APPENDIX K

TRAFFIC IMPACT ASSESSMENT REPORT

TRAFFIC IMPACT ASSESSMENT

FOR

HOLCIM SALT ASH SAND OPERATIONS

8 OAKVALE DRIVE

SALT ASH

VOLUME 1 REPORT

Ref. 20047RF

1 October 2021

Prepared By

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STAGE 5

ROAD SAFETY AUDIT REPORT

FOR

EXISTING ROADS AND INTERSECTIONS

AT SALT ASH,

WILLIAMTOWN

AND

TOMAGO

Volume 2

Ref. 20047RSA.R1

26 November 2021

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1.0 INTRODUCTION

1.1 Background

This report details a Stage 5 Road Safety Audit of various existing roads that are used as the main transport routes by trucks generated by Holcim Sand Quarry at Salt Ash.

This includes;

- Oakvale Drive, Salt Ash;
- Nelson Bay Road between Oakvale Drive, Salt Ash and Cabbage Tree Road, Williamtown; and
- Cabbage Tree Road/Tomago Road between Williamtown and Tomago.

The audit also includes the access intersections used by sand importation trucks at Anna Bay (Nelson Bay Road/Horse Trail), Tanilba Bay (Lemon Tree Passage Road/Oyster Cove Road) and Cabbage Tree Quarry (Cabbage Tree Road/Quarry Access Road).

Holcim operates the existing sand quarry at 8 Oakvale Drive, Salt Ash and have lodged an application to increase production and transportation.

The road safety audit was requested as part of the SEARS for Traffic and Road Transport Matters for Holcim Salt Ash Sand Operations – SSD 9099356.

This report Volume 2 documents the results of the road safety audit.

The Traffic Impact Assessment which includes traffic modelling of the impacts of the Project are included in the Volume 1 report.

The Stage 5 audit was undertaken on the existing road and traffic management along the route. The purpose of the audit was to examine the features of the existing road network which may affect road user safety and identify potential safety hazards.

The audit examined the existing road alignment, cross sections, road shoulders, intersections, delineation/signage, bridges and culverts, pavement, provision for heavy vehicles and other miscellaneous matters and assessed these against current road practice guidelines and standards, with the objective of identifying any real or potential road safety hazards.

While not normally part of a road safety audit, the most recent 3 year crash statistics for the roads were also analysed.

1.2 Audit Methodology and Auditors

The audit has been carried out following the procedures set out in the Austroads Guide to Road Safety Parts 6 and 6A. The audit examines the features of the existing road network which may affect road user safety and it has sought to identify potential safety hazards.

However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this report were to be followed, this would not confirm that the road network is ‘safe’; rather, adoption of any actions should improve the level of safety of the audited road network.

The Road Safety Audit Team included:

Terry Lawrence	Director Accredited Level 3 Road Safety Auditor (Audit Leader) Auditor ID: RSA-02-002
Lisa Tulau	Design Manager Accredited Level 3 Road Safety Auditor Auditor ID: RSA-02-0443

1.3 References & Documentation

The following references and documents were reviewed as part of the Audit.

References

- Austroads Guide to Road Safety: Part 1: Road Safety Overview and Part 6 and 6A: Managing Road Safety Audits and Implementing Road Safety Audits.
- Austroads - Guide to Road Design
- RMS (now TfNSW) - Supplements to Austroads Guide to Road Design
- RMS (now TfNSW) Delineation Manual

Documentation

- Recent traffic volumes collected between 6-13 August 2021 for the traffic impact assessment, as well as traffic modelling of critical intersections; and
- Three year road crash statistics between 1 October 2017 and 30 September 2020, as supplied by the TfNSW.

1.4 Audit Process

The Road Safety Audit included the following tasks:

- A review of all relevant information to conduct the audit.
- Auditing of existing road network. A site inspection of the road network was undertaken on Saturday 6 November, 2021.
- Identification of any non-conformances and road safety considerations.
- Preparation of Road Safety Audit Report.

The road network was examined relative to design standards and guidelines in terms of:

- Road alignment and cross sections
- Auxiliary Lanes
- Intersections
- Signs and Lighting
- Markings and Delineation
- Crash Barriers and Clear Zones
- Pedestrians, Cyclists and Public Transport
- Bridges and Culverts
- Pavement
- Provision for Heavy Vehicles
- Parking

- Miscellaneous Issues

The audit report was prepared concurrently.

1.5 Responding to the Audit Report

As set out in the road safety audit guidelines, responsibility for the road design/road network always rests with the road designer/road authority and not with the auditor. The road designer/road authority is under no obligation to accept any or all the audit recommendations. Also, it is not the role of the auditor to agree to or approve of the road designer/road authority's response to the audit. Rather, the audit provides the opportunity to highlight potential problems and have them formally considered by the road designer/road authority, in conjunction with all other relevant considerations.

To assist with this, a table contained within Audit Findings provides a column for any response.

2.0 DESCRIPTION OF THE AUDITED ROAD NETWORK

2.1 Road Network and Intersections

Oakvale Drive

Oakvale Drive is a two lane local road that provides access to Holcim's Salt Ash Quarry and adjacent land uses including Oakvale Wildlife Park, Macka's Sand Quarry and Australian Angus Beef Operation.

Oakvale Drive will accommodate 100% of finished sand product trucks, as well as 100% of the trucks importing sand and fill to Salt Ash Quarry.

At its northern end, Oakvale Drive intersects with Nelson Bay Road and Lemon Tree Passage Road at a two lane roundabout intersection.

Oakvale Drive consists of a section of public road, which links to a private road.

The public road section is approximately 480 metres in length and includes vehicle access to Oakvale Wildlife Park. This section has a sealed road pavement width which varies between 8.5 to 11.0 metres wide with grass shoulders.

A 90 degree bend occurs at the vehicle entrance to Oakvale Wildlife Park with Give Way Control on the eastern arm of Oakvale Drive.

A sealed private road with a posted 20km/h speed limit links to the public road section, east of the vehicle access to Oakvale Wildlife Park. The private road provides vehicle access to Holcim's Sand Quarry, as well as to the Macka's Sand Quarry.

Oakvale Drive, including the private road sections is an approved 25 metre/26 metre B double route.

Oakvale Drive accommodates all the vehicles generated by Holcim's Salt Ash Quarry including heavy vehicles.

Nelson Bay Road between Oakvale Drive, Salt Ash and Cabbage Tree Road, Williamtown

Nelson Bay Road is a state arterial road and an approved 25 metre/26 metre B double route.

The section of Nelson Bay Road between Oakvale Drive at Salt Ash and Cabbage Tree Road at Williamtown forms part of Sydney and Newcastle transport routes and accommodates approximately 96% of finished sand product trucks generated by Salt Ash Quarry, as well as the transport route for trucks importing sand from Cabbage Tree Road Quarry. Approximately 35% of sand importation trucks use this section of Nelson Bay Road, as well as 96% of fill importation trucks.

An additional 3% of finished sand product trucks associated with the North Coast market as well as an additional 3% of fill importation trucks use Nelson Bay Road between Oakvale Drive and Richardson Road.

Traffic management in this section of Nelson Bay Road includes;

- An 80km/h speed limit;

- Dual carriageway with four lanes between Oakvale Drive and 830 metres south west of Richardson Road;

- A single carriageway with two lanes between 830 metres south west of Richardson Road and Medowie Road;

- Dual carriageway with four lanes between Medowie Road and Cabbage Tree Road.

Traffic management at principal intersections include;

- Two lane roundabout at Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road;

- Two lane roundabout at Nelson Bay Road/Richardson Road/Salt Ash Avenue;

- Two lane roundabout at Nelson Bay Road/Medowie Road;

- Traffic signals at Nelson Bay Road/Williamtown Drive;

- Two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane.

Cabbage Tree Road/Tomago Road

Cabbage Tree Road/Tomago Road is a state arterial road that links between Nelson Bay Road at Williamtown and Pacific Highway at Tomago. Cabbage Tree Road/Tomago Road is an approved 25 metre/26 metre B-double route.

Cabbage Tree Road/Tomago Road form part of the Sydney/Central Coast Transport Route and accommodates approximately 90% of finished sand product trucks generated by Salt Ash Quarry and 90% of the fill importation trucks.

The eastern section of Cabbage Tree Road will also be used by trucks importing sand to Salt Ash Quarry from Cabbage Tree Road Quarry. Up to 35% of sand importation trucks use this section of Cabbage Tree Road.

The road is generally a two lane road with a high level of traffic management including centreline and edgeline road marking, sealed shoulders, guide posts and channelised treatments and auxiliary lanes at principal intersections.

The eastern section of the route generally has rural and semi rural residential land uses fronting the road.

The western section between Masonite Road and Pacific Highway generally has industrial uses adjacent the road.

Traffic management at principal intersections include;

- Two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane;

- A left turn deceleration lane (AUL) and a left turn acceleration lane (AUL) in Cabbage Tree Road at the Cabbage Tree Quarry Access Road together with left in/left out restrictions on the Access Road.

- CHR and AUL right and left turn treatments at Cabbage Tree Road/Tomago Road/Masonite Road;

- Traffic signals at the intersection of Tomago Road/Westrac Access Road;

- CHR and AUL right and left turn treatments in Tomago Road at the;

  - Access Road to 606-608 Tomago Road;
  - Tomago Aluminium Entrance Road.

- Two lane roundabout at Tomago Road/Old Punt Road; and

- Traffic signals at Tomago Road/Pacific Highway.

The speed limit in Cabbage Tree Road/Tomago Road is 80km/h, with a section of 60km/h between Old Punt Road and Pacific Highway.

2.2 Quarry Access Intersections

Holcim's trucks use the following intersections to access the sand quarries that are part of its current and proposed future operations.

- Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road, Salt Ash, which is a two lane roundabout. The intersection is/will be used by all 100% of finished sand product trucks and sand and fill importation trucks;

- Nelson Bay Road/Horse Trail, Anna Bay, which is a T junction intersection with No Right Turn restrictions out of Horse Trail. This intersection is/will be used by 50% of the sand importation trucks;

- Cabbage Tree Road/Cabbage Tree Quarry Access Road, which is a T junction intersection with left turn only movements permitted into and out of the Quarry Access Road. This intersection is/will be used by 35% of the sand importation trucks;

- Lemon Tree Passage Road/Oyster Cove Road, which is a T junction intersection with priority control. This intersection is/will be used by 15% of the sand importation trucks.

2.3 Traffic Conditions

Weekdays carry the highest traffic volumes on the road network and the weekday AM and PM peak hours represent the busiest times.

SIDRA traffic modelling undertaken for the traffic assessment at the principal intersections on the transport routes which also included Quarry Access Intersections indicated that all the intersections currently operate at a satisfactory to good level of service (i.e. Level of Service A or B operation) with low vehicle delays.

This indicates that all these intersections have spare capacity.

2.4 Crash Records

Road crash data for the 3 year period between 1 October 2017 and 30 September 2020 was obtained from TfNSW. The crash data is analysed and summarised below.

Oakvale Drive Salt Ash

There were no reported crashes in Oakvale Drive during the 3 year period.

Nelson Bay Road between Oakvale Drive, Salt Ash and Cabbage Tree Road Williamtown

There were a total of 22 reported crashes in this 7.8km long section of Nelson Bay Road during the 3 year period, which included 13 injury and 9 non injury crashes.

Intersection crashes totalled 14 crashes, 9 of which were injury crashes. These were spread over a number of intersections with Nelson Bay Road/Oakvale Drive/Lemon Tree Passage roundabout accounting for 3 crashes (1 injury crash) and the roundabouts at Richardsons Road/Salt Ash Avenue and at Cabbage Tree Road accounting for 4 crashes (2 injury crashes) and 3 crashes (1 injury crash) respectively.

The 5 other intersection crashes occurred at 4 different intersections.

Midblock crashes totalled 8 crashes with 4 injury crashes.

The crash types varied with rear end, side swipe, right/through and out of control crashes involving cars and a cyclist and one (1) pedestrian crash at the intersections. Midblock crashes included rear end, run off the road and crashes involving vehicles leaving driveways and through traffic on Nelson Bay Road.

An examination of the crash types and locational spread of the crashes indicates that there is no treatable pattern that could be addressed by specific remedial measures.

Cabbage Tree Road/Tomago Road between Nelson Bay Road Williamtown and Pacific Highway Tomago

There were a total of 25 crashes in Cabbage Tree Road/Tomago Road during this 3 year period, including 3 fatal crashes, 16 injury crashes and 6 non injury crashes. This road section is 15.1km long between Williamtown and Tomago.

Intersection crashes totalled 7 crashes (3 injury crashes) and occurred at the signalised Pacific Highway/Tomago Road intersection (5 crashes) and the roundabout controlled Tomago Road/Old Punt Road intersection (2 crashes).

Midblock crashes totalled 18 crashes and included the 3 fatal crashes and 13 injury crashes.

The fatal crashes included a head on crash involving a truck and car, 350 metres west of Masonite Road, a run off the road crash 325 metres west of Masonite Road and a truck emerging from a driveway and a motorcycle rider travelling east in Cabbage Tree Road, 2.6kms west of Nelson Bay Road.

Intersection crashes included rear end, head on and right/through crashes.

Midblock crashes included, rear end, run off road and head on crashes. Apart from 2 of the fatal crashes which occurred west of Masonite Road, the midblock crashes were spread over the length of Cabbage Tree Road/Tomago Road.

An examination of the crash types and locational spread of the crashes indicates that there is no treatable pattern that could be addressed by specific measures.

Quarry Access Intersections

There were no recorded crashes during the 3 year period at the following Quarry Access Intersections;

- Nelson Bay Road/Horse Trail;
- Cabbage Tree Road/Cabbage Tree Quarry Access Road;
- Lemon Tree Passage Road/Oyster Cove Road.

As noted above, there were 3 crashes, including one injury crash at the Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road intersection which included a rear end crash, a car losing control and hitting a sign and a cyclist losing control and running off the road.

There is no treatable pattern to these crashes.

3.0 AUDIT FINDINGS

3.1 Oakvale Drive

Road Alignment and Cross Sections

The public road section of Oakvale Drive has a flat vertical alignment.

The horizontal alignment includes a 90 degree bend at the vehicle entrance to Oakvale Wildlife Park.

Oakvale Drive is a two lane road with a sealed road pavement 8.5 metres to 11.0 metres wide with grass shoulders.

Auxiliary Lanes

There are no auxiliary lanes in Oakvale Drive.

Intersections

There is one intersection in Oakvale Drive which is located on the 90 degree bend at the vehicle entrance to Oakvale Wildlife Park.

Give Way Control is provided on the eastern leg of Oakvale Drive.

Signs and Lighting

Other than the Give Way signage at the intersection, and at the Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road intersection, there is not other signage in Oakvale Drive. While there is street lighting at the Nelson Bay/Oakvale Drive/Lemon Tree Passage Road intersection, there is no street lighting in Oakvale Drive.

Road Marking and Delineation

Double barrier lines and E4 lines are provided in Oakvale Drive at the Nelson Bay Road roundabout.

Pedestrians, Cyclists and Public Transport

There is very little pedestrian and cyclist activity in Oakvale Drive and there are no formal footpaths.

Crash Barriers and ClearZone

There are no crash barriers in Oakvale Drive. The grass shoulders provide nominal clear zones, although electricity poles are approximately 3.0 metres from the edge of the road pavement and within the nominal clear zone.

Bridges and Culverts

There are no bridges or culverts within the public road section of Oakvale Drive.

Pavement

The pavement in Oakvale Drive is in fair condition.

Provision for Heavy Vehicles

Heavy vehicles associated with the sand quarries use Oakvale Drive. Heavy vehicles currently made up approximately 46% of vehicles using Oakvale Drive on an average weekday.

Parking

No parking occurs in Oakvale Drive.

Miscellaneous

There are no miscellaneous issues in Oakvale Drive.

3.2 Nelson Bay Road between Oakvale Drive and Cabbage Tree Road

Road Alignment and Cross Sections

Nelson Bay Road between Oakvale Drive and Cabbage Tree Road has a variable horizontal alignment with straight sections interspersed with small and large radius curves.

Grades along this section of Nelson Bay Road are relatively flat.

The cross sections vary with dual carriageway sections provided west of Oakvale Drive for a distance of approximately 1.6km at Salt Ash and from Medowie Road to Cabbage Tree Road at Williamtown, which is a distance of approximately 1.3km. The section of Nelson Bay Road in between is 2 lanes.

These dual carriageway sections include 2 lanes (3.5 metres wide), sealed shoulders (1.5 to 3.0 metres wide) and a median of variable width.

The 2 lane road sections typically have a sealed carriageway with 2 x 3.5 metre wide lanes and sealed shoulders 1.8 metres to 3.0 metres wide.

Auxiliary Lanes

Auxiliary lanes are provided at principal intersections and at vehicle entrances to a number of larger residential tourist/commercial developments.

These include AUL left turn lanes and CHR right turn treatments/lanes as well as left turn acceleration lanes.

While the lengths vary, these are generally consistent with current guidelines.

Intersections

Intersection treatments in Nelson Bay Road include:

- Two lane roundabout at Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road;
- Two lane roundabout at Nelson Bay Road/Richardson Road/Salt Ash Avenue;
- Two lane roundabout at Nelson Bay Road/Medowie Road;

- Traffic signals at Nelson Bay Road/Williamtown Drive;

- Two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane.

The channelisation of the traffic signal control intersection of Nelson Bay Road/Williamtown Road incorporates an AUL left turn treatment and CHR (right turn treatment) in Nelson Bay Road, as well as an AUL left turn acceleration lane for the left turn out of Williamtown Drive.

Other intersection treatments include:

- CHR right turn treatment in Nelson Bay Road at David Drive with a No Right Turn out of David Drive;

- Left in/left out together with AUL left turn lanes in Nelson Bay Road at Macka's Sand Quarry Entrance at Lot 218 Nelson Bay Road Salt Ash (west of Richardson Road);

- CHR right turn treatment in Nelson Bay Road at Slades Road with a No Right Turn out of Slades Road.

Signs and Lighting

Signage includes speed limit signs and other regulatory signage such as roundabout, give way signs, advisory signs, directional signs and warning signs. The signage along the route is considered to be effective and appropriate and is generally in fair condition.

Street lighting is provided in Nelson Bay Road in the sections between;

- Oakdale Drive/Lemon Tree Passage Road and Richardson Road; and

- Medowie Road and Cabbage Tree Road/Lavis lane.

Road Marking and Delineation

Centreline markings are provided in the undivided road sections of Nelson Bay Road. Edgelines are provided along the full route on both sides of the carriageway, as well as adjacent the median in the divided road sections. Chevron road markings are also provided where required, as well as lane lines and C1 lines.

Other road markings include directional arrows, intersection marking (TB lines).

RRPM's (Raised Reflective Pavement Markers) are provided along the route and guidepost/reflectors are provided in those sections where there is no streetlighting.

The road marking and delineation of Nelson Bay Road is considered generally satisfactory, although some sections of road marking requires maintenance.

Crash Barriers and Clear Zones

Clear zones for the posted speed limit are achieved for the divided road sections and at the principal intersections which have been upgraded.

Poles are generally set back in the 2 lane undivided road sections within the existing road reserve.

Sections of Type F kerb are used at the Nelson Bay Road/Richardson Road/Salt Ash Avenue roundabout intersection.

Guardrail has also been installed on the north east corner of the Nelson Bay Road/Lemon Tree Passage Road/Oakvale Drive roundabout intersection and on the north western corner of Nelson Bay Road/Cabbage Tree Road/Lavis Lane roundabout intersection. Appropriate end treatments have been provided with the guardrail.

A section of Briffin Wire fencing approximately 670 metres long is provided approximately 400 metres east of Medowie Road to protect a drop off adjacent the road.

Pedestrians and Public Transport

The frontage development, other than bus stops in Nelson Bay Road, does not generate pedestrian activity along most of the route.

Footpaths and pedestrian kerb ramps are provided at the principal intersections in Nelson Bay Road at:

- Lemon Tree Passage Road/Oakvale Drive;
- Richardson Road/Salt Ash Avenue;
- Medowie Road; and
- Williamtown Road, which also includes signalised pedestrian crossings.

The road shoulder areas on both sides of Nelson Bay Road provide room for cyclists and shared path areas are provided at the roundabout intersections of Medowie Road, Richardson Road/Salt Ash Road and Lemon Tree Passage Road/Oakvale Drive.

There are some squeeze points in the two lane section of Nelson Bay Road at Salt Ash where the sealed road shoulder narrows to less than 1.2 metres.

Short sections of marked bike lane are provided at several intersections.

Buses operate along Nelson Bay Road. Pull off areas and bus bays are provided along the route where buses pick up/set down.

Bridges and Culverts

There are no bridges or culverts in this section of Nelson Bay Road.

Pavement

The road pavement along Nelson Bay Road appears to be generally in a satisfactory condition.

Provision for Heavy Vehicles

Nelson Bay Road is a state arterial road under the control of TfNSW. It has a road function to cater for heavy vehicles. In this regard Nelson Bay Road is an approved 25/26 metre B-double route and carries a range of heavy vehicles. Heavy vehicles make up 8.7% - 11.4% of the total traffic using this section of Nelson Bay Road on an average weekday.

Parking

The frontage development along Nelson Bay Road which is mostly rural and tourist type uses does not generate on street parking.

Miscellaneous

There are no miscellaneous issues in this section of Nelson Bay Road.

3.3 Cabbage Tree Road/Tomago Road

Alignment and Cross Sections

Cabbage Tree Road between Nelson Bay Road and Masonite Road has a variable horizontal alignment with straight sections interspersed with curves.

Grades in Cabbage Tree Road are relatively flat.

Cross sections in Cabbage Tree Road include:

- 2 lane section with kerb and gutter immediately west of Nelson Bay Road which is 11.0 metres wide and approximately 530 metres in length. This provides lane widths of 5.5 metres.

- 2 lane section with 3.5 metre wide lanes (i.e. 7.0 metre wide carriageway) and sealed shoulders 2.0 metres wide.

Tomago Road between Masonite Road and Pacific Highway has a curvilinear horizontal alignment.

The vertical alignment is relatively flat, with sections of moderate grades.

Cross sections include:

- 2 x 3.5 metre wide lanes (i.e. 7.0 metre wide carriageway) with sealed shoulders up to 2.0 metres wide;

- A short section of multi lane road at the traffic signal controlled intersection at the Westrac Access Road; and

- A short section of 4 lanes at the Pacific Highway intersection.

Auxiliary Lanes

Auxiliary lanes are provided at the principal intersections along Cabbage Tree Road/Tomago Road. Auxiliary Lanes include AUL left turn lanes and CHR right turn treatments as well as left turn acceleration lanes and additional lanes at some intersections as capacity measures.

Intersections

Intersection treatments at principal intersections in Cabbage Tree Road/Tomago Road include:

- Two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane;
- A left turn deceleration lane (AUL) and a left turn acceleration lane (AUL) in Cabbage Tree Road at the Cabbage Tree Quarry Access Road together with left in/left out restrictions on the Access Road.
- CHR and AUL right and left turn treatments at Cabbage Tree Road/Tomago Road/Masonite Road;
- Traffic signals at the intersection of Tomago Road/Westrac Access Road;
- CHR and AUL right and left turn treatments in Tomago Road at the;
  - Access Road to 606-608 Tomago Road;
  - Tomago Aluminium Entrance Road.
- Two lane roundabout at Tomago Road/Old Punt Road; and
- Traffic signals at Tomago Road/Pacific Highway.

The channelisation of the traffic signal control intersection of Tamago Road/Westrac Access Road incorporates two through lanes in each direction in Tomago Road as well as and AUL left turn lane and a 2 lane right turn (CHR) treatment.

Other intersection treatments include an AUL left turn treatment in Tomago Road at McIntyre Road and an AUR right turn treatment in Tomago Road at Campbell Street.

Other minor intersections have basic (BAR) right and left turn (BAL) treatments.

It should be noted that AUR right turn treatments which currently exist in Tomago Road at Campbell Street are no longer recommended/permitted for use (as new treatments) in NSW. In evaluating the road safety risk there has been no reported crashes at the Tomago Road/Campbell Street intersection in the 3 year period between 1 October 2017 and 30 September 2020. Based on this, the road safety risk of maintaining the AUR treatment at the intersection, in the short to medium term, is considered to be low.

Signs and Lighting

Signage includes speed limit signs and other regulatory signage such as roundabout, give way signs, advisory signs, directional signs and warning signs. The signage along the route is considered to be effective and appropriate and is generally in fair condition.

Street lighting is provided at the principal intersections along the route and in the section of Tomago Road between the Westrac Access Road to the Pacific Highway.

Road Marking and Delineation

Centreline markings are provided along the full length of Cabbage Tree Road/Tomago Road. Edgelines are provided along the full route on both sides of the carriageway.

Chevron road markings are also provided where required, as well as lane lines and C1 lines.

Other road markings include directional arrows, intersection marking (TB lines).

RRPM's (Raised Reflective Pavement Markers) are provided along the route and guidepost/reflectors are provided in those sections where there is no streetlighting.

The road marking and delineation in Cabbage Tree Road/Tomago Road is considered satisfactory.

Clear Zone and Crash Barriers

Clear Zones are not achieved along the full length of Cabbage Tree Road and Tomago Road.

Headwalls for driveways intrude into the nominal clear zone area at a number of locations in Cabbage Tree Road as well as an unprotected culvert. While poles are set back, some poles are also within the clear zone.

Guardrail is used in a number of locations along the route at intersections and at midblock locations. Appropriate end treatments are provided with the guardrail at all of these locations.

Briffin Wire is also used in Tomago Road opposite the driveway entrance road to 606-608 Tomago Road.

Pedestrians, Cyclists and Public Transport

The frontage development, in Cabbage Tree Road/Tomago Road, does not generate pedestrian activity along most of the route.

Footpaths, pedestrian kerb ramps and signalised crossings are provided at the signalised Tomago Road/Westrac Access Road intersection.

In addition, a pedestrian refuge is provided in Tomago Road adjacent the Sweet Water Grove residential development, 330 metres west of the Pacific Highway.

The road shoulder areas on both sides of Cabbage Tree Road/Tomago Road provide room for cyclists.

There are some squeeze points at intersections where the sealed road shoulders have been narrowed to provide additional lanes.

Marked bike lanes are provided at the Tomago Road/Westrac Access Road intersection.

Limited bus services operate in sections of Cabbage Tree Road and Tomago Road. Bus bays/pull off areas are provided in both roads.

Bridges and Culverts

There are no bridges along the route. There are several culverts in Cabbage Tree Road and Tomago Road. The width of the road pavement is maintained at these locations. As noted above one (1) culvert in Cabbage Tree Road is within the clear zone and is unprotected. The risk of the unprotected culvert is considered to be low.

Pavement

The road pavement along Cabbage Tree Road/Tomago Road appears to be generally in satisfactory condition, although ongoing maintenance is required.

Provision for Heavy Vehicles

Cabbage Tree Road/Tomago Road is a state arterial road under the control of TfNSW. It has a road function to cater for heavy vehicles. In this regard Cabbage Tree Road/Tomago Road is an approved 25/26 metre B-double route and carries a range of heavy vehicles. Heavy vehicles make up 11.6% - 12.9% of the total traffic using this road on an average weekday.

Parking

The frontage development along Cabbage Tree Road/Tomago Road which is a mix of rural and industrial uses does not generate on street parking.

Miscellaneous

There are no miscellaneous issues in this section of Nelson Bay Road.

3.4 Quarry Access Intersections

As noted in Section 2.2, Holcim's trucks use the following intersections to access the sand quarries that are part of its current and proposed future operations.

- Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road, Salt Ash;
- Nelson Bay Road/Horse Trail, Anna Bay;
- Cabbage Tree Road/Cabbage Tree Quarry Access Road; and
- Lemon Tree Passage Road/Oyster Cove Road.

Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road, Salt Ash

This intersection provides access to Holcim's Salt Ash Quarry and has recently been upgraded by TfNSW to a 2 lane roundabout.

The roundabout has 2 lane approaches in Nelson Bay Road East and Lemon Tree Passage Road, 3 lane approach in Nelson Bay Road West and a single lane approach in Oakvale Drive.

Sight distance at the roundabout is good and meets Austroad requirements for the operating speeds at the roundabout.

While sand trucks use all legs of the intersection the major movements are the right turn from Nelson Bay Road into Oakvale Drive and the left turn out of Oakvale Drive.

The traffic management at this intersection is considered to be satisfactory.

Nelson Bay Road/Horse Trail Anna Bay

This intersection is used by the sand importation trucks, importing sand from the Anna Bay Quarry to Salt Ash.

The intersection is a T-junction with left turn out only restrictions on Horse Trail. No U-turn restrictions also apply in Nelson Bay Road.

Nelson Bay Road has two through and departure lanes in each approach plus a sealed road shoulder for cyclists, as well as right and left turn lanes.

A right turn lane/bay (CHR) 120 metres long including taper is provided in the western approach of Nelson Bay Road.

A left turn lane/bay (AUL) 105 metres long including taper is provided in the eastern approach of Nelson Bay Road.

Sight distance at the intersection is good and meets Austroad requirements for the posted 80km/hr speed limit.

The sand trucks turn right into Horse Trail from Nelson Bay Road and left out of Horse Trail.

The traffic management at this intersection is considered to be satisfactory.

Cabbage Tree Road/Cabbage Tree Quarry Access Road Williamtown

This intersection is used by sand importation trucks to import sand from Cabbage Tree Quarry to Salt Ash Quarry. This intersection was recently constructed, as part of the approval for Cabbage Tree Road Quarry.

The intersection is a T-junction intersection with left turn in/left turn out only restrictions in the Quarry Access Road.

Cabbage Tree Road has a single through lane in each direction plus auxiliary lanes.

A left turn deceleration lane (AUL) 160 metres long (including taper) is provided in the western approach of Cabbage Tree Road for the left turn into the quarry. A left turn acceleration lane 300 metres long (AUL) is provided in the eastern departure leg of Cabbage Tree Road to allow vehicles turning left out of the quarry to join Cabbage Tree Road.

Sight distance at the intersection and merge points is satisfactory and meets Austroad requirements for the posted 80km/hr speed limit.

The traffic management at this intersection is considered to be satisfactory.

Lemon Tree Passage Road/Oyster Cove Road Tanilba Bay

This intersection is used by sand importation trucks importing sand from Tanilba Bay Quarry to Salt Ash.

The sand trucks turn left into Oyster Cove Road from Lemon Tree Passage Road and right out of Oyster Cove Road.

This intersection is a T-junction intersection with Priority Control on Oyster Cove Road.

A short AUL left turn lane (65 metres including taper) together with a through lane is provided in the eastbound approach of Lemon Tree Passage Road.

A sealed shoulder providing a basic right turn treatment (BAL) is provided in the westbound approach together with a westbound through lane. The sealed shoulder enables through vehicles to pass right turn vehicles into Oyster Cove Road.

Sight distance at the intersection is satisfactory and meets Austroad requirements for the posted 100km/hr speed limit.

Both Lemon Tree Passage Road and Oyster Cove Road are approved 25 metre/26 metre B double routes.

The length of the AUL left turn lane (65 metres including taper) in the eastbound approach of Lemon Tree Passage Road is less than Austroads recommended minimum length of 120 metres for a 90km/h design speed and a comfortable rate of deceleration ($2.5m/s^2$).

It is noted that the left turn volume into Oyster Cove Road is very low numbering between 8-11vph in the AM and PM peak hours. In addition, the volume of sand importation trucks turning left into Oyster Cove Road is also very low at 3 trucks per hour and this volume will not increase with the Holcim's Project.

Given that trucks turning left into Oyster Cove Road would start to decrease their speed well in advance of the intersection (i.e. further away than 120 metres) the existing shorter deceleration lane is considered to be a relatively low risk in terms of conflicts and potential road safety.

3.5 Audit Summary and Risk Ranking

The audit findings are listed in Table 3.1 together with the risk ranking, where applicable.

Risks and potential safety issues have been identified and ranked using Austroads Ranking method, based on frequency, severity, overall level of risk and treatment approach presented in Tables 4.1 to 4.4 in Guide to Road Safety Part 6: Road Safety Audit (See Appendix 1).

The risk rankings and Austroads suggested treatment approach are defined as follows:

- Intolerable - Must be corrected
- High - Should be corrected or the risk significantly reduced, even if the treatment cost is high
- Medium - Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high
- Low - Should be corrected or the risk reduced, if the treatment cost is low

TABLE 3.1

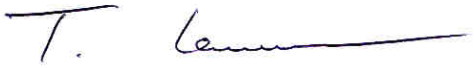
AUDIT FINDINGS

Item	Issue	Risk Ranking	Response by Road Authorities
1	Provide ongoing maintenance to line marking, delineation and signage in Nelson Bay Road as required.	- (Maintenance Issue)	
2	a) Provide ongoing maintenance to pavement in Cabbage Tree Road/Tomago Road; and b) Provide ongoing maintenance to line marking, delineation and signage in Cabbage Tree Road/Tomago Road as required.	- (Maintenance Issue)	
3	Short AUL left turn lane in the eastbound approach of Lemon Tree Passage Road at the intersection with Oyster Cove Road. The length at 65 metres is less than the current Austroad guidelines which indicate a length of 120 metres. The potential conflict is between the left turn heavy vehicles slowing down to turn left and eastbound through vehicles. The risk is considered to be low based on the small left turn volumes and the fact that heavy vehicles turning left would start to decrease their speed well in advance of the intersection (i.e. further away than 120 metres). It is noted that the left turn volume of sand importation trucks numbers 3 trucks per hour and this will not increase for the Project.	Low	

4.0 FORMAL STATEMENT

We have examined the road route and intersections described in Section 1.1 and shown in **Figure 1** and we have audited these roads and intersections in accordance with the procedures set out in the Austroad Guide to Road Safety Parts 6 and 6A.

The audit has been carried out for the sole purpose of identifying any features of the road network and intersections that could be altered to improve potential road safety. Several minor issues have been identified and are detailed in Table 3.1.



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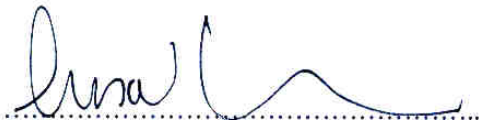
Terry Lawrence
Lead Road Safety Auditor (Level 3)



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Road Safety Auditor (Level 3)

26 November 2021

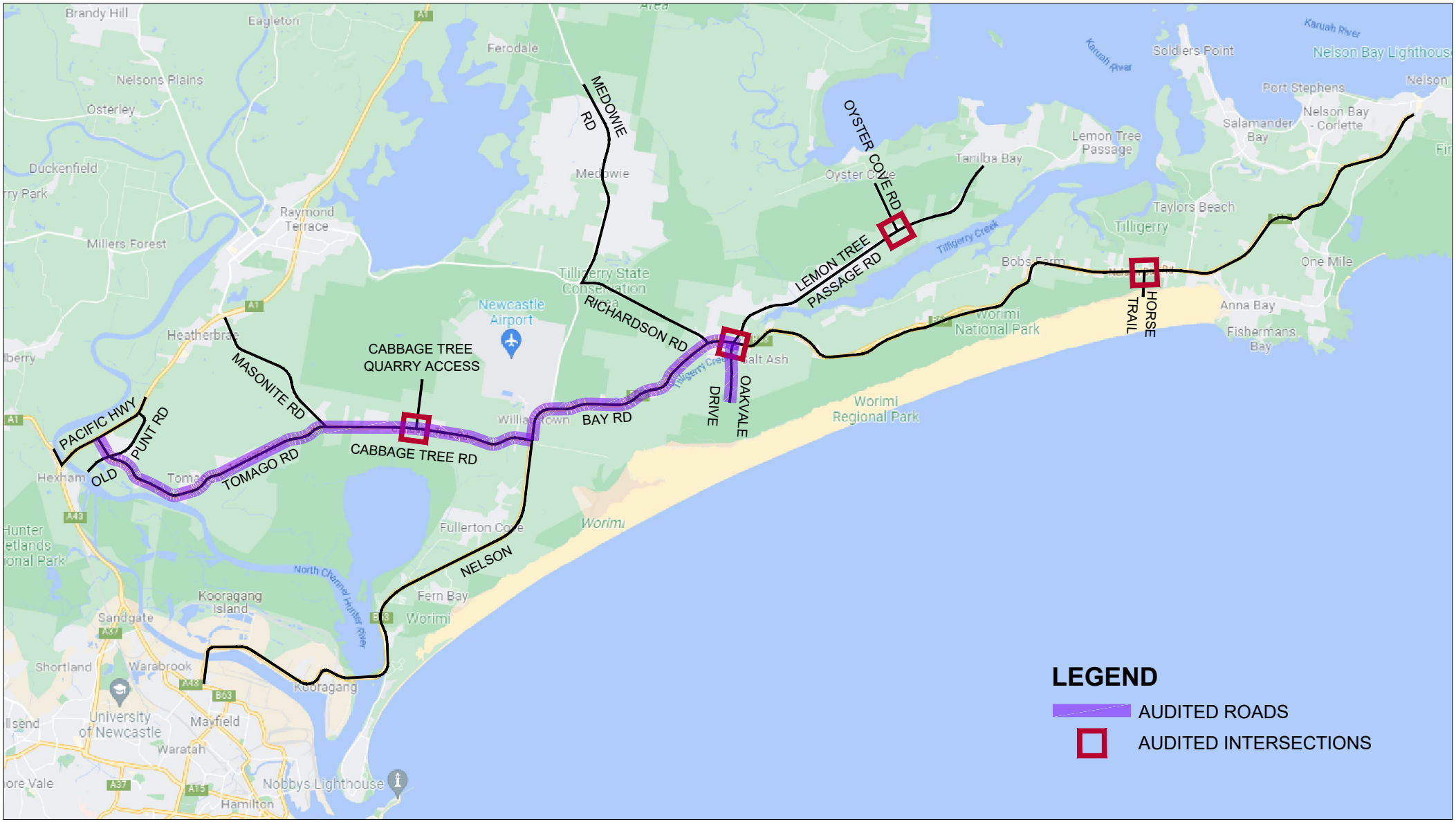

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FIGURE 1

HOLCIM SALT ASH SAND OPERATIONS

8 OAKVALE DRIVE, SALT ASH

AUDITED ROADS AND INTERSECTIONS

JOB NO.20047 RSA 12.10.21

APPENDIX 1

Austroads Risk Assessment Table 4.1 to 4.4 Extract

How does the client decide whether or not to accept an audit finding or recommendation?

