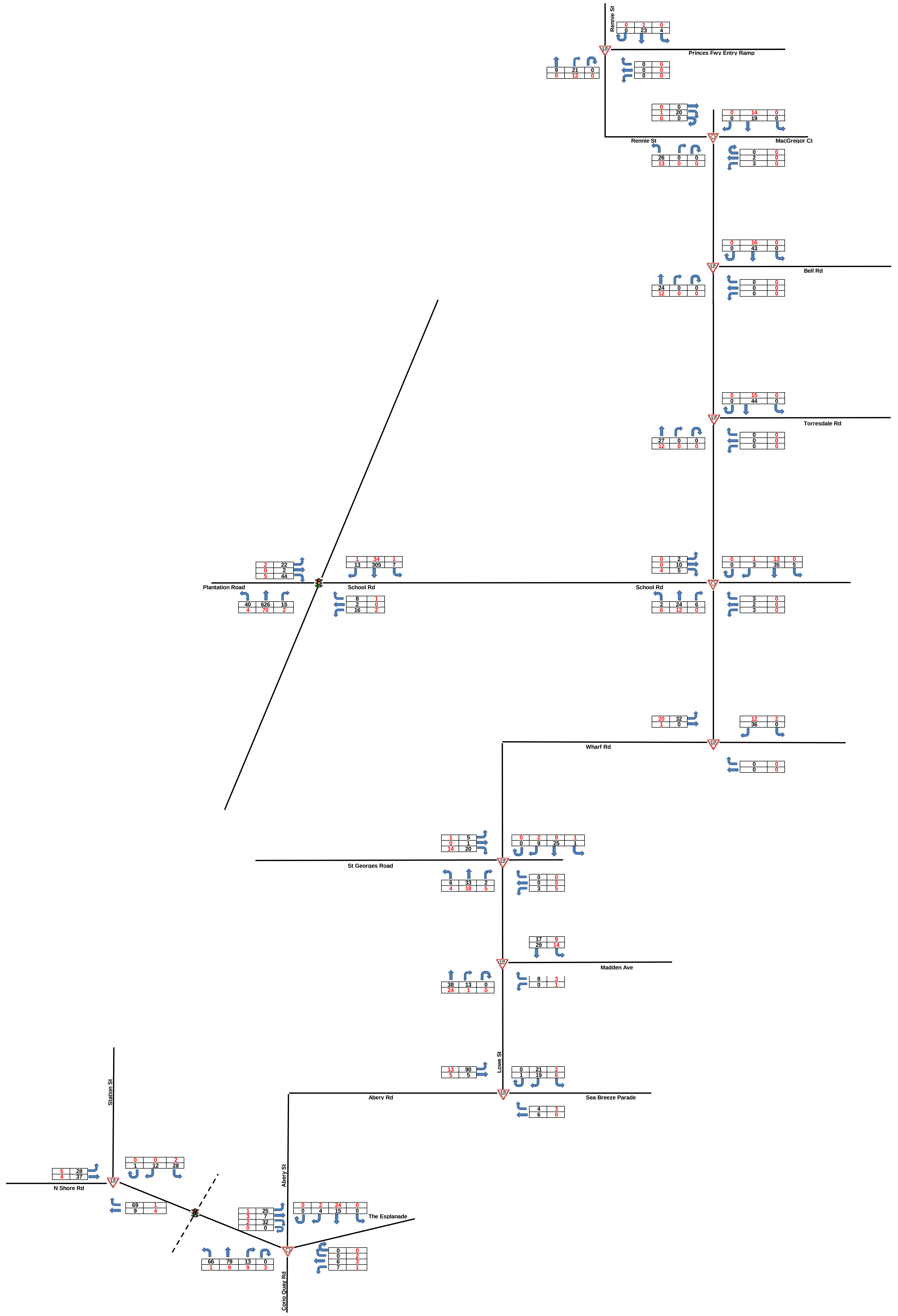

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				www.aecom.com	SHEET NUMBER: 60642423_TFD_003

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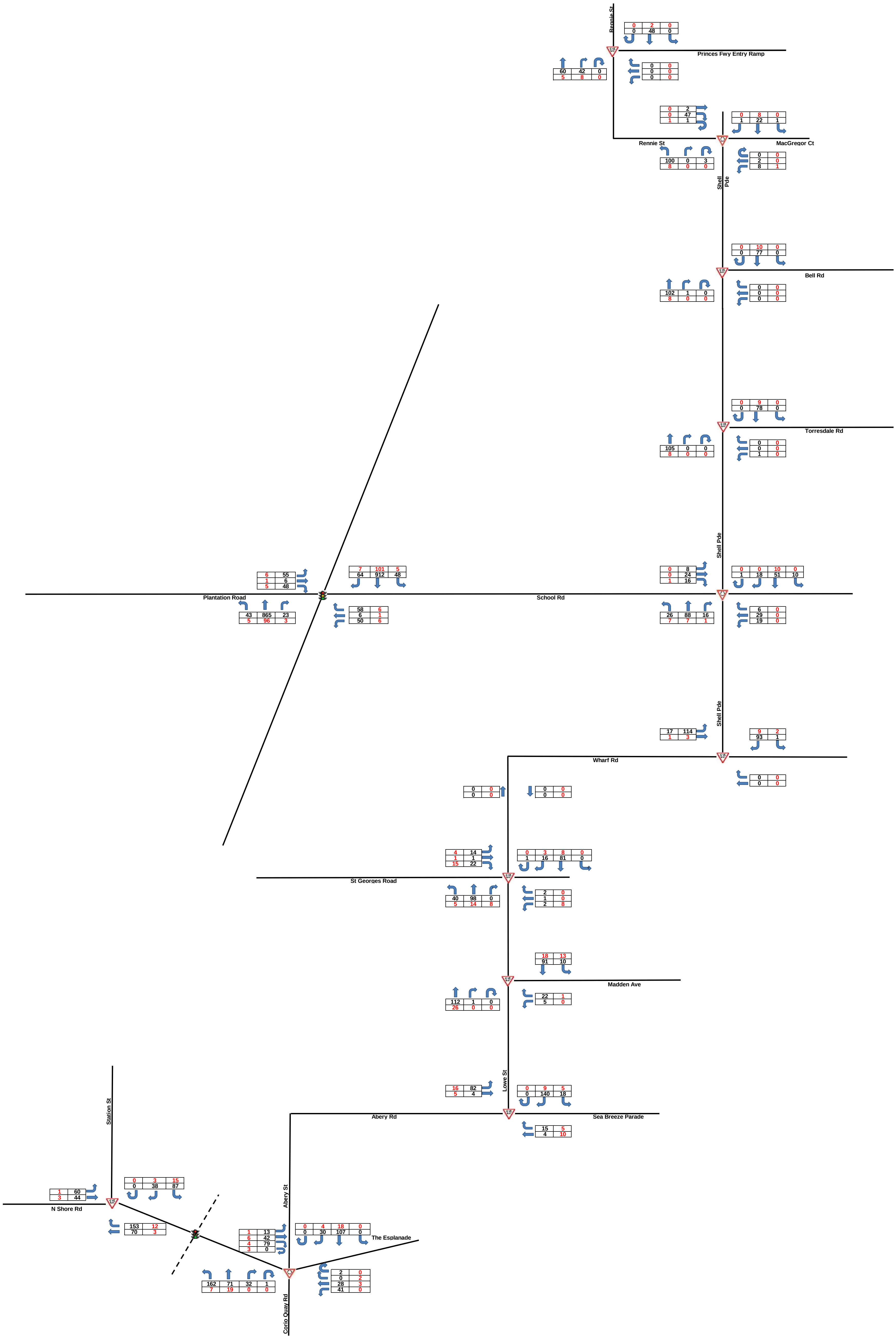

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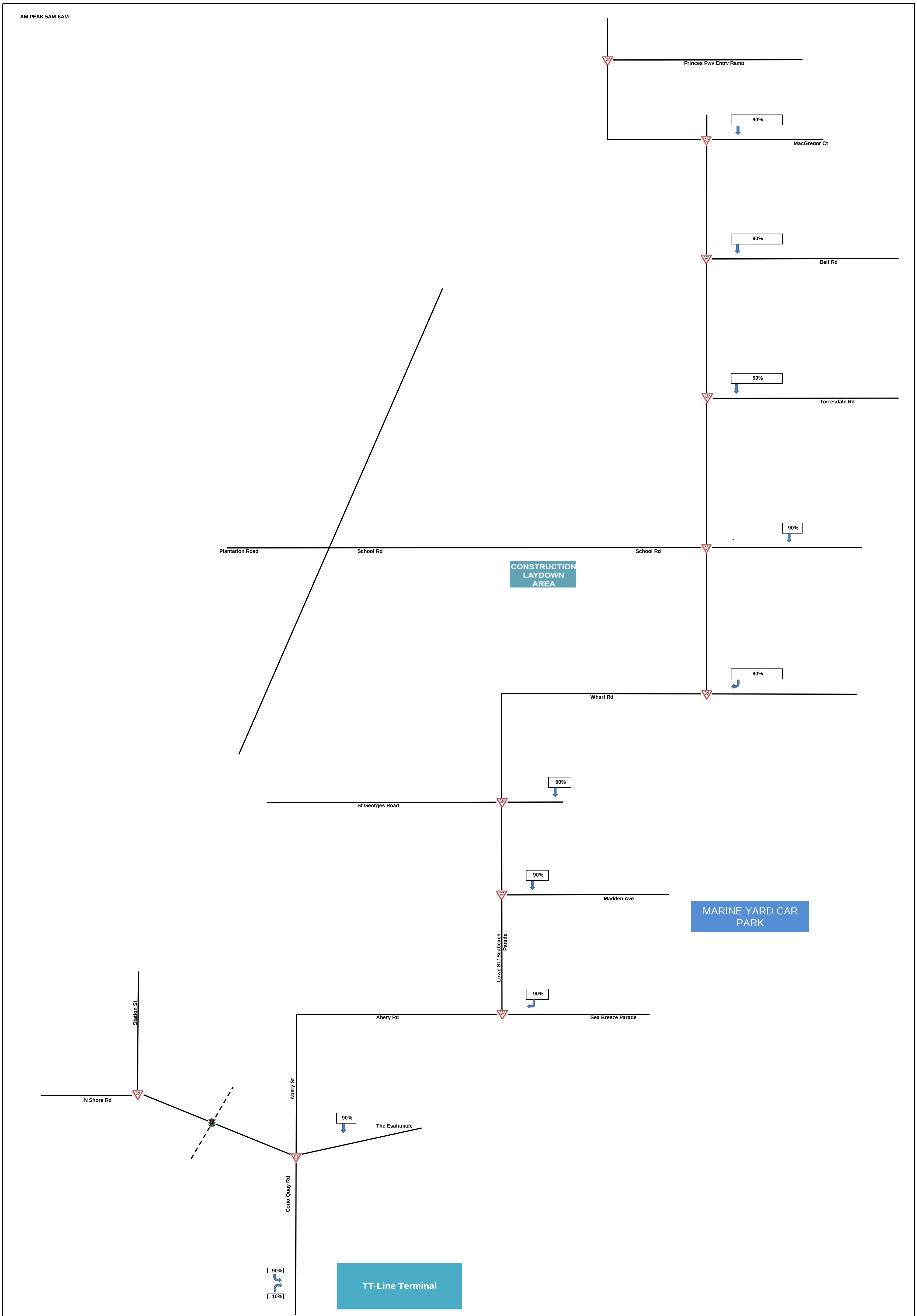

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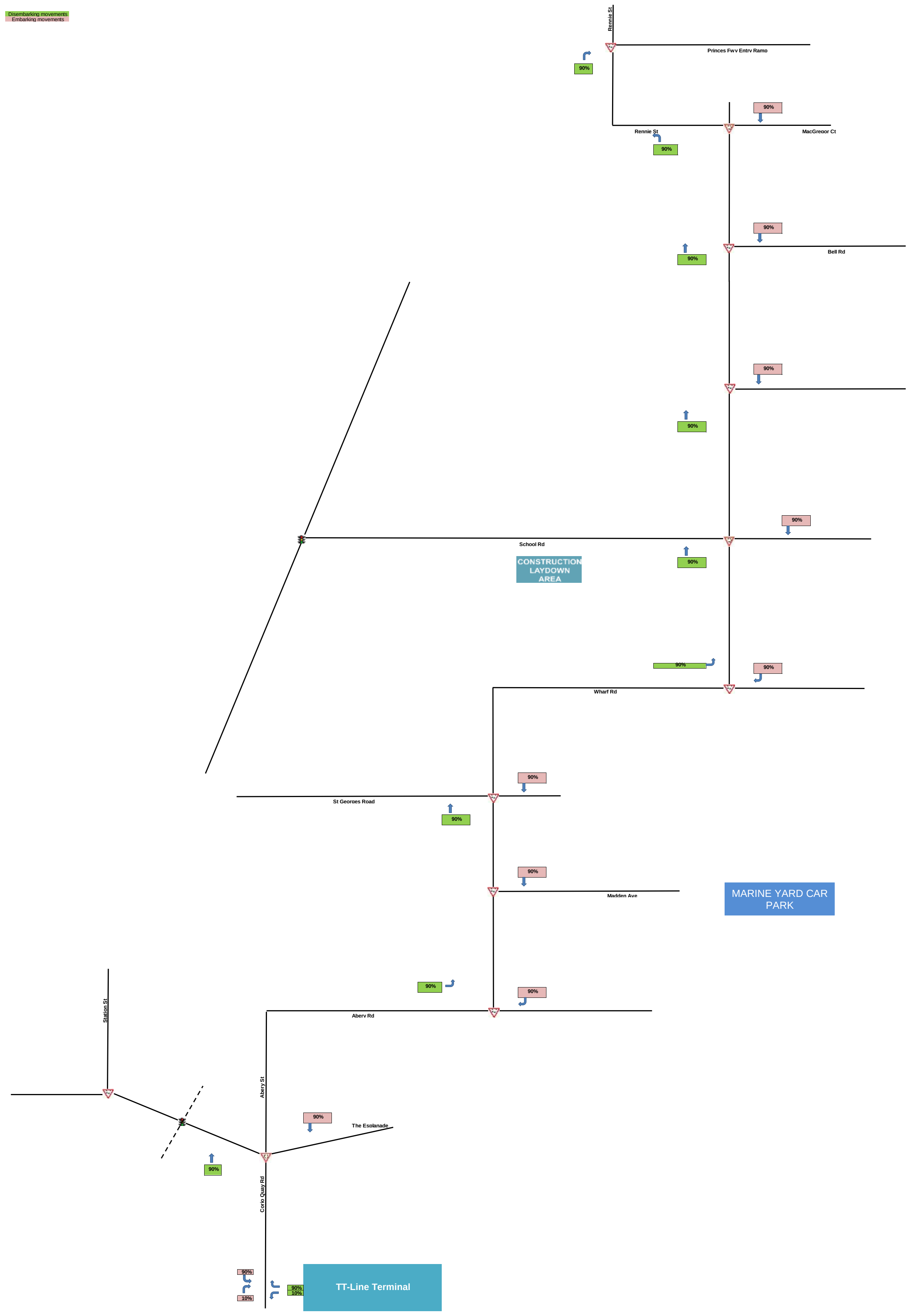

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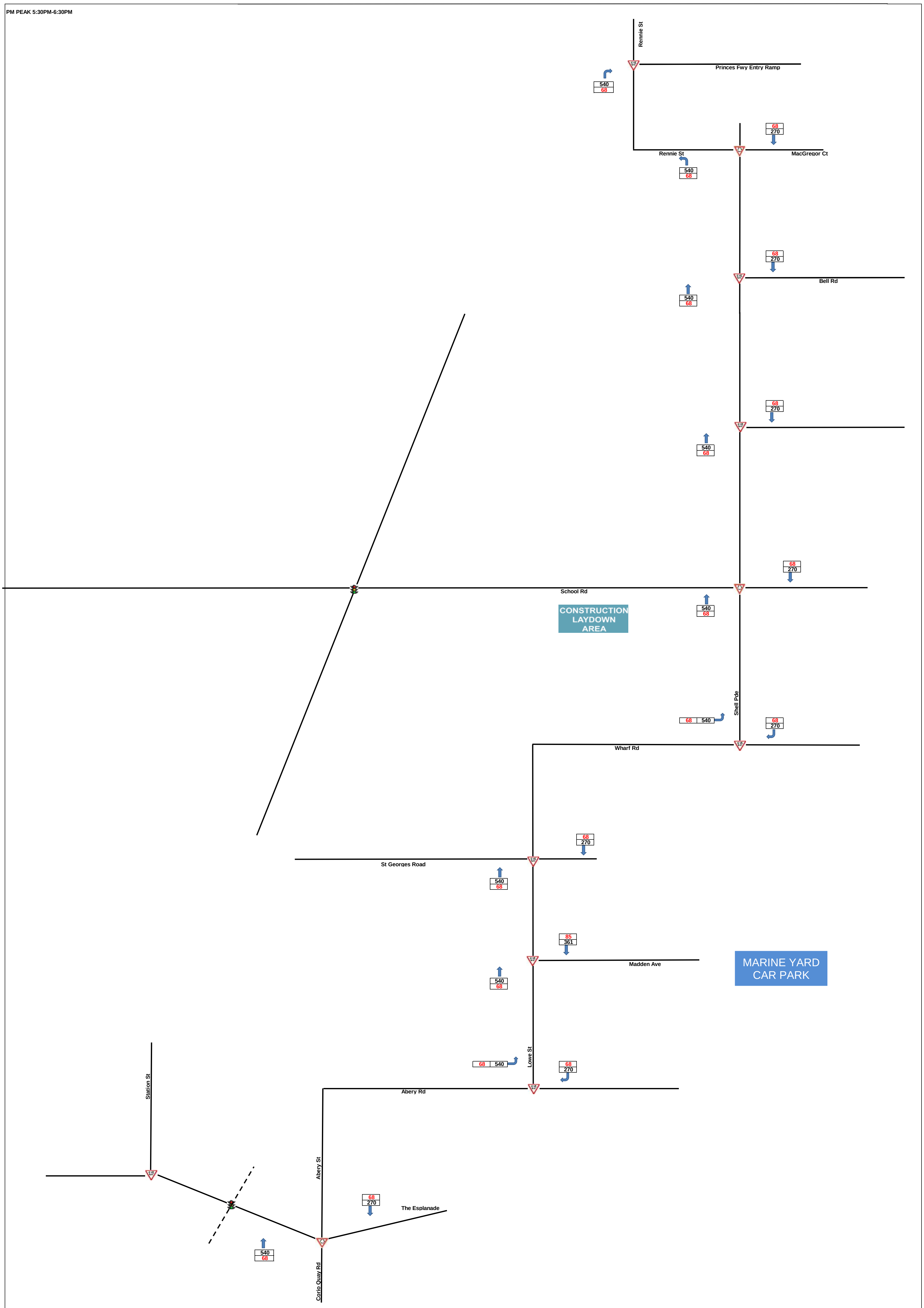

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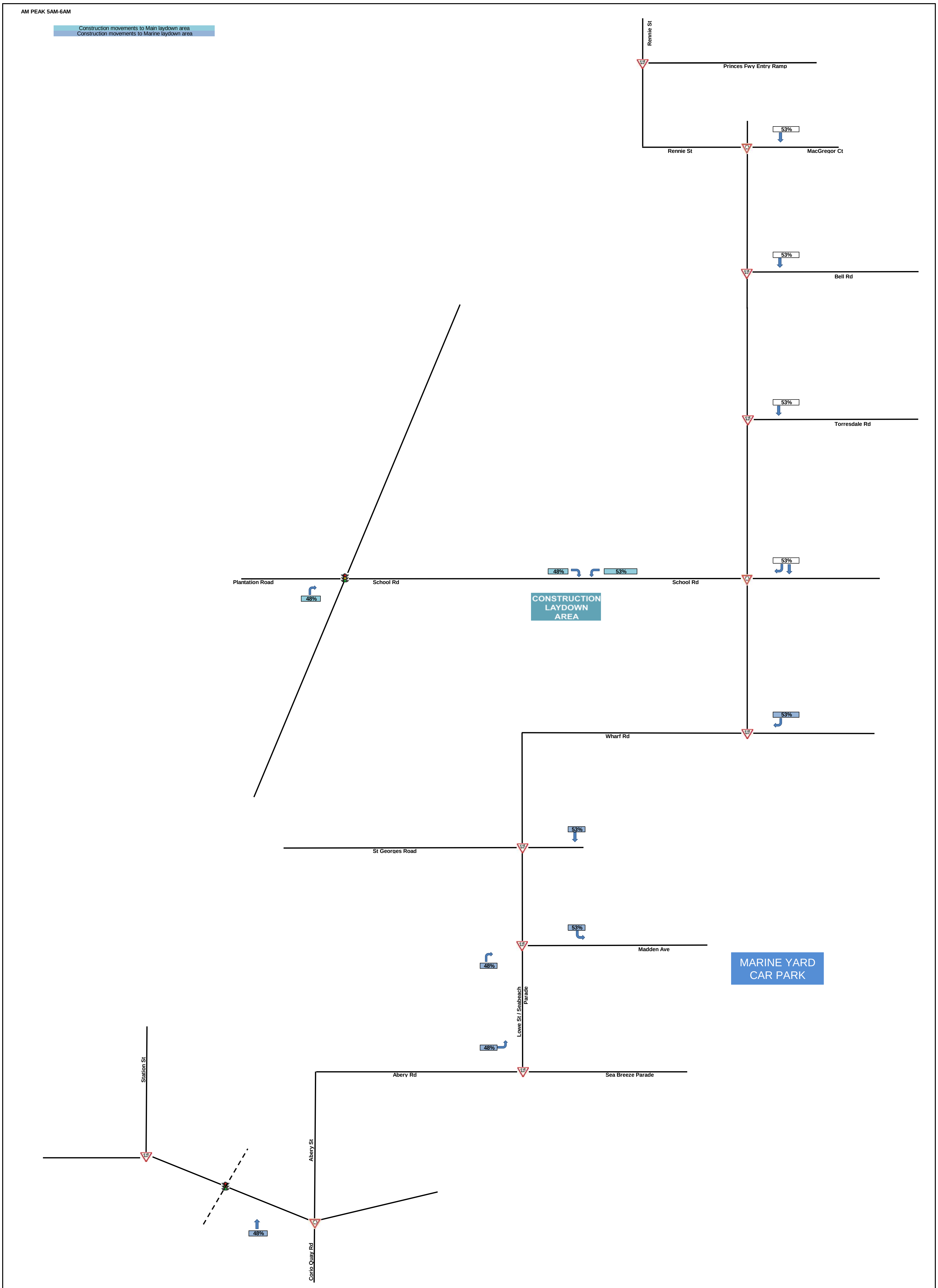

