

ANNEXURE 8

Traffic and Car Parking Assessment

prepared by

ARC Traffic & Transport



Shoalhaven Starches, Bomaderry
MP 06_0028 Modification Proposal
Traffic Impact Assessment
November 2016

prepared for

Manildra Shoalhaven Starches

prepared by

ARC Traffic + Transport

Introduction

Manildra Shoalhaven Starches (Manildra) proposes a Modification to Project Approval MP06_0228 to undertake modifications to the existing Ethanol Distillation Plant to produce up to 110 million litres (ML) per year of beverage grade ethanol. The Modification will not involve an increase in overall ethanol production above the current approved 300 ML per year, but would provide greater flexibility in the type of ethanol that is produced from the plant. The Modification would include the following components: -

Central and Eastern Plant Areas

- Relocation of previously approved Evaporator;
- Construction of a Beverage Grade Ethanol Plant. Existing structures on the site of the proposed Beverage Grade Ethanol Plant (two water tanks, diesel above ground tanks, a brick pump house, and redundant former plant) will be demolished as part of these works;
- Installation of three above ground tanks. Two 400kL tanks (tanks 1 and 2) will be installed in the ethanol recovery area, with an existing tank to be removed to make room for one of these tanks. A 1,000kL tank (tank 8) will be installed in the ethanol storage area.
- Cooling towers;
- New gantry pipe connecting the ethanol plant, tanks and cooling towers;
- Electrical substation;
- Emergency ISO tank container storage area, including extension of an access road from the former Dairy Farmers complex;
- An internal access road to and from the ISO tank container storage;
- Two railway sidings will be extended along the south-eastern side of the former Dairy Farmers site. To accommodate the extension of the railway siding, existing water treatment tanks, pump house and piping will be removed, and existing water treatment ponds will be filled in.

Adjacent to the Bolong Road BOC Gas Facility

- Construction of a new staff car park, including the redevelopment of the existing paved car parking in this area of the site, and re-laying of additional pavement for parking purposes.

ARC Traffic + Transport (ARC) has been commissioned to examine the access, traffic and parking issues associated with the Modification. In this regard, the scope of this Traffic Impact Assessment has been guided by the requirements of the Department of Planning & Environment (DP&E) Secretary's Environmental Assessment Requirements, 24th August 2016, which state the following in regard to traffic and transport issues: -

The relevant key issues for assessment include:

- *traffic and access, including impacts on Bolong Road, nearby intersections and the adequacy of internal access roads to service the modified development*
- *car parking*

- *hazard and risk*

In addition, assessment requirements have been provided to the DP&E by Shoalhaven City Council (Council) and include the following: -

Traffic/Access: The application will need to be supported by a Traffic Impact Assessment (TIA) to enable Council to understand how the proposal will operate and assess impacts/additional works that may be required. The TIA should include, but not be limited to, the following:

- a) Turning path plans for all manoeuvring required in and out of the site (e.g. the container loading and unloading area and any other areas where vehicle movements are expected);*
- b) Vehicle numbers requiring access in and out of the various access point and the impacts that such traffic movements would have on the existing access points (i.e. all changes to vehicle access patterns and volumes need to be detailed and assessed accordingly);*
- c) An assessment of whether such access points to the site will be sufficient to accommodate traffic generated by the modified proposal (e.g. are they currently operating as designed) and any intersection treatment/ up grading of the access point and associated concept designs demonstrating compliance with relevant standards. This including details on any signage required;*
- d) An assessment of available sight distances at the access points to be used;*
- e) An assessment of the available width of the internal service road providing access to the container storage/ loading/unloading area (section that runs parallel to Bolong Road), its ability to allow two-way heavy vehicle movement simultaneously; and*
- f) Council's Traffic Section has advised that the access to the container storage/loading/unloading area was also only accepted on a trial basis by RMS and council, and if safety issues regarding the access could not be resolved then a roundabout at the access was to be considered. This issue should be considered/addressed.*

Roads and Maritime Services (RMS): Council has had a brief discussion with RMS where it has been advised that they would like to be consulted as part of the applications assessment process. It is therefore recommended that a discussion be had with RMS prior to the lodgement of the application.

In regard to this last requirement, and further to our detailed discussions with Council officers, ARC has also contacted the RMS to discuss the Modification; the RMS have indicated that the scope of assessment required by Council, and moreover the scope of assessment proposed by ARC, appropriately covers the issues of relevance to the RMS.