Part of the answer can lie at the start of the design process: could an audit have been undertaken earlier? Certainly, the earlier an audit is undertaken, the sooner a potential problem can be addressed. This generally means it will be easier or cheaper to resolve the problem.

Faced with an audit finding or recommendation that is difficult to resolve, the client needs to consider the:

- likelihood that the identified problem will result in harm
- severity of that harm
- effectiveness of a remedy in reducing the harm
- the designer's advice/response to the audit
- cost of remedying the problem (there may be several alternative treatments).

This requires engineering judgement and additional road safety engineering advice about managing the risk.

There may be occasions that the audit recommendations require consideration of issues outside the original scope of the project. This should not be an excuse to dismiss these and they still require consideration by the appropriate authority or person. It may be that the original scope of the project needs to be altered.

C. Risk ranking of safety issues

The following tables may be useful to provide an indication of the level of risk and how to respond to it. Determine into which category in Table 4.1 and Table 4.2 the issue best fits. From this select the risk category in Table 4.3 and its suggested treatment approach in Table 4.4. This is not a scientific system and professional judgement should be used. Section 9.3 provides an evidence based approach to prioritising the treatment of works emanating from road safety audits of existing roads.

Table 4.1: How often is the problem likely to lead to a crash?

Frequency	Description
Frequent	Once or more per week
Probable	Once or more per year (but less than once a week)
Occasional	Once every five or ten years
Improbable	Less often than once every ten years

Table 4.2: What is the likely severity of the resulting crash type?

Severity	Description	Examples
Catastrophic	Likely multiple deaths	High-speed, multi-vehicle crash on a freeway. Car runs into crowded bus stop. Bus and petrol tanker collide. Collapse of a bridge or tunnel.
Serious	Likely death or serious injury	High or medium-speed vehicle/vehicle collision. High or medium-speed collision with a fixed roadside object. Pedestrian or cyclist struck by a car.
Minor	Likely minor injury	Some low-speed vehicle collisions. Cyclist falls from bicycle at low speed. Left-turn rear-end crash in a slip lane.
Limited	Likely trivial injury or property damage only	Some low-speed vehicle collisions. Pedestrian walks into object (no head injury). Car reverses into post.

Table 4.3: The resulting level of risk

	Frequent	Probable	Occasional	Improbable
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low

Table 4.4: Treatment approach

Risk	Suggested treatment approach
Intolerable	Must be corrected.
High	Should be corrected or the risk significantly reduced, even if the treatment costs is high.
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.
Low	Should be corrected or the risk reduced, if the treatment cost is low.

D. Implementing the agreed changes

Once the corrective action report has been finalised, the agreed actions need to be implemented. The designer has to develop design changes that address the safety problems. If one is at the pre-opening stage, the actions need to be implemented as soon as possible on site. Temporary warning, delineation or other treatment may be needed until the agreed solution is implemented.

Actions taken should be recorded (for example, description of work, by whom and when). This is to fully close out the road safety audit finding as well as to factual record what works were completed. Reasons for any variations from the proposed action must also be set out in writing.

Framing responses to audit findings or recommendations

When an audit finding or recommendation is not accepted, or is accepted only in part, care should be taken about framing the corrective action report, bearing in mind that it may become a public document in the event of a crash occurring.

Consider the following responses to findings or recommendations made during a pre-opening audit of a project to widen the carriageway of a two-lane, two-way road to provide an overtaking lane:

- *Safety issues:*
  'Fixed objects within the new clear zone. These include a concrete bus shelter and stockpiles of aggregate and box culverts.' Three sections of guard fence are now nearer the edge line, but do not have safe end treatments.
- *Findings or recommendations*
  Take action to reinstate appropriate clear zones for this road. Pay attention to the guard fence.
- *Responses:*
  'The bus shelter was constructed before work on the overtaking lane. It is 4 m from the edge line. The expense of moving it is not considered justified. Most of this highway has objects within the clear zone, for example 3 km to the south there are 150 trees within 1.5 m to 6 m from the edge line. The stockpiles cannot be removed as there are few stockpile sites in the area. All the guard fence was constructed before construction of the overtaking lane. Compared with other guard fence in this region, it is not considered a priority and no action is planned to install the correct end treatment.'
  How might these responses be viewed by someone injured in a collision with the bus shelter, a stockpile or a guard fence end (or by a lawyer)? It would be of little comfort for drivers to know they would have been even worse off had the car veered off the road 3 km further on, or that the road authority had a problem finding stockpile sites, or that it's not the client's problem because the fixed objects were put in earlier by someone else. What these responses lack, and what any response needs, is a consideration of points in the previous inset ('How does the client decide whether or not to accept an audit finding or recommendation', in B above), an explanation of why action cannot be taken (for example, financial implications) and consideration of other possible options to reduce the risk associated with significant problem.

CONTENTS

FIGURES

REFERENCES

APPENDICES

GLOSSARY

ADT	-	Average Daily Volume (7 day average)
AWT	-	Average Weekday Volume (5 day average)
AUL	-	Auxiliary left turn lane treatment
AUR	-	Auxiliary right turn lane treatment
AVD	-	Average vehicle delay per vehicle in seconds
BAL	-	Basic left turn treatment
BAR	-	Basic right turn treatment
CHR	-	Channelised right treatment/lane
DPIE	-	Department of Planning, Infrastructure and Environment
DS	-	Degree of Saturation, a measure of intersection performance based on the ratio of demand flow to capacity
Light Vehicles	-	Austroads 1 and 2 vehicle classifications and motorbikes
LS	-	Level of Service, a measure of intersection performance based on vehicle delay. There are six levels of service from A to F, where Level of Service A represents very good conditions and spare capacity and Level of Service F represents oversaturated conditions.
Heavy Vehicles	-	Austroads 3-12 vehicle classifications
RMS	-	Roads and Maritime Services, NSW (now TfNSW)
SEARs	-	Secretary's Environmental Assessment Requirements
SIDRA	-	SIDRA Intersection Traffic Model
SSD	-	State Significant Development
TfNSW	-	Transport for NSW
vpd	-	Vehicles per day
vph	-	Vehicles per hour
95th% queue	-	95th percentile queue length in metres

EXECUTIVE SUMMARY

1. *This report documents the traffic impacts for a proposed State Significant Development Application at Holcim's Salt Ash Sand Operations, located at 8 Oakvale Drive, Salt Ash New South Wales (the 'Project').*

2. *Holcim operates a quarry at this site that produces a variety of dry form and wet processed sand. As part of the current consent Holcim import 200,000 tonnes per annum (tpa) of sand via the road network from sand quarries at Anna Bay, Tanilba Bay and Cabbage Tree Road (Williamtown) for processing on site.*

3. *The Project seeks to extract and process up to 550,000 tonnes per annum (tpa) of sand at the site using both dry extraction and dredging techniques. Holcim also propose to import up to 200,000 tpa of sand from their Tanilba Bay and Anna Bay operations, as well as other local extractive operations for processing at the site, resulting in a total of up to 750,000 tonnes of sand products processed and dispatched from the site per year.*

4. *As part of the Project, raw materials and virgin excavated natural material (VENM) and/or excavated natural material (ENM) will be imported by road. This will include sand importation of 200,000tpa and up to 550,000tpa of VENM/ENM.*

5. *Vehicle access to the quarry is via a private road that connects to Oakvale Drive and then via Nelson Bay Road at Salt Ash.*

6. *The main transport route for 90% of product sales (dispatch) and VENM/ENM importation is via Nelson Bay Road (to Williamtown), Cabbage Tree Road/Tomago Road and then via Pacific Highway to the Central Coast and Sydney.*

7. *Minor transport routes for product sales and VENM/ENM importation include:*

    - *South via Nelson Bay Road to the Newcastle market (6%);*
    - *Via Richardson Road and Medowie Road and Pacific Highway for the North Coast market (3%); and*
    - *North via Nelson Bay Road for the Port Stephens market (1%).*

8. *The sand importation routes include;*

    - *Tanilba Bay Quarry - Oyster Cove Road and Lemon Tree Passage Road (15%);*
    - *Anna Bay Quarry – Nelson Bay Road (50%);*
    - *Cabbage Tree Quarry – Cabbage Tree Road and Nelson Bay Road (35%).*

9. *All of the transport routes are approved 25 metre/26 metre B Doubles routes.*

10. *The quarry currently employs 10 full time staff and 5 contractors. With the Project an additional 6 full time staff will be employed, resulting in 16 full time staff and 5 contractors.*

11. *It is also proposed to extend the hours of operation at the quarry with an additional third shift Monday to Friday (24 hour operation) and a single shift on Saturday between 6.00am to 6.00pm.*

12. *The NSW Government has been, and is currently proposing to upgrade the section of Nelson Bay Road between Bobs Farm/Salt Ash and Williamtown.*

13. *Holcim are proposing to use 19 metre long truck and dog combinations, with average loads of 33 tonnes.*

14. *The quarry will have the highest traffic generation on weekdays. The Project at 750,000tpa, including the importation of 200,000tpa of sand and 550,000tpa of VENM/ENM including maintenance vehicles will generate the following truck volumes:*

    - *168 truck loads (336 two way truck movements) on an average day; and*
    - *257 truck loads (514 two way truck movements) on a maximum day.*

15. *When compared to the existing operation this will be an increase of:*

    - *111 truck loads (222 two way truck movements) on an average day; and*
    - *101 truck loads (202 two way truck movements) on a maximum day.*

16. *During a maximum hour, the Project will generate 30 truck loads (60 two way truck movements).*

17. *While the maximum hour for the Project is unlikely to occur in the weekday morning (AM) and afternoon (PM) peak hour periods, the SIDRA modelling for the Project has assumed that it will.*

18. *The total number of Holcim's trucks with the Project in place, using the road network on an average weekday, will make up a relatively small proportion of the total volumes using the road network, representing between 0.7% to 3.0% of total traffic volumes.*

19. *The assessment of the traffic impacts of the additional trucks associated with the operation of the Project on the adjacent road network, including the principal intersections, as well as the quarry access intersections has found that the impacts will be satisfactory. All intersections will operate at a Level of Service A or B operation.*

20. *The assessment of the cumulative impacts for the future 2031 year with the Project has also found that the traffic impacts on the principal intersections and the quarry access intersections will be satisfactory with all intersections operating at a Level of Service A, B or C operation.*

21. *Construction traffic impacts are also assessed as satisfactory, as the number of construction vehicles will be relatively low in number and less than what has been assessed for the operational impacts.*

22. *The Project is not expected to have any negative impacts on other road users including pedestrians, cyclists and public transport vehicles (buses).*

1.0 INTRODUCTION

1.1 Overview

Holcim (Australia) Pty Ltd (Holcim) owns and operates the Salt Ash Sand Operations (the 'site' or the 'quarry'), a longstanding operation at 8 Oakvale Drive, Salt Ash, New South Wales (Lot 4 DP 774726) that extracts, processes and transports sand products for use in the production of industrial and construction materials, such as glass and concrete.

Holcim currently produce a variety of dry form and wet processed sand at the site for glass and construction applications. Such operations have been in place at the site since 1980.

Holcim propose to meet part of the increased forecast demand in natural sand in the Hunter region and beyond by maximising the extraction of remaining sand resource from the existing quarry through a State significant development (SSD) application.

Holcim proposes to extract and process up to 550,000 tonnes per annum (tpa) of sand at the site using both dry extraction and dredging techniques. Holcim also propose to import up to 200,000tpa of sand from their Tanilba Bay and Anna Bay operations, as well as other local extractive operations for processing at the site, resulting in a total of up to 750,000 tonnes of sand products processed and dispatched from the site per year (the project).

The importation of Virgin Excavated Natural Material (VENM) and/or Excavated Natural Material (ENM) (hereafter referred to as 'fill') by road would be required during the project on an as required basis to rehabilitate the site, aiding in batter stabilisation, ground stabilisation and backfilling the dredge pond.

The project would be for a period of up to 30 years.

This report documents the traffic impacts of the project.

1.2 Authority Requirements

The Project's Secretary's Environmental Assessment Requirements (SEAR's) for traffic and road transport are summarised in Table 1.1, together with where each requirement is addressed in this report or elsewhere in the EIS documentation.

TABLE 1.1
TRAFFIC AND ROAD TRANSPORT SEARS

Stakeholder	EIS Requirement Traffic and Road Transport	Comment
Department of Planning, Industry and Environment	(i) Accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products;	See Sections 2 and 3.
	(ii) A road safety audit.	See Volume 2 of this report for the road safety audit.
	(iii) A detailed assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road network, (as identified above) having regard to the cumulative impacts of the development in relation to the proposed, approved and existing developments in the vicinity of the site in accordance with the Roads and Maritime Services (now TfNSW) Guide to Traffic Generating Developments (2002). This assessment must include a strategy to manage and/or minimise traffic impacts over the life of the development; and	See Section 5.
	(iv) A description of the measures that would be implemented to mitigate any impacts.	No mitigation measures are required for the Project.
TfNSW	1. TfNSW recommends that the EIS refer to the following guidelines with regard to the traffic and transport impacts of the proposed development: ▪ Road and Related Facilities within the Department of Planning EIS Guidelines; and ▪ Section 2 Traffic Impact Studies of Roads and Maritime's Guide to Traffic Generating Developments 2002. ▪ Austroads Guide to Traffic Management, Part 12, Integrated Transport Assessments for Developments.	These guidelines have been referenced in the preparation of the Traffic Assessment Report.
	2. A traffic and transport study shall be prepared in accordance with the Roads and Maritime's Guide to Traffic Generating Developments 2002 and is to include (but not be limited to) the following:	See Section 1.3
	▪ Review of historical development consents associated with the current approval limits for extraction of sand at the site and importation of sand products from other operations in the Port Stephens local government area.	See EIS
	▪ Comparison of current (approved) and proposed operations to determine change in traffic generation and the associated impact on the road network.	See Sections 2, 3 and 5.

Stakeholder	EIS Requirement Traffic and Road Transport	Comment
	▪ Assessment of all relevant vehicular traffic routes and intersections for access to/from the subject properties.	See Sections 4 and 5.
	▪ Details of all traffic types and volumes likely to be generated by the proposal during construction, operation and rehabilitation, including description of heavy vehicle types, and haul route origins and destinations.	See Section 3.
	▪ Daily inbound and outbound traffic profile by time of day and day of week broken down per vehicle types.	See Section 5
	▪ Investigate the use of vehicles with higher carrying capacity such as Performance Based Standards combinations to reduce the number of heavy vehicle movements.	Holcim proposes to use truck and dog combinations with average loads of 33 tonne. Higher capacity PBS vehicles may be used over the life of the quarry.
	▪ Traffic management plan on how to manage number of vehicles likely to be generated during construction, operation and rehabilitation, and awaiting loading, unloading or servicing that can be accommodated on the site to avoid queuing in the surrounding road network.	The quarry access is via a private road off Oakvale Drive. Large areas are available for truck manoeuvring and queueing within the quarry site and will therefore avoid queuing on local roads.
	▪ Detailed site layout (if additional works are required) to demonstrate that the site will be able to accommodate the most productive vehicle type as well as the worst performing vehicle type. This includes parking layout on site in accordance with the relevant Australian Standard and Council's Development Control Plan.	See Figures 3 and 5.
	▪ Details of access to, from and within the site from the road network including assessment of intersection location, design and sight distance. It must be demonstrated that the site plan, site access and surrounding road network can accommodate the largest vehicles entering, exiting and manoeuvring throughout the site.	See Sections 4.2 and 4.4.
	▪ An assessment of the forecasted daily and peak (AM, PM) vehicle movements impact on road safety and midblock capacity of road network including potential impact on pavement lifespan.	See Section 5
	▪ Traffic analysis of any major/relevant intersections impacted, using SIDRA or similar traffic model, including: a) current traffic counts and 10 year traffic growth projections;	See Sections 4.3, 5.3 and 5.4.

Stakeholder	EIS Requirement Traffic and Road Transport	Comment
	b) with and without development scenarios; c) 95th percentile back of queue lengths; d) delays and level of service on all legs for the relevant intersections; and e) electronic data for TfNSW review.	
	▪ An assessment of the cumulative study area traffic impacts associated with the development and any other known proposed/approved developments in the area.	See Section 5.4
	▪ If required, identification of any dangerous goods likely to be transported on arterial and local roads to/from the site and, if necessary, the preparation of an incident management strategy.	No dangerous goods are proposed to be transported.
	▪ Identify the necessary road network infrastructure upgrades that are required to maintain existing levels of service on both the local and classified road network for the development. In this regard, preliminary concept drawings shall be submitted with the EIS for any identified road infrastructure upgrades. However, it should be noted that any identified road infrastructure upgrades will need to be to the satisfaction of Transport for NSW and Council.	No upgrades are considered to be required by the Project. It is noted that NSW Government is proposing to upgrade Nelson Bay Road between Bobs Farm/Salt Ash and Williamtown.
	▪ An assessment of any other impacts on the regional and state road network including consideration of pedestrian, cyclist and public transport facilities and provision for service vehicles.	See Sections 4.5, 4.6 and 5.6.

1.3 Structure of this Report

Structure of Report

This report has been prepared to assess the traffic impacts associated with the Project and will inform the preparation of the Environmental Impact Statement (EIS).

The assessment has been undertaken in accordance with the requirements of Roads and Traffic Authority now Roads & Maritime Services (RMS) *Guide to Traffic Generating Developments October 2002*.

Other technical standards/publications referenced in this assessment include:

- Austroads Guide to Road Design and RMS supplements.
- Austroads Guide to Traffic Management and RMS supplements.
- Austroads Guide to Traffic Management Part 12. Traffic Impacts of Developments.

The remaining sections of this report address the following;

- Section 2 – provides an overview of the existing operations at the sand quarry;
- Section 3 – describes the Project;
- Section 4 – examines the existing traffic conditions on the road network;
- Section 5 – evaluates the traffic impacts of the proposed continued operations of the sand quarry including any cumulative impacts; and
- Section 6 – presents conclusions.

2.0 EXISTING OPERATIONS

2.1 Site

The site (**Figures 1** and **2**) is located at 8 Oakvale Drive Salt Ash, NSW (Lot 4 DP774726) and is approximately 20 kilometres (kms) north of Newcastle, within the Port Stephens Local Government Area.

Access to the site is via Oakvale Drive from Nelson Bay Road.

Land use surrounding the site is a mixture of rural, residential, public recreation, and environmental conservation areas.

Other land uses serviced by Oakvale Drive include Oakvale Wildlife Park, rural properties and Macka's Sand Quarry and Australian Angus Beef operation.

2.2 Existing Operations

Holcim produce a variety of dry form and wet processed sand at the site for glass and construction applications.

The existing operations at the site comprise:

- extraction of sand through dry excavation of the dune mass to a depth of 5 metres (m) Australian Height Datum (AHD) no greater than 30 metres from the lot boundaries;
- importation of sand via the road network from Anna Bay, Tanilba Bay and Cabbage Tree Road Quarry operations for processing on-site;
- processing of sand products extracted on-site and received from off-site at the processing plant;
- haulage of product from the quarry to Oakvale Drive, Nelson Bay Road and the wider road network; and
- progressive rehabilitation of extraction areas.

2.3 Infrastructure and Equipment

A depot is established in the northern part of the site and includes the following ancillary infrastructure:

- An amenities/office building providing an office, lunchroom, laboratory, toilet and shower.
- Weighbridge.
- Designated parking area for employees and visitors.
- Various processing plant and infrastructure.
- Vehicle wash down bay.
- Storage sheds for dry sand products.
- Bunded fuel storage facilities, oil storage shed and dedicated liquid petroleum gas (LPG) supply.
- Various maintenance sheds and workshops.
- Waste receptacles such as dumpsters and skip bins.

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FIGURE 1

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

LOCATION

JOB NO.20047

6.10.21

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FIGURE 2

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

SITE

JOB NO.20047

6.10.21

Fixed plant at the site includes:

- In-feed plant.
- Wet plant.
- Dry plant.
- Cyclone towers.
- Dry sand silos.

Mobile equipment operated at the site comprises:

- Three front-end loaders (capacity nine tonnes).
- Articulated dump truck.
- Two wheel loaders.
- Forklift.
- Excavator (as required).
- Elevated work platform (for maintenance tasks).
- Crane (for maintenance tasks).
- Dozer.
- Utility front-end loader.

The existing services and utilities at the site include:

- Mains electricity, which is distributed via a kiosk substation and network of underground electrical cables to power the site office, weighbridge, processing plant, workshop and lighting;

- Solar panels on the roof of the office building to supplement power supply;

- Rainwater tanks located adjacent to the office building which capture water for use in on-site ablutions. A water truck is also used on a campaign basis to provide dust suppression and top up rainwater tanks in extended dry periods. Bottled potable water is brought to site; and

- A 2,500 litre (L) septic tank which captures wastewater from the site office and amenities.

The existing operations on the site are shown in **Figure 3**.

2.4 Employment

Holcim employ 10 full time staff and five contractors at the quarry.

2.5 Hours of Operation

The typical existing operating hours include:

- Monday to Thursday – 6.00am to 10.00pm;
- Friday – 6.00am to 6.00pm;
- Saturday – 6.00am to 2.00pm; and
- no operation on Sundays or Public Holidays.

Holcim typically operate two shifts on Monday to Thursday; 6.00am to 2.00pm; and 2.00pm to 10.00pm. Site management and office personnel typically work a standard work day between 6.00am and 5.00pm.

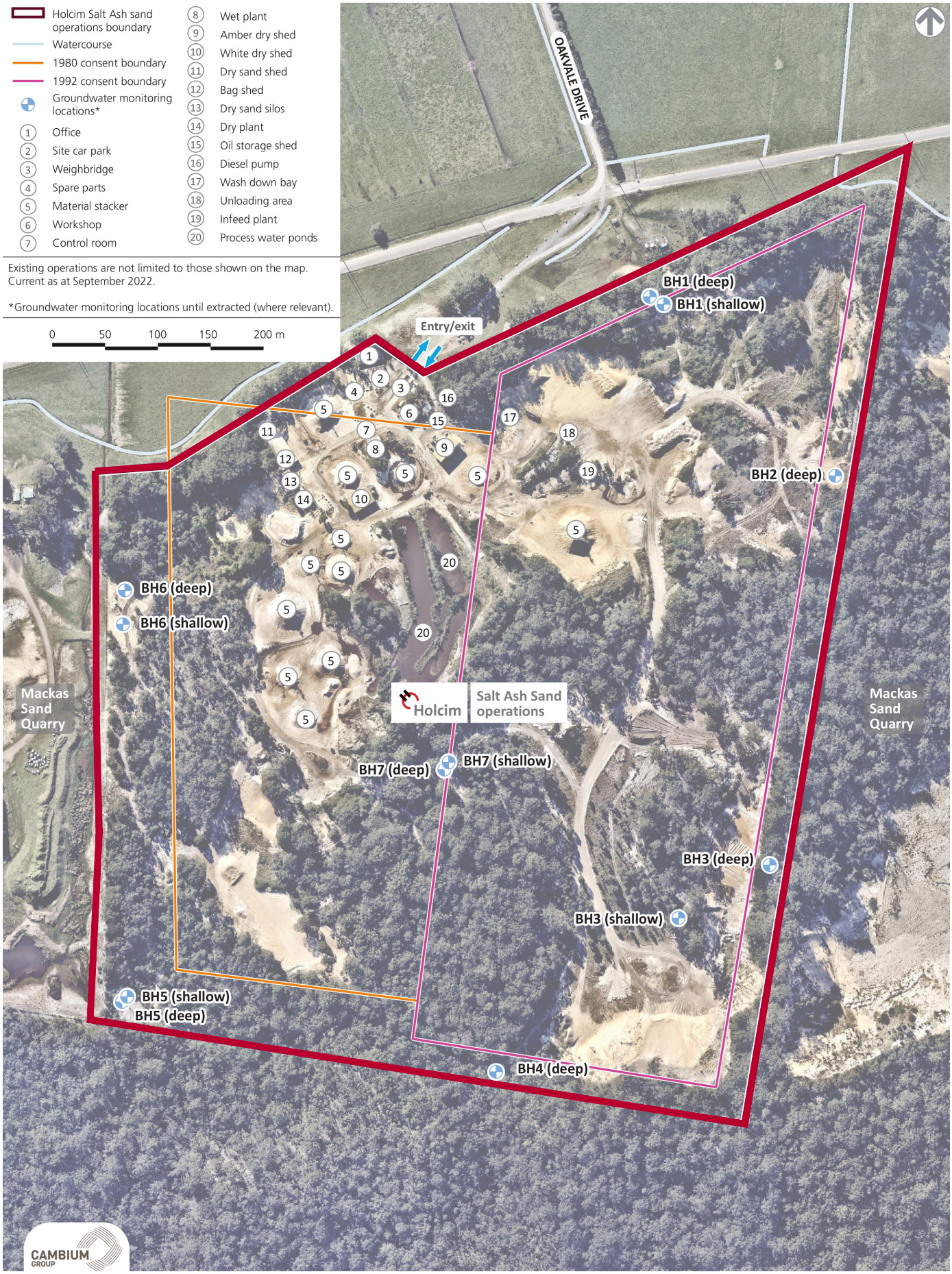

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FIGURE 3

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

EXISTING OPERATION

JOB NO.20047 14.9.22

2.6 Transport Routes and Access to the Site

Access to the site is via Nelson Bay Road and Oakvale Drive. Oakvale Drive is a local roadway which terminates at the entrance to private property at 4 Oakvale Drive (Lot 8 DP833768). A private road then runs south through the property to the entrance of the quarry.

Holcim currently imports sand products to the quarry by road from their Tanilba Bay and Anna Bay Quarry operations, along with Cabbage Tree Road Quarry for processing.

Holcim uses the following transport routes for importation of products to the site:

- Tanilba Bay Quarry – trucks exit the Tanilba Bay operations and travel south along Oyster Cove Road and then proceed south west along Lemon Tree Passage Road to the intersection at Nelson Bay Road. Trucks then proceed down Oakvale Drive and enter the quarry. Tanilba Bay accounts for 15% of sand importation trucks.

- Anna Bay Quarry – trucks exit the Anna Bay Quarry via the easement trail north to Nelson Bay Road, before proceeding west along Nelson Bay Road to the intersection with Oakvale Drive. Trucks then proceed down Oakvale Drive and enter the quarry. Anna Bay accounts for 50% of sand importation trucks.

- Cabbage Tree Road Quarry – Holcim also imports sand from the Cabbage Tree Road Sand Quarry. Trucks exit the Cabbage Tree Road Quarry and proceed east along Cabbage Tree Road, north west along Nelson Bay Road to Oakvale Drive and then enter the site. Cabbage Tree Road Quarry accounts for 35% of sand importation trucks.

Holcim currently transports sand products by road from the quarry to local and regional consumers. These sand products are processed from sand extracted at the site and sand products imported from the Anna Bay, Tanilba Bay and Cabbage Tree Road Quarry operations.

Holcim uses the following transport routes for the dispatch of finished sand products from the site:

- Newcastle supply contracts (approximately 6% of supply contracts) – trucks exit the site via Oakvale Drive and travel south west along Nelson Bay Road towards Kooragang Island and Newcastle via Cormorant Road and Tourle Street.

- Sydney, Central Coast and Hunter Valley supply contracts (approximately 90% of supply contracts) – trucks exit the site via Oakvale Drive and travel south west along Nelson Bay Road to the intersection with Cabbage Tree Road, before proceeding west along Cabbage Tree Road and Tomago Road, and then left onto the Pacific Highway and M1 south towards Sydney via Hexham. Trucks may also proceed via the New England Highway and/or Hunter Valley Expressway to the Hunter Valley and beyond. Trucks may also take an alternate route and exit the site via Oakvale Drive and travel south west along Nelson Bay Road to the intersection with Richardson Road, before proceeding north west along Richardson Road to Raymond Terrace, and then south onto the Pacific Highway and M1 south towards Sydney via Hexham.

- North Coast supply contracts (approximately 3% of supply contracts) – trucks exit the site via Oakvale Drive and travel south along Nelson Bay Road to the intersection with Richardson Road, before proceeding north west along Richardson

Road, north along Medowie Road, and then right onto the Pacific Highway northbound.

- Port Stephens supply contracts (approximately 1% of supply contracts) – on very rare occasions, trucks exit the site via Oakvale Drive and travel east along Nelson Bay Road towards Port Stephens.

Figures 4A and **4B** shows the transport routes used for Holcim's operation.

2.7 Truck Size and Approved Transport Levels

Holcim's product trucks are typically 19.0 metre long truck and dog combinations which have average loads of 33 tonnes.

Trucks used by local customers and for ex bin sales range in size between rigid trucks (small and heavy rigid trucks) and 19.0 metre articulated vehicles.

There are no current dispatch limits under the existing development consent..

2.8 Traffic Generation

The traffic generation of the existing operation includes:

- Light vehicle trips associated with employees and any visitors estimated as up to 42 two way trips per day based on 21 in/21 out per day (NB this allows for some off site trips to get lunch etc).

- Heavy vehicles associated with the importation of raw materials and fill material, as well as the dispatch of sand products which is estimated to be 114 two way heavy vehicle trips per day (57 in/57 out) on an average day and up to 312 two way heavy vehicle trips (156 in/156 out) on a busy day. The heavy vehicles include delivery and service/maintenance trucks which number 2 in/2 out and 10 in/10 out truck movements on an average day and busy day respectively.

Weekday hourly volumes are estimated to be:

- 10 two way heavy vehicle trips per hour (5 in/5 out) in an average hour; and

- 44 two way heavy vehicle trips per hour (22 in/22 out) in a busy hour.

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FIGURE 4A

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

TRANSPORT ROUTES FOR SAND IMPORTATION

JOB NO.20047

6.10.21

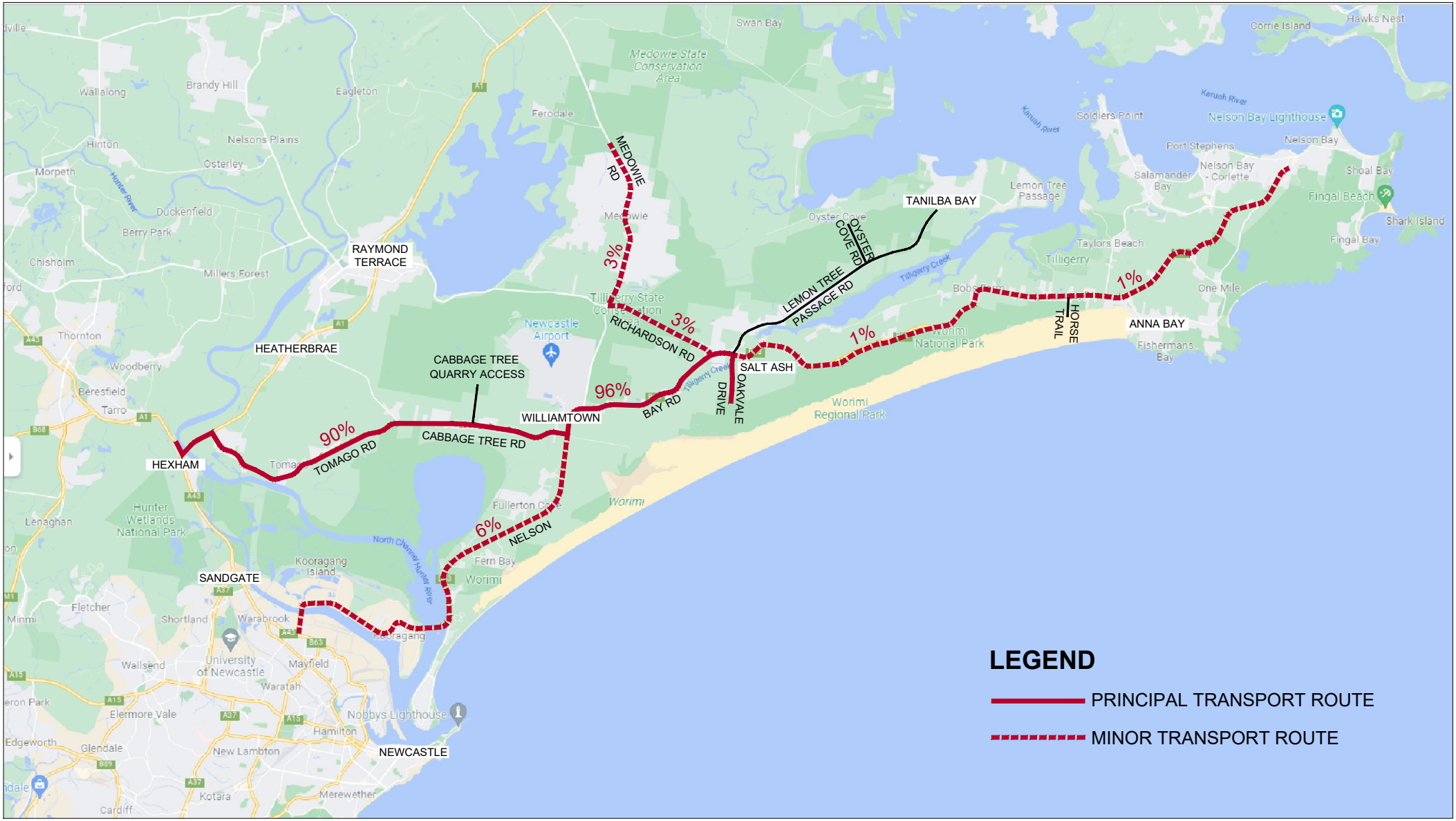

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FIGURE 4B

HOLCIM SALT ASH SAND OPERATIONS

8 OAKVALE DRIVE, SALT ASH

TRANSPORT ROUTES FOR PRODUCT SALES AND VENM IMPORTATION

JOB NO.20047

6.10.21

3.0 THE PROJECT

3.1 Project Description

Sand from the site is currently extracted to 5AHD under the original 1980 and 1992 development consents. Significant sand resource remains below 5AHD.

Holcim is seeking SSD approval to extract and process an estimated minimum of 10 million tonnes of sand from the quarry at a rate of up to 550,000tpa. Additionally, the importation of up to 200,000tpa of sand from Anna Bay, Tanilba Bay, Cabbage Tree Road Quarry and other local extractive operations, as required, will continue for the project. This sand would be processed at the site and dispatched as per the existing operations. As such, the project will seek to process and dispatch up to 750,000tpa of sand products from the quarry.

Given the existing operations, infrastructure and services at the site, there will be little work required to establish the project, with existing fixed and mobile plant and equipment continued to be used.

Where additional infrastructure or establishment works are required, this will be delivered as part of the initial stages of the project and may include:

- relocation and upgrade of utility infrastructure;
- construction of new internal haul roads;
- upgrade of existing processing plant and associated infrastructure;
- establishing a diesel-powered dredge; and
- construction of processing plant for the dredge, and associated diesel generators to power the plant.

Similar to existing operations, sand extraction will first involve clearing and grubbing of vegetation and stripping and stockpiling of topsoil for later reuse in rehabilitation. The sand will be extracted by front-end loader to a nominated depth, followed by an excavator above and below the aquifer within its reach. The excavated sand will then be transferred by front-end loader and/or dump trucks to the existing processing plant for subsequent processing.

As groundwater is encountered, a pond would be created and will be made large enough to float a dredge.

The dredge would commence immediately south of the processing area of the quarry and will then progressively extract sand in a southerly direction away from the processing plant in a staged process.

The dredge will move backwards and forwards across the dredge pond, vacuuming (dredging) away the underwater sand resource. A slurry containing a mixture of sand and water will be pumped from the dredge via a floated pipeline to a processing plant to be established. The dredge will manoeuvre around the pond and will be secured to the pond banks via wires.

Once the dredge pond is formed, as the dredge vacuums away the underwater sand resource, surface sand would slump into the dredge pond at the natural angle of repose and be captured by the dredge. It is envisaged that this process would reduce the need for manual handling of material, however if required, sand adjacent to the pond edges may also be placed into the dredge pond by excavator or front-end loader to then be captured by the dredge.

Sand may be extracted within the entire project site via a combination of dry extraction and dredging operations to a maximum anticipated depth of 35 metres below the water table. **Figure 5** shows the Project overview.

3.2 Employment

The Project would provide employment opportunity for an additional six full time personnel, bringing the total employment for the quarry to sixteen full time and five casual employees.

3.3 Hours of Operation

The proposed operating hours for the project are:

- Monday to Friday – 24 hour operations;
- Saturday – 6.00am to 6.00pm; and
- No operation on Sundays or public holidays.

The nominated operating hours of specific project activities are as follows:

- Importation of raw sand – 7.00am to 6.00pm Monday to Saturday.
- Dredging and processing – 24 hours Monday to Friday and 6.00am to 6.00pm Saturday.
- Dispatch – 24 hours Monday to Friday and 6.00am to 6.00pm Saturday.
- Fill importation – 24 hours Monday to Friday and 6.00am to 6.00pm Saturday.
- Deliveries and maintenance – 24 hours Monday to Friday and 6.00am to 6.00pm Saturday.

Holcim propose to operate three shifts on Monday to Friday; 6.00am to 2.00pm; 2.00pm to 10.00pm; and 10.00pm to 6.00am. There would be a single day shift between 6.00am to 6.00pm on Saturdays.

Site management and office personnel work a standard 6.00am to 5.00pm work day during weekdays.

3.4 Transport

The Project seeks to transport up to 750,000tpa of sand products from the quarry, subject to market demand for a period of 30 years. As part of the Project, raw materials and fill material will be imported by road. This will include sand importation of 200,000tpa and up to 550,000tpa of fill material.

3.5 Transport Routes

The transport routes for the Project will be the same as the existing transport routes (**Figure 4A** and **4B** refer).