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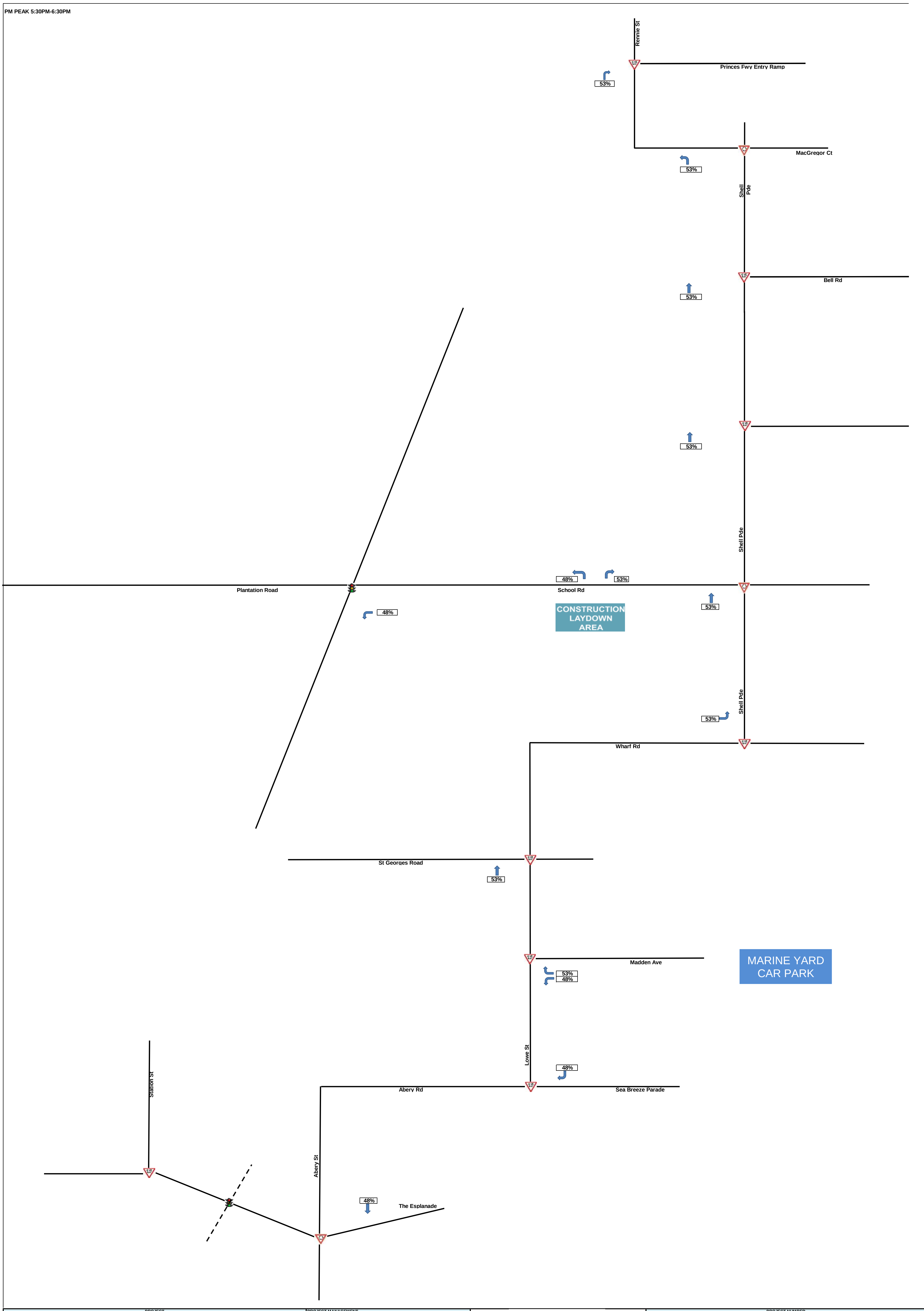

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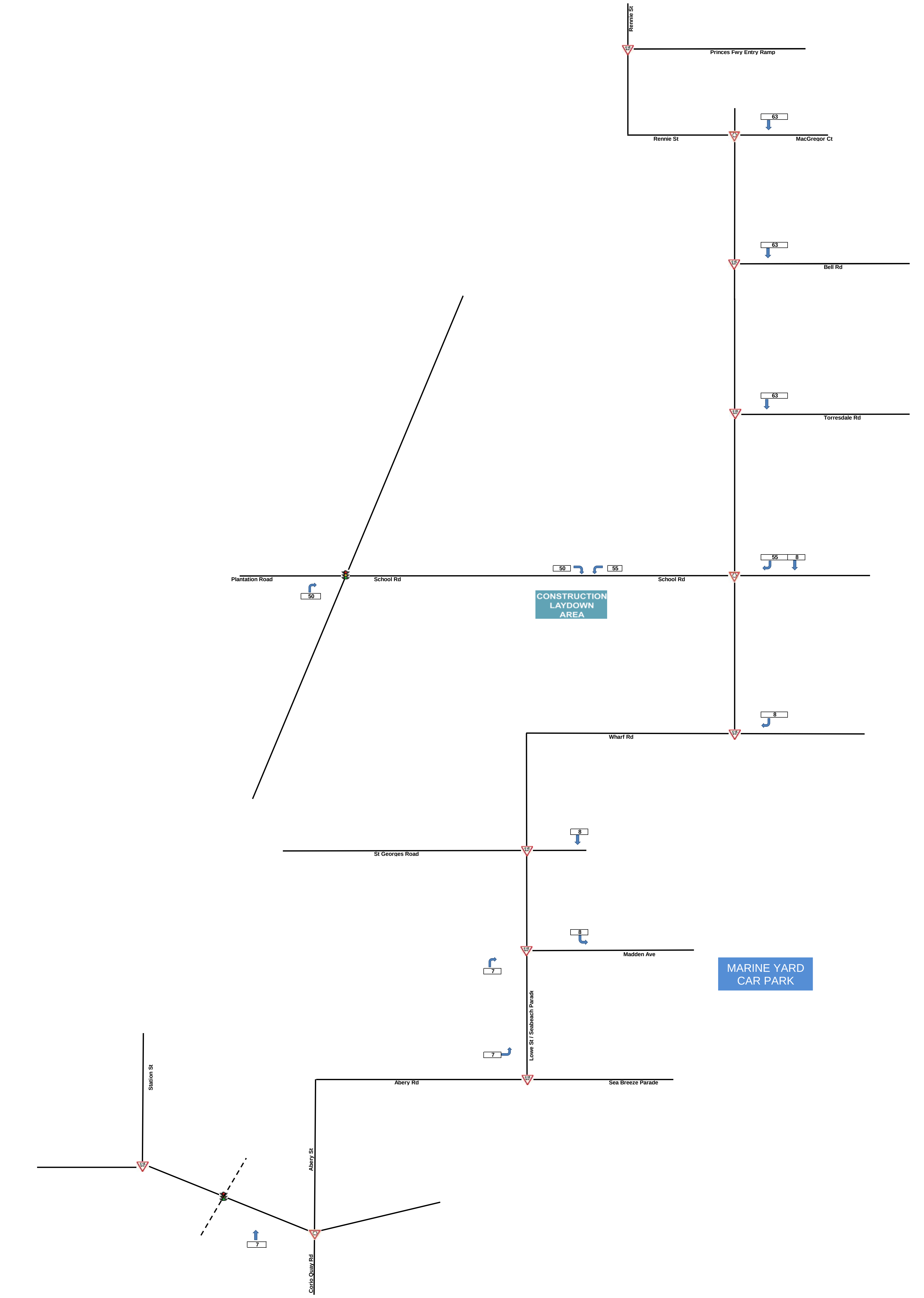

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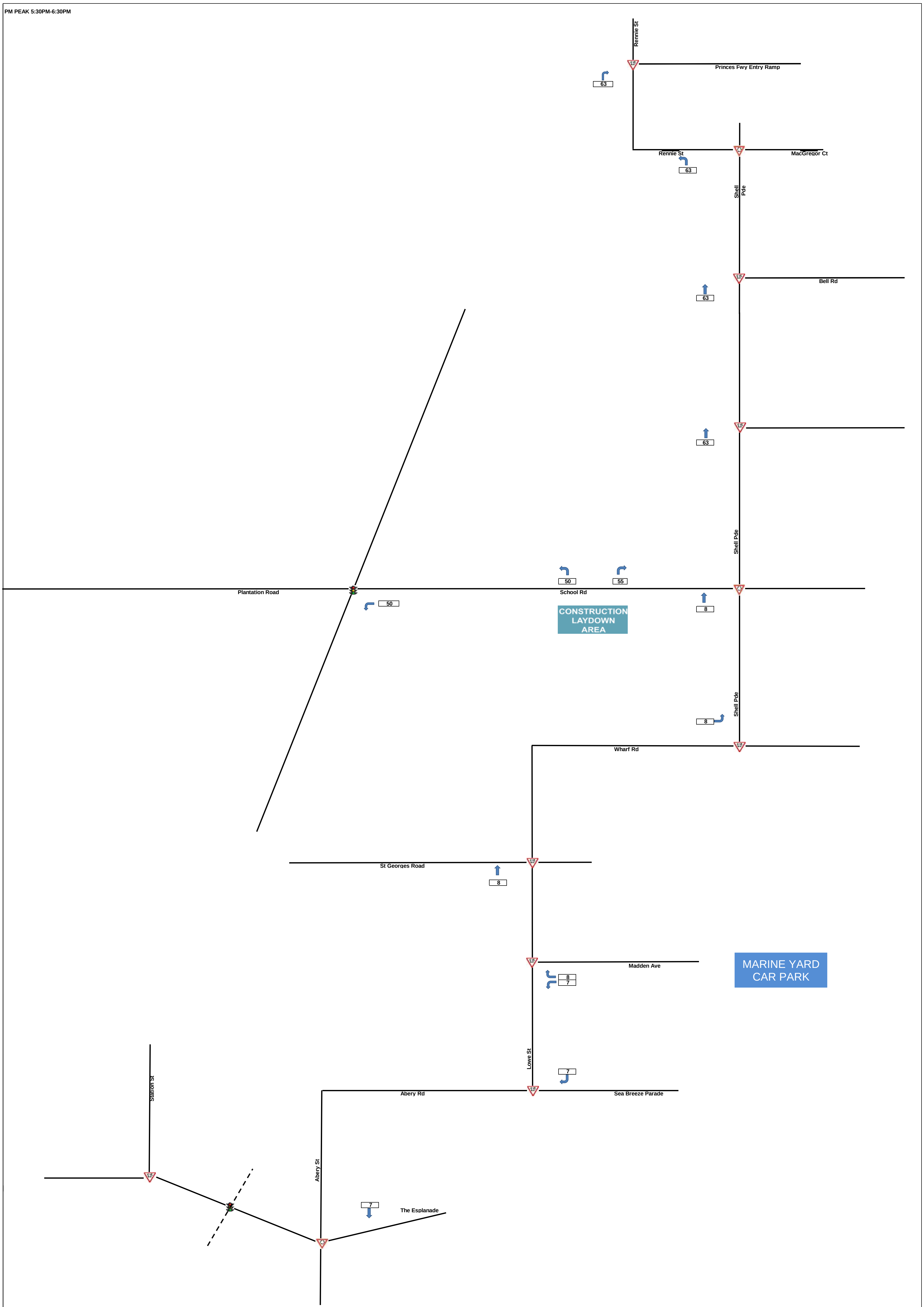

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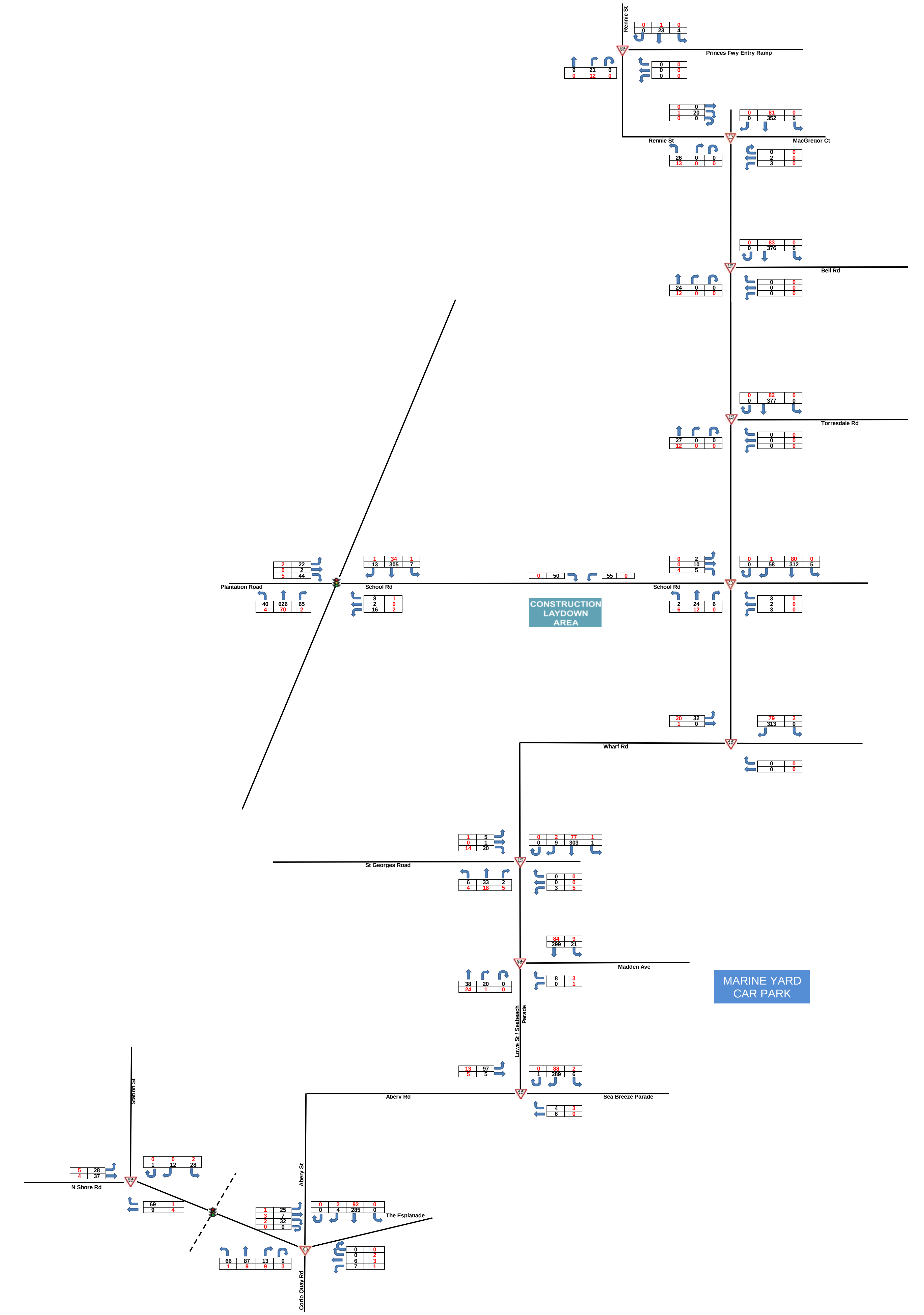

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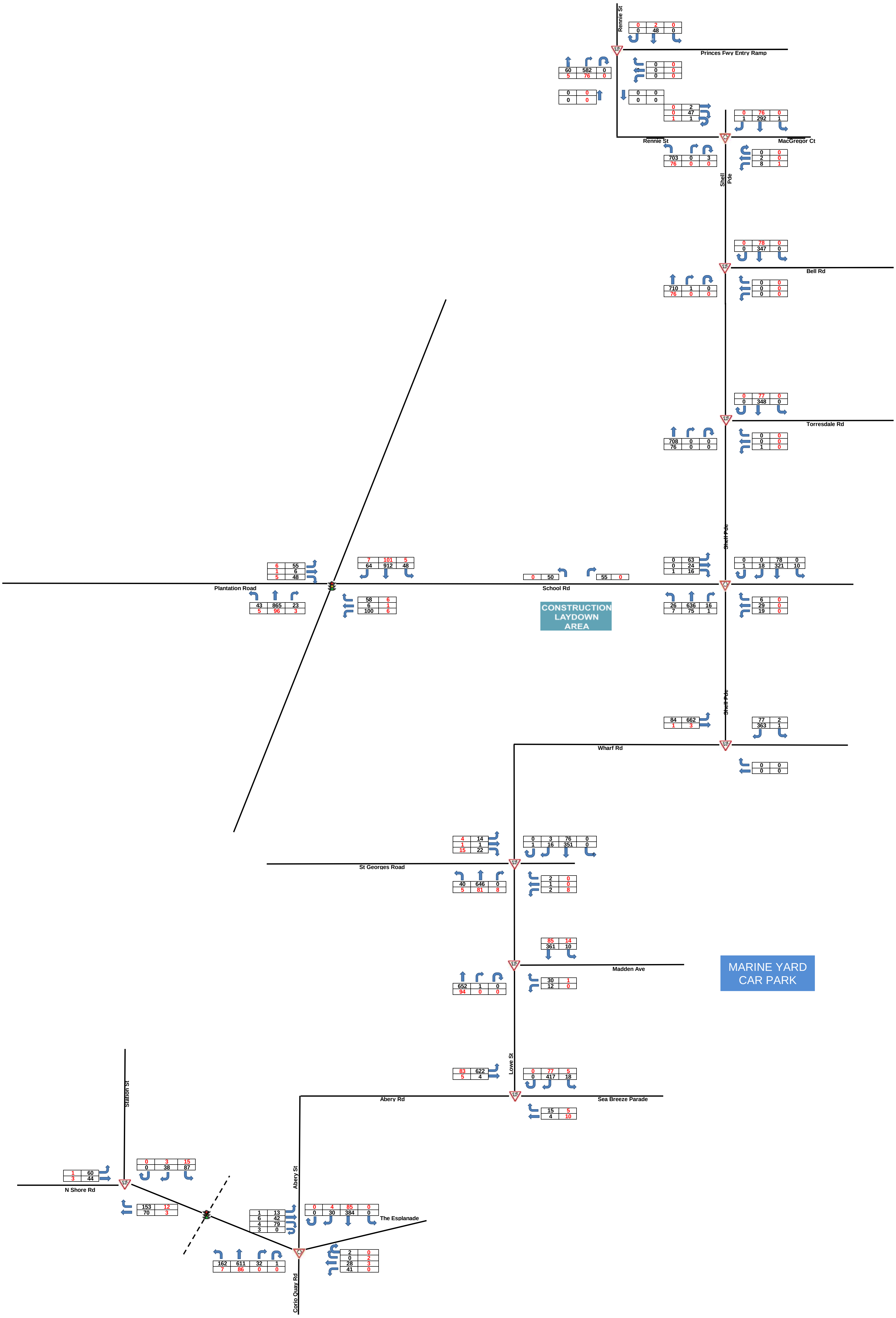

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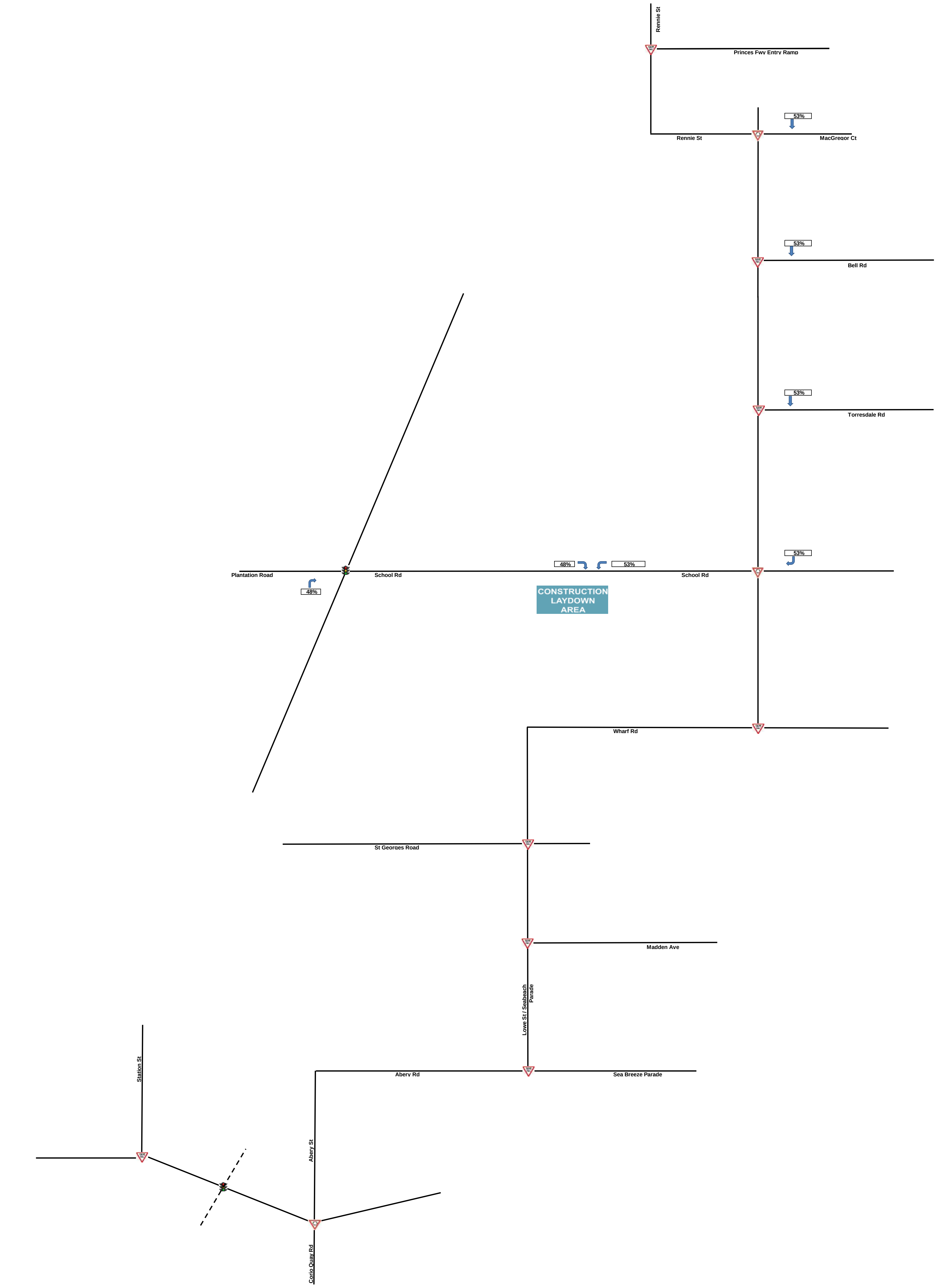