This assessment references recent reports prepared by ARC in regard to the operation of the primary Shoalhaven Starches Site; the adjacent Dairy Farmers Site; and the broader local traffic environment. Specifically, ARC has referenced the following past reports: -

- Shoalhaven Starches Packing Plant Construction Traffic Management Plan 2016 (PP CTMP)
- Dairy Farmers Site Reuse Proposal - Meat Processing Plant Traffic Impact Assessment 2014 (Meat Plant TIA)

- Shoalhaven Starches Access Review 2014 (Access Review)
- Shoalhaven Starches Staff Car Park Proposal TIA 2012 (Dairy Car Park TIA)
- Shoalhaven Starches Ethanol Upgrade & Packaging Plant TIA 2008 (Ethanol Upgrade TIA)

ARC has also referenced the appropriate AustRoads guidelines and Australian Standards.

From the outset, ARC would acknowledge the input of Council and RMS officers in regard to scoping this assessment, and in regard to the identification of local issues.

1 Background

1.1 Manildra Shoalhaven Starches

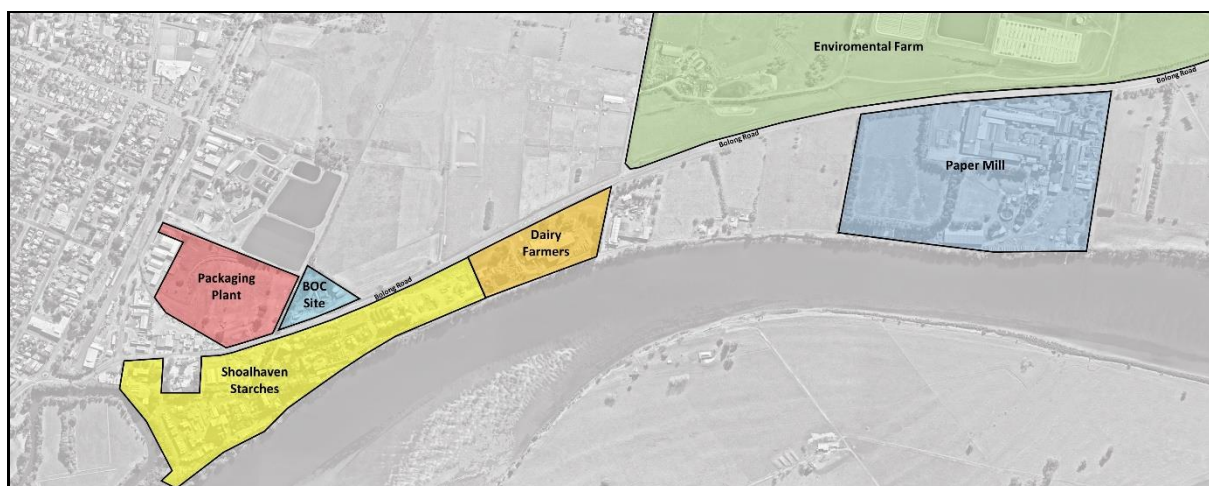
Manildra's Shoalhaven Starches operations occupy a number of distinct 'sites' in Bomaderry; while operations are integrated across all sites, they are differentiated in this assessment for ease of reference.

The primary Shoalhaven Starches Site (Starches Site) and immediately adjacent Dairy Farmers Site (Dairy Site) are located south of Bolong Road. The Packaging Plant (currently under construction) is located on the northern side of Bolong Road opposite the primary Starches Site, while the Environmental Farm Site (the Farm Site) is located north of Bolong Road and east of Hanigans Lane. A BOC Gas facility and other infrastructure supporting the Shoalhaven Starches operations (the BOC Site) is located on the northern side of Bolong Road east of Abernathy's Creek.

It is noted that Manildra recently purchased the former Shoalhaven Paper Mill site (Paper Mill) located on the southern side of Bolong Road approximately 1km east of the Dairy Site; however, the use of the Paper Mill will be the subject of a future (modification) proposal, and is not considered as part of this Modification.

Each of the key Manildra sites are shown in their local context in **Figure 1.1**.

Figure 1.1 Manildra Shoalhaven Starches Sites, Bolong Road Bomaderry



Source: Nearmap

1.2 Previous Site Approvals

1.2.1 Shoalhaven Starches Expansion Project Approval MP06-0228

The SSEP Approval was granted by the Minister for Planning on the 28th January 2009. This approval also encapsulated previous approvals into one overall approval. The SSEP is a 'transitional Part 3A Project' for the purposes of Schedule 6A of the Environmental Planning & Assessment Act.