Holcim expects the split between the routes to be similar to the existing split with;

- 6% travelling south via Nelson Bay Road to the Newcastle market;
- 90% travelling west via Nelson Bay Road, Cabbage Tree Road and Tomago Road to the Central Coast, Hunter and Sydney Markets;
- 3% travelling north via Richardson Road and via Medowie Road and Pacific Highway for the North Coast Markets; and

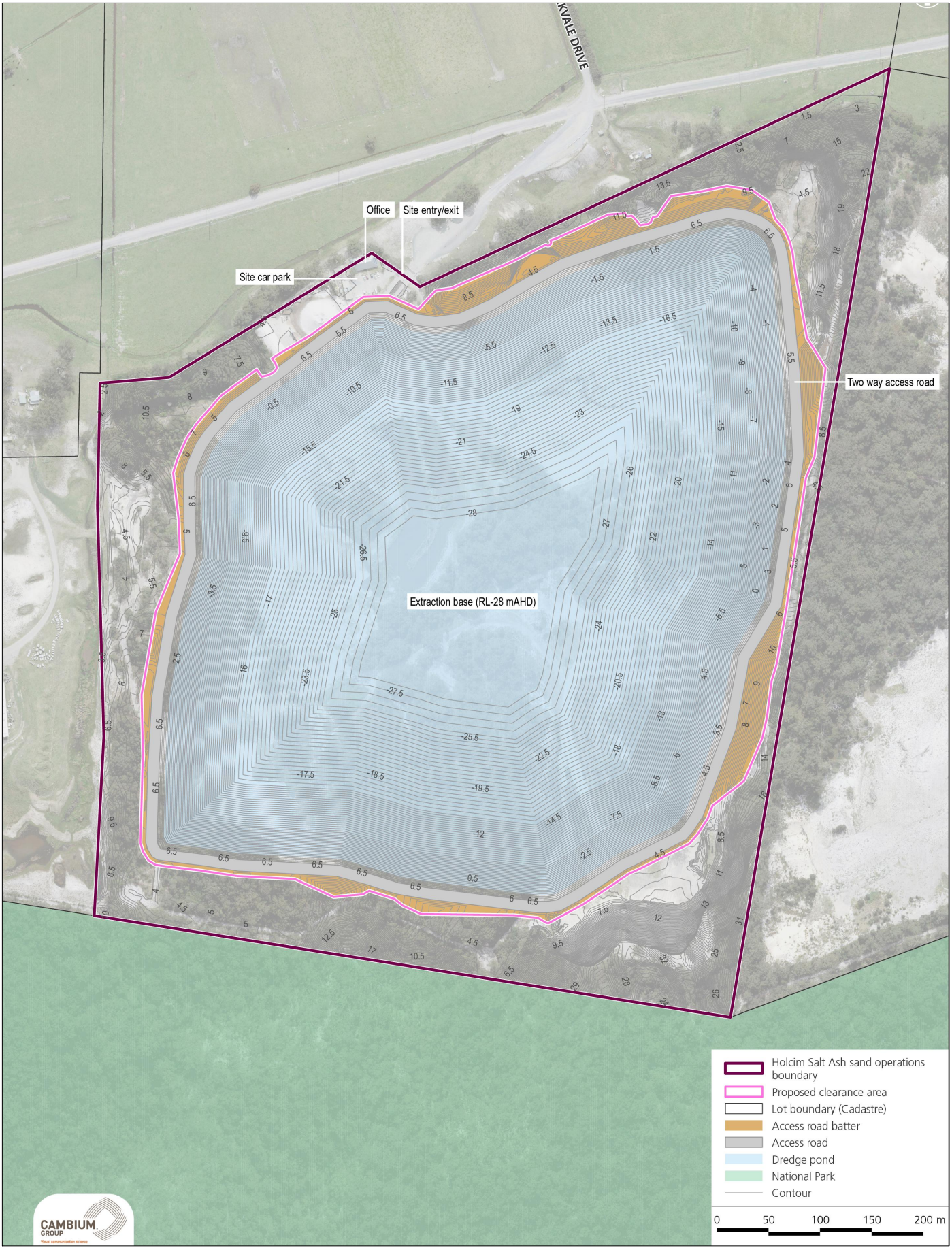

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FIGURE 5

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

PROJECT OVERVIEW

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- 1% travelling north via Nelson Bay Road for the Port Stephens Market.

Trucks importing the fill material are expected to use the same transport routes as used by the sand product trucks with a similar split.

The sand importation truck split will continue to be:

- 15% from Tanilba Bay;
- 50% from Anna Bay; and
- 35% from Cabbage Tree Road Quarry.

3.6 Truck Size for Product and Fill Transport

Holcim will continue to use 19.0 metre truck and dog combination trucks with average loads of 33 tonnes.

3.7 Traffic Generation

The traffic generation of the project includes:

- Light vehicle trips associated with employees and any visitors estimated as up to 60 two way trips per day based on 30 in/30 out per day (NB this allows for some off site trips to get lunch etc).

- Heavy vehicles associated with the importation of raw materials and fill material, as well as the dispatch of sand products which is estimated to be 336 two way heavy vehicle trips per day (168 in/168 out) on an average day and up to 514 two way heavy vehicle trips (257 in/257 out) on a busy day. The heavy vehicles include delivery and service/maintenance trucks which number 11 one way trucks (11 in/11 out) and 16 one way trucks (16 in/16 out) on an average day and a busy day respectively.

Weekday hourly volumes are estimated to be:

- 18 two way heavy vehicle trips per hour (9 in/9 out) in an average hour; and

- 60 two way heavy vehicle trips per hour (30 in/30 out) in a busy hour.

4.0 EXISTING TRAFFIC CONDITIONS

4.1 Principal Road Network

The principal road network that will serve Holcim Salt Ash Sand Operation includes;

- Oakvale Drive;
- Nelson Bay Road;
- Cabbage Tree Road/Tomago Road;
- Richardson Road/Medowie Road; and
- Lemon Tree Passage Road/Oyster Cove Road.

4.2 Description of Roads

4.2.1 Oakvale Drive

Oakvale Drive is a two lane local road that provides access to Holcim's Salt Ash Quarry and adjacent land uses including Oakvale Wildlife Park and Macka's Sand Quarry.

At its northern end, Oakvale Drive intersects with Nelson Bay Road and Lemon Tree Passage Road at a two lane roundabout intersection.

Oakvale Drive consists of a section of public road, which links to a private road.

The public road section is approximately 480 metres in length and includes vehicle access to Oakvale Wildlife Park. This section has a sealed road pavement width which varies between 8.5 to 11.0 metres wide with grass shoulders.

A 90 degree bend occurs at the vehicle entrance to Oakvale Wildlife Park with Give Way Control on the eastern arm of Oakvale Drive.

A private road with a posted 20km/h speed limit links to the public road section, east of the vehicle access to Oakvale Wildlife Park. The private road provides vehicle access to Holcim's Sand Quarry, as well as to the Macka's Sand Quarry. A series of haul roads link to the private road. The private road and haul roads are sealed and provide for two way traffic.

The length of the private road to the entrance to Holcim's Sand Quarry is 780 metres.

4.2.2 Nelson Bay Road

Nelson Bay Road is a state arterial road that links between Stockton Bridge at Kooragang Island in the south and Nelson Bay in the north.

Nelson Bay Road, between Kooragang Island and Anna Bay is a 25 metre/26 metre B-double route.

As a state road, Nelson Bay Road has a high level of traffic management along its full length with centreline marking, together with a median in sections, edgelines, guideposts, pavement markers and sealed shoulders. Dual carriageway sections are provided in the busier sections of the route. Major intersections typically have roundabout treatments and or traffic signals and minor intersections and some property access driveways/roads have auxiliary turning lanes.

Speed limits vary along its length between 70km/h, 80km/h and 100km/h.

Section between Oakvale Drive, Salt Ash and Cabbage Tree Road, Williamtown

The section between Oakvale Drive at Salt Ash and Cabbage Tree Road at Williamtown forms part of Sydney and Newcastle transport routes and accommodates approximately 96% of finished sand product trucks generated by Salt Ash Quarry, as well as the transport route for trucks importing sand from Cabbage Tree Road Quarry. Approximately 35% of sand importation trucks use this section of Nelson Bay Road.

An additional 3% of finished sand product trucks associated with the North Coast market use Nelson Bay Road between Oakvale Drive and Richardson Road.

Traffic management in this section of Nelson Bay Road includes;

- An 80km/h speed limit;
- Dual carriageway with four lanes between Oakvale Drive and 830 metres south west of Richardson Road;
- A single carriageway with two lanes between 830 metres south west of Richardson Road and Medowie Road;
- Dual carriageway with four lanes between Medowie Road and Cabbage Tree Road.

Traffic management at principal intersections include;

- Two lane roundabout at Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road;
- Two lane roundabout at Nelson Bay Road/Richardson Road/Salt Ash Avenue;
- Two lane roundabout at Nelson Bay Road/Medowie Road;
- Traffic signals at Nelson Bay Road/Williamtown Drive;
- Two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane.

Section between Cabbage Tree Road, Williamtown and Stockton Bridge Road, Kooragang Island

The section of Nelson Bay Road between Cabbage Tree Road and Stockton Bridge forms part of Salt Ash Quarry transport route to the Newcastle area and accommodates approximately 6% of finished sand product trucks generated by the quarry.

Traffic management in this section of Nelson Bay Road includes;

- A single carriageway with two lanes between south of Cabbage Tree Road and south/west of Coxs Lane;
- A short section of four lane road, south west of Coxs Lane;
- A single carriageway with two lanes between Seaside Boulevarde and north of Vardon Road;
- A four lane divided road between north of Vardon Road and Stockton Bridge.

The speed limit in this section varies between 70km/h, 80km/h and 100km/h.

The traffic management at principal intersections include;

- Grade separated Northbound and Southbound ramps at Coxs Lane;
- Two lane roundabout at Nelson Bay Road/Seaside Boulevarde/Fullerton Cove Road;
- Two lane roundabout at Nelson Bay Road/Fullerton Street.

Section between Oakvale Drive, Salt Ash and Horse Trail, Anna Bay

The section of Nelson Bay Road between Oakvale Drive, Salt Ash and Horse Trail at Anna Bay is the transport route for the Port Stephens area and accommodates 1% of finished sand product trucks generated by Salt Ash Quarry. It is also the sand importation transport route from the Anna Bay Quarry with up to 50% of sand importation trucks using this route.

Nelson Bay Road, in this section, is predominantly a dual carriageway four lane road between Anna Bay and 4.3km west of Oakvale Drive, where it becomes a single carriageway with two lanes.

The speed limit varies between 80km/h and 100km/h.

The traffic management at principal intersections include;

- An AUL left turn treatment in Nelson Bay Road at Marsh Road (South intersection);
- An AUL left turn treatment and seagull right turn treatment in Nelson Bay Road at;

  - Marsh Road (North intersection); and
  - Trotter Road.

- An AUL left turn treatment and CHR right turn treatment in Nelson Bay Road at Horse Trail, together with a No Right Turn restriction on the right turn out of Horse Trail. No U turn restrictions are also provided in Nelson Bay Road.

NSW Government is currently upgrading strategic sections of Nelson Bay Road and further details are provided in Section 4.7.

4.2.3 Cabbage Tree Road/Tomago Road

Cabbage Tree Road/Tomago Road form part of the Sydney/Central Coast Transport Route and accommodates approximately 90% of finished sand product trucks generated by Salt Ash Quarry.

The eastern section of Cabbage Tree Road will also be used by trucks importing sand to Salt Ash Quarry from Cabbage Tree Road Quarry, with up to 35% of sand importation trucks using Cabbage Tree Road.

Cabbage Tree Road/Tomago Road is a state arterial road that links between Nelson Bay Road near Williamtown and Pacific Highway at Tomago. Cabbage Tree Road/Tomago Road is an approved 25 metre/26 metre B-double route.

The road is generally a two lane road with a high level of traffic management including centreline and edgeline road marking, sealed shoulders, guide posts and channelised treatments and auxiliary lanes at principal intersections.

The eastern section of the route generally has rural and semi rural residential land uses fronting the road.

The western section between Masonite Road and Pacific Highway generally has industrial uses adjacent the road.

Traffic management at principal intersections include;

- Two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane;
- A left turn deceleration lane (AUL) and a left turn acceleration lane (AUL) in Cabbage Tree Road at the Cabbage Tree Quarry Access Road together with left in/left out restrictions on the Access Road.
- CHR and AUL right and left turn treatments at Cabbage Tree Road/Tomago Road/Masonite Road;
- Traffic signals at the intersection of Tomago Road/Westrac Access Road;
- CHR and AUL right and left turn treatments in Tomago Road at the;
    - Access Road to 606-608 Tomago Road;
    - Tomago Aluminium Entrance Road.
- Two lane roundabout at Tomago Road/Old Punt Road; and
- Traffic signals at Tomago Road/Pacific Highway.

The speed limit in Cabbage Tree Road/Tomago Road is 80km/h, with sections of 60km/h west of Nelson Bay Road and between Old Punt Road and Pacific Highway.

4.2.4 Richardson Road

Richardson Road, between Nelson Bay Road and Medowie Road forms part of the North Coast transport route and accommodates approximately 3% of finished sand product trucks.

Richardson Road is a state arterial road that runs between Nelson Bay Road at Salt Ash and Pacific Highway at Raymond Terrace.

It is an approved 25 metre/26 metres B double route.

The section between Nelson Bay Road and Medowie Street is constructed as a two lane road with centreline markings, edgelines, sealed shoulders, pavement markers and guideposts/reflectors.

The speed limit varies between 80km/h and 90km/h.

The traffic management at principal intersections includes;

- Two lane roundabout at Richardson Road/Nelson Bay Road/Salt Ash Drive; and
- Two lane roundabout at Richardson Road/Medowie Road.

4.2.5 Medowie Road

Medowie Road, north of Richardson Road forms part of the North Coast transport route and accommodates approximately 3% of finished sand product trucks generated by Salt Ash Quarry.

Medowie Road is a regional road and links between Nelson Bay Road near Williamtown and the Pacific Highway near Euwylong. Medowie Road passes Newcastle Airport/ Williamtown RAAF air base and the township of Medowie.

The eastern section of the route generally has rural and semi rural residential land uses fronting the road.

It is predominantly a two lane road with a high level of traffic management including centerline, edgeline road markings, guide posts, sealed road shoulders.

Principal intersections, north of Richardson Road, have channelised CHR and AUL right and left turn treatments and or roundabouts.

Medowie Road forms a T junction intersection with Pacific Highway. The traffic management at the intersection in Pacific Highway includes a seagull channelisation for the right turns into and out of Medowie Road and an AUL left turn treatment for the left turn into Medowie Road.

The speed limit along Medowie Road varies with 80km/h between Williamtown and the Medowie township, 50km/h in the township and 80 and 100km/h north of the Medowie township.

Medowie Road is an approved 25 metre/26 metre B-double route.

4.2.6 Lemon Tree Passage Road and Oyster Cove Road

Lemon Tree Passage Road and Oyster Cove Road is the transport route for the importation of sand from the Tanilba Bay Quarry to Salt Ash Quarry. Some 15% of sand importation trucks use Oyster Cove Road and Lemon Tree Passage Road.

Lemon Tree Passage Road and Oyster Cove Road are local roads controlled by Port Stephens Council and are approved 25 metre/26 metre B Double routes.

Lemon Tree Passage Road is a two lane road with centreline markings, edgelines and sealed shoulders. The speed limit varies between 60km/h, 80km/h and 90km/h, along its length.

Intersection treatments include give way/priority control on the side streets intersecting Lemon Tree Passage Road.

Traffic management at the intersection of Oyster Cove Road includes;

- A short AUL left turn treatment for the left turn into Oyster Cove Road; and
- A sealed shoulder providing a basic right turn treatment (BAR) to enable through vehicles to pass right turn vehicles turning into Oyster Cove Road;

- Priority control on Oyster Cove Road.

Oyster Cove Road is a two lane local road that links between Lemon Tree Passage Road and Oyster Cove. It generally has a sealed pavement width of 6.5 metres, with some wider sections.

It serves a small community and several businesses including a marina at Oyster Cove and provides access to the Tanilba Bay Quarry.

The speed limit is 50km/h in the Oyster Cove Village and 100km/h in the section between the village and Lemon Tree Passage Road.

Tanilba Bay Quarry access is a sealed road/driveway access located approximately 2.3km from Lemon Tree Passage Road.

Due to its low usage by vehicles, Oyster Cove Road has limited traffic management implemented along its length. Oyster Cove Road is an approved 25 metre/26 metre B Double route.

4.3 Existing Traffic Conditions on Road Network

4.3.1 Existing Traffic Volumes

Daily volumes including vehicle classification counts were undertaken on the road network adjacent Salt Ash Quarry between 6-12 August, 2020.

The volume and vehicle classification count locations included Oakvale Drive, Nelson Bay Road and Cabbage Tree Road (at several locations), Richardson Road and Lemon Tree Passage Road.

Figure 6 shows the count locations and **Figure 7** shows a summary of daily volume and vehicle classification counts.

In addition, weekday AM and PM peak period intersection counts were undertaken on the 12th and 13th of August 2020, at the principal intersection used by Salt Ash Quarry trucks. **Figure 6** shows the count locations.

Weekdays have the highest traffic generation of Salt Ash Quarry and AM and PM peak hours represent those periods with the highest traffic volumes using the road network.

4.3.2 Daily Volumes on Road Network

Table 4.1 and **Figure 7** shows the daily traffic volumes and the proportion of heavy vehicles using the road network in the area.

Reference to Table 4.1 shows that on a typical weekday two way traffic volumes using the road network adjacent Salt Ash Quarry are as follows;

- 493 vehicles per day (vpd) in Oakvale Drive, south of Nelson Bay Drive. Heavy vehicles (Austroad Class 3-12) represent 42.2% of total vehicles;

- 16,140 vpd in Nelson Bay Road, east of Oakvale Drive. Heavy vehicles (Austroad Class 3-12) represent 9.7% of total vehicles;

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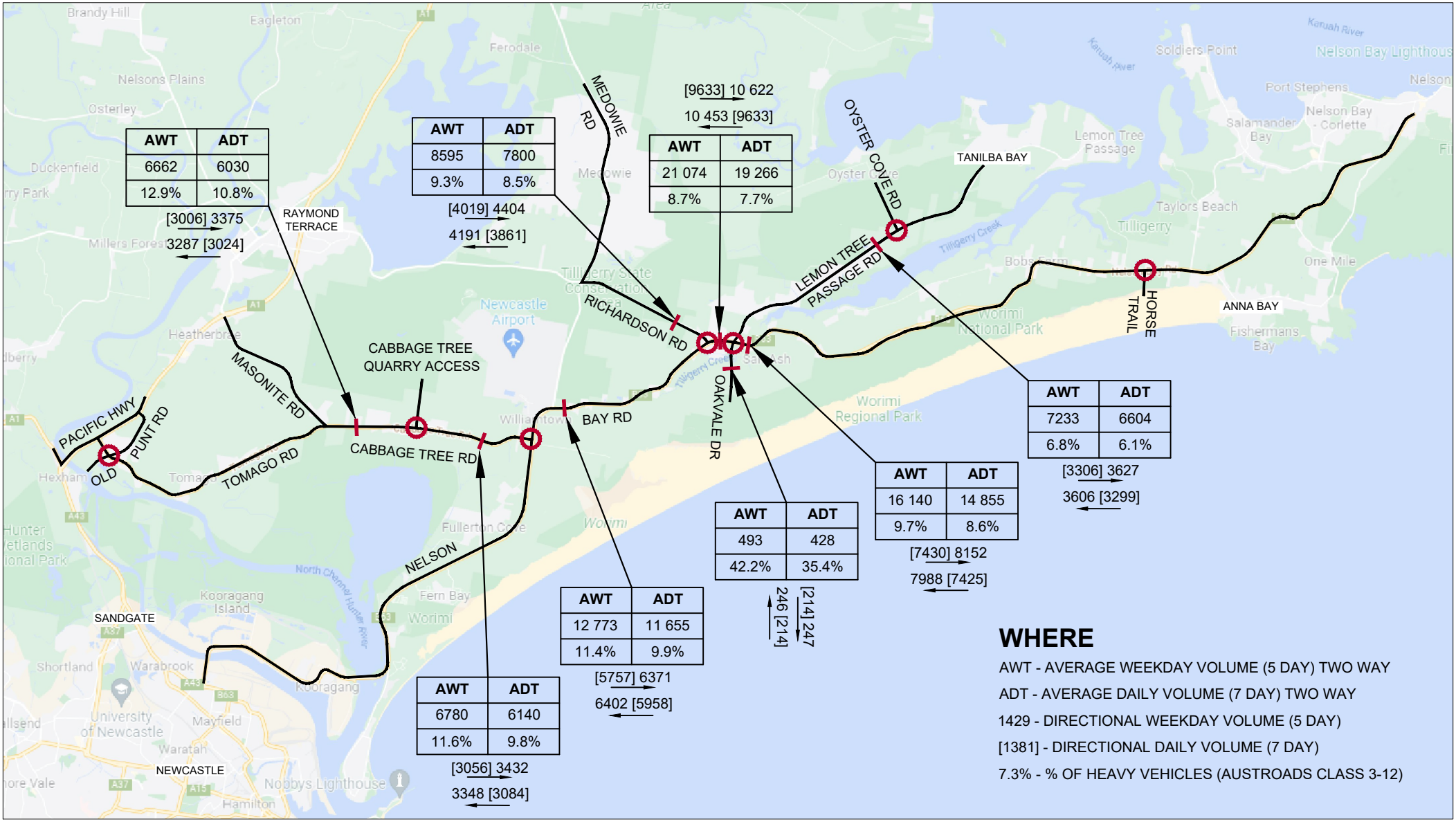
FIGURE 6

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

TRAFFIC COUNT LOCATIONS

JOB NO.20047 6.10.21



SOURCE: Traffic Counts 6-12 August, 2020

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FIGURE 7

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

WEEKDAY AND DAILY TRAFFIC VOLUME

JOB NO.20047

6.10.21

- 21,074 vpd in Nelson Bay Road, west of Oakvale Drive. Heavy vehicles (Austroad Class 3-12) represent 8.7% of total vehicles;

- 12,773 vpd in Nelson Bay Road, east of Medowie Road. Heavy vehicles (Austroad Class 3-12) represent 11.4% of total vehicles;

- 6,780 vpd in Cabbage Tree Road, west of Nelson Bay Road. Heavy vehicles (Austroad Class 3-12) represent 11.6% of total vehicles;

- 6,662 vpd in Nelson Cabbage Tree Road, east of Masonite Road. Heavy vehicles (Austroad Class 3-12) represent 12.9% of total vehicles;

- 8,595 vpd in Richardson Road, north of Nelson Bay Road. Heavy vehicles (Austroad Class 3-12) represent 9.3% of total vehicles;

- 7,233 vpd in Lemon Tree Passage Road, west of Oyster Cove Road. Heavy vehicles (Austroad Class 3-12) represent 6.8% of total vehicles;

TABLE 4.1

TWO WAY 5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES AND VEHICLE CLASSIFICATIONS USING ROAD NETWORK

Location	5 Day Average (Weekday) Traffic Volumes			7 Day Average (ADT) Traffic Volumes		
	Total	No. of Heavy Vehicles[1]	% of Heavy Vehicles	Total	No. of Heavy Vehicles	% of Heavy Vehicles
Oakvale Drive, south of Nelson Bay Road	493	207	42.2%	428	152	35.4%
Nelson Bay Road, east of Oakvale Drive	16,140	1,558	9.7%	14,855	1,277	8.6%
Nelson Bay Road, west of Oakvale Drive	21,074	1,828	8.7%	19,266	1,475	7.7%
Nelson Bay Road, east of Medowie Road	12,773	1,453	11.4%	11,655	1,157	9.9%
Cabbage Tree Road, west of Nelson Bay Road	6,780	788	11.6%	6,140	600	9.8%
Cabbage Tree Road, east of Masonite Road	6,662	861	12.9%	6,030	654	10.8%
Richardson Road, north of Nelson Bay Road	8,595	799	9.3%	7,880	668	8.5%
Lemon Tree Passage Road, west of Oyster Cove Road	7,233	492	6.8%	6,604	405	6.1%

Source: Traffic Counts 6-12 August 2020

1. *Austroad Class 3-12*

4.3.3 Weekday AM and PM Peak Hour Traffic Volumes

AM Peak Hour

Figure 8 shows the existing AM peak hour traffic volumes at the intersection on the road network used by Salt Ash Quarry vehicles. The AM peak hour generally occurred between 7.15am – 8.15am and between 7.30am – 8.30am at these intersections.

The westbound direction in Nelson Bay Road generally is the peak direction of travel. In Nelson Bay Road significant turning volumes occur into and out of Richardson Road, Medowie Road and Cabbage Tree Road, which reflects the arterial road status of these roads.

On the day of the survey, between 7.30am – 8.30am both the Salt Ash Quarry and the adjacent Macka's Sand Quarry generated relatively low volumes of sand trucks with 4 trucks exiting Oakvale Drive and 9 trucks entering Oakvale Drive.

The traffic counts also included intersections used by the sand importation trucks at Tanilba Bay, Anna Bay and Cabbage Tree Road Quarry. On the day of the survey there was little or no activity associated with sand importation.

PM Peak Hour

Figure 9 shows the existing PM Peak hour traffic volumes at the intersections on the road network used by the Salt Ash Quarry vehicles. The PM peak hour occurred between 3.30pm – 4.30pm generally across the road network.

The eastbound direction in Nelson Bay Road generally is the peak direction of travel.

Similar to the AM peak hour there are significant turning volumes to/from Nelson Bay Road at Richardson Road, Medowie Road and Cabbage Tree Road.

In Oakvale Drive there were no entering trucks during the 3.30pm – 4.30pm peak hour. Trucks exiting Oakvale Drive numbered 4 during the same period.

During this period there were also no sand importation trucks from Tanilba Bay, Anna Bay and Cabbage Tree Road Quarry.

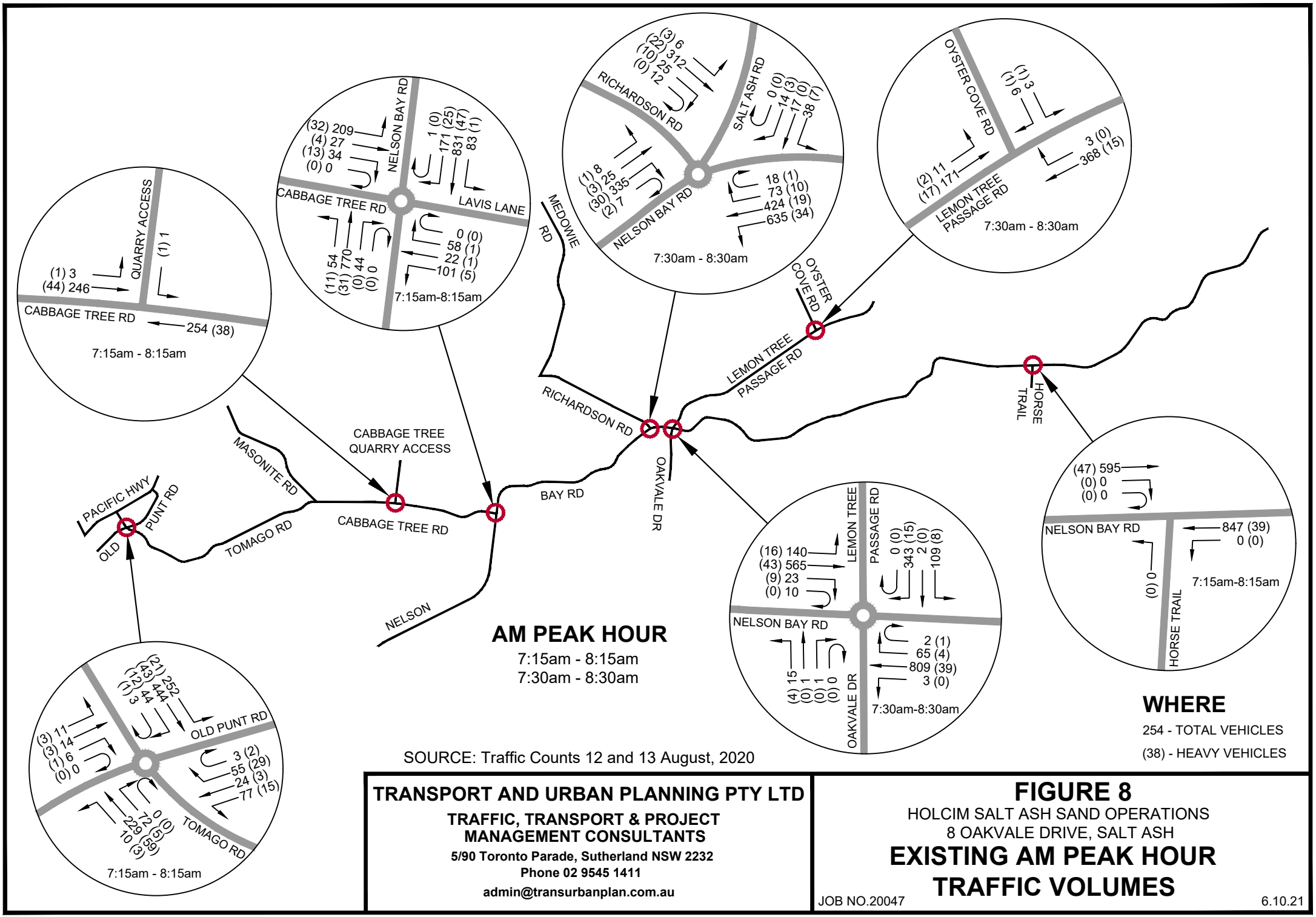
4.3.4 Traffic Conditions on the Road Network

As part of the review of traffic conditions on the road network, the operational capacity of the principal intersections on the road network has been assessed using the SIDRA 9 traffic model.

SIDRA is a suitable model to assess the operational performance of intersections. Criteria for interpreting an intersections operation are Level of Service (LS), Degree of Saturation (DS) and Average Vehicle Delay (AVD). For intersections under Priority/Stop Sign control and Roundabout Control, Average Vehicle Delay for Individual Movements (HMD) is relevant.

Table 4.2 below is reproduced from the RTA's Guide to Traffic Generation Developments (October 2002) and provides an explanation of the various levels of service for intersections.

A Level of Service D or better (i.e. A, B, C or D) is generally considered to be minimum design requirement for intersections. The level of service for intersections controlled



SOURCE: Traffic Counts 12 and 13 August, 2020

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FIGURE 8

HOLCIM SALT ASH SAND OPERATIONS

8 OAKVALE DRIVE, SALT ASH

EXISTING AM PEAK HOUR TRAFFIC VOLUMES

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by Give Way/Stop Signs is determined from the movement with highest Average Vehicle Delay (HMD). For intersections controlled by roundabouts and traffic signals, the Level of Service is determined by the Average Vehicle Delay for all vehicles using the intersection (AVD).

TABLE 4.2

LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Intersection is oversaturated	Oversaturated, requires other control mode

The intersections modelled included those intersections used by the majority of the sand sales and fill/sand importation vehicles and include:

- Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road;
- Nelson Bay Road/Richardson Road/Salt Ash Avenue;
- Nelson Bay Road/Cabbage Tree Road/Lavis Lane;
- Tomago Road/Old Punt Road;
- Nelson Bay Road/Horse Trail; and
- Lemon Tree Passage Road/Oyster Cove Road.

Modelling was not undertaken for the Cabbage Tree Road/Cabbage Tree Quarry Access Road, as access to the quarry is restricted to left in/left out with left turn deceleration and acceleration lanes provided in Cabbage Tree Road.

A comparison of the August 2020 weekday AM and PM intersection volumes for the Nelson Bay Road/Cabbage Tree Road/Lavis Lane intersection was made to volumes collected in early December 2018.

It was noted that weekday peak hour August 2020 volumes were on average 11.4% lower than the December 2018 volumes, which was probably due to COVID restrictions including on air travel at Newcastle Airport at Williamtown.

To ensure a worst case was modelled the existing intersection volumes as shown in **Figures 8** and **9** have been increased by 11.4% in the AM and PM peak hour SIDRA models.

The modelling adopted the adjusted higher volumes, as well as the existing traffic management and traffic controls at the above intersections.

The results of the SIDRA modelling are shown in Tables 4.3, 4.4, 4.5, 4.6, 4.7 and 4.8.

Reference to these tables shows that:

- The intersection of Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road operates at a good level of service with Level of Service A operation and low vehicle delays in the AM and PM peak hours (Table 4.3);

- The intersection of Nelson Bay Road/Richardson Road/Salt Ash Avenue also operates at a Level of Service A operation with low vehicle delays in the peak hours, which is a good operation (Table 4.4);

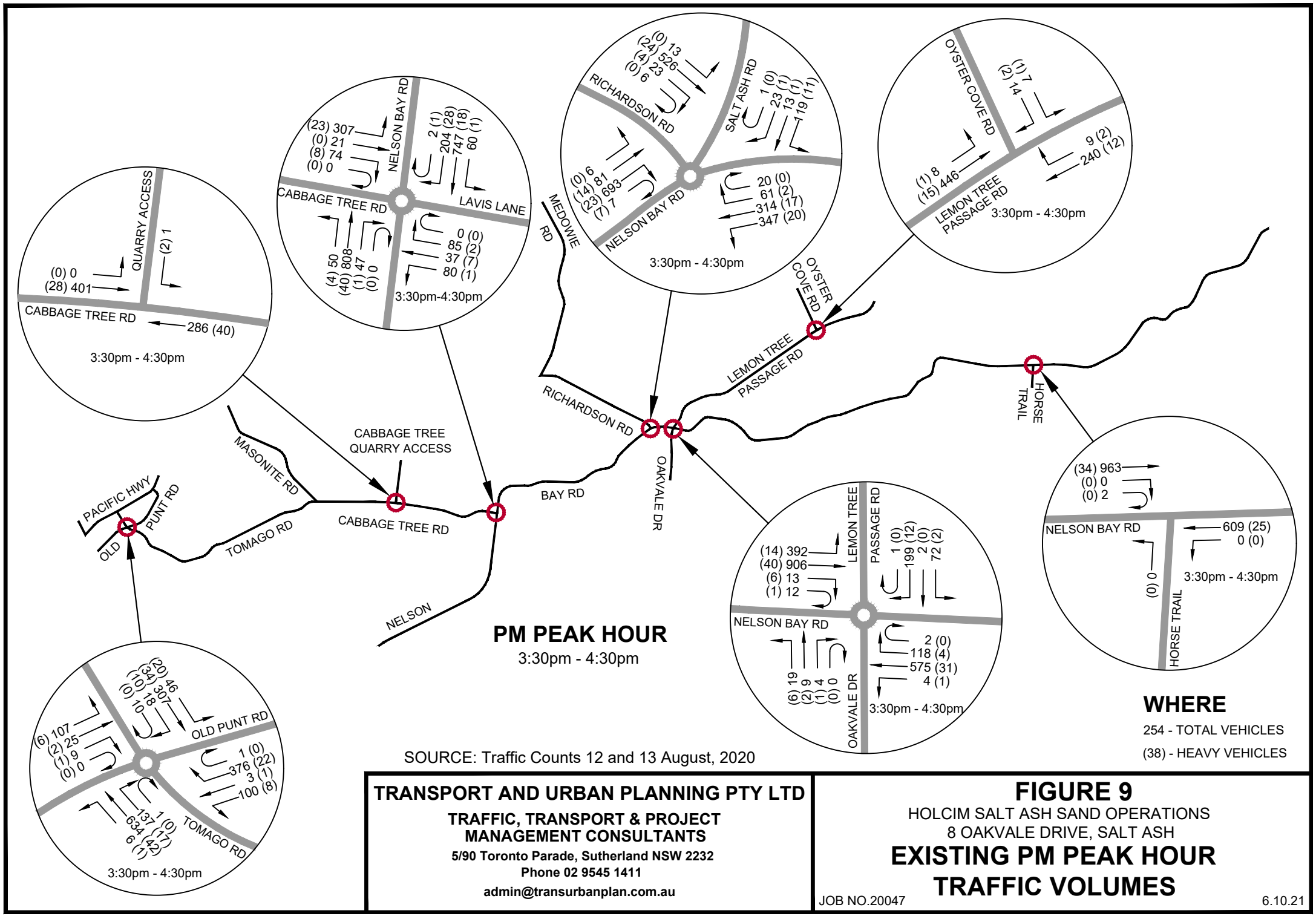
- The intersection of Nelson Bay Road/Cabbage Tree Road/Lavis Lane operates at a Level of Service A operation with low vehicle delays in the peak hours, which is a good operation (Table 4.5);

- The intersection of Tomago Road/Old Punt Road operates at a Level of Service A operation with low vehicle delays in the peak hours, which is a good operation (Table 4.6);

- The intersection of Nelson Bay Road/Horse Trail operates at a Level of Service A/B operation, with low vehicle delays in the peak hours, which is a good to satisfactory operation (Table 4.7); and

- The intersection of Lemon Tree Passage Road/Oyster Cove Road also operates at a Level of Service A/B operation with low vehicle delays, in the peak hours, which is a satisfactory to good operation (Table 4.8).

Extracts of the SIDRA traffic modelling outputs are contained in Appendix 1.