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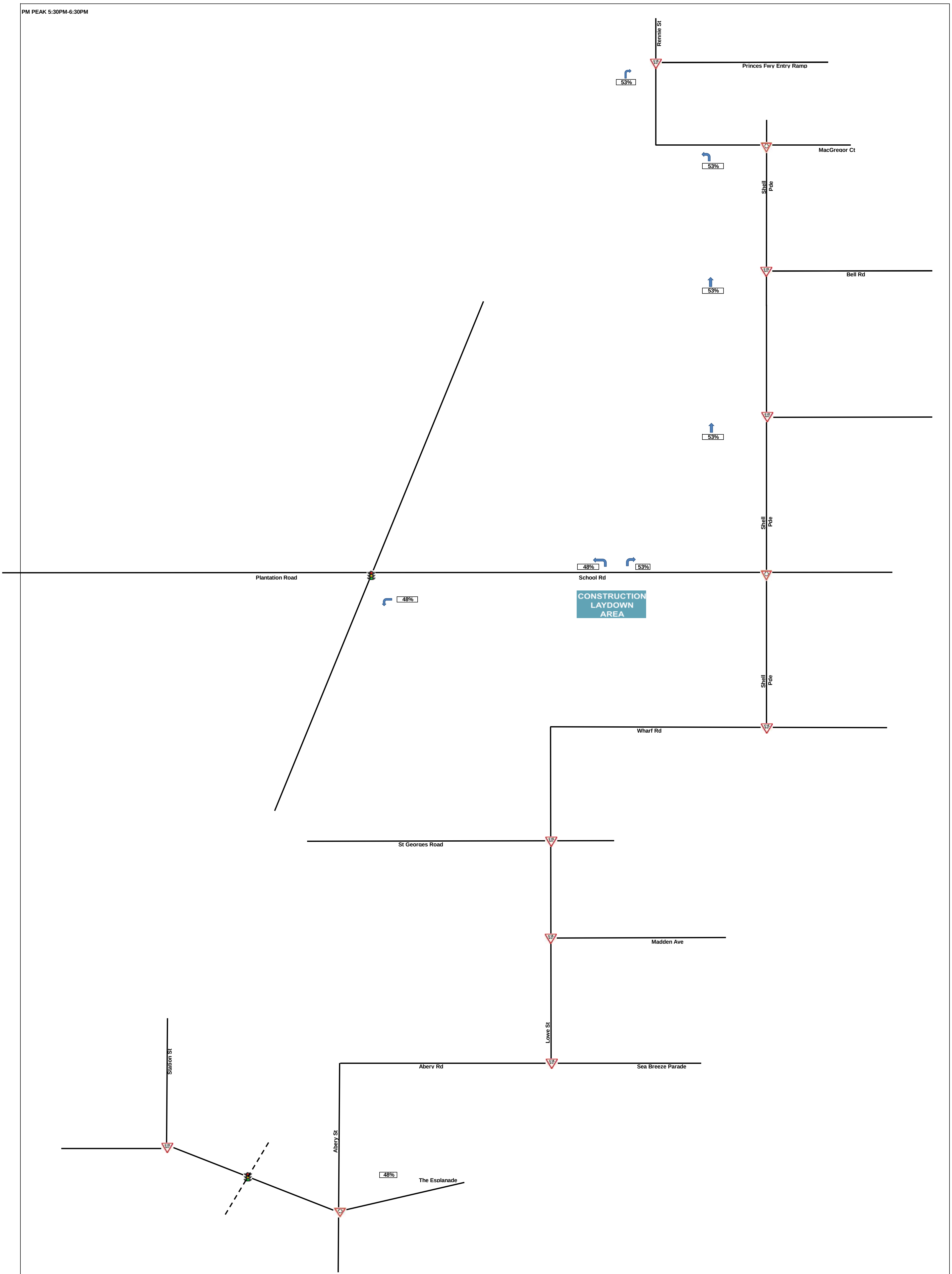

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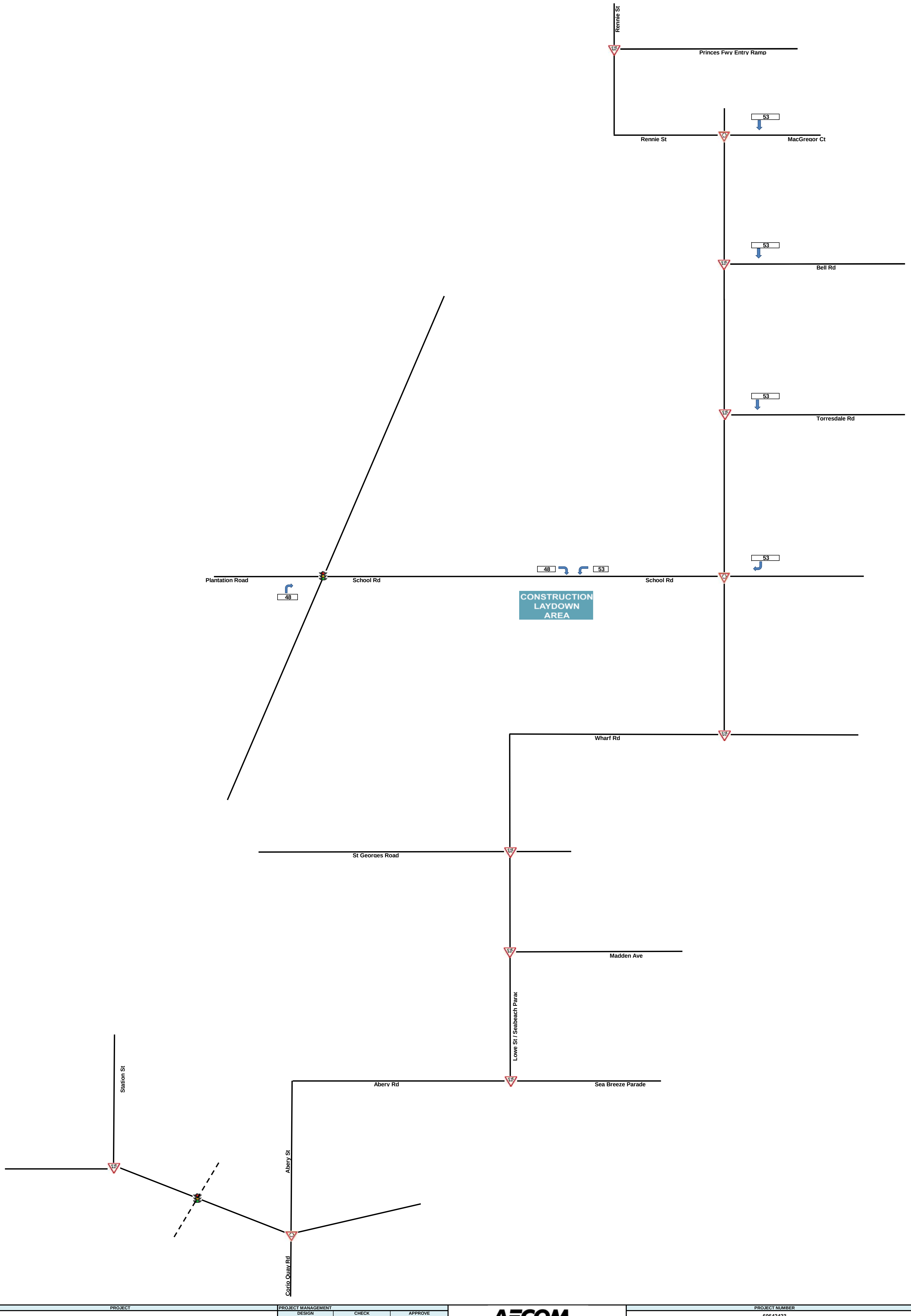

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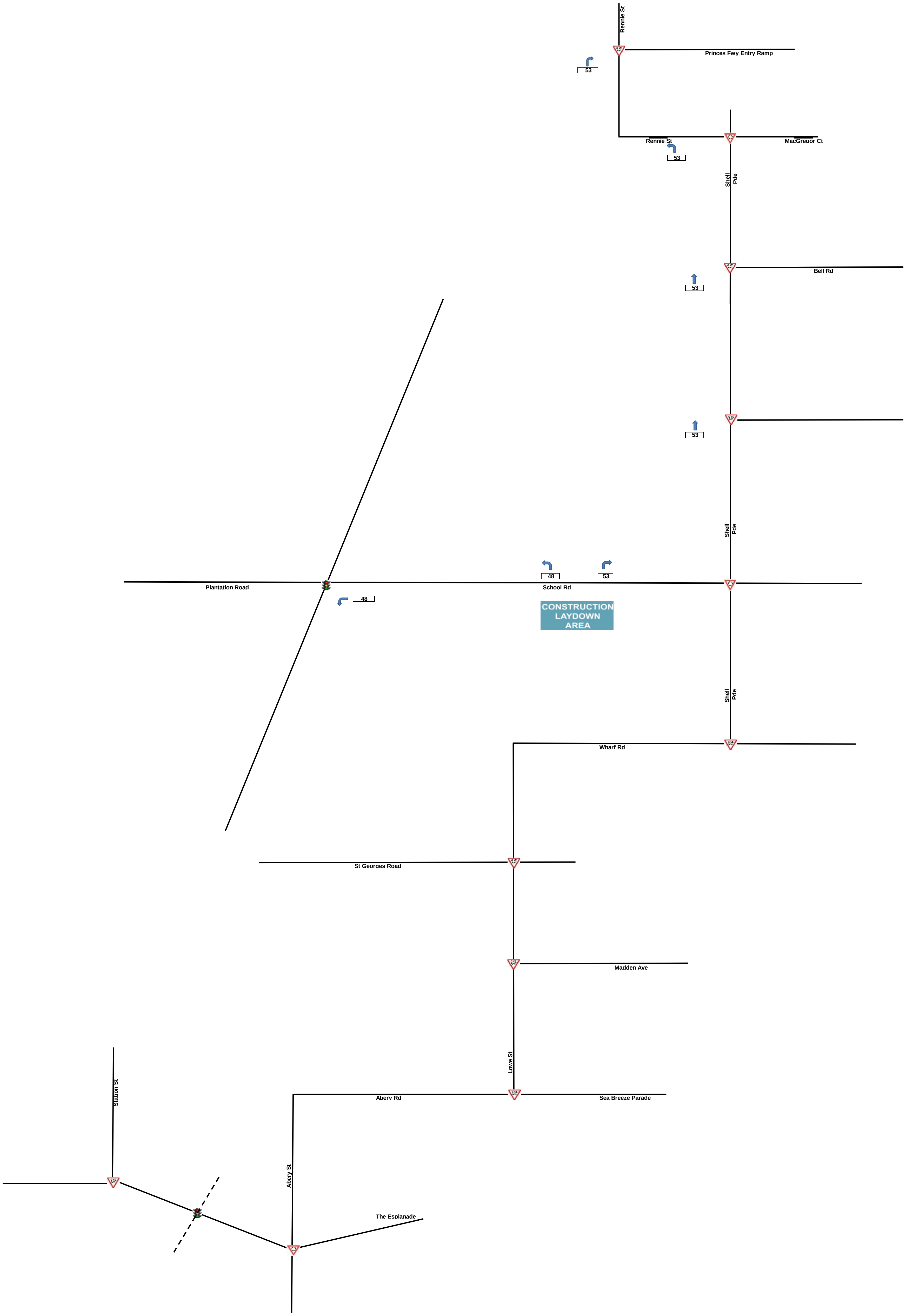

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AECOM

CONSULTANT
AECOM Australia Pty Ltd
A.B.N 20 093 846 925
www.aecom.com

PROJECT NUMBER
60642423

SHEET TITLE
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SHEET NUMBER
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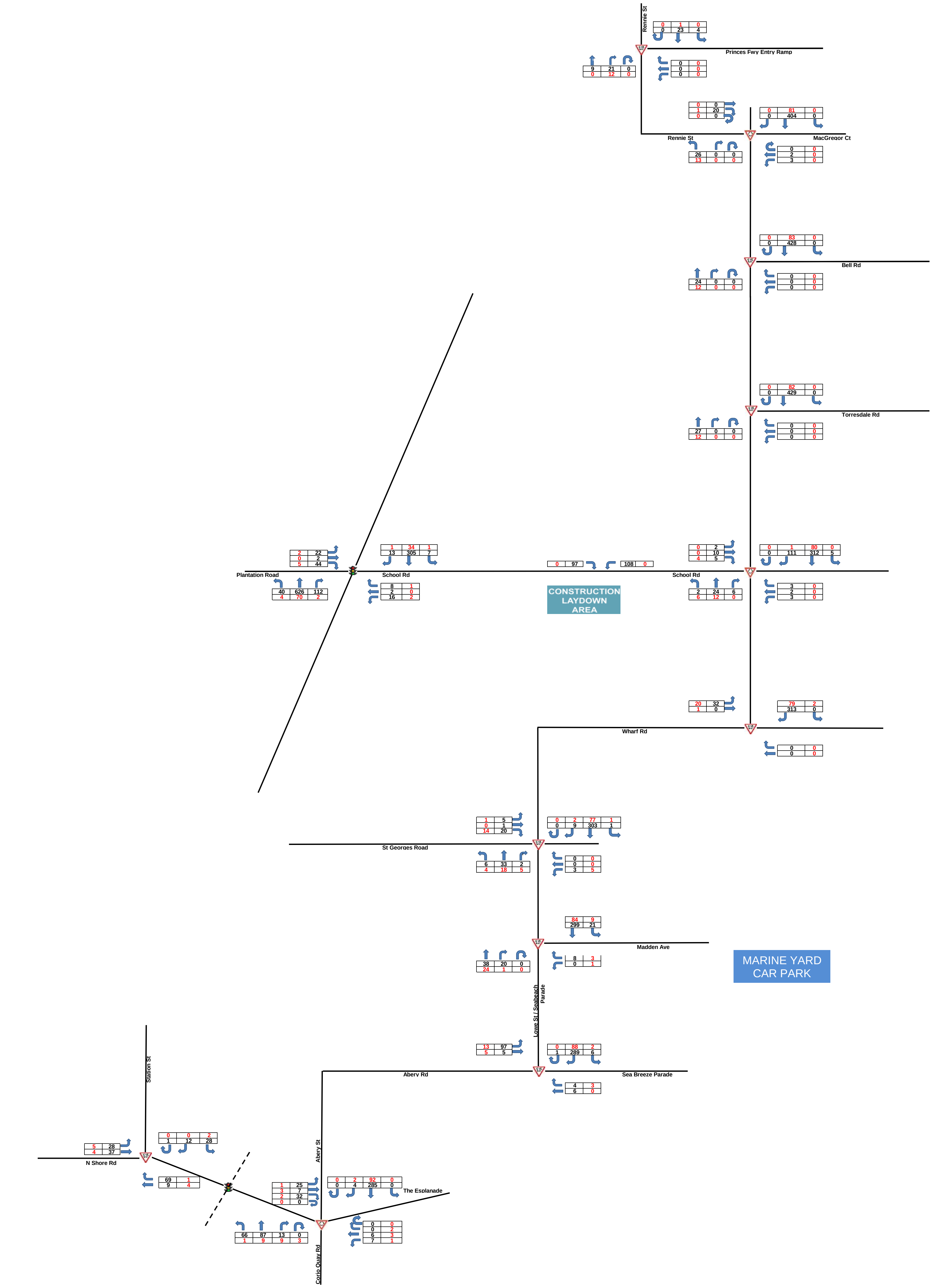

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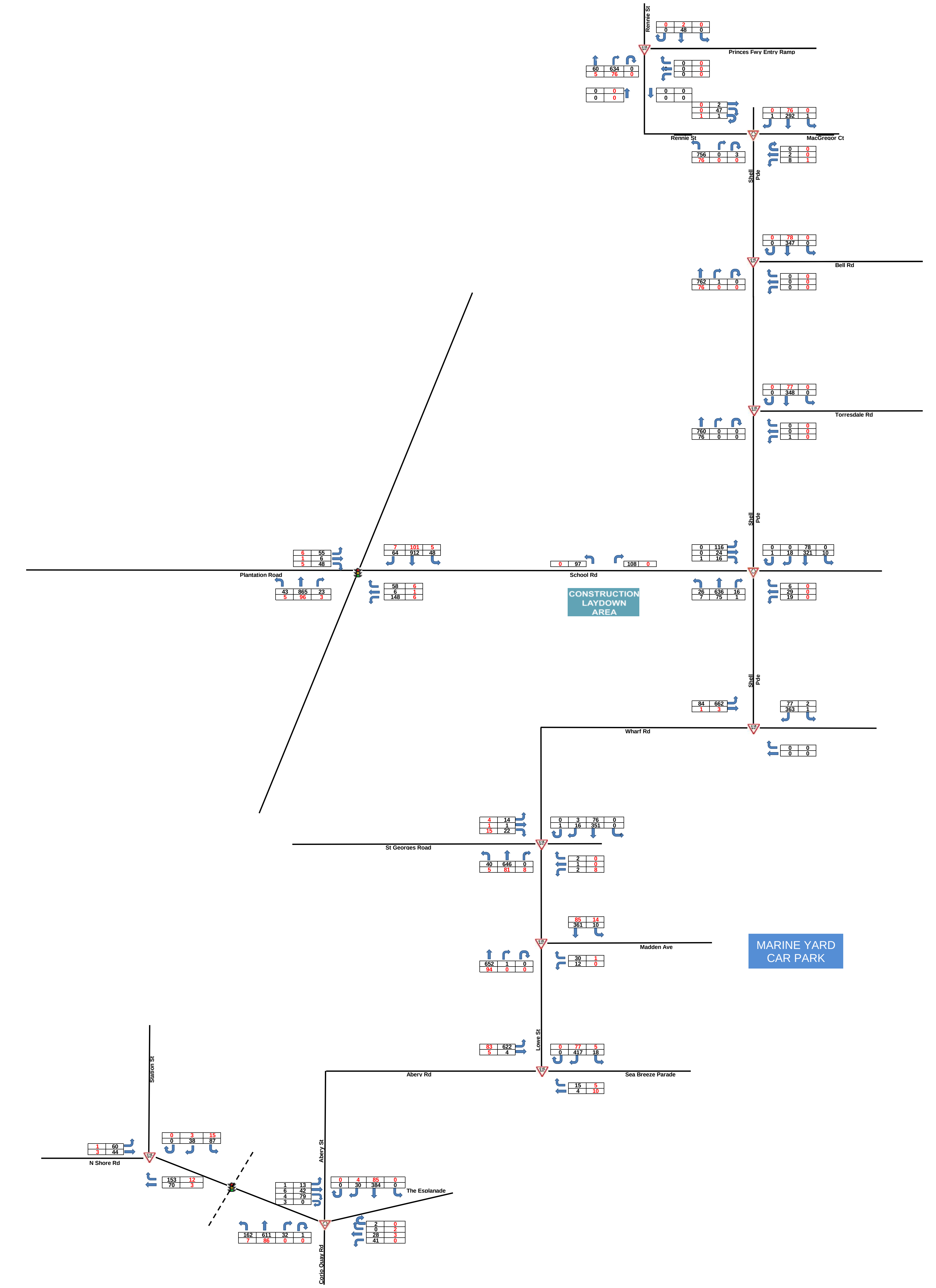

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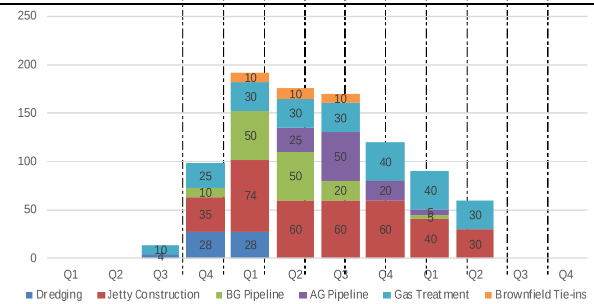
					SHEET NUMBER: 60642423_TFD_020

Appendix C

Construction histogram

Appendix C Construction histogram

Construction Activity	Activity Detail	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4	Activity Duration	Overall Duration
Dredging	Mobilise dredging equipment (vessles, barges, equipment)													1 month	5 months
	Dredging and spoil disposal activities													4 months	
Jetty, Offshore Pipelines & Supporting Infrastructure	Mobilise piling and construction equipment (lift barge, piling rig, vessels)													1 month	22 months
	Piling													6 months	
	Jetty modularised components fit-out and installation (with piping)													10 months	
	Marine loading arms and jetty head facilities installation													2 months	
	Electrical and Instrumentation cable pulls and terminations													4 months	
	Seawater cooling pipeline installation to Refinery intake													3 months	
	Mechanical completion, walkdowns, punchlist clearance, handover													2 months	
	Pre-Commissioning													2 months	
	Commissioning													3 months	
	Final demobilization													1 month	
Above and Below Ground Pipeline	Mobilisation													1 month	14 months
	Trench and lay pipeline (from gas Treatment facility to Lara Gate)													4 months	
	Pipeline installation (Jetty guardhouse to gas treatment facility)													2 months	
	Hydrostatic Testing													1 month	
	Reinstatement													1 month	
	Pre-Commissioning													1 month	
	Commissioning													1 month	
	Final demobilization													1 month	
Gas Treatment Facilities	Site preparation and temporary facilities setup													4 months	23 months
	Civil works (drains, foundations etc)													3 months	
	Nitrogen and odourant facilities installation													8 months	
	Mechanical completion, walkdowns, punchlist clearance, handover													2 months	
	Pre-Commissioning													2 months	
	Commissioning													3 months	
	Final demobilization													1 month	
Brownfield Modifications	Tie-ins, modifications, installations													5 months	5 months
Resources Histogram															



Appendix D

GeelongPort - TTLine relocation - assumed traffic generation and distribution analysis

Appendix D GeelongPort - TTLine relocation - assumed traffic generation and distribution analysis

Background information

Several publicly available information sources have been reviewed to gather information on the proposed TTLine (Spirit of Tasmania) relocation project, taking terminal operations from Station Pier to a purpose-built facility at Corio Quay. The following provides an overview of the information sources and key findings with regards to the project

1. Source: https://geelongport.com.au/development/spirit-of-tasmania/
    - In 2020, Spirit of Tasmania, announced it would move its Victorian port operations from Station Pier, Port Melbourne, to Corio Quay, Geelong. The company has signed a new 30-year lease with GeelongPort to relocate to Corio Quay in 2022 when the Station Pier lease expires. The brand new 12-hectare purpose-designed terminal will feature:
        - Comfortable, accessible and connected passenger lounge areas
        - Children's play area, cafe, and a pet exercise area;
        - Space for seamless and efficient boarding and security processes for passengers;
        - Dedicated passenger drop-off and long-term parking;
        - Dedicated berth for the Spirit of Tasmania vessels;
        - Office facilities and crew accommodation;
        - Crew and staff car parking; and
        - Flexible storage and expanded facilities for freight clients.
    - Construction is due to commence during 2021 and the facility is planned to be operational by 2022.
2. Source: https://engage.geelongport.com.au/spiritoftasmania
    - About the project
        - Spirit of Tasmania is relocating its Victorian operations from Station Pier, Port Melbourne to Corio Quay, north of Geelong to provide an improved experience for the 450,000 passengers who travel annually and support the long-term operations of this highly valued service.
        - GeelongPort has partnered with Spirit of Tasmania to develop a dedicated passenger and freight terminal for Spirit of Tasmania's vessels.
        - The new 12-hectare site located within GeelongPort's Corio Quay precinct will include a passenger terminal building, a vehicle marshalling area for 600 cars, a parking area for 150 trucks, security facilities, public amenities, crew accommodation, a cafe, children's play area and a pet exercise area.
        - Construction of the new facilities will start in 2021 and will be operational by 2022.
3. Source: www.spiritoftasmania.com.au
    - Operations are as follows:
        - Melbourne to Devonport Sailing Times - departs at 730pm from Melbourne arriving devonport at 6am in the morning
        - Check-in opens between 1.5 to 2.5hours prior to departure and closes strictly 45 minutes before the departure time. Special needs check-in 2hrs prior to departure.
        - Devonport to Melbourne Sailing Times - departs 730pm from Devonport arriving in Melbourne at 6am.

