St Marys Freight Hub

Operational Traffic and Access Management Plan

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1. INTRODUCTION

1.1 Background

The St Marys Freight Hub Project includes a rail link to the existing Main West Railway Line (Main West Line) approximately 300m west of St Marys Station, hardstand area for container storage and operations, new internal vehicle access roads from Lee Holm Road and Forrester Road, office, ancillary site and operational facilities, signage, landscaping, utility services, vegetation works, construction and operation of the Project, with a maximum operating capacity of 301,000 Twenty-Foot Equivalent Units (TEUs) per annum. The facility will operate 24 hours a day, 7 day a week.

The site is shown in Figure 1.1.



Adapted from SIX Maps

Figure 1.1: Project Site

1.2 Approval Details

The St Marys Freight Hub project (modification 5), hereafter referred to as the Project, received development consent by the NSW Department of Planning, Industry and Environment on 7 May 2021 (SSD7308-MOD 5).

Condition D8 of the consent states:

"Prior to the commencement of operation, the Applicant must prepare an Operational Traffic and Access Management Plan (OTAMP) and submit it to the Planning Secretary for approval. The OTAMP must be prepared by a suitably qualified and experienced person(s) in consultation with Council and TfNSW. The OTAMP must address the following:

(a) detail numbers and frequency of truck movements, sizes of trucks, vehicle routes and hours of operation;

(b) detail access arrangements for the site to ensure road and site safety, and demonstrate there will be no queuing on the road network;

(c) detail measures to ensure turning areas and internal access roads are kept clear of any obstacles, including parked cared, at all times; and

(d) *set out a framework and procedures, agreed with TfNSW, for data collection required to prepare the Biannual Trip Origin and Destination Report required under condition E8 including a main gate monitoring system (e.g. CCTV) to identify heavy vehicles turning left from the site onto Forrester Road, or turning right from Forrester Road to the site".*

Condition E8, which is referenced in Condition D8 states:

"*Each six months following the commencement of operation, the Applicant must prepare a Biannual Trip Origin and Destination Report (in a format agreed with TfNSW under condition D8(d)) that advises:*

(a) the total number of actual and standard twenty-foot equivalent shipping containers despatched and received during this period;

(b) the number of actual and standard twenty-foot equivalent shipping containers transported to and from the site by rail during the period;

(c) actual hours of operation for the truck gate listing days and hours of operation;

(d) records of vehicle numbers accessing the site including a record of heavy vehicle entry by date and approximate time;

(e) direction of travel into and out of the site for light vehicles on a representative day; and

(f) representative vehicle origins and destination of all classes of vehicles and covering the intermodal terminal and any other uses.

A copy of the report required under condition E8 is to be submitted to the Planning Secretary and TfNSW within one month of its preparation."

Condition E19 of the consent states:

"The Applicant must operate the project to ensure the following:

(a) safe pedestrian access to the station entrance away from heavy vehicle movements; and

(b) truck movements are reduced to the greatest extent possible during school pick up/drop off times."

1.3 Report Contents and Structure

Bitzios Consulting has been engaged by Pacific National (the Applicant) to prepare an Operational Traffic and Access Management Plan (OTAMP) for the project.

This OTAMP has been prepared in accordance with Conditions D8 and E19 of the development consent and has been prepared as part of a State Significant Development (SSD) Application for which approval was sought under Section 4.38 of the *Environmental Planning and Assessment Act 1979*. The requirements of these conditions and where they are addressed in this OTAMP are presented in Table 1.1.

Table 1.1: Condition Items and Response Locations in this OTAMP

Condition Requirement	Addressed in Section(s)
Condition D8	
Prior to the commencement of operation, the Applicant must prepare an **Operational Traffic and Access Management Plan (OTAMP)** and submit it to the Planning Secretary for approval. The OTAMP must be prepared by a suitably qualified and experienced person(s) in consultation with Council and TfNSW. The OTAMP must address the following: (a) detail numbers and frequency of truck movements, sizes of trucks, vehicle routes and hours of operation;	Multiple sections
(b) detail access arrangements for the site to ensure road and site safety, and demonstrate there will be no queuing on the road network;	3.2.3, 3.2.5
(c) detail measures to ensure turning areas and internal access roads are kept clear of any obstacles, including parked cared, at all times; and	3.2.3, 3.2.5
(d) set out a framework and procedures, agreed with TfNSW, for data collection required to prepare the Biannual Trip Origin and Destination Report required under condition E8 including a main gate monitoring system (e.g. CCTV) to identify heavy vehicles turning left from the site onto Forrester Road, or turning right from Forrester Road to the site.	1.2, 6.2
Condition E19	
The Applicant must operate the project to ensure the following: (a) safe pedestrian access to the station entrance away from heavy vehicle movements; and (b) truck movements are reduced to the greatest extent possible during school pick up/drop off times.	2.6

In addition to the above, Penrith City Council provided comments on the draft OTAMP, which have been addressed in this version. A table of Bitzios Consulting's responses to each comment is provided in Table A.1 in **Appendix A**.

The remainder of this OTAMP is structured as follows:

- **Section 2 – Site and Project Descriptions:** Describes the site description and environment, including road network, operations overview and the predicted impacts to the surrounding traffic environment
- **Section 3 – Operational Traffic and Access Management Plan:** Outlines the site's operational framework and access arrangements
- **Section 4 – Traffic Management Controls:** Provides an overview of traffic management controls proposed during operation of the Project
- **Section 5 – Traffic Management Procedures:** Outlines traffic management procedures to ensure traffic during operations is managed safely and appropriately
- **Section 6 – Inspections and Monitoring:** Outlines procedural requirements for inspections and monitoring to ensure compliance with the OTAMP
- **Section 7 – Review and Improvement:** Outlines the process for ongoing review and improvement of the OTAMP
- **Section 8 – Documentation:** Outlines the documentation requirements for the OTAMP.

1.4 Responsible Person

The responsibility for the implementation of this OTAMP rests with the site manager.

2. SITE AND PROJECT DESCRIPTIONS

2.1 Regional Context

The Project site is located approximately 43km north-west of the Sydney CBD and 48km north-west of Port Botany. It is situated within the Penrith Local Government Area, approximately 8km east of Penrith City Centre.

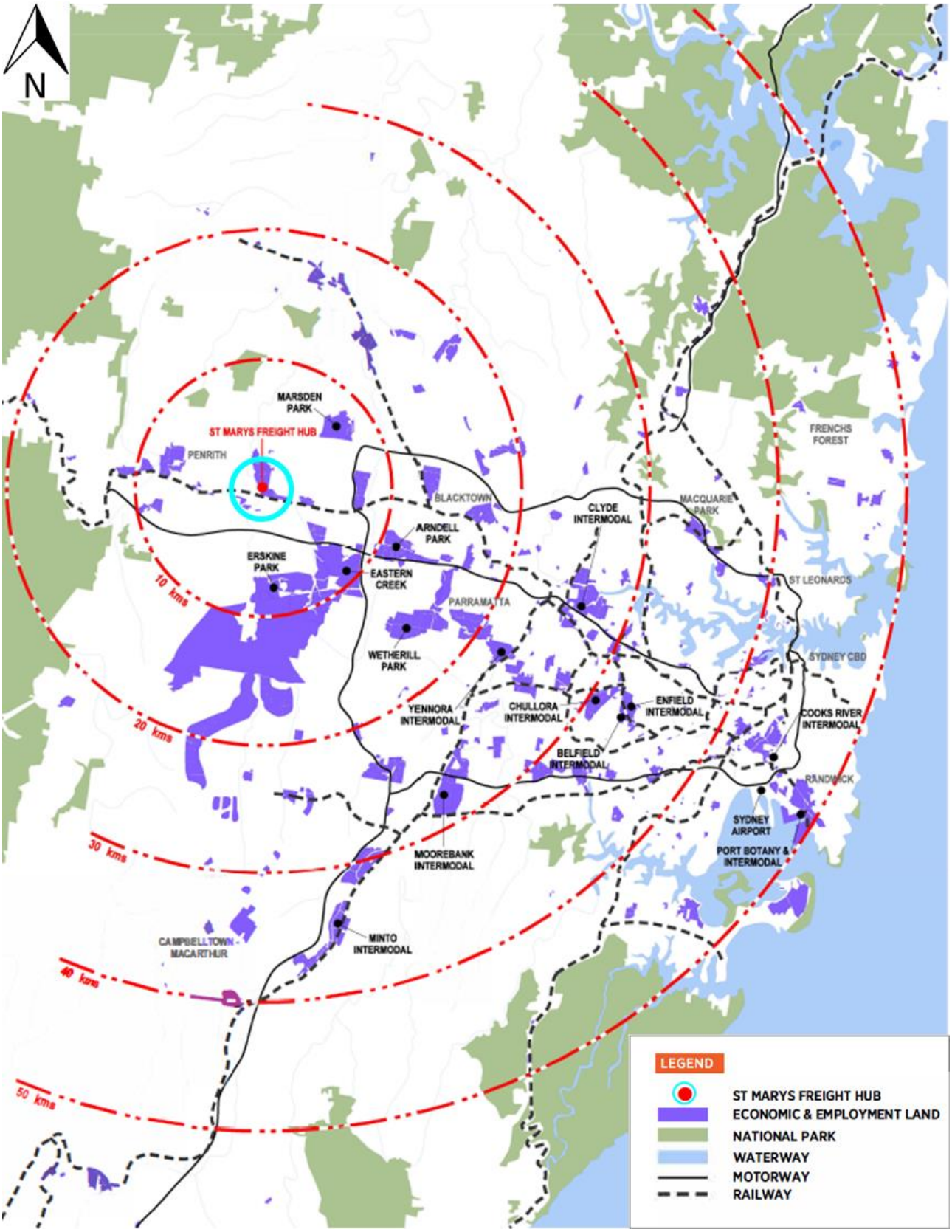
The site is located approximately 1.8km north-west of the Great Western Highway/Glossop Street intersection and 3km north-west of the Mamre Road/M4 Western Motorway (M4) interchange. The M4 provides the primary road link between the site and key employment and industrial areas across Western Sydney, and the Westlink M7 Motorway (M7) to the east. The M7 connects to northern and southern NSW, as well as the wider state road network.

The site utilises the former Dunheved Railway spur line that is connected to the existing Main West Line approximately 300m west of St Marys Station. The Main West Line provides suburban (Emu Plains to City), intercity (Bathurst to Sydney) and regional (Dubbo and Broken Hill to Sydney) passenger services, the Indian Pacific, and freight rail connections to Port Botany, other intermodal terminal facilities in Sydney, regional NSW and interstate freight rail lines.

Trains will deliver full containers from Port Botany to St Marys where they will be unloaded onto the site and then reloaded onto trucks that will then make deliveries to freight forwarders, warehousing and distribution centres in areas such as Erskine Park, Eastern Creek, Arndell Park, Wetherill Park, Marsden Park. Empty or full containers will be delivered by truck to the site and then loaded onto trains to be sent to Port Botany. No warehouse facilities for stuffing or de-stuffing containers are proposed on-site.

The intermodal facility will reduce the length of many truck trips that are currently accessing customers located in Western Sydney via Port Botany (*1 truck from St Marys replaces roughly 9-10 trucks from Port Botany, equating to an estimated 10 million truck kilometres removed per year*).

The regional context of the Project is shown in Figure 2.1.



Source: St Marys Freight Hub Environmental Impact Statement (SITE planning + design & Urbanco, May 2019), Figure 3

Figure 2.1: Regional Context of the Project

2.2 Local Context

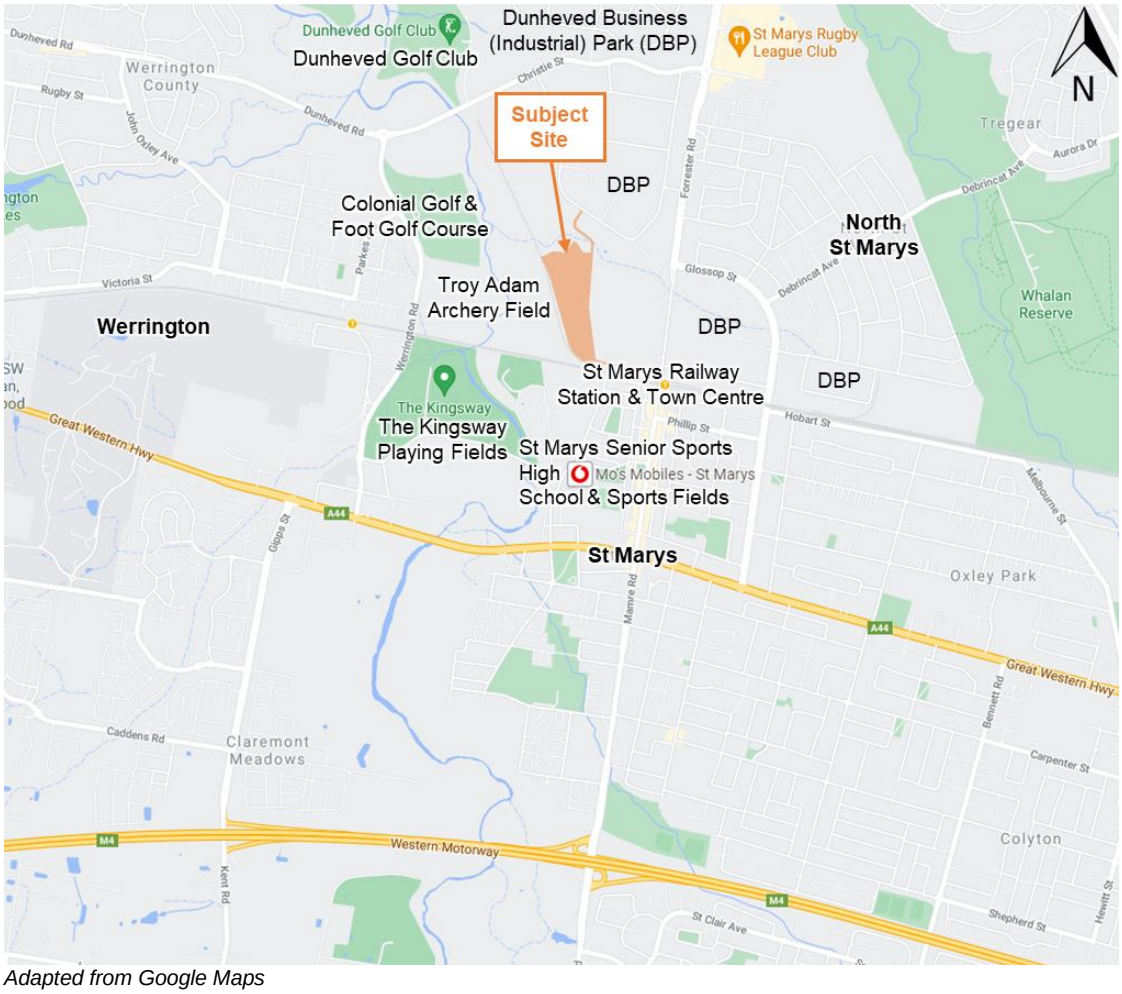
The Project site is located in the industrial suburb of St Marys, which consists of approximately 2,550,000m^2 of industrial development. The surrounding area includes:

- The Dunheved Business (Industrial) Park and Dunheved Golf Course to the north
- Dunheved Railway spur line west of the site, connecting to the Main West passenger and freight rail line south of it
- The St Marys Senior High School sports fields and public recreation fields to the south
- St Marys Railway Station and multi-level commuter car park to the south-east
- St Marys Town Centre to the south-east, comprising commercial and retail services and facilities
- A portion of the broader site (west of the rail siding), South Creek, the Colonial Golf and Footgolf Course, the Troy Adams Archery Field and areas of public recreation to the west.

A number of residential suburbs are located in proximity of the site. The approximate distance of these suburbs to the site are provided in Table 2.1 and the local context is presented in Figure 2.2.

Table 2.1: Distance to Residential Suburbs from the Project Site

Residential Suburb	Approximate Distance to St Marys Freight Hub Site
St Marys	200m to the south
North St Marys	600m to the east
Werrington	800m to the west



Adapted from Google Maps

Figure 2.2: Local Context of the Project

2.3 Development Overview

The development involves the construction and operation of the St Marys Freight Hub, an intermodal terminal facility comprising of a rail link to the existing Main West Line, container storage and operations, new internal vehicle access roads from Lee Holm Road and Forrester Road, office, and ancillary site and operational facilities. Key components of the Project are summarised in Table 2.2.

Table 2.2: Key Components of the Project

Construction Activities	Ancillary Development
▪ Hardstand area for container storage and laydown, rail and vehicle loading and unloading areas ▪ New internal access roads providing separate ingress and egress for light and heavy vehicles as follows: - To/from Lee Holm Road for light vehicles - To/from Forrester Road for heavy vehicles. ▪ Wash bay area ▪ Office building pad site ▪ Fuel storage area ▪ Container workshop (repair bay) pad site ▪ Transport workshop pad site ▪ Staff and visitor light vehicle parking bays ▪ Heavy vehicle parking bays.	▪ Signage and landscaping ▪ Utility services to support the proposed development including drainage, potable water, water (for firefighting purposes), power, data, security and sewerage ▪ Minor realignment of a section of the Sydney Trains high voltage overhead power line at the southern end of the subject site ▪ Minor clearing of areas of vegetation regrowth, remediation and minor earthworks ▪ Electrical transformer.

2.4 Built Form

2.4.1 Terminal Hardstand

The terminal hardstand provides a large container storage and operating area. This area will be connected to the Dunheved Railway spur line, allowing efficient freight transfer between the storage area and freight trains.

2.4.2 Office and Maintenance Facilities

Office and maintenance facilities are located on the eastern property boundary of the Project site for staff, including:

- Administration offices
- Wash bay
- Fuel storage area
- Transport workshop
- Container repair workshop.

2.4.3 Vehicle Access and Movements

The Project will include the following two site access points:

- **Access 1 –** New driveway on the northern boundary on Lee Holm Road, west of No. 83-91. It will provide access for light vehicles via a 6m wide driveway with two-way traffic to the staff and visitor car park, office and ancillary facilities
- **Access 2 –** Existing driveway on the south-eastern boundary near the southern (cul-de-sac) end of Forrester Road. It will provide access for heavy vehicles via an 10m wide driveway, wide enough to accommodate two-way B-doubles. To accommodate the safe, simultaneous entry and exit of B-doubles, the driveway crossover will be widened and access-controlled through a range of measures.

Further details on vehicle access and circulation within the site are provided in Sections 3.2.3 and 3.2.5 respectively.

2.5 Ancillary Infrastructure

Ancillary supporting infrastructure are to be implemented to facilitate the operation of the site and minimising the environmental impact. The ancillary infrastructure consists of:

- Signage installation throughout the internal and access road network for the purpose of traffic control and wayfinding the site facilities
- Utility services to support the proposed development including drainage, potable water, water (for firefighting purposes), power, data, security and sewerage
- Minor realignment of a section of the Sydney Trains high voltage overhead power line at the southern end of the subject site
- Minor clearing of areas of vegetation regrowth, remediation and minor earthworks
- Electrical transformer.

2.6 Operational Hours

The Project's transport operations are proposed to be 24/7, except for a cease of operations from Saturday 2pm to Sunday 4am. Rail intermodal operations are also proposed to be 24/7. Empty depot operations are proposed to be 24 hours a day, Monday to Friday and possibly on Saturday from 5am-12pm. The Project's proposed operating hours and staff by shift are summarised in Table 2.3. Truck movements to and from the site will be reduced by 33% between 7:30-9am and 2:30-4pm on weekdays to a maximum of 15 trucks IN and 15 trucks OUT over each 1.5-hour school period.