SOURCE: Traffic Counts 12 and 13 August, 2020

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FIGURE 9

HOLCIM SALT ASH SAND OPERATIONS

8 OAKVALE DRIVE, SALT ASH

EXISTING PM PEAK HOUR TRAFFIC VOLUMES

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TABLE 4.3

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/OAKVALE DRIVE/LEMON TREE PASSAGE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Oakvale Drive								
Left	0.035	8.7	A	1.5	0.053	7.5	A	2.1
Through	0.035	7.9	A	1.5	0.053	7.4	A	2.1
Right	0.035	12.6	A	1.5	0.053	12.2	A	2.1
U-turn	0.035	14.7	B	1.5	0.053	13.5	A	2.1
East Nelson Bay Road								
Left	0.488	8.0	A	24.7	0.342	7.4	A	15.3
Through	0.488	8.8	A	24.7	0.342	7.6	A	15.3
Right	0.488	13.7	A	24.7	0.342	12.3	A	14.8
U-turn	0.488	15.0	B	24.7	0.342	12.1	A	14.8
North Lemon Tree Passage								
Left	0.203	11.1	A	6.9	0.155	13.5	A	5.1
Through	0.203	10.3	A	6.9	0.155	11.4	A	5.1
Right	0.400	14.0	A	16.4	0.286	14.9	B	11.6
U-turn	0.400	13.8	A	16.4	0.286	14.6	B	11.6
West Nelson Bay Road								
Left	0.132	6.7	A	5.6	0.338	6.9	A	14.7
Through	0.269	7.1	A	13.4	0.433	7.9	A	22.4
Right	0.269	12.0	A	13.4	0.433	12.6	A	22.4
U-turn	0.269	11.2	A	13.4	0.433	11.7	A	22.4
TOTAL – All Vehicles	**0.488**	**9.4**	**A**	**24.7**	**0.433**	**8.7**	**A**	**22.4**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 4.4

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/RICHARDSON ROAD/SALT ASH AVENUE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Nelson Bay Road								
Left	0.429	5.4	A	21.2	0.279	5.4	A	11.6
Through	0.429	11.7	A	21.1	0.279	11.6	A	11.6
Right	0.429	13.5	A	21.1	0.279	13.1	A	11.6
U-turn	0.429	12.7	A	21.1	0.279	12.4	A	11.6
North Salt Ash Avenue								
Left	0.090	5.0	A	2.4	0.237	6.3	A	7.2
Through	0.090	11.1	A	2.4	0.237	12.8	A	7.2
Right	0.090	13.1	A	2.4	0.237	14.0	A	7.2
U-turn	0.090	13.8	A	2.4	0.237	15.2	B	7.2
North West Richardson Road								
Left	0.197	8.2	A	8.7	0.390	7.9	A	18.2
Through	0.197	6.7	A	8.7	0.390	8.4	A	18.2
Right	0.197	17.5	B	7.5	0.390	19.1	B	15.5
U-turn	0.197	14.0	A	7.5	0.390	16.1	B	15.5
West Nelson Bay Road								
Left	0.211	7.4	A	10.5	0.388	6.8	A	19.0
Through	0.211	7.7	A	10.5	0.388	7.4	A	19.0
Right	0.211	8.1	A	10.5	0.388	7.6	A	19.0
U-turn	0.211	15.8	B	9.7	0.388	17.7	B	17.6
TOTAL – All Vehicles	**0.429**	**8.2**	A	**21.2**	**0.390**	**8.4**	A	**19.0**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 4.5

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Nelson Bay Road								
Left	0.395	7.2	A	18.7	0.440	7.6	A	21.8
Through	0.395	6.9	A	18.7	0.440	7.5	A	21.8
Right	0.395	13.8	A	17.4	0.440	14.5	A	20.6
U-turn	0.395	13.4	A	17.4	0.440	14.0	A	20.6
East Lavis Lane								
Left	0.281	9.7	A	10.3	0.315	9.0	A	12.0
Through	0.281	7.3	A	10.3	0.315	7.8	A	12.0
Right	0.281	13.5	A	10.3	0.315	13.4	A	12.0
U-turn	0.281	16.0	B	10.3	0.315	15.9	B	12.0
North Nelson Bay Road								
Left	0.316	5.8	A	12.7	0.303	6.0	A	11.5
Through	0.566	6.9	A	34.1	0.543	6.9	A	30.4
Right	0.566	13.3	A	34.1	0.543	13.4	A	30.4
U-turn	0.566	12.6	A	34.1	0.543	13.6	A	30.4
West Cabbage Tree Road								
Left	0.252	7.7	A	11.0	0.371	8.0	A	16.2
Through	0.122	9.2	A	5.4	0.172	8.7	A	6.0
Right	0.122	17.2	B	5.4	0.172	16.1	B	6.0
U-turn	0.122	15.0	B	5.4	0.172	15.2	B	6.0
TOTAL – All Vehicles	**0.566**	**8.0**	**A**	**34.1**	**0.543**	**8.5**	A	**30.4**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 4.6

SIDRA MODELLING RESULTS FOR TOMAGO ROAD/OLD PUNT ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South East Tomago Road								
Left	0.092	5.2	A	4.4	0.267	7.3	A	10.9
Through	0.222	4.7	A	11.1	0.642	8.7	A	50.7
Right	0.222	9.9	A	11.1	0.642	13.7	A	50.7
U-turn	0.222	12.2	A	11.1	0.642	15.7	B	50.7
North East Old Punt Road								
Left	0.222	7.0	A	10.8	0.504	5.8	A	19.4
Through	0.222	5.9	A	10.8	0.504	5.5	A	19.4
Right	0.222	12.5	A	10.8	0.504	10.8	A	19.4
U-turn	0.222	14.8	B	10.8	0.504	13.1	A	19.4
North West Tomago Road								
Left	0.246	4.3	A	9.9	0.120	5.8	A	6.3
Through	0.390	4.1	A	19.9	0.273	4.5	A	13.9
Right	0.390	10.1	A	19.9	0.273	10.9	A	13.9
U-turn	0.390	12.4	A	19.9	0.273	12.3	A	13.9
South West Old Punt Road								
Left	0.041	5.7	A	1.4	0.294	13.8	A	12.5
Through	0.041	4.7	A	1.4	0.294	9.7	A	12.5
Right	0.041	10.3	A	1.4	0.294	15.3	B	12.5
U-turn	0.041	12.4	A	1.4	0.294	17.3	B	12.5
TOTAL – All Vehicles	**0.390**	**5.5**	**A**	**19.9**	**0.642**	**9.0**	A	**50.7**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 4.7

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/HORSE TRAIL INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Horse Trail								
Left	0.001	5.5	A	0.0	0.001	4.7	A	0.0
East Nelson Bay Road								
Left	0.001	6.9	A	0.0	0.001	6.9	A	0.0
Through	0.249	0.0	A	0.0	0.179	0.0	A	0.0
West Nelson Bay Road								
Through	0.179	0.0	A	0.0	0.281	0.1	A	0.0
Right	0.003	14.7	B	0.1	0.002	11.4	A	0.0
TOTAL – All Vehicles	**0.249**	**0.1**	**B**	**0.1**	**0.281**	**0.1**	**A**	**0.0**

Where: *DS - Degree of Saturation*
AVD - Average Vehicle Delay in Seconds
LS - Level of Service
95th% Queue Length - 95th% Queue Length in Metres

TABLE 4.8

SIDRA MODELLING RESULTS FOR LEMON TREE PASSAGE ROAD/OYSTER COVE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Lemon Tree Passage Road								
Through	0.217	0.0	A	0.3	0.160	0.4	A	1.5
Right	0.217	8.9	A	0.3	0.160	13.0	A	1.5
North Oyster Cove Road								
Left	0.018	6.6	A	0.5	0.056	7.9	A	1.6
Right	0.018	11.2	A	0.5	0.056	14.9	B	1.6
West Lemon Tree Passage Road								
Left	0.007	8.3	A	0.0	0.005	8.1	A	0.0
Through	0.103	0.0	A	0.0	0.258	0.0	A	0.0
TOTAL – All Vehicles	**0.217**	**0.4**	**A**	**0.5**	**0.258**	**0.8**	**B**	**1.6**

Where: *DS - Degree of Saturation*
AVD - Average Vehicle Delay in Seconds
LS - Level of Service
95th% Queue Length - 95th% Queue Length in Metres

4.4 Assessment of Quarry Access Intersections

Holcim's trucks use the following intersections to access the sand quarries that are part of its current and proposed future operations.

- Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road, Salt Ash;
- Nelson Bay Road/Horse Trail, Anna Bay;
- Cabbage Tree Road/Cabbage Tree Quarry Access Road; and
- Lemon Tree Passage Road/Oyster Cove Road.

Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road, Salt Ash

This intersection provides access to Holcim's Salt Ash Quarry and has recently been upgraded by TfNSW to a 2 lane roundabout.

The roundabout has 2 lane approaches in Nelson Bay Road East and Lemon Tree Passage Road, 3 lane approach in Nelson Bay Road West and a single lane approach in Oakvale Drive.

Sight distance at the roundabout is good and meets Austroad requirements for the operating speeds at the roundabout.

While sand trucks use all legs of the intersection, the major movements are the right turn from Nelson Bay Road into Oakvale Drive and the left turn out of Oakvale Drive.

Figure 10A shows the traffic management at this intersection.

Nelson Bay Road/Horse Trail Anna Bay

This intersection is used by the sand importation trucks, importing sand from the Anna Bay Quarry to Salt Ash.

The intersection is a T-junction with left turn out only restrictions on Horse Trail. No U-turn restrictions also apply in Nelson Bay Road.

Nelson Bay Road has 2 through and departure lanes in each approach plus a sealed road shoulder for cyclists, as well as right and left turn lanes.

A right turn lane/bay (CHR) 120 metres long including taper is provided in the western approach of Nelson Bay Road.

A left turn lane/bay (AUL) 105 metres long including taper is provided in the eastern approach of Nelson Bay Road.

Sight distance at the intersection is good and meets Austroad requirements for the posted 80km/hr speed limit.

The sand trucks turn right into Horse Trail from Nelson Bay Road and left out of Horse Trail.

Figure 10B shows the traffic management at this intersection.

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FIGURE 10A

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

TRAFFIC MANAGEMENT AT NELSON BAY RD, OAKVALE DR AND LEMON TREE PASSAGE RD, SALT ASH

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FIGURE 10B

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

TRAFFIC MANAGEMENT AT NELSON BAY RD AND HORSE TRAIL, ANNA BAY

JOB NO.20047 6.10.21

Cabbage Tree Road/Cabbage Tree Quarry Access Road Williamtown

This intersection is used by sand importation trucks to import sand from Cabbage Tree Quarry to Salt Ash Quarry.

The intersection is a T-junction intersection with left turn in/left turn out only restrictions in the Quarry Access Road.

Cabbage Tree Road has a single through lane in each direction plus auxiliary lanes.

A left turn deceleration lane (AUL) 160 metres long (including taper) is provided in the western approach of Cabbage Tree Road for the left turn into the quarry. A left turn acceleration lane 300 metres long (AUL) is provided in the eastern departure leg of Cabbage Tree Road to allow vehicles turning left out of the quarry to join Cabbage Tree Road.

Sight distance at the intersection and merge points is good and meets Austroad requirements for the posted 80km/hr speed limit.

Figure 10C shows the traffic management at this intersection.

Lemon Tree Passage Road/Oyster Cove Road Tanilba Bay

This intersection is used by sand importation trucks importing sand from Tanilba Bay Quarry to Salt Ash.

The sand trucks turn left into Oyster Cove Road from Lemon Tree Passage Road and right out of Oyster Cove Road.

This intersection is a T-junction intersection with priority Control on Oyster Cove Road.

A short AUL left turn lane (65 metres including taper) together with a through lane is provided in the eastbound approach of Lemon Tree Passage Road.

A sealed shoulder providing a basic right turn treatment (BAL) is provided in the westbound approach together with a westbound through lane. The sealed shoulder enables through vehicles to pass right turn vehicles into Oyster Cove Road.

Sight distance at the intersection is satisfactory and meets Austroad requirements for the posted 100km/hr speed limit.

Figure 10D shows the traffic management at this intersection.

4.5 Road Safety

4.5.1 Crash Statistics

Road crash data was obtained from TfNSW for the main sections of the transport routes used by Holcim for sand sales and sand importation for the 3 year period between 1 October 2017 and 30 September 2020. The crash data has been analysed and is summarised below.

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FIGURE 10C

HOLCIM SALT ASH SAND OPERATIONS

8 OAKVALE DRIVE, SALT ASH

TRAFFIC MANAGEMENT AT CABBAGE TREE RD AND CABBAGE TREE QUARRY ACCESS RD, WILLIAMTOWN

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FIGURE 10D

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

TRAFFIC MANAGEMENT AT LEMON TREE PASSAGE RD AND OYSTER COVE RD, TANILBA BAY

JOB NO.20047 6.10.21

Oakvale Drive Salt Ash

There were no reported crashes in Oakvale Drive during the 3 year period.

Nelson Bay Road between Oakvale Drive, Salt Ash and Cabbage Tree Road Williamtown

There were a total of 22 reported crashes in this 7.8km long section of Nelson Bay Road during the 3 year period, which included 13 injury and 9 non injury crashes.

Intersection crashes totalled 14 crashes, 9 of which were injury crashes. These were spread over a number of intersections with Nelson Bay Road/Oakvale Drive/Lemon Tree Passage roundabout accounting for 3 crashes (1 injury crash) and the roundabouts at Richardsons Road/Salt Ash Avenue and at Cabbage Tree Road accounting for 4 crashes (2 injury crashes) and 3 crashes (1 injury crash) respectively.

The 5 other intersection crashes occurred at 4 different intersections.

Midblock crashes totaled 8 crashes with 4 injury crashes.

The crash types varied with rear end, side swipe, right/through and out of control crashes and 1 pedestrian crash at the intersections. Midblock crashes included rear end, run off the road and crashes involving vehicles leaving driveways and through traffic on Nelson Bay Road.

An examination of the crash types and locational spread of the crashes indicates that there is no treatable pattern that could be addressed by specific remedial measures.

Nelson Bay Road between Oakvale Drive, Salt Ash and Horse Trail Anna Bay

There were a total of 27 crashes in this 14.3km long section of Nelson Bay Road during the 3 year period including 1 fatal crash, 21 injury crashes and 5 non injury crashes.

Intersection crashes accounted for 2 crashes (1 injury crash) with the remaining crashes occurring at midblock locations.

The fatal crash involved a truck turning right into a driveway, west of Janet Parade and colliding with an eastbound vehicle.

Crash types varied with rear end, right/through, head on, run off road, change lanes, same direction, U-turn and crashes involving vehicles leaving driveways and through traffic on Nelson Bay Road.

There were no recorded crashes at the intersection of Nelson Bay Road/Horse Trail, which is the intersection used by sand importation trucks from Anna Bay Quarry.

An examination of the crash types and locational spread of the crashes indicates that there is no identified treatable pattern that could be addressed by remedial measures.

Cabbage Tree Road/Tomago Road between Nelson Bay Road Williamtown and Pacific Highway Tomago

There were a total of 25 crashes in Cabbage Tree Road/Tomago Road during this 3 year period, including 3 fatal crashes, 16 injury crashes and 6 non injury crashes. This road section is 15.1km long between Williamtown and Tomago.

Intersection crashes totalled 7 crashes (3 injury crashes) and occurred at the signalised Pacific Highway/Tomago Road intersection (5 crashes) and the roundabout controlled Tomago Road/Old Punt Road intersection (2 crashes).

Midblock crashes totalled 18 crashes and included the 3 fatal crashes and 13 injury crashes.

The fatal crashes included a head on crash involving a truck and car, 350 metres west of Masonite Road, a run off the road crash 325 metres west of Masonite Road and a truck emerging from a driveway and a motorcycle rider travelling east in Cabbage Tree Road, 2.6km west of Nelson Bay Road.

Intersection crashes included rear end, head on and right/through crashes.

Midblock crashes included, rear end, run off road and head on crashes. Apart from 2 of the fatal crashes which occurred west of Masonite Road, the midblock crashes were spread over the length of Cabbage Tree Road/Tomago Road.

Lemon Tree Passage Road between Nelson Bay Road, Salt Ash and Oyster Cove Road Tanilba Bay

There were a total of 8 crashes in this 6.4km long section of Lemon Tree Passage Road during the 3 year period including one fatal crash, 6 injury crashes and 1 non injury crash.

Midblock crashes included the fatal crash and 5 injury and 1 non injury crash. There was also 1 intersection crash which was an injury crash.

The fatal crash involved an eastbound vehicle, which ran off the road and collided with a culvert, 500 metres west of Rookes Road.

The midblock crashes included run off the road crashes which were the majority (6 crashes) and 1 rear end crash.

The locational spread of the crashes does not indicate that a single remedial measure would be available.

There were no recorded crashes at the intersection of Lemon Tree Passage Road/Oyster Cove Road which is the intersection used by sand importation trucks from Tanilba Bay Quarry.

Oyster Cove Road between Lemon Tree Passage Road and Oyster Cove

There were no reported crashes in Oyster Cove Road during the 3 year period.

4.5.2 Road Safety Audit

A Stage 5 Road Safety audit was undertaken on the roads that make up the main transport routes used by Holcim trucks. This includes;

- Oakvale Drive, Salt Ash;
- Nelson Bay Road between Oakvale Drive, Salt Ash and Cabbage Tree Road, Williamtown; and
- Cabbage Tree Road/Tomago Road between Williamtown and Tomago.

The audit also include the access intersections used by sand importation trucks at Anna Bay (Nelson Bay Road/Horse Trail), Tanilba Bay (Lemon Tree Passage Road/Oyster Cove Road) and Cabbage Tree Quarry (Cabbage Tree Road/Quarry Access Road).

The Stage 5 audit was undertaken on the existing road and traffic management along the route. The purpose of the audit was to examine the features of the existing road network which may affect road user safety and identify potential safety hazards.

The audit examined the existing road alignment, cross sections, road shoulders, intersections, delineation/signage, bridges and culverts, pavement, provision for heavy vehicles and other miscellaneous matters and assessed these against current road practice guidelines and standards, with the objective of identifying any real or potential road safety hazards.

While not normally part of a road safety audit, the most recent 3 year crash statistics for the roads were also analysed.

A separate road safety audit report has been prepared and is presented as Volume 2.

4.6 Pedestrians and Cyclists

Pedestrian crossing activity along the transport routes is limited. Other than bus stops, the frontage development in Nelson Bay Road, Cabbage Tree Road and in Lemon Tree Passage Road does not generate pedestrian crossing activity. As such pedestrian crossing volumes along the routes are low.

Cyclist facilities include short sections of bicycle lanes in Nelson Bay Road at specific locations, as well as sealed shoulders on both sides of the road, which vary in width in the single carriageway sections.

Sealed shoulders are also provided in Cabbage Tree Road/Tomago Road along most of its length. At those locations where there is no sealed shoulder, cyclists would need to use the travel lane.

4.7 Buses

Several bus routes use Nelson Bay Road, north of Cabbage Tree Road at Williamtown, including routes 130, 131 and 135.

The 130 and 131 services travel between Newcastle and Port Stephens.

Pull off areas and bus bays are provided in Nelson Bay Road.

The 135 bus service travels between Raymond Terrace and Nelson Bay and uses the section of Cabbage Tree Road east of Masonite Road and Nelson Bay Road, north of Cabbage Tree Road.

The 136 and 138 bus services use Nelson Bay Road. The 136 bus travels between Stockton, Medowie and Raymond Terrace via Medowie Road. The 138 bus travels

between Newcastle and Lemon Tree Passage via Nelson Bay Road and Lemon Tree Passage Road.

The 137 bus service also uses Lemon Tree Passage Road and Richardson Road between Raymond Terrace and Lemon Tree Passage.

4.8 Planned Road Upgrades

The NSW Government has undertaken recent road upgrades in Nelson Bay Road at Williamtown and Salt Ash, including intersection upgrades to Nelson Bay Road/Medowie Road and Nelson Bay Road/Lemon Tree Passage Road/Oakvale Drive.

The government is proposing to upgrade Nelson Bay Road between Williamtown and Bobs Farm by duplicating the road. Some $275 million is budgeted for these works.

Three options are being considered, including duplication of the existing single lane sections (referred to as the online option) and two offline options, which include new road sections.

Following community consultation, the options are under consideration.

TfNSW is planning to publish a preferred options report for the project later this year (i.e. 2021).

Tenders have been called for Section 1 of the route at Bobs Farm which is not impacted by the options and involves duplication of Nelson Bay Road for approximately 1km within the existing road boundary between 900 metres and 1.9km east of Marsh Street at Salt Ash/Bobs Farm. These works are expected to be completed in 18 months to 2 years.

5.0 ASSESSMENT OF TRAFFIC IMPACTS OF PROJECT

5.1 Traffic Increases

While there will be an increase in light vehicles attending the quarry site from 42 two way trips (21 in/21 out) to 60 two way trips per day (30 in/30 out), as well as in the number of fuel and maintenance vehicles with the Project, the largest increase will be in product transport vehicles (heavy vehicles) associated with the additional sand sales and fill importation. Sand importation will not increase with the Project and will remain at 200,000tpa.

The proposed operating hours for sand and fill importation, sand sales (dispatch) and maintenance with the Project are as follows:

- Importation of raw sand – 7.00am to 6.00pm Monday to Saturday;
- Dispatch – 24 hours Monday to Friday and 6.00am to 6.00pm Saturday;
- Fill importation – 24 hours Monday to Friday and 6.00am to 6.00pm Saturday; and
- Deliveries and maintenance – 24 hours Monday to Friday and 6.00am to 6.00pm Saturday.

5.2 Increase in Heavy Vehicle Movements with Project

While the quarry will operate on Saturdays, weekdays are expected to have the highest traffic generation by the quarry.

Tables 5.1 and 5.2 shows the increase in heavy vehicles for an average day and maximum day.

Reference to Table 5.1 shows that the increase in heavy vehicles on an average weekday with the Project will be 222 two way truck movements (i.e. 111 in/111 out).

On a maximum day (Table 5.2) the increase in heavy vehicles with the Project will be 202 two way truck movements (i.e. 101 in/101 out).

On a maximum day Holcim will not import any sand products, which will permit Holcim to concentrate on sand sales and fill importation.

TABLE 5.1

HEAVY VEHICLE MOVEMENTS ON AN AVERAGE DAY (WEEKDAY)

	Existing		Project 750,000tpa		Increase	
	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips
Product Transport	21	42	75	150	+54	+108
Fill Importation	-	-	48	96	+48	+96
Sand Importation	34	68	34	68	-	-
Maintenance/Others	2	4	11	22	+9	+18
Total	57	114	168	336	+111	+222

TABLE 5.2

HEAVY VEHICLE MOVEMENTS ON A MAXIMUM DAY (WEEKDAY)

	Existing		Project 750,000tpa		Increase	
	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips
Product Transport	47	94	121	242	+74	+148
Fill Importation	-	-	120	240	+120	+240
Sand Importation	99	198	-	-	-99	-198
Maintenance/Others	10	20	16	32	+6	+12
Total	156	312	257	514	+101	+202

5.3 Impact on Road Network

As noted in Table 5.1 total trucks will number 336 two way truck movements with the Project on an average weekday. When assigned to the road network total trucks on an average weekday will number:

- 336 two way truck movements in Oakvale Drive, which will be an increase of 222 two way movements from an average day under existing operations;
- 282 two way truck movements in Nelson Bay Road, west of Richardson Road, which is an increase of 214 two way truck movements from an average day under existing operations;
- 266 two way truck movements in Cabbage Tree Road, west of Nelson Bay Road, which is an increase of 202 two way truck movements from an average weekday under existing operations;
- 16 two way truck movements in Nelson Bay Road, south of Cabbage Tree Road, which is an increase of 12 two way truck movements from an average weekday under existing operations;
- 8 two way truck movements in Richardson Road, north of Nelson Bay Road and Medowie Road, north of Richardson Road. This is an increase of 6 two way truck movements from an average weekday under existing operations;
- 36 two way truck movements in Nelson Bay Road east of Oakvale Drive which is an increase of 2 two way truck movements from an average weekday under existing operations; and
- 10 two way truck movements in Lemon Tree Passage Road, north east of Oakvale Drive, which is the same as an average weekday under existing operations (i.e. no increase).

The additional truck movements generated by the Project will represent the following increases in total volumes and heavy vehicles on the road network.

- Nelson Bay Road, west of Oakvale Drive – 1.0% of total volumes and 14.1% of heavy vehicles;
- Nelson Bay Road, east of Medowie Road – 1.7% of total vehicles and 14.7% of heavy vehicles;

- Richardson Road, north of Nelson Bay Road – 0.07% of total vehicles and 0.8% of heavy vehicles;

- Cabbage Tree Road, west of Nelson Bay Road – 3.0% of total vehicles and 25.6% of heavy vehicles;

- Nelson Bay Road, east of Oakvale Drive – 0.01% of total vehicles and 0.13% of heavy vehicles.

5.3.2 Impact on Principal Intersections

The Project is expected to generate:

- 18 two way heavy vehicle trips (i.e. 9 in/9 out) in the average hour, which will be an increase of 8 two way heavy vehicle trips from the existing operation; and

- Two way heavy vehicle trips (i.e. 30 in/30 out) in the maximum hour, which will be an increase of 16 two way heavy vehicle trips from the existing operation.

The maximum hour (i.e. 30 in/30 out) is likely to occur twice per day on busy days, when sales to the Sydney market are high and may not overlap with the current weekday AM and PM peak hours on the road network adjacent the site.

Figure 11 shows the truck movements for the maximum hour assigned to the road network based on the transport routes and traffic assignment outlined in Section 3.5 of this report.

To examine the impact at the principal intersections of the additional traffic from the maximum hour for the Project during the weekday AM and PM peak hours, SIDRA traffic modelling has been undertaken.

The modelling has adopted the maximum hour traffic volumes (**Figure 11**) overlaid onto the adjusted AM and PM peak hour volumes at the principal intersections.

The results of the modelling are shown in Tables 5.3 to 5.6 for those intersections along the main transport route. Reference to these tables shows the following:

- The intersection of Nelson Bay Road/Oakvale Drive/Lemon Tree Passage Road will continue to operate at a good level of service with a Level of Service A operation and low vehicle delays in the AM and PM peak hours (Table 5.3);

- The intersection of Nelson Bay Road/Richardson Road/Salt Ash Avenue will also continue to operate at a Level of Service A operation with low vehicle delays in the peak hours, which is a good operation (Table 5.4);

- The intersection of Nelson Bay Road/Cabbage Tree Road/Lavis Lane will continue to operate at a Level of Service A operation with low vehicle delays in the peak hours, which is a good operation (Table 5.5); and

- The intersection of Tomago Road/Old Punt Road will continue to operate at a Level of Service A operation with low vehicle delays in the peak hours, which is a good operation (Table 5.6);

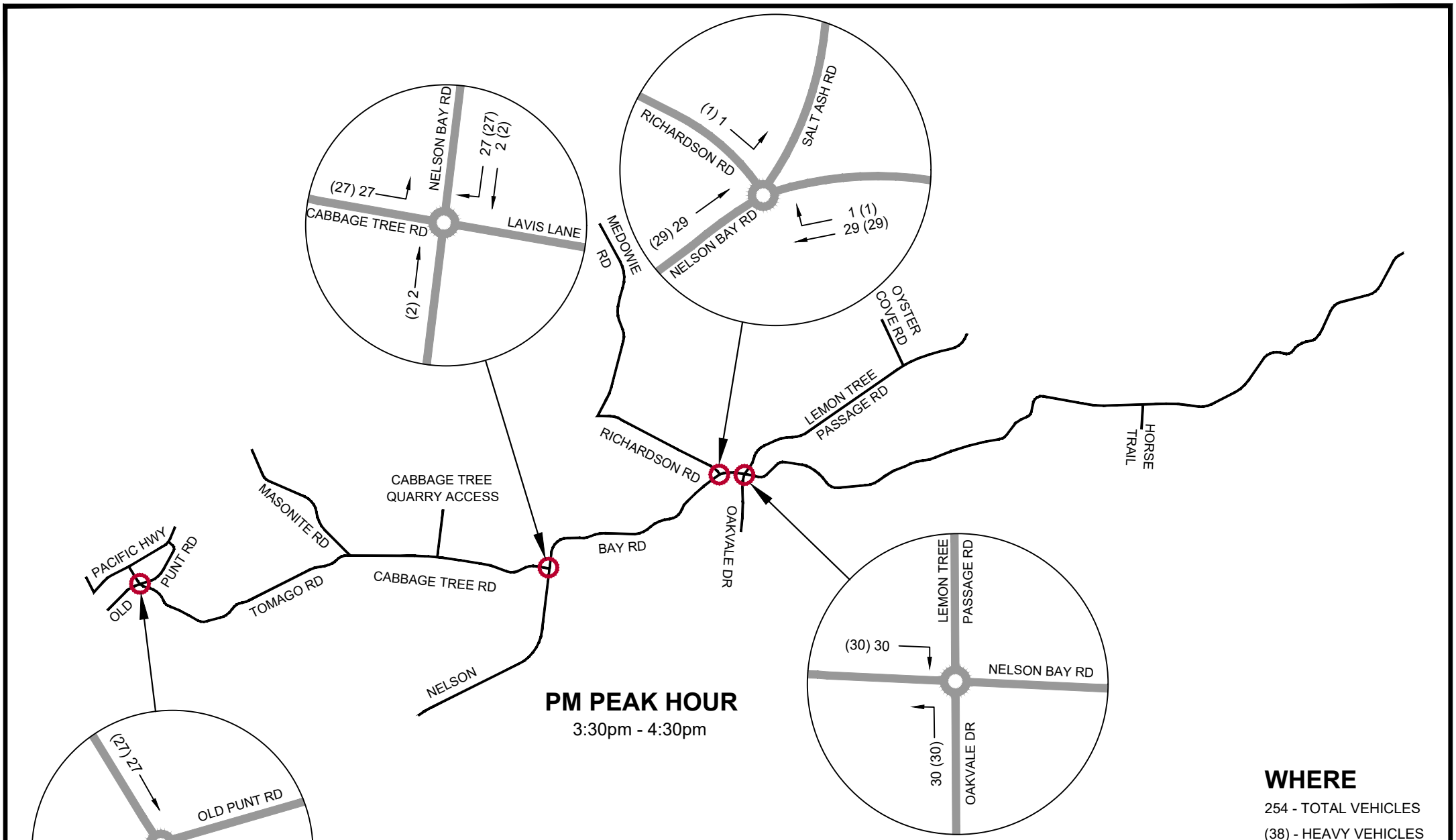

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FIGURE 11

HOLCIM SALT ASH SAND OPERATIONS
8 OAKVALE DRIVE, SALT ASH

TRUCK VOLUMES IN MAXIMUM HOUR WITH PROJECT

JOB NO.20047

6.10.21

While there will be no increase in sand importation with the Project, the Anna Bay and Tanilba Bay intersections have been included in the modelling. Three (3) truck loads per hour (i.e. 6 two way truck movements) have been adopted in the modelling for the Project at each intersection. The results for these intersections are shown in Table 5.7 and 5.8.

Reference to these tables shows that:

- The intersection of Nelson Bay Road/Horse Trail will operate at a Level of Service B operation, with low vehicle delays in the peak hours, which is a satisfactory operation (Table 5.7); and

- The intersection of Lemon Tree Passage Road/Oyster Cove Road will also continue to operate at a Level of Service A/B operation with low vehicle delays, in the peak hours, which is a satisfactory to good operation (Table 5.8).

The modelling results indicate that the additional traffic from the Project will have satisfactory traffic impacts on the principal intersections.

Extracts of the SIDRA traffic modelling outputs are contained in Appendix 1.

TABLE 5.3

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/OAKVALE DRIVE/LEMON TREE PASSAGE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Oakvale Drive								
Left	0.126	11.1	A	8.3	0.119	9.2	A	6.7
Through	0.126	8.1	A	8.3	0.119	7.5	A	6.7
Right	0.126	12.8	A	8.3	0.119	12.3	A	6.7
U-turn	0.126	14.9	B	8.3	0.119	13.6	A	6.7
East Nelson Bay Road								
Left	0.497	8.2	A	25.2	0.352	7.6	A	15.1
Through	0.497	9.0	A	25.2	0.352	7.7	A	15.1
Right	0.497	13.9	A	25.1	0.352	12.4	A	14.6
U-turn	0.497	15.3	B	25.1	0.352	12.3	A	14.6
North Lemon Tree Passage								
Left	0.207	11.3	A	7.1	0.159	13.7	A	5.3
Through	0.207	10.4	A	7.1	0.159	11.6	A	5.3
Right	0.407	14.2	A	16.9	0.294	15.0	B	11.9
U-turn	0.407	14.0	A	16.9	0.294	14.7	B	11.9
West Nelson Bay Road								
Left	0.133	6.7	A	5.7	0.340	7.0	A	14.9
Through	0.283	7.1	A	15.5	0.450	8.0	A	25.5
Right	0.283	12.5	A	15.5	0.450	13.4	A	25.5
U-turn	0.283	11.2	A	15.5	1.450	11.7	A	25.5
TOTAL – All Vehicles	**0.497**	**9.6**	**A**	**25.2**	**0.450**	**8.9**	**A**	**25.5**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.4

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/RICHARDSON ROAD/SALT ASH AVENUE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Nelson Bay Road								
Left	0.444	5.5	A	23.9	0.294	5.5	A	12.7
Through	0.444	11.8	A	22.4	0.294	11.6	A	12.7
Right	0.444	13.5	A	22.4	0.294	13.1	A	12.7
U-turn	0.444	12.7	A	22.4	0.294	12.4	A	12.7
North Salt Ash Avenue								
Left	0.092	5.1	A	2.5	0.243	6.5	A	7.4
Through	0.092	11.2	A	2.5	0.243	12.9	A	7.4
Right	0.092	13.2	A	2.5	0.243	14.2	A	7.4
U-turn	0.092	13.8	A	2.5	0.243	15.3	B	7.4
North West Richardson Road								
Left	0.203	8.3	A	9.1	0.402	8.1	A	19.3
Through	0.203	6.9	A	9.1	0.402	8.7	A	19.3
Right	0.203	17.7	B	7.7	0.402	19.4	B	16.2
U-turn	0.203	14.2	A	7.7	0.402	16.4	B	16.2
West Nelson Bay Road								
Left	0.234	7.5	A	12.9	0.409	6.8	A	21.3
Through	0.234	7.8	A	12.9	0.409	7.5	A	21.3
Right	0.234	8.4	A	12.9	0.409	7.7	A	21.3
U-turn	0.234	15.8	B	12.0	0.409	17.8	B	20.0
TOTAL – All Vehicles	**0.444**	**8.3**	**A**	**23.9**	**0.409**	**8.5**	**A**	**21.3**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.5

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Nelson Bay Road								
Left	0.409	7.5	A	20.0	0.456	7.9	A	23.3
Through	0.409	7.1	A	20.0	0.456	7.7	A	21.3
Right	0.409	14.1	A	18.4	0.456	14.8	A	21.9
U-turn	0.409	13.7	A	18.4	0.456	14.3	A	21.9
East Lavis Lane								
Left	0.289	9.9	A	10.7	0.324	9.3	A	12.6
Through	0.289	7.6	A	10.7	0.324	8.2	A	12.6
Right	0.289	13.7	A	10.7	0.324	13.7	A	12.6
U-turn	0.289	16.2	B	10.7	0.324	16.2	B	12.6
North Nelson Bay Road								
Left	0.327	5.8	A	13.4	0.315	6.0	A	12.2
Through	0.585	7.0	A	38.4	0.563	7.0	A	34.5
Right	0.585	13.5	A	38.4	0.563	13.6	A	34.5
U-turn	0.585	12.6	A	38.4	0.563	13.6	A	34.5
West Cabbage Tree Road								
Left	0.304	8.2	A	15.9	0.424	8.6	A	22.1
Through	0.127	9.3	A	5.6	0.177	8.8	A	6.2
Right	0.127	17.3	B	5.6	0.177	16.2	B	6.2
U-turn	0.127	15.1	B	5.6	0.177	15.3	B	6.2
TOTAL – All Vehicles	**0.585**	**8.2**	**A**	**38.4**	**0.563**	**8.8**	**A**	**34.5**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.6

SIDRA MODELLING RESULTS FOR TOMAGO ROAD/OLD PUNT ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South East Tomago Road								
Left	0.102	5.2	A	5.3	0.281	7.3	A	12.3
Through	0.246	4.8	A	13.6	0.675	9.3	A	60.2
Right	0.246	9.9	A	13.6	0.675	14.2	A	60.2
U-turn	0.246	12.2	A	13.6	0.675	16.2	B	60.2
North East Old Punt Road								
Left	0.230	7.4	A	11.6	0.517	6.1	A	20.8
Through	0.230	6.1	A	11.6	0.517	5.8	A	20.8
Right	0.230	12.8	A	11.6	0.517	11.1	A	20.8
U-turn	0.230	15.1	B	11.6	0.517	13.3	A	20.8
North West Tomago Road								
Left	0.249	4.3	A	10.1	0.131	5.8	A	7.0
Through	0.417	4.2	A	23.6	0.297	4.7	A	17.0
Right	0.417	10.1	A	23.6	0.297	10.9	A	17.0
U-turn	0.417	12.4	A	23.6	0.297	12.3	A	17.0
South West Old Punt Road								
Left	0.041	5.9	A	1.4	0.308	14.6	B	13.4
Through	0.041	4.8	A	1.4	0.308	10.1	A	13.4
Right	0.041	10.4	A	1.4	0.308	15.8	B	13.4
U-turn	0.041	12.5	A	1.4	0.308	17.8	B	13.4
TOTAL – All Vehicles	**0.417**	**5.6**	**A**	**23.6**	**0.675**	**9.3**	**A**	**60.2**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.7

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/HORSE TRAIL INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Horse Trail								
Left	0.008	8.0	A	0.0	0.006	6.4	A	0.0
East Nelson Bay Road								
Left	0.001	6.9	A	0.0	0.001	6.9	A	0.0
Through	0.249	0.0	A	0.0	0.179	0.0	A	0.0
West Nelson Bay Road								
Through	0.179	0.0	A	0.0	0.281	0.1	A	0.0
Right	0.024	26.6	B	0.1	0.014	18.0	B	0.8
TOTAL – All Vehicles	**0.249**	**0.1**	**B**	**0.1**	**0.281**	**0.1**	**B**	**0.8**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.8

SIDRA MODELLING RESULTS FOR LEMON TREE PASSAGE ROAD/OYSTER COVE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Lemon Tree Passage Road								
Through	0.217	0.0	A	0.3	0.160	0.4	A	1.5
Right	0.217	8.9	A	0.3	0.160	13.0	A	1.5
North Oyster Cove Road								
Left	0.030	6.6	A	1.0	0.073	7.9	A	2.2
Right	0.030	13.4	A	1.0	0.073	16.7	B	2.2
West Lemon Tree Passage Road								
Left	0.010	8.7	A	0.0	0.008	8.7	A	0.0
Through	0.103	0.0	A	0.0	0.258	0.0	A	0.0
TOTAL – All Vehicles	**0.217**	**0.5**	**A**	**1.0**	**0.258**	**0.9**	**B**	**2.2**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

5.4 Assessment of Cumulative Impacts

As part of the SEARs, the cumulative impacts for a future 10 year time frame are required to be examined.