  - Day sailings operate between September and April, when consecutive day / night sailing are scheduled
  - Current fleet:

    Spirit of Tas 1 – PAX 1,400, Cars 500, Lane capacity 1,464m

    Spirit of Tas 2 – PAX 1,400, Cars 500, Lane capacity 1,464m

4. Source: source: https://www.theadvocate.com.au/story/7209447/new-spirit-vessels-to-arrive-in-2023-and-2024/
   - New vessel information includes:
     - Two new vessels are due to arrive in the State in late 2023 and the second a year later in 2024.

Traffic generation and distribution

Development assumptions

The following assumptions have been made with regards to the proposed relocation of the SoT terminal at GeelongPort, Corio Quay:

1. Assume full capacity at 2024, with new vessel capable of carrying a total of 600 cars (noting this is deemed to be a robust assessment given it is unlikely that full capacity would be achieved from year-one operations based on a review of publicly available information)
2. Trucks assumed to operate over the course of a day, with limited interaction with peak passenger arrivals/departures from the terminal.
3. Check-in occurs over a 2.5 hour time period with both double sailing assumed to occur during both the AM and PM sailing periods.

Traffic generation

TT-Line operations will result in traffic movements from a mix of passenger vehicles and freight vehicles embarking and disembarking the vessel in the AM and PM peak periods as follows:

- AM sailing
  - As gates are expected to close at 6:45 am, passengers and freight vehicles will have up to 30 minutes before departure to arrive and process through security to the ferry. As such, passenger and freight vehicles are assumed to travel via the local road network to the TT-Line Terminal from 5:30 am to 6:30 am prior to the 7:00 am departure
  - No passenger and freight vehicles are expected to be disembarking the ship in the AM sailing
- PM sailing
  - The ferry will discharge passenger and freight vehicles at 6:00 pm which would result in approximately 675 vehicular movements on the local road network in the vicinity of the project between 6:00 pm and 6:30pm
  - As gates are expected to close at 6:45 pm, passengers and freight vehicles will have up to 30 minutes before departure to arrive and process through security to the ferry. As such, passenger and freight vehicles are assumed to travel via the local road network to the TT-Line Terminal from 5:30 pm to 6:30 pm prior to the 7:00 pm departure

Subsequently, it is expected that these movements would occur concurrently to the project construction traffic movements. Passenger and freight vehicles are anticipated to be originating from Melbourne (90 per cent) and locally from the Geelong area (10 per cent). A summary of the traffic generation for TT-Line is provided in Table 13-1.

Table 13-1 TT-Line anticipated traffic generation during operation

	AM peak				PM peak			
	Embark		Disembark		Embark		Disembark	
Origin	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Melbourne	270	68	0	0	270	68	540	68
Local (Geelong area)	30	7	0	0	30	7	60	7
Total	**300**	**75**	**0**	**0**	**300**	**75**	**600**	**75**

Traffic distribution

Passenger and freight vehicles will be travelling to the Terminal located off Corio Quay Road via the study area roads in the morning and the afternoon, coinciding with the project construction movements during AM and PM peak periods. For the purpose of this assessment, it has been assumed that for vehicular movements originating from Melbourne would utilise Shell Parade instead of Princes Highway as it provides an easier connection from the Princes Freeway and ensures that passengers and freight vehicles would avoid travelling via central Geelong.

The destinations and the roads utilised by the TT-Line operational traffic are summarised in Table 13-2, with the distributed trips on the network detailed in Table 13-3. Diagrammatic traffic distribution and assigned demands can be seen from the following traffic flow diagrams in in Appendix **B**:

- *Sheet number 60642434_TFD_005 - 2024 Committed Development Traffic Distribution- Morning time periods, 5 am to 6 am*
- *Sheet number 60642434_TFD_006 - 2024 Committed Development Traffic Distribution - Evening time periods, 530 pm to 630 pm*
- *Sheet number 60642434_TFD_007 - 2024 Committed Development Traffic Volumes- Morning time periods, 5 am to 6 am*
- *Sheet number 60642434_TFD_008 - 2024 Committed Development Traffic Volumes - Evening time periods, 530 pm to 630 pm*

Table 13-2 TT-Line operational traffic distribution

Location	Origin	Distribution
TT-Line Terminal (Corio Quay Road)	Melbourne	via Princes Freeway, off-ramp, Shell Parade, Seabeach Parade and Corio Quay Road
	Local (Geelong area)	Via Latrobe Terrace, Princes Highway/Melbourne Road and Corio Quay Road

Table 13-3 TT-Line anticipated traffic distribution on the local road network

	TT-Line traffic movements during peak periods		TT-Line and project generated traffic movements during peak periods	
Road	AM peak	PM peak	AM peak	PM peak
Princes Freeway off-ramp	338	946	401	1,009
Shell Parade	338	946	401	1,009
Wharf Road	338	946	346	954
Lowe Street	338	946	346	954
Seabeach Parade	338	946	345	953
Corio Quay Road	375	1050	375	1050
Princes Highway/Melbourne Road	37	104	37	104

Appendix E

SIDRA modelling

MOVEMENT SUMMARY

Site: 1. [1. Shell Pde/Rennie St Roundabout - AM 5-6am (Site Folder: 2021 Survey Base Models)]

5-6 am
Site Category: AM Peak
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	37	12	39	32.4	0.029	3.5	LOS A	0.1	1.0	0.03	0.42	0.03	55.6
3	R2	1	0	1	0.0	0.029	9.3	LOS A	0.1	1.0	0.03	0.42	0.03	58.9
3u	U	1	0	1	0.0	0.029	11.7	LOS B	0.1	1.0	0.03	0.42	0.03	60.7
Approach		39	12	41	30.8	0.029	3.8	LOS A	0.1	1.0	0.03	0.42	0.03	55.8
East: McGregor Ct														
4	L2	3	0	3	0.0	0.005	3.5	LOS A	0.0	0.2	0.21	0.42	0.21	55.1
5	T1	2	0	2	0.0	0.005	3.2	LOS A	0.0	0.2	0.21	0.42	0.21	56.9
6u	U	1	0	1	0.0	0.005	12.0	LOS B	0.0	0.2	0.21	0.42	0.21	59.2
Approach		6	0	6	0.0	0.005	4.8	LOS A	0.0	0.2	0.21	0.42	0.21	56.4
North: Off Ramp														
7	L2	1	0	1	0.0	0.028	3.3	LOS A	0.1	1.1	0.10	0.31	0.10	56.5
8	T1	31	13	33	41.9	0.028	3.2	LOS A	0.1	1.1	0.10	0.31	0.10	57.8
9	R2	1	0	1	0.0	0.028	9.3	LOS A	0.1	1.1	0.10	0.31	0.10	58.9
Approach		33	13	35	39.4	0.028	3.4	LOS A	0.1	1.1	0.10	0.31	0.10	57.8
West: Rennie St														
11	T1	1	0	1	0.0	0.015	2.8	LOS A	0.1	0.6	0.03	0.62	0.03	54.1
12	R2	20	1	21	5.0	0.015	9.3	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
12u	U	1	0	1	0.0	0.015	11.7	LOS B	0.1	0.6	0.03	0.62	0.03	56.0
Approach		22	1	23	4.5	0.015	9.1	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
All Vehicles		100	26	105	26.0	0.029	4.9	LOS A	0.1	1.1	0.07	0.43	0.07	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [1. Shell Pde/Rennie St Roundabout - PM 530-630pm (Site Folder: 2021 Survey Base Models)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	104	8	109	7.7	0.070	3.3	LOS A	0.3	2.1	0.03	0.42	0.03	56.4
3	R2	1	0	1	0.0	0.070	9.3	LOS A	0.3	2.1	0.03	0.42	0.03	59.1
3u	U	3	0	3	0.0	0.070	11.7	LOS B	0.3	2.1	0.03	0.42	0.03	61.0
Approach		108	8	114	7.4	0.070	3.6	LOS A	0.3	2.1	0.03	0.42	0.03	56.5
East: McGregor Ct														
4	L2	6	0	6	0.0	0.007	3.6	LOS A	0.0	0.3	0.25	0.41	0.25	55.3
5	T1	2	0	2	0.0	0.007	3.3	LOS A	0.0	0.3	0.25	0.41	0.25	57.2
6u	U	1	0	1	0.0	0.007	12.1	LOS B	0.0	0.3	0.25	0.41	0.25	59.5
Approach		9	0	9	0.0	0.007	4.5	LOS A	0.0	0.3	0.25	0.41	0.25	56.2
North: Off Ramp														
7	L2	1	0	1	0.0	0.026	3.4	LOS A	0.1	0.9	0.15	0.32	0.15	56.2
8	T1	29	8	31	27.6	0.026	3.3	LOS A	0.1	0.9	0.15	0.32	0.15	57.7
9	R2	1	0	1	0.0	0.026	9.4	LOS A	0.1	0.9	0.15	0.32	0.15	58.7
Approach		31	8	33	25.8	0.026	3.5	LOS A	0.1	0.9	0.15	0.32	0.15	57.7
West: Rennie St														
11	T1	2	0	2	0.0	0.031	2.8	LOS A	0.2	1.1	0.04	0.62	0.04	54.1
12	R2	45	0	47	0.0	0.031	9.3	LOS A	0.2	1.1	0.04	0.62	0.04	54.5
12u	U	1	0	1	0.0	0.031	11.7	LOS B	0.2	1.1	0.04	0.62	0.04	56.0
Approach		48	0	51	0.0	0.031	9.1	LOS A	0.2	1.1	0.04	0.62	0.04	54.5
All Vehicles		196	16	206	8.2	0.070	4.9	LOS A	0.3	2.1	0.06	0.45	0.06	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - AM 5-6am (Site Folder: 2021 Survey Base Models)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	2	0	2	0.0	0.032	3.2	LOS A	0.2	1.5	0.08	0.37	0.08	55.8
2	T1	34	11	36	32.4	0.032	3.3	LOS A	0.2	1.5	0.08	0.37	0.08	57.1
3	R2	6	0	6	0.0	0.032	9.3	LOS A	0.2	1.5	0.08	0.37	0.08	58.1
Approach		42	11	44	26.2	0.032	4.2	LOS A	0.2	1.5	0.08	0.37	0.08	57.2
East: School Road														
4	L2	3	0	3	0.0	0.006	3.5	LOS A	0.0	0.2	0.18	0.47	0.18	54.5
5	T1	2	0	2	0.0	0.006	3.2	LOS A	0.0	0.2	0.18	0.47	0.18	56.3
6	R2	3	0	3	0.0	0.006	9.5	LOS A	0.0	0.2	0.18	0.47	0.18	56.8
Approach		8	0	8	0.0	0.006	5.6	LOS A	0.0	0.2	0.18	0.47	0.18	55.8
North: Shell Parade														
7	L2	5	0	5	0.0	0.043	3.4	LOS A	0.3	2.2	0.16	0.34	0.16	55.9
8	T1	45	12	47	26.7	0.043	3.5	LOS A	0.3	2.2	0.16	0.34	0.16	57.3
9	R2	4	1	4	25.0	0.043	9.7	LOS A	0.3	2.2	0.16	0.34	0.16	57.3
Approach		54	13	57	24.1	0.043	3.9	LOS A	0.3	2.2	0.16	0.34	0.16	57.2
West: School Road														
10	L2	2	0	2	0.0	0.018	3.5	LOS A	0.1	0.8	0.20	0.46	0.20	54.5
11	T1	10	0	11	0.0	0.018	3.4	LOS A	0.1	0.8	0.20	0.46	0.20	56.1
12	R2	9	4	9	44.4	0.018	10.0	LOS B	0.1	0.8	0.20	0.46	0.20	55.0
12u	U	1	0	1	0.0	0.018	11.9	LOS B	0.1	0.8	0.20	0.46	0.20	58.3
Approach		22	4	23	18.2	0.018	6.5	LOS A	0.1	0.8	0.20	0.46	0.20	55.6
All Vehicles		126	28	133	22.2	0.043	4.6	LOS A	0.3	2.2	0.14	0.38	0.14	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - PM 530-630pm (Site Folder: 2021 Survey Base Models)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	32	7	34	21.9	0.104	3.7	LOS A	0.6	4.8	0.21	0.38	0.21	55.0
2	T1	91	7	96	7.7	0.104	3.4	LOS A	0.6	4.8	0.21	0.38	0.21	57.2
3	R2	16	1	17	6.3	0.104	9.6	LOS A	0.6	4.8	0.21	0.38	0.21	57.5
Approach		139	15	146	10.8	0.104	4.2	LOS A	0.6	4.8	0.21	0.38	0.21	56.7
East: School Road														
4	L2	18	0	19	0.0	0.038	3.6	LOS A	0.2	1.3	0.23	0.40	0.23	55.5
5	T1	28	0	29	0.0	0.038	3.3	LOS A	0.2	1.3	0.23	0.40	0.23	57.3
6	R2	6	0	6	0.0	0.038	9.6	LOS A	0.2	1.3	0.23	0.40	0.23	57.8
Approach		52	0	55	0.0	0.038	4.1	LOS A	0.2	1.3	0.23	0.40	0.23	56.7
North: Shell Parade														
7	L2	10	0	11	0.0	0.068	3.6	LOS A	0.4	3.3	0.24	0.41	0.24	54.9
8	T1	59	10	62	16.9	0.068	3.6	LOS A	0.4	3.3	0.24	0.41	0.24	56.4
9	R2	17	0	18	0.0	0.068	9.6	LOS A	0.4	3.3	0.24	0.41	0.24	57.2
Approach		86	10	91	11.6	0.068	4.8	LOS A	0.4	3.3	0.24	0.41	0.24	56.4
West: School Road														
10	L2	8	0	8	0.0	0.038	3.9	LOS A	0.2	1.6	0.32	0.47	0.32	54.0
11	T1	23	0	24	0.0	0.038	3.8	LOS A	0.2	1.6	0.32	0.47	0.32	55.7
12	R2	16	1	17	6.3	0.038	9.9	LOS A	0.2	1.6	0.32	0.47	0.32	55.9
12u	U	1	0	1	0.0	0.038	12.3	LOS B	0.2	1.6	0.32	0.47	0.32	57.8
Approach		48	1	51	2.1	0.038	6.0	LOS A	0.2	1.6	0.32	0.47	0.32	55.5
All Vehicles		325	26	342	8.0	0.104	4.6	LOS A	0.6	4.8	0.23	0.41	0.23	56.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - AM 5-6am (Site Folder: 2021 Survey Base Models)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)														
2	T1	59	23	62	39.0	0.045	0.0	LOS A	0.1	0.6	0.07	0.11	0.07	58.4
3	R2	13	1	14	7.7	0.045	5.7	LOS A	0.1	0.6	0.07	0.11	0.07	52.9
Approach		72	24	76	33.3	0.045	1.1	NA	0.1	0.6	0.07	0.11	0.07	57.6
East: Madden Avenue														
4	L2	1	1	1	100.0	0.010	5.7	LOS A	0.0	0.2	0.14	0.54	0.14	44.5
6	R2	11	3	12	27.3	0.010	5.1	LOS A	0.0	0.2	0.14	0.54	0.14	47.1
Approach		12	4	13	33.3	0.010	5.1	LOS A	0.0	0.2	0.14	0.54	0.14	46.8
North: Seabeach Road (N)														
7	L2	22	9	23	40.9	0.045	6.0	LOS A	0.0	0.0	0.00	0.19	0.00	50.2
8	T1	44	16	46	36.4	0.045	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	58.3
Approach		66	25	69	37.9	0.045	2.0	NA	0.0	0.0	0.00	0.19	0.00	55.9
All Vehicles		150	53	158	35.3	0.045	1.8	NA	0.1	0.6	0.04	0.18	0.04	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - PM 530-630pm (Site Folder: 2021 Survey Base Models)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	INPUT VOLUMES HV] veh/h	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	95% BACK OF QUEUE Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)														
2	T1	132	25	139	18.9	0.080	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	59.9
3	R2	1	0	1	0.0	0.080	5.8	LOS A	0.0	0.1	0.00	0.00	0.00	54.9
Approach		133	25	140	18.8	0.080	0.0	NA	0.0	0.1	0.00	0.00	0.00	59.9
East: Madden Avenue														
4	L2	5	0	5	0.0	0.021	4.8	LOS A	0.1	0.4	0.19	0.55	0.19	49.1
6	R2	22	1	23	4.5	0.021	5.0	LOS A	0.1	0.4	0.19	0.55	0.19	48.2
Approach		27	1	28	3.7	0.021	5.0	LOS A	0.1	0.4	0.19	0.55	0.19	48.4
North: Seabeach Road (N)														
7	L2	23	13	24	56.5	0.080	6.2	LOS A	0.0	0.0	0.00	0.10	0.00	49.5
8	T1	104	17	109	16.3	0.080	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	59.4
Approach		127	30	134	23.6	0.080	1.1	NA	0.0	0.0	0.00	0.10	0.00	57.8
All Vehicles		287	56	302	19.5	0.080	1.0	NA	0.1	0.4	0.02	0.10	0.02	58.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - AM 5-6am (Site Folder: 2021 Survey Base Models)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 81 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	42	4	44	9.5	0.031	8.2	LOS A	0.2	1.5	0.19	0.64	0.19	58.4
2	T1	666	67	701	10.1	* 0.261	12.7	LOS B	5.6	42.5	0.61	0.52	0.61	62.6
3	R2	16	2	17	12.5	* 0.176	49.5	LOS D	0.7	5.6	0.98	0.70	0.98	35.1
3u	U	1	0	1	0.0	0.176	50.4	LOS D	0.7	5.6	0.98	0.70	0.98	37.3
Approach		725	73	763	10.1	0.261	13.3	LOS B	5.6	42.5	0.60	0.53	0.60	61.2
East: School Road														
4	L2	18	2	19	11.1	0.051	31.8	LOS C	0.6	4.7	0.80	0.69	0.80	40.1
5	T1	2	0	2	0.0	0.051	29.2	LOS C	0.6	4.7	0.84	0.68	0.84	38.5
6	R2	9	1	9	11.1	0.051	38.7	LOS D	0.4	2.8	0.88	0.67	0.88	38.0
Approach		29	3	31	10.3	0.051	33.7	LOS C	0.6	4.7	0.83	0.68	0.83	39.3
North: Princes Hwy														
7	L2	8	1	8	12.5	0.007	10.5	LOS B	0.1	0.7	0.32	0.63	0.32	56.3
8	T1	324	32	341	9.9	0.098	6.3	LOS A	1.8	13.3	0.42	0.34	0.42	70.3
9	R2	14	1	15	7.1	* 0.083	30.1	LOS C	0.4	3.3	0.92	0.68	0.92	43.2
9u	U	1	0	1	0.0	0.083	31.4	LOS C	0.4	3.3	0.92	0.68	0.92	46.5
Approach		347	34	365	9.8	0.098	7.4	LOS A	1.8	13.3	0.44	0.36	0.44	68.1
West: Plantation Road														
10	L2	23	2	24	8.7	0.048	26.0	LOS C	0.7	5.4	0.72	0.68	0.72	43.2
11	T1	2	0	2	0.0	0.048	20.4	LOS C	0.7	5.4	0.72	0.68	0.72	42.3
12	R2	48	5	51	10.4	* 0.264	40.6	LOS D	1.9	14.3	0.92	0.75	0.92	37.0
Approach		73	7	77	9.6	0.264	35.4	LOS D	1.9	14.3	0.85	0.72	0.85	38.9
All Vehicles		1174	117	1236	10.0	0.264	13.4	LOS B	5.6	42.5	0.57	0.50	0.57	60.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	1	1	25.3	LOS C	0.0	0.0	0.79	0.79	67.6	55.0	0.81
East: School Road												

P2	Full	2	2	27.7	LOS C	0.0	0.0	0.83	0.83	59.3	41.0	0.69
West: Plantation Road												
P4	Full	1	1	28.5	LOS C	0.0	0.0	0.84	0.84	56.2	36.0	0.64
All Pedestrians		4	4	27.3	LOS C	0.0	0.0	0.82	0.82	60.6	43.3	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - PM 530-630pm (Site Folder: 2021 Survey Base Models)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 104 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	46	5	48	10.9	0.040	12.6	LOS B	0.7	5.7	0.37	0.67	0.37	54.6
2	T1	919	92	967	10.0	* 0.357	16.7	LOS B	10.4	78.7	0.65	0.56	0.65	58.6
3	R2	24	2	25	8.3	* 0.284	61.7	LOS E	1.4	10.7	0.99	0.72	0.99	31.4
3u	U	2	0	2	0.0	0.284	62.7	LOS E	1.4	10.7	0.99	0.72	0.99	33.1
Approach		991	99	1043	10.0	0.357	17.7	LOS B	10.4	78.7	0.64	0.57	0.64	57.1
East: School Road														
4	L2	53	5	56	9.4	0.165	41.2	LOS D	2.6	19.9	0.85	0.73	0.85	36.6
5	T1	7	1	7	14.3	0.165	35.6	LOS D	2.6	19.9	0.85	0.73	0.85	36.1
6	R2	61	6	64	9.8	0.316	49.6	LOS D	3.0	22.9	0.93	0.76	0.93	34.1
Approach		121	12	127	9.9	0.316	45.1	LOS D	3.0	22.9	0.89	0.75	0.89	35.2
North: Princes Hwy														
7	L2	51	5	54	9.8	0.035	8.1	LOS A	0.2	1.9	0.16	0.64	0.16	58.6
8	T1	969	97	1020	10.0	0.306	9.5	LOS A	8.2	62.4	0.49	0.43	0.49	66.2
9	R2	68	7	72	10.3	* 0.450	37.1	LOS D	3.1	23.3	0.97	0.77	0.97	39.8
9u	U	12	0	13	0.0	0.450	38.3	LOS D	3.1	23.3	0.97	0.77	0.97	42.7
Approach		1100	109	1158	9.9	0.450	11.5	LOS B	8.2	62.4	0.51	0.46	0.51	62.9
West: Plantation Road														
10	L2	58	6	61	10.3	0.096	28.1	LOS C	2.0	15.2	0.68	0.71	0.68	41.7
11	T1	7	1	7	14.3	* 0.367	46.5	LOS D	3.0	22.7	0.95	0.76	0.95	32.7
12	R2	51	5	54	9.8	0.367	52.2	LOS D	3.0	22.7	0.95	0.76	0.95	33.4
Approach		116	12	122	10.3	0.367	39.8	LOS D	3.0	22.7	0.82	0.74	0.82	37.0
All Vehicles		2328	232	2451	10.0	0.450	17.3	LOS B	10.4	78.7	0.60	0.54	0.60	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	6	6	36.4	LOS D	0.0	0.0	0.84	0.84	78.7	55.0	0.70
East: School Road												