Table 2.3: Proposed St Marys Freight Hub Operating Hours and Staffing

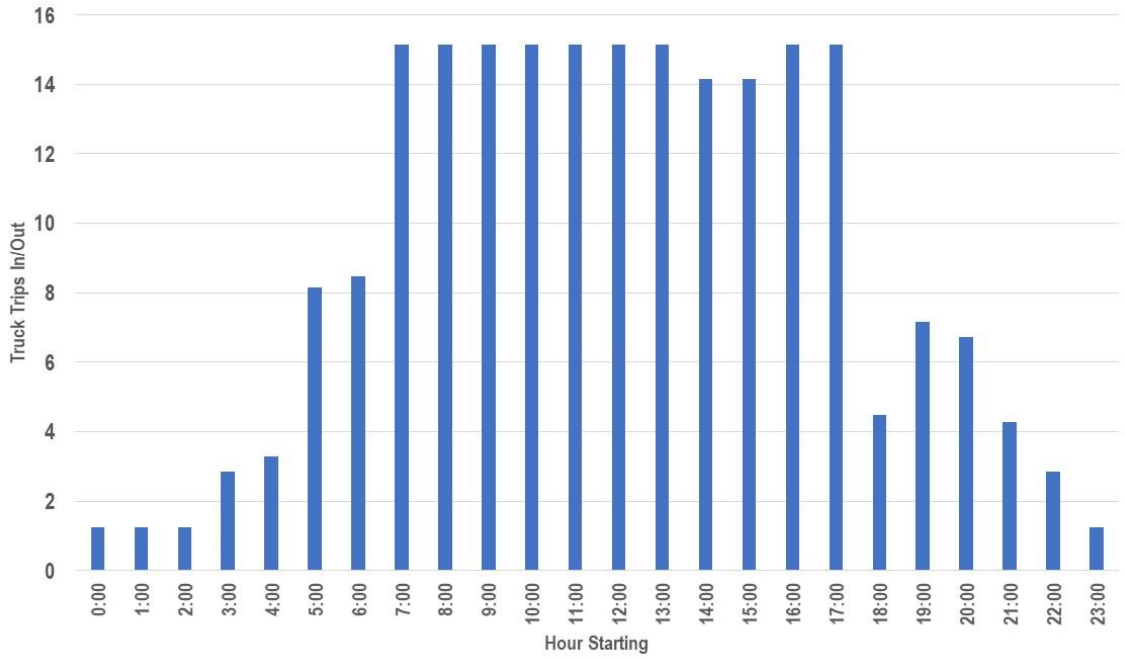
Section	Approx. Staff	Hours	Details
1. Administrative/management staff per mantle deployed to St Marys	30	▪ 4am-4pm (day shift)	Office staff generally work a maximum 10-hour shift within the span of hours provided
	7	▪ 4pm-4am (night shift)	
2. Truck drivers starting and ending their shifts at St Marys, Train drivers and ground crew	20	▪ 7 trucks 5am-3pm ▪ 8 trucks 6am-4pm (day shift)	Drivers generally work 10 hours per day
	20	▪ 7 trucks 3pm-1am ▪ 8 trucks 4pm-2am (night shift)	
3. Permanent service/maintenance staff stationed at St Marys	8	▪ Usually 5am-5pm	Staff generally work a maximum 10-hour shift within the span of hours provided
	2	▪ Usually 5pm-5am	
4. Permanent terminal staff (reach stacker, forklift operators, and any other administrative/ground staff)	23	▪ 24 hours	3 equal shifts which will not coincide with road peak hours

2.7 Traffic Generation

The full traffic generation calculations are contained in Section 3 of the Traffic and Transport Impact Assessment, submitted as Appendix 4 of the EIS, see:

https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-7308%2120190517T232741.042%20GMT)

During the operational period, the site is forecast to generate 436 truck trips per day (218 in and 218 out). Approximately 80% of all daily trips will take place between 6:00am and 6:00pm (174 trips each way). As shown in Figure 2.3, this equates to 15 trucks in and out during the AM and PM peak hours comprising of a mix of semi-trailers and B-doubles.



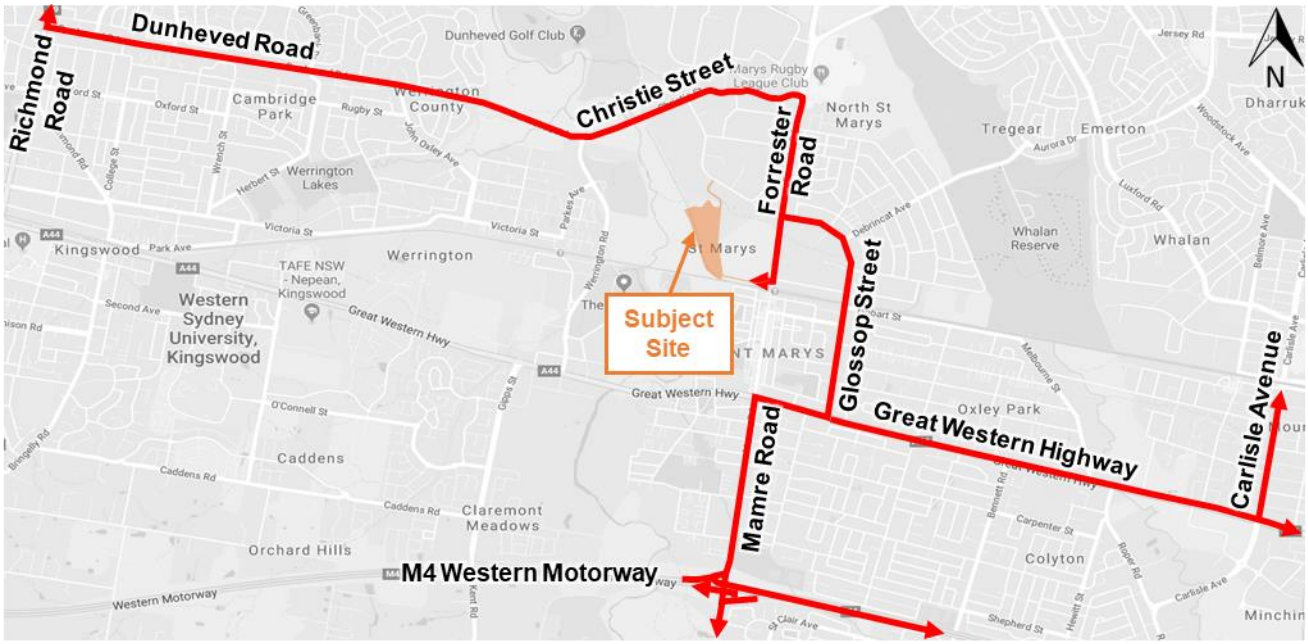
Source: Section 3 of the Traffic and Transport Impact Assessment

Figure 2.3: Truck Trip Generation Profile Each Day

From Table 2.3, assuming a rate of one private vehicle per worker, the maximum traffic generation by site staff is expected to approximately 124 light vehicles (both ways) per day with a maximum of approximately 40-45 light vehicles on-site during the day. Given that most of the workers' shifts start and end outside of road network peak hours, the traffic generation of light vehicles at times co-incident with the road peak is expected to be minimal with negligible impacts.

2.8 Approved Truck Routes

The approved truck routes to and from the Project site are shown in Figure 2.4. Only these routes are to be used at all times.



Adapted from Google Maps

Figure 2.4: Approved Truck Routes to/from the Project Site

3. Operational Traffic and Access Management Plan

3.1 Principles, Objectives, Requirements and Criteria

3.1.1 Traffic and Transport Management Principles

The overall principles for the OTAMP during the operational phase of the Project are to:

- Provide a safe and convenient environment for pedestrians
- Minimise impacts on pedestrian movements and amenity
- Manage and control vehicular movements to and from the site
- Maintain traffic capacity at intersections and along mid-blocks in the vicinity of the site
- Maintain access to adjacent properties to the site
- Restrict vehicle activity to designated truck routes within the site
- Protect and maintain safety for onsite workers
- Provide appropriate access to and from the site for all operational traffic
- Manage and control vehicle activity in the vicinity of the site.

3.1.2 Scope

The scope of impacts addressed by this OTAMP are for traffic (including cars, light trucks and heavy trucks) and pedestrian operations.

3.1.3 Objectives

The key objectives of the OTAMP are to:

- Protect the safety of onsite personnel, pedestrians and drivers
- Manage operational activities so that they do not adversely compromise safe traffic flow within and surrounding the site
- Minimise environmental impacts due to operational traffic
- Manage operational traffic so that it does not interrupt traffic on the surrounding road network.

3.1.4 Regulatory Requirements

Relevant aspects of the following regulatory requirements must be addressed within the OTAMP that would be developed by the operator for the Project:

- Conditions of Consent for the Project
- *Environmental Planning and Assessment Act 1979*
- *Environmental Planning and Assessment Regulation 2000*
- *Heavy Vehicle (Adoption of National Law) Act 2013*
- *Heavy Vehicle (Adoption of National Law) Regulation 2013*
- *Road Transport (Safety and Traffic Management) Act 1999*
- *Roads Act 1993*
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulation 2011*.

3.1.5 Performance Criteria

The performance criteria that the OTAMP will be assessed against include:

- Zero safety incidents
- Adherence to any relevant permits and/or licence conditions
- Minimal delays to traffic on the road sections affected by the operations
- No complaints in relation to onsite operational traffic from neighbouring property owners or residents in the local area
- Level of access provided through the use of designated ingress and egress points
- Responses to all issues, queries and concerns within an agreed timeframe as detailed within the Operational Environmental Management Plan (OEMP)
- Compliance with all standards, regulations and codes.

3.1.6 Implementation and Operation

The OTAMP will form part of the suite of environmental management documents developed under the OEMP for the Project. The implementation of the OTAMP will occur prior to the approved commencement of operation of the Project and will conform to the processes identified within this document and those identified within the OEMP.

3.2 Project Operational Framework

3.2.1 Operations Overview

The Project involves the operation of the St Marys Freight Hub, an intermodal terminal facility comprising of a rail link to the existing Main West Line, container storage and operations, office, ancillary site and operational facilities and an internal vehicle access road between site accesses from Lee Holm Road and Forrester Road.

Key components of the Project include:

- Hardstand area for container storage and laydown, rail and vehicle loading and unloading areas
- New internal access roads providing separate ingress and egress for light and heavy vehicles as follows:
  - To/from Lee Holm Road for light vehicles
  - To/from Forrester Road for heavy vehicles.
- Wash bay area
- Office building pad site
- Fuel storage area
- Container workshop (repair bay) pad site
- Transport workshop pad site
- Staff and visitor light vehicle parking bays
- Heavy vehicle parking bays.

The transfer of containers between road and rail would occur entirely within the Project site and would not impact on the performance of the surrounding road network or the main internal road through the site. Designated routes in the surrounding road network, as shown in Figure 2.4, will be used by trucks to move containers between the site and freight destinations/origins 24 hours per day, 7 days a week.

3.2.2 Hours of Operation

The Project's proposed operating hours and staff by shift are detailed in Section 2.6.

3.2.3 Site Access Locations

The Project will include the following two site access points:

- **Access 1:** New driveway on the northern boundary on Lee Holm Road, west of No. 83-91. It will provide access for light vehicles via a 6m wide driveway with two-way traffic to the car park, office and ancillary facilities. Heavy vehicles are not permitted to use the Lee Holm Road access at any time.
- **Access 2:** Existing driveway on the south-eastern boundary near the southern (cul-de-sac) end of Forrester Road. It will provide access for heavy vehicles via a 10m wide driveway, wide enough to accommodate two-way B-doubles.

3.2.4 Forrester Road Access

To accommodate the safe, simultaneous entry and exit of B-doubles, the existing Forrester Road driveway crossover will be widened and access-controlled through a range of measures. No additional controls are to be used to restrict regular road users, including other vehicles, pedestrians, cyclists or trucks entering the Project site.

Three detection cameras will monitor the following locations:

- Vehicles exiting the St Marys Railway Station Kiss 'n' Ride drop-off zone
- Trucks entering the Project site
- Pedestrians crossing the Project site entry
- Pedestrians crossing Forrester Road.

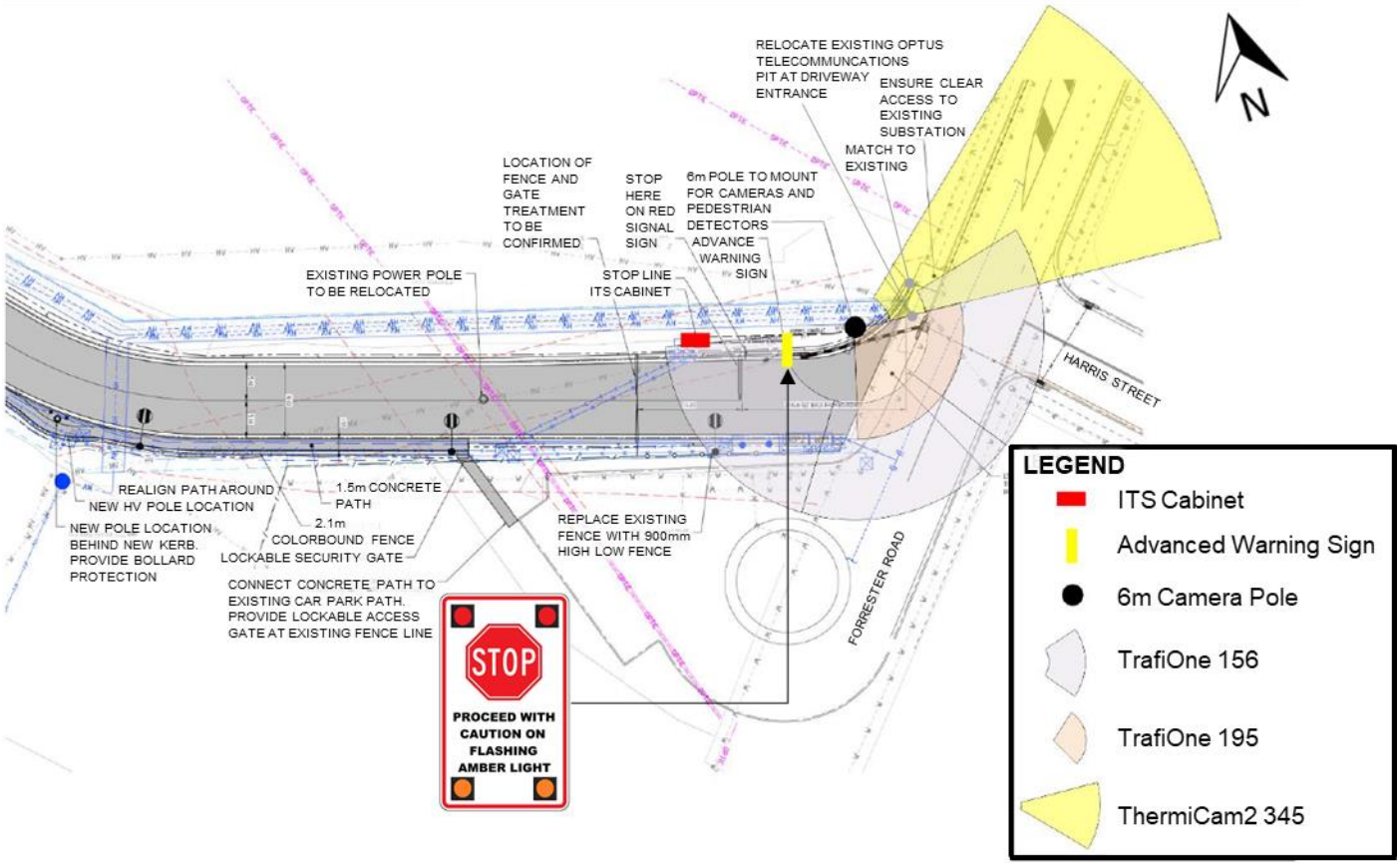
The function of each camera is explained below, and their coverage area is shown in Figure 3.1:

1. **TrafiOne 195:** This will detect pedestrians in the coverage area shown in orange, accompanied by stop/go signals to warn both entering and exiting vehicles which will give way
2. **TrafiOne 156:** This will detect exiting vehicles in the coverage area shown in purple which will be stopped upon leaving the site, giving way to pedestrians on the crossover, incoming vehicles and vehicles exiting the Kiss 'n' Ride drop-off zone. The exit will have a stop/go signal, 'STOP HERE ON RED SIGNAL' sign and an Advance Warning Sign. The camera will be focused on the stopped vehicle location to confirm that it stops at the stop line. If the vehicle fails to stop, an alert is raised. A number of cameras to detect that the exit is clear allows the vehicle to be released safely
3. **ThermiCam2 345:** This will detect incoming vehicles in the coverage area shown in yellow which will be stopped on Forrester Road prior to entering the site, giving way to any pedestrians and have clear sightlines.

During the Hazard and Operability Study workshop, Australian Container Freight Services advised that all drivers using the Forrester Road exit will be trained to understand the controls installed to assist in the safe exit of the site. All drivers will understand the different states of the Advanced Warning Sign, including when the exit is clear.

The proposed detection zones and Advance Warning Sign location are shown in Figure 3.1. Further details on the control measures are provided in the SAGE report in **Appendix B**.

The light and heavy vehicle access locations are shown in Figure 3.2.



Source: Functional Specification: 68202 – St Marys Freight Hub (SAGE Automation, December 2020), Figure 2

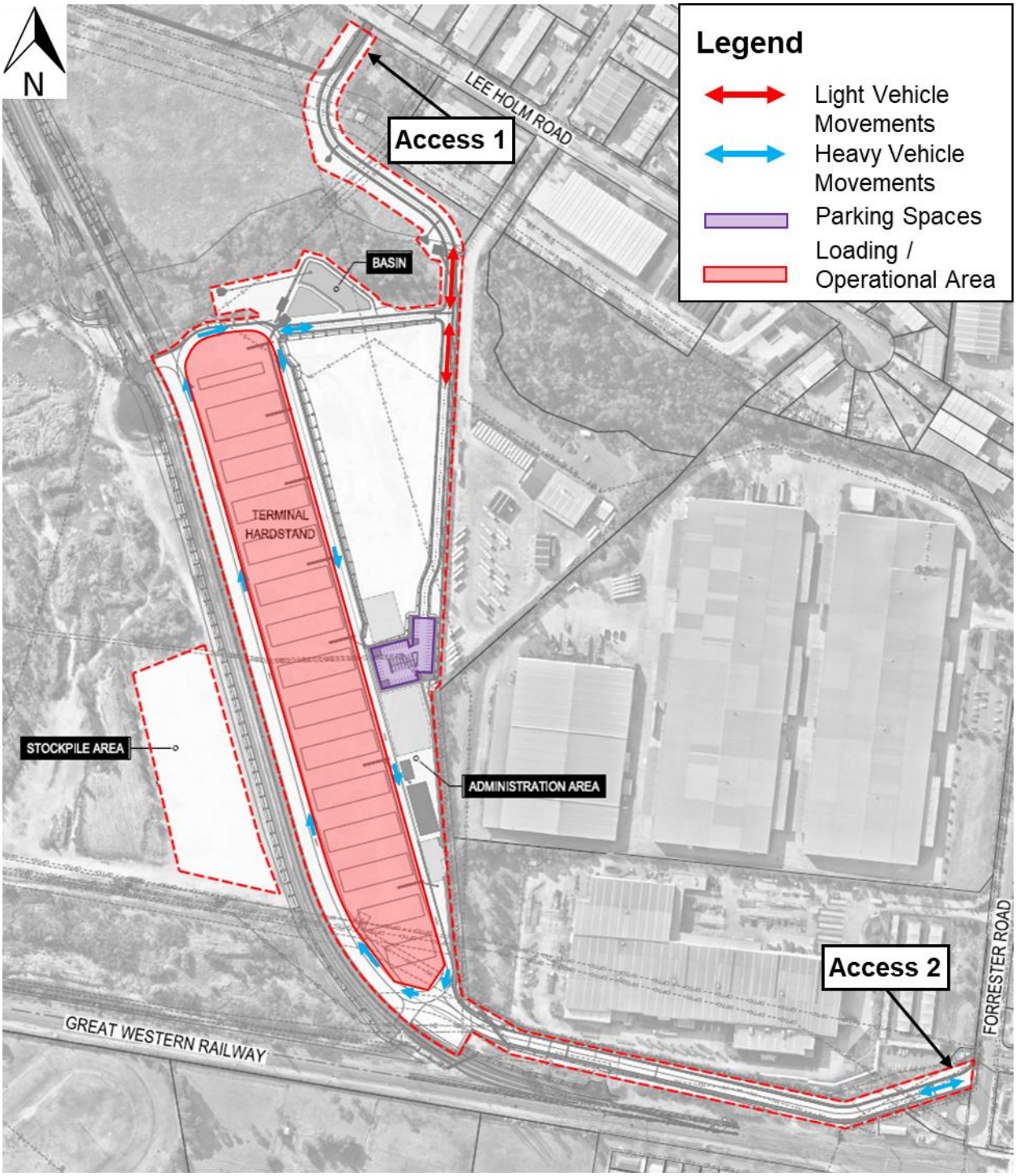
Figure 3.1: Forrester Road Heavy Vehicle Access Detection Equipment and Zones

3.2.5 Internal Roads

There will be three internal roads throughout the Project site as described below, including one for light vehicles (Internal Road 1) and two for heavy vehicles (Internal Roads 2 and 3). All internal roads will have one lane in each direction, and Internal Roads 2 and 3 will be wide enough to accommodate two-way B-doubles.