Prior to COVID, there had been considerable traffic growth in Nelson Bay Road over a 10 year period. The historical traffic growth is a good indication of the likely future traffic growth.

The TfNSW traffic counting station in Nelson Bay Road, 310 metres east of Greenleaf Road on Stockton Bridge (Station ID 05962) shows that between 2008 and 2018 there was a 24% increase in daily traffic volumes using Nelson Bay Road in this 10 year period.

The TfNSW counting station in Pacific Highway west of Tomago Road Tomago (ID 05001) shows that for the 10 year period between 2009 and 2019 the traffic growth in daily volumes was 22.7%, which is similar to the growth at the Stockton Bridge counting station.

Adopting this growth rate (i.e. a lineal increase of 2.4% per year) for the road network and at the principal intersections, will account for the future traffic growth associated with future development in the area.

Future 2031 traffic volumes using the principal intersections have been calculated based on the 2.4% lineal increase per year.

This increase has been added to the adjusted 2021 AM and PM peak hour volumes to determine the 2031 base case volumes.

In addition, Boral have lodged an SSD application to expand its sand quarry off Coxs Lane at Fullerton Cove (south of Cabbage Tree Road), which is yet to be determined by the Department of Planning, Infrastructure and Environment.

If approved, this proposal would have a maximum hour of 60 two way trucks (30 in/30 out) of which 30 two way trucks (15 in each direction) would use Cabbage Tree Road/Tomago Road) and 2 two way truck movements (one (1) in each direction) would use Nelson Bay Road between Cabbage Tree Road and Medowie Road.

These additional trucks have been included in 2031 base case volumes for the intersections of Nelson Bay Road/Cabbage Tree Road/Lavis Lane and Tomago Road/Old Punt Road.

The operation of the principal intersections in 2031 for the base case and with the additional traffic from the Project in the maximum hour, has been modelled using the SIDRA model.

The Anna Bay and Tanilba Bay intersections which are used by the sand importation trucks have also been modelled.

Table 5.9 to 5.14 show the SIDRA modelling results for the principal intersections in 2031 without the Project (i.e. base case).

Most of the intersection will retain either a Level of Service A or B operation in the AM and PM peak hours, which is a satisfactory to good operation. The Nelson Bay Road/Horse Trail (Anna Bay) intersection is projected to have a Level of Service B operation and the Lemon Tree Passage Road/Oyster Cove Road (Tanilba Bay)

intersection is predicted to have Level of Service A/B operation, both of which are satisfactory to good operations.

Tables 5.15 to 5.20 show the SIDRA modelling results for 2031 with the Project.

The modelling shows that most of the intersections will retain the same level of service with the Project, as recorded for the 2031 base case, (i.e. Level of Service A or B operation) with only small increases in vehicle delay.

The Nelson Bay Road/Horse Trail intersection is projected to have a Level of Service C/B operation with the Project in 2031, which is a satisfactory operation.

Most of the increase in vehicle delay in 2031 as compared to 2021 will be from the growth in background traffic at the principal intersections.

In summary, the assessment of the cumulative impacts at the principal intersections used by Holcim's quarry trucks indicates that the cumulative impacts in year 2031 will be satisfactory.

Extracts of the SIDRA traffic modelling outputs are contained in Appendix 1.

TABLE 5.9

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/OAKVALE DRIVE/LEMON TREE PASSAGE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 BASE – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Oakvale Drive								
Left	0.047	10.7	A	2.1	0.061	8.3	A	2.6
Through	0.047	9.7	A	2.1	0.061	8.2	A	2.6
Right	0.047	14.3	A	2.1	0.061	13.0	A	2.6
U-turn	0.047	16.5	A	2.1	0.061	14.2	A	2.6
East Nelson Bay Road								
Left	0.666	10.3	A	48.2	0.449	7.8	A	22.3
Through	0.666	11.2	A	48.2	0.449	8.0	A	22.3
Right	0.666	16.3	B	47.1	0.449	12.7	A	21.6
U-turn	0.666	17.3	B	47.1	0.449	12.6	A	21.6
North Lemon Tree Passage								
Left	0.276	12.6	A	9.8	0.231	16.9	A	8.1
Through	0.276	11.2	A	9.8	0.231	12.9	A	8.1
Right	0.540	15.9	B	28.1	0.421	17.1	B	20.3
U-turn	0.540	15.7	B	28.1	0.421	16.8	B	20.3
West Nelson Bay Road								
Left	0.168	6.9	A	7.7	0.443	7.2	A	21.4
Through	0.340	7.4	A	19.1	0.551	8.9	A	33.9
Right	0.340	12.1	A	19.1	0.551	12.8	A	33.9
U-turn	0.340	11.3	A	19.1	0.551	11.9	A	33.9
TOTAL – All Vehicles	**0.666**	**10.9**	**A**	**48.2**	**0.551**	**9.6**	**A**	**33.9**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.10

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/RICHARDSON ROAD/SALT ASH AVENUE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 BASE – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Nelson Bay Road								
Left	0.542	5.6	A	31.6	0.352	5.6	A	16.2
Through	0.542	12.0	A	31.4	0.352	11.7	A	16.2
Right	0.542	13.7	A	31.4	0.352	13.2	A	16.2
U-turn	0.542	12.9	A	31.4	0.352	12.5	A	16.2
North Salt Ash Avenue								
Left	0.122	5.5	A	3.5	0.354	8.2	A	12.6
Through	0.122	11.5	A	3.5	0.354	14.6	A	12.6
Right	0.122	13.1	A	3.5	0.354	15.8	B	12.6
U-turn	0.122	14.1	A	3.5	0.354	17.0	B	12.6
North West Richardson Road								
Left	0.269	9.1	A	12.9	0.587	10.6	A	35.6
Through	0.269	7.2	A	12.9	0.587	11.4	A	35.6
Right	0.269	18.3	B	10.9	0.587	22.9	B	29.1
U-turn	0.269	14.6	B	10.9	0.587	19.6	B	29.1
West Nelson Bay Road								
Left	0.303	8.6	A	17.6	0.527	8.3	A	33.4
Through	0.303	9.1	A	17.6	0.527	9.1	A	33.4
Right	0.303	9.5	A	17.6	0.527	9.4	A	33.4
U-turn	0.303	17.6	B	15.8	0.527	20.6	B	31.4
TOTAL – All Vehicles	**0.542**	**8.7**	**A**	**31.6**	**0.587**	**10.0**	**A**	**35.6**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.11

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 BASE – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Nelson Bay Road								
Left	0.532	8.4	A	31.4	0.604	10.0	A	44.1
Through	0.532	7.6	A	28.8	0.604	9.5	A	44.1
Right	0.532	14.7	A	28.8	0.604	16.7	B	40.5
U-turn	0.532	14.3	A	28.8	0.604	16.2	B	40.5
East Lavis Lane								
Left	0.470	16.6	B	23.0	0.520	15.8	B	27.3
Through	0.470	12.0	A	23.0	0.520	13.2	A	27.3
Right	0.470	18.0	B	23.0	0.520	18.5	B	27.3
U-turn	0.470	20.5	B	23.0	0.520	20.9	B	27.3
North Nelson Bay Road								
Left	0.410	6.2	A	18.2	0.396	6.4	A	16.5
Through	0.734	8.1	A	58.4	0.709	8.2	A	53.9
Right	0.734	13.9	A	58.4	0.709	14.3	A	53.9
U-turn	0.734	13.1	A	58.4	0.709	14.7	B	53.9
West Cabbage Tree Road								
Left	0.363	8.6	A	18.3	0.554	10.1	A	31.0
Through	0.217	9.8	A	11.8	0.303	9.6	A	13.8
Right	0.217	18.8	B	11.8	0.303	17.6	B	13.8
U-turn	0.217	15.6	B	11.8	0.303	16.2	B	13.8
TOTAL – All Vehicles	**0.734**	**9.3**	**A**	**58.4**	**0.709**	**10.5**	**A**	**53.9**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.12

SIDRA MODELLING RESULTS FOR TOMAGO ROAD/OLD PUNT ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 BASE – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South East Tomago Road								
Left	0.124	5.6	A	6.3	0.383	8.6	A	18.3
Through	0.299	5.0	A	17.2	0.920	22.6	B	190.1
Right	0.299	10.1	A	17.2	0.920	29.5	C	190.1
U-turn	0.299	12.4	A	17.2	0.920	31.3	C	190.1
North East Old Punt Road								
Left	0.321	9.0	A	18.9	0.674	8.0	A	39.1
Through	0.321	7.3	A	18.9	0.674	7.4	A	39.1
Right	0.321	14.2	A	18.9	0.674	12.7	A	39.1
U-turn	0.321	16.8	B	18.9	0.674	14.9	B	39.1
North West Tomago Road								
Left	0.315	4.5	A	13.8	0.163	6.3	A	9.1
Through	0.509	4.4	A	31.7	0.372	4.9	A	22.5
Right	0.509	10.3	A	31.7	0.372	11.4	A	22.5
U-turn	0.509	12.6	A	31.7	0.372	12.6	A	22.5
South West Old Punt Road								
Left	0.055	6.5	A	2.0	0.580	34.9	C	34.9
Through	0.055	5.1	A	2.0	0.580	23.8	B	34.9
Right	0.055	10.6	A	2.0	0.580	29.3	C	34.9
U-turn	0.055	12.8	A	2.0	0.580	31.2	C	34.9
TOTAL – All Vehicles	**0.509**	**6.0**	**A**	**31.7**	**0.920**	**17.3**	**B**	**190.1**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.13

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/HORSE TRAIL INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 BASE – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Horse Trail								
Left	0.001	6.3	A	0.0	0.001	5.2	A	0.0
East Nelson Bay Road								
Left	0.001	6.9	A	0.0	0.001	6.9	A	0.0
Through	0.309	0.0	A	0.0	0.222	0.0	A	0.0
West Nelson Bay Road								
Through	0.222	0.0	A	0.0	0.349	0.1	A	0.0
Right	0.004	18.8	B	0.1	0.002	13.3	A	0.1
TOTAL – All Vehicles	**0.309**	**0.1**	**B**	**0.1**	**0.349**	**0.1**	**A**	**0.1**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.14

SIDRA MODELLING RESULTS FOR LEMON TREE PASSAGE ROAD/OYSTER COVE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 BASE – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Lemon Tree Passage Road								
Through	0.269	0.0	A	0.4	0.203	0.6	A	2.6
Right	0.269	9.3	A	0.4	0.203	15.6	B	2.6
North Oyster Cove Road								
Left	0.028	6.7	A	0.8	0.079	8.8	A	2.1
Right	0.028	13.4	A	0.8	0.079	20.3	B	2.1
West Lemon Tree Passage Road								
Left	0.009	8.4	A	0.0	0.007	8.0	A	0.0
Through	0.127	0.0	A	0.0	0.320	0.0	A	0.0
TOTAL – All Vehicles	**0.269**	**0.4**	**A**	**0.8**	**0.320**	**0.9**	**B**	**2.6**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.15

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/OAKVALE DRIVE/LEMON TREE PASSAGE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Oakvale Drive								
Left	0.168	13.7	A	11.8	0.139	10.3	A	8.3
Through	0.168	10.0	A	11.8	0.139	8.4	A	8.3
Right	0.168	14.6	B	11.8	0.139	13.2	A	8.3
U-turn	0.168	16.8	B	11.8	0.139	14.4	A	8.3
East Nelson Bay Road								
Left	0.679	10.6	A	48.9	0.459	7.9	A	22.1
Through	0.679	11.5	A	48.9	0.459	8.2	A	22.1
Right	0.679	16.6	B	47.6	0.459	12.9	A	21.4
U-turn	0.679	17.7	B	47.6	0.459	12.7	A	21.4
North Lemon Tree Passage								
Left	0.282	12.8	A	10.0	0.237	17.1	A	8.4
Through	0.282	11.3	A	10.0	0.237	13.1	A	8.4
Right	0.551	16.2	B	29.1	0.432	17.5	B	21.2
U-turn	0.551	16.0	B	29.1	0.432	17.2	B	21.2
West Nelson Bay Road								
Left	0.168	6.9	A	7.8	0.434	7.2	A	21.5
Through	0.356	7.5	A	22.5	0.568	8.9	A	37.9
Right	0.356	13.0	A	22.5	0.568	13.7	A	37.9
U-turn	0.356	11.3	A	22.5	0.568	11.9	A	37.9
TOTAL – All Vehicles	**0.679**	**11.2**	**A**	**48.9**	**0.568**	**9.7**	**A**	**37.9**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.16

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/RICHARDSON ROAD/SALT ASH AVENUE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Nelson Bay Road								
Left	0.558	5.7	A	35.3	0.368	5.6	A	17.5
Through	0.558	12.0	A	33.4	0.368	11.7	A	17.5
Right	0.558	13.7	A	33.4	0.368	13.2	A	17.5
U-turn	0.558	12.9	A	33.4	0.368	12.5	A	17.5
North Salt Ash Avenue								
Left	0.125	5.6	A	3.6	0.365	8.6	A	13.3
Through	0.125	11.6	A	3.6	0.365	14.9	A	13.3
Right	0.125	13.6	A	3.6	0.365	16.2	B	13.3
U-turn	0.125	14.2	A	3.6	0.365	17.4	B	13.3
North West Richardson Road								
Left	0.278	9.3	A	13.5	0.608	11.1	A	38.0
Through	0.278	7.3	A	13.5	0.608	12.0	A	38.0
Right	0.278	18.5	B	11.3	0.608	23.6	B	30.7
U-turn	0.278	14.7	B	11.3	0.608	20.2	B	30.7
West Nelson Bay Road								
Left	0.331	8.7	A	20.9	0.551	8.6	A	38.1
Through	0.331	9.2	A	20.9	0.551	9.4	A	38.1
Right	0.331	9.7	A	20.9	0.551	9.8	A	38.1
U-turn	0.331	17.7	B	18.9	0.551	21.0	B	38.1
TOTAL – All Vehicles	**0.558**	**8.8**	**A**	**35.3**	**0.608**	**10.2**	**A**	**38.1**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.17

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Nelson Bay Road								
Left	0.552	9.0	A	35.6	0.628	10.9	A	49.5
Through	0.552	8.2	A	35.6	0.628	10.3	A	49.5
Right	0.552	15.3	B	32.2	0.628	17.5	B	45.0
U-turn	0.552	14.9	B	32.2	0.628	17.1	B	45.0
East Lavis Lane								
Left	0.491	17.4	B	24.7	0.543	16.7	B	29.3
Through	0.491	13.0	A	24.7	0.543	14.3	A	29.3
Right	0.491	18.9	B	24.7	0.543	19.5	B	29.3
U-turn	0.491	21.4	B	24.7	0.543	21.9	B	29.3
North Nelson Bay Road								
Left	0.421	6.2	A	19.1	0.408	6.4	A	17.3
Through	0.754	8.3	A	67.3	0.730	8.4	A	62.3
Right	0.754	14.3	A	67.3	0.730	14.8	B	62.3
U-turn	0.754	13.3	A	67.3	0.730	15.0	B	62.3
West Cabbage Tree Road								
Left	0.425	9.3	A	25.4	0.625	11.2	A	41.1
Through	0.223	9.8	A	12.3	0.311	9.7	A	14.3
Right	0.223	18.9	B	12.3	0.311	17.7	B	14.3
U-turn	0.223	15.6	B	12.3	0.311	16.2	B	14.3
TOTAL – All Vehicles	**0.754**	**9.8**	**A**	**67.3**	**0.730**	**11.1**	**A**	**62.3**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.18

SIDRA MODELLING RESULTS FOR TOMAGO ROAD/OLD PUNT ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South East Tomago Road								
Left	0.135	5.6	A	7.3	0.400	8.8	A	20.5
Through	0.324	5.1	A	20.2	0.961	32.2	C	282.9
Right	0.324	10.1	A	20.2	0.961	41.0	C	282.9
U-turn	0.324	12.4	A	20.2	0.961	42.9	D	282.9
North East Old Punt Road								
Left	0.336	9.6	A	20.4	0.692	8.5	A	41.8
Through	0.336	7.7	A	20.4	0.692	7.8	A	41.8
Right	0.336	14.6	B	20.4	0.692	13.2	A	41.8
U-turn	0.336	17.2	B	20.4	0.692	15.4	B	41.8
North West Tomago Road								
Left	0.317	4.5	A	14.0	0.174	6.3	A	10.0
Through	0.536	4.4	A	36.6	0.397	5.1	A	26.2
Right	0.536	10.4	A	36.6	0.397	11.4	A	26.2
U-turn	0.536	12.6	A	36.6	0.397	12.6	A	26.2
South West Old Punt Road								
Left	0.056	6.7	A	2.1	0.615	41.3	C	38.5
Through	0.056	5.3	A	2.1	0.615	27.5	C	38.5
Right	0.056	10.7	A	2.1	0.615	33.0	C	38.5
U-turn	0.056	12.9	A	2.1	0.615	34.9	C	38.5
TOTAL – All Vehicles	**0.536**	**6.0**	**A**	**36.6**	**0.961**	**22.1**	**B**	**282.8**

Where: *DS* - *Degree of Saturation*
AVD - *Average Vehicle Delay in Seconds*
LS - *Level of Service*
95th% Queue Length - *95th% Queue Length in Metres*

TABLE 5.19

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/HORSE TRAIL INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 WITH PROJECT – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
South Horse Trail								
Left	0.009	9.7	A	0.0	0.007	7.3	A	0.0
East Nelson Bay Road								
Left	0.001	6.9	A	0.0	0.001	6.9	A	0.0
Through	0.309	0.1	A	0.0	0.222	0.0	A	0.0
West Nelson Bay Road								
Through	0.222	0.0	A	0.0	0.349	0.1	A	0.0
Right	0.038	39.1	C	0.1	0.019	22.7	B	1.1
TOTAL – All Vehicles	**0.309**	**0.2**	**C**	**0.1**	**0.349**	**0.1**	**B**	**1.1**

Where: *DS - Degree of Saturation*
AVD - Average Vehicle Delay in Seconds
LS - Level of Service
95th% Queue Length - 95th% Queue Length in Metres

TABLE 5.20

SIDRA MODELLING RESULTS FOR LEMON TREE PASSAGE ROAD/OYSTER COVE ROAD INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR 2031 WITH PROJECT – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95th% Queue Length	DS	AVD	LS	95th% Queue Length
East Lemon Tree Passage Road								
Through	0.269	0.0	A	0.4	0.203	0.6	A	2.6
Right	0.269	9.3	A	0.4	0.203	15.7	B	2.6
North Oyster Cove Road								
Left	0.044	6.7	A	1.3	0.105	8.8	A	3.0
Right	0.044	16.2	B	1.3	0.105	23.3	B	3.0
West Lemon Tree Passage Road								
Left	0.012	8.7	A	0.0	0.010	8.5	A	0.0
Through	0.127	0.0	A	0.0	0.320	0.0	A	0.0
TOTAL – All Vehicles	**0.269**	**0.6**	**B**	**1.3**	**0.320**	**1.1**	**B**	**3.0**

Where: *DS - Degree of Saturation*
AVD - Average Vehicle Delay in Seconds
LS - Level of Service

5.5 Construction Impacts

Given the existing operations, infrastructure and services at the site, there will be little work required to establish the Project, with existing and mobile plant and equipment continued to be used.

Where additional infrastructure or establishment works are required, this will be delivered as part of the initial stages of the Project and may include:

- Relocation and upgrade of utility infrastructure;
- Construction of new internal haul roads;
- Upgrade of existing processing plant and associated infrastructure;
- Establishing a diesel-powered dredge; and
- Construction of processing plant for the dredge, and associated diesel generators to power the plant.

Construction vehicles will include low loaders delivering earth working equipment, semi trailers and truck and dog trailers delivering hard stand materials and light vehicles associated with the workforce.

The volume of these vehicles arriving and departing the site per hour and per day will be less than the number of trucks assessed for the operational impacts.

Therefore, the traffic impacts associated with construction are assessed as satisfactory.

5.6 Impacts on Other Road Users

The Project is not expected to have any negative impacts on other road users, including pedestrians, cyclists and public transport vehicles (buses). While there will be an increase in truck numbers using the transport routes, the truck numbers will be spread over the day. In addition, the transport routes are predominantly state arterial roads and approved 25 metre/26 metre B-double routes. As state arterial roads, the roads are expected to carry heavy vehicles.

The traffic modelling shows that the principal intersections which will be used by the Project's trucks will have sufficient capacity to cater for background traffic growth, as well as the Project's traffic for the next 10 years.

5.7 On Site Operation

The Project will not have any adverse impacts on Holcim's on site operations and or result in any queuing in Oakvale Drive.

As noted in Section 4.2.1, access to Holcim's Sand Quarry site is from a private road which is 780 metres in distance from the public road section of Oakvale Drive. All access roads into and out of the quarry are wide enough for two way operations. All vehicles can enter and exit the quarry site in a forward direction.

The increase in employee numbers for the Project will be due to the additional shift per day that is proposed for Monday - Friday where three shifts are proposed.

The quarry has sufficient existing car parking on site to accommodate any increase in parking demand associated with the increase in employment.

6.0 CONCLUSIONS

The Project seeks to process and transport up to 750,000tpa of sand products from the quarry, subject to market demand for a period of 30 years. As part of the Project, raw materials and fill material will be imported by road. This will include sand importation of 200,000tpa and up to 550,000tpa of fill.

Vehicle access to the quarry is via a private road that connects to Oakvale Drive and then via Nelson Bay Road at Salt Ash.

The main transport route for 90% of product sales (dispatch) and fill importation is via Nelson Bay Road (to Williamtown), Cabbage Tree Road/Tomago Road and then via Pacific Highway to the Central Coast and Sydney.

Minor transport routes for product sales and fill importation include:

- South via Nelson Bay Road to the Newcastle market (6%);
- Via Richardson Road and Medowie Road and Pacific Highway for the North Coast market (3%); and
- North via Nelson Bay Road for the Port Stephens market (1%).

The sand importation routes include;

- Tanilba Bay Quarry - Oyster Cove Road and Lemon Tree Passage Road (15%);
- Anna Bay Quarry – Nelson Bay Road (50%);
- Cabbage Tree Quarry – Cabbage Tree Road and Nelson Bay Road (35%).

The quarry currently employs 10 full time staff and 5 contractors. With the Project an additional 6 full time staff will be employed, resulting in 16 full time staff and 5 contractors.

It is also proposed to extend the hours of operation at the quarry with an additional 3rd shift Monday to Friday (24 hour operation) and a single shift on Saturday between 6.00am to 6.00pm.

The assessment of the traffic impacts of the additional trucks associated with the operation of the Project on the adjacent road network including the principal intersections and the quarry access intersections has found that the impacts will be satisfactory.

The assessment of the cumulative impacts for the future 2031 year with the Project also found that the traffic impacts on the principal intersections and the quarry access intersections will be satisfactory.

Construction traffic impacts are also assessed as satisfactory, as the number of construction vehicles will be relatively low in number and less than what has been assessed for the operational impacts.

The Project is not expected to have any negative impacts on other road users including pedestrians, cyclists and public transport vehicles (buses).

REFERENCES

1. Austroads Guide to Road Design

2. RMS (now TfNSW) Guide to Traffic Generating Development October 2002

3. Austroads Guide to Traffic Management

4. RMS (now TfNSW) Austroads Guide Supplements – Austroads Guide to Traffic Management

5. RMS (now TfNSW) Supplement to Austroads Guide to Road Design

6. Austroads Guide to Traffic Management Part 12 – Traffic Impact of Developments

7. TfNSW Crash Data for various roads for period 1 October 2017 to 30 September 2020

8. TfNSW Website
    - Traffic Volume Viewer
    - Road Projects
    - Restricted Access Vehicle (RAV) Map

APPENDIX 1

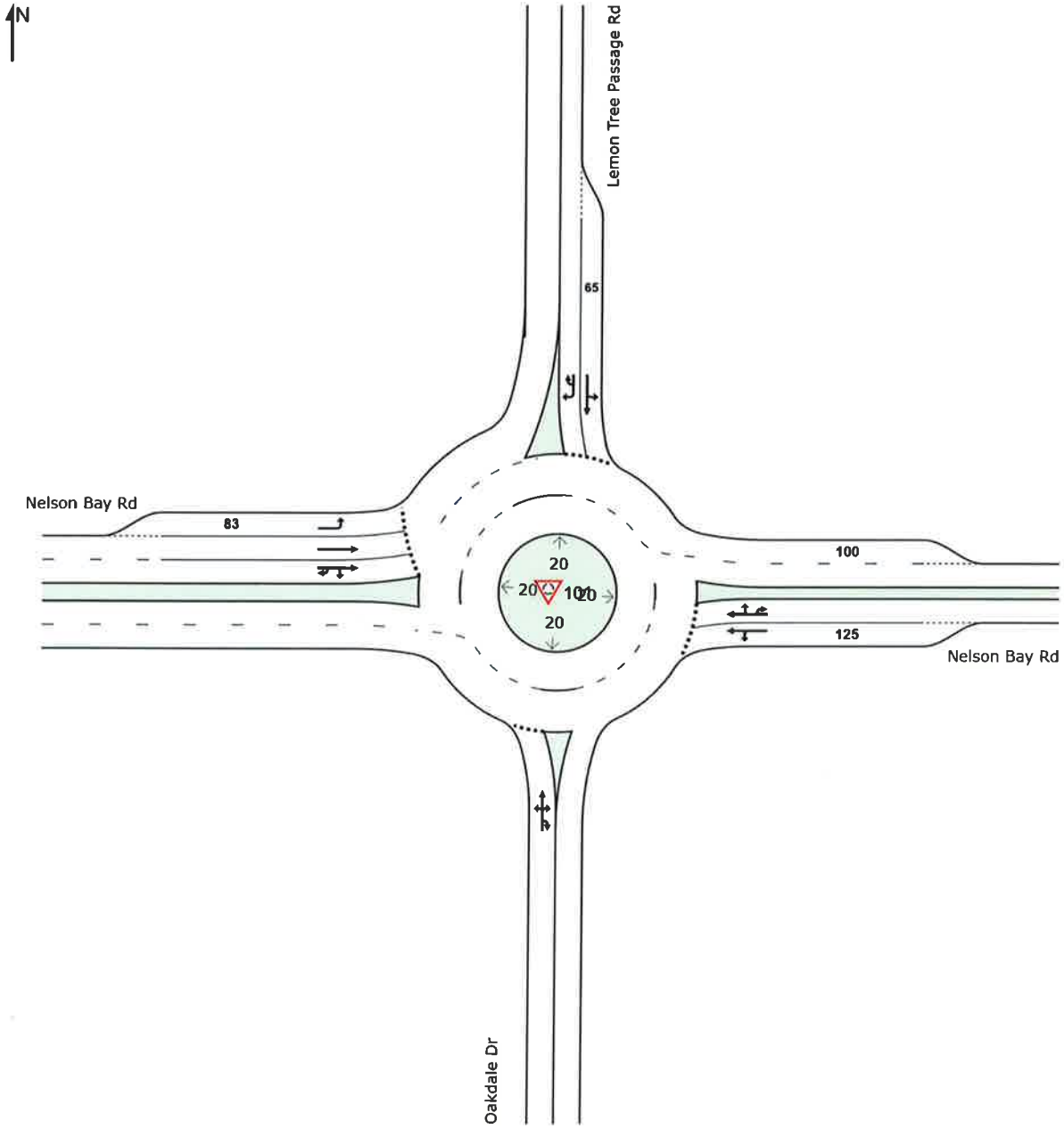
Extracts of SIDRA Modelling Outputs

SITE LAYOUT

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd -ExA AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

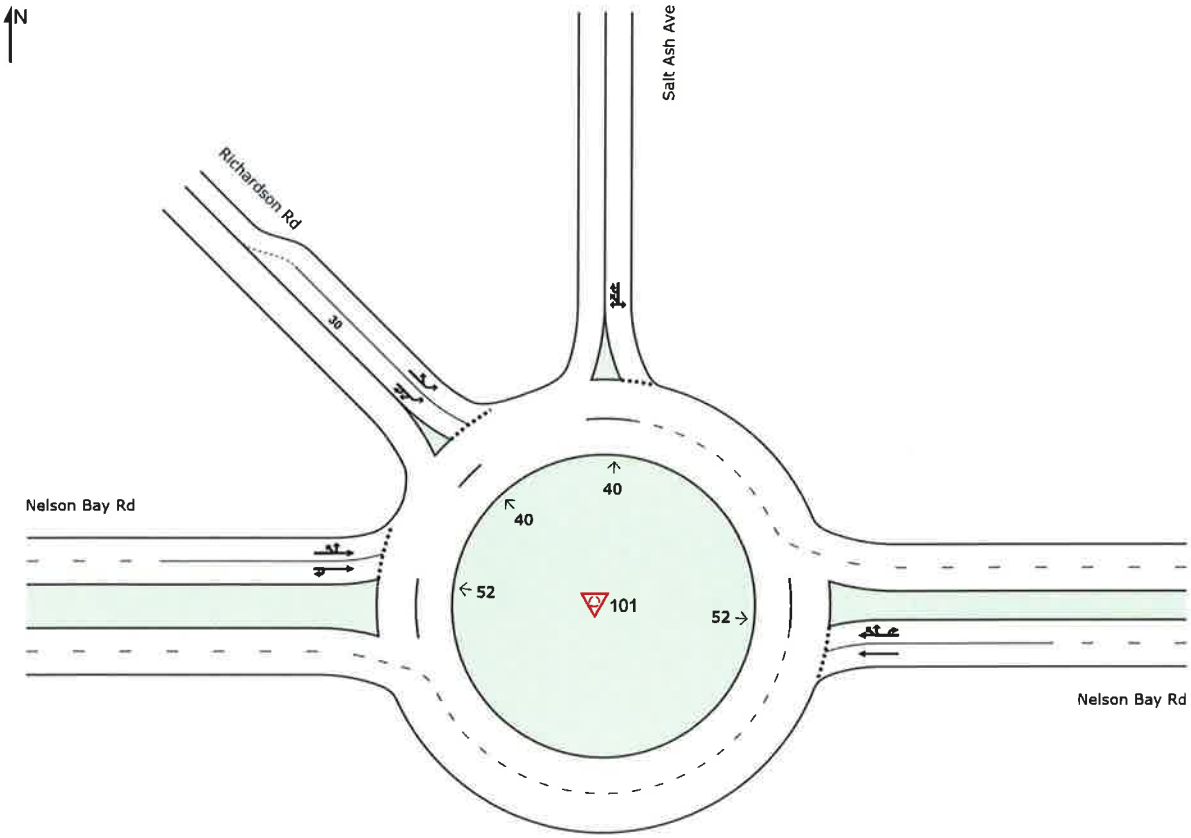


SITE LAYOUT

Site: 101 [Nelson Bay Rd & Richardson Rd - ExA AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Elliptical shape restrictions apply to this Roundabout.

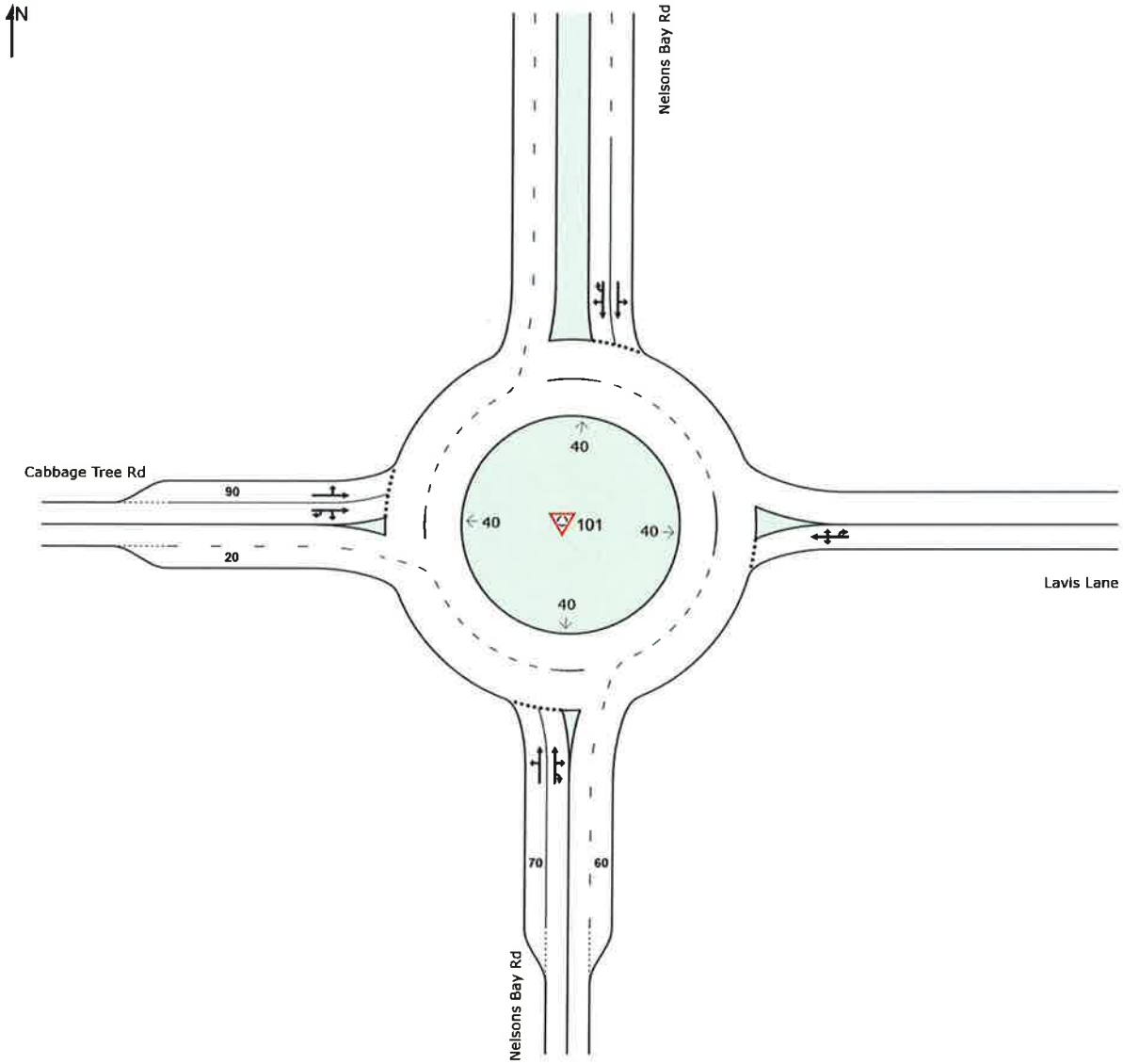
Organisation: TRANSPORT AND URBAN PLANNING PTY LTD | Licence: NETWORK / 1PC | Created: Thursday, 30 September 2021 4:45:24 PM
Project: C:\Users\Terry\TransUrban Dropbox\Terry Lawrence (terry)\My PC (DESKTOP-F6FBNCR)\Documents\Version Control on Old PC \20047 - SaltAsh3.sip9

SITE LAYOUT

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - ExA - AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

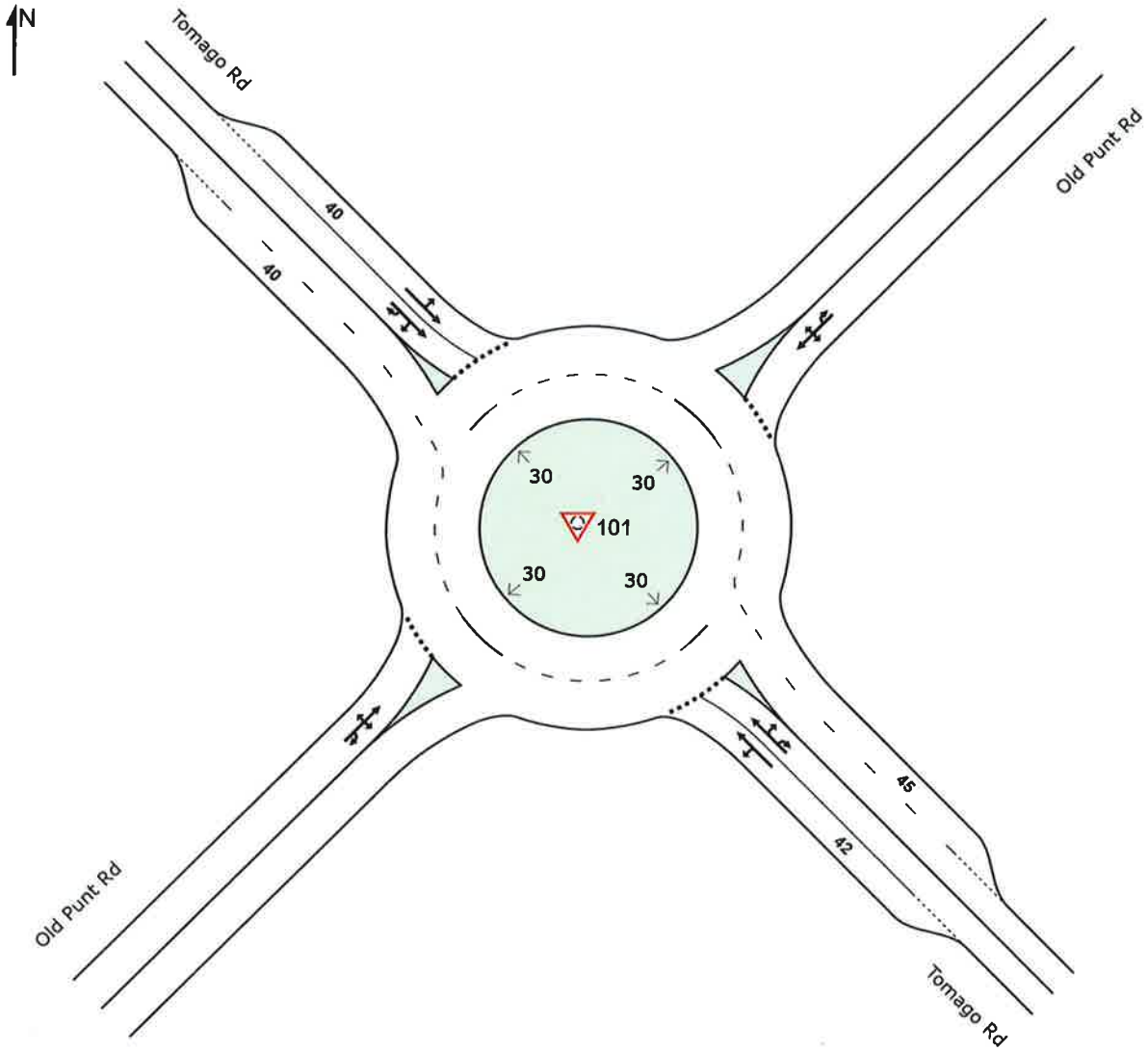


SITE LAYOUT

Site: 101 [Tomago Rd & Old Punt Rd -Ex AMA (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