The SSEP provides for an increase in ethanol production at Shoalhaven Starches in a staged manner from 126 million litres per year to 300 million litres per year. To accomplish the increase in ethanol production, the SSEP required a series of plant upgrades and increases in throughput of raw materials, principally flour and grain. The SSEP included the following alterations and additions: -

- The provision of an additional product dryer;
- Additional equipment and storage vessels for the ethanol plant including additional fermenters, additional cooling towers and molecular sieves;
- Upgrades to the Stillage Recovery Plant, including additional DDGS Dryers, Decanters, chemical storage and evaporators. This proposal also included the installation of a DDGS Pellet Plant; and
- The establishment of a new Packaging Plant, container loading area and rail spur line on the northern side of Bolong road.

As outlined, the SSEP approval also consolidated all previous approvals (up to that time) into a single Project Approval.

Following the SSEP Approval, Manildra acquired the Dairy Site, and commenced investigations into relocating the Packaging Plant from the approved Packaging Plant site north of Bolong Road to the Dairy Site; as an interim measure during these investigations, approval was provided in 2012 for interim Packaging Plant operations on the Starches Site.

More recently, Manildra submitted (additional) modification proposals to the DP&E in regard to the demolition of an industrial building (Moorehouse) within the Starches Site to accommodate the (approved) No.5 Starch Dryer. These modifications have both been recently approved by the DP&E.

It is noted that Condition 31(b) of the SSEP Approval requires the provision of 60 additional staff park spaces (across the broader Starches Site). The Dairy Site was identified as an appropriate location for this parking, and subsequently a new staff car park on the Dairy Site – accompanied by additional infrastructure at the intersection of Bolong Road & Dairy Driveway, and within the Dairy Site – was approved. It is noted that while much of this intersection and internal infrastructure is now in place at the Dairy Site, the Dairy Car Park itself, and a left turn auxiliary lane Bolong Road to Dairy Driveway which was part of the approved upgrade design (to accommodate the Dairy Car Park) have not been constructed.

Importantly, it is also acknowledged that Council has raised issues in regard to the design of the intersection upgrades completed to date, which are examined in further detail in **Section 2** below.

The Farm has evolved over time in accordance with appropriate approvals, though it is noted that the DP&E recently suspended operations at the (previously utilised) coal and storage area at the Farm as they were not subject to the SSEP Approval. Manildra has recently submitted a modification proposal to the DP&E which would provide for these operations to recommence.

With regard to key access, traffic and parking issues, this generally summarises all Shoalhaven Starches proposals/approvals relating to the Starches Site, Dairy Site, Packaging Plant and Farm to October 2016.

1.2.2 Dairy Site Meat Processing Plant & Starches Site Access Review

In 2014, a Meat Processing Plant was approved by Council to operate at the Dairy Site, utilising the existing on-site buildings/infrastructure generally occupying the eastern portion of the Dairy Site. It is noted that the background traffic analysis of the Meat Plant (detailed in the [Meat Plant TIA](#)) identified a number of access issues relating to the broader SSEP Approval for the use of the Dairy Site, and specifically the fact that a number of the required infrastructure upgrades (under the SSEP Approval) had not been completed. This was almost exclusively as a result of the fact that the approved Dairy Car Park had not been built, and as such the infrastructure required to support the additional movements to/from the Dairy Car Park at the intersection of Bolong Road & Dairy Driveway have not to date been 'warranted'.

Notwithstanding – and further also to a review of general access at the adjacent Starches Site Ethanol Driveway - ARC (further to consultation with Council) prepared a detailed [Access Review](#) as a general supplement to the [Meat Plant TIA](#), detailing the infrastructure and management measures required to provide compliance with the SSEP Approval; to improve general safety and movement efficiency at the Ethanol Drive; and subsequently to appropriately accommodate the traffic demands of the Meat Plant proposal at the intersection of Bolong Road & Dairy Driveway.

The primary infrastructure works at the intersection of Bolong Road & Dairy Driveway recommended in the [Access Review](#) and the [DF Meat TIA](#) – and moreover upgrades required under the earlier SSEP approvals - have at this time been largely completed, though it is again noted that the conditioned auxiliary left turn lane (Bolong Road to Dairy Driveway) and the Dairy Car Park have not been constructed. As detailed in **Section 3**, it is the opinion of ARC (and generally agreed with Council) that further to the Modification (which would relocate staff parking away from the Dairy Car Park) the auxiliary left turn lane Bolong Road to Dairy Driveway will not be 'warranted'.

Notwithstanding, it is again acknowledged that it is the view of Council that the (completed to date) upgrades of the intersection of Bolong Road & Dairy Driveway have not been completed *to the satisfaction of Council*. These upgrade issues, and a review of all access points subject to changed operations further to the Modification, are detailed further in **Section 2** below.