- **Internal Road 1:** Connecting the Lee Holm Road access to the car park, office and ancillary facilities. The car park will have a combined entry and exit point, and a clockwise circulating road to allow cars to turn around
- **Internal Road 2:** Connecting the Forrester Road access to Internal Road 3 at a T-intersection. There will be an unpinning area for three entering B-doubles
- **Internal Road 3:** A one-way circulating road in a clockwise direction, providing access to the container storage and operating area, and temporary stockpile area. The northern (i.e., eastbound) part of the road will have two lanes, providing a holding area for the entire 15 x B-double fleet approved to enter the site and in the event of incidents on local B-double routes. There will also be a pinning lane for three outgoing B-doubles.

The proposed internal roads are shown in Figure 3.2.



Source: BG&E

Figure 3.2: Light and Heavy Vehicle Access and Circulation within the Project Site

3.2.6 Public Transport Accessibility

The site access at Forrester Road is adjacent to St Marys Station, which provides convenient access by train via the T1 Western Line and by bus at the St Marys Interchange on either side of the station.

3.2.7 Cycle Access

The existing cycling infrastructure surrounding the site consists of mostly on-road cycle routes with bike storage facilities provided at St Marys Station.

3.2.8 Pedestrian Access

There are footpaths along each side of Forrester Road. There is only one section of footpath along Lee Holm Road along its southern side between Maxim Place and Narang Place. The limited length of footpath is consistent with the industrial land uses that front Lee Holm Road and the limited demand for pedestrian movement between them.

Pedestrians accessing the site will be encouraged to do so via the site via the Forrester Road entry due to its proximity to public and active transport facilities. As detailed in Section 3.2.3, a pedestrian route will be provided across the Forrester Road driveway crossover with automated detection of pedestrians and the stopping of exiting trucks at a signal in accordance with the SAGE system, with further details provided in the SAGE report in **Appendix B**.

3.3 Operational Traffic Conditions

3.3.1 Intersections

Table 3.1 summarises the 2030 performance of key surrounding intersections.

Table 3.1: Intersection Performance – 2030

Intersection	AM Peak				PM Peak			
	DoS (v/c)	Average Delay (s)	LoS	95th Percentile Queue (m)	DoS (v/c)	Average Delay (s)	LoS	95th Percentile Queue (m)
Great Western Highway / Queen Street/Mamre Road	0.92	55	D	355	1.09	53	D	404
Great Western Highway / Carlisle Avenue	0.80	44	D	199	0.79	46	D	278
Mamre Road / M4 (south)	0.67	20	B	218	1.21	54	D	592
Mamre Road / M4 (north)	0.84	28	B	274	0.95	36	C	570
Great Western Highway / Glossop Street	0.66	39	C	230	0.90	33	C	209
Glossop Street / Harris Street	0.52	13	A	7	0.55	13	A	4
Forrester Road / Harris Street	0.16	8	A	5	0.21	8	A	6
Forrester Road / Glossop Street	0.90	26	B	278	0.90	34	C	344

[1]*Green shading indicates that the intersection will operate below practical capacity.*
[2]*Orange shading indicates that the intersection is modelled to operate above practical capacity, but below theoretical capacity.*
[3]*Red shading indicates that the intersection that are modelled to operate above their theoretical capacity.*

The following intersections are forecast to operate at their theoretical capacity during the following peaks in 2030:

- Great Western Highway/Queen Street/Mamre Road – PM peak
- Mamre Road/M4 south – PM peak.

The following intersections are forecast to reach their practical capacity during the following peaks in 2030:

- Great Western Highway/Queen Street/Mamre Road – AM peak
- Mamre Road/M4 north – PM peak.

The following intersection approaches are forecast to have significant queues during the following peaks in 2030:

- Great Western Highway/Queen Street/Mamre Road:
  - Mamre Road south approach – AM and PM peaks (355 and 404 metres respectively).
- Mamre Road/M4 south:
  - Mamre Road south approach – PM peak (592 metres).
- Mamre Road/M4 north:
  - Mamre Road north approach – PM peak (570 metres)
  - Mamre Road south approach – PM peak (305 metres).
- Forrester Road/Glossop Street:
  - Glossop Street east approach – PM peak (344 metres).

The following mid-block traffic congestion issues are expected in year 2030 peak periods, marginally influenced by the project:

- Mamre Road south approach queues at the Great Western Highway/Queen Street/Mamre Road will extend beyond the Saddington Street intersection
- Mamre Road north approach queues at the Mamre/M4 north intersection will extend beyond the Hall Street intersection
- Mamre Road south approach queues at the Mamre/M4 north intersection will extend back beyond the Mamre/M4 south intersection and onto the M4 westbound off-ramp
- Glossop Street east approach queues at the Forrester Road/Glossop Street intersection will extend to the Telford Place intersection.

3.3.2 Road Sections

Table 3.2 shows the weekly bidirectional 2019 traffic volumes and the additional Project-related heavy truck volumes for the periods of 6am-6pm, 6pm-10pm and 10pm-6pm at key surrounding locations.

Table 3.2: 2019 Daily Traffic Volumes and Additional Daily Project Heavy Truck Volumes

Location	Period	2019 Volumes			Additional Volumes*
		Cars	Light Trucks	Heavy Trucks	Heavy Trucks
Glossop Street at No. 16	6am-6pm	88,912	11,778	4,912	394
	6pm-10pm	19,310	1,056	417	8
	10pm-6am	13,987	1,286	735	34
Forrester Road at No. 171	6am-6pm	95,808	11,470	2,975	12
	6pm-10pm	20,032	1,001	219	-
	10pm-6am	15,204	1,378	457	1
Forrester Road at No. 75	6am-6pm	15,757	1,775	259	394
	6pm-10pm	3,629	98	19	8
	10pm-6am	2,506	222	66	34
Mamre Road at No. 58	6am-6pm	105,247	11,414	5,093	331
	6pm-10pm	24,824	1,342	643	7
	10pm-6am	18,036	1,525	659	29

**Worst-case scenario based on a hypothetical calculation of all trucks being semi-trailers and B-doubles.*

The impacts of additional trucks on link capacity are minimal with most locations subject to much less than a 10% increase in truck traffic and a maximum 1-2% increase in total traffic. The only exception is on Forrester Road (south) where there are no residential properties located and the road is industrial in character.

4. TRAFFIC MANAGEMENT CONTROLS

4.1 Workplace Safety Training

Employees, contractors and truck drivers must be informed of relevant policies and procedures relating to safety management measures when on-site, or for accessing the site, including those detailed in Chapter 5 of this report. Specifically:

- **Employees:** All employees are to complete site induction and initial and recurring safety training on risk management and emergency procedures related to their conduct when in their vehicle(s) or on foot within the site. Induction requirements will include visitors who, after accessing the site office, enter further into the site in their vehicle(s) or on foot. All staff and visitors arriving to the site in light vehicles are to be advised to do so via the Lee Holm Road access
- **Contractors (other than truck drivers):** Are required to complete site-specific inductions before accessing the site. Contractors are required to report directly to the site office to advise of their presence before accessing the remainder of the site.
- **Truck Drivers:** Are to be made aware of the Forrester Road site entry and exit protocols before accessing the site. Drivers are to acknowledge their understanding and acceptance of those protocols and entry conditions before entering the site for the first time.

4.2 Personal Protective Equipment

All employees and contractors are required to wear the appropriate Personal Protective Equipment (PPE) while undertaking work within the facility. Minimum PPE requirements are to be adhered to as outlined within the relevant operational documentation and legislation. High visibility clothing is to be worn by all employees at all times while on-site.

4.3 Liaison with Stakeholders

Prior to the commencement of operation of the site, a written notification is to be provided to nearby sensitive receptors that would likely be affected by the operation of trucks into and out of Forrester Road. This includes, but is not limited to, local residents and nearby businesses along Forrester Road south, and relevant authorities.

5. TRAFFIC MANAGEMENT PROCEDURES

5.1 Heavy Vehicle Movements

A Vehicle Booking System will be implemented to:

- Manage and regulate heavy vehicles entering and exiting the site
- Prevent heavy vehicles queueing on Forrester Road. The northern (i.e., eastbound) part of Internal Road 3 will have two lanes, providing a holding area for the entire 15 x B-double fleet approved to enter the site upon exiting the site in the event of incidents on local B-double routes. There will also be a pinning lane for three exiting B-doubles. The heavy vehicle holding area within the Project site is shown in Figure 5.1.

Monitoring and controlling heavy vehicle movements impacting traffic conditions on local B-double routes such as the M4 and Great Western Highway will be managed through:

- Short-range radio communication on approach to the site, the use of Global Positioning Systems (GPS) and wireless communications
- The vehicle holding areas within the Project site in the event of incidents on local B-double routes.

5.2 Safety and Amenity of Road Users and the Public

To maintain the safety and amenity of road users and the public, the following procedures will be applied:

- A Driver Code of Conduct will be developed documenting mandatory truck routes and safe driving practises both within the site and on the surrounding road network for all users of the site and prior to the Project's commencement of operations
- All complaints involving vehicle movements and driving practices relating to operations of the site will be responded to within an appropriate time frame as determined within the OEMP.

In the unlikely event that partial road closures are required on Forrester Road, stakeholders are to be given a minimum of 48 hours advance notice of closure times. Temporary road closures and lane management will be subjected to coordination with the appropriate approval authorities. All traffic-related issues and changes will be presented to stakeholders as part of the consultation process and will be carried out in non-peak periods wherever possible.

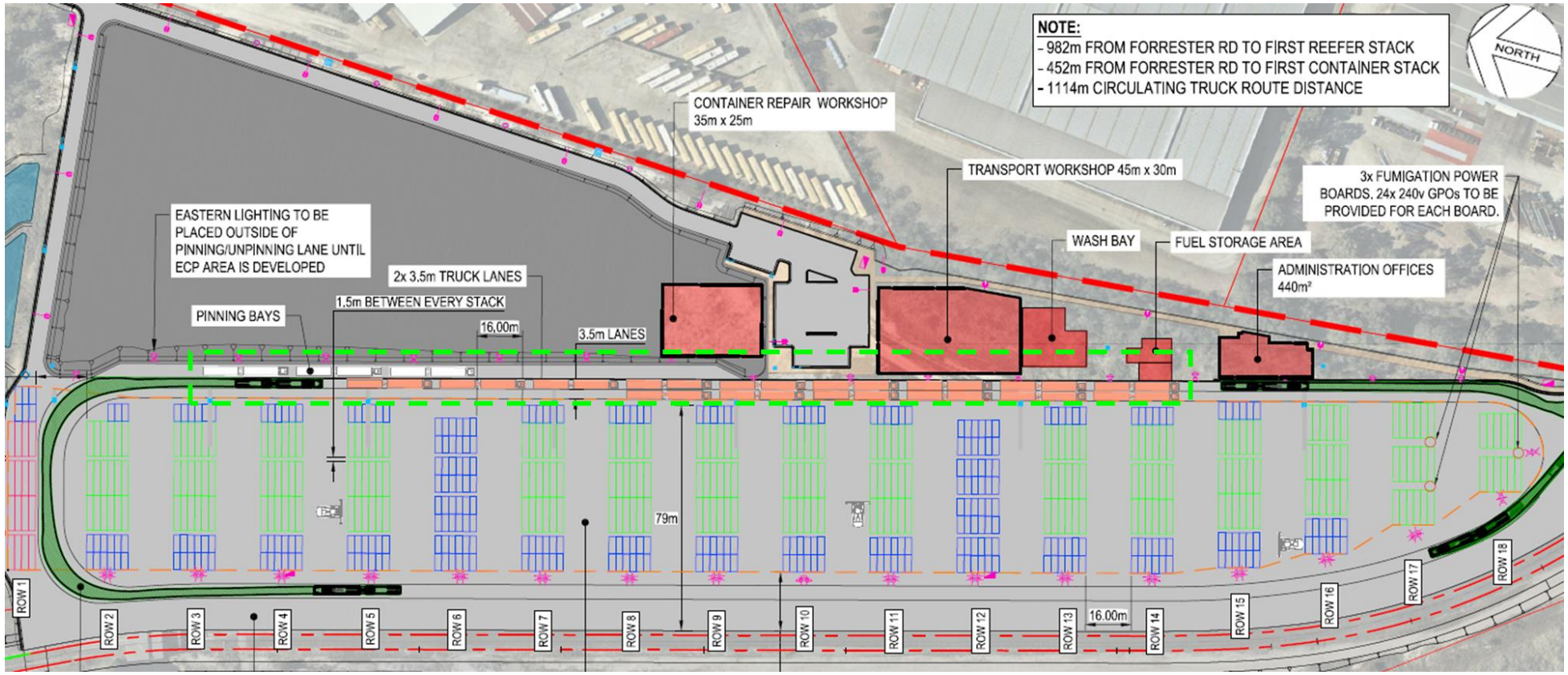
To reduce the impact on local amenity during the Project's operation:

- Existing speed limits will be followed to minimise noise generation
- Appropriate wayfinding and traffic control signs for vehicles entering and exiting the site will be installed.

5.3 Information Signage, Distance Information and Advance Warning

All appropriate signage is to be established on-site prior to the Project's commencement of operations. Signage is to be maintained regularly throughout the operational period. This signage includes, but is not limited to:

- **Information signs –** Providing advice and notification to the public of the features and facilities of the site
- **Wayfinding signs –** Guiding drivers and pedestrians to their locations within the site in a safe manner
- **Traffic control signs –** Prohibiting and regulating traffic movements
- **Warning signs –** Providing advanced notice to drivers of incoming road hazards.



Source: BG&E

Figure 5.1: Heavy Vehicle Holding Area within the Project Site

On-site traffic and pedestrian-related signage is to:

- Be approved by site management (for new signs)
- Provide clear and concise message to all users
- Not be a traffic safety hazard in their construction or operation.

All road-related signage is to be manufactured and constructed in accordance with:

- AS1742: Manual of uniform control traffic devices
- AS1743: Road signs – Specifications
- AS1744: Standard alphabets for road signs.

5.4 Incident Management

In the event of a site safety incident in relation to traffic or pedestrians, the following procedure will be triggered:

- Preparation of an Incident Report, including a summary of the incident, its cause and the outcomes of the incident investigation
- Detail any communication with stakeholders regarding the incident
- Undertake monitoring of the cause(s) of the incident if possible
- Detail corrective and preventative actions that have been, or will be, implemented to address the incident and prevent its recurrence
- Following approval from the site manager, implement recommended modifications to site traffic and pedestrian management procedures, signage, or other infrastructure
- Report the findings of the investigation to the site manager and/or relevant authorities if necessary.

5.5 Emergency Response

It is imperative that emergency vehicles access to, from and within the site be maintained during the Project's operation. Fire, ambulance and police services must have unencumbered access to all of the Project site areas at all times.

The nearest public hospitals are:

- **Nepean Hospital –** Derby Street, Kingswood NSW 2747, approximately 9.9km from the site
- **Blacktown Hospital –** 18 Blacktown Road, Blacktown NSW 2148, approximately 18.3km from the site.

The nearest ambulance station is located at 124 Ellsworth Drive, Tregear NSW 2770, approximately 3.8km from the site.

The nearest fire station is St Marys Fire Station, located at 1 Marsden Road, St Marys NSW 2760, approximately 3.3km from the site.

The nearest police station is St Marys Police Station, located at 38-42 King Street, St Marys NSW 2760, approximately 2.9km from the site.

6. INSPECTIONS AND MONITORING

6.1 On-Site Inspections Report

At the Project's commencement of operations, and then every six months thereafter, traffic and pedestrian safety inspections are to be undertaken to within the site and as its accesses to:

- Identify any traffic and/or pedestrian hazards within the site
- Recommend measures to mitigate the traffic and/or pedestrian hazards identified
- Modify the traffic and pedestrian management procedures within, or referred to, by this OTAMP.

Inspections are to be completed by an NSW-accredited Road Safety Auditor and a report is to be prepared and maintained on-site.

6.2 Monitoring Requirements

6.2.1 St Marys Freight Hub Traffic Monitoring Report

Truck and container movements and site operations are to be monitored, as follows:

- Record the number of standard twenty-foot equivalent shipping containers despatched and received by road each day
- Record the number of standard twenty-foot equivalent shipping containers despatched and received by rail each day
- Record the hours of operation for the truck gate at the Forrester Road access each day
- Record the heavy vehicle volumes entering the site via the Forrester Road by day and by time (maximum 15-minute intervals)
- Record the total vehicle volumes entering and exiting the site via the Lee Holm Road access by day and by time (maximum 15-minute intervals)
- For a single representative day, every 6 months record the direction of travel for light vehicles into and out of the site
- For a single representative day, every 6 months record the origins and destination of all classes of vehicles entering and leaving the site via either access using an origin-destination survey. The survey locations are defined in Figure 6.1 and the output is to be origin-destination traffic matrices by hour by vehicle class, as follows: light vehicles, rigid trucks, articulated trucks
- Prepare a St Marys Freight Hub Traffic Monitoring Report including the above data every 6 months.

A copy of the report is to be submitted to the Planning Secretary and Transport for NSW within one month of its preparation.

6.2.2 Other On-Site Monitoring

The site manager is responsible for other ad-hoc on-site monitoring such as:

- Visual monitoring of traffic and pedestrian movements on-site for risk identification
- Inspection of the access roads to ensure that the road pavement conditions do not have an adverse impact on traffic or pedestrian safety.
- Inspection of traffic control and warning signage throughout the site to ensure they are adequately maintained, have sufficient visibility and remain appropriate for changing circumstances on site.

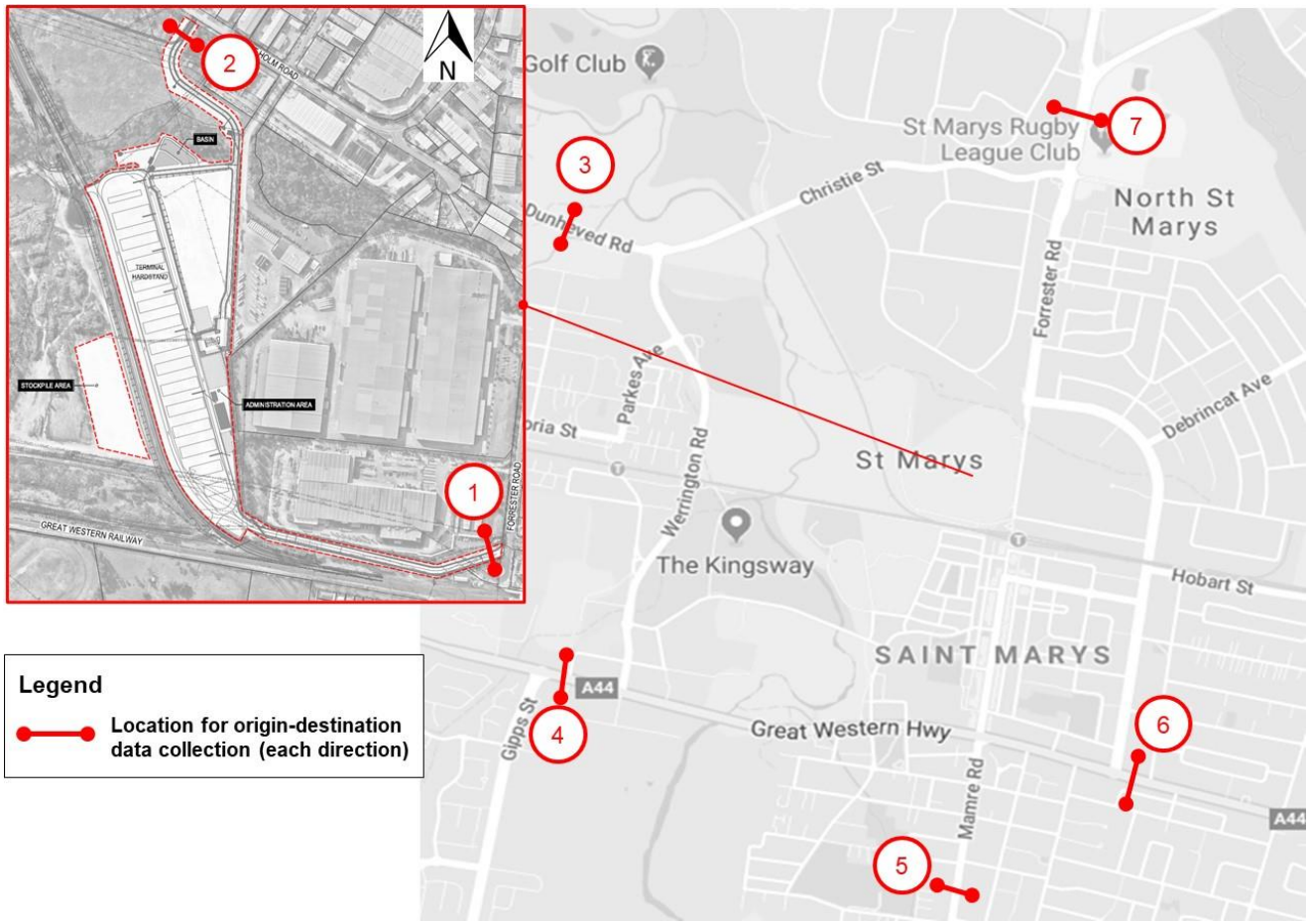


Figure 6.1: Origin-Destination Survey Data Capture Locations

6.3 Corrective Actions

The implementation of corrective actions to address any traffic and/or pedestrian safety issues identified during inspection and monitoring processes is the responsibility of the site manager.