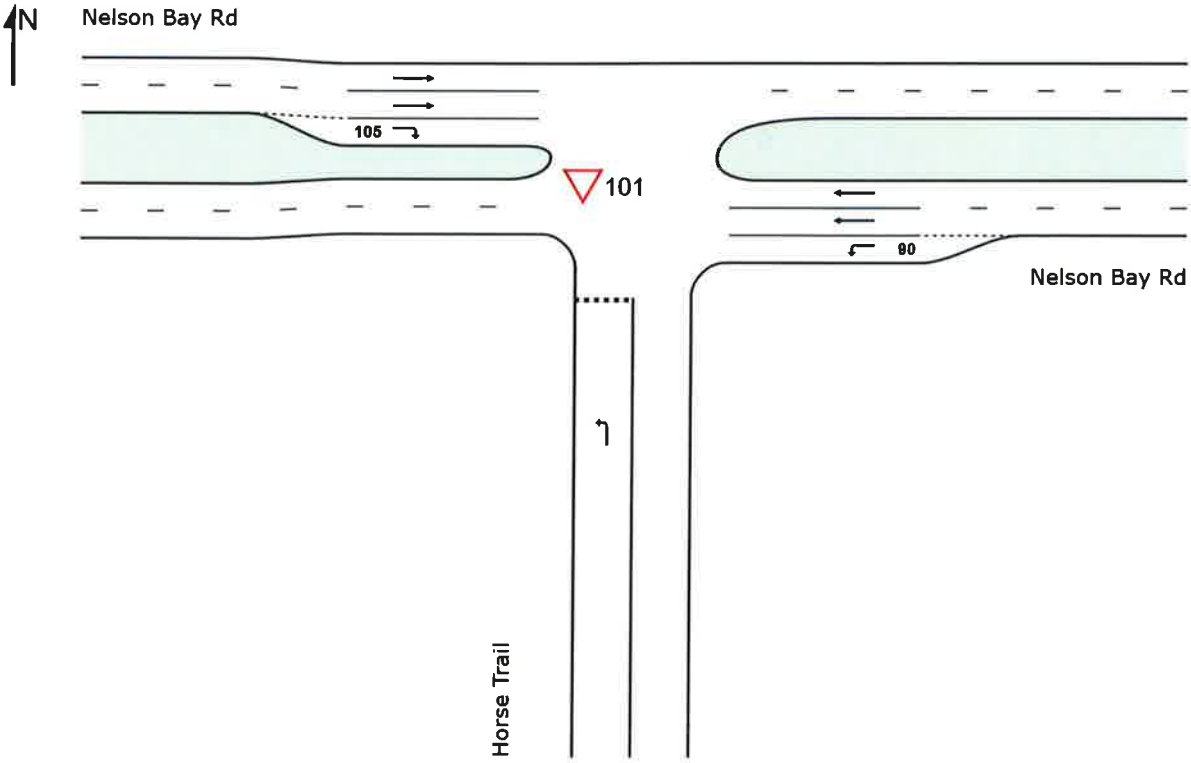
SITE LAYOUT

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd -ExA AM (Site Folder: General)]

Existing AM Adjusted

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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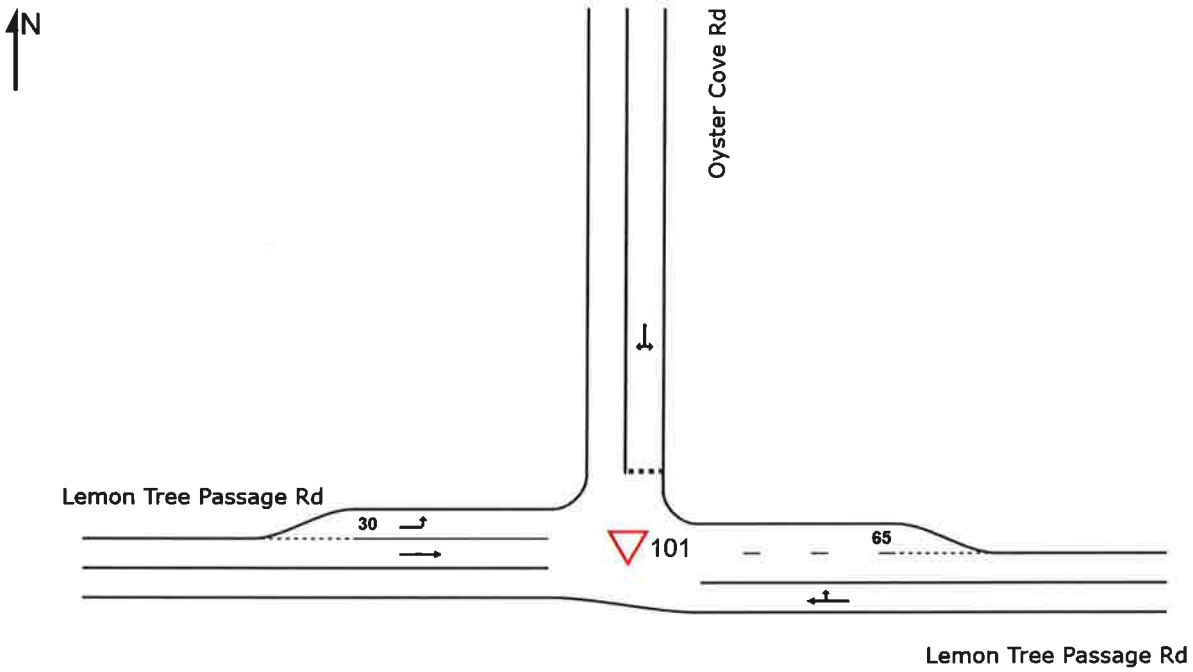
Project: C:\Users\Terry\TransUrban Dropbox\Terry Lawrence (terry)\My PC (DESKTOP-F6FBNCR)\Documents\Version Control on Old PC \20047 - SaltAsh3.sip9

SITE LAYOUT

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd -ExA AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Organisation: TRANSPORT AND URBAN PLANNING PTY LTD | Licence: NETWORK / 1PC | Created: Thursday, 30 September 2021 4:46:55 PM
Project: C:\Users\Terry\TransUrban Dropbox\Terry Lawrence (terry)\My PC (DESKTOP-F6FBNCR)\Documents\Version Control on Old PC \20047 - SaltAsh3.sip9

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd -ExA AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Oakdale Dr														
1	L2	15	4	15	26.7	0.035	8.7	LOS A	0.1	1.5	0.67	0.78	0.67	50.9
2	T1	1	0	1	0.0	0.035	7.9	LOS A	0.1	1.5	0.67	0.78	0.67	57.6
3	R2	1	0	1	0.0	0.035	12.6	LOS A	0.1	1.5	0.67	0.78	0.67	57.3
3u	U	1	0	1	0.0	0.035	14.7	LOS B	0.1	1.5	0.67	0.78	0.67	54.1
Approach		18	4	18	22.2	0.035	9.2	LOS A	0.1	1.5	0.67	0.78	0.67	51.7
East: Nelson Bay Rd														
4	L2	4	0	4	0.0	0.488	8.0	LOS A	3.2	24.7	0.64	0.69	0.66	62.8
5	T1	902	44	902	4.9	0.488	8.8	LOS A	3.2	24.7	0.64	0.71	0.66	63.0
6	R2	73	5	73	6.8	0.488	13.7	LOS A	3.2	24.7	0.65	0.75	0.68	61.5
6u	U	2	1	2	50.0	0.488	15.0	LOS B	3.2	24.7	0.65	0.75	0.68	52.0
Approach		981	50	981	5.1	0.488	9.1	LOS A	3.2	24.7	0.64	0.72	0.67	62.9
North: Lemon Tree Passage Rd														
7	L2	122	9	122	7.4	0.203	11.1	LOS A	0.9	6.9	0.61	0.83	0.61	60.7
8	T1	2	0	2	0.0	0.203	10.3	LOS A	0.9	6.9	0.61	0.83	0.61	58.9
9	R2	382	17	382	4.5	0.400	14.0	LOS A	2.1	16.4	0.64	0.87	0.66	59.4
9u	U	1	0	1	0.0	0.400	13.8	LOS A	2.1	16.4	0.64	0.87	0.66	61.6
Approach		507	26	507	5.1	0.400	13.3	LOS A	2.1	16.4	0.64	0.86	0.65	59.7
West: Nelson Bay Rd														
10	L2	156	18	156	11.5	0.132	6.7	LOS A	0.6	5.6	0.23	0.55	0.23	62.1
11	T1	630	45	630	7.1	0.269	7.1	LOS A	1.6	13.4	0.24	0.51	0.24	65.0
12	R2	26	10	26	38.5	0.269	12.0	LOS A	1.6	13.4	0.24	0.51	0.24	59.0
12u	U	11	0	11	0.0	0.269	11.2	LOS A	1.6	13.4	0.24	0.51	0.24	67.6
Approach		823	73	823	8.9	0.269	7.3	LOS A	1.6	13.4	0.24	0.52	0.24	64.3
All Vehicles		2329	153	2329	6.6	0.488	9.4	LOS A	3.2	24.7	0.50	0.68	0.51	62.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd -ExA PM (Site Folder: General)]

Existing PM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Oakdale Dr														
1	L2	19	6	19	31.6	0.053	7.5	LOS A	0.2	2.1	0.57	0.74	0.57	50.7
2	T1	9	2	9	22.2	0.053	7.4	LOS A	0.2	2.1	0.57	0.74	0.57	53.9
3	R2	4	1	4	25.0	0.053	12.2	LOS A	0.2	2.1	0.57	0.74	0.57	52.4
3u	U	1	0	1	0.0	0.053	13.5	LOS A	0.2	2.1	0.57	0.74	0.57	54.9
Approach		33	9	33	27.3	0.053	8.2	LOS A	0.2	2.1	0.57	0.74	0.57	51.9
East: Nelson Bay Rd														
4	L2	5	1	5	20.0	0.342	7.4	LOS A	1.9	15.3	0.46	0.60	0.46	58.6
5	T1	641	35	641	5.5	0.342	7.6	LOS A	1.9	15.3	0.47	0.62	0.47	63.8
6	R2	132	5	132	3.8	0.342	12.3	LOS A	1.9	14.8	0.47	0.66	0.47	62.9
6u	U	2	0	2	0.0	0.342	12.1	LOS A	1.9	14.8	0.47	0.66	0.47	65.2
Approach		780	41	780	5.3	0.342	8.4	LOS A	1.9	15.3	0.47	0.63	0.47	63.6
North: Lemon Tree Passage Rd														
7	L2	81	3	81	3.7	0.155	13.5	LOS A	0.7	5.1	0.69	0.86	0.69	60.7
8	T1	3	0	3	0.0	0.155	11.4	LOS A	0.7	5.1	0.69	0.86	0.69	57.9
9	R2	223	14	223	6.3	0.286	14.9	LOS B	1.5	11.6	0.71	0.92	0.71	58.2
9u	U	1	0	1	0.0	0.286	14.6	LOS B	1.5	11.6	0.71	0.92	0.71	60.8
Approach		308	17	308	5.5	0.286	14.5	LOS A	1.5	11.6	0.71	0.90	0.71	58.8
West: Nelson Bay Rd														
10	L2	437	16	437	3.7	0.338	6.9	LOS A	2.0	14.7	0.35	0.58	0.35	63.9
11	T1	1010	45	1010	4.5	0.433	7.9	LOS A	2.9	22.4	0.35	0.54	0.35	65.1
12	R2	15	7	15	46.7	0.433	12.6	LOS A	2.9	22.4	0.36	0.54	0.36	58.1
12u	U	14	1	14	7.1	0.433	11.7	LOS A	2.9	22.4	0.36	0.54	0.36	64.6
Approach		1476	69	1476	4.7	0.433	7.7	LOS A	2.9	22.4	0.35	0.55	0.35	64.7
All Vehicles		2597	136	2597	5.2	0.433	8.7	LOS A	2.9	22.4	0.43	0.62	0.43	63.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd - ExA AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	707	38	707	5.4	0.429	5.4	LOS A	2.7	21.2	0.27	0.42	0.27	70.4
6a	R1	473	21	473	4.4	0.429	11.7	LOS A	2.7	21.1	0.29	0.62	0.29	63.2
6	R2	82	11	82	13.4	0.429	13.5	LOS A	2.7	21.1	0.29	0.62	0.29	60.2
6u	U	20	1	20	5.0	0.429	12.7	LOS A	2.7	21.1	0.29	0.62	0.29	65.5
Approach		1282	71	1282	5.5	0.429	8.4	LOS A	2.7	21.2	0.28	0.51	0.28	66.7
North: Salt Ash Ave														
7	L2	43	8	43	18.6	0.090	5.0	LOS A	0.3	2.4	0.48	0.69	0.48	54.2
9	R2	19	0	19	0.0	0.090	11.1	LOS A	0.3	2.4	0.48	0.69	0.48	60.5
9b	R3	16	4	16	25.0	0.090	13.1	LOS A	0.3	2.4	0.48	0.69	0.48	55.9
9u	U	1	0	1	0.0	0.090	13.8	LOS A	0.3	2.4	0.48	0.69	0.48	58.8
Approach		79	12	79	15.2	0.090	8.2	LOS A	0.3	2.4	0.48	0.69	0.48	56.0
NorthWest: Richardson Rd														
27b	L3	7	4	7	57.1	0.197	8.2	LOS A	1.0	8.7	0.54	0.59	0.54	57.5
27a	L1	348	25	348	7.2	0.197	6.7	LOS A	1.0	8.7	0.54	0.62	0.54	67.3
29b	R3	28	12	28	42.9	0.197	17.5	LOS B	0.9	7.5	0.55	0.67	0.55	56.9
29u	U	14	0	14	0.0	0.197	14.0	LOS A	0.9	7.5	0.55	0.67	0.55	70.0
Approach		397	41	397	10.3	0.197	7.8	LOS A	1.0	8.7	0.54	0.63	0.54	66.3
West: Nelson Bay Rd														
10b	L3	9	1	9	11.1	0.211	7.4	LOS A	1.2	10.5	0.61	0.63	0.61	61.7
10	L2	28	4	28	14.3	0.211	7.7	LOS A	1.2	10.5	0.61	0.63	0.61	59.2
11	T1	374	34	374	9.1	0.211	8.1	LOS A	1.2	10.5	0.62	0.65	0.62	65.3
12u	U	8	2	8	25.0	0.211	15.8	LOS B	1.1	9.7	0.62	0.67	0.62	64.5
Approach		419	41	419	9.8	0.211	8.2	LOS A	1.2	10.5	0.62	0.65	0.62	64.7
All Vehicles		2177	165	2177	7.6	0.429	8.2	LOS A	2.7	21.2	0.40	0.57	0.40	65.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd - PMA (Site Folder: General)]

Existing PM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	387	23	387	5.9	0.279	5.4	LOS A	1.5	11.6	0.24	0.42	0.24	70.5
6a	R1	350	20	350	5.7	0.279	11.6	LOS A	1.5	11.6	0.23	0.62	0.23	62.9
6	R2	68	2	68	2.9	0.279	13.1	LOS A	1.5	11.6	0.23	0.62	0.23	60.6
6u	U	22	0	22	0.0	0.279	12.4	LOS A	1.5	11.6	0.23	0.62	0.23	66.9
Approach		827	45	827	5.4	0.279	8.8	LOS A	1.5	11.6	0.24	0.53	0.24	66.1
North: Salt Ash Ave														
7	L2	133	13	133	9.8	0.237	6.3	LOS A	1.0	7.2	0.65	0.81	0.65	56.2
9	R2	15	1	15	6.7	0.237	12.8	LOS A	1.0	7.2	0.65	0.81	0.65	59.3
9b	R3	27	1	27	3.7	0.237	14.0	LOS A	1.0	7.2	0.65	0.81	0.65	61.2
9u	U	1	0	1	0.0	0.237	15.2	LOS B	1.0	7.2	0.65	0.81	0.65	59.2
Approach		176	15	176	8.5	0.237	8.1	LOS A	1.0	7.2	0.65	0.81	0.65	57.2
NorthWest: Richardson Rd														
27b	L3	15	0	15	0.0	0.390	7.9	LOS A	2.2	18.2	0.74	0.73	0.77	58.1
27a	L1	586	26	586	4.4	0.390	8.4	LOS A	2.2	18.2	0.74	0.78	0.78	66.2
29b	R3	26	5	26	19.2	0.390	19.1	LOS B	2.1	15.5	0.74	0.84	0.80	62.4
29u	U	7	0	7	0.0	0.390	16.1	LOS B	2.1	15.5	0.74	0.84	0.80	69.6
Approach		634	31	634	4.9	0.390	8.9	LOS A	2.2	18.2	0.74	0.78	0.79	65.9
West: Nelson Bay Rd														
10b	L3	7	0	7	0.0	0.388	6.8	LOS A	2.4	19.0	0.59	0.60	0.59	64.8
10	L2	91	16	91	17.6	0.388	7.4	LOS A	2.4	19.0	0.59	0.60	0.59	59.3
11	T1	772	25	772	3.2	0.388	7.6	LOS A	2.4	19.0	0.60	0.61	0.60	67.0
12u	U	8	8	8	100.0	0.388	17.7	LOS B	2.3	17.6	0.60	0.63	0.60	61.8
Approach		878	49	878	5.6	0.388	7.6	LOS A	2.4	19.0	0.60	0.61	0.60	66.1
All Vehicles		2515	140	2515	5.6	0.390	8.4	LOS A	2.4	19.0	0.52	0.64	0.53	65.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - ExA - AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	61	13	61	21.3	0.395	7.2	LOS A	2.4	18.7	0.48	0.54	0.48	60.5
2	T1	858	35	858	4.1	0.395	6.9	LOS A	2.4	18.7	0.49	0.56	0.49	67.0
3	R2	49	0	49	0.0	0.395	13.8	LOS A	2.3	17.4	0.49	0.58	0.49	62.7
3u	U	1	0	1	0.0	0.395	13.4	LOS A	2.3	17.4	0.49	0.58	0.49	65.1
Approach		969	48	969	5.0	0.395	7.3	LOS A	2.4	18.7	0.49	0.56	0.49	66.3
East: Lavis Lane														
4	L2	113	6	113	5.3	0.281	9.7	LOS A	1.4	10.3	0.71	0.84	0.71	56.1
5	T1	25	1	25	4.0	0.281	7.3	LOS A	1.4	10.3	0.71	0.84	0.71	54.4
6	R2	65	1	65	1.5	0.281	13.5	LOS A	1.4	10.3	0.71	0.84	0.71	58.8
6u	U	1	0	1	0.0	0.281	16.0	LOS B	1.4	10.3	0.71	0.84	0.71	57.1
Approach		204	8	204	3.9	0.281	10.6	LOS A	1.4	10.3	0.71	0.84	0.71	56.7
North: Nelsons Bay Rd														
7	L2	93	1	93	1.1	0.316	5.8	LOS A	1.7	12.7	0.32	0.50	0.32	61.0
8	T1	926	53	926	5.7	0.566	6.9	LOS A	4.2	34.1	0.37	0.52	0.37	67.0
9	R2	191	28	191	14.7	0.566	13.3	LOS A	4.2	34.1	0.39	0.54	0.39	63.7
9u	U	1	0	1	0.0	0.566	12.6	LOS A	4.2	34.1	0.39	0.54	0.39	70.2
Approach		1211	82	1211	6.8	0.566	7.8	LOS A	4.2	34.1	0.37	0.52	0.37	66.0
West: Cabbage Tree Rd														
10	L2	233	36	233	15.5	0.252	7.7	LOS A	1.2	11.0	0.64	0.74	0.64	61.9
11	T1	30	5	30	16.7	0.122	9.2	LOS A	0.5	5.4	0.63	0.83	0.63	58.3
12	R2	38	15	38	39.5	0.122	17.2	LOS B	0.5	5.4	0.63	0.83	0.63	54.4
12u	U	1	0	1	0.0	0.122	15.0	LOS B	0.5	5.4	0.63	0.83	0.63	65.7
Approach		302	56	302	18.5	0.252	9.1	LOS A	1.2	11.0	0.64	0.76	0.64	60.4
All Vehicles		2686	194	2686	7.2	0.566	8.0	LOS A	4.2	34.1	0.47	0.59	0.47	64.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - ExA PM (Site Folder: General)]

Existing PM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	56	5	56	8.9	0.440	7.6	LOS A	2.8	21.8	0.57	0.59	0.57	62.9
2	T1	900	45	900	5.0	0.440	7.5	LOS A	2.8	21.8	0.57	0.61	0.57	66.0
3	R2	53	1	53	1.9	0.440	14.5	LOS A	2.7	20.6	0.58	0.63	0.58	62.0
3u	U	1	0	1	0.0	0.440	14.0	LOS A	2.7	20.6	0.58	0.63	0.58	64.4
Approach		1010	51	1010	5.0	0.440	7.9	LOS A	2.8	21.8	0.57	0.61	0.57	65.6
East: Lavis Lane														
4	L2	90	1	90	1.1	0.315	9.0	LOS A	1.5	12.0	0.71	0.84	0.71	56.4
5	T1	42	8	42	19.0	0.315	7.8	LOS A	1.5	12.0	0.71	0.84	0.71	53.8
6	R2	95	3	95	3.2	0.315	13.4	LOS A	1.5	12.0	0.71	0.84	0.71	57.9
6u	U	1	0	1	0.0	0.315	15.9	LOS B	1.5	12.0	0.71	0.84	0.71	56.6
Approach		228	12	228	5.3	0.315	10.7	LOS A	1.5	12.0	0.71	0.84	0.71	56.5
North: Nelsons Bay Rd														
7	L2	67	1	67	1.5	0.303	6.0	LOS A	1.6	11.5	0.36	0.51	0.36	60.7
8	T1	833	20	833	2.4	0.543	6.9	LOS A	3.9	30.4	0.41	0.54	0.41	67.4
9	R2	228	32	228	14.0	0.543	13.4	LOS A	3.9	30.4	0.43	0.56	0.43	63.3
9u	U	2	1	2	50.0	0.543	13.6	LOS A	3.9	30.4	0.43	0.56	0.43	56.1
Approach		1130	54	1130	4.8	0.543	8.2	LOS A	3.9	30.4	0.41	0.55	0.41	66.1
West: Cabbage Tree Rd														
10	L2	342	26	342	7.6	0.371	8.0	LOS A	2.0	16.2	0.71	0.78	0.74	63.5
11	T1	24	0	24	0.0	0.172	8.7	LOS A	0.7	6.0	0.66	0.86	0.66	57.4
12	R2	83	9	83	10.8	0.172	16.1	LOS B	0.7	6.0	0.66	0.86	0.66	59.8
12u	U	1	0	1	0.0	0.172	15.2	LOS B	0.7	6.0	0.66	0.86	0.66	64.3
Approach		450	35	450	7.8	0.371	9.5	LOS A	2.0	16.2	0.70	0.80	0.72	62.4
All Vehicles		2818	152	2818	5.4	0.543	8.5	LOS A	3.9	30.4	0.54	0.63	0.54	64.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd -Ex AMA (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	12	4	12	33.3	0.092	5.2	LOS A	0.4	4.4	0.34	0.45	0.34	54.0
22	T1	255	66	255	25.9	0.222	4.7	LOS A	1.1	11.1	0.33	0.49	0.33	55.3
23	R2	81	6	81	7.4	0.222	9.9	LOS A	1.1	11.1	0.33	0.50	0.33	55.5
23u	U	1	0	1	0.0	0.222	12.2	LOS A	1.1	11.1	0.33	0.50	0.33	57.3
Approach		349	76	349	21.8	0.222	5.9	LOS A	1.1	11.1	0.33	0.49	0.33	55.3
NorthEast: Old Punt Rd														
24	L2	86	17	86	19.8	0.222	7.0	LOS A	0.9	10.8	0.51	0.70	0.51	52.9
25	T1	27	4	27	14.8	0.222	5.9	LOS A	0.9	10.8	0.51	0.70	0.51	54.8
26	R2	62	33	62	53.2	0.222	12.5	LOS A	0.9	10.8	0.51	0.70	0.51	53.5
26u	U	4	2	4	50.0	0.222	14.8	LOS B	0.9	10.8	0.51	0.70	0.51	55.0
Approach		179	56	179	31.3	0.222	8.9	LOS A	0.9	10.8	0.51	0.70	0.51	53.4
NorthWest: Tomago Rd														
27	L2	281	24	281	8.5	0.246	4.3	LOS A	1.2	9.9	0.28	0.47	0.28	55.1
28	T1	495	48	495	9.7	0.390	4.1	LOS A	2.3	19.9	0.30	0.42	0.30	56.4
29	R2	49	14	49	28.6	0.390	10.1	LOS A	2.3	19.9	0.30	0.42	0.30	55.8
29u	U	4	1	4	25.0	0.390	12.4	LOS A	2.3	19.9	0.30	0.42	0.30	57.5
Approach		829	87	829	10.5	0.390	4.6	LOS A	2.3	19.9	0.29	0.44	0.29	55.9
SouthWest: Old Punt Rd														
30	L2	13	7	13	53.8	0.041	5.7	LOS A	0.1	1.4	0.33	0.54	0.33	52.7
31	T1	16	4	16	25.0	0.041	4.7	LOS A	0.1	1.4	0.33	0.54	0.33	55.2
32	R2	7	1	7	14.3	0.041	10.3	LOS A	0.1	1.4	0.33	0.54	0.33	55.5
32u	U	1	0	1	0.0	0.041	12.4	LOS A	0.1	1.4	0.33	0.54	0.33	57.5
Approach		37	12	37	32.4	0.041	6.3	LOS A	0.1	1.4	0.33	0.54	0.33	54.4
All Vehicles		1394	231	1394	16.6	0.390	5.5	LOS A	2.3	19.9	0.33	0.49	0.33	55.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd - Ex PMA (Site Folder: General)]

Existing PM Adjusted
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	7	1	7	14.3	0.267	7.3	LOS A	1.4	10.9	0.60	0.68	0.60	53.1
22	T1	707	47	707	6.6	0.642	8.7	LOS A	6.2	50.7	0.73	0.80	0.83	53.8
23	R2	153	19	153	12.4	0.642	13.7	LOS A	6.2	50.7	0.77	0.84	0.91	53.4
23u	U	1	0	1	0.0	0.642	15.7	LOS B	6.2	50.7	0.77	0.84	0.91	55.2
Approach		868	67	868	7.7	0.642	9.6	LOS A	6.2	50.7	0.74	0.81	0.85	53.7
NorthEast: Old Punt Rd														
24	L2	112	9	112	8.0	0.504	5.8	LOS A	2.4	19.4	0.48	0.75	0.50	51.5
25	T1	4	1	4	25.0	0.504	5.5	LOS A	2.4	19.4	0.48	0.75	0.50	52.8
26	R2	419	25	419	6.0	0.504	10.8	LOS A	2.4	19.4	0.48	0.75	0.50	53.4
26u	U	1	0	1	0.0	0.504	13.1	LOS A	2.4	19.4	0.48	0.75	0.50	54.9
Approach		536	35	536	6.5	0.504	9.7	LOS A	2.4	19.4	0.48	0.75	0.50	53.0
NorthWest: Tomago Rd														
27	L2	52	23	52	44.2	0.120	5.8	LOS A	0.5	6.3	0.41	0.52	0.41	53.5
28	T1	342	38	342	11.1	0.273	4.5	LOS A	1.5	13.9	0.40	0.46	0.40	55.8
29	R2	20	11	20	55.0	0.273	10.9	LOS A	1.5	13.9	0.40	0.46	0.40	54.3
29u	U	11	0	11	0.0	0.273	12.3	LOS A	1.5	13.9	0.40	0.46	0.40	57.9
Approach		425	72	425	16.9	0.273	5.2	LOS A	1.5	13.9	0.40	0.47	0.40	55.5
SouthWest: Old Punt Rd														
30	L2	120	7	120	5.8	0.294	13.8	LOS A	1.6	12.5	0.80	0.89	0.80	51.5
31	T1	28	3	28	10.7	0.294	9.7	LOS A	1.6	12.5	0.80	0.89	0.80	53.0
32	R2	11	1	11	9.1	0.294	15.3	LOS B	1.6	12.5	0.80	0.89	0.80	53.2
32u	U	1	0	1	0.0	0.294	17.3	LOS B	1.6	12.5	0.80	0.89	0.80	55.0
Approach		160	11	160	6.9	0.294	13.2	LOS A	1.6	12.5	0.80	0.89	0.80	51.9
All Vehicles		1989	185	1989	9.3	0.642	9.0	LOS A	6.2	50.7	0.60	0.72	0.65	53.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd -ExA AM (Site Folder: General)]

Existing AM Adjusted

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	1	0	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.45	0.48	0.45	43.7
Approach		1	0	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.45	0.48	0.45	43.7
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	944	44	944	4.7	0.249	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		945	44	945	4.7	0.249	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.8
West: Nelson Bay Rd														
11	T1	663	53	663	8.0	0.179	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	1	0	1	0.0	0.003	14.7	LOS B	0.0	0.1	0.66	0.71	0.66	44.6
Approach		664	53	664	8.0	0.179	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		1610	97	1610	6.0	0.249	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.8

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

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd -ExA PM (Site Folder: General)]

Existing PM Adjusted

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	1	0	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.38	0.45	0.38	44.0
Approach		1	0	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.38	0.45	0.38	44.0
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	679	28	679	4.1	0.179	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		680	28	680	4.1	0.179	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.9
West: Nelson Bay Rd														
11	T1	1073	38	1073	3.5	0.281	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
12	R2	1	0	1	0.0	0.002	11.4	LOS A	0.0	0.0	0.52	0.64	0.52	46.4
Approach		1074	38	1074	3.5	0.281	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.8
All Vehicles		1755	66	1755	3.8	0.281	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.8

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd -ExA AM (Site Folder: General)]

Existing AM Adjusted
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	410	17	410	4.1	0.217	0.0	LOS A	0.0	0.3	0.01	0.01	0.01	99.7
6	R2	4	0	4	0.0	0.217	8.9	LOS A	0.0	0.3	0.01	0.01	0.01	72.4
Approach		414	17	414	4.1	0.217	0.1	NA	0.0	0.3	0.01	0.01	0.01	99.3
North: Oyster Cove Rd														
7	L2	4	1	4	25.0	0.018	6.6	LOS A	0.1	0.5	0.45	0.64	0.45	52.9
9	R2	7	1	7	14.3	0.018	11.2	LOS A	0.1	0.5	0.45	0.64	0.45	55.0
Approach		11	2	11	18.2	0.018	9.5	LOS A	0.1	0.5	0.45	0.64	0.45	54.2
West: Lemon Tree Passage Rd														
10	L2	12	2	12	16.7	0.007	8.3	LOS A	0.0	0.0	0.00	0.66	0.00	68.7
11	T1	191	19	191	9.9	0.103	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		203	21	203	10.3	0.103	0.5	NA	0.0	0.0	0.00	0.04	0.00	97.3
All Vehicles		628	40	628	6.4	0.217	0.4	NA	0.1	0.5	0.01	0.03	0.01	97.2

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd -Ex PMA (Site Folder: General)]

Existing PM Adjusted
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	274	14	274	5.1	0.160	0.4	LOS A	0.2	1.5	0.07	0.02	0.07	98.1
6	R2	10	3	10	30.0	0.160	13.0	LOS A	0.2	1.5	0.07	0.02	0.07	69.4
Approach		284	17	284	6.0	0.160	0.8	NA	0.2	1.5	0.07	0.02	0.07	96.7
North: Oyster Cove Rd														
7	L2	8	1	8	12.5	0.056	7.9	LOS A	0.2	1.6	0.63	0.80	0.63	52.9
9	R2	16	3	16	18.8	0.056	14.9	LOS B	0.2	1.6	0.63	0.80	0.63	51.7
Approach		24	4	24	16.7	0.056	12.6	LOS A	0.2	1.6	0.63	0.80	0.63	52.1
West: Lemon Tree Passage Rd														
10	L2	9	1	9	11.1	0.005	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	70.5
11	T1	497	17	497	3.4	0.258	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		506	18	506	3.6	0.258	0.2	NA	0.0	0.0	0.00	0.01	0.00	99.1
All Vehicles		814	39	814	4.8	0.258	0.8	NA	0.2	1.6	0.04	0.04	0.04	95.7

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

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd - AMA & Prop (Site Folder: General)]

AM Adjusted with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Oakdale Dr														
1	L2	44	33	44	75.0	0.126	11.1	LOS A	0.5	8.3	0.71	0.85	0.71	42.3
2	T1	1	0	1	0.0	0.126	8.1	LOS A	0.5	8.3	0.71	0.85	0.71	55.9
3	R2	1	0	1	0.0	0.126	12.8	LOS A	0.5	8.3	0.71	0.85	0.71	55.6
3u	U	1	0	1	0.0	0.126	14.9	LOS B	0.5	8.3	0.71	0.85	0.71	52.6
Approach		47	33	47	70.2	0.126	11.2	LOS A	0.5	8.3	0.71	0.85	0.71	43.0
East: Nelson Bay Rd														
4	L2	4	0	4	0.0	0.497	8.2	LOS A	3.3	25.2	0.65	0.71	0.68	62.7
5	T1	902	44	902	4.9	0.497	9.0	LOS A	3.3	25.2	0.65	0.74	0.69	63.0
6	R2	73	5	73	6.8	0.497	13.9	LOS A	3.2	25.1	0.66	0.77	0.70	61.5
6u	U	2	1	2	50.0	0.497	15.3	LOS B	3.2	25.1	0.66	0.77	0.70	51.9
Approach		981	50	981	5.1	0.497	9.3	LOS A	3.3	25.2	0.65	0.74	0.69	62.8
North: Lemon Tree Passage Rd														
7	L2	122	9	122	7.4	0.207	11.3	LOS A	0.9	7.1	0.62	0.84	0.62	60.6
8	T1	2	0	2	0.0	0.207	10.4	LOS A	0.9	7.1	0.62	0.84	0.62	58.7
9	R2	382	17	382	4.5	0.407	14.2	LOS A	2.2	16.9	0.66	0.89	0.69	59.3
9u	U	1	0	1	0.0	0.407	14.0	LOS A	2.2	16.9	0.66	0.89	0.69	61.5
Approach		507	26	507	5.1	0.407	13.5	LOS A	2.2	16.9	0.65	0.88	0.67	59.6
West: Nelson Bay Rd														
10	L2	156	18	156	11.5	0.133	6.7	LOS A	0.6	5.7	0.23	0.55	0.23	62.1
11	T1	630	45	630	7.1	0.283	7.1	LOS A	1.7	15.5	0.24	0.51	0.24	65.0
12	R2	50	34	50	68.0	0.283	12.5	LOS A	1.7	15.5	0.24	0.52	0.24	57.6
12u	U	11	0	11	0.0	0.283	11.2	LOS A	1.7	15.5	0.24	0.52	0.24	67.6
Approach		847	97	847	11.5	0.283	7.4	LOS A	1.7	15.5	0.24	0.52	0.24	64.0
All Vehicles		2382	206	2382	8.6	0.497	9.6	LOS A	3.3	25.2	0.51	0.69	0.53	61.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd - PMA & Prop (Site Folder: General)]

PM Adjusted with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Oakdale Dr														
1	L2	46	33	46	71.7	0.119	9.2	LOS A	0.4	6.7	0.60	0.79	0.60	43.8
2	T1	9	2	9	22.2	0.119	7.5	LOS A	0.4	6.7	0.60	0.79	0.60	53.1
3	R2	4	1	4	25.0	0.119	12.3	LOS A	0.4	6.7	0.60	0.79	0.60	51.7
3u	U	1	0	1	0.0	0.119	13.6	LOS A	0.4	6.7	0.60	0.79	0.60	54.1
Approach		60	36	60	60.0	0.119	9.2	LOS A	0.4	6.7	0.60	0.79	0.60	45.6
East: Nelson Bay Rd														
4	L2	5	1	5	20.0	0.352	7.6	LOS A	1.9	15.1	0.48	0.61	0.48	58.5
5	T1	641	35	641	5.5	0.352	7.7	LOS A	1.9	15.1	0.49	0.64	0.49	63.7
6	R2	132	5	132	3.8	0.352	12.4	LOS A	1.9	14.6	0.49	0.68	0.49	62.8
6u	U	2	0	2	0.0	0.352	12.3	LOS A	1.9	14.6	0.49	0.68	0.49	65.1
Approach		780	41	780	5.3	0.352	8.5	LOS A	1.9	15.1	0.49	0.64	0.49	63.5
North: Lemon Tree Passage Rd														
7	L2	81	3	81	3.7	0.159	13.7	LOS A	0.7	5.3	0.70	0.87	0.70	60.5
8	T1	3	0	3	0.0	0.159	11.6	LOS A	0.7	5.3	0.70	0.87	0.70	57.8
9	R2	223	14	223	6.3	0.294	15.0	LOS B	1.5	11.9	0.73	0.92	0.73	58.0
9u	U	1	0	1	0.0	0.294	14.7	LOS B	1.5	11.9	0.73	0.92	0.73	60.6
Approach		308	17	308	5.5	0.294	14.7	LOS B	1.5	11.9	0.72	0.91	0.72	58.6
West: Nelson Bay Rd														
10	L2	437	16	437	3.7	0.340	7.0	LOS A	2.0	14.9	0.35	0.58	0.35	63.8
11	T1	1010	45	1010	4.5	0.450	8.0	LOS A	3.0	25.5	0.36	0.54	0.36	65.1
12	R2	42	34	42	81.0	0.450	13.4	LOS A	3.0	25.5	0.37	0.55	0.37	56.5
12u	U	14	1	14	7.1	0.450	11.7	LOS A	3.0	25.5	0.37	0.55	0.37	64.5
Approach		1503	96	1503	6.4	0.450	7.9	LOS A	3.0	25.5	0.36	0.55	0.36	64.4
All Vehicles		2651	190	2651	7.2	0.450	8.9	LOS A	3.0	25.5	0.44	0.63	0.44	62.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd - AMA & Prop (Site Folder: General)]