2 Existing Access & Traffic Operations

The Starches Site, Dairy Site and BOC Site provide a number of access points to Bolong Road, which are detailed in sections below. It is noted that other access driveways (to the Starches Site, Packaging Plant and Interim Packaging Plant) would not be affected by the Modification.

2.1 Bolong Road & Dairy Driveway

2.1.1 Existing Design

As discussed above, the intersection of Bolong Road & Dairy Driveway has been extensively upgraded in recent years. The primary upgrades – which include a channelised right turn lane Bolong Road to Dairy Driveway; a large internal apron area within Dairy Driveway to provide for U-Turning vehicles; and an acceleration lane Dairy Driveway to Bolong Road – were specifically designed to accommodate the U-Turn demand for vehicles accessing the Gluten Driveway from the west. It is also noted that parts of the upgrade were designed with consideration of the previous design speed in Bolong Road (100km/h) whereas the intersection now lies within a 60km/h zone.

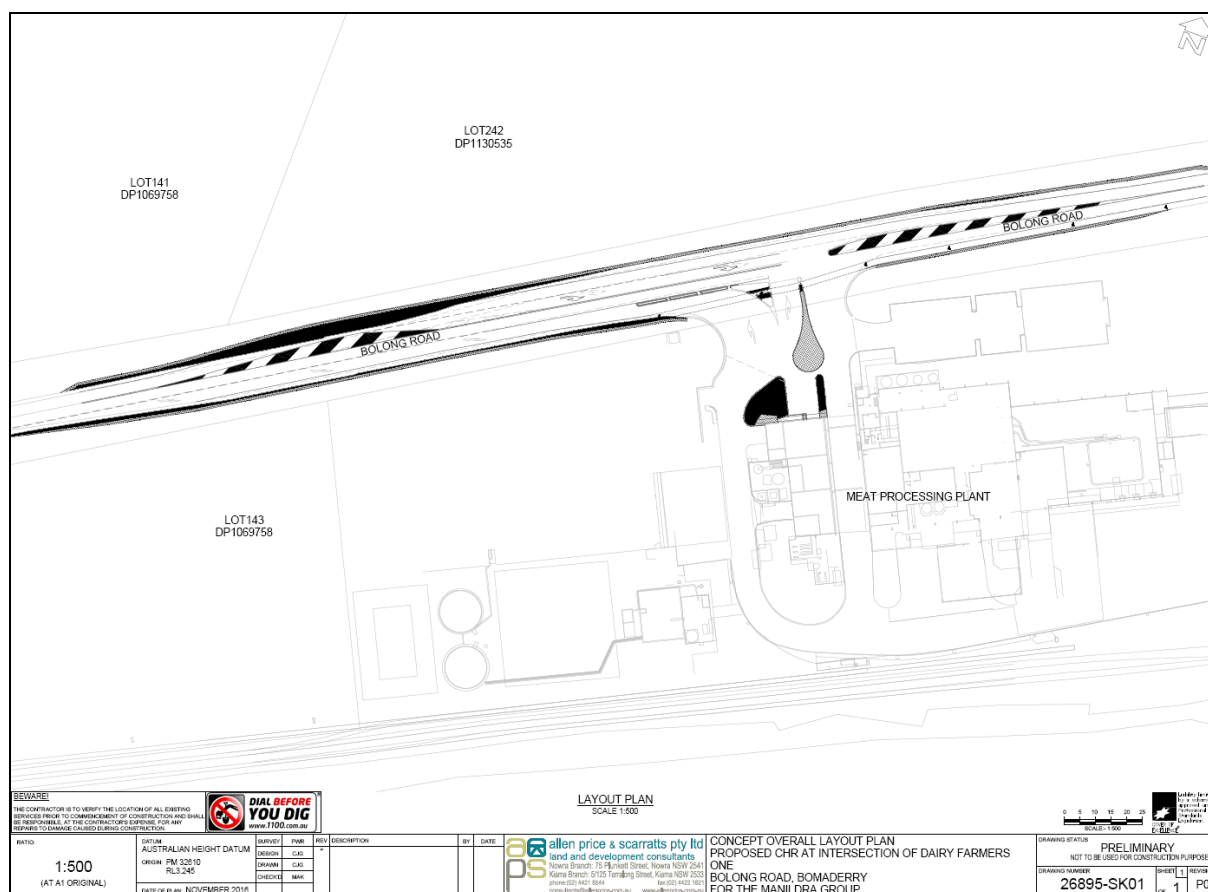
While the Modification is forecast to generate only very minor additional daily and peak hour trips to this, the relocation of the Dairy Car Park will result in a reduction in traffic flows from those previously forecast (upon which the existing upgrades are based – see also **Section 3**).