P2 Full	4	4	38.9	LOS D	0.0	0.0	0.87	0.87	70.5	41.0	0.58
West: Plantation Road											
P4 Full	1	1	39.8	LOS D	0.0	0.0	0.88	0.88	67.5	36.0	0.53
All Pedestrians	11	12	37.6	LOS D	0.0	0.0	0.85	0.85	74.7	48.2	0.65

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1. [1. Shell Pde/Rennie St Roundabout - AM 5-6am (Site Folder: 2024 Future Base)]

5-6 am
Site Category: AM Peak
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	39	13	41	33.3	0.031	3.5	LOS A	0.1	1.0	0.03	0.42	0.03	55.6
3	R2	1	0	1	0.0	0.031	9.3	LOS A	0.1	1.0	0.03	0.42	0.03	58.9
3u	U	1	0	1	0.0	0.031	11.7	LOS B	0.1	1.0	0.03	0.42	0.03	60.7
Approach		41	13	43	31.7	0.031	3.8	LOS A	0.1	1.0	0.03	0.42	0.03	55.8
East: McGregor Ct														
4	L2	3	0	3	0.0	0.005	3.5	LOS A	0.0	0.2	0.21	0.42	0.21	55.1
5	T1	2	0	2	0.0	0.005	3.2	LOS A	0.0	0.2	0.21	0.42	0.21	56.9
6u	U	1	0	1	0.0	0.005	12.0	LOS B	0.0	0.2	0.21	0.42	0.21	59.2
Approach		6	0	6	0.0	0.005	4.8	LOS A	0.0	0.2	0.21	0.42	0.21	56.4
North: Off Ramp														
7	L2	1	0	1	0.0	0.030	3.3	LOS A	0.1	1.1	0.11	0.31	0.11	56.5
8	T1	33	14	35	42.4	0.030	3.2	LOS A	0.1	1.1	0.11	0.31	0.11	57.8
9	R2	1	0	1	0.0	0.030	9.3	LOS A	0.1	1.1	0.11	0.31	0.11	58.9
Approach		35	14	37	40.0	0.030	3.4	LOS A	0.1	1.1	0.11	0.31	0.11	57.8
West: Rennie St														
11	T1	1	0	1	0.0	0.015	2.8	LOS A	0.1	0.6	0.03	0.62	0.03	54.1
12	R2	21	1	22	4.8	0.015	9.3	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
12u	U	1	0	1	0.0	0.015	11.7	LOS B	0.1	0.6	0.03	0.62	0.03	56.0
Approach		23	1	24	4.3	0.015	9.1	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
All Vehicles		105	28	111	26.7	0.031	4.9	LOS A	0.1	1.1	0.07	0.43	0.07	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [1. Shell Pde/Rennie St Roundabout - PM 530-630pm (Site Folder: 2024 Future Base)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	108	8	114	7.4	0.073	3.3	LOS A	0.3	2.1	0.03	0.42	0.03	56.4
3	R2	1	0	1	0.0	0.073	9.3	LOS A	0.3	2.1	0.03	0.42	0.03	59.1
3u	U	3	0	3	0.0	0.073	11.7	LOS B	0.3	2.1	0.03	0.42	0.03	61.0
Approach		112	8	118	7.1	0.073	3.6	LOS A	0.3	2.1	0.03	0.42	0.03	56.5
East: McGregor Ct														
4	L2	8	0	8	0.0	0.009	3.6	LOS A	0.0	0.3	0.25	0.41	0.25	55.4
5	T1	2	0	2	0.0	0.009	3.3	LOS A	0.0	0.3	0.25	0.41	0.25	57.3
6u	U	1	0	1	0.0	0.009	12.1	LOS B	0.0	0.3	0.25	0.41	0.25	59.6
Approach		11	0	12	0.0	0.009	4.3	LOS A	0.0	0.3	0.25	0.41	0.25	56.1
North: Off Ramp														
7	L2	1	0	1	0.0	0.026	3.4	LOS A	0.1	0.9	0.16	0.32	0.16	56.2
8	T1	30	8	32	26.7	0.026	3.3	LOS A	0.1	0.9	0.16	0.32	0.16	57.7
9	R2	1	0	1	0.0	0.026	9.4	LOS A	0.1	0.9	0.16	0.32	0.16	58.7
Approach		32	8	34	25.0	0.026	3.5	LOS A	0.1	0.9	0.16	0.32	0.16	57.7
West: Rennie St														
11	T1	2	0	2	0.0	0.033	2.8	LOS A	0.2	1.2	0.04	0.62	0.04	54.1
12	R2	47	0	49	0.0	0.033	9.3	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
12u	U	1	0	1	0.0	0.033	11.7	LOS B	0.2	1.2	0.04	0.62	0.04	56.0
Approach		50	0	53	0.0	0.033	9.1	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
All Vehicles		205	16	216	7.8	0.073	4.9	LOS A	0.3	2.1	0.07	0.45	0.07	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - AM 5-6am (Site Folder: 2024 Future Base)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	8	6	8	75.0	0.039	3.8	LOS A	0.2	2.0	0.08	0.37	0.08	54.2
2	T1	36	12	38	33.3	0.039	3.3	LOS A	0.2	2.0	0.08	0.37	0.08	57.1
3	R2	6	0	6	0.0	0.039	9.3	LOS A	0.2	2.0	0.08	0.37	0.08	58.1
Approach		50	18	53	36.0	0.039	4.1	LOS A	0.2	2.0	0.08	0.37	0.08	56.7
East: School Road														
4	L2	3	0	3	0.0	0.006	3.5	LOS A	0.0	0.2	0.18	0.47	0.18	54.5
5	T1	2	0	2	0.0	0.006	3.2	LOS A	0.0	0.2	0.18	0.47	0.18	56.3
6	R2	3	0	3	0.0	0.006	9.5	LOS A	0.0	0.2	0.18	0.47	0.18	56.8
Approach		8	0	8	0.0	0.006	5.6	LOS A	0.0	0.2	0.18	0.47	0.18	55.8
North: Shell Parade														
7	L2	5	0	5	0.0	0.046	3.4	LOS A	0.3	2.4	0.16	0.34	0.16	55.9
8	T1	48	13	51	27.1	0.046	3.5	LOS A	0.3	2.4	0.16	0.34	0.16	57.3
9	R2	4	1	4	25.0	0.046	9.7	LOS A	0.3	2.4	0.16	0.34	0.16	57.3
Approach		57	14	60	24.6	0.046	3.9	LOS A	0.3	2.4	0.16	0.34	0.16	57.2
West: School Road														
10	L2	2	0	2	0.0	0.018	3.5	LOS A	0.1	0.8	0.20	0.46	0.20	54.5
11	T1	10	0	11	0.0	0.018	3.5	LOS A	0.1	0.8	0.20	0.46	0.20	56.1
12	R2	9	4	9	44.4	0.018	10.1	LOS B	0.1	0.8	0.20	0.46	0.20	55.0
12u	U	1	0	1	0.0	0.018	11.9	LOS B	0.1	0.8	0.20	0.46	0.20	58.2
Approach		22	4	23	18.2	0.018	6.5	LOS A	0.1	0.8	0.20	0.46	0.20	55.6
All Vehicles		137	36	144	26.3	0.046	4.5	LOS A	0.3	2.4	0.14	0.38	0.14	56.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - PM 530-630pm (Site Folder: 2024 Future Base)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	33	7	35	21.2	0.109	3.7	LOS A	0.7	5.0	0.21	0.39	0.21	55.0
2	T1	95	7	100	7.4	0.109	3.4	LOS A	0.7	5.0	0.21	0.39	0.21	57.2
3	R2	17	1	18	5.9	0.109	9.6	LOS A	0.7	5.0	0.21	0.39	0.21	57.5
Approach		145	15	153	10.3	0.109	4.2	LOS A	0.7	5.0	0.21	0.39	0.21	56.7
East: School Road														
4	L2	19	0	20	0.0	0.040	3.6	LOS A	0.2	1.3	0.23	0.40	0.23	55.5
5	T1	29	0	31	0.0	0.040	3.3	LOS A	0.2	1.3	0.23	0.40	0.23	57.3
6	R2	6	0	6	0.0	0.040	9.6	LOS A	0.2	1.3	0.23	0.40	0.23	57.8
Approach		54	0	57	0.0	0.040	4.1	LOS A	0.2	1.3	0.23	0.40	0.23	56.7
North: Shell Parade														
7	L2	12	2	13	16.7	0.073	3.8	LOS A	0.5	3.6	0.24	0.41	0.24	54.5
8	T1	61	10	64	16.4	0.073	3.6	LOS A	0.5	3.6	0.24	0.41	0.24	56.3
9	R2	18	0	19	0.0	0.073	9.6	LOS A	0.5	3.6	0.24	0.41	0.24	57.1
Approach		91	12	96	13.2	0.073	4.8	LOS A	0.5	3.6	0.24	0.41	0.24	56.2
West: School Road														
10	L2	8	0	8	0.0	0.040	3.9	LOS A	0.2	1.7	0.33	0.48	0.33	54.0
11	T1	24	0	25	0.0	0.040	3.8	LOS A	0.2	1.7	0.33	0.48	0.33	55.6
12	R2	17	1	18	5.9	0.040	10.0	LOS A	0.2	1.7	0.33	0.48	0.33	55.9
12u	U	1	0	1	0.0	0.040	12.3	LOS B	0.2	1.7	0.33	0.48	0.33	57.7
Approach		50	1	53	2.0	0.040	6.1	LOS A	0.2	1.7	0.33	0.48	0.33	55.5
All Vehicles		340	28	358	8.2	0.109	4.6	LOS A	0.7	5.0	0.24	0.41	0.24	56.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - AM 5-6am (Site Folder: 2024 Future Base)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)														
2	T1	62	24	65	38.7	0.048	0.0	LOS A	0.1	0.7	0.07	0.11	0.07	58.4
3	R2	14	1	15	7.1	0.048	5.7	LOS A	0.1	0.7	0.07	0.11	0.07	52.9
Approach		76	25	80	32.9	0.048	1.1	NA	0.1	0.7	0.07	0.11	0.07	57.5
East: Madden Avenue														
4	L2	1	1	1	100.0	0.010	5.7	LOS A	0.0	0.2	0.15	0.54	0.15	44.4
6	R2	11	3	12	27.3	0.010	5.1	LOS A	0.0	0.2	0.15	0.54	0.15	47.1
Approach		12	4	13	33.3	0.010	5.2	LOS A	0.0	0.2	0.15	0.54	0.15	46.8
North: Seabeach Road (N)														
7	L2	23	9	24	39.1	0.047	6.0	LOS A	0.0	0.0	0.00	0.19	0.00	50.3
8	T1	46	17	48	37.0	0.047	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	58.2
Approach		69	26	73	37.7	0.047	2.0	NA	0.0	0.0	0.00	0.19	0.00	56.0
All Vehicles		157	55	165	35.0	0.048	1.8	NA	0.1	0.7	0.05	0.18	0.05	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - PM 530-630pm (Site Folder: 2024 Future Base)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)														
2	T1	138	26	145	18.8	0.084	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	59.9
3	R2	1	0	1	0.0	0.084	5.8	LOS A	0.0	0.1	0.00	0.00	0.00	54.9
Approach		139	26	146	18.7	0.084	0.0	NA	0.0	0.1	0.00	0.00	0.00	59.9
East: Madden Avenue														
4	L2	5	0	5	0.0	0.022	4.8	LOS A	0.1	0.4	0.19	0.55	0.19	49.1
6	R2	23	1	24	4.3	0.022	5.1	LOS A	0.1	0.4	0.19	0.55	0.19	48.2
Approach		28	1	29	3.6	0.022	5.0	LOS A	0.1	0.4	0.19	0.55	0.19	48.4
North: Seabeach Road (N)														
7	L2	23	13	24	56.5	0.083	6.2	LOS A	0.0	0.0	0.00	0.10	0.00	49.5
8	T1	109	18	115	16.5	0.083	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	59.4
Approach		132	31	139	23.5	0.083	1.1	NA	0.0	0.0	0.00	0.10	0.00	57.9
All Vehicles		299	58	315	19.4	0.084	1.0	NA	0.1	0.4	0.02	0.10	0.02	58.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - AM 5-6am (Site Folder: 2024 Future Base)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 81 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	44	4	46	9.1	0.032	8.2	LOS A	0.2	1.6	0.19	0.64	0.19	58.5
2	T1	696	70	733	10.1	* 0.273	12.8	LOS B	5.9	44.8	0.62	0.52	0.62	62.5
3	R2	17	2	18	11.8	* 0.186	49.5	LOS D	0.8	5.9	0.98	0.70	0.98	35.1
3u	U	1	0	1	0.0	0.186	50.4	LOS D	0.8	5.9	0.98	0.70	0.98	37.3
Approach		758	76	798	10.0	0.273	13.4	LOS B	5.9	44.8	0.60	0.53	0.60	61.1
East: School Road														
4	L2	18	2	19	11.1	0.051	31.8	LOS C	0.6	4.7	0.80	0.69	0.80	40.1
5	T1	2	0	2	0.0	0.051	29.2	LOS C	0.6	4.7	0.84	0.68	0.84	38.5
6	R2	9	1	9	11.1	0.051	38.7	LOS D	0.4	2.8	0.88	0.67	0.88	38.0
Approach		29	3	31	10.3	0.051	33.7	LOS C	0.6	4.7	0.83	0.68	0.83	39.3
North: Princes Hwy														
7	L2	8	1	8	12.5	0.007	10.5	LOS B	0.1	0.7	0.32	0.63	0.32	56.3
8	T1	339	34	357	10.0	0.103	6.3	LOS A	1.8	14.0	0.42	0.34	0.42	70.3
9	R2	14	1	15	7.1	* 0.083	30.1	LOS C	0.4	3.3	0.92	0.68	0.92	43.2
9u	U	1	0	1	0.0	0.083	31.4	LOS C	0.4	3.3	0.92	0.68	0.92	46.5
Approach		362	36	381	9.9	0.103	7.4	LOS A	1.8	14.0	0.44	0.36	0.44	68.2
West: Plantation Road														
10	L2	24	2	25	8.3	0.049	26.0	LOS C	0.7	5.6	0.72	0.68	0.72	43.2
11	T1	2	0	2	0.0	0.049	20.4	LOS C	0.7	5.6	0.72	0.68	0.72	42.3
12	R2	49	5	52	10.2	* 0.269	40.6	LOS D	1.9	14.6	0.92	0.75	0.92	37.1
Approach		75	7	79	9.3	0.269	35.4	LOS D	1.9	14.6	0.85	0.72	0.85	39.0
All Vehicles		1224	122	1288	10.0	0.273	13.4	LOS B	5.9	44.8	0.57	0.50	0.57	60.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	1	1	25.3	LOS C	0.0	0.0	0.79	0.79	67.6	55.0	0.81
East: School Road												

P2 Full	2	2	27.7	LOS C	0.0	0.0	0.83	0.83	59.3	41.0	0.69
West: Plantation Road											
P4 Full	1	1	28.5	LOS C	0.0	0.0	0.84	0.84	56.2	36.0	0.64
All Pedestrians	4	4	27.3	LOS C	0.0	0.0	0.82	0.82	60.6	43.3	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - PM 530-630pm (Site Folder: 2024 Future Base)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 104 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	INPUT VOLUMES HV] veh/h	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	95% BACK OF QUEUE Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	48	5	51	10.4	0.042	12.6	LOS B	0.8	5.9	0.37	0.67	0.37	54.7
2	T1	961	96	1012	10.0	* 0.374	16.9	LOS B	10.9	83.2	0.65	0.57	0.65	58.4
3	R2	26	3	27	11.5	* 0.311	61.9	LOS E	1.5	11.8	0.99	0.72	0.99	31.3
3u	U	2	0	2	0.0	0.311	62.9	LOS E	1.5	11.8	0.99	0.72	0.99	33.1
Approach		1037	104	1092	10.0	0.374	17.9	LOS B	10.9	83.2	0.65	0.57	0.65	56.9
East: School Road														
4	L2	56	6	59	10.7	0.174	41.3	LOS D	2.8	21.1	0.85	0.74	0.85	36.4
5	T1	7	1	7	14.3	0.174	35.7	LOS D	2.8	21.1	0.85	0.74	0.85	36.0
6	R2	64	6	67	9.4	0.331	49.7	LOS D	3.2	24.0	0.93	0.76	0.93	34.1
Approach		127	13	134	10.2	0.331	45.2	LOS D	3.2	24.0	0.89	0.75	0.89	35.2
North: Princes Hwy														
7	L2	53	5	56	9.4	0.037	8.2	LOS A	0.3	2.2	0.17	0.64	0.17	58.5
8	T1	1013	101	1066	10.0	0.321	9.6	LOS A	8.7	65.9	0.50	0.44	0.50	66.1
9	R2	71	7	75	9.9	* 0.466	37.1	LOS D	3.2	24.2	0.98	0.77	0.98	39.8
9u	U	12	0	13	0.0	0.466	38.4	LOS D	3.2	24.2	0.98	0.77	0.98	42.7
Approach		1149	113	1209	9.8	0.466	11.5	LOS B	8.7	65.9	0.52	0.47	0.52	62.8
West: Plantation Road														
10	L2	61	6	64	9.8	0.100	28.2	LOS C	2.1	15.9	0.68	0.72	0.68	41.7
11	T1	7	1	7	14.3	* 0.384	46.7	LOS D	3.1	23.5	0.95	0.76	0.95	32.7
12	R2	53	5	56	9.4	0.384	52.4	LOS D	3.1	23.5	0.95	0.76	0.95	33.4
Approach		121	12	127	9.9	0.384	39.8	LOS D	3.1	23.5	0.82	0.74	0.82	37.1
All Vehicles		2434	242	2562	9.9	0.466	17.4	LOS B	10.9	83.2	0.61	0.54	0.61	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	AVERAGE BACK OF QUEUE Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	6	6	36.4	LOS D	0.0	0.0	0.84	0.84	78.7	55.0	0.70
East: School Road												

P2 Full	4	4	38.9	LOS D	0.0	0.0	0.87	0.87	70.5	41.0	0.58
West: Plantation Road											
P4 Full	1	1	39.8	LOS D	0.0	0.0	0.88	0.88	67.5	36.0	0.53
All Pedestrians	11	12	37.6	LOS D	0.0	0.0	0.85	0.85	74.7	48.2	0.65

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1. [1. Shell Pde/Rennie St Roundabout - AM 5-6am (Site Folder: 2024 Committed)]