7. REVIEW AND IMPROVEMENT

An effective OTAMP includes processes that allow for continual improvement which will be provided within the OEMP. The OEMP will identify the processes for providing effective feedback on the environmental performance of the operations of the Project.

Updates or amendments of the OEMP would be implemented where mitigation strategies are not achieving compliance. Continual improvement through planning, implementing, acting and monitoring the environmental performance of the Project will occur during the operational phase, as necessary.

8. DOCUMENTATION

The OEMP will include a section to identify the documentation requirements for operational traffic and pedestrian management of the Project. The section will identify the responsibilities of the project team for capturing and keeping data and documents. The operator/tenant is required to develop and implement a system for document control for documents relating to operational traffic and access management and compliance. This must be documented within the OEMP.

8.1 Document Control

The site manager will review and coordinate the preparation and distribution of operational traffic and access management documents as appropriate. Operational traffic and access management documents will be stored on-site for ready reference.

The site manager is required to develop and implement a document control procedure to control the flow and revision of documents within and between the owner's/tenant's representative, stakeholders and contractors. The document control procedure must also ensure that the documentation is:

- Developed, reviewed and approved prior to issue
- Issued for use
- Controlled and stored for the legally required timeframe
- Removed from use when superseded or obsolete
- Archived. A register and distribution list must identify the current revision of particular documents or data. Document control would be in accordance with ISO 14001.

8.2 Records

The site manager is responsible for maintaining all operational traffic and access management documents as current at the point of use.

The site manager is required to develop and implement a process for control of all operational traffic and access records, including:

- All monitoring, inspection and compliance reports/records
- Correspondence with relevant authorities
- Induction and training records
- Reports on traffic incidents, other traffic non-conformances, complaints and follow-up action
- Community complaints information
- Minutes of OTAMP management system review meetings and evidence of any action taken
- Review and update of documents in accordance with changes to legislation and activities on-site.

Appendix A: Penrith City Council Comments and Responses



Table A.1: Penrith City Council Comments and Responses

PCC Comment	Bitzios Consulting Response
The OTMP should explicitly state that heavy vehicles will not be *permitted* to use the Lee Holm Road entrance	Added a sentence to the end of Section 3.2.3 that states, “Heavy vehicles are not permitted to use the Lee Holm Road access”.
Section 2.7 deals with traffic generation, however there is no reference given as to the source of the calculations (nor is it included as an appendix to the report), therefore no way to verify the accuracy of the stated daily movements and the adequacy of the OTMP in addressing those. This needs to be included, either within the OTMP itself, or more appropriately to Council and other stakeholders as a separate attachment for review alongside the OTMP, to assist in review of the document.	Figure 2.3 references Chapter 3 of the Traffic and Transport Impact Assessment (https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-7308%2120190517T232741.042%20GMT), submitted as Appendix 4 of the EIS which includes the traffic generation calculations, rather than repeating them in the OTAMP.
Section 2.8 of the OTMP “Truck Routes” (and in Fig. 2.4, page 9) indicates that 84% of trucks will be using Mamre Road (i.e., 11% accessing Erskine Park and 73% accessing Easter Creek/Ingleburn). This is not acceptable as it places too much burden on Mamre Road. The 73% of trucks accessing Eastern Creek and Ingleburn (according to Fig. 2.4) must be redirected to travel east along the Great Western Highway from Glossop Street, then via Wallgrove Road in order to access the M4, M7 and other eastern or southern links). The OTMP needs to be amended accordingly.	There are three issues here: 1. The routes and their usage are exactly the same as those in the traffic and transport report in the EIS, which have been approved 2. Drivers of heavy vehicles are free to use any approved B-double route they choose, and Mamre Road is an approved route 3. The percentages shown in the EIS (and hence the OTAMP) are the most likely routes based on their travel times. Overall, there is no basis to mandate percentages of trucks on certain routes. As such, we have modified Section 2.8 to state that, “Only these routes are to be used at all times”, removed percentages from text and figures and changed routes to all one colour.
The OTMP does not fully respond to or mention Condition E19. Specifically with regard to part (b) of Condition E19. The whole condition states “The Applicant must operate the project to ensure the following: (a) safe pedestrian access to the station entrance away from heavy vehicle movements; and (b) truck movements are reduced to the greatest extent possible during school pick up/drop off times.” It would appear from the OTMP that school zone times are the busiest periods of operation proposed for the terminal. This needs to be included in the OTMP and part (b) adequately responded to with specificity.	Added a sentence to the end of Section 2.6 that states, “Truck movements to and from the site will be reduced by 33% between 7:30-9am and 2:30-4pm on weekdays to a maximum of 15 trucks IN and 15 trucks OUT over each 1.5-hour school period".

PCC Comment	Bitzios Consulting Response
Part (a) of the above appears to have been addressed to some extent (although not directly in response to Condition E19, which isn't mentioned) in Section 3.2.4 of the OTMP which proposes camera activated advanced warning signs to alert truck drivers when pedestrians are present. But, whilst the OTMP explains the practice for drivers when another truck is entering, it doesn't describe the procedure for drivers when pedestrians detected (i.e., what will the advance warning sign say?, what response will be required of the driver?, etc.). This needs to be clarified and included.	Further detail added to Section 3.2.4 explaining the: ▪ Pedestrian detection mechanism/process/protocol for entering/exiting trucks using the TrafiOne195 camera ▪ Exiting truck detection mechanism/process using the TrafiOne156 camera ▪ Entering truck detection mechanism/process using ThermiCam3 345 ▪ Clear pedestrian sightlines and give way protocols for entering trucks. Further details are provided in the SAGE report in **Appendix B**.
Section 3.2.8 states "As detailed in Section 3.2.3, a pedestrian crossing with push buttons or automatic detection will be provided along the Forrester Road driveway crossover." However no such detail of a proposal for a signalised pedestrian crossing is provided in Section 3.2.3, nor is it even mentioned. This needs to be clarified and detailed.	This will be a detection-based system ONLY and accompanied by stop/go signals to warn both entering and exiting vehicles.
Section 5.1 states "Vehicle holding areas within the Project site in the event of congestion and/or incidents on local B-double routes" as the primary means for preventing queuing of trucks entering the site from Forrester Road, but no further detail is given as to how this works. This detail should be provided in the OTMP as instructional to the ongoing operations as to what truck drivers are expected to do in order to fulfil the above operational requirement in these instances. This needs clarification and inclusion in the OTMP.	Changed dot point 2 in Section 5.1 to remove congestion and leave it as incidents. Added further detail to dot point 2 in Section 5.1 on the proposed holding area where up to 15 B-doubles could be stored for incidents up to 1 hour in duration which require exiting vehicles to be held back on-site. Figure 5.1 also added showing the heavy vehicle holding area.

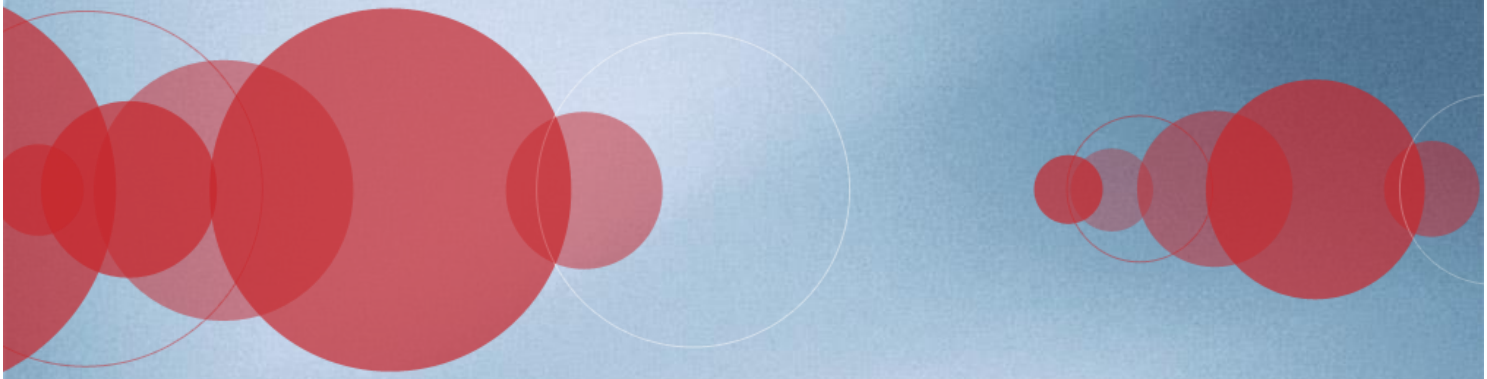
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Appendix B: SAGE Report on Forrester Road Site Access Management Strategy



Functional Specification

68202 – St Marys Freight Hub



SAGE Automation

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1 Document Control

1.1 Record Version Control

Project	68202 – St Marys Freight Hub				
Date of Record	7 December 2020				
Customer	McMahon Services				
Subject	Functional Specification				
Project Manager	Vini Japiassu				
Technical Lead	Kain Matikulas				
Revision	0				
Prepared by (SAGE)	Kain Matikulas	Sign		Date	7/12/2020
Approved by (SAGE)	Vini Japiassu	Sign		Date	7/12/2020
Reviewed (Client)		Sign		Date	
Approved (Client)		Sign		Date	

1.2 Confidentiality

This document contains commercially sensitive information and may only be distributed to those parties (outside of SAGE Automation) directly involved as follows:

1. The customer/end-user for the purposes of evaluation, verification and subsequent acceptance of this functional specification for construction purposes.
2. Contributors of technical and other material included in this document, for review and verification of correctness.

1.3 Revision History

Date	Revision	Description	Written/Reviewed By
7/12/2020	0	Issued for construction	Kain Matikulas / Vini Japiassu

2 Background

Transportation of shipping containers between Port Botany and the Western Sydney Region is currently via road transport only. A proposed freight hub to be located at St Marys in Sydney's western suburbs is designed to reduce road traffic by utilising rail system to shift shipping containers from Port Botany to St Marys. Once the shipping containers have been transported to St Marys, semi-trailers, B-Doubles and High Productivity Vehicle (HPV) trucks will transport the freight from the intermodal hub to customers located typically within a 20-kilometre radius of the Freight Hub.

As part of the new freight hub, the road transport is required to enter and leave the site via Forrester Road closely located to the railway station/ kiss'n'ride. The Forrester Road Entry is to accommodate two-way heavy vehicular traffic whereby entry off Forrester Road is suitably wide to allow for two passing HPV/B-double vehicles at the entry. The access management strategy for the site will be prioritizing the access of an incoming truck by temporarily holding all outgoing trucks within the property at the holding line. The control of the outgoing trucks will be via camera technology and an advanced warning sign to stop each truck leaving.



Figure 1 : Forrester Road Entrance and railway station kiss'n'ride

The control of the outgoing trucks must take into consideration, the existing road traffic, including the vehicles exiting kiss'n'ride area, incoming trucks and pedestrians crossing the new freight hub entry and Forrester Road.

3 Overview

The new freight hub project requires the Forrester Road Entry to accommodate for two-way heavy vehicle traffic. The entry off Forrester Road will be suitably wide to allow for two HPV/B-double vehicles to pass, while the two vehicles could pass simultaneously through this entry point, it is a narrow gap and poses safety risks for passing vehicles.
To reduce the likelihood of pedestrian and vehicle interaction with freight vehicles, incoming trucks will be prioritised by temporarily holding an outgoing truck within the property at the holding line via an Advanced Warning Sign, including stop lights. Detection cameras will be utilised to hold exiting vehicles longer if there is a vehicle or pedestrian that could impact the safe exiting of a truck.

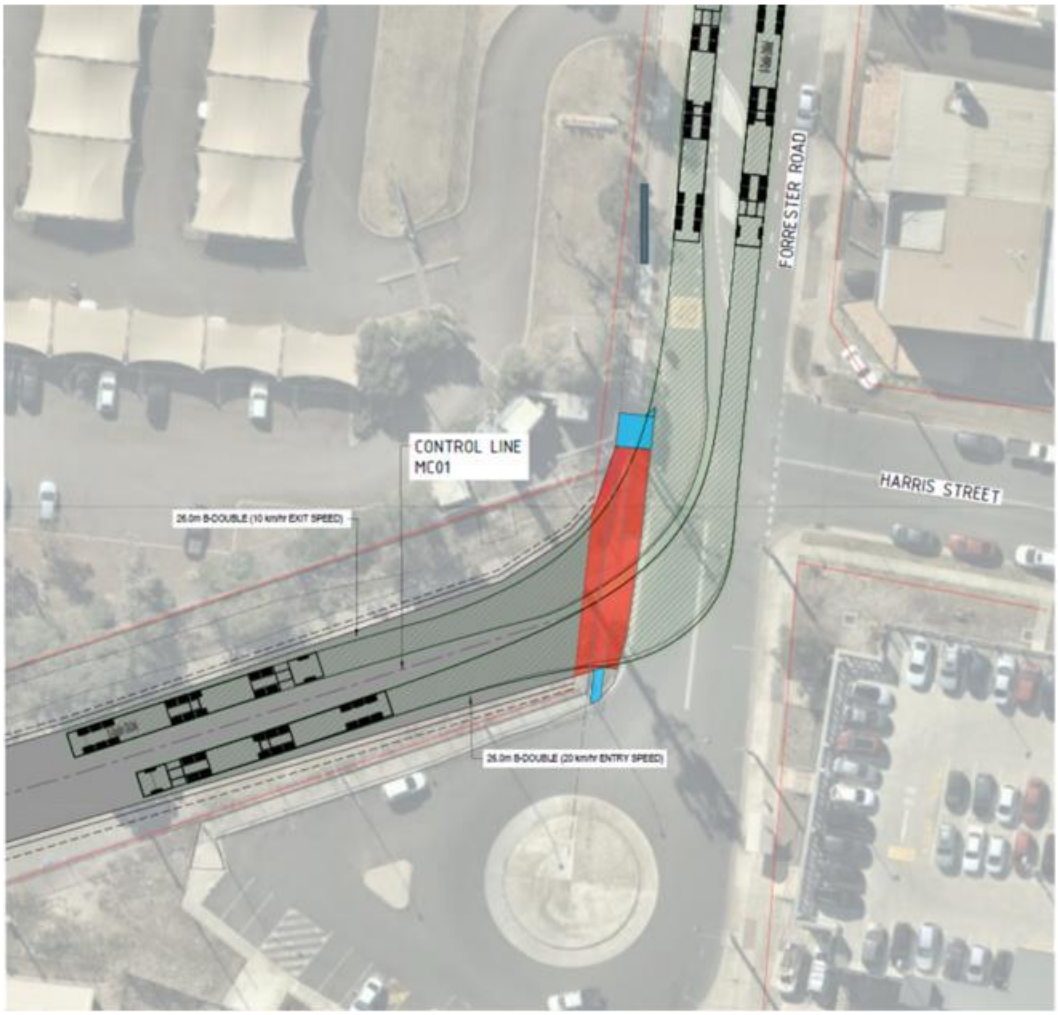


Figure 1: Truck Entry / Exit Paths to Forrester Road

During the initial stages of the project, a traffic analysis report was complete to assist in determining the best routes for the project, including such aspects of minimising the impact on local traffic. With this concept design focusing on the entry to the new site, focus on the Forrester Road / Harris Street intersection has been summarised below:

The expected maximum number of trucks in/out of the site is 15 trips in and 15 trips out per hour. The peak times for regular traffic movement is 8:00am – 9:00am for the morning and 4:30pm – 5:30pm for the

afternoon. The data analysis for the Harris Street – Forrester Road intersection showed the following summary data:

- Morning Peak hour:
  - Turn Left from Forrester Road South Bound to Harris Street – 47 Vehicles
  - Along Forrester Road South Bound – 64 Vehicles
  - Turn Left from Harris Street West Bound to Forrester Road – 6 Vehicles
  - Turn Right from Harris Street West Bound to Forrester Road – 36 Vehicles
  - Turn Right from Forrester Road North Bound to Harris Street – 5 Vehicles
  - Along Forrester Road North Bound – 73 Vehicles
  - Pedestrian Crossing Forrester Road – 2 Pedestrians
  - Pedestrian Crossing Harris Street – 45 Pedestrians
- Afternoon Peak hour:
  - Turn Left from Forrester Road South Bound to Harris Street – 25 Vehicles
  - Along Forrester Road South Bound – 73 Vehicles
  - Turn Left from Harris Street West Bound to Forrester Road – 9 Vehicles
  - Turn Right from Harris Street West Bound to Forrester Road – 177 Vehicles
  - Turn Right from Forrester Road North Bound to Harris Street – 12 Vehicles
  - Along Forrester Road North Bound – 68 Vehicles
  - Pedestrian Crossing Forrester Road – 1 Pedestrians
  - Pedestrian Crossing Harris Street – 32 Pedestrians

For full details of the traffic analysis refer to SSD-7308 – Heavy Vehicle & Transport Analysis Summary Report by urbanco.

4 Freight Hub Exit Flow Control

The control of vehicles around the Forrester Road Freight Hub Entry is limited to stopping and holding the vehicles exiting onto Forrester Road. No additional controls are to be used to restrict regular road users, including vehicles, pedestrians, cyclists or trucks entering the Freight Hub. To control exiting vehicles an Advance Warning Sign is to be installed, designed to stop each vehicle leaving the site. A single camera focused on the stopped vehicle location confirms the vehicle stops at the stop line, if the vehicle fails to stop a failure to stop alert is raised. A number of cameras to detect that the exit is clear allows the vehicle to be released safely.

During the HAZOP workshop, ACFS advised that all drivers using the Forrester Road exit will be trained to understand the controls installed to assist in the safe exit of the site. All drivers will understand the different states of the Advanced Warning Sign, including when the exit is clear.

The proposed detection zones and Advance Warning Sign location is shown below:

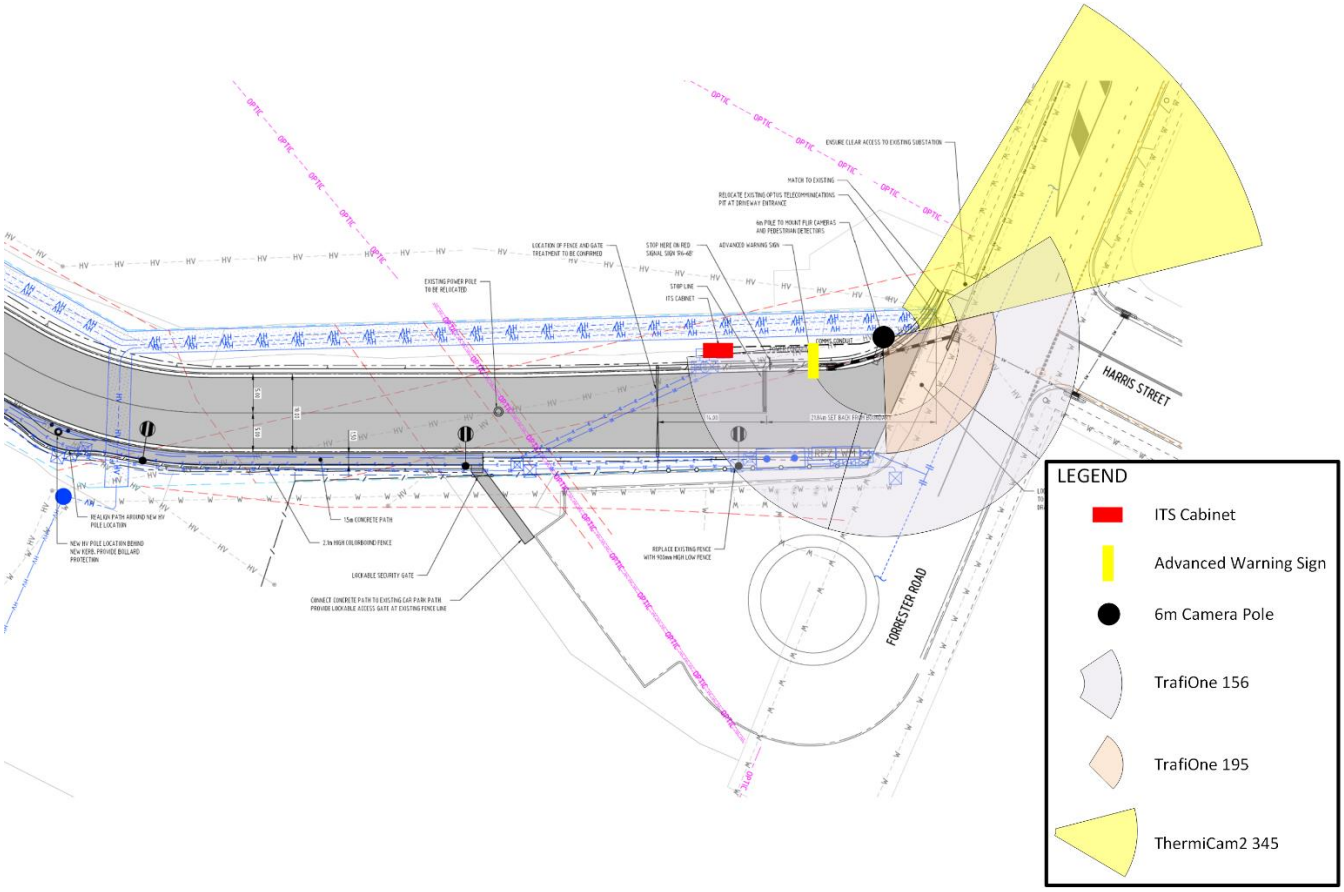


Figure 2: ITS Equipment Location and Detection Zones

The detection cameras will monitor the following locations:

- Vehicles exiting the station kiss'n'ride drop-off zone
- Trucks entering the Freight Hub
- Pedestrians crossing the new freight hub entry
- Pedestrians crossing Forrester Road

4.1 Advanced Warning Sign (AWS)

The AWS consists of a static sign with two red lights and two amber lights. The red lights are intended to hold any truck exiting the site at the designated stop line for a minimum time, including extending the time in case of pedestrians, cyclists or vehicles being detected in the monitored zones. The amber lights are intended to indicate the monitored area is clear and the truck is able to exit with caution. The amber lights will flash when operating.