AM Adjusted with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	736	65	736	8.8	0.444	5.5	LOS A	2.9	23.9	0.28	0.43	0.28	69.2
6a	R1	474	22	474	4.6	0.444	11.8	LOS A	2.8	22.4	0.30	0.62	0.30	63.3
6	R2	82	11	82	13.4	0.444	13.5	LOS A	2.8	22.4	0.30	0.62	0.30	60.4
6u	U	20	1	20	5.0	0.444	12.7	LOS A	2.8	22.4	0.30	0.62	0.30	65.6
Approach		1312	99	1312	7.5	0.444	8.3	LOS A	2.9	23.9	0.29	0.51	0.29	66.3
North: Salt Ash Ave														
7	L2	43	8	43	18.6	0.092	5.1	LOS A	0.3	2.5	0.49	0.70	0.49	54.2
9	R2	19	0	19	0.0	0.092	11.2	LOS A	0.3	2.5	0.49	0.70	0.49	60.5
9b	R3	16	4	16	25.0	0.092	13.2	LOS A	0.3	2.5	0.49	0.70	0.49	55.8
9u	U	1	0	1	0.0	0.092	13.8	LOS A	0.3	2.5	0.49	0.70	0.49	58.7
Approach		79	12	79	15.2	0.092	8.3	LOS A	0.3	2.5	0.49	0.70	0.49	56.0
NorthWest: Richardson Rd														
27b	L3	7	4	7	57.1	0.203	8.3	LOS A	1.0	9.1	0.56	0.60	0.56	57.4
27a	L1	349	26	349	7.4	0.203	6.9	LOS A	1.0	9.1	0.56	0.63	0.56	67.1
29b	R3	28	12	28	42.9	0.203	17.7	LOS B	1.0	7.7	0.57	0.68	0.57	56.8
29u	U	14	0	14	0.0	0.203	14.2	LOS A	1.0	7.7	0.57	0.68	0.57	69.8
Approach		398	42	398	10.6	0.203	7.9	LOS A	1.0	9.1	0.56	0.64	0.56	66.2
West: Nelson Bay Rd														
10b	L3	9	1	9	11.1	0.234	7.5	LOS A	1.4	12.9	0.63	0.64	0.63	61.6
10	L2	28	4	28	14.3	0.234	7.8	LOS A	1.4	12.9	0.63	0.64	0.63	59.2
11	T1	403	63	403	15.6	0.234	8.4	LOS A	1.4	12.9	0.63	0.66	0.63	63.6
12u	U	8	2	8	25.0	0.234	15.8	LOS B	1.3	12.0	0.63	0.69	0.63	64.4
Approach		448	70	448	15.6	0.234	8.4	LOS A	1.4	12.9	0.63	0.66	0.63	63.3
All Vehicles		2237	223	2237	10.0	0.444	8.3	LOS A	2.9	23.9	0.41	0.57	0.41	65.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd - PMA & Proposal (Site Folder: General)]

PM Adjusted with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	416	52	416	12.5	0.294	5.5	LOS A	1.6	12.7	0.25	0.43	0.25	68.3
6a	R1	351	21	351	6.0	0.294	11.6	LOS A	1.6	12.7	0.23	0.62	0.23	63.1
6	R2	68	2	68	2.9	0.294	13.1	LOS A	1.6	12.7	0.23	0.62	0.23	60.9
6u	U	22	0	22	0.0	0.294	12.4	LOS A	1.6	12.7	0.23	0.62	0.23	67.3
Approach		857	75	857	8.8	0.294	8.8	LOS A	1.6	14.0	0.24	0.53	0.24	65.4
North: Salt Ash Ave														
7	L2	133	13	133	9.8	0.243	6.5	LOS A	1.0	7.4	0.66	0.82	0.66	56.1
9	R2	15	1	15	6.7	0.243	12.9	LOS A	1.0	7.4	0.66	0.82	0.66	59.2
9b	R3	27	1	27	3.7	0.243	14.2	LOS A	1.0	7.4	0.66	0.82	0.66	61.1
9u	U	1	0	1	0.0	0.243	15.3	LOS B	1.0	7.4	0.66	0.82	0.66	59.0
Approach		176	15	176	8.5	0.243	8.3	LOS A	1.0	7.4	0.66	0.82	0.66	57.1
NorthWest: Richardson Rd														
27b	L3	15	0	15	0.0	0.402	8.1	LOS A	2.4	19.3	0.75	0.76	0.80	58.0
27a	L1	587	27	587	4.6	0.402	8.7	LOS A	2.4	19.3	0.76	0.80	0.82	66.1
29b	R3	26	5	26	19.2	0.402	19.4	LOS B	2.2	16.2	0.76	0.87	0.83	62.3
29u	U	7	0	7	0.0	0.402	16.4	LOS B	2.2	16.2	0.76	0.87	0.83	69.4
Approach		635	32	635	5.0	0.402	9.2	LOS A	2.4	19.3	0.76	0.80	0.82	65.7
West: Nelson Bay Rd														
10b	L3	7	0	7	0.0	0.409	6.8	LOS A	2.6	21.3	0.60	0.61	0.60	64.7
10	L2	91	16	91	17.6	0.409	7.5	LOS A	2.6	21.3	0.60	0.61	0.60	59.3
11	T1	801	54	801	6.7	0.409	7.7	LOS A	2.6	21.3	0.61	0.62	0.61	66.0
12u	U	8	8	8	100.0	0.409	17.8	LOS B	2.4	20.0	0.62	0.64	0.62	61.7
Approach		907	78	907	8.6	0.409	7.8	LOS A	2.6	21.3	0.61	0.62	0.61	65.2
All Vehicles		2575	200	2575	7.8	0.409	8.5	LOS A	2.6	21.3	0.53	0.65	0.54	64.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - AMA & Prop (Site Folder: General)]

AM Adjusted & Proposal in Maximum Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	61	13	61	21.3	0.409	7.5	LOS A	2.5	20.0	0.52	0.56	0.52	60.2
2	T1	860	37	860	4.3	0.409	7.1	LOS A	2.5	20.0	0.53	0.58	0.53	66.6
3	R2	49	0	49	0.0	0.409	14.1	LOS A	2.4	18.4	0.53	0.60	0.53	62.4
3u	U	1	0	1	0.0	0.409	13.7	LOS A	2.4	18.4	0.53	0.60	0.53	64.8
Approach		971	50	971	5.1	0.409	7.5	LOS A	2.5	20.0	0.53	0.58	0.53	66.0
East: Lavis Lane														
4	L2	113	6	113	5.3	0.289	9.9	LOS A	1.4	10.7	0.72	0.85	0.72	55.9
5	T1	25	1	25	4.0	0.289	7.6	LOS A	1.4	10.7	0.72	0.85	0.72	54.2
6	R2	65	1	65	1.5	0.289	13.7	LOS A	1.4	10.7	0.72	0.85	0.72	58.6
6u	U	1	0	1	0.0	0.289	16.2	LOS B	1.4	10.7	0.72	0.85	0.72	56.9
Approach		204	8	204	3.9	0.289	10.9	LOS A	1.4	10.7	0.72	0.85	0.72	56.5
North: Nelsons Bay Rd														
7	L2	93	1	93	1.1	0.327	5.8	LOS A	1.7	13.4	0.32	0.50	0.32	61.0
8	T1	928	55	928	5.9	0.585	7.0	LOS A	4.5	38.4	0.38	0.53	0.38	66.9
9	R2	218	55	218	25.2	0.585	13.5	LOS A	4.5	38.4	0.40	0.54	0.40	60.7
9u	U	1	0	1	0.0	0.585	12.6	LOS A	4.5	38.4	0.40	0.54	0.40	70.1
Approach		1240	111	1240	9.0	0.585	8.0	LOS A	4.5	38.4	0.38	0.53	0.38	65.2
West: Cabbage Tree Rd														
10	L2	260	68	260	26.2	0.304	8.2	LOS A	1.5	15.9	0.67	0.77	0.67	59.2
11	T1	30	5	30	16.7	0.127	9.3	LOS A	0.5	5.6	0.64	0.83	0.64	58.2
12	R2	38	15	38	39.5	0.127	17.3	LOS B	0.5	5.6	0.64	0.83	0.64	54.3
12u	U	1	0	1	0.0	0.127	15.1	LOS B	0.5	5.6	0.64	0.83	0.64	65.6
Approach		329	88	329	26.7	0.304	9.4	LOS A	1.5	15.9	0.66	0.78	0.66	58.5
All Vehicles		2744	257	2744	9.4	0.585	8.2	LOS A	4.5	38.4	0.49	0.60	0.49	63.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - PMA & Prop (Site Folder: General)]

PM Adjusted with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	56	5	56	8.9	0.456	7.9	LOS A	3.0	23.3	0.60	0.61	0.60	62.6
2	T1	902	47	902	5.2	0.456	7.7	LOS A	3.0	23.3	0.61	0.63	0.61	65.7
3	R2	53	1	53	1.9	0.456	14.8	LOS B	2.8	21.9	0.62	0.65	0.62	61.7
3u	U	1	0	1	0.0	0.456	14.3	LOS A	2.8	21.9	0.62	0.65	0.62	64.1
Approach		1012	53	1012	5.2	0.456	8.1	LOS A	3.0	23.3	0.61	0.63	0.61	65.3
East: Lavis Lane														
4	L2	90	1	90	1.1	0.324	9.3	LOS A	1.6	12.6	0.73	0.86	0.74	56.2
5	T1	42	8	42	19.0	0.324	8.2	LOS A	1.6	12.6	0.73	0.86	0.74	53.6
6	R2	95	3	95	3.2	0.324	13.7	LOS A	1.6	12.6	0.73	0.86	0.74	57.6
6u	U	1	0	1	0.0	0.324	16.2	LOS B	1.6	12.6	0.73	0.86	0.74	56.4
Approach		228	12	228	5.3	0.324	10.9	LOS A	1.6	12.6	0.73	0.86	0.74	56.3
North: Nelsons Bay Rd														
7	L2	67	1	67	1.5	0.315	6.0	LOS A	1.7	12.2	0.36	0.51	0.36	60.7
8	T1	835	22	835	2.6	0.563	7.0	LOS A	4.1	34.5	0.42	0.55	0.42	67.3
9	R2	255	59	255	23.1	0.563	13.6	LOS A	4.1	34.5	0.44	0.57	0.44	60.8
9u	U	2	1	2	50.0	0.563	13.6	LOS A	4.1	34.5	0.44	0.57	0.44	56.0
Approach		1159	83	1159	7.2	0.563	8.4	LOS A	4.1	34.5	0.42	0.55	0.42	65.3
West: Cabbage Tree Rd														
10	L2	369	53	369	14.4	0.424	8.6	LOS A	2.4	22.1	0.74	0.85	0.81	61.6
11	T1	24	0	24	0.0	0.177	8.8	LOS A	0.8	6.2	0.67	0.87	0.67	57.4
12	R2	83	9	83	10.8	0.177	16.2	LOS B	0.8	6.2	0.67	0.87	0.67	59.7
12u	U	1	0	1	0.0	0.177	15.3	LOS B	0.8	6.2	0.67	0.87	0.67	64.2
Approach		477	62	477	13.0	0.424	9.9	LOS A	2.4	22.1	0.72	0.85	0.78	61.0
All Vehicles		2876	210	2876	7.3	0.563	8.8	LOS A	4.1	34.5	0.56	0.65	0.57	63.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd -AMA & Prop (Site Folder: General)]

AM Adjusted with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	12	4	12	33.3	0.102	5.2	LOS A	0.4	5.3	0.35	0.46	0.35	53.9
22	T1	282	93	282	33.0	0.246	4.8	LOS A	1.3	13.6	0.34	0.49	0.34	55.1
23	R2	81	6	81	7.4	0.246	9.9	LOS A	1.3	13.6	0.34	0.50	0.34	55.5
23u	U	1	0	1	0.0	0.246	12.2	LOS A	1.3	13.6	0.34	0.50	0.34	57.2
Approach		376	103	376	27.4	0.246	5.9	LOS A	1.3	13.6	0.34	0.49	0.34	55.2
NorthEast: Old Punt Rd														
24	L2	86	17	86	19.8	0.230	7.4	LOS A	1.0	11.6	0.54	0.72	0.54	52.7
25	T1	27	4	27	14.8	0.230	6.1	LOS A	1.0	11.6	0.54	0.72	0.54	54.6
26	R2	62	33	62	53.2	0.230	12.8	LOS A	1.0	11.6	0.54	0.72	0.54	53.3
26u	U	4	2	4	50.0	0.230	15.1	LOS B	1.0	11.6	0.54	0.72	0.54	54.8
Approach		179	56	179	31.3	0.230	9.3	LOS A	1.0	11.6	0.54	0.72	0.54	53.2
NorthWest: Tomago Rd														
27	L2	281	24	281	8.5	0.249	4.3	LOS A	1.2	10.1	0.28	0.47	0.28	55.1
28	T1	522	75	522	14.4	0.417	4.2	LOS A	2.5	23.6	0.31	0.43	0.31	56.2
29	R2	49	14	49	28.6	0.417	10.1	LOS A	2.5	23.6	0.31	0.43	0.31	55.8
29u	U	4	1	4	25.0	0.417	12.4	LOS A	2.5	23.6	0.31	0.43	0.31	57.4
Approach		856	114	856	13.3	0.417	4.6	LOS A	2.5	23.6	0.30	0.44	0.30	55.8
SouthWest: Old Punt Rd														
30	L2	13	7	13	53.8	0.041	5.9	LOS A	0.1	1.4	0.35	0.55	0.35	52.6
31	T1	16	4	16	25.0	0.041	4.8	LOS A	0.1	1.4	0.35	0.55	0.35	55.1
32	R2	7	1	7	14.3	0.041	10.4	LOS A	0.1	1.4	0.35	0.55	0.35	55.4
32u	U	1	0	1	0.0	0.041	12.5	LOS A	0.1	1.4	0.35	0.55	0.35	57.4
Approach		37	12	37	32.4	0.041	6.5	LOS A	0.1	1.4	0.35	0.55	0.35	54.3
All Vehicles		1448	285	1448	19.7	0.417	5.6	LOS A	2.5	23.6	0.34	0.49	0.34	55.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd - PMA & Prop (Site Folder: General)]

PM Adjusted with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	7	1	7	14.3	0.281	7.3	LOS A	1.4	12.3	0.61	0.69	0.61	53.1
22	T1	734	74	734	10.1	0.675	9.3	LOS A	7.0	60.2	0.76	0.83	0.89	53.6
23	R2	153	19	153	12.4	0.675	14.2	LOS A	7.0	60.2	0.81	0.88	0.98	53.2
23u	U	1	0	1	0.0	0.675	16.2	LOS B	7.0	60.2	0.81	0.88	0.98	55.0
Approach		895	94	895	10.5	0.675	10.1	LOS A	7.0	60.2	0.76	0.84	0.90	53.5
NorthEast: Old Punt Rd														
24	L2	112	9	112	8.0	0.517	6.1	LOS A	2.6	20.8	0.51	0.77	0.54	51.4
25	T1	4	1	4	25.0	0.517	5.8	LOS A	2.6	20.8	0.51	0.77	0.54	52.7
26	R2	419	25	419	6.0	0.517	11.1	LOS A	2.6	20.8	0.51	0.77	0.54	53.3
26u	U	1	0	1	0.0	0.517	13.3	LOS A	2.6	20.8	0.51	0.77	0.54	54.8
Approach		536	35	536	6.5	0.517	10.0	LOS A	2.6	20.8	0.51	0.77	0.54	52.9
NorthWest: Tomago Rd														
27	L2	52	23	52	44.2	0.131	5.8	LOS A	0.6	7.0	0.41	0.52	0.41	53.5
28	T1	369	65	369	17.6	0.297	4.7	LOS A	1.7	17.0	0.41	0.47	0.41	55.7
29	R2	20	11	20	55.0	0.297	10.9	LOS A	1.7	17.0	0.41	0.46	0.41	54.3
29u	U	11	0	11	0.0	0.297	12.3	LOS A	1.7	17.0	0.41	0.46	0.41	57.8
Approach		452	99	452	21.9	0.297	5.3	LOS A	1.7	17.0	0.41	0.47	0.41	55.4
SouthWest: Old Punt Rd														
30	L2	120	7	120	5.8	0.308	14.6	LOS B	1.7	13.4	0.82	0.90	0.82	51.2
31	T1	28	3	28	10.7	0.308	10.1	LOS A	1.7	13.4	0.82	0.90	0.82	52.7
32	R2	11	1	11	9.1	0.308	15.8	LOS B	1.7	13.4	0.82	0.90	0.82	52.9
32u	U	1	0	1	0.0	0.308	17.8	LOS B	1.7	13.4	0.82	0.90	0.82	54.6
Approach		160	11	160	6.9	0.308	13.9	LOS A	1.7	13.4	0.82	0.90	0.82	51.6
All Vehicles		2043	239	2043	11.7	0.675	9.3	LOS A	7.0	60.2	0.62	0.74	0.69	53.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd - AMA & Prop (Site Folder: General)]

AM Adjusted with Project

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	4	3	4	75.0	0.008	8.0	LOS A	0.0	0.5	0.51	0.57	0.51	40.7
Approach		4	3	4	75.0	0.008	8.0	LOS A	0.0	0.5	0.51	0.57	0.51	40.7
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	944	44	944	4.7	0.249	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		945	44	945	4.7	0.249	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.8
West: Nelson Bay Rd														
11	T1	663	53	663	8.0	0.179	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	4	3	4	75.0	0.024	26.6	LOS B	0.1	1.3	0.78	0.91	0.78	39.3
Approach		667	56	667	8.4	0.179	0.2	NA	0.1	1.3	0.00	0.01	0.00	79.4
All Vehicles		1616	103	1616	6.4	0.249	0.1	NA	0.1	1.3	0.00	0.00	0.00	79.5

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

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd - PMA & Prop (Site Folder: General)]

Existing PM Adjusted

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	4	3	4	75.0	0.006	6.4	LOS A	0.0	0.4	0.43	0.51	0.43	41.5
Approach		4	3	4	75.0	0.006	6.4	LOS A	0.0	0.4	0.43	0.51	0.43	41.5
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	679	28	679	4.1	0.179	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		680	28	680	4.1	0.179	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.9
West: Nelson Bay Rd														
11	T1	1073	38	1073	3.5	0.281	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
12	R2	4	3	4	75.0	0.014	18.0	LOS B	0.0	0.8	0.63	0.78	0.63	43.3
Approach		1077	41	1077	3.8	0.281	0.1	NA	0.0	0.8	0.00	0.00	0.00	79.6
All Vehicles		1761	72	1761	4.1	0.281	0.1	NA	0.0	0.8	0.00	0.00	0.00	79.5

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd -AMA & Prop (Site Folder: General)]

AM Adjusted with Proposal
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	410	17	410	4.1	0.217	0.0	LOS A	0.0	0.3	0.01	0.01	0.01	99.7
6	R2	4	0	4	0.0	0.217	8.9	LOS A	0.0	0.3	0.01	0.01	0.01	72.4
Approach		414	17	414	4.1	0.217	0.1	NA	0.0	0.3	0.01	0.01	0.01	99.3
North: Oyster Cove Rd														
7	L2	4	1	4	25.0	0.030	6.6	LOS A	0.1	1.0	0.51	0.68	0.51	51.6
9	R2	10	4	10	40.0	0.030	13.4	LOS A	0.1	1.0	0.51	0.68	0.51	48.9
Approach		14	5	14	35.7	0.030	11.5	LOS A	0.1	1.0	0.51	0.68	0.51	49.6
West: Lemon Tree Passage Rd														
10	L2	15	5	15	33.3	0.010	8.7	LOS A	0.0	0.0	0.00	0.66	0.00	63.7
11	T1	191	19	191	9.9	0.103	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		206	24	206	11.7	0.103	0.6	NA	0.0	0.0	0.00	0.05	0.00	96.0
All Vehicles		634	46	634	7.3	0.217	0.5	NA	0.1	1.0	0.02	0.03	0.02	96.1

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd - PMA & Prop (Site Folder: General)]

PM Adjusted with Proposal
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	274	14	274	5.1	0.160	0.4	LOS A	0.2	1.5	0.07	0.02	0.07	98.1
6	R2	10	3	10	30.0	0.160	13.0	LOS A	0.2	1.5	0.07	0.02	0.07	69.4
Approach		284	17	284	6.0	0.160	0.8	NA	0.2	1.5	0.07	0.02	0.07	96.7
North: Oyster Cove Rd														
7	L2	8	1	8	12.5	0.073	7.9	LOS A	0.3	2.2	0.67	0.82	0.67	51.8
9	R2	19	6	19	31.6	0.073	16.7	LOS B	0.3	2.2	0.67	0.82	0.67	48.5
Approach		27	7	27	25.9	0.073	14.1	LOS A	0.3	2.2	0.67	0.82	0.67	49.5
West: Lemon Tree Passage Rd														
10	L2	12	4	12	33.3	0.008	8.7	LOS A	0.0	0.0	0.00	0.66	0.00	63.7
11	T1	497	17	497	3.4	0.258	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		509	21	509	4.1	0.258	0.2	NA	0.0	0.0	0.00	0.02	0.00	98.5
All Vehicles		820	45	820	5.5	0.258	0.9	NA	0.3	2.2	0.05	0.04	0.05	94.8

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

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd - 2031 AM Base (Site Folder: General)]

2031 AM Base
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Oakdale Dr														
1	L2	15	4	15	26.7	0.047	10.7	LOS A	0.2	2.1	0.76	0.86	0.76	49.5
2	T1	1	0	1	0.0	0.047	9.7	LOS A	0.2	2.1	0.76	0.86	0.76	55.9
3	R2	1	0	1	0.0	0.047	14.3	LOS A	0.2	2.1	0.76	0.86	0.76	55.6
3u	U	1	0	1	0.0	0.047	16.5	LOS B	0.2	2.1	0.76	0.86	0.76	52.6
Approach		18	4	18	22.2	0.047	11.1	LOS A	0.2	2.1	0.76	0.86	0.76	50.3
East: Nelson Bay Rd														
4	L2	5	0	5	0.0	0.666	10.3	LOS A	6.2	48.2	0.82	0.92	0.99	61.7
5	T1	1119	55	1119	4.9	0.666	11.2	LOS A	6.2	48.2	0.82	0.93	1.00	61.7
6	R2	91	6	91	6.6	0.666	16.3	LOS B	6.0	47.1	0.82	0.96	1.02	60.2
6u	U	3	1	3	33.3	0.666	17.3	LOS B	6.0	47.1	0.82	0.96	1.02	54.4
Approach		1218	62	1218	5.1	0.666	11.6	LOS A	6.2	48.2	0.82	0.93	1.00	61.6
North: Lemon Tree Passage Rd														
7	L2	151	11	151	7.3	0.276	12.6	LOS A	1.2	9.8	0.68	0.86	0.68	59.8
8	T1	3	0	3	0.0	0.276	11.2	LOS A	1.2	9.8	0.68	0.86	0.68	58.0
9	R2	474	21	474	4.4	0.540	15.9	LOS B	3.7	28.1	0.75	0.98	0.93	57.7
9u	U	1	0	1	0.0	0.540	15.7	LOS B	3.7	28.1	0.75	0.98	0.93	59.8
Approach		629	32	629	5.1	0.540	15.1	LOS B	3.7	28.1	0.73	0.95	0.87	58.2
West: Nelson Bay Rd														
10	L2	194	23	194	11.9	0.168	6.9	LOS A	0.9	7.7	0.28	0.56	0.28	61.8
11	T1	781	56	781	7.2	0.340	7.4	LOS A	2.3	19.1	0.30	0.51	0.30	64.6
12	R2	30	12	30	40.0	0.340	12.1	LOS A	2.3	19.1	0.30	0.52	0.30	58.6
12u	U	14	0	14	0.0	0.340	11.3	LOS A	2.3	19.1	0.30	0.52	0.30	67.2
Approach		1019	91	1019	8.9	0.340	7.5	LOS A	2.3	19.1	0.29	0.52	0.29	63.9
All Vehicles		2884	189	2884	6.6	0.666	10.9	LOS A	6.2	48.2	0.61	0.79	0.72	61.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd -2031 PM Base (Site Folder: General)]

2031 PM Base
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Oakdale Dr														
1	L2	19	6	19	31.6	0.061	8.3	LOS A	0.2	2.6	0.64	0.80	0.64	50.2
2	T1	9	2	9	22.2	0.061	8.2	LOS A	0.2	2.6	0.64	0.80	0.64	53.3
3	R2	4	1	4	25.0	0.061	13.0	LOS A	0.2	2.6	0.64	0.80	0.64	51.8
3u	U	1	0	1	0.0	0.061	14.2	LOS A	0.2	2.6	0.64	0.80	0.64	54.3
Approach		33	9	33	27.3	0.061	9.0	LOS A	0.2	2.6	0.64	0.80	0.64	51.3
East: Nelson Bay Rd														
4	L2	6	1	6	16.7	0.449	7.8	LOS A	2.8	22.3	0.57	0.63	0.57	58.8
5	T1	795	43	795	5.4	0.449	8.0	LOS A	2.8	22.3	0.57	0.66	0.57	63.2
6	R2	164	7	164	4.3	0.449	12.7	LOS A	2.8	21.6	0.58	0.70	0.58	62.2
6u	U	2	0	2	0.0	0.449	12.6	LOS A	2.8	21.6	0.58	0.70	0.58	64.6
Approach		967	51	967	5.3	0.449	8.8	LOS A	2.8	22.3	0.57	0.66	0.57	63.0
North: Lemon Tree Passage Rd														
7	L2	100	4	100	4.0	0.231	16.9	LOS B	1.1	8.1	0.77	0.90	0.77	59.1
8	T1	5	0	5	0.0	0.231	12.9	LOS A	1.1	8.1	0.77	0.90	0.77	56.6
9	R2	277	17	277	6.1	0.421	17.1	LOS B	2.6	20.3	0.82	0.98	0.95	56.3
9u	U	1	0	1	0.0	0.421	16.8	LOS B	2.6	20.3	0.82	0.98	0.95	58.7
Approach		383	21	383	5.5	0.421	17.0	LOS B	2.6	20.3	0.81	0.96	0.90	57.0
West: Nelson Bay Rd														
10	L2	542	20	542	3.7	0.433	7.2	LOS A	2.8	21.4	0.44	0.61	0.44	63.4
11	T1	1252	56	1252	4.5	0.551	8.9	LOS A	4.3	33.9	0.45	0.57	0.45	64.5
12	R2	19	8	19	42.1	0.551	12.8	LOS A	4.3	33.9	0.47	0.57	0.47	57.7
12u	U	17	1	17	5.9	0.551	11.9	LOS A	4.3	33.9	0.47	0.57	0.47	64.3
Approach		1830	85	1830	4.6	0.551	8.4	LOS A	4.3	33.9	0.45	0.58	0.45	64.1
All Vehicles		3213	166	3213	5.2	0.551	9.6	LOS A	4.3	33.9	0.53	0.65	0.54	62.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd - 2031 AM Base (Site Folder: General)]

2031 AM Base
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	877	47	877	5.4	0.542	5.6	LOS A	4.0	31.6	0.36	0.44	0.36	69.6
6a	R1	587	26	587	4.4	0.542	12.0	LOS A	4.0	31.4	0.39	0.63	0.39	62.7
6	R2	102	14	102	13.7	0.542	13.7	LOS A	4.0	31.4	0.39	0.63	0.39	59.7
6u	U	25	1	25	4.0	0.542	12.9	LOS A	4.0	31.4	0.39	0.63	0.39	65.2
Approach		1591	88	1591	5.5	0.542	8.6	LOS A	4.0	31.6	0.37	0.53	0.37	66.1
North: Salt Ash Ave														
7	L2	54	10	54	18.5	0.122	5.5	LOS A	0.4	3.5	0.54	0.74	0.54	54.0
9	R2	24	0	24	0.0	0.122	11.5	LOS A	0.4	3.5	0.54	0.74	0.54	60.2
9b	R3	20	5	20	25.0	0.122	13.5	LOS A	0.4	3.5	0.54	0.74	0.54	55.6
9u	U	1	0	1	0.0	0.122	14.1	LOS A	0.4	3.5	0.54	0.74	0.54	58.5
Approach		99	15	99	15.2	0.122	8.6	LOS A	0.4	3.5	0.54	0.74	0.54	55.8
NorthWest: Richardson Rd														
27b	L3	9	6	9	66.7	0.269	9.1	LOS A	1.4	12.9	0.63	0.63	0.63	56.8
27a	L1	432	31	432	7.2	0.269	7.2	LOS A	1.4	12.9	0.63	0.67	0.63	66.6
29b	R3	35	15	35	42.9	0.269	18.3	LOS B	1.4	10.9	0.64	0.72	0.64	56.5
29u	U	17	0	17	0.0	0.269	14.6	LOS B	1.4	10.9	0.64	0.72	0.64	69.3
Approach		493	52	493	10.5	0.269	8.3	LOS A	1.4	12.9	0.63	0.67	0.63	65.6
West: Nelson Bay Rd														
10b	L3	11	1	11	9.1	0.303	8.6	LOS A	2.1	17.6	0.76	0.73	0.76	61.2
10	L2	35	6	35	17.1	0.303	9.1	LOS A	2.1	17.6	0.76	0.73	0.76	58.3
11	T1	464	42	464	9.1	0.303	9.5	LOS A	2.1	17.6	0.75	0.76	0.75	64.2
12u	U	10	3	10	30.0	0.303	17.6	LOS B	1.9	15.8	0.75	0.79	0.75	63.3
Approach		520	52	520	10.0	0.303	9.6	LOS A	2.1	17.6	0.75	0.75	0.75	63.7
All Vehicles		2703	207	2703	7.7	0.542	8.7	LOS A	4.0	31.6	0.50	0.60	0.50	65.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd -2031 PM Base (Site Folder: General)]

2031 PM Base
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	480	28	480	5.8	0.352	5.6	LOS A	2.1	16.2	0.30	0.44	0.30	70.0
6a	R1	435	25	435	5.7	0.352	11.7	LOS A	2.1	16.2	0.28	0.62	0.28	62.6
6	R2	84	3	84	3.6	0.352	13.2	LOS A	2.1	16.2	0.28	0.62	0.28	60.3
6u	U	27	0	27	0.0	0.352	12.5	LOS A	2.1	16.2	0.28	0.62	0.28	66.6
Approach		1026	56	1026	5.5	0.352	9.0	LOS A	2.1	16.2	0.29	0.54	0.29	65.7
North: Salt Ash Ave														
7	L2	165	16	165	9.7	0.354	8.2	LOS A	1.7	12.6	0.76	0.90	0.84	54.7
9	R2	19	1	19	5.3	0.354	14.6	LOS B	1.7	12.6	0.76	0.90	0.84	57.9
9b	R3	34	1	34	2.9	0.354	15.8	LOS B	1.7	12.6	0.76	0.90	0.84	59.6
9u	U	1	0	1	0.0	0.354	17.0	LOS B	1.7	12.6	0.76	0.90	0.84	57.5
Approach		219	18	219	8.2	0.354	10.0	LOS A	1.7	12.6	0.76	0.90	0.84	55.7
NorthWest: Richardson Rd														
27b	L3	19	0	19	0.0	0.587	10.6	LOS A	4.4	35.6	0.88	1.00	1.11	57.0
27a	L1	727	32	727	4.4	0.587	11.4	LOS A	4.4	35.6	0.88	1.00	1.12	64.1
29b	R3	32	7	32	21.9	0.587	22.9	LOS B	4.0	29.1	0.87	1.01	1.13	58.8
29u	U	9	0	9	0.0	0.587	19.6	LOS B	4.0	29.1	0.87	1.01	1.13	66.0
Approach		787	39	787	5.0	0.587	12.0	LOS A	4.4	35.6	0.87	1.00	1.12	63.7
West: Nelson Bay Rd														
10b	L3	9	0	9	0.0	0.527	8.3	LOS A	4.2	33.4	0.74	0.75	0.81	63.6
10	L2	113	20	113	17.7	0.527	9.1	LOS A	4.2	33.4	0.74	0.75	0.81	58.4
11	T1	958	31	958	3.2	0.527	9.4	LOS A	4.2	33.4	0.74	0.79	0.83	65.8
12u	U	10	10	10	100.0	0.527	20.6	LOS B	4.0	31.4	0.75	0.83	0.85	60.8
Approach		1090	61	1090	5.6	0.527	9.5	LOS A	4.2	33.4	0.74	0.78	0.83	64.9
All Vehicles		3122	174	3122	5.6	0.587	10.0	LOS A	4.4	35.6	0.63	0.77	0.73	64.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - 2031 AM Base (Site Folder: General)]

2031 AM Base
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	91	31	91	34.1	0.532	8.4	LOS A	3.8	31.4	0.62	0.60	0.63	56.8
2	T1	1065	44	1065	4.1	0.532	7.6	LOS A	3.8	28.8	0.63	0.63	0.64	65.8
3	R2	61	0	61	0.0	0.532	14.7	LOS B	3.8	28.8	0.64	0.65	0.66	61.7
3u	U	1	0	1	0.0	0.532	14.3	LOS A	3.8	28.8	0.64	0.65	0.66	64.0
Approach		1218	75	1218	6.2	0.532	8.0	LOS A	3.8	31.4	0.63	0.62	0.64	64.8
East: Lavis Lane														
4	L2	140	8	140	5.7	0.470	16.6	LOS B	3.0	23.0	0.87	1.00	1.08	52.5
5	T1	31	1	31	3.2	0.470	12.0	LOS A	3.0	23.0	0.87	1.00	1.08	51.1
6	R2	81	1	81	1.2	0.470	18.0	LOS B	3.0	23.0	0.87	1.00	1.08	55.0
6u	U	1	0	1	0.0	0.470	20.5	LOS B	3.0	23.0	0.87	1.00	1.08	53.5
Approach		253	10	253	4.0	0.470	16.5	LOS B	3.0	23.0	0.87	1.00	1.08	53.1
North: Nelsons Bay Rd														
7	L2	115	1	115	0.9	0.410	6.2	LOS A	2.4	18.2	0.42	0.53	0.42	60.4
8	T1	1149	67	1149	5.8	0.734	8.1	LOS A	7.1	58.4	0.55	0.56	0.55	65.7
9	R2	237	35	237	14.8	0.734	13.9	LOS A	7.1	58.4	0.60	0.58	0.60	62.3
9u	U	1	0	1	0.0	0.734	13.1	LOS A	7.1	58.4	0.60	0.58	0.60	68.6
Approach		1502	103	1502	6.9	0.734	8.9	LOS A	7.1	58.4	0.55	0.56	0.55	64.7
West: Cabbage Tree Rd														
10	L2	289	45	289	15.6	0.363	8.6	LOS A	2.0	18.3	0.76	0.84	0.79	61.2
11	T1	37	6	37	16.2	0.217	9.8	LOS A	0.9	11.8	0.72	0.89	0.72	57.6
12	R2	62	34	62	54.8	0.217	18.8	LOS B	0.9	11.8	0.72	0.89	0.72	50.9
12u	U	1	0	1	0.0	0.217	15.6	LOS B	0.9	11.8	0.72	0.89	0.72	64.8
Approach		389	85	389	21.9	0.363	10.4	LOS A	2.0	18.3	0.75	0.85	0.77	58.9
All Vehicles		3362	273	3362	8.1	0.734	9.3	LOS A	7.1	58.4	0.62	0.65	0.65	63.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - 2031 PM Base (Site Folder: General)]

2031 PM Base
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	84	21	84	25.0	0.604	10.0	LOS A	5.4	44.1	0.74	0.77	0.84	58.0
2	T1	1117	57	1117	5.1	0.604	9.5	LOS A	5.4	44.1	0.75	0.80	0.86	64.6
3	R2	66	1	66	1.5	0.604	16.7	LOS B	5.3	40.5	0.75	0.84	0.88	60.7
3u	U	1	0	1	0.0	0.604	16.2	LOS B	5.3	40.5	0.75	0.84	0.88	63.0
Approach		1268	79	1268	6.2	0.604	9.9	LOS A	5.4	44.1	0.75	0.80	0.86	63.9
East: Lavis Lane														
4	L2	112	1	112	0.9	0.520	15.8	LOS B	3.5	27.3	0.88	1.03	1.14	52.6
5	T1	52	10	52	19.2	0.520	13.2	LOS A	3.5	27.3	0.88	1.03	1.14	50.3
6	R2	118	4	118	3.4	0.520	18.5	LOS B	3.5	27.3	0.88	1.03	1.14	53.8
6u	U	1	0	1	0.0	0.520	20.9	LOS B	3.5	27.3	0.88	1.03	1.14	52.7
Approach		283	15	283	5.3	0.520	16.5	LOS B	3.5	27.3	0.88	1.03	1.14	52.7
North: Nelsons Bay Rd														
7	L2	83	1	83	1.2	0.396	6.4	LOS A	2.3	16.5	0.46	0.55	0.46	60.1
8	T1	1034	26	1034	2.5	0.709	8.2	LOS A	6.8	53.9	0.58	0.60	0.59	66.2
9	R2	283	40	283	14.1	0.709	14.3	LOS A	6.8	53.9	0.63	0.63	0.66	62.1
9u	U	2	1	2	50.0	0.709	14.7	LOS B	6.8	53.9	0.63	0.63	0.66	55.1
Approach		1402	68	1402	4.9	0.709	9.4	LOS A	6.8	53.9	0.58	0.60	0.60	64.9
West: Cabbage Tree Rd														
10	L2	424	32	424	7.5	0.554	10.1	LOS A	3.8	31.0	0.86	0.99	1.05	62.1
11	T1	30	0	30	0.0	0.303	9.6	LOS A	1.4	13.8	0.77	0.91	0.79	56.5
12	R2	120	26	120	21.7	0.303	17.6	LOS B	1.4	13.8	0.77	0.91	0.79	56.3
12u	U	1	0	1	0.0	0.303	16.2	LOS B	1.4	13.8	0.77	0.91	0.79	63.1
Approach		575	58	575	10.1	0.554	11.7	LOS A	3.8	31.0	0.83	0.97	0.98	60.4
All Vehicles		3528	220	3528	6.2	0.709	10.5	LOS A	6.8	53.9	0.71	0.77	0.80	62.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd -2031 AM Base (Site Folder: General)]