5-6 am
Site Category: AM Peak
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	39	13	41	33.3	0.031	3.5	LOS A	0.1	1.1	0.04	0.42	0.04	55.6
3	R2	1	0	1	0.0	0.031	9.3	LOS A	0.1	1.1	0.04	0.42	0.04	58.9
3u	U	1	0	1	0.0	0.031	11.7	LOS B	0.1	1.1	0.04	0.42	0.04	60.7
Approach		41	13	43	31.7	0.031	3.8	LOS A	0.1	1.1	0.04	0.42	0.04	55.8
East: McGregor Ct														
4	L2	3	0	3	0.0	0.007	5.7	LOS A	0.0	0.3	0.57	0.51	0.57	53.6
5	T1	2	0	2	0.0	0.007	5.4	LOS A	0.0	0.3	0.57	0.51	0.57	55.3
6u	U	1	0	1	0.0	0.007	14.2	LOS B	0.0	0.3	0.57	0.51	0.57	57.4
Approach		6	0	6	0.0	0.007	7.0	LOS A	0.0	0.3	0.57	0.51	0.57	54.8
North: Off Ramp														
7	L2	1	0	1	0.0	0.264	3.3	LOS A	1.4	11.4	0.12	0.31	0.12	56.6
8	T1	370	81	389	21.9	0.264	3.1	LOS A	1.4	11.4	0.12	0.31	0.12	58.2
9	R2	1	0	1	0.0	0.264	9.3	LOS A	1.4	11.4	0.12	0.31	0.12	59.1
Approach		372	81	392	21.8	0.264	3.2	LOS A	1.4	11.4	0.12	0.31	0.12	58.2
West: Rennie St														
11	T1	1	0	1	0.0	0.015	2.8	LOS A	0.1	0.6	0.03	0.62	0.03	54.1
12	R2	21	1	22	4.8	0.015	9.3	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
12u	U	1	0	1	0.0	0.015	11.7	LOS B	0.1	0.6	0.03	0.62	0.03	56.0
Approach		23	1	24	4.3	0.015	9.1	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
All Vehicles		442	95	465	21.5	0.264	3.6	LOS A	1.4	11.4	0.11	0.34	0.11	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [1. Shell Pde/Rennie St Roundabout - PM 530-630pm (Site Folder: 2024 Committed)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	716	76	754	10.6	0.452	3.3	LOS A	3.1	23.6	0.05	0.40	0.05	56.4
3	R2	1	0	1	0.0	0.452	9.3	LOS A	3.1	23.6	0.05	0.40	0.05	59.3
3u	U	3	0	3	0.0	0.452	11.7	LOS B	3.1	23.6	0.05	0.40	0.05	61.1
Approach		720	76	758	10.6	0.452	3.4	LOS A	3.1	23.6	0.05	0.40	0.05	56.4
East: McGregor Ct														
4	L2	8	0	8	0.0	0.013	5.9	LOS A	0.1	0.5	0.59	0.53	0.59	54.0
5	T1	2	0	2	0.0	0.013	5.6	LOS A	0.1	0.5	0.59	0.53	0.59	55.8
6u	U	1	0	1	0.0	0.013	14.4	LOS B	0.1	0.5	0.59	0.53	0.59	58.0
Approach		11	0	12	0.0	0.013	6.6	LOS A	0.1	0.5	0.59	0.53	0.59	54.7
North: Off Ramp														
7	L2	1	0	1	0.0	0.276	3.4	LOS A	1.5	11.9	0.19	0.33	0.19	56.2
8	T1	368	76	387	20.7	0.276	3.3	LOS A	1.5	11.9	0.19	0.33	0.19	57.8
9	R2	1	0	1	0.0	0.276	9.5	LOS A	1.5	11.9	0.19	0.33	0.19	58.7
Approach		370	76	389	20.5	0.276	3.3	LOS A	1.5	11.9	0.19	0.33	0.19	57.8
West: Rennie St														
11	T1	2	0	2	0.0	0.033	2.8	LOS A	0.2	1.2	0.04	0.62	0.04	54.1
12	R2	47	0	49	0.0	0.033	9.3	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
12u	U	1	0	1	0.0	0.033	11.7	LOS B	0.2	1.2	0.04	0.62	0.04	56.0
Approach		50	0	53	0.0	0.033	9.1	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
All Vehicles		1151	152	1212	13.2	0.452	3.6	LOS A	3.1	23.6	0.10	0.39	0.10	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - AM 5-6am (Site Folder: 2024 Committed)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	8	6	8	75.0	0.039	3.8	LOS A	0.2	2.1	0.08	0.37	0.08	54.2
2	T1	36	12	38	33.3	0.039	3.3	LOS A	0.2	2.1	0.08	0.37	0.08	57.1
3	R2	6	0	6	0.0	0.039	9.3	LOS A	0.2	2.1	0.08	0.37	0.08	58.1
Approach		50	18	53	36.0	0.039	4.1	LOS A	0.2	2.1	0.08	0.37	0.08	56.7
East: School Road														
4	L2	3	0	3	0.0	0.008	4.9	LOS A	0.0	0.3	0.50	0.53	0.50	53.4
5	T1	2	0	2	0.0	0.008	4.6	LOS A	0.0	0.3	0.50	0.53	0.50	55.1
6	R2	3	0	3	0.0	0.008	10.9	LOS B	0.0	0.3	0.50	0.53	0.50	55.5
Approach		8	0	8	0.0	0.008	7.1	LOS A	0.0	0.3	0.50	0.53	0.50	54.6
North: Shell Parade														
7	L2	5	0	5	0.0	0.285	3.4	LOS A	2.2	18.4	0.19	0.32	0.19	56.0
8	T1	385	80	405	20.8	0.285	3.5	LOS A	2.2	18.4	0.19	0.32	0.19	57.5
9	R2	4	1	4	25.0	0.285	9.7	LOS A	2.2	18.4	0.19	0.32	0.19	57.4
Approach		394	81	415	20.6	0.285	3.5	LOS A	2.2	18.4	0.19	0.32	0.19	57.5
West: School Road														
10	L2	2	0	2	0.0	0.018	3.5	LOS A	0.1	0.8	0.20	0.46	0.20	54.5
11	T1	10	0	11	0.0	0.018	3.5	LOS A	0.1	0.8	0.20	0.46	0.20	56.1
12	R2	9	4	9	44.4	0.018	10.1	LOS B	0.1	0.8	0.20	0.46	0.20	55.0
12u	U	1	0	1	0.0	0.018	11.9	LOS B	0.1	0.8	0.20	0.46	0.20	58.2
Approach		22	4	23	18.2	0.018	6.5	LOS A	0.1	0.8	0.20	0.46	0.20	55.6
All Vehicles		474	103	499	21.7	0.285	3.8	LOS A	2.2	18.4	0.18	0.34	0.18	57.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - PM 530-630pm (Site Folder: 2024 Committed)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	33	7	35	21.2	0.531	3.9	LOS A	5.5	42.4	0.35	0.36	0.35	54.7
2	T1	703	75	740	10.7	0.531	3.6	LOS A	5.5	42.4	0.35	0.36	0.35	56.8
3	R2	17	1	18	5.9	0.531	9.8	LOS A	5.5	42.4	0.35	0.36	0.35	57.2
Approach		753	83	793	11.0	0.531	3.8	LOS A	5.5	42.4	0.35	0.36	0.35	56.7
East: School Road														
4	L2	19	0	20	0.0	0.053	5.2	LOS A	0.3	2.0	0.55	0.55	0.55	54.1
5	T1	29	0	31	0.0	0.053	4.9	LOS A	0.3	2.0	0.55	0.55	0.55	55.8
6	R2	6	0	6	0.0	0.053	11.2	LOS B	0.3	2.0	0.55	0.55	0.55	56.3
Approach		54	0	57	0.0	0.053	5.7	LOS A	0.3	2.0	0.55	0.55	0.55	55.2
North: Shell Parade														
7	L2	12	2	13	16.7	0.333	3.9	LOS A	3.0	24.0	0.33	0.37	0.33	54.7
8	T1	399	78	420	19.5	0.333	3.8	LOS A	3.0	24.0	0.33	0.37	0.33	56.6
9	R2	18	0	19	0.0	0.333	9.7	LOS A	3.0	24.0	0.33	0.37	0.33	57.4
Approach		429	80	452	18.6	0.333	4.0	LOS A	3.0	24.0	0.33	0.37	0.33	56.5
West: School Road														
10	L2	8	0	8	0.0	0.074	8.8	LOS A	0.5	3.7	0.81	0.72	0.81	51.0
11	T1	24	0	25	0.0	0.074	8.8	LOS A	0.5	3.7	0.81	0.72	0.81	52.5
12	R2	17	1	18	5.9	0.074	15.1	LOS B	0.5	3.7	0.81	0.72	0.81	52.7
12u	U	1	0	1	0.0	0.074	17.2	LOS B	0.5	3.7	0.81	0.72	0.81	54.4
Approach		50	1	53	2.0	0.074	11.1	LOS B	0.5	3.7	0.81	0.72	0.81	52.4
All Vehicles		1286	164	1354	12.8	0.531	4.2	LOS A	5.5	42.4	0.37	0.39	0.37	56.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - AM 5-6am (Site Folder: 2024 Committed)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)														
2	T1	62	24	65	38.7	0.051	0.4	LOS A	0.1	1.0	0.21	0.13	0.21	57.8
3	R2	14	1	15	7.1	0.051	7.0	LOS A	0.1	1.0	0.21	0.13	0.21	52.3
Approach		76	25	80	32.9	0.051	1.6	NA	0.1	1.0	0.21	0.13	0.21	57.0
East: Madden Avenue														
4	L2	1	1	1	100.0	0.014	8.4	LOS A	0.0	0.3	0.35	0.62	0.35	43.8
6	R2	11	3	12	27.3	0.014	6.0	LOS A	0.0	0.3	0.35	0.62	0.35	46.3
Approach		12	4	13	33.3	0.014	6.2	LOS A	0.0	0.3	0.35	0.62	0.35	46.1
North: Seabeach Road (N)														
7	L2	23	9	24	39.1	0.253	6.1	LOS A	0.0	0.0	0.00	0.03	0.00	51.8
8	T1	383	84	403	21.9	0.253	0.1	LOS A	0.0	0.0	0.00	0.03	0.00	59.6
Approach		406	93	427	22.9	0.253	0.4	NA	0.0	0.0	0.00	0.03	0.00	59.2
All Vehicles		494	122	520	24.7	0.253	0.7	NA	0.1	1.0	0.04	0.06	0.04	58.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - PM 530-630pm (Site Folder: 2024 Committed)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)														
2	T1	746	94	785	12.6	0.436	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	60.0
3	R2	1	0	1	0.0	0.436	8.5	LOS A	0.0	0.1	0.00	0.00	0.00	55.0
Approach		747	94	786	12.6	0.436	0.0	NA	0.0	0.1	0.00	0.00	0.00	60.0
East: Madden Avenue														
4	L2	5	0	5	0.0	0.048	6.0	LOS A	0.1	0.9	0.59	0.79	0.59	46.4
6	R2	23	1	24	4.3	0.048	8.8	LOS A	0.1	0.9	0.59	0.79	0.59	45.6
Approach		28	1	29	3.6	0.048	8.3	LOS A	0.1	0.9	0.59	0.79	0.59	45.8
North: Seabeach Road (N)														
7	L2	23	13	24	56.5	0.289	6.3	LOS A	0.0	0.0	0.00	0.03	0.00	49.8
8	T1	446	85	469	19.1	0.289	0.1	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		469	98	494	20.9	0.289	0.4	NA	0.0	0.0	0.00	0.03	0.00	59.3
All Vehicles		1244	193	1309	15.5	0.436	0.3	NA	0.1	0.9	0.01	0.03	0.02	59.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - AM 5-6am (Site Folder: 2024 Committed)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 81 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	44	4	46	9.1	0.032	8.2	LOS A	0.2	1.6	0.19	0.64	0.19	58.5
2	T1	696	70	733	10.1	* 0.273	12.8	LOS B	5.9	44.8	0.62	0.52	0.62	62.5
3	R2	17	2	18	11.8	* 0.186	49.5	LOS D	0.8	5.9	0.98	0.70	0.98	35.1
3u	U	1	0	1	0.0	0.186	50.4	LOS D	0.8	5.9	0.98	0.70	0.98	37.3
Approach		758	76	798	10.0	0.273	13.4	LOS B	5.9	44.8	0.60	0.53	0.60	61.1
East: School Road														
4	L2	18	2	19	11.1	0.051	31.8	LOS C	0.6	4.7	0.80	0.69	0.80	40.1
5	T1	2	0	2	0.0	0.051	29.2	LOS C	0.6	4.7	0.84	0.68	0.84	38.5
6	R2	9	1	9	11.1	0.051	38.7	LOS D	0.4	2.8	0.88	0.67	0.88	38.0
Approach		29	3	31	10.3	0.051	33.7	LOS C	0.6	4.7	0.83	0.68	0.83	39.3
North: Princes Hwy														
7	L2	8	1	8	12.5	0.007	10.5	LOS B	0.1	0.7	0.32	0.63	0.32	56.3
8	T1	339	34	357	10.0	0.103	6.3	LOS A	1.8	14.0	0.42	0.34	0.42	70.3
9	R2	14	1	15	7.1	* 0.083	30.1	LOS C	0.4	3.3	0.92	0.68	0.92	43.2
9u	U	1	0	1	0.0	0.083	31.4	LOS C	0.4	3.3	0.92	0.68	0.92	46.5
Approach		362	36	381	9.9	0.103	7.4	LOS A	1.8	14.0	0.44	0.36	0.44	68.2
West: Plantation Road														
10	L2	24	2	25	8.3	0.049	26.0	LOS C	0.7	5.6	0.72	0.68	0.72	43.2
11	T1	2	0	2	0.0	0.049	20.4	LOS C	0.7	5.6	0.72	0.68	0.72	42.3
12	R2	49	5	52	10.2	* 0.269	40.6	LOS D	1.9	14.6	0.92	0.75	0.92	37.1
Approach		75	7	79	9.3	0.269	35.4	LOS D	1.9	14.6	0.85	0.72	0.85	39.0
All Vehicles		1224	122	1288	10.0	0.273	13.4	LOS B	5.9	44.8	0.57	0.50	0.57	60.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	1	1	25.3	LOS C	0.0	0.0	0.79	0.79	67.6	55.0	0.81
East: School Road												

P2 Full	2	2	27.7	LOS C	0.0	0.0	0.83	0.83	59.3	41.0	0.69
West: Plantation Road											
P4 Full	1	1	28.5	LOS C	0.0	0.0	0.84	0.84	56.2	36.0	0.64
All Pedestrians	4	4	27.3	LOS C	0.0	0.0	0.82	0.82	60.6	43.3	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - PM 530-630pm (Site Folder: 2024 Committed)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 104 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	48	5	51	10.4	0.042	12.6	LOS B	0.8	5.9	0.37	0.67	0.37	54.7
2	T1	961	96	1012	10.0	* 0.374	16.9	LOS B	10.9	83.2	0.65	0.57	0.65	58.4
3	R2	26	3	27	11.5	* 0.311	61.9	LOS E	1.5	11.8	0.99	0.72	0.99	31.3
3u	U	2	0	2	0.0	0.311	62.9	LOS E	1.5	11.8	0.99	0.72	0.99	33.1
Approach		1037	104	1092	10.0	0.374	17.9	LOS B	10.9	83.2	0.65	0.57	0.65	56.9
East: School Road														
4	L2	56	6	59	10.7	0.174	41.3	LOS D	2.8	21.1	0.85	0.74	0.85	36.4
5	T1	7	1	7	14.3	0.174	35.7	LOS D	2.8	21.1	0.85	0.74	0.85	36.0
6	R2	64	6	67	9.4	0.331	49.7	LOS D	3.2	24.0	0.93	0.76	0.93	34.1
Approach		127	13	134	10.2	0.331	45.2	LOS D	3.2	24.0	0.89	0.75	0.89	35.2
North: Princes Hwy														
7	L2	53	5	56	9.4	0.037	8.2	LOS A	0.3	2.2	0.17	0.64	0.17	58.5
8	T1	1013	101	1066	10.0	0.321	9.6	LOS A	8.7	65.9	0.50	0.44	0.50	66.1
9	R2	71	7	75	9.9	* 0.466	37.1	LOS D	3.2	24.2	0.98	0.77	0.98	39.8
9u	U	12	0	13	0.0	0.466	38.4	LOS D	3.2	24.2	0.98	0.77	0.98	42.7
Approach		1149	113	1209	9.8	0.466	11.5	LOS B	8.7	65.9	0.52	0.47	0.52	62.8
West: Plantation Road														
10	L2	61	6	64	9.8	0.100	28.2	LOS C	2.1	15.9	0.68	0.72	0.68	41.7
11	T1	7	1	7	14.3	* 0.384	46.7	LOS D	3.1	23.5	0.95	0.76	0.95	32.7
12	R2	53	5	56	9.4	0.384	52.4	LOS D	3.1	23.5	0.95	0.76	0.95	33.4
Approach		121	12	127	9.9	0.384	39.8	LOS D	3.1	23.5	0.82	0.74	0.82	37.1
All Vehicles		2434	242	2562	9.9	0.466	17.4	LOS B	10.9	83.2	0.61	0.54	0.61	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	6	6	36.4	LOS D	0.0	0.0	0.84	0.84	78.7	55.0	0.70
East: School Road												

P2 Full	4	4	38.9	LOS D	0.0	0.0	0.87	0.87	70.5	41.0	0.58
West: Plantation Road											
P4 Full	1	1	39.8	LOS D	0.0	0.0	0.88	0.88	67.5	36.0	0.53
All Pedestrians	11	12	37.6	LOS D	0.0	0.0	0.85	0.85	74.7	48.2	0.65

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1. [1. Shell Pde/Rennie St Roundabout - AM 5-6am (Site Folder: 2024 Committed + Construction)]

5-6 am
Site Category: AM Peak
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	39	13	41	33.3	0.031	3.5	LOS A	0.1	1.1	0.04	0.42	0.04	55.6
3	R2	1	0	1	0.0	0.031	9.3	LOS A	0.1	1.1	0.04	0.42	0.04	58.9
3u	U	1	0	1	0.0	0.031	11.7	LOS B	0.1	1.1	0.04	0.42	0.04	60.7
Approach		41	13	43	31.7	0.031	3.8	LOS A	0.1	1.1	0.04	0.42	0.04	55.8
East: McGregor Ct														
4	L2	3	0	3	0.0	0.007	6.1	LOS A	0.0	0.3	0.60	0.53	0.60	53.4
5	T1	2	0	2	0.0	0.007	5.8	LOS A	0.0	0.3	0.60	0.53	0.60	55.0
6u	U	1	0	1	0.0	0.007	14.6	LOS B	0.0	0.3	0.60	0.53	0.60	57.2
Approach		6	0	6	0.0	0.007	7.4	LOS A	0.0	0.3	0.60	0.53	0.60	54.5
North: Off Ramp														
7	L2	1	0	1	0.0	0.303	3.3	LOS A	1.6	13.3	0.12	0.31	0.12	56.6
8	T1	433	81	456	18.7	0.303	3.1	LOS A	1.6	13.3	0.12	0.31	0.12	58.2
9	R2	1	0	1	0.0	0.303	9.3	LOS A	1.6	13.3	0.12	0.31	0.12	59.1
Approach		435	81	458	18.6	0.303	3.1	LOS A	1.6	13.3	0.12	0.31	0.12	58.2
West: Rennie St														
11	T1	1	0	1	0.0	0.015	2.8	LOS A	0.1	0.6	0.03	0.62	0.03	54.1
12	R2	21	1	22	4.8	0.015	9.3	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
12u	U	1	0	1	0.0	0.015	11.7	LOS B	0.1	0.6	0.03	0.62	0.03	56.0
Approach		23	1	24	4.3	0.015	9.1	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
All Vehicles		505	95	532	18.8	0.303	3.5	LOS A	1.6	13.3	0.12	0.33	0.12	57.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [1. Shell Pde/Rennie St Roundabout - PM 530-630pm (Site Folder: 2024 Committed + Construction)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	779	76	820	9.8	0.489	3.3	LOS A	3.5	26.9	0.06	0.40	0.06	56.4
3	R2	1	0	1	0.0	0.489	9.3	LOS A	3.5	26.9	0.06	0.40	0.06	59.3
3u	U	3	0	3	0.0	0.489	11.7	LOS B	3.5	26.9	0.06	0.40	0.06	61.1
Approach		783	76	824	9.7	0.489	3.4	LOS A	3.5	26.9	0.06	0.40	0.06	56.4
East: McGregor Ct														
4	L2	8	0	8	0.0	0.013	5.9	LOS A	0.1	0.5	0.59	0.53	0.59	54.0
5	T1	2	0	2	0.0	0.013	5.6	LOS A	0.1	0.5	0.59	0.53	0.59	55.8
6u	U	1	0	1	0.0	0.013	14.4	LOS B	0.1	0.5	0.59	0.53	0.59	58.0
Approach		11	0	12	0.0	0.013	6.6	LOS A	0.1	0.5	0.59	0.53	0.59	54.7
North: Off Ramp														
7	L2	1	0	1	0.0	0.276	3.4	LOS A	1.5	11.9	0.19	0.33	0.19	56.2
8	T1	368	76	387	20.7	0.276	3.3	LOS A	1.5	11.9	0.19	0.33	0.19	57.8
9	R2	1	0	1	0.0	0.276	9.5	LOS A	1.5	11.9	0.19	0.33	0.19	58.7
Approach		370	76	389	20.5	0.276	3.3	LOS A	1.5	11.9	0.19	0.33	0.19	57.8
West: Rennie St														
11	T1	2	0	2	0.0	0.033	2.8	LOS A	0.2	1.2	0.04	0.62	0.04	54.1
12	R2	47	0	49	0.0	0.033	9.3	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
12u	U	1	0	1	0.0	0.033	11.7	LOS B	0.2	1.2	0.04	0.62	0.04	56.0
Approach		50	0	53	0.0	0.033	9.1	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
All Vehicles		1214	152	1278	12.5	0.489	3.6	LOS A	3.5	26.9	0.10	0.39	0.10	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - AM 5-6am (Site Folder: 2024 Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_AM (Network Folder: 2024 + Com + Dev)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	8	75.0	8	75.0	0.045	4.4	LOS A	0.1	0.9	0.24	0.38	0.24	51.3
2	T1	38	33.3	38	33.3	0.045	3.7	LOS A	0.1	0.9	0.24	0.38	0.24	56.3
3	R2	6	0.0	6	0.0	0.045	9.5	LOS A	0.1	0.9	0.24	0.38	0.24	57.3
Approach		53	36.0	53	36.0	0.045	4.5	LOS A	0.1	0.9	0.24	0.38	0.24	56.0
East: School Road														
4	L2	3	0.0	3	0.0	0.008	5.2	LOS A	0.0	0.1	0.53	0.54	0.53	53.2
5	T1	2	0.0	2	0.0	0.008	4.9	LOS A	0.0	0.1	0.53	0.54	0.53	48.3
6	R2	3	0.0	3	0.0	0.008	11.2	LOS B	0.0	0.1	0.53	0.54	0.53	55.3
Approach		8	0.0	8	0.0	0.008	7.4	LOS A	0.0	0.1	0.53	0.54	0.53	53.3
North: Shell Parade														
7	L2	5	0.0	5	0.0	0.323	3.4	LOS A	1.1	8.6	0.19	0.37	0.19	55.4
8	T1	413	20.4	413	20.4	0.323	3.5	LOS A	1.1	8.6	0.19	0.37	0.19	56.8
9	R2	61	0.0	61	0.0	0.323	9.4	LOS A	1.1	8.6	0.19	0.37	0.19	51.8
Approach		479	17.6	479	17.6	0.323	4.2	LOS A	1.1	8.6	0.19	0.37	0.19	56.4
West: School Road														
10	L2	2	0.0	2	0.0	0.018	3.5	LOS A	0.0	0.3	0.21	0.46	0.21	53.0
11	T1	11	0.0	11	0.0	0.018	3.5	LOS A	0.0	0.3	0.21	0.46	0.21	55.0
12	R2	9	44.4	9	44.4	0.018	10.1	LOS B	0.0	0.3	0.21	0.46	0.21	53.6
12u	U	1	0.0	1	0.0	0.018	11.9	LOS B	0.0	0.3	0.21	0.46	0.21	44.8
Approach		23	18.2	23	18.2	0.018	6.5	LOS A	0.0	0.3	0.21	0.46	0.21	54.0
All Vehicles		563	19.1	563	19.1	0.323	4.4	LOS A	1.1	8.6	0.20	0.38	0.20	56.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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 (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [School Road / Site Access - AM 5-6am (Site Folder: 2024 Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_AM (Network Folder: 2024 + Com + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Access														
1	L2	1	0.0	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.05	0.57	0.05	53.5
3	R2	1	0.0	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.05	0.57	0.05	50.7
Approach		2	0.0	2	0.0	0.001	5.6	LOS A	0.0	0.0	0.05	0.57	0.05	52.5
East: School Road (E)														
4	L2	58	0.0	58	0.0	0.041	5.5	LOS A	0.0	0.0	0.00	0.47	0.00	52.5
5	T1	15	50.0	15	50.0	0.041	0.0	LOS A	0.0	0.0	0.00	0.47	0.00	54.2
Approach		73	10.1	73	10.1	0.041	4.4	NA	0.0	0.0	0.00	0.47	0.00	52.9
West: School Road (W)														
11	T1	22	19.0	22	19.0	0.035	0.1	LOS A	0.1	0.5	0.17	0.39	0.17	52.0
12	R2	53	0.0	53	0.0	0.035	5.6	LOS A	0.1	0.5	0.17	0.39	0.17	53.7
Approach		75	5.6	75	5.6	0.035	4.0	NA	0.1	0.5	0.17	0.39	0.17	53.4
All Vehicles		149	7.7	149	7.7	0.041	4.2	NA	0.1	0.5	0.09	0.43	0.09	53.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - PM 530-630pm (Site Folder: 2024 Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_PM (Network Folder: 2024 + Com + Dev)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	35	21.2	35	21.2	0.536	3.9	LOS A	2.3	17.4	0.35	0.36	0.35	51.4
2	T1	748	10.5	748	10.5	0.536	3.6	LOS A	2.3	17.4	0.35	0.36	0.35	56.8
3	R2	18	5.9	18	5.9	0.536	9.8	LOS A	2.3	17.4	0.35	0.36	0.35	57.2
Approach		801	10.9	801	10.9	0.536	3.8	LOS A	2.3	17.4	0.35	0.36	0.35	56.6
East: School Road														
4	L2	20	0.0	20	0.0	0.053	5.2	LOS A	0.1	0.8	0.55	0.55	0.55	54.1
5	T1	31	0.0	31	0.0	0.053	4.9	LOS A	0.1	0.8	0.55	0.55	0.55	49.6
6	R2	6	0.0	6	0.0	0.053	11.2	LOS B	0.1	0.8	0.55	0.55	0.55	56.3
Approach		57	0.0	57	0.0	0.053	5.7	LOS A	0.1	0.8	0.55	0.55	0.55	52.6
North: Shell Parade														
7	L2	13	16.7	13	16.7	0.333	3.9	LOS A	1.2	9.7	0.33	0.37	0.33	54.7
8	T1	420	19.5	420	19.5	0.333	3.8	LOS A	1.2	9.7	0.33	0.37	0.33	56.6
9	R2	19	0.0	19	0.0	0.333	9.7	LOS A	1.2	9.7	0.33	0.37	0.33	51.4
Approach		452	18.6	452	18.6	0.333	4.0	LOS A	1.2	9.7	0.33	0.37	0.33	56.4
West: School Road														
10	L2	8	0.0	8	0.0	0.075	8.9	LOS A	0.2	1.5	0.82	0.73	0.82	48.8
11	T1	25	0.0	25	0.0	0.075	8.9	LOS A	0.2	1.5	0.82	0.73	0.82	50.5
12	R2	18	5.9	18	5.9	0.075	15.2	LOS B	0.2	1.5	0.82	0.73	0.82	50.8
12u	U	1	0.0	1	0.0	0.075	17.3	LOS B	0.2	1.5	0.82	0.73	0.82	37.7
Approach		53	2.0	53	2.0	0.075	11.2	LOS B	0.2	1.5	0.82	0.73	0.82	50.2
All Vehicles		1362	12.7	1362	12.7	0.536	4.2	LOS A	2.3	17.4	0.37	0.39	0.37	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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 (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [School Road / Site Access - PM 530-630pm (Site Folder: 2024 Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_PM (Network Folder: 2024 + Com + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Access														
1	L2	53	0.0	53	0.0	0.075	5.7	LOS A	0.1	0.6	0.15	0.57	0.15	53.2
3	R2	58	0.0	58	0.0	0.075	5.7	LOS A	0.1	0.6	0.15	0.57	0.15	50.1
Approach		111	0.0	111	0.0	0.075	5.7	LOS A	0.1	0.6	0.15	0.57	0.15	52.1
East: School Road (E)														
4	L2	1	0.0	1	0.0	0.046	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.8
5	T1	84	8.8	84	8.8	0.046	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		85	8.6	85	8.6	0.046	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.9
West: School Road (W)														
11	T1	109	1.0	109	1.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	1	0.0	1	0.0	0.057	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.7
Approach		111	1.0	111	1.0	0.057	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		306	2.7	306	2.7	0.075	2.1	NA	0.1	0.6	0.05	0.21	0.05	56.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - AM 5-6am (Site Folder: 2024 Committed + Construction)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)														
2	T1	62	24	65	38.7	0.055	0.5	LOS A	0.2	1.4	0.27	0.18	0.27	57.2
3	R2	21	1	22	4.8	0.055	7.0	LOS A	0.2	1.4	0.27	0.18	0.27	51.5
Approach		83	25	87	30.1	0.055	2.2	NA	0.2	1.4	0.27	0.18	0.27	56.0
East: Madden Avenue														
4	L2	1	1	1	100.0	0.014	8.4	LOS A	0.0	0.3	0.35	0.62	0.35	43.8
6	R2	11	3	12	27.3	0.014	6.1	LOS A	0.0	0.3	0.35	0.62	0.35	46.3
Approach		12	4	13	33.3	0.014	6.3	LOS A	0.0	0.3	0.35	0.62	0.35	46.1
North: Seabeach Road (N)														
7	L2	30	9	32	30.0	0.257	6.0	LOS A	0.0	0.0	0.00	0.04	0.00	52.9
8	T1	383	84	403	21.9	0.257	0.1	LOS A	0.0	0.0	0.00	0.04	0.00	59.5
Approach		413	93	435	22.5	0.257	0.5	NA	0.0	0.0	0.00	0.04	0.00	59.1
All Vehicles		508	122	535	24.0	0.257	0.9	NA	0.2	1.4	0.05	0.08	0.05	58.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 103 [3. Seabeach Parade and Madden Ave Priority Intersection - PM 530-630pm (Site Folder: 2024 Committed + Construction)]