The AWS is the only interface with the exiting trucks, prompting the trucks to stop and wait, until safe to exit. The AWS is controlled from a local PLC which allows the sign release trucks exiting the site when safe, The PLC also has the ability to be manually overridden in case of any abnormal situations or faults in detection from the cameras.

The AWS Dimensions: 1200mm wide x 1800mm High



Figure 3: AWS Sign

4.2 Thermal Detection Cameras

To detect the exiting vehicle and that the exit is clear from pedestrians, cyclists and other vehicles, a number of thermal detection cameras are to be installed. As the facility will operate 24/7, thermal cameras have been selected to reliably detect in all weather conditions and even in total darkness.

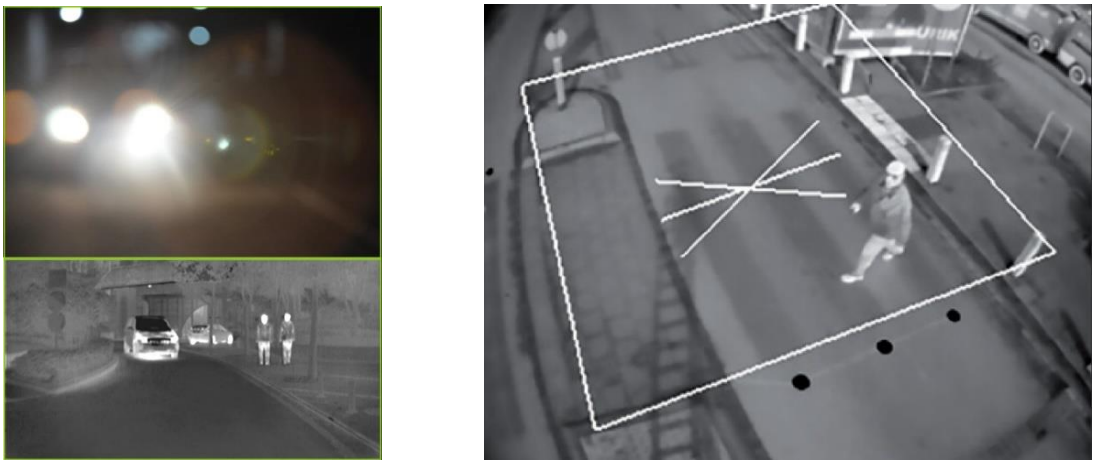


Figure 4: Thermal vs Image Cameras

Each of the five cameras will be mounted onto the 6-meter camera pole, with a number of mounting options to allow for ideal viewing angles of the cameras. The camera Pole vertical deflection must not exceed ±0.5%.



Figure 5: FLIR Camera Mounting options

4.3 ITS Equipment Connection

The ITS equipment will be connected to a single cabinet located within site grounds. The AWS will be mounted to allow exiting vehicles to clearly see the sign from the stop line, including the Red Stop and Amber lights. All cameras are to be mounted to a single camera pole, located to allow all detection zones to be visible. To allow monitoring of the system and manual override, an operator station is to be installed in the dispatch office.

The approximate location of the ITS cabinet, camera pole and conduits are shown below:

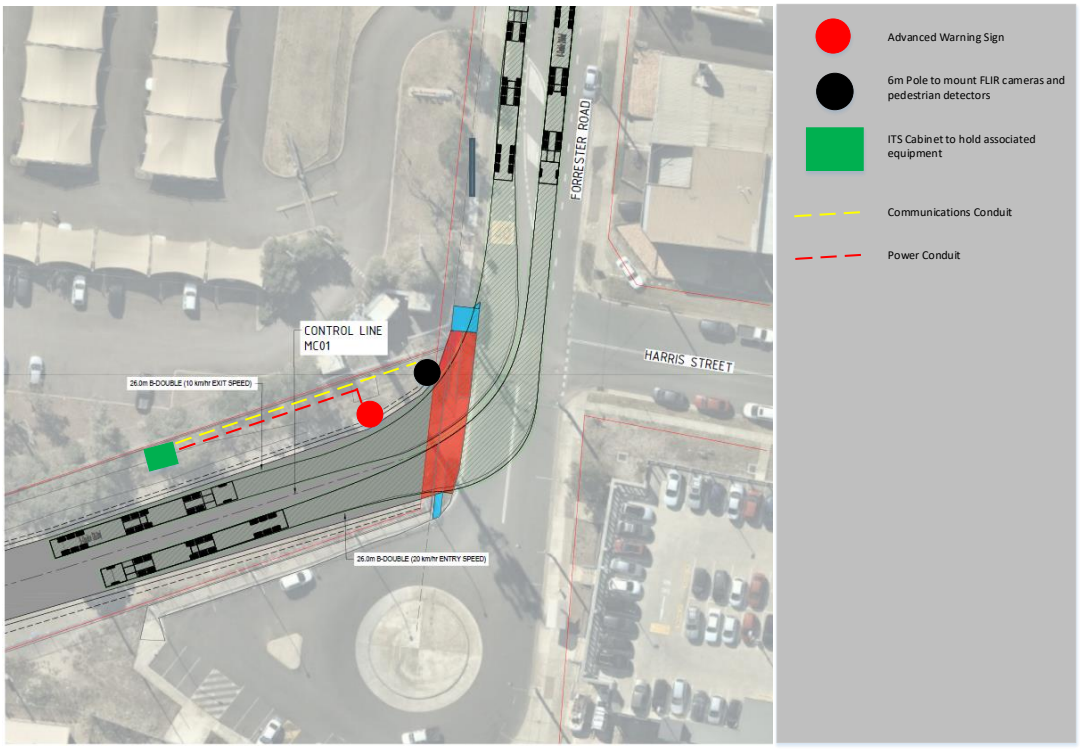


Figure 6: Location of ITS Equipment

The ITS cabinet includes a local battery backup in-case of an incoming power failure, the UPS will allow the detection cameras and AWS to operate for a minimum of an hour. If the power remains off for an extended period, the cameras and the AWS lights will switch off. The UPS is intended to give sufficient time to operations personnel to inform drivers of the power outage and put alternative temporary controls in place.

Installed in the dispatch office will be an operator station which will allow manual override of the AWS to change from Red lights to Flashing Amber. The operator station will also indicate a fault with the system, allowing early indication to dispatch to communicate to the drivers of a fault with the AWS system. Connection between the dispatch office and the ITS cabinet requires two conduits, 100mm power and 100mm communications conduits.

The connection to the Dispatch office allows the camera images to be displayed on a local monitor, providing the dispatch office staff the ability to monitor the vehicles exiting the site and monitor the surrounding areas in case of pedestrians being in the detection zones for extended periods of time.

The high-level connection diagram is shown below:

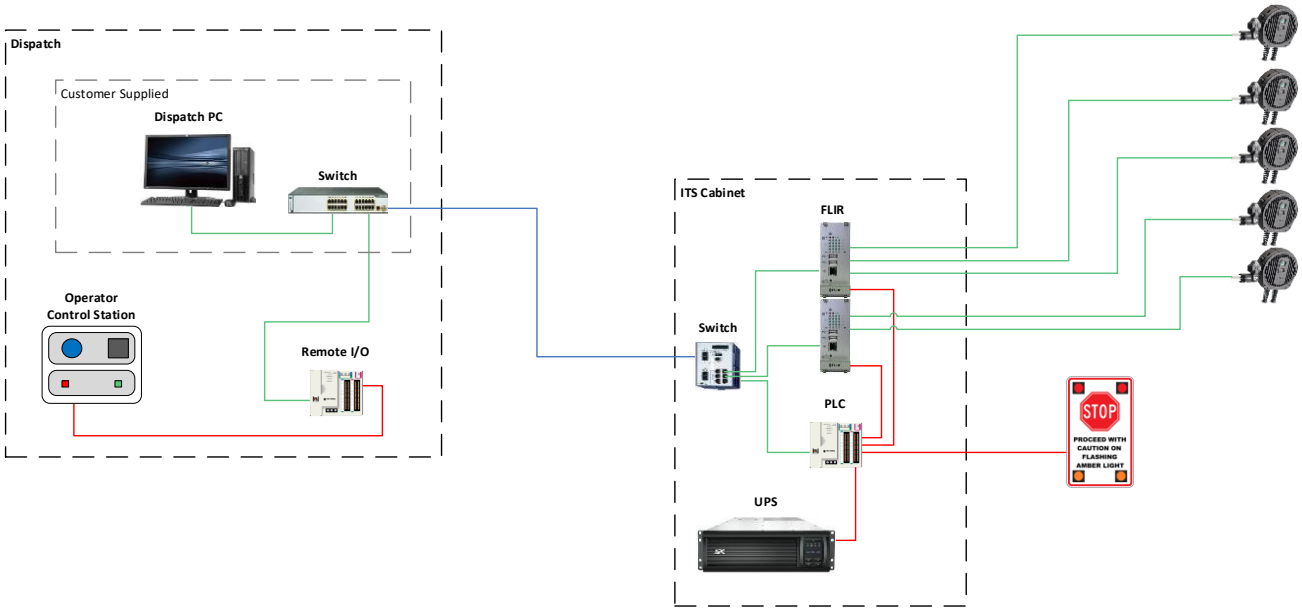


Figure 7: High-level Connection of ITS Equipment

Refer to detailed cabinet schematics for all electrical and communications connections and Appendix B for ITS equipment cable schedule.

For hardware details, refer to section 6, Proposed Equipment.

5 AWS Control

The Advanced Warning Sign is to be controlled via two PLC outputs, one for the red stop lights, one for the flashing amber lights. During normal operation, the AWS operates as described below in the exit control.

If any faults are detected in the system, i.e. camera fault, the AWS will flash the two amber lights and indicate to the dispatch office via the remote operator station that there is a fault with the system.

The remote operator station also allows override control of the AWS to flash the two amber lights at any time. This override will be available via a manually operated switch on the operator station in the dispatch office.

5.1 Exit Control

The control of exiting vehicles is based on 3 steps including, 1) Vehicle stops at the stop point, 2) Camera detects the vehicle has stopped, 3) the detection area is clear and the vehicle is released.

As the vehicle approaches the stop line, a camera monitors the exiting vehicle to confirm the vehicle stops at the correct position. Once stopped for the appropriate amount of time, initially 3 seconds, and the exit is clear, the stop lights will turn off and the truck will be allowed to move off. The exit is monitored by cameras detecting vehicles, pedestrians and cyclists, if the detection zones are not clear, the stop lights will be prevented from turning off, holding the truck from exiting for an extended time.

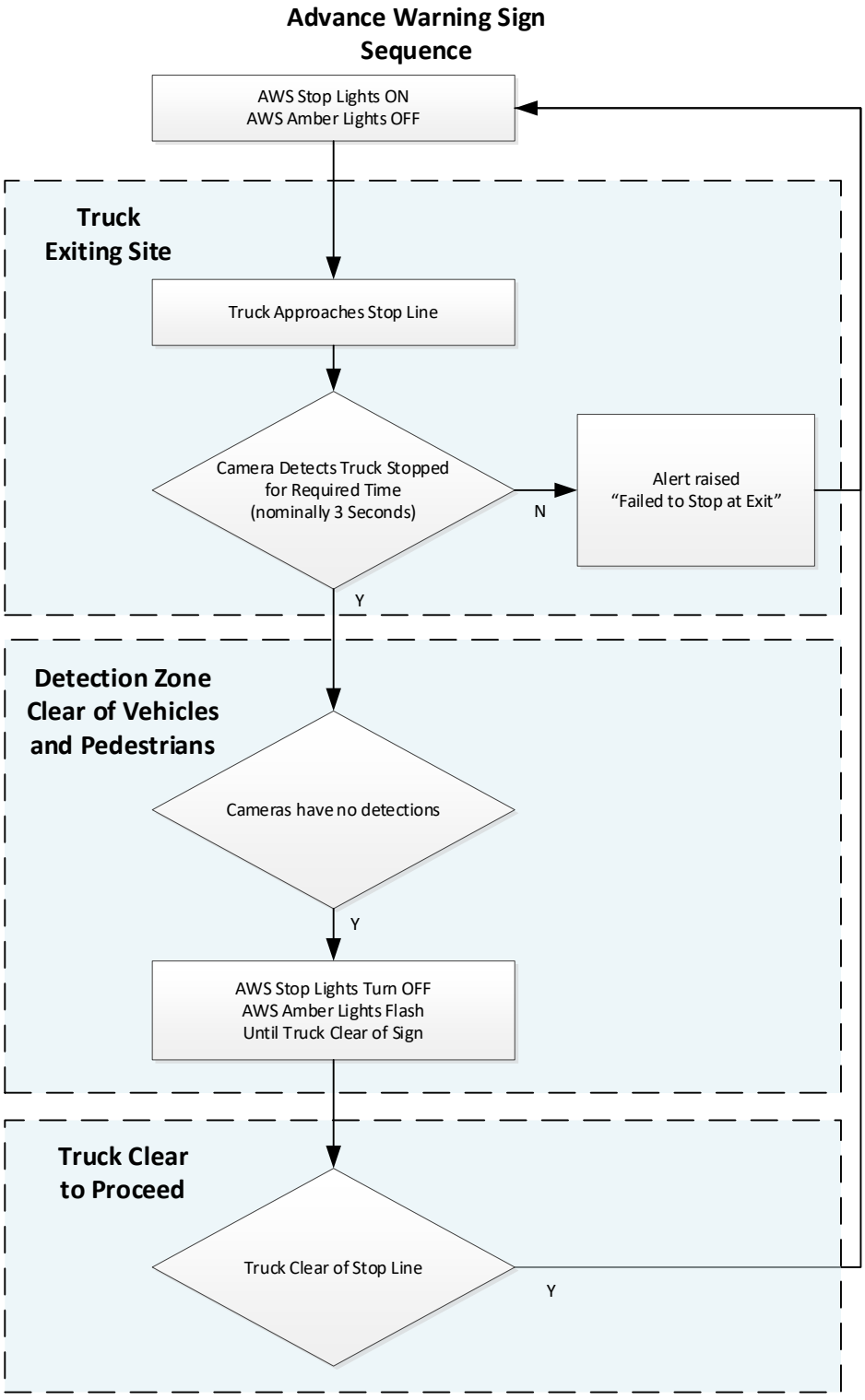


Figure 8: AWS Normal Operational Sequence

5.2 PLC I/O

A full list of PLC inputs and outputs has been listed below

Input	Description	Location
I000	UPS Loss of Mains Power	ITS Cabinet
I001	UPS Battery Fault	ITS Cabinet
I002	Camera 1 Detection	ITS Cabinet
I003	Camera 1 Fault	ITS Cabinet
I004	Camera 2 Detection	ITS Cabinet
I005	Camera 2 Fault	ITS Cabinet
I006	Camera 3 Detection	ITS Cabinet
I007	Camera 3 Fault	ITS Cabinet
I008	Camera 4 Detection	ITS Cabinet
I009	Camera 4 Fault	ITS Cabinet
I010	Camera 5 Detection	ITS Cabinet
I011	Camera 5 Fault	ITS Cabinet
I012	Spare	ITS Cabinet
I013	Spare	ITS Cabinet
I014	Spare	ITS Cabinet
I015	Spare	ITS Cabinet
I100	AWS Selector Switch - Normal	Operator Station
I101	AWS Selector witch - Override	Operator Station
I102	AWS Selector Reset Push Button	Operator Station
I103	Spare	Operator Station
I104	Spare	Operator Station
I105	Spare	Operator Station
I106	Spare	Operator Station
I107	Spare	Operator Station

Output	Description	Location
O000	AWS Fault Indication Lamp	ITS Cabinet
O001	Driver Failed to Stop Indication Lamp	ITS Cabinet
O002	AWS Red Stop Light Control Relay	ITS Cabinet
O003	AWS Amber Warning Light Control Relay	ITS Cabinet
O004	Spare	ITS Cabinet
O005	Spare	ITS Cabinet
O006	Spare	ITS Cabinet
O007	Spare	ITS Cabinet
O008	Spare	ITS Cabinet
O100	AWS Fault Indication Lamp	Operator Station
O101	Driver Failed to Stop Indication Lamp	Operator Station
O102	AWS Red Stop Light Indication Lamp	Operator Station
O103	AWS Amber Warning Light Indication Lamp	Operator Station
O104	Spare	Operator Station
O105	Spare	Operator Station
O106	Spare	Operator Station
O107	Spare	Operator Station

5.3 System Faults

As an indication to the drivers leaving the site, any camera faults within the system will change the AWS to a state of flashing amber. This will allow the drivers to exit the site with further caution as the camera system is not in operation.

The following table shows the list of faults on the system along with the resulting action:

Fault ID	Description	Action
001	UPS Loss of Mains Power	Operator Station Fault Indication
002	UPS Battery Fault	Operator Station Fault Indication
003	Camera 1 Fault	Operator Station Fault Indication and Flash Amber Lights
004	Camera 2 Fault	Operator Station Fault Indication and Flash Amber Lights
005	Camera 3 Fault	Operator Station Fault Indication and Flash Amber Lights
006	Camera 4 Fault	Operator Station Fault Indication and Flash Amber Lights
007	Camera 5 Fault	Operator Station Fault Indication and Flash Amber Lights
008	Driver Failed to stop	Operator Station Failed to Stop indication

6 Equipment

6.1 FLIR Cameras

Two cameras have been chosen to fulfil the requirements of the system:

- FLIR TrafiOne – General traffic and pedestrian detection
  - 1 x TrafiOne 156
  - 3 x TrafiOne 195
- FLIR Thermicam2 – Freight truck detection
  - 1 x ThermiCam2 345

The **FLIR TrafiOne** thermal camera which is suitable for all weather conditions. Datasheets are available in Appendix A1.



Figure 9: FLIR Trafione camera

The **FLIR Thermicam2** thermal camera which is suitable for all weather conditions. Datasheets are available in Appendix A2.



Figure 10: FLIR Thermicam2 camera

6.2 FLIR Output Module

The **TI BPL2** output module unit will connect to the FLIR cameras and provide relay control of the Advanced Warning Sign. The unit has 16 digital outputs which will be used to drive the Flashing Amber Warning Signs via interface relays. Datasheets are available in Appendix A3.



Figure 11: FLIR VIP-IP processing module.

6.3 Beckhoff CX5130 Embedded PC

A Beckhoff CX5130 Embedded PC is used connect to the system and run the ThermiCam configuration software. It is a ruggedized PC that can operate in temperatures up to 60°C. PC specifications are listed below:

- OS: Windows 10 Embedded
- CPU: Intel Atom E3827 1.75GHz
- Memory: 4GB DDR3 RAM
- PSU: 24VDC
- Protection class: IP20.