2031 AM Base
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	15	5	15	33.3	0.124	5.6	LOS A	0.5	6.3	0.40	0.49	0.40	53.7
22	T1	331	97	331	29.3	0.299	5.0	LOS A	1.6	17.2	0.40	0.51	0.40	54.9
23	R2	100	8	100	8.0	0.299	10.1	LOS A	1.6	17.2	0.40	0.52	0.40	55.2
23u	U	1	0	1	0.0	0.299	12.4	LOS A	1.6	17.2	0.40	0.52	0.40	57.0
Approach		447	110	447	24.6	0.299	6.2	LOS A	1.6	17.2	0.40	0.51	0.40	54.9
NorthEast: Old Punt Rd														
24	L2	107	21	107	19.6	0.321	9.0	LOS A	1.6	18.9	0.66	0.81	0.66	51.9
25	T1	30	5	30	16.7	0.321	7.3	LOS A	1.6	18.9	0.66	0.81	0.66	53.6
26	R2	77	41	77	53.2	0.321	14.2	LOS A	1.6	18.9	0.66	0.81	0.66	52.4
26u	U	5	3	5	60.0	0.321	16.8	LOS B	1.6	18.9	0.66	0.81	0.66	53.5
Approach		219	70	219	32.0	0.321	10.8	LOS A	1.6	18.9	0.66	0.81	0.66	52.3
NorthWest: Tomago Rd														
27	L2	348	30	348	8.6	0.315	4.5	LOS A	1.7	13.8	0.34	0.49	0.34	54.9
28	T1	629	75	629	11.9	0.509	4.4	LOS A	3.5	31.7	0.39	0.45	0.39	55.8
29	R2	61	17	61	27.9	0.509	10.3	LOS A	3.5	31.7	0.39	0.45	0.39	55.4
29u	U	5	1	5	20.0	0.509	12.6	LOS A	3.5	31.7	0.39	0.45	0.39	57.2
Approach		1043	123	1043	11.8	0.509	4.8	LOS A	3.5	31.7	0.38	0.46	0.38	55.5
SouthWest: Old Punt Rd														
30	L2	16	9	16	56.3	0.055	6.5	LOS A	0.2	2.0	0.41	0.58	0.41	52.3
31	T1	20	5	20	25.0	0.055	5.1	LOS A	0.2	2.0	0.41	0.58	0.41	54.8
32	R2	9	1	9	11.1	0.055	10.6	LOS A	0.2	2.0	0.41	0.58	0.41	55.2
32u	U	1	0	1	0.0	0.055	12.8	LOS A	0.2	2.0	0.41	0.58	0.41	57.1
Approach		46	15	46	32.6	0.055	6.9	LOS A	0.2	2.0	0.41	0.58	0.41	54.0
All Vehicles		1755	318	1755	18.1	0.509	6.0	LOS A	3.5	31.7	0.42	0.52	0.42	54.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd - 2031 PM Base (Site Folder: General)]

2031 PM
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	9	1	9	11.1	0.383	8.6	LOS A	2.2	18.3	0.73	0.82	0.75	52.6
22	T1	892	73	892	8.2	0.920	22.6	LOS B	22.7	190.1	0.93	1.34	1.84	46.2
23	R2	190	24	190	12.6	0.920	29.5	LOS C	22.7	190.1	1.00	1.51	2.21	44.0
23u	U	1	0	1	0.0	0.920	31.3	LOS C	22.7	190.1	1.00	1.51	2.21	45.3
Approach		1092	98	1092	9.0	0.920	23.7	LOS B	22.7	190.1	0.94	1.36	1.90	45.9
NorthEast: Old Punt Rd														
24	L2	139	11	139	7.9	0.674	8.0	LOS A	4.9	39.1	0.67	0.91	0.81	50.6
25	T1	5	1	5	20.0	0.674	7.4	LOS A	4.9	39.1	0.67	0.91	0.81	52.0
26	R2	520	31	520	6.0	0.674	12.7	LOS A	4.9	39.1	0.67	0.91	0.81	52.4
26u	U	1	0	1	0.0	0.674	14.9	LOS B	4.9	39.1	0.67	0.91	0.81	53.9
Approach		665	43	665	6.5	0.674	11.7	LOS A	4.9	39.1	0.67	0.91	0.81	52.0
NorthWest: Tomago Rd														
27	L2	65	29	65	44.6	0.163	6.3	LOS A	0.8	9.1	0.48	0.57	0.48	53.2
28	T1	439	62	439	14.1	0.372	4.9	LOS A	2.4	22.5	0.50	0.49	0.50	55.3
29	R2	25	14	25	56.0	0.372	11.4	LOS A	2.4	22.5	0.51	0.49	0.51	53.8
29u	U	13	0	13	0.0	0.372	12.6	LOS A	2.4	22.5	0.51	0.49	0.51	57.3
Approach		542	105	542	19.4	0.372	5.6	LOS A	2.4	22.5	0.50	0.50	0.50	55.0
SouthWest: Old Punt Rd														
30	L2	149	9	149	6.0	0.580	34.9	LOS C	4.3	34.9	0.96	1.13	1.39	43.1
31	T1	35	4	35	11.4	0.580	23.8	LOS B	4.3	34.9	0.96	1.13	1.39	44.1
32	R2	13	1	13	7.7	0.580	29.3	LOS C	4.3	34.9	0.96	1.13	1.39	44.3
32u	U	1	0	1	0.0	0.580	31.2	LOS C	4.3	34.9	0.96	1.13	1.39	45.5
Approach		198	14	198	7.1	0.580	32.6	LOS C	4.3	34.9	0.96	1.13	1.39	43.4
All Vehicles		2497	260	2497	10.4	0.920	17.3	LOS B	22.7	190.1	0.77	1.04	1.27	49.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd - 2031 AM Base (Site Folder: General)]

2031 AM Base

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	1	0	1	0.0	0.001	6.3	LOS A	0.0	0.0	0.51	0.51	0.51	43.3
Approach		1	0	1	0.0	0.001	6.3	LOS A	0.0	0.0	0.51	0.51	0.51	43.3
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	1170	55	1170	4.7	0.309	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		1171	55	1171	4.7	0.309	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.8
West: Nelson Bay Rd														
11	T1	822	65	822	7.9	0.222	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	1	0	1	0.0	0.004	18.8	LOS B	0.0	0.1	0.76	0.78	0.76	42.5
Approach		823	65	823	7.9	0.222	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		1995	120	1995	6.0	0.309	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.7

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

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd -2031 PM Base (Site Folder: General)]

2031 PM Base

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	1	0	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.43	0.47	0.43	43.9
Approach		1	0	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.43	0.47	0.43	43.9
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	842	35	842	4.2	0.222	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		843	35	843	4.2	0.222	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.8
West: Nelson Bay Rd														
11	T1	1331	47	1331	3.5	0.349	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
12	R2	1	0	1	0.0	0.002	13.3	LOS A	0.0	0.1	0.61	0.68	0.61	45.4
Approach		1332	47	1332	3.5	0.349	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.7
All Vehicles		2176	82	2176	3.8	0.349	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.7

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd -2031 AM Base (Site Folder: General)]

2031 AM Base
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	508	21	508	4.1	0.269	0.0	LOS A	0.1	0.4	0.01	0.01	0.01	99.6
6	R2	5	0	5	0.0	0.269	9.3	LOS A	0.1	0.4	0.01	0.01	0.01	72.4
Approach		513	21	513	4.1	0.269	0.1	NA	0.1	0.4	0.01	0.01	0.01	99.3
North: Oyster Cove Rd														
7	L2	5	1	5	20.0	0.028	6.7	LOS A	0.1	0.8	0.52	0.70	0.52	52.6
9	R2	9	1	9	11.1	0.028	13.4	LOS A	0.1	0.8	0.52	0.70	0.52	54.4
Approach		14	2	14	14.3	0.028	11.0	LOS A	0.1	0.8	0.52	0.70	0.52	53.7
West: Lemon Tree Passage Rd														
10	L2	15	3	15	20.0	0.009	8.4	LOS A	0.0	0.0	0.00	0.66	0.00	67.6
11	T1	234	24	234	10.3	0.127	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		249	27	249	10.8	0.127	0.5	NA	0.0	0.0	0.00	0.04	0.00	97.1
All Vehicles		776	50	776	6.4	0.269	0.4	NA	0.1	0.8	0.02	0.03	0.02	97.1

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd - 2031 PM Base (Site Folder: General)]

2031 PM Base
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	340	17	340	5.0	0.203	0.6	LOS A	0.3	2.6	0.09	0.02	0.09	97.3
6	R2	12	4	12	33.3	0.203	15.6	LOS B	0.3	2.6	0.09	0.02	0.09	68.7
Approach		352	21	352	6.0	0.203	1.1	NA	0.3	2.6	0.09	0.02	0.09	95.9
North: Oyster Cove Rd														
7	L2	8	1	8	12.5	0.079	8.8	LOS A	0.3	2.1	0.74	0.87	0.74	50.1
9	R2	16	3	16	18.8	0.079	20.3	LOS B	0.3	2.1	0.74	0.87	0.74	49.0
Approach		24	4	24	16.7	0.079	16.4	LOS B	0.3	2.1	0.74	0.87	0.74	49.4
West: Lemon Tree Passage Rd														
10	L2	13	1	13	7.7	0.007	8.0	LOS A	0.0	0.0	0.00	0.66	0.00	71.7
11	T1	616	21	616	3.4	0.320	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach		629	22	629	3.5	0.320	0.2	NA	0.0	0.0	0.00	0.01	0.00	99.0
All Vehicles		1005	47	1005	4.7	0.320	0.9	NA	0.3	2.6	0.05	0.04	0.05	95.6

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

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd - 2031 AM & Prop (Site Folder: General)]

2031 AM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg Satn v/c	Aver Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop Que	Effective Stop Rate	Aver No. Cycles	Aver Speed km/h
South: Oakdale Dr														
1	L2	44	33	44	75.0	0.168	13.7	LOS A	0.7	11.8	0.80	0.90	0.80	41.1
2	T1	1	0	1	0.0	0.168	10.0	LOS A	0.7	11.8	0.80	0.90	0.80	53.8
3	R2	1	0	1	0.0	0.168	14.6	LOS B	0.7	11.8	0.80	0.90	0.80	53.5
3u	U	1	0	1	0.0	0.168	16.8	LOS B	0.7	11.8	0.80	0.90	0.80	50.7
Approach		47	33	47	70.2	0.168	13.7	LOS A	0.7	11.8	0.80	0.90	0.80	41.7
East: Nelson Bay Rd														
4	L2	5	0	5	0.0	0.679	10.6	LOS A	6.3	48.9	0.82	0.95	1.03	61.6
5	T1	1119	55	1119	4.9	0.679	11.5	LOS A	6.3	48.9	0.83	0.96	1.04	61.6
6	R2	91	6	91	6.6	0.679	16.6	LOS B	6.1	47.6	0.83	0.99	1.05	59.9
6u	U	3	1	3	33.3	0.679	17.7	LOS B	6.1	47.6	0.83	0.99	1.05	54.2
Approach		1218	62	1218	5.1	0.679	11.9	LOS A	6.3	48.9	0.83	0.97	1.04	61.4
North: Lemon Tree Passage Rd														
7	L2	151	11	151	7.3	0.282	12.8	LOS A	1.2	10.0	0.69	0.87	0.69	59.6
8	T1	3	0	3	0.0	0.282	11.3	LOS A	1.2	10.0	0.69	0.87	0.69	57.8
9	R2	474	21	474	4.4	0.551	16.2	LOS B	3.8	29.1	0.77	0.99	0.96	57.4
9u	U	1	0	1	0.0	0.551	16.0	LOS B	3.8	29.1	0.77	0.99	0.96	59.5
Approach		629	32	629	5.1	0.551	15.4	LOS B	3.8	29.1	0.75	0.96	0.89	57.9
West: Nelson Bay Rd														
10	L2	194	23	194	11.9	0.168	6.9	LOS A	0.9	7.8	0.28	0.56	0.28	61.8
11	T1	781	56	781	7.2	0.356	7.5	LOS A	2.4	22.5	0.30	0.52	0.30	64.6
12	R2	54	46	54	85.2	0.356	13.0	LOS A	2.4	22.5	0.31	0.52	0.31	56.6
12u	U	14	0	14	0.0	0.356	11.3	LOS A	2.4	22.5	0.31	0.52	0.31	67.2
Approach		1043	125	1043	12.0	0.356	7.7	LOS A	2.4	22.5	0.30	0.53	0.30	63.7
All Vehicles		2937	252	2937	8.6	0.679	11.2	LOS A	6.3	48.9	0.62	0.81	0.74	60.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd , Oakdale Dr & Lemon Tree Passage Rd -2031 PM & Prop (Site Folder: General)]

2031 PM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Oakdale Dr														
1	L2	46	33	46	71.7	0.139	10.3	LOS A	0.5	8.3	0.67	0.83	0.67	43.3
2	T1	9	2	9	22.2	0.139	8.4	LOS A	0.5	8.3	0.67	0.83	0.67	52.3
3	R2	4	1	4	25.0	0.139	13.2	LOS A	0.5	8.3	0.67	0.83	0.67	50.9
3u	U	1	0	1	0.0	0.139	14.4	LOS A	0.5	8.3	0.67	0.83	0.67	53.3
Approach		60	36	60	60.0	0.139	10.3	LOS A	0.5	8.3	0.67	0.83	0.67	45.1
East: Nelson Bay Rd														
4	L2	6	1	6	16.7	0.459	7.9	LOS A	2.8	22.1	0.58	0.64	0.58	58.7
5	T1	795	43	795	5.4	0.459	8.2	LOS A	2.8	22.1	0.59	0.67	0.59	63.1
6	R2	164	7	164	4.3	0.459	12.9	LOS A	2.8	21.4	0.59	0.71	0.59	62.1
6u	U	2	0	2	0.0	0.459	12.7	LOS A	2.8	21.4	0.59	0.71	0.59	64.5
Approach		967	51	967	5.3	0.459	9.0	LOS A	2.8	22.1	0.59	0.68	0.59	62.9
North: Lemon Tree Passage Rd														
7	L2	100	4	100	4.0	0.237	17.1	LOS B	1.1	8.4	0.78	0.90	0.78	58.9
8	T1	5	0	5	0.0	0.237	13.1	LOS A	1.1	8.4	0.78	0.90	0.78	56.4
9	R2	277	17	277	6.1	0.432	17.5	LOS B	2.7	21.2	0.83	0.99	0.98	56.0
9u	U	1	0	1	0.0	0.432	17.2	LOS B	2.7	21.2	0.83	0.99	0.98	58.3
Approach		383	21	383	5.5	0.432	17.4	LOS B	2.7	21.2	0.82	0.97	0.92	56.7
West: Nelson Bay Rd														
10	L2	542	20	542	3.7	0.434	7.2	LOS A	2.9	21.5	0.44	0.61	0.44	63.4
11	T1	1252	56	1252	4.5	0.568	8.9	LOS A	4.6	37.9	0.46	0.57	0.46	64.4
12	R2	46	35	46	76.1	0.568	13.7	LOS A	4.6	37.9	0.49	0.57	0.49	56.2
12u	U	17	1	17	5.9	0.568	11.9	LOS A	4.6	37.9	0.49	0.57	0.49	64.2
Approach		1857	112	1857	6.0	0.568	8.6	LOS A	4.6	37.9	0.46	0.58	0.46	63.9
All Vehicles		3267	220	3267	6.7	0.568	9.7	LOS A	4.6	37.9	0.54	0.66	0.55	62.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd - 2031 AM & Prop (Site Folder: General)]

2031 AM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	908	76	908	8.4	0.558	5.7	LOS A	4.3	35.3	0.37	0.45	0.37	68.5
6a	R1	588	27	588	4.6	0.558	12.0	LOS A	4.2	33.4	0.40	0.62	0.40	62.8
6	R2	102	14	102	13.7	0.558	13.7	LOS A	4.2	33.4	0.40	0.62	0.40	59.8
6u	U	25	1	25	4.0	0.558	12.9	LOS A	4.2	33.4	0.40	0.62	0.40	65.3
Approach		1623	118	1623	7.3	0.558	8.6	LOS A	4.3	35.3	0.38	0.53	0.38	65.7
North: Salt Ash Ave														
7	L2	54	10	54	18.5	0.125	5.6	LOS A	0.5	3.6	0.56	0.75	0.56	54.0
9	R2	24	0	24	0.0	0.125	11.6	LOS A	0.5	3.6	0.56	0.75	0.56	60.2
9b	R3	20	5	20	25.0	0.125	13.6	LOS A	0.5	3.6	0.56	0.75	0.56	55.6
9u	U	1	0	1	0.0	0.125	14.2	LOS A	0.5	3.6	0.56	0.75	0.56	58.4
Approach		99	15	99	15.2	0.125	8.7	LOS A	0.5	3.6	0.56	0.75	0.56	55.7
NorthWest: Richardson Rd														
27b	L3	9	6	9	66.7	0.278	9.3	LOS A	1.5	13.5	0.65	0.64	0.65	56.6
27a	L1	433	32	433	7.4	0.278	7.3	LOS A	1.5	13.5	0.65	0.68	0.65	66.5
29b	R3	35	15	35	42.9	0.278	18.5	LOS B	1.4	11.3	0.66	0.73	0.66	56.4
29u	U	17	0	17	0.0	0.278	14.7	LOS B	1.4	11.3	0.66	0.73	0.66	69.1
Approach		494	53	494	10.7	0.278	8.4	LOS A	1.5	13.5	0.65	0.68	0.65	65.5
West: Nelson Bay Rd														
10b	L3	11	1	11	9.1	0.331	8.7	LOS A	2.3	20.9	0.77	0.74	0.77	61.1
10	L2	35	6	35	17.1	0.331	9.2	LOS A	2.3	20.9	0.77	0.74	0.77	58.2
11	T1	493	71	493	14.4	0.331	9.7	LOS A	2.3	20.9	0.77	0.77	0.77	62.9
12u	U	10	3	10	30.0	0.331	17.7	LOS B	2.0	18.9	0.76	0.81	0.76	63.2
Approach		549	81	549	14.8	0.331	9.8	LOS A	2.3	20.9	0.77	0.77	0.77	62.5
All Vehicles		2765	267	2765	9.7	0.558	8.8	LOS A	4.3	35.3	0.51	0.61	0.51	64.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Nelson Bay Rd & Richardson Rd -2031 PM & Prop (Site Folder: General)]

2031 PM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Nelson Bay Rd														
5	T1	509	57	509	11.2	0.368	5.6	LOS A	2.2	17.5	0.31	0.45	0.31	68.2
6a	R1	436	26	436	6.0	0.368	11.7	LOS A	2.2	17.5	0.29	0.62	0.29	62.8
6	R2	84	3	84	3.6	0.368	13.2	LOS A	2.2	17.5	0.29	0.62	0.29	60.6
6u	U	27	0	27	0.0	0.368	12.6	LOS A	2.2	17.5	0.29	0.62	0.29	66.9
Approach		1056	86	1056	8.1	0.368	8.9	LOS A	2.2	18.8	0.30	0.54	0.30	65.2
North: Salt Ash Ave														
7	L2	165	16	165	9.7	0.365	8.6	LOS A	1.8	13.3	0.77	0.91	0.87	54.4
9	R2	19	1	19	5.3	0.365	14.9	LOS B	1.8	13.3	0.77	0.91	0.87	57.6
9b	R3	34	1	34	2.9	0.365	16.2	LOS B	1.8	13.3	0.77	0.91	0.87	59.2
9u	U	1	0	1	0.0	0.365	17.4	LOS B	1.8	13.3	0.77	0.91	0.87	57.2
Approach		219	18	219	8.2	0.365	10.4	LOS A	1.8	13.3	0.77	0.91	0.87	55.4
NorthWest: Richardson Rd														
27b	L3	19	0	19	0.0	0.608	11.1	LOS A	4.7	38.0	0.90	1.02	1.16	56.6
27a	L1	728	33	728	4.5	0.608	12.0	LOS A	4.7	38.0	0.89	1.02	1.16	63.5
29b	R3	32	7	32	21.9	0.608	23.6	LOS B	4.2	30.7	0.88	1.02	1.17	58.3
29u	U	9	0	9	0.0	0.608	20.2	LOS B	4.2	30.7	0.88	1.02	1.17	65.2
Approach		788	40	788	5.1	0.608	12.5	LOS A	4.7	38.0	0.89	1.02	1.16	63.1
West: Nelson Bay Rd														
10b	L3	9	0	9	0.0	0.551	8.6	LOS A	4.6	38.1	0.75	0.78	0.85	63.5
10	L2	113	20	113	17.7	0.551	9.4	LOS A	4.6	38.1	0.75	0.78	0.85	58.3
11	T1	987	60	987	6.1	0.551	9.8	LOS A	4.6	38.1	0.76	0.82	0.87	65.0
12u	U	10	10	10	100.0	0.551	21.0	LOS B	4.4	36.1	0.76	0.86	0.90	60.7
Approach		1119	90	1119	8.0	0.551	9.9	LOS A	4.6	38.1	0.76	0.82	0.87	64.2
All Vehicles		3182	234	3182	7.4	0.608	10.2	LOS A	4.7	38.1	0.64	0.78	0.75	63.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - 2031 AM & Prop (Site Folder: General)]

2031 AM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	91	31	91	34.1	0.552	9.0	LOS A	4.3	35.6	0.67	0.65	0.70	56.5
2	T1	1067	46	1067	4.3	0.552	8.2	LOS A	4.3	35.6	0.68	0.68	0.72	65.4
3	R2	61	0	61	0.0	0.552	15.3	LOS B	4.3	32.2	0.68	0.71	0.73	61.3
3u	U	1	0	1	0.0	0.552	14.9	LOS B	4.3	32.2	0.68	0.71	0.73	63.7
Approach		1220	77	1220	6.3	0.552	8.6	LOS A	4.3	35.6	0.68	0.68	0.72	64.4
East: Lavis Lane														
4	L2	140	8	140	5.7	0.491	17.4	LOS B	3.3	24.7	0.89	1.02	1.12	51.9
5	T1	31	1	31	3.2	0.491	13.0	LOS A	3.3	24.7	0.89	1.02	1.12	50.5
6	R2	81	1	81	1.2	0.491	18.9	LOS B	3.3	24.7	0.89	1.02	1.12	54.3
6u	U	1	0	1	0.0	0.491	21.4	LOS B	3.3	24.7	0.89	1.02	1.12	52.8
Approach		253	10	253	4.0	0.491	17.4	LOS B	3.3	24.7	0.89	1.02	1.12	52.5
North: Nelsons Bay Rd														
7	L2	115	1	115	0.9	0.421	6.2	LOS A	2.5	19.1	0.43	0.53	0.43	60.3
8	T1	1151	69	1151	6.0	0.754	8.3	LOS A	7.9	67.3	0.57	0.58	0.57	65.5
9	R2	264	62	264	23.5	0.754	14.3	LOS A	7.9	67.3	0.63	0.60	0.64	59.9
9u	U	1	0	1	0.0	0.754	13.3	LOS A	7.9	67.3	0.63	0.60	0.64	68.4
Approach		1531	132	1531	8.6	0.754	9.2	LOS A	7.9	67.3	0.57	0.58	0.57	64.1
West: Cabbage Tree Rd														
10	L2	316	72	316	22.8	0.425	9.3	LOS A	2.4	25.4	0.78	0.92	0.87	59.4
11	T1	37	6	37	16.2	0.223	9.8	LOS A	0.9	12.3	0.73	0.89	0.73	57.5
12	R2	62	34	62	54.8	0.223	18.9	LOS B	0.9	12.3	0.73	0.89	0.73	50.9
12u	U	1	0	1	0.0	0.223	15.6	LOS B	0.9	12.3	0.73	0.89	0.73	64.7
Approach		416	112	416	26.9	0.425	10.8	LOS A	2.4	25.4	0.77	0.91	0.84	57.7
All Vehicles		3420	331	3420	9.7	0.754	9.8	LOS A	7.9	67.3	0.65	0.69	0.70	62.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [SA Nelsons Bay Rd & Cabbage Tree Rd - 2031 PM & Prop (Site Folder: General)]

2031 PM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelsons Bay Rd														
1	L2	84	21	84	25.0	0.628	10.9	LOS A	6.1	49.5	0.79	0.84	0.93	57.7
2	T1	1119	59	1119	5.3	0.628	10.3	LOS A	6.1	49.5	0.79	0.86	0.95	64.2
3	R2	66	1	66	1.5	0.628	17.5	LOS B	5.8	45.0	0.80	0.89	0.97	60.3
3u	U	1	0	1	0.0	0.628	17.1	LOS B	5.8	45.0	0.80	0.89	0.97	62.6
Approach		1270	81	1270	6.4	0.628	10.7	LOS A	6.1	49.5	0.79	0.86	0.95	63.5
East: Lavis Lane														
4	L2	112	1	112	0.9	0.543	16.7	LOS B	3.8	29.3	0.89	1.05	1.19	51.9
5	T1	52	10	52	19.2	0.543	14.3	LOS A	3.8	29.3	0.89	1.05	1.19	49.7
6	R2	118	4	118	3.4	0.543	19.5	LOS B	3.8	29.3	0.89	1.05	1.19	53.1
6u	U	1	0	1	0.0	0.543	21.9	LOS B	3.8	29.3	0.89	1.05	1.19	52.0
Approach		283	15	283	5.3	0.543	17.4	LOS B	3.8	29.3	0.89	1.05	1.19	52.0
North: Nelsons Bay Rd														
7	L2	83	1	83	1.2	0.408	6.4	LOS A	2.4	17.3	0.47	0.55	0.47	60.0
8	T1	1036	28	1036	2.7	0.730	8.4	LOS A	7.5	62.3	0.59	0.62	0.62	66.0
9	R2	310	67	310	21.6	0.730	14.8	LOS B	7.5	62.3	0.66	0.65	0.69	60.0
9u	U	2	1	2	50.0	0.730	15.0	LOS B	7.5	62.3	0.66	0.65	0.69	54.9
Approach		1431	97	1431	6.8	0.730	9.7	LOS A	7.5	62.3	0.60	0.62	0.63	64.2
West: Cabbage Tree Rd														
10	L2	451	59	451	13.1	0.625	11.2	LOS A	4.6	41.1	0.89	1.02	1.14	59.8
11	T1	30	0	30	0.0	0.311	9.7	LOS A	1.5	14.3	0.78	0.92	0.81	56.4
12	R2	120	26	120	21.7	0.311	17.7	LOS B	1.5	14.3	0.78	0.92	0.81	56.2
12u	U	1	0	1	0.0	0.311	16.2	LOS B	1.5	14.3	0.78	0.92	0.81	63.0
Approach		602	85	602	14.1	0.625	12.4	LOS A	4.6	41.1	0.86	1.00	1.06	58.8
All Vehicles		3586	278	3586	7.8	0.730	11.1	LOS A	7.5	62.3	0.73	0.80	0.86	61.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd -2031 AM & Prop (Site Folder: General)]

2031 AM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	15	5	15	33.3	0.135	5.6	LOS A	0.6	7.3	0.41	0.50	0.41	53.7
22	T1	358	124	358	34.6	0.324	5.2	LOS A	1.8	20.2	0.41	0.51	0.41	54.8
23	R2	100	8	100	8.0	0.324	10.1	LOS A	1.8	20.2	0.42	0.52	0.42	55.1
23u	U	1	0	1	0.0	0.324	12.4	LOS A	1.8	20.2	0.42	0.52	0.42	56.9
Approach		474	137	474	28.9	0.324	6.2	LOS A	1.8	20.2	0.41	0.51	0.41	54.8
NorthEast: Old Punt Rd														
24	L2	107	21	107	19.6	0.336	9.6	LOS A	1.7	20.4	0.70	0.84	0.70	51.6
25	T1	30	5	30	16.7	0.336	7.7	LOS A	1.7	20.4	0.70	0.84	0.70	53.3
26	R2	77	41	77	53.2	0.336	14.6	LOS B	1.7	20.4	0.70	0.84	0.70	52.1
26u	U	5	3	5	60.0	0.336	17.2	LOS B	1.7	20.4	0.70	0.84	0.70	53.2
Approach		219	70	219	32.0	0.336	11.3	LOS A	1.7	20.4	0.70	0.84	0.70	52.1
NorthWest: Tomago Rd														
27	L2	348	30	348	8.6	0.317	4.5	LOS A	1.7	14.0	0.34	0.50	0.34	54.9
28	T1	655	102	655	15.6	0.536	4.4	LOS A	3.9	36.6	0.41	0.45	0.41	55.7
29	R2	61	17	61	27.9	0.536	10.4	LOS A	3.9	36.6	0.41	0.45	0.41	55.3
29u	U	5	1	5	20.0	0.536	12.6	LOS A	3.9	36.6	0.41	0.45	0.41	57.1
Approach		1069	150	1069	14.0	0.536	4.8	LOS A	3.9	36.6	0.39	0.47	0.39	55.4
SouthWest: Old Punt Rd														
30	L2	16	9	16	56.3	0.056	6.7	LOS A	0.2	2.1	0.42	0.60	0.42	52.2
31	T1	20	5	20	25.0	0.056	5.3	LOS A	0.2	2.1	0.42	0.60	0.42	54.7
32	R2	9	1	9	11.1	0.056	10.7	LOS A	0.2	2.1	0.42	0.60	0.42	55.1
32u	U	1	0	1	0.0	0.056	12.9	LOS A	0.2	2.1	0.42	0.60	0.42	57.0
Approach		46	15	46	32.6	0.056	7.0	LOS A	0.2	2.1	0.42	0.60	0.42	54.0
All Vehicles		1808	372	1808	20.6	0.536	6.0	LOS A	3.9	36.6	0.43	0.53	0.43	54.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tomago Rd & Old Punt Rd - 2031 PM & Prop (Site Folder: General)]

2031 PM with Proposal
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Tomago Rd														
21	L2	9	1	9	11.1	0.400	8.8	LOS A	2.4	20.5	0.74	0.84	0.78	52.4
22	T1	919	100	919	10.9	0.961	32.2	LOS C	32.6	282.8	0.94	1.62	2.43	41.7
23	R2	190	24	190	12.6	0.961	41.0	LOS C	32.6	282.8	1.00	1.88	2.98	38.8
23u	U	1	0	1	0.0	0.961	42.9	LOS D	32.6	282.8	1.00	1.88	2.98	39.8
Approach		1119	125	1119	11.2	0.961	33.5	LOS C	32.6	282.8	0.95	1.66	2.51	41.2
NorthEast: Old Punt Rd														
24	L2	139	11	139	7.9	0.692	8.5	LOS A	5.3	41.8	0.70	0.95	0.88	50.3
25	T1	5	1	5	20.0	0.692	7.8	LOS A	5.3	41.8	0.70	0.95	0.88	51.7
26	R2	520	31	520	6.0	0.692	13.2	LOS A	5.3	41.8	0.70	0.95	0.88	52.1
26u	U	1	0	1	0.0	0.692	15.4	LOS B	5.3	41.8	0.70	0.95	0.88	53.6
Approach		665	43	665	6.5	0.692	12.2	LOS A	5.3	41.8	0.70	0.95	0.88	51.7
NorthWest: Tomago Rd														
27	L2	65	29	65	44.6	0.174	6.3	LOS A	0.8	10.0	0.48	0.57	0.48	53.2
28	T1	466	89	466	19.1	0.397	5.1	LOS A	2.6	26.2	0.51	0.50	0.51	55.1
29	R2	25	14	25	56.0	0.397	11.4	LOS A	2.6	26.2	0.52	0.49	0.52	53.7
29u	U	13	0	13	0.0	0.397	12.6	LOS A	2.6	26.2	0.52	0.49	0.52	57.2
Approach		569	132	569	23.2	0.397	5.7	LOS A	2.6	26.2	0.51	0.51	0.51	54.9
SouthWest: Old Punt Rd														
30	L2	149	9	149	6.0	0.615	41.3	LOS C	4.8	38.5	0.98	1.16	1.48	41.3
31	T1	35	4	35	11.4	0.615	27.5	LOS B	4.8	38.5	0.98	1.16	1.48	42.3
32	R2	13	1	13	7.7	0.615	33.0	LOS C	4.8	38.5	0.98	1.16	1.48	42.5
32u	U	1	0	1	0.0	0.615	34.9	LOS C	4.8	38.5	0.98	1.16	1.48	43.5
Approach		198	14	198	7.1	0.615	38.3	LOS C	4.8	38.5	0.98	1.16	1.48	41.6
All Vehicles		2551	314	2551	12.3	0.961	22.1	LOS B	32.6	282.8	0.79	1.18	1.56	46.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd - 2031 AM & Prop (Site Folder: General)]

2031 AM with Project

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	4	3	4	75.0	0.009	9.7	LOS A	0.0	0.6	0.57	0.62	0.57	40.0
Approach		4	3	4	75.0	0.009	9.7	LOS A	0.0	0.6	0.57	0.62	0.57	40.0
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	1170	55	1170	4.7	0.309	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		1171	55	1171	4.7	0.309	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.8
West: Nelson Bay Rd														
11	T1	822	65	822	7.9	0.222	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	4	3	4	75.0	0.038	39.1	LOS C	0.1	2.0	0.86	0.95	0.86	34.6
Approach		826	68	826	8.2	0.222	0.2	NA	0.1	2.0	0.00	0.00	0.00	79.4
All Vehicles		2001	126	2001	6.3	0.309	0.2	NA	0.1	2.0	0.00	0.00	0.00	79.4

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

MOVEMENT SUMMARY

▽ Site: 101 [Nelson Bay Rd & Horse Trail Rd -2031 PM & Prop (Site Folder: General)]

2031 PM with Proposal
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Horse Trail														
1	L2	4	3	4	75.0	0.007	7.3	LOS A	0.0	0.5	0.48	0.54	0.48	41.0
Approach		4	3	4	75.0	0.007	7.3	LOS A	0.0	0.5	0.48	0.54	0.48	41.0
East: Nelson Bay Rd														
4	L2	1	0	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	842	35	842	4.2	0.222	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		843	35	843	4.2	0.222	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.8
West: Nelson Bay Rd														
11	T1	1331	47	1331	3.5	0.349	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
12	R2	4	3	4	75.0	0.019	22.7	LOS B	0.1	1.1	0.73	0.87	0.73	41.0
Approach		1335	50	1335	3.7	0.349	0.1	NA	0.1	1.1	0.00	0.00	0.00	79.5
All Vehicles		2182	88	2182	4.0	0.349	0.1	NA	0.1	1.1	0.00	0.00	0.00	79.5

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd -2031 AM & Prop (Site Folder: General)]

2031 AM with Proposal
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	508	21	508	4.1	0.269	0.0	LOS A	0.1	0.4	0.01	0.01	0.01	99.6
6	R2	5	0	5	0.0	0.269	9.3	LOS A	0.1	0.4	0.01	0.01	0.01	72.4
Approach		513	21	513	4.1	0.269	0.1	NA	0.1	0.4	0.01	0.01	0.01	99.3
North: Oyster Cove Rd														
7	L2	5	1	5	20.0	0.044	6.7	LOS A	0.2	1.3	0.57	0.74	0.57	51.0
9	R2	12	4	12	33.3	0.044	16.2	LOS B	0.2	1.3	0.57	0.74	0.57	48.7
Approach		17	5	17	29.4	0.044	13.4	LOS A	0.2	1.3	0.57	0.74	0.57	49.4
West: Lemon Tree Passage Rd														
10	L2	18	6	18	33.3	0.012	8.7	LOS A	0.0	0.0	0.00	0.66	0.00	63.7
11	T1	234	24	234	10.3	0.127	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		252	30	252	11.9	0.127	0.6	NA	0.0	0.0	0.00	0.05	0.00	96.0
All Vehicles		782	56	782	7.2	0.269	0.6	NA	0.2	1.3	0.02	0.04	0.02	96.1

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

MOVEMENT SUMMARY

▽ Site: 101 [Lemon Tree Passage Rd & Oyster Cove Rd - 2031 PM & Prop (Site Folder: General)]

2031 PM with Proposal
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Lemon Tree Passage Rd														
5	T1	340	17	340	5.0	0.203	0.6	LOS A	0.4	2.6	0.09	0.02	0.09	97.2
6	R2	12	4	12	33.3	0.203	15.7	LOS B	0.4	2.6	0.09	0.02	0.09	68.7
Approach		352	21	352	6.0	0.203	1.1	NA	0.4	2.6	0.09	0.02	0.09	95.9
North: Oyster Cove Rd														
7	L2	8	1	8	12.5	0.105	8.8	LOS A	0.3	3.0	0.78	0.89	0.78	48.5
9	R2	19	6	19	31.6	0.105	23.3	LOS B	0.3	3.0	0.78	0.89	0.78	45.5
Approach		27	7	27	25.9	0.105	19.0	LOS B	0.3	3.0	0.78	0.89	0.78	46.4
West: Lemon Tree Passage Rd														
10	L2	16	4	16	25.0	0.010	8.5	LOS A	0.0	0.0	0.00	0.66	0.00	66.1
11	T1	616	21	616	3.4	0.320	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach		632	25	632	4.0	0.320	0.2	NA	0.0	0.0	0.00	0.02	0.00	98.5
All Vehicles		1011	53	1011	5.2	0.320	1.1	NA	0.4	3.0	0.05	0.04	0.05	94.8

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

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