Seabeach Parade and Madden Ave Priority Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Seabeach Road (S)															
2	T1	746	94	785	12.6	0.436	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	60.0
3	R2	1	0	1	0.0	0.436	8.5	LOS A	0.0	0.1	0.00	0.00	0.00	55.0
Approach		747	94	786	12.6	0.436	0.0	NA	0.0	0.1	0.00	0.00	0.00	60.0
East: Madden Avenue															
4	L2	12	0	13	0.0	0.070	6.0	LOS A	0.2	1.3	0.56	0.77	0.56	46.6
6	R2	31	1	33	3.2	0.070	8.8	LOS A	0.2	1.3	0.56	0.77	0.56	45.9
Approach		43	1	45	2.3	0.070	8.1	LOS A	0.2	1.3	0.56	0.77	0.56	46.1
North: Seabeach Road (N)															
7	L2	24	14	25	58.3	0.290	6.3	LOS A	0.0	0.0	0.00	0.03	0.00	49.6
8	T1	446	85	469	19.1	0.290	0.1	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		470	99	495	21.1	0.290	0.4	NA	0.0	0.0	0.00	0.03	0.00	59.2
All Vehicles		1260	194	1326	15.4	0.436	0.4	NA	0.2	1.3	0.02	0.04	0.02	59.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - AM 5-6am (Site Folder: 2024 Committed + Construction)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 81 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	44	4	46	9.1	0.032	8.2	LOS A	0.2	1.6	0.19	0.64	0.19	58.5
2	T1	696	70	733	10.1	* 0.273	12.8	LOS B	5.9	44.8	0.62	0.52	0.62	62.5
3	R2	67	2	71	3.0	* 0.652	51.9	LOS D	3.1	22.1	1.00	0.80	1.16	34.4
3u	U	1	0	1	0.0	0.652	53.0	LOS D	3.1	22.1	1.00	0.80	1.16	36.3
Approach		808	76	851	9.4	0.652	15.8	LOS B	5.9	44.8	0.63	0.55	0.64	58.3
East: School Road														
4	L2	18	2	19	11.1	0.051	31.8	LOS C	0.6	4.7	0.80	0.69	0.80	40.1
5	T1	2	0	2	0.0	0.051	29.2	LOS C	0.6	4.7	0.84	0.68	0.84	38.5
6	R2	9	1	9	11.1	0.051	38.7	LOS D	0.4	2.8	0.88	0.67	0.88	38.0
Approach		29	3	31	10.3	0.051	33.7	LOS C	0.6	4.7	0.83	0.68	0.83	39.3
North: Princes Hwy														
7	L2	8	1	8	12.5	0.007	11.4	LOS B	0.1	0.8	0.35	0.62	0.35	55.5
8	T1	339	34	357	10.0	0.103	6.3	LOS A	1.8	14.0	0.42	0.34	0.42	70.3
9	R2	14	1	15	7.1	* 0.083	30.1	LOS C	0.4	3.3	0.92	0.68	0.92	43.2
9u	U	1	0	1	0.0	0.083	31.4	LOS C	0.4	3.3	0.92	0.68	0.92	46.5
Approach		362	36	381	9.9	0.103	7.4	LOS A	1.8	14.0	0.44	0.36	0.44	68.2
West: Plantation Road														
10	L2	24	2	25	8.3	0.049	26.0	LOS C	0.7	5.6	0.72	0.68	0.72	43.2
11	T1	2	0	2	0.0	0.049	20.4	LOS C	0.7	5.6	0.72	0.68	0.72	42.3
12	R2	49	5	52	10.2	* 0.269	40.6	LOS D	1.9	14.6	0.92	0.75	0.92	37.1
Approach		75	7	79	9.3	0.269	35.4	LOS D	1.9	14.6	0.85	0.72	0.85	39.0
All Vehicles		1274	122	1341	9.6	0.652	15.0	LOS B	5.9	44.8	0.59	0.51	0.60	58.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	1	1	25.3	LOS C	0.0	0.0	0.79	0.79	67.6	55.0	0.81
East: School Road												

P2 Full	2	2	27.7	LOS C	0.0	0.0	0.83	0.83	59.3	41.0	0.69
West: Plantation Road											
P4 Full	1	1	28.5	LOS C	0.0	0.0	0.84	0.84	56.2	36.0	0.64
All Pedestrians	4	4	27.3	LOS C	0.0	0.0	0.82	0.82	60.6	43.3	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - PM 530-630pm (Site Folder: 2024 Committed + Construction)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 104 seconds (Site User-Given Phase Times)

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	48	5	51	10.4	0.042	12.6	LOS B	0.8	5.9	0.37	0.67	0.37	54.7
2	T1	961	96	1012	10.0	* 0.374	16.9	LOS B	10.9	83.2	0.65	0.57	0.65	58.4
3	R2	26	3	27	11.5	* 0.312	62.0	LOS E	1.5	11.8	0.99	0.72	0.99	31.3
3u	U	2	0	2	0.0	0.312	62.9	LOS E	1.5	11.8	0.99	0.72	0.99	33.1
Approach		1037	104	1092	10.0	0.374	17.9	LOS B	10.9	83.2	0.65	0.57	0.65	56.9
East: School Road														
4	L2	106	6	112	5.7	0.290	41.5	LOS D	5.0	37.1	0.87	0.77	0.87	36.8
5	T1	7	1	7	14.3	0.290	35.9	LOS D	5.0	37.1	0.87	0.77	0.87	35.8
6	R2	64	6	67	9.4	0.312	49.4	LOS D	3.2	23.9	0.93	0.76	0.93	34.2
Approach		177	13	186	7.3	0.312	44.2	LOS D	5.0	37.1	0.89	0.77	0.89	35.7
North: Princes Hwy														
7	L2	53	5	56	9.4	0.036	8.2	LOS A	0.3	2.2	0.17	0.64	0.17	58.5
8	T1	1013	101	1066	10.0	0.321	9.6	LOS A	8.7	65.9	0.50	0.44	0.50	66.1
9	R2	71	7	75	9.9	* 0.466	37.1	LOS D	3.2	24.2	0.98	0.77	0.98	39.8
9u	U	12	0	13	0.0	0.466	38.4	LOS D	3.2	24.2	0.98	0.77	0.98	42.7
Approach		1149	113	1209	9.8	0.466	11.5	LOS B	8.7	65.9	0.52	0.47	0.52	62.8
West: Plantation Road														
10	L2	61	6	64	9.8	0.100	28.2	LOS C	2.1	15.9	0.68	0.72	0.68	41.7
11	T1	7	1	7	14.3	* 0.457	49.4	LOS D	3.2	24.3	0.98	0.77	0.98	31.9
12	R2	53	5	56	9.4	0.457	55.1	LOS E	3.2	24.3	0.98	0.77	0.98	32.6
Approach		121	12	127	9.9	0.457	41.2	LOS D	3.2	24.3	0.83	0.74	0.83	36.6
All Vehicles		2484	242	2615	9.7	0.466	18.0	LOS B	10.9	83.2	0.61	0.55	0.61	55.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	6	6	36.4	LOS D	0.0	0.0	0.84	0.84	78.7	55.0	0.70
East: School Road												

P2 Full	4	4	38.9	LOS D	0.0	0.0	0.87	0.87	70.5	41.0	0.58
West: Plantation Road											
P4 Full	1	1	39.8	LOS D	0.0	0.0	0.88	0.88	67.5	36.0	0.53
All Pedestrians	11	12	37.6	LOS D	0.0	0.0	0.85	0.85	74.7	48.2	0.65

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1. [1. Shell Pde/Rennie St Roundabout - AM 5-6am (Site Folder: 2024 Diesel Storage + Committed + Construction)]

5-6 am
Site Category: AM Peak
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	39	13	41	33.3	0.031	3.5	LOS A	0.1	1.1	0.04	0.42	0.04	55.6
3	R2	1	0	1	0.0	0.031	9.3	LOS A	0.1	1.1	0.04	0.42	0.04	58.9
3u	U	1	0	1	0.0	0.031	11.7	LOS B	0.1	1.1	0.04	0.42	0.04	60.7
Approach		41	13	43	31.7	0.031	3.8	LOS A	0.1	1.1	0.04	0.42	0.04	55.8
East: McGregor Ct														
4	L2	3	0	3	0.0	0.007	6.5	LOS A	0.0	0.3	0.63	0.54	0.63	53.1
5	T1	2	0	2	0.0	0.007	6.2	LOS A	0.0	0.3	0.63	0.54	0.63	54.8
6u	U	1	0	1	0.0	0.007	15.0	LOS B	0.0	0.3	0.63	0.54	0.63	56.9
Approach		6	0	6	0.0	0.007	7.8	LOS A	0.0	0.3	0.63	0.54	0.63	54.3
North: Off Ramp														
7	L2	1	0	1	0.0	0.334	3.3	LOS A	1.9	15.0	0.13	0.31	0.13	56.6
8	T1	485	81	511	16.7	0.334	3.1	LOS A	1.9	15.0	0.13	0.31	0.13	58.2
9	R2	1	0	1	0.0	0.334	9.4	LOS A	1.9	15.0	0.13	0.31	0.13	59.1
Approach		487	81	513	16.6	0.334	3.1	LOS A	1.9	15.0	0.13	0.31	0.13	58.2
West: Rennie St														
11	T1	1	0	1	0.0	0.015	2.8	LOS A	0.1	0.6	0.03	0.62	0.03	54.1
12	R2	21	1	22	4.8	0.015	9.3	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
12u	U	1	0	1	0.0	0.015	11.7	LOS B	0.1	0.6	0.03	0.62	0.03	56.0
Approach		23	1	24	4.3	0.015	9.1	LOS A	0.1	0.6	0.03	0.62	0.03	54.4
All Vehicles		557	95	586	17.1	0.334	3.5	LOS A	1.9	15.0	0.12	0.33	0.12	57.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [1. Shell Pde/Rennie St Roundabout - PM 530-630pm (Site Folder: 2024 Diesel Storage + Committed + Construction)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	779	76	820	9.8	0.489	3.3	LOS A	3.5	26.9	0.06	0.40	0.06	56.4
3	R2	1	0	1	0.0	0.489	9.3	LOS A	3.5	26.9	0.06	0.40	0.06	59.3
3u	U	3	0	3	0.0	0.489	11.7	LOS B	3.5	26.9	0.06	0.40	0.06	61.1
Approach		783	76	824	9.7	0.489	3.4	LOS A	3.5	26.9	0.06	0.40	0.06	56.4
East: McGregor Ct														
4	L2	8	0	8	0.0	0.012	5.9	LOS A	0.1	0.5	0.59	0.53	0.59	54.0
5	T1	2	0	2	0.0	0.012	5.6	LOS A	0.1	0.5	0.59	0.53	0.59	55.8
6u	U	1	0	1	0.0	0.012	14.4	LOS B	0.1	0.5	0.59	0.53	0.59	58.0
Approach		11	0	12	0.0	0.012	6.6	LOS A	0.1	0.5	0.59	0.53	0.59	54.7
North: Off Ramp														
7	L2	1	0	1	0.0	0.276	3.4	LOS A	1.5	11.9	0.19	0.33	0.19	56.2
8	T1	368	76	387	20.7	0.276	3.3	LOS A	1.5	11.9	0.19	0.33	0.19	57.8
9	R2	1	0	1	0.0	0.276	9.5	LOS A	1.5	11.9	0.19	0.33	0.19	58.7
Approach		370	76	389	20.5	0.276	3.3	LOS A	1.5	11.9	0.19	0.33	0.19	57.8
West: Rennie St														
11	T1	2	0	2	0.0	0.033	2.8	LOS A	0.2	1.2	0.04	0.62	0.04	54.1
12	R2	47	0	49	0.0	0.033	9.3	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
12u	U	1	0	1	0.0	0.033	11.7	LOS B	0.2	1.2	0.04	0.62	0.04	56.0
Approach		50	0	53	0.0	0.033	9.1	LOS A	0.2	1.2	0.04	0.62	0.04	54.5
All Vehicles		1214	152	1278	12.5	0.489	3.6	LOS A	3.5	26.9	0.10	0.39	0.10	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - AM 5-6am (Site Folder: 2024 Diesel Storage + Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_AM (Network Folder: 2024 Diesel Storage + Com + Dev)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	8	75.0	8	75.0	0.048	4.9	LOS A	0.1	1.0	0.33	0.41	0.33	50.6
2	T1	38	33.3	38	33.3	0.048	4.1	LOS A	0.1	1.0	0.33	0.41	0.33	55.9
3	R2	6	0.0	6	0.0	0.048	9.8	LOS A	0.1	1.0	0.33	0.41	0.33	56.8
Approach		53	36.0	53	36.0	0.048	4.9	LOS A	0.1	1.0	0.33	0.41	0.33	55.5
East: School Road														
4	L2	3	0.0	3	0.0	0.008	5.5	LOS A	0.0	0.1	0.57	0.55	0.57	53.1
5	T1	2	0.0	2	0.0	0.008	5.2	LOS A	0.0	0.1	0.57	0.55	0.57	48.1
6	R2	3	0.0	3	0.0	0.008	11.5	LOS B	0.0	0.1	0.57	0.55	0.57	55.2
Approach		8	0.0	8	0.0	0.008	7.7	LOS A	0.0	0.1	0.57	0.55	0.57	53.1
North: Shell Parade														
7	L2	5	0.0	5	0.0	0.356	3.4	LOS A	1.2	9.7	0.20	0.40	0.20	54.9
8	T1	413	20.4	413	20.4	0.356	3.5	LOS A	1.2	9.7	0.20	0.40	0.20	56.3
9	R2	117	0.0	117	0.0	0.356	9.4	LOS A	1.2	9.7	0.20	0.40	0.20	51.1
Approach		535	15.7	535	15.7	0.356	4.8	LOS A	1.2	9.7	0.20	0.40	0.20	55.6
West: School Road														
10	L2	2	0.0	2	0.0	0.018	3.5	LOS A	0.0	0.3	0.21	0.46	0.21	53.0
11	T1	11	0.0	11	0.0	0.018	3.5	LOS A	0.0	0.3	0.21	0.46	0.21	55.0
12	R2	9	44.4	9	44.4	0.018	10.1	LOS B	0.0	0.3	0.21	0.46	0.21	53.6
12u	U	1	0.0	1	0.0	0.018	11.9	LOS B	0.0	0.3	0.21	0.46	0.21	44.7
Approach		23	18.2	23	18.2	0.018	6.5	LOS A	0.0	0.3	0.21	0.46	0.21	54.0
All Vehicles		619	17.3	619	17.3	0.356	4.9	LOS A	1.2	9.7	0.22	0.40	0.22	55.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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 (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2. Shell Pde/School Rd Roundabout - PM 530-630pm (Site Folder: 2024 Diesel Storage + Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_PM (Network Folder: 2024 Diesel Storage + Com + Dev)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Shell Parade														
1	L2	35	21.2	35	21.2	0.536	3.9	LOS A	2.3	17.4	0.35	0.36	0.35	51.4
2	T1	748	10.5	748	10.5	0.536	3.6	LOS A	2.3	17.4	0.35	0.36	0.35	56.8
3	R2	18	5.9	18	5.9	0.536	9.8	LOS A	2.3	17.4	0.35	0.36	0.35	57.2
Approach		801	10.9	801	10.9	0.536	3.8	LOS A	2.3	17.4	0.35	0.36	0.35	56.6
East: School Road														
4	L2	20	0.0	20	0.0	0.053	5.2	LOS A	0.1	0.8	0.55	0.55	0.55	54.1
5	T1	31	0.0	31	0.0	0.053	4.9	LOS A	0.1	0.8	0.55	0.55	0.55	49.6
6	R2	6	0.0	6	0.0	0.053	11.2	LOS B	0.1	0.8	0.55	0.55	0.55	56.3
Approach		57	0.0	57	0.0	0.053	5.7	LOS A	0.1	0.8	0.55	0.55	0.55	52.6
North: Shell Parade														
7	L2	13	16.7	13	16.7	0.333	3.9	LOS A	1.2	9.7	0.33	0.37	0.33	54.7
8	T1	420	19.5	420	19.5	0.333	3.8	LOS A	1.2	9.7	0.33	0.37	0.33	56.6
9	R2	19	0.0	19	0.0	0.333	9.7	LOS A	1.2	9.7	0.33	0.37	0.33	51.4
Approach		452	18.6	452	18.6	0.333	4.0	LOS A	1.2	9.7	0.33	0.37	0.33	56.4
West: School Road														
10	L2	8	0.0	8	0.0	0.075	8.9	LOS A	0.2	1.5	0.82	0.73	0.82	48.8
11	T1	25	0.0	25	0.0	0.075	8.9	LOS A	0.2	1.5	0.82	0.73	0.82	50.5
12	R2	18	5.9	18	5.9	0.075	15.2	LOS B	0.2	1.5	0.82	0.73	0.82	50.8
12u	U	1	0.0	1	0.0	0.075	17.3	LOS B	0.2	1.5	0.82	0.73	0.82	37.7
Approach		53	2.0	53	2.0	0.075	11.2	LOS B	0.2	1.5	0.82	0.73	0.82	50.2
All Vehicles		1362	12.7	1362	12.7	0.536	4.2	LOS A	2.3	17.4	0.37	0.39	0.37	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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 (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [School Road / Site Access - AM 5-6am (Site Folder: 2024 Diesel Storage + Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_AM (Network Folder: 2024 Diesel Storage + Com + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Access														
1	L2	1	0.0	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.01	0.59	0.01	53.6
3	R2	1	0.0	1	0.0	0.001	5.7	LOS A	0.0	0.0	0.01	0.59	0.01	50.8
Approach		2	0.0	2	0.0	0.001	5.6	LOS A	0.0	0.0	0.01	0.59	0.01	52.6
East: School Road (E)														
4	L2	114	0.0	114	0.0	0.063	5.5	LOS A	0.0	0.0	0.00	0.57	0.00	52.0
5	T1	2	50.0	2	50.0	0.063	0.0	LOS A	0.0	0.0	0.00	0.57	0.00	53.6
Approach		116	0.9	116	0.9	0.063	5.4	NA	0.0	0.0	0.00	0.57	0.00	52.0
West: School Road (W)														
11	T1	2	50.0	2	50.0	0.048	0.3	LOS A	0.1	0.7	0.23	0.54	0.23	49.9
12	R2	102	0.0	102	0.0	0.048	5.7	LOS A	0.1	0.7	0.23	0.54	0.23	52.6
Approach		104	1.0	104	1.0	0.048	5.6	NA	0.1	0.7	0.23	0.54	0.23	52.5
All Vehicles		222	0.9	222	0.9	0.063	5.5	NA	0.1	0.7	0.11	0.55	0.11	52.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [School Road / Site Access - PM 530-630pm (Site Folder: 2024 Diesel Storage + Committed + Construction)]