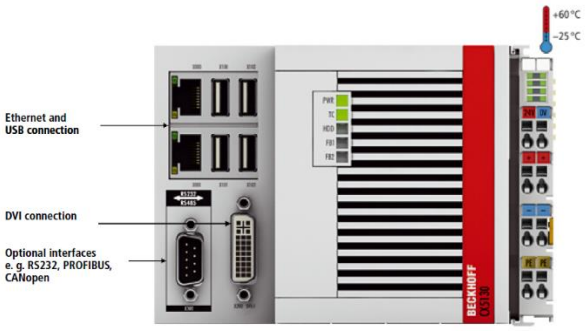


Figure 12: Beckhoff CX5130 Embedded PC

6.4 MOXA Unmanaged Switch

We have chosen a **MOXA EDS-208A-T** unmanaged switch to connect the various hardware in the cabinet. Datasheets are available in Appendix A4.



Figure 13: Moxa Unmanaged Switch.

6.5 Advance Warning Sign

We have chosen **BRAUMS** to provide the flasher unit, beacons, and termination enclosure, compliant to AS2144. This will be a mains powered unit. The static part of the sign will be supplied by Artcraft. Datasheets are available in Appendix A5.



Figure 14: Flashers.

6.6 Interface Relay

The Advance Warning Flashing light **Weidmuller interface relays** (part number 8870330000, relay base part no. 8869490000 that will take the 48V Digital Output signal from the and provide power to the Advance Warning Flashing Signs. Datasheets are available in Appendix A6.



Figure 15: Interface relay base.



Figure 16: Interface relay

6.7 Rittal ITS Cabinet

We have chosen a **Rittal** ITS cabinet (part number 9729709). The Rittal cabinet is built for SAGE and has VicRoads type approval. We are proposing T33 smoke blue colour Datasheets are available in Appendix A7.



Photo 17: Rittal ITS Cabinet

Appendix A - Datasheets

Appendix A1 – FLIR TrafiOne Thermal Camera Datasheet

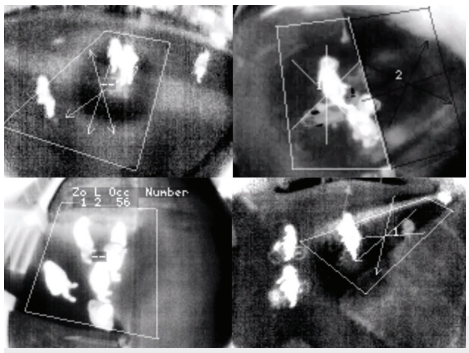


SMART CITY SENSOR

TRAFIONE

TrafiOne is an all-round detection sensor for traffic monitoring and dynamic traffic signal control. Offered in a compact and affordable package, the TrafiOne uses thermal imaging and Wi-Fi technology to adapt traffic signals based on the presence detection of vehicles, bicycles and pedestrians, while also generating high resolution data at intersections and in urban environments. As a result, TrafiOne helps traffic engineers improve traffic flows, monitor congestion, enhance safety for vehicles and vulnerable road users, collect data, and measure travel and delay times for different transport modes.

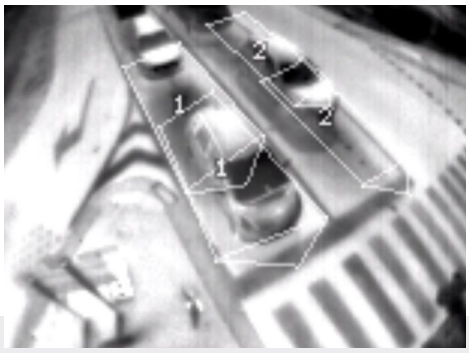
www.flir.com/Traffic



Thermal Imaging Sensor

TrafiOne allows for more dynamic control of traffic signals 24/7.

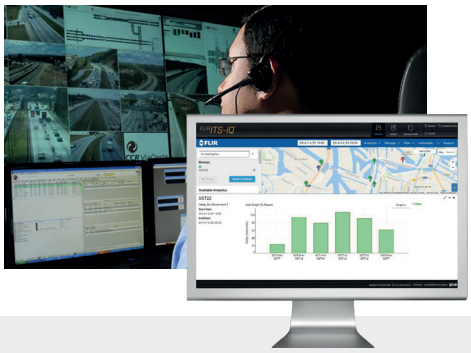
- Sees traffic in total darkness, through shadows and sun glare
- Detects the presence of vehicles and bicyclists at the stopbar
- Detects pedestrians and bicyclists in the crossing or on the curb
- Connects to traffic signal controller via dry contact outputs or TCP/IP network communication



WI-FI Technology

Secure wireless communication allows for quick and easy configuration of detection zones.

- Monitors Mac addresses of Wi-Fi enabled devices, such as smartphones
- Determines travel and route times along road segments
- Measures queue delay times at intersections via Wi-Fi signal strength



FLIR ITS-IQ

TrafiOne information is processed using cloud-based data analysis.

- FLIR ITS-IQ provides critical understanding or road network performance
- Smart analytics transform information into useful traffic insights
- User-friendly dashboard lets traffic engineers generate reports and take measures, when needed

TECHNICAL SPECIFICATIONS

System Overview	
Functionalities	Curbside and on-crossing pedestrian and bicycle presence detection Visual HD streaming video (optional license) Stopbar vehicle and bicycle presence detection (optional license) Wi-Fi monitoring (optional license) Pedestrian counting (optional license)
# detection zones	8 vehicle presence zones 8 pedestrian presence zones
Configuration	Web page via secure Wi-Fi or Ethernet
Thermal Sensor	
Resolution	160 x 120
Frame rate	9 FPS
Detector type	Focal Plane Array (FPA) uncooled VOx microbolometer LWIR sensor, 8 to 14 µm wavelength
Streaming Video	RTSP
Compression	H.264, MPEG-4
Visual Sensor	
Resolution	1080 x 1920 HD color CMOS
Frame rate	30 fps
Lens HFOV	95°
Streaming Video	RTSP
Compression	H.264, MPEG-4, MJPEG
Housing	
Material	Aluminum housing with PC GF10 sunshield
Bracket	PA GF30 mounting clamps and aluminum tube
Power, outputs, communication	
Input power	12 – 42 V AC/DC
Power consumption	Average 6 Watt, peak 7 Watt
Outputs	1 N/O and 1 N/C dry contacts direct 16 N/C dry contacts via TI BPL2 or TI BPL2 EDGE interface
Ethernet	10/100 MBps
PoE	PoE A and PoE B
Powerline Communication	Up to 2 MBps via TI BPL2 or TI BPL2 EDGE interface
Wi-Fi	IEEE 802.11 type b,g,n EIRP < 100mW
Environmental	
Shock & Vibration	NEMA TS2 specs
Materials	All weatherproof UV-resistant
IP Rating	IP67
Temperature range	-40°C to +60°C / -40°F to +140°F /
FCC	FCC part 15 class A
Regulatory	
EU Directives	EMC 2014/30/EU, RoHS 2011/65/EU

Product specific	TrafiOne 195	TrafiOne 156
Part number	10-7070	10-7075
HFOV	95°	56°
Detection distance (depending on installation height)	vehicle & bicycle presence: 0 - 20m, 0 - 65.6ft pedestrian & bicycle presence: 0 - 12m, 0 - 39ft	vehicle & bicycle presence: 10 - 35m, 33 - 115ft pedestrian & bicycle presence: 10 - 25m, 33 - 82ft
Installation height	3.5 - 6m / 11.4 - 19.6ft	5.5 - 8m / 18 - 26ft

Specifications are subject to change without notice. For the most up-to-date specs, go to www.flir.com

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Appendix A2 – FLIR Thermicam2 Thermal Camera datasheet

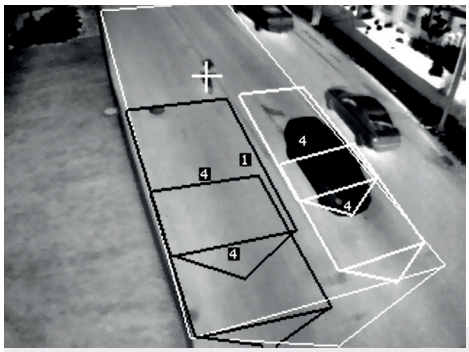


INTELLIGENT THERMAL TRAFFIC SENSOR

THERMICAM2

ThermiCam2 is an intelligent thermal sensor capable of detecting vehicles, bicyclists and pedestrians for dynamic traffic signal control and data collection. Integrated Wi-Fi technology allows simultaneous thermal detection, travel time and delay time calculation. Since the ThermiCam2 relies on thermal energy rather than light, it offers 24/7 traffic monitoring and can detect road users at night, through glare, and in harsh weather conditions.

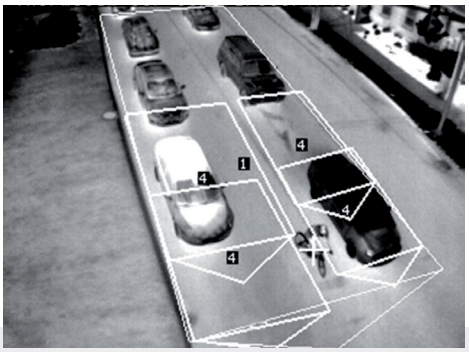
www.flir.com/Traffic



Traffic Signal Control

ThermiCam2 allows for dynamic control of traffic signals by detecting vehicles, bicyclists and pedestrians 24/7.

- Adapt signal times according to actual demand and optimize traffic flow
- Distinguish between vehicles and bicyclists on the road
- Protect vulnerable road users



Traffic Data Collection

ThermiCam2 collects valuable traffic data using thermal detection and Wi-Fi monitoring at the same time.

- Use Wi-Fi to anonymously track how road users move and to calculate travel and delay times at intersections
- Determine origin destination and turning movement counts
- Collect vehicle class and measure traffic volume, speed, occupancy, headway and gap time



Data Analytics

ThermiCam2 connects to the Acyclica cloud, where smart analytics transform data into meaningful traffic insights critical to understanding performance.

- Wide range of analytics to help agencies monitor travel times, traffic patterns and congestion
- User friendly dashboards for traffic engineers to run reports and take measures where they are needed
- High resolution, high quality intersection data through data fusion in the Acyclica cloud

TECHNICAL SPECIFICATIONS

System Overview	
Functionality	Vehicle and bicycle presence detection Traffic flow monitoring ITS-IQ Cloud communication (real-time data)
License based functionality (optional)	Wrong way driver detection Premium traffic data collection ITS-IQ Tier 1 Data analytics (historical & real-time data, images, APIs) ITS-IQ Tier 2 Data analytics (Advanced Wi-Fi travel & delay time, O/D)
# detection zones	24 vehicle detection zones \ 8 bicycle detection zones \ 6 traffic data zones \ 6 wrong way driver zones
Configuration	Web page setup via secure Wi-Fi, Ethernet or BPL
Camera	
Type	Focal Plane Array (FPA), uncooled VOx microbolometer Long wave Infrared (7 – 14 µm)
Resolution	QVGA (320 x 240)
Frame Rate	30 fps
Compression	H.264, MPEG-4, MJPEG
Streaming Video	RTSP

Product Types

	Part Number	Resolution	Field of view	Detection distance for vehicle presence
ThermiCam2 390	10-7430	QVGA	Horizontal: 90° Vertical: 69°	1-25 m
ThermiCam2 345	10-7432	QVGA	Horizontal: 45° Vertical: 35°"	5-50 m
ThermiCam2 335	10-7434	QVGA	Horizontal: 35° Vertical: 27°	15-75 m
ThermiCam2 325	10-7436	QVGA	Horizontal: 25° Vertical: 19°	30-90 m
ThermiCam2 317	10-7438	QVGA	Horizontal: 17° Vertical: 13°	45-120 m

Housing	
Material	Aluminum housing with integrated polycarbonate sunshield
Dimensions (incl. mounting bracket)	Vertically mounted: 45 cm x 16 cm x 12 cm Horizontally mounted: 41 cm x 18 cm x 12 cm
Power, outputs, communication	
Input power	24-42 VAC / 24-48 VDC
Power consumption	Avg 10.5 W Peak 15 W
Output contacts	1 N/O and 1 N/C dry contacts direct 16 N/C dry contacts via TI BPL2 interface
PoE	PoE mode A for configuration, video streaming and data communication
BPL	50 Mbps Broadband over Powerline communication via TI BPL2 interface
Wi-Fi	IEEE 802.11 b/g/n for configuration and Wi-Fi travel time monitoring
Environmental	
Schock & Vibration	NEMA TS2 specs
Materials	All weatherproof UV resistant
IP Rating	IP 67
Temperature Range	-34°C to + 74°C
Regulatory	
FCC / EU Directives	FCC part 15 class A, EMC 2014/30/EU, RoHS 2011/65/EU, LVD 2014/35/EU, RED 2014/53/EU

Specifications are subject to change without notice. For the most up-to-date specs, go to www.flir.com

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Appendix A3 – FLIR TI BPL2 Output module datasheet

FLIR TI BPL2

2nd generation Broadband over Power Line interface



System Overview	
Basic Functionality	Connecting zone outputs from BPL2 sensor(s)* or Power Line (PL) sensor(s)** to controller Providing power to BPL2 or PL sensor(s) Connecting PC to BPL2 or PL sensor(s) for system configuration & viewing
Number of cameras	Standard 1 – 4 x BPL2 or PL sensors Maximum 7 x BPL2 or PL sensors
Detection outputs	16 x optical coupled dry contacts N/C via terminal connector on the back Imax = 50mA, Umax = 48VDC Configurable 'Close on Event' or 'Open on Event' 16 x output status LEDS on the front
Error outputs	4 x optical coupled dry contacts N/O via terminal connector on the back Imax = 50mA, Umax = 48VDC 1 interface error LED on the front 4 x BPL2 or PL sensor status LEDS
Communication	JSON HTTP API or XML2 protocol
Power, connectivity	
Input Voltage	12 – 42 VDC or 12 – 30 VAC
Power Consumption	≤ 3W
Current Consumption	≤ 130 mA@ 24 VDC
Network connection	RJ45 Ethernet connector
Interface mounting	BOX, EURO-rack mountable, DIN-rail clickable
Sensor connection	Via 4 x terminal connectors on the back
Environmental	
EMC	Electromagnetic Compatibility - 2014/30/EU
FCC	FCC Part 15 class B
Temperature range	NEMA II specs: -40C to +74C
Physical dimensions	
Width X Height X Depth	5,05 cm x 12,84 cm x 18,00 cm
Weight	750g

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Appendix A4 – Moxa EDS-208A-T datasheet

EDS-205A/208A Series Hardware Installation Guide

Moxa EtherDevice Switch

Sixth Edition, April 2014

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P/N: 1802002050025

Overview

The EDS-205A/208A series of industrial Ethernet switches are entry-level industrial 5 and 8-port Ethernet switches that support IEEE 802.3, IEEE 802.3u, and IEEE 802.3x with 10/100M, full/half-duplex, and MDI/MDIX auto-sensing.

The EDS-205A/208A series provides 12/24/48 VDC (9.6 to 60 VDC)/18 to 30 VAC redundant power inputs that can be connected simultaneously to a live AC/DC power source. The switches are available with a standard operating temperature range from -10 to 60°C, or with a wide operating temperature range from -40 to 75°C, and IP30 metal housing makes them rugged enough for any harsh industrial environment.

To provide greater versatility for use with applications from different industries, the EDS-205A/208A also allow users to enable or disable broadcast storm protection with DIP switches on the outer panel.

The EDS-205A/208A switches can be easily installed with DIN-Rail mounting as well as distribution boxes. The DIN-rail mounting capability and IP30 metal housing with LED indicators make the plug-and-play EDS-205A/208A switches reliable and easy to use.

NOTE Throughout this Hardware Installation Guide, we use **EDS** as an abbreviation for Moxa EtherDevice Switch:
EDS = Moxa EtherDevice Switch



ATTENTION

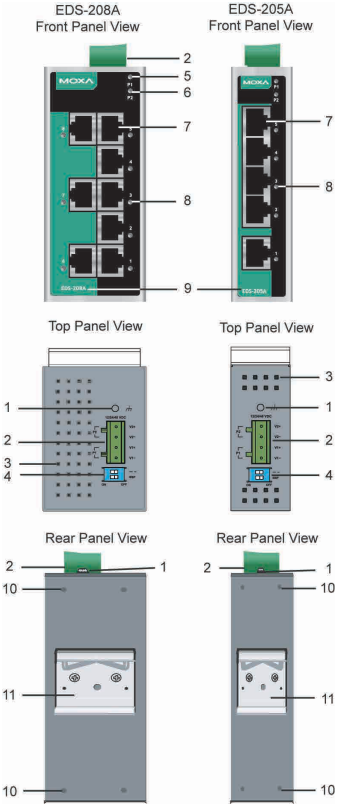
This device complies with part 15 of FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Package Checklist

Your EDS is shipped with the following items. If any of these items is missing or damaged, please contact your customer service representative for assistance.

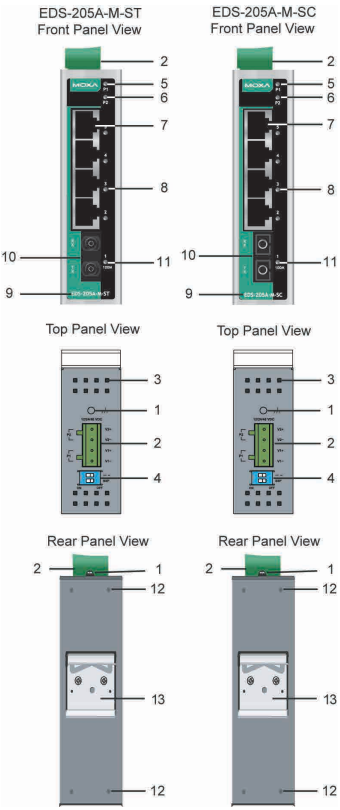
- Moxa EtherDevice™ Switch
- Hardware Installation Guide
- Moxa Product Warranty booklet

Panel Layout of EDS-205A/208A (Standard)



1. Grounding screw
2. Terminal block for power input P1/P2
3. Heat dissipation orifices
4. DIP Switches
5. Power input P1 LED
6. Power input P2 LED
7. 10/100BaseT(X) Port
8. TP port's 10/100 Mbps LED
9. Model Name
10. Screw hole for wall mounting kit
11. DIN-Rail Kit

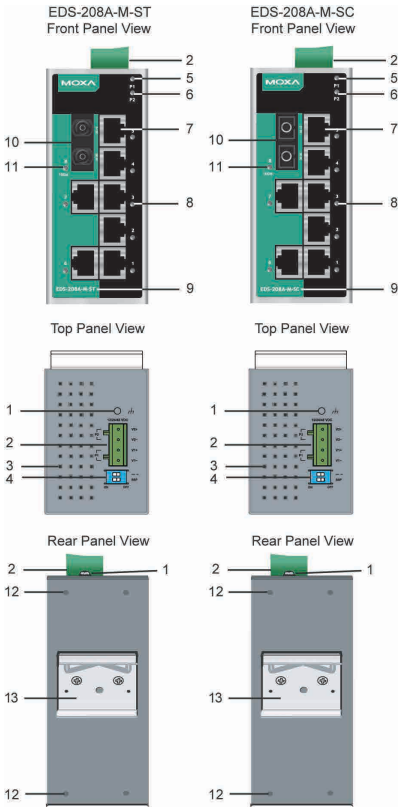
Panel Layout of EDS-205A-M-SC/ST



NOTE:
The appearance of EDS-205A-S-SC is identical to EDS-205A-M-SC.

1. Grounding screw
2. Terminal block for power input P1/P2
3. Heat dissipation orifices
4. DIP Switches
5. Power input P1 LED
6. Power input P2 LED
7. 10/100BaseT(X) Port
8. TP port's 10/100 Mbps LED
9. Model Name
10. 100BaseFX Port
11. FX port's 100 Mbps LED
12. Screw hole for wall mounting kit
13. DIN-Rail Kit

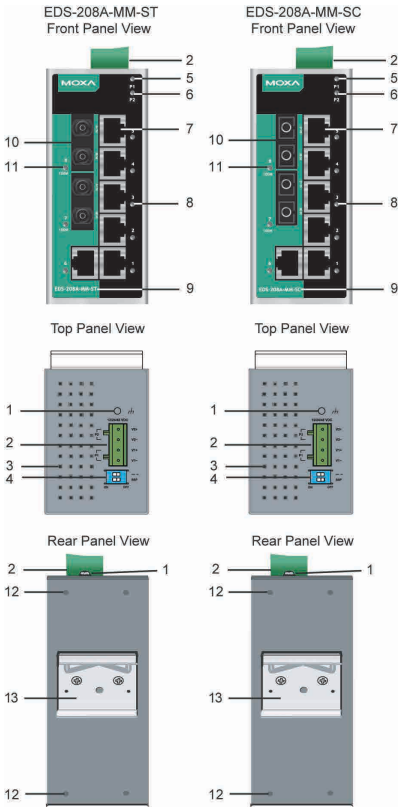
Panel Layout of EDS-208A-M-SC/ST



NOTE:
The appearance of EDS-208A-S-SC is identical to EDS-208A-M-SC.

1. Grounding screw
2. Terminal block for power input P1/P2
3. Heat dissipation orifices
4. DIP Switches
5. Power input P1 LED
6. Power input P2 LED
7. 10/100BaseT(X) Port
8. TP port's 10/100 Mbps LED
9. Model Name
10. 100BaseFX Port
11. FX port's 100 Mbps LED
12. Screw hole for wall mounting kit
13. DIN-Rail Kit

Panel Layout of EDS-208A-MM-SC/ST

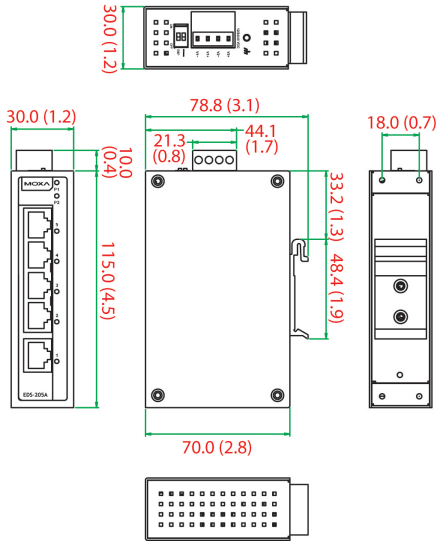


NOTE:
The appearance of EDS-208A-SS-SC is identical to EDS-208A-MM-SC.

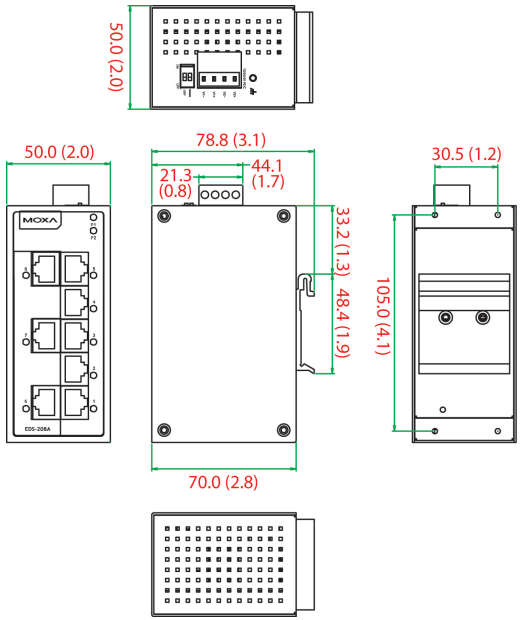
1. Grounding screw
2. Terminal block for power input P1/P2
3. Heat dissipation orifices
4. DIP Switches
5. Power input P1 LED
6. Power input P2 LED
7. 10/100BaseT(X) Port
8. TP port's 10/100 Mbps LED
9. Model Name
10. 100BaseFX Port
11. FX port's 100 Mbps LED
12. Screw hole for wall mounting kit
13. DIN-Rail Kit

Mounting Dimensions

EDS-205A



EDS-208A



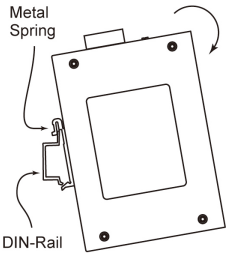
Unit = mm (inch)

DIN-Rail Mounting

The aluminum DIN-rail attachment plate should already be fixed to the back panel of the EDS when you take it out of the box. If you need to reattach the DIN-rail attachment plate, make sure the stiff metal spring is situated towards the top, as shown in the figures below.

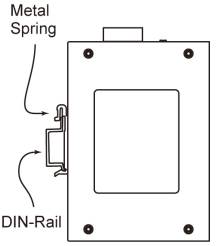
STEP 1:

Insert the top of the DIN-Rail into the slot just below the stiff metal spring.



STEP 2:

The DIN-Rail attachment unit will snap into place as shown below.



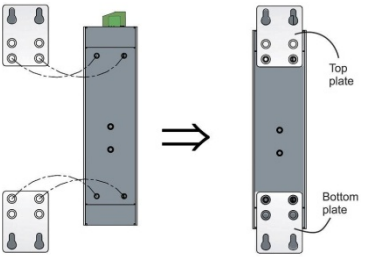
To remove the EDS from the DIN-Rail, simply reverse Steps 1 and 2 above.

Wall Mounting (optional)

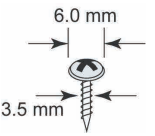
For some applications, you will find it convenient to mount the EDS-205A/208A on the wall, as shown in the following figures.

STEP 1:

Remove the aluminum DIN-Rail attachment plate from the EDS-205A/208A's rear panel, and then attach the wall mount plates as shown in the diagram at the right.



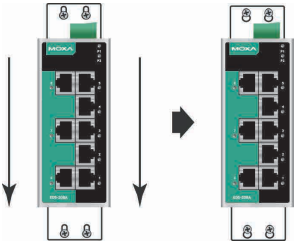
STEP 2: Mounting the EDS-205A/208A on the wall requires 4 screws. Use the switch, with wall mount plates attached, as a guide to mark the correct locations of the 4 screws. The heads of the screws should be less than 6.0 mm in diameter, and the shafts should be less than 3.5 mm in diameter, as shown in the figure at the right.



NOTE Before tightening the screws into the wall, make sure the screw head and shank size are suitable by inserting the screw into one of the keyhole-shaped apertures of the wall mounting plates.

Do not screw the screws in completely—leave about 2 mm to allow room for sliding the wall mount panel between the wall and the screws.

STEP 3:
Once the screws are fixed on the wall, insert the four screw heads through the large parts of the keyhole-shaped apertures, and then slide the EDS-205A/208A downwards, as indicated. Tighten the four screws for added stability.



II 3G

ATEX Information

1. Certificate number DEMKO 10 ATEX 0909900X
2. Ambient range (-40°C ≤ Tamb ≤ 75°C)
3. Certification string (Ex nA nC IIC T4 Gc)
4. Standards covered (EN 60079-0:2012, EN 60079-15:2010)
5. The conditions of safe usage:
   - Subject devices are for use in ambient temperature -40°C ≤Tamb ≤ +75°C.
   - Subject devices are to be installed in an IP54 enclosure.
   - Subject devices are for use in an area of not more than pollution degree 2 in accordance with IEC 60664-1.
   - Subject devices are to use Conductors suitable for use in an ambient temperature of 100°C must be used for the Power Supply Terminal.

Wiring Requirements

WARNING

Safety First!
Turn the power off before disconnecting modules or wires. The correct power supply voltage is listed on the product label. Check the voltage of your power source to make sure that you are using the correct voltage. Do **NOT** use a voltage greater than what is specified on the product label.
These devices must be supplied by a SELV source as defined in the Low Voltage Directive 2006/95/EC and 2004/108/EC.

WARNING

Safety First!
Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size.
If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

You should also pay attention to the following points:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.
  NOTE: Do not run signal or communications wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.
- You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separated.
- It is strongly advised that you label wiring to all devices in the system when necessary.

Grounding the EtherDevice Switch

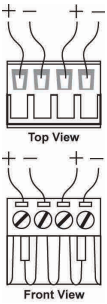
Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.

ATTENTION

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel.

Wiring the Redundant Power Inputs

The top two contacts and the bottom two contacts of the 4-contact terminal block connector on the EDS's top panel are used for the EDS's two AC/DC inputs. Top and front views of one of the terminal block connectors are shown here.



STEP 1:
Insert the negative/positive AC/DC wires into the V-/V+ terminals.

STEP 2:
To keep the AC/DC wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

STEP 3:
Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on EDS's top panel.

ATTENTION

Before connecting the EtherDevice Switch to the AC/DC power inputs, make sure the AC/DC power source voltage is stable.

Communication Connections

The EDS-205A models have 4 or 5 10/100BaseT(X) Ethernet ports, and 1 or 0 (zero) 100 BaseFX multi/single-mode (SC/ST-type connector) fiber ports. The EDS-208A models have 6, 7 or 8 10/100BaseT(X) Ethernet ports, and 2, 1 or 0 (zero) 100 BaseFX multi/single-mode (SC/ST-type connector) fiber ports.

10/100BaseT(X) Ethernet Port Connection

The 10/100BaseT(X) ports located on the EDS's front panel are used to connect to Ethernet-enabled devices. Below we show pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch-type) ports, and also show cable wiring diagrams for straight-through and cross-over Ethernet cables.

10/100Base T(x) RJ45 Pinouts

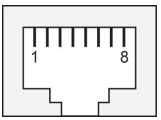
MDI Port Pinouts

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-

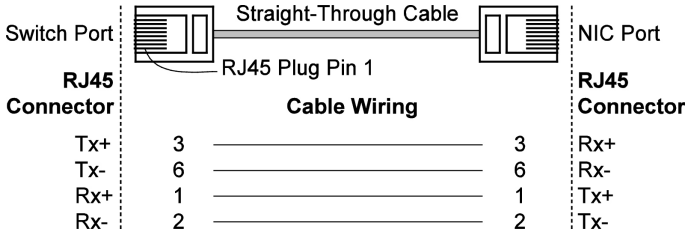
MDI-X Port Pinouts

Pin	Signal
1	Rx+
2	Rx-
3	Tx+
6	Tx-

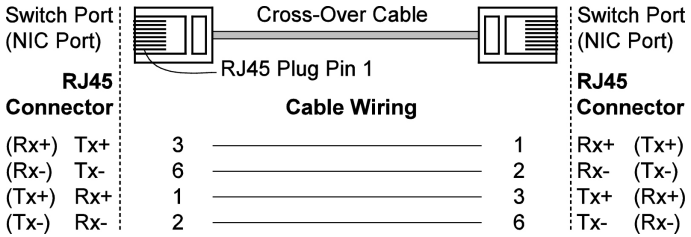
8-pin RJ45



RJ45 (8-pin) to RJ45 (8-pin) Straight-Through Cable Wiring



RJ45 (8-pin) to RJ45 (8-pin) Cross-Over Cable Wiring

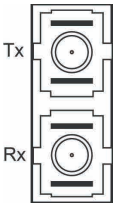


100BaseFX Ethernet Port Connection

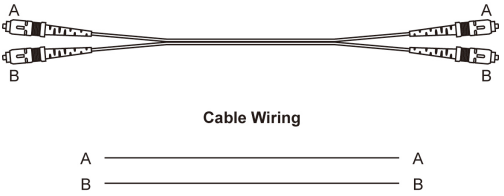
The concept behind the SC/ST port and cable is quite straightforward. Suppose you are connecting devices I and II; contrary to electrical signals, optical signals do not require a circuit in order to transmit data. Consequently, one of the optical lines is used to transmit data from device I to device II, and the other optical line is used transmit data from device II to device I, for full-duplex transmission.

Remember to connect the Tx (transmit) port of device I to the Rx (receive) port of device II, and the Rx (receive) port of device I to the Tx (transmit) port of device II. If you make your own cable, we suggest labeling the two sides of the same line with the same letter (A-to-A and B-to-B, as shown below, or A1-to-A2 and B1-to-B2).

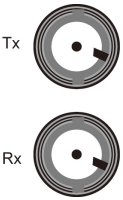
SC-Port Pinouts



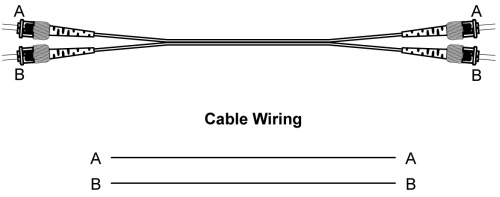
SC-Port to SC-Port Cable Wiring



ST-Port Pinouts



ST-Port to ST-Port Cable Wiring



ATTENTION

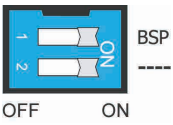
This is a Class 1 Laser/LED product. To avoid causing serious damage to your eyes, do not stare directly into the Laser Beam.

Redundant Power Inputs

Both power inputs can be connected simultaneously to live AC/DC power sources. If one power source fails, the other live source acts as a backup, and automatically supplies all of the EDS's power needs.

DIP Switch Settings

EDS-205A/208A DIP Switches



The default setting for each DIP Switch is OFF. The following table explains the effect of setting the DIP Switches to the ON positions.

DIP Switch	Setting	Description
----		Serves no function (reserved for future use).
BSP	ON	Enables broadcast storm protection
	OFF	Disables broadcast storm protection

ATTENTION

To actively updated DIP switch settings, power off and then power on the EDS.

LED Indicators

The front panel of the Moxa EtherDevice Switch contains several LED indicators. The function of each LED is described in the table below.

LED	Color	State	Description
P1	AMBER	On	Power is being supplied to power input P1.
		Off	Power is **not** being supplied to power input P1.
P2	AMBER	On	Power is being supplied to power input P2.
		Off	Power is **not** being supplied to power input P2.
10M	Yellow	On	TP port's 10 Mbps link is active.
		Blinking	Data is being transmitted at 10 Mbps.
		Off	TP Port's 10 Mbps link is inactive
100M	GREEN	On	TP port's 100 Mbps link is active.
		Blinking	Data is being transmitted at 100 Mbps.
		Off	100Base TP Port's link is inactive.

Auto MDI/MDI-X Connection

The Auto MDI/MDI-X function allows users to connect the EDS's 10/100BaseTX ports to any kind of Ethernet device, without needing to pay attention to the type of Ethernet cable being used for the connection. This means that you can use either a straight-through cable or cross-over cable to connect the EDS to Ethernet devices.

Dual Speed Functionality and Switching

The Moxa EtherDevice Switch's 10/100 Mbps switched RJ45 port auto negotiates with the connected device for the fastest data transmission rate supported by both devices. All models of Moxa EtherDevice Switch are plug-and-play devices, so that software configuration is not required at installation, or during maintenance. The half/full duplex mode for the switched RJ45 ports is user dependent and changes (by auto-negotiation) to full or half duplex, depending on which transmission speed is supported by the attached device.

Switching, Filtering, and Forwarding

Each time a packet arrives at one of the switched ports, a decision is made to either filter or forward the packet. Packets with source and destination addresses belonging to the same port segment will be filtered, constraining those packets to one port, and relieving the rest of the network from the need to process them. A packet with destination address on another port segment will be forwarded to the appropriate port, and will not be sent to ports where it is not needed. Packets that are used in maintaining the operation of the network (such as the occasional multi-cast packet) are forwarded to all ports. The EDS operates in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

Switching and Address Learning

The EDS has an address table that can hold up to 1024 addresses, which makes it suitable for use with large networks. The address tables are self-learning, so that as nodes are added or removed, or moved from one segment to another, the EDS automatically keeps up with new node locations. An address-aging algorithm causes the least-used addresses to be deleted in favor of newer, more frequently used addresses. To reset the address buffer, power down the unit and then power it back up.

Auto-Negotiation and Speed Sensing

All of the EDS's RJ45 Ethernet ports independently support auto-negotiation for speeds in the 10BaseT and 100BaseTX modes, with operation according to the IEEE 802.3u standard. This means that some nodes could be operating at 10 Mbps, while at the same time, other nodes are operating at 100 Mbps. Auto-negotiation takes place when an RJ45 cable connection is made, and then each time a LINK is enabled. The EDS advertises its capability for using either 10 Mbps or 100 Mbps transmission speeds, with the device at the other end of the cable expected to advertise in a similar manner. Depending on what type of device is connected, this will result in agreement to operate at a speed of either 10 Mbps or 100 Mbps. If an EDS RJ45 Ethernet port is connected to a non-negotiating device, it will default to 10 Mbps speed and half-duplex mode, as required by the IEEE 802.3u standard.

Specifications

Technology	
Standards	IEEE 802.3 for 10BaseT, IEEE 802.3u for 100BaseT(X) and 100BaseFX, IEEE 802.3x for Flow Control
Processing Type	Store and Forward
Flow Control	IEEE 802.3x flow control, back pressure flow control
Interface	
RJ45 Ports	10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection
Fiber Ports	100BaseFX ports (SC/ST connector, multi/single-mode)

LED Indicators	P1, P2 (Power), 10/100M (TP port), and 100M (Fiber port)
DIP Switch	enable/disable broadcast storm protection
Optical Fiber	

	100BaseFX	
	Multi-mode	Single-mode
Wavelength	1300 nm	1310 nm
Max. TX	-10 dBm	0 dBm
Min. TX	-20 dBm	-5 dBm
RX Sensitivity	-32 dBm	-34 dBm
Link Budget	12 dB	29 dB
Typical Distance	5 km[a]	40 km[c]
	4 km[b]	
Saturation	-6 dBm	-3 dBm

a. using [50/125μm, 800 MHz*km] cable
b. using [62.5/125μm, 500 MHz*km] cable
c. using [9/125 μm, 3.5 PS/(nm*km)] cable

Power	
Input Voltage	12/24/48 VDC (9.6 to 60 VDC), 18 to 30VAC (47 to 63 Hz)
Input Current @ 24VDC	0.1 A (EDS-205A) 0.11 A (EDS-205A-M/S) 0.13 A (EDS-208A) 0.17 A (EDS-208A-M/S) 0.22 A (EDS-208A-MM/SS)
Connection	Removable 4-contact terminal block
Overload Current Protection	1.1 A
Reverse Polarity Protection	Present
Physical Characteristics	
Housing	IP30 protection, metal case
Dimensions	EDS-208A Series: 50 x 115 x 70 mm EDS-205A: 30 x 115 x 70 mm
Weight	EDS-208A Series: 275 g EDS-205A: 175 g
Installation	DIN-Rail Mounting, Wall Mounting (with optional kit)
Environmental Limits	
Operating Temperature	-10 to 60°C (14 to 140°F) -40 to 75°C (-40 to 167°F) for -T models
Storage Temperature	-40 to 85°C (-40 to 185°F)
Ambient Relative Humidity	5 to 95% (non-condensing)
Regulatory Approvals	
Safety	UL508
Hazardous Location	UL/cUL Class I, Division 2, Groups A, B, C, and D; ATEX Zone 2, Ex nA nC IIC T4 Gc
Maritime	DNV, GL, ABS, LR, NK
Rail Traffic	EN 50121-4
EMI	FCC Part 15, CISPR (EN 55022) class A
EMS	EN 61000-4-2 (ESD), Level 3 EN 61000-4-3 (RS), Level 3

	EN 61000-4-4 (EFT), Level 3 EN 61000-4-5 (Surge), Level 3 EN 61000-4-6 (CS), Level 3 EN 61000-4-8 EN 61000-4-11
Shock	IEC 60068-2-27
Freefall	IEC 60068-2-32
Vibration	IEC 60068-2-6
WARRANTY	5 years

Technical Support Contact Information
www.moxa.com/support

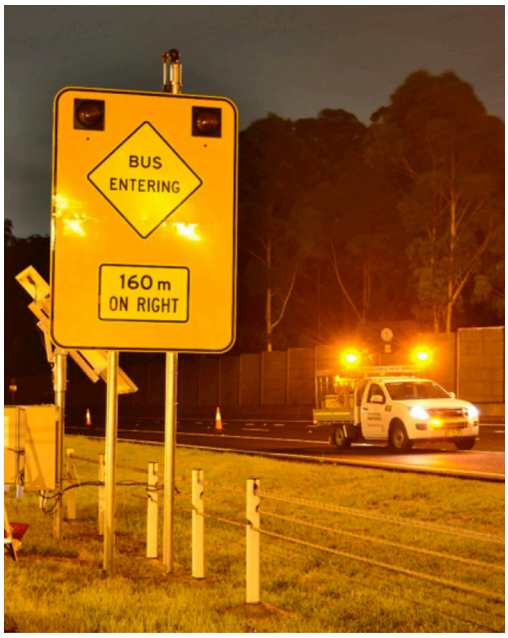
Moxa Americas:
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Fax: 1-714-528-6778

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Moxa Asia-Pacific:
Tel: +886-2-8919-1230
Fax: +886-2-8919-1231

Appendix A5 – Braums Advance Warning Flashers datasheet



Choose the future

Choose BRAUMS

"ITS" Moving Traffic

ADVANCED WARNING FLASHER SYSTEMS

Improved safety

Responsive to customer needs

Wide range of applications

BRAUMS

"ITS" Moving Traffic

ADVANCED WARNING FLASHER SYSTEMS

The BRAUMS Advanced Warning Flasher Systems (AWFS) are designed to provide advanced and/or extra warning to road users (motorists, cyclists and pedestrians) as they approach a location with a potential safety risk.