Network: N101 [School Rd Rabout and Site Access_PM (Network Folder: 2024 Diesel Storage + Com + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Access														
1	L2	102	0.0	102	0.0	0.146	5.8	LOS A	0.2	1.2	0.15	0.58	0.15	53.2
3	R2	114	0.0	114	0.0	0.146	5.8	LOS A	0.2	1.2	0.15	0.58	0.15	50.1
Approach		216	0.0	216	0.0	0.146	5.8	LOS A	0.2	1.2	0.15	0.58	0.15	52.0
East: School Road (E)														
4	L2	1	0.0	1	0.0	0.046	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.8
5	T1	84	8.8	84	8.8	0.046	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		85	8.6	85	8.6	0.046	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.9
West: School Road (W)														
11	T1	109	1.0	109	1.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	1	0.0	1	0.0	0.057	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.7
Approach		111	1.0	111	1.0	0.057	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		412	2.0	412	2.0	0.146	3.1	NA	0.2	1.2	0.08	0.31	0.08	55.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - AM 5-6am (Site Folder: 2024 Diesel Storage + Committed + Construction)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 81 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	44	4	46	9.1	0.032	8.2	LOS A	0.2	1.6	0.19	0.64	0.19	58.5
2	T1	696	70	733	10.1	* 0.273	12.8	LOS B	5.9	44.8	0.62	0.52	0.62	62.5
3	R2	114	2	120	1.8	* 1.091	144.2	LOS F	10.2	72.4	1.00	1.25	2.73	18.1
3u	U	1	0	1	0.0	1.091	145.3	LOS F	10.2	72.4	1.00	1.25	2.73	18.6
Approach		855	76	900	8.9	1.091	30.2	LOS C	10.2	72.4	0.65	0.63	0.88	46.8
East: School Road														
4	L2	18	2	19	11.1	0.051	31.8	LOS C	0.6	4.7	0.80	0.69	0.80	40.1
5	T1	2	0	2	0.0	0.051	29.2	LOS C	0.6	4.7	0.84	0.68	0.84	38.5
6	R2	9	1	9	11.1	0.051	38.7	LOS D	0.4	2.8	0.88	0.67	0.88	38.0
Approach		29	3	31	10.3	0.051	33.7	LOS C	0.6	4.7	0.83	0.68	0.83	39.3
North: Princes Hwy														
7	L2	8	1	8	12.5	0.007	11.1	LOS B	0.1	0.7	0.34	0.63	0.34	55.8
8	T1	339	34	357	10.0	0.103	6.3	LOS A	1.8	14.0	0.42	0.34	0.42	70.3
9	R2	14	1	15	7.1	* 0.083	30.1	LOS C	0.4	3.3	0.92	0.68	0.92	43.2
9u	U	1	0	1	0.0	0.083	31.4	LOS C	0.4	3.3	0.92	0.68	0.92	46.5
Approach		362	36	381	9.9	0.103	7.4	LOS A	1.8	14.0	0.44	0.36	0.44	68.2
West: Plantation Road														
10	L2	24	2	25	8.3	0.049	26.0	LOS C	0.7	5.6	0.72	0.68	0.72	43.2
11	T1	2	0	2	0.0	0.049	20.4	LOS C	0.7	5.6	0.72	0.68	0.72	42.3
12	R2	49	5	52	10.2	* 0.269	40.6	LOS D	1.9	14.6	0.92	0.75	0.92	37.1
Approach		75	7	79	9.3	0.269	35.4	LOS D	1.9	14.6	0.85	0.72	0.85	39.0
All Vehicles		1321	122	1391	9.2	1.091	24.3	LOS C	10.2	72.4	0.61	0.56	0.76	50.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	1	1	25.3	LOS C	0.0	0.0	0.79	0.79	67.6	55.0	0.81

East: School Road											
P2 Full	2	2	27.7	LOS C	0.0	0.0	0.83	0.83	59.3	41.0	0.69
West: Plantation Road											
P4 Full	1	1	28.5	LOS C	0.0	0.0	0.84	0.84	56.2	36.0	0.64
All Pedestrians	4	4	27.3	LOS C	0.0	0.0	0.82	0.82	60.6	43.3	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 14. [4. Princes Hwy / School Road Signalised Int - PM 530-630pm (Site Folder: 2024 Diesel Storage + Committed + Construction)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 104 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy														
1	L2	48	5	51	10.4	0.042	12.6	LOS B	0.8	5.9	0.37	0.67	0.37	54.7
2	T1	961	96	1012	10.0	* 0.374	16.9	LOS B	10.9	83.2	0.65	0.57	0.65	58.4
3	R2	26	3	27	11.5	* 0.312	62.0	LOS E	1.5	11.8	0.99	0.72	0.99	31.3
3u	U	2	0	2	0.0	0.312	62.9	LOS E	1.5	11.8	0.99	0.72	0.99	33.1
Approach		1037	104	1092	10.0	0.374	17.9	LOS B	10.9	83.2	0.65	0.57	0.65	56.9
East: School Road														
4	L2	106	6	112	5.7	0.290	41.5	LOS D	5.0	37.1	0.87	0.77	0.87	36.8
5	T1	7	1	7	14.3	0.290	35.9	LOS D	5.0	37.1	0.87	0.77	0.87	35.8
6	R2	64	6	67	9.4	0.312	49.4	LOS D	3.2	23.9	0.93	0.76	0.93	34.2
Approach		177	13	186	7.3	0.312	44.2	LOS D	5.0	37.1	0.89	0.77	0.89	35.7
North: Princes Hwy														
7	L2	53	5	56	9.4	0.036	8.2	LOS A	0.3	2.2	0.17	0.64	0.17	58.5
8	T1	1013	101	1066	10.0	0.321	9.6	LOS A	8.7	65.9	0.50	0.44	0.50	66.1
9	R2	71	7	75	9.9	* 0.466	37.1	LOS D	3.2	24.2	0.98	0.77	0.98	39.8
9u	U	12	0	13	0.0	0.466	38.4	LOS D	3.2	24.2	0.98	0.77	0.98	42.7
Approach		1149	113	1209	9.8	0.466	11.5	LOS B	8.7	65.9	0.52	0.47	0.52	62.8
West: Plantation Road														
10	L2	61	6	64	9.8	0.100	28.2	LOS C	2.1	15.9	0.68	0.72	0.68	41.7
11	T1	7	1	7	14.3	* 0.457	49.4	LOS D	3.2	24.3	0.98	0.77	0.98	31.9
12	R2	53	5	56	9.4	0.457	55.1	LOS E	3.2	24.3	0.98	0.77	0.98	32.6
Approach		121	12	127	9.9	0.457	41.2	LOS D	3.2	24.3	0.83	0.74	0.83	36.6
All Vehicles		2484	242	2615	9.7	0.466	18.0	LOS B	10.9	83.2	0.61	0.55	0.61	55.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hwy												
P1	Full	6	6	36.4	LOS D	0.0	0.0	0.84	0.84	78.7	55.0	0.70

East: School Road											
P2 Full	4	4	38.9	LOS D	0.0	0.0	0.87	0.87	70.5	41.0	0.58
West: Plantation Road											
P4 Full	1	1	39.8	LOS D	0.0	0.0	0.88	0.88	67.5	36.0	0.53
All Pedestrians	11	12	37.6	LOS D	0.0	0.0	0.85	0.85	74.7	48.2	0.65

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix F

Approvals and control measures for inclusion in the TMP

Appendix F Approvals and control measures for inclusion in the TMP

Additional approvals and control measures should be considered with regards to construction transportation routes to the project work sites. These should be considered in more detail with relevant stakeholder co-ordination as part of a subsequent TMP for the project.

Transport

TMP and transport approvals

When any works are planned on a road, lane, street or footpath, a TMP should be submitted to the relevant road authority (Department of Transport and local councils) for review. This requirement is in accordance with the *Road Management Act 2004*, the *Road Safety Act 1986* and the Australian Standard AS 1742.3 2009 Traffic control devices for works on roads.

During the development of the TMP and associated sub-plans (worksite TMPs), consultation with key stakeholders should be undertaken to meet subsequent planning condition obligations. At this stage, the necessary approvals should be discussed and agreed, including:

1. **Road works permits:** Typically, functional and detailed design plans would be submitted to the road authority for approval prior to the commencement of any upgrade. A 'works within the road reserves permit', 'road opening permits' and 'vehicle crossing permits' should be sought as required.
2. **Memorandum of Authorisation (MoA):** DoT and CoGG would require MoAs to be completed for implementation of traffic management measures.
3. **Overhead constraints:** Powercor commissioned to undertake overhead constraints assessments. The total ground clearance should be confirmed of the component required to be delivered during the construction phase of the project. Overheads that must have sufficient clearance include wires, structures and trees, this also applies to ground clearance at rail level crossings. A request for raising overhead cables is to be made with the relevant asset owner who would perform these works for a fee should there be insufficient clearance for passage of the OD vehicles.
4. **Over-size vehicle permits:** The NHVR issues permits for oversized vehicles. DoT (Regional Roads Victoria (RRV)), on behalf of NHVR, would require at least 28 days to assess any route. Local councils will also be consulted, and agreements sought during this process.

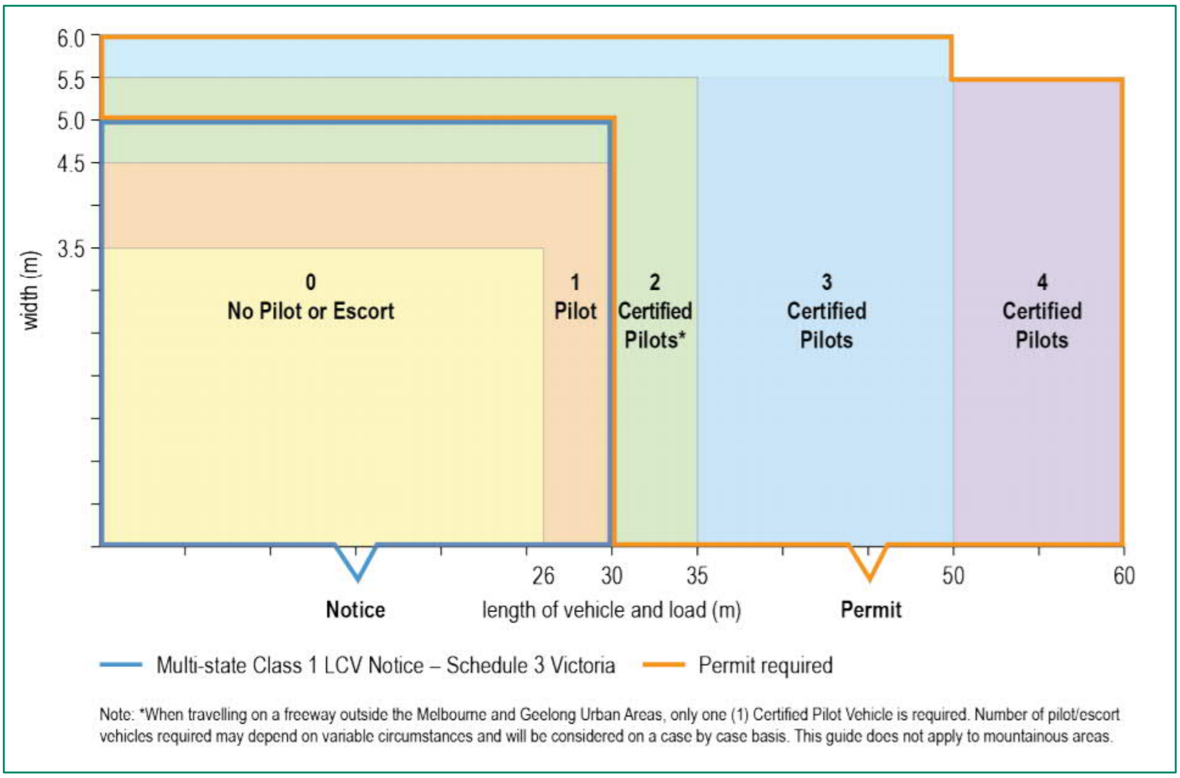
   The NHVR outlines requirements for the movement of oversize loads and provides dimensional limits depending on vehicle types. Where the dimensions or mass limits exceed those outlined on NHVR guidelines, a specific permit must be requested from the road authority. DoT (RRV), on behalf of NHVR, will require at least 28 days to assess any route.

1. **Bridge and culvert condition / weight bearing assessments:** These may be required to ensure any construction vehicles do not have any adverse impacts to any bridges or culverts on route to the project sites. Co-ordination with the local authority would be required to understand any historical data on such assets and need for any additional assessments.

1\. **Rail track crossings:** DoT would need to give permission (provide necessary staff on site) for any such over-dimensional vehicles crossing or travelling across train tracks. A permit is required when an over-dimensional vehicle crossing the railway line is greater than 4.9 metres in height, three metres wide or 26.0 metres in length. Several rail track crossings exist within the proximity of the project sites and should be avoided if possible.

All relevant stakeholders should be involved at the outset of obtaining necessary permits to ensure that no delays to the project are experienced, and the above information should be used as a guide only in relation to those discussions.

In addition to the above, pilot and escort vehicles ensure the safe movement of OD vehicles on the road. Pilot vehicles, certified pilot vehicles and escort vehicles typical requirements are shown in Figure 13-1.



Source: NHVR, 2017

Figure 13-1 Pilot and escort graph guide

The above typical requirements are dependent on several parameters to ensure safe and efficient movement of oversize loads:

1. vehicle and load width and length
2. location of movement
3. traffic volumes and variations
4. other associated risks such as road congestion or crash risk.

Driver induction training

Prior to commencing construction activities, regular and returning drivers of semi-trailers, rigid vehicles and/or B-Double and OD vehicles who would access and egress the site for pick-up and delivery of material should be required to undertake a driver induction. The induction course should be developed early to ensure it is ready prior to construction activity (including any site preparation works) commencing. Irregular and one-off drivers of pick-ups and deliveries would be considered exempt to this induction requirement.

The induction course should intend to cover:

1. Suitable routes to and from the site.
2. Suitable times of travel (i.e. outside of school bus times as outlined in TMP).
3. Applicable traffic management procedures that will need to be in place prior to approaching or departing the site (if required).
4. Communications and notification procedures.
5. Speed restrictions (on the road network and the site).
6. Safety procedures (during transportation and in the evident of an accident / emergency).

Construction staging and parking

It is proposed to provide all car parking within the confines of the site and would therefore not encroach on the local road network.

It is considered that there would be sufficient area within the site during differing phases of construction to accommodate vehicle parking, including construction traffic deliveries and on-site manoeuvring as and when required.

The site manager should continually monitor parking provisions within the site boundary, as well as the staging of construction vehicles into and out of the site, to ensure no impact on the local road network occurs. If required, the day-to-day vehicle parking demands can be reduced via the promotion and consideration of car sharing of workers to/from the site and mini-bus service transporting workers to/from the site.

Signage and speed limits

Signage

The safety of traffic (both construction and general background) should be managed at the access points through the installation of appropriate construction vehicle signage. Australian Standard AS 1742 defines the signage layout required for entering or crossing construction vehicles. The signage requirements at all intersections should involve similar signage, an example of such signage includes:

1. ‘Give Way’ (R1-2)
2. ‘Trucks (crossing or entering)’ (T2-25)
3. Depending upon the vehicle access wayfinding strategy additional signage may be required for the following:
   - Informing visitors / local users of any works / delays (vms or other static signage provisions).
   - No truck entry signs to inform drivers of access locations where access is not permitted, as agreed with local stakeholders.

Speed limits

Given the existing local traffic types/volumes and nominated speed limits no adjustments to posted speed limits would seem to be required at this stage for general worker/ construction vehicle access.

It is suggested that this is reviewed during TMP development for the project with consideration to the safe system principles. Shell Parade notably has posted speed limits of 80km/hr and has several roundabouts that will need to be negotiated, which do not correctly have any speed reduction signage present upon approach. Accordingly, during construction and onwards operation (including other key local land uses), consideration of reduced speed limits should be considered, notably at a 70km/hr the likelihood of death from a head-on collision, see Figure 13-2, is significantly reduced.

Other areas for the project to consider in terms of speed should be at site access locations and internal accesses if any pedestrian or cyclists’ interactions may occur (side impact).

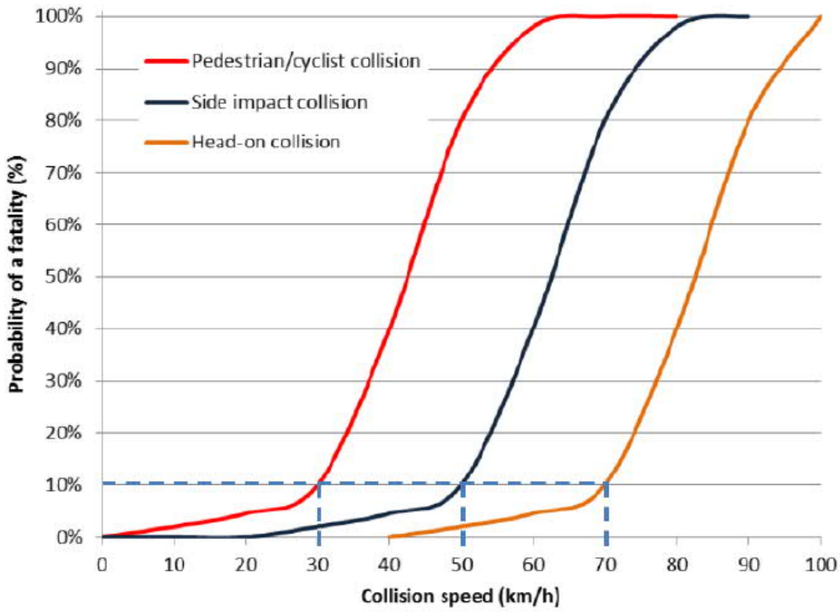


Figure 13-2 Relationship between collision speed and probability of a fatality – Source: Austroads (2018b)

The speed at which OD vehicles would be able to operate would be contingent upon the vehicle configuration, size of the load and any restrictions imposed (whether by the delivery operator or any authority). As such, it is expected that OD vehicles should travel significantly slower than the posted speed limit, with the escort arrangement being configured as to remain near the OD vehicle.

There would be occasions where intersections would need to be shutdown to allow for safe passage and manoeuvrability of OD vehicles (if required following contractor route assessment). During these times the appropriate warning signage, along with temporary reductions in speed limits, should be in place for all affected intersection approaches. The temporary reductions in speed limits are to only be in place while the OD movements are taking place and must not be visible to traffic at all other times (Worksite TMPs may be required for these specific circumstances).

Operating and working hours

The normal standard working hours for the proposed construction of the project are as follows:

1. 11-hour (7am to 6pm) working weekday and 24 working days in a month (noting final working hours for the project will be determined when a contractor has been commissioned, it is likely that in additional to the working weekday, that specific construction or transport delivery tasks would also occur on a weekend when impacts to local community and business can be reduced)
2. Activities within the site compounds and other site facilities are expected outside the normal working hours to facilitate pre-starts, safety inductions and toolbox talks.
3. In addition, certain circumstances, such as the delivery of works plant or construction material along with certain work activities which require completion that day may be conducted outside the normal standard hours of operations.

   This may occur even when work is scheduled for completion during normal standard hours of operations, due to the continuous nature or requirements of the work. Safety reasons may also dictate that the delivery of works plant or construction material is required to travel outside of normal hours of operation to reduce road network impacts. In this situation, local authorities should be notified as appropriate.

Nonetheless, the timings indicated should be adhered to wherever possible to minimise the impact to the local road network, users and local residents. Typical vehicle access times are provided in Table 13-4.

Table 13-4 Typical vehicle access times to/from site (final working hours to be confirmed)

Vehicle Type	Typical Travel Times	Vehicle Speeds	Comment
General workers vehicles / Medium Rigid Vehicle's and below	5:00am-7:00pm Monday to Saturday	As posted on local road network.	
Heavy Rigid and Articulated Vehicles	6:30am- 7:00pm and in consultation with school bus operators.	As posted on local road network. Speed on site will be dictated by nominated contractors HSMP.	Occur only outside of typical local road network peak operational times in order to minimise disruption.
Over-Dimensional Vehicles	TBC by NHVR permit approval (in consultation with DoT-RRV, Council and DEDJTR).	Usually undertaken with convoy at controlled speeds of 20kph and lower.	Subject to transport contractor review.

School bus routes operate throughout the area and OD and construction vehicles must not interfere with their operation. Any school bus routes should not be used by construction and OD vehicles during bus operating times.

General

Public consultation, advertising and complaints

Public communication should be undertaken by a nominated project team member with regards to any traffic matters causing disruption to local business or residents in accordance with a developed Community Engagement Plan. This plan sets out relevant stakeholders and means of communication with local residents, property owners and road users in relation to traffic deliveries, timeframes, and any traffic related activities with potential to disturb or disrupt local traffic. An underlying principle of the plan is that early and frequent communication with local stakeholders would reduce potential for complaints.

Complaints should be managed in accordance with a Complaints Investigation and Response Plan developed for the project. The plan applies on a whole of project basis and outlines how complaints will be received, administered, investigated, and managed.

In the event of unexpected impacts, the relevant Site Manager should be contacted and reference to the Complaints Investigation and Response Plan be undertaken to resolve such impacts in a timely and safe manner.

Road authority notifications

DoT and CoGG would have specific road authority notifications for what would need to be conducted and adhered to. Such measures might typically include:

1. VMS or additional signage erection as part of road works to be put in place to inform local road users of works or closures to be informed 2 weeks prior to the construction works and/or closure occurring.
2. Directly affected business / residents to be notified (letter drop or other means), also see above subsection.
3. 24-hour public complaints hotline or website that allows public to raise concerns and issues directly with the nominated contractor.

Local business/resident/visitor/tourist and access impacts

Local impacts

Notable considerations include:

1. Local land use access and operations.

2. Maintenance requirements and protocols will need to be co-ordinated and agreed. Expected that inspection prior to construction would occur and any issues fixed as required.
3. Agree measures to control work sites and protocols to deal with ad-hoc people entering the site area. Including safety protocols for a range of events including fire.
4. Visitors and tourists to travelling onwards to the proposed GeelongPort TTLine terminal.

Wider impacts

Expected to be limited to any OD vehicle access requirements. During these times the appropriate warning signage, along with temporary reductions in speed limits, should be in place for all affected intersection approaches. The temporary reductions in speed limits are to only be in place while the OD movements are taking place and must not be visible to traffic at all other times (Worksite TMPs may be required for these specific circumstances).

OD vehicles should travel under convoy at speeds typically around 20km/hr. To reduce road closures on two-way road sections, vehicles can traverse road shoulders or be stopped in designated zones to allow for safe passage of the OD vehicle before proceeding on their respective journey.

As advised in this section an accumulation of the control measures would be required during OD transportation and reduce impacts to the wider road network and its users. This would be considered further once the nominated transport contractor is hired and assessments completed as part of the associated TMP which would be reviewed and verified by NHVR (in consultation with relevant road authorities).