Warnings are presented with an image and/or text on a static reflective aluminium sign, with two yellow beacons, flashing alternately. The flashing beacons make the sign more conspicuous than unlit static signs. The signs and the beacons are fully customisable to meet your specific requirements.

Key Features

- Can be activated by time of day or environmental conditions (such as reduced visibility)
- Can be activated by a large range of vehicle detection methods, including radar detection, video detection, thermal imagery sensors, inductive loops or ultrasonic sensors (commonly used in car parks).
- Can also be activated by remote switching or manual switching either at the sign or inside of a building/carpark.
- System can be customised to constantly flash day and night
- The static sign may be hinged, if it is not to be displayed when the potential safety risk is not present, and can be manually opened and closed when required.
- Able to be integrated into a new or existing system, such as Traffic Signal Controller near a signaled intersection or railway crossing.
- Capable of being powered by Mains supply or solar power.



- The amount of time the beacons alternately flash for when activated can be adjusted to suit using a rotary switch on the BRAUMS BPF0204 Flasher Device.
- Able to be split into sub-systems, with a single detection sub-system activating one or multiple flashing sign sub-systems. Communications between sub-systems can be hard-wired, or wireless, such as Wi-Fi, Cellular (3G/4G), or using a dedicated licensed two-way radio link in the UHF frequency band (450-520 MHz).
- A wide range of symbolic images and text can be printed onto the static sign, and the size of the sign can be customised. Static signs are made to meet the relevant Road Authority's Specifications.
- The flashing beacons are commonly amber LED traffic signal lanterns, 200mm in diameter. However, red, green, and white can also be provided, as well as 100mm and 300mm sized traffic signal lantern beacons.
- All 200mm and 300mm traffic signal lanterns are compliant with the Australian Standard: AS 2144 "Traffic signal lanterns"
- Solar Powered systems are sized depending on how much autonomy is needed, in the event of no sunlight, as well as how often the system is expected to be in operation for.

Certified System™
Quality
ISO 9001
SAI GLOBAL

www.braums.com.au
BRAUMS Pty Ltd
Telephone: +61 2 9684 3399
Facsimile: +61 2 9684 3390
E-mail: info@braums.com.au
Unit N,10-16 South Street,
Rydalmere NSW 2116 Australia
PO Box 324 Ermington NSW 2115
ABN 31 150 551 732

Appendix A6– Weidmuller interface relays datasheet

RIDERSERIES RCI
RCI484AE8

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
D-32758 Detmold
Germany
Fon: +49 5231 1429-0
Fax: +49 5231 14292083
www.weidmueller.com



Standard relay within the RIDERSERIES RCI.
- 2 CO contacts
- Relay with DC coil
- Relay with test button, integrated status display and free-wheel diode

General ordering data

Type	RCI484AE8
Order No.	8870330000
Version	RIDERSERIES RCI, Relay, No. of contacts: 2 CO contact with test button AgNi 90/10, Rated control voltage: 48 V DC, Continuous current: 8 A, Plug-in connection
GTIN (EAN)	4032248613717
Qty.	10 pc(s).

RIDERSERIES RCI
RCI484AE8

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
D-32758 Detmold
Germany
Fon: +49 5231 1429-0
Fax: +49 5231 14292083
www.weidmueller.com

Technical data

Dimensions and weights

Width	13 mm	Width (inches)	0.512 inch
Height	29 mm	Height (inches)	1.142 inch
Depth	26.7 mm	Depth (inches)	1.051 inch
Net weight	17.1 g		

Temperatures

Humidity	40 °C / 93 % rel. humidity, no condensation	Operating temperature	-40 °C...70 °C
Storage temperature	-40 °C...85 °C		

Input

Rated control voltage	48 V DC	Rated current DC	8.7 mA
Power rating	400 mW	Pull-in/drop-out voltage, typ.	33.6 V / 4.8 V DC
Coil resistance	5520 Ω ± 10 %	Status indicator	Green LED
Protective circuit	Free-wheel diode		

Output

Rated switching voltage	240 V AC	Max. switching voltage, AC	400 V
Continuous current	8 A	Inrush current	15 A / 4 s
AC switching capacity (resistive), max.	2000 VA	DC switching capacity (resistive), max.	192 W @ 24 V
Switch-on delay	≤ 10 ms	Switch-off delay	≤ 6 ms
Min. switching power	1 mA @ 24 V, 10 mA @ 12 V, 100 mA @ 5 V	Max. switching frequency at rated load	0.1 Hz

Contact data

Contact type	2 CO contact with test button (AgNi 90/10)	Mechanical service life	AC coil 5 x 10^6 Switch. cycles, DC coil 10 x 10^6 Switch. cycles

General data

Test button	yes (loackable, just when removing the detent lock)	Mechanical switch position indicator	Yes
UL 94 flammability rating	V-2		

Insulation coordination

Rated voltage	250 V	Creepage and clearance distance input – output	≥ 8 mm
Dielectric strength input – output	5 kV_{eff} / 1min	Dielectric strength of neighbouring contacts	2.5 KV_{eff} / 1 min.
Dielectric strength of open contact	1 kV_{eff} / 1 min	Impulse withstand voltage	5 kV (1.2/50 µs)
Insulating material group	IIIa	Pollution severity	2
Surge voltage category	III		

Further details of approvals / standards

Standards	IEC 61810-1, UL508	Certificate No. (CSA)	249409-2426937
Certificate No. (cURus)	E224238		

RIDERSERIES RCI
RCI484AE8

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
D-32758 Detmold
Germany
Fon: +49 5231 1429-0
Fax: +49 5231 14292083
www.weidmueller.com

Technical data

Connection data

Wire connection method	Plug-in connection	Pitch in mm (P)	5 mm

Classifications

ETIM 3.0	EC001437	ETIM 4.0	EC001437
ETIM 5.0	EC001437	ETIM 6.0	EC001437
UNSPSC	30-21-19-17	eClass 5.1	27-37-16-01
eClass 6.2	27-37-16-01	eClass 7.1	27-37-16-01
eClass 8.1	27-37-16-01	eClass 9.0	27-37-16-01
eClass 9.1	27-37-16-01		

Product information

Descriptive text technical data	x = 25.5 without test button / 26.7 with test button

Approvals

Approvals	
ROHS	Conform

Downloads

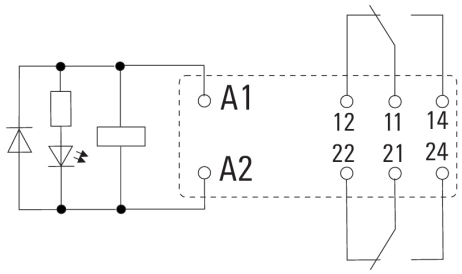
Approval/Certificate/Document of Conformity	DE_PA5600_160401_002.pdf
Brochure/Catalogue	CAT 4.2 ELECTR 15/16 EN
Engineering Data	EPLAN, WSCAD

RIDERSERIES RCI
RCI484AE8

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Klingenbergstraße 16
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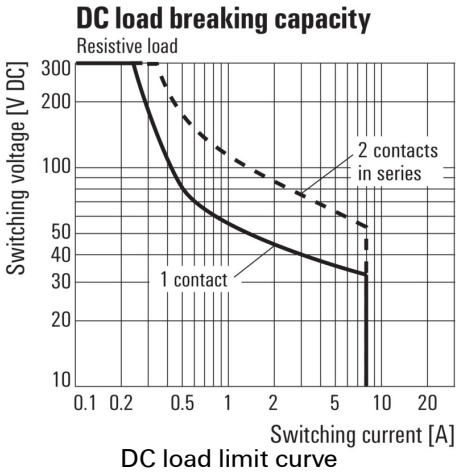
Drawings

Wiring diagram



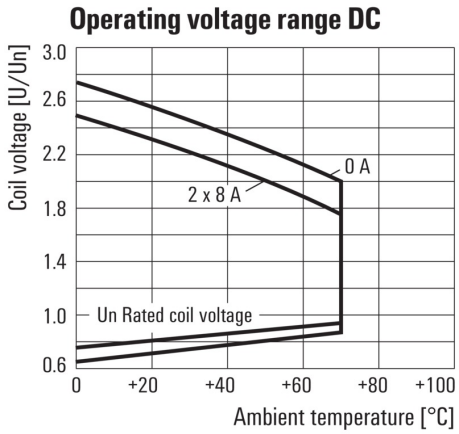
View of Pins from below

Graph



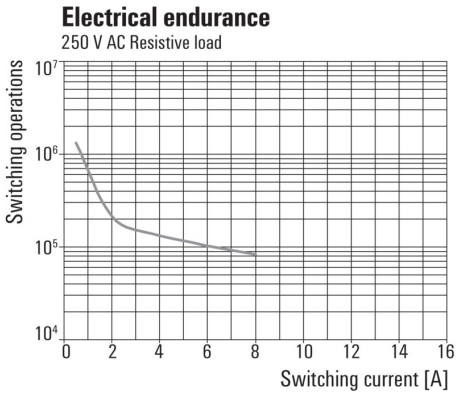
DC load limit curve
Resistive load

Graph



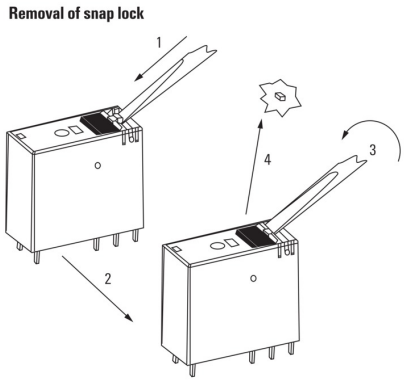
DC operational voltage range

Graph



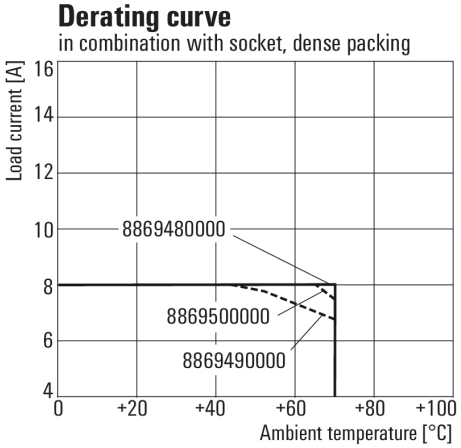
Electrical service life
250 V AC resistive load

Dimensional drawing



Detailed drawing
Removal of the test button detent lock

Derating curve



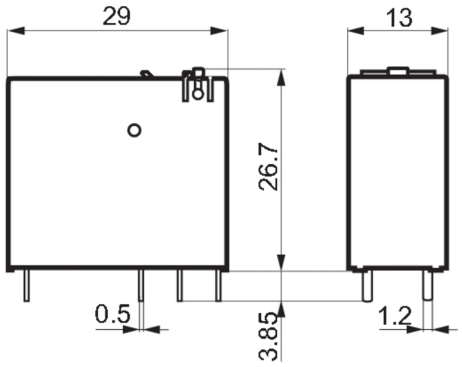
Relay in combination with base

RIDERSERIES RCI
RCI484AE8

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
D-32758 Detmold
Germany
Fon: +49 5231 1429-0
Fax: +49 5231 14292083
www.weidmueller.com

Drawings

Dimensional drawing



Miscellaneous

Type code	RCI				
Type	RIDER Control Industrial				
Type of construction					
3	16 A, pinning 5 mm				
4	8 A, pinning 5 mm				
Type of contact					
1	1 CO contacts without push button				
2	2 CO contacts without push button				
7	1 CO contact with push button				
8	2 CO contacts with push button				
Contact material					
4	AgNi 90/10				

Coil	
012	12 V DC
024	24 V DC
048	48 V DC
110	110 V DC
524	24 V AC
615	115 V AC
730	230 V AC
AB2	12 V DC + LED + diode
AC4	24 V DC + LED + diode
AE8	48 V DC + LED + diode
BB0	110 V DC + LED + diode
R24	24 V AC + LED
S15	115 V AC + LED
T30	230 V AC + LED

Type codes

Appendix A7– Rittal ITS Cabinet

Field FC



INDEX

Leaflet
Catalogue Information
Technical Drawings

WEB LINKS

Field FC Information Page

Ask a question / Send us an enquiry

Information about B&R

Local Sales Team Phone Numbers

Head Office PO Box 1151 Browns Plains BC QLD 4118 Australia
T +61 7 3714 1000 **F** +61 7 3714 1081 brenclosures.com.au

Field FC

Features

- Protection rating – IP66
- Approvals
  CE marked
  Lloyds
- Flush front and read doors with concealed hinges
- Lifting lugs (eye bolts) on enclosure top
- Plinths for corrosion protection
- 3 point locking, low profile handle to minimise damage
- Door stays to retain door in open position
- Rainhood / Sunshield to minimise the effect of the elements
- Adjustable internal mounting rail system



OVERVIEW

With substantial growth in infrastructure in Australia, the requirement to protect electronic equipment in outdoor and isolated locations has lead to the need for a flexible enclosure.The field enclosure has been designed specifically to minimise vandalism.

MATERIALS

- Body – Zinc coated steel, 316 stainless steel or aluminium
- Body thickness – 2mm
- Surface finish - Polyester powdercoated T33 smoke blue textured gloss (anti-graffiti coating also available)

APPLICATION

The flexibility of the range allows it to be used in a variety of applications including the housing of ITS equipment, GPS receivers/transmitters, road monitoring/traffic management equipment, radio communications equipment.

INCLUSIONS

- Enclosure frame
- Front and rear door
- Rainhood / Sunshield
- 3mm aluminium gland plates
- 100mm high plinth – stainless
- Eye bolts
- Vertical mounting posts








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Field FC

SELECTION GUIDE

Catalogue No.			Dimensions (mm)				
Zinc coated steel	316 stainless steel	Aluminium	Height*	Width	Depth	Usable Depth	Available RU
FC130706	FC130706/S▲	FC130706/A▲	1375	755	620	520	24
FC160706	FC160706/S▲	FC160706/A▲	1675	755	620	520	31
FC190706	FC190706/S▲	FC190706/A▲	1975	755	620	520	38
FC220706▲	FC220706/S▲	FC220706/A▲	2275	755	620	520	45

Note: side panels and racks not included
Overall height
▲ Available with vertical door rail

ACCESSORIES

			To suit enclosure(mm)	
Product	Description	Catalogue No.*	Height	Depth
Flush side panel – zinc coated steel	panel with no ventilation	FCCP1306	1375	620
		FCCP1606	1675	620
		FCCP1906	1975	620
		FCCP2206▲	2275	620
Flush side panel – 316 stainless steel	panel with no ventilation	FCCP1306/S▲	1375	620
		FCCP1606/S▲	1675	620
		FCCP1906/S▲	1975	620
		FCCP2206/S▲	2275	620
Flush side panel – aluminium	panel with no ventilation	FCCP1306/A▲	1375	620
		FCCP1606/A▲	1675	620
		FCCP1906/A▲	1975	620
		FCCP2206/A▲	2275	620
Vented side panel – zinc coated steel	panel with no ventilation	FCCP1306V	1375	620
		FCCP1606V	1675	620
		FCCP1906V	1975	620
		FCCP2206V▲	2275	620
Vented side panel – 316 stainless steel	panel with no ventilation	FCCP1306V/S▲	1375	620
		FCCP1606V/S▲	1675	620
		FCCP1906V/S▲	1975	620
		FCCP2206V/S▲	2275	620
Vented side panel – aluminium	panel with no ventilation	FCCP1306V/A▲	1375	620
		FCCP1606V/A▲	1675	620
		FCCP1906V/A▲	1975	620
		FCCP2206V/A▲	2275	620

* Includes one side panel only
▲ Available on request



Side panel



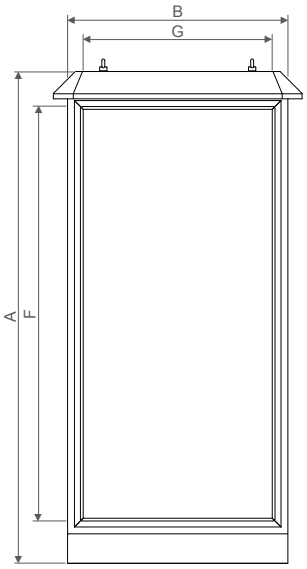
Vented side panel

Queensland P +61 7 3714 1000
Townsville P +61 7 4775 6255
Sydney P +61 2 8867 7688
Newcastle P +61 2 4961 4433
Victoria P +61 3 8588 8400
South Australia P +61 8 8417 6200
Western Australia P +61 8 9248 9744
Tasmania P +61 3 6331 5545
Northern Territory P +61 8 8947 0870

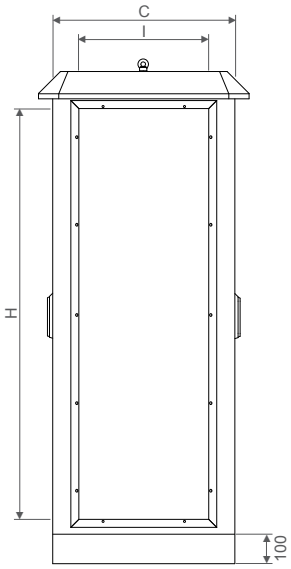
sales@brenclosures.com.au
brenclosures.com.au

PROUDLY AUSTRALIAN

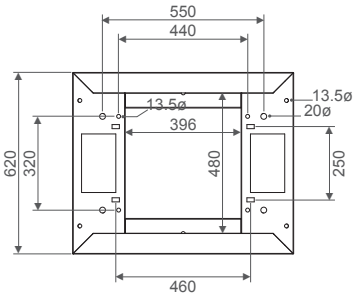
Technical Drawings



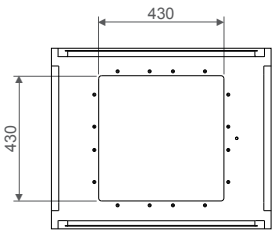
Front View



Side View



Bottom View



Cable Entry

			Dimensions (mm)						
	Catalogue No.		External			Front Depth		Mounting Pan	
Zinc coated steel	316 stainless steel	Aluminium	A	B	C	D	E	G	H
FC130706	FC130706/S	FC130706/A	1375	755	620	1085	640	1095	440
FC160706	FC160706/S	FC160706/A	1675	755	620	1385	640	1395	440
FC190706	FC190706/S	FC190706/A	1975	755	620	1685	640	1695	440
FC220706	FC220706/S	FC220706/A	2275	755	620	1985	640	1995	440

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Appendix B – Cable Schedule

CABLE SCHEDULE															
CLASS	CABLE DESCRIPTION	Cable Type	PLANT AREA	EQUIPMENT NUMBER	FROM TAG	FROM DESCRIPTION	TO TAG	TO DESCRIPTION	SIZE mm^2	NO OF CORES	MANUFACTURER	INSULATION TYPE	CABLE LENGTHS (M)	REFERENCE DRAWINGS	REVISION	COMMENTS
LV POWER	Main Supply					230VAC A,N &E Dist Board	Q0104	ITS Cabinet	25	2C + E				SMFH-68202-RevA 2020.07.10	0	
CONTROL	Power Cable				A0143	Solid State Flasher	A4005	Amber Warning Light	2.5	11C+E				SMFH-68202-RevA 2020.07.10	0	
CONTROL	Power Cable				1501	Relay	A4017	Red Stop Light	2.5	11C+E				SMFH-68202-RevA 2020.07.10	0	
CONTROL	Camera Power supply	RS485 BPL				ITS Cabinet	63421	Thermal Camera 2	0.75	4/STP	Belden			SMFH-68202-RevA 2020.07.10	0	
CONTROL	Camera Power supply	RS485 BPL				ITS Cabinet	63471	Thermal Camera 3	0.75	4/STP	Belden			SMFH-68202-RevA 2020.07.10	0	
CONTROL	Camera Power supply	RS485 BPL				ITS Cabinet	64371	Thermal Camera 4	0.75	4/STP	Belden			SMFH-68202-RevA 2020.07.10	0	
CONTROL	Camera Power supply	RS485 BPL				ITS Cabinet	64421	Thermal Camera 5	0.75	4/STP	Belden			SMFH-68202-RevA 2020.07.10	0	
CONTROL	Camera Power supply	RS485 BPL				ITS Cabinet	64471	Thermal Camera 6	0.75	4/STP	Belden			SMFH-68202-RevA 2020.07.10	0	
COMMS	Fibre Optic	Fibre			4504	Dispatch office	4510	ITS Cabinet		8C				SMFH-68202-RevA 2020.07.10	0	

Notes:
Cable lengths where shown are estimated from drawing take offs and will need to be confimed on site