2.1.1 Existing Design Issues

Further to the proposed development of Dairy Car Park – and with additional consideration of the forecast Meat Plant operations – the Access Review determined that warrants for an auxiliary left turn would be met, albeit marginally. However, and as discussed above, it is the opinion of ARC that further to the Modification (which would relocate the Dairy Car Park from the Dairy Site) the auxiliary left turn lane Bolong Road to Dairy Site will not be ‘warranted’ (see **Section 3**).

Conversely, and as also discussed in **Section 1.2.2**, Council is of the opinion that the intersection upgrades have not been completed to an appropriate standard. In this regard, Council has specifically noted issues in regard to the width of verges adjacent to the intersection; provisions for cyclists on the southern side of Bolong Road through the intersection; lane widths; and general marking, signage and lighting ‘deficiencies’. Based on our discussions with Council, these issues do not relate to the general (traffic) operations of the intersection, but to general design and – by association – safety.

Manildra has acknowledged these issues, and in consultation with Council is currently finalising additional upgrades of the intersection so as to provide all required infrastructure at the intersection in accordance with Council requirements. In this regard, a Concept Layout Plan has been prepared by Allen Price & Scarratts (7th November 2016) which is reproduced below.

Figure 2.1.1 Bolong Road & Dairy Driveway Concept Layout Plan

Source: Allen Price & Scarratts

This Concept Layout Plan has subsequently been provided to Council for comment; Mr Scott Wells (on behalf of Council, email, 7th November 2016) has confirmed that it is accepted that the above described works will address the current outstanding safety issues (relating to the original works undertaken by Shoalhaven Starches) with those works specifically including: -

- Works will be undertaken to upgrade the right turn lane to CHR standard (AUSTROADS for 80kph design environment)
- Works will be undertaken to address the minimum required shoulder width on the northern side of Bolong Road (2m sealed)
- Works will be undertaken to address the minimum required shoulder width on the southern side of Bolong Road (2m sealed)
- Works will be undertaken to address cyclist safety on the southern side of Bolong Road "through" the Dairy Farmers access including widening the "gap" in the median to the minimum required width (1.5m) and marking of cyclist logos to reinforce that route for cyclists

In addition, Mr Wells provides the following comment in regard to the previously conditioned auxiliary left turn lane Bolong Road to Dairy Driveway: -

It would appear that the left turn lane (movement east>south) into the Dairy Farmers access has been deleted on the basis of less traffic movements. This is ok based on the current lesser traffic movements, however should movements be increased associated with any future development activity that may be reviewed.

Further to the provision of an upgraded intersection compliant with the design criteria noted by Mr Wells (above), it is therefore apparent that the intersection will provide a design acceptable to Council, and should necessarily therefore be implemented further to Council approval of final design plans.

2.2 Bolong Road & Ethanol Driveway

2.2.1 Existing Design

This access intersection provides a channelised right turn lane to Ethanol Driveway from Bolong Road west, and a basic left treatment to Ethanol Driveway from Bolong Road east. All movements are provided for at the intersection, though the Ethanol Driveway currently generates very few vehicle trips to/from the east.

The Modification in and of itself would have no impact on operational daily and/or peak hour traffic flows at this intersection, essentially replacing some tanker trucks with ISO container carrying trucks with no anticipated increase in overall truck volumes. There would be minor levels of additional trip generation during the construction of the Beverage Grade Ethanol Plant but these would be temporary only (see also **Section 3**).

2.2.2 Existing Design Issues

As discussed in **Section 1.2**, the Access Review provided a number of recommendations by which to improve the efficiency and safety of the intersection further to the identification of design and operations issues by Council, ARC and Manildra.

The primary issue identified related to the observed use of the intersection for U-Turns by trucks arriving from the west accessing the Starches Site Gluten Driveway immediately adjacent to and east of Abernathy's Creek. As part of previous SSEP approvals, access to Gluten Driveway from Bolong Road has been restricted to left in/left out only by a central median and barrier fence (in Bolong Road) so as to remove the impact of vehicles turning right to Gluten Driveway from the west in a section of Bolong Road too narrow to provide for passing (eastbound) movements.

This access restriction was accompanied by the significant upgrades to the intersection of Bolong Road & Dairy Driveway (and to internal driveway infrastructure) to provide for vehicles previously turning right to Gluten Driveway to instead travel east to Dairy Driveway, complete a turn within Dairy Driveway, and then depart to the west and enter Gluten Driveway via a left turn (per **Section 2.1** above).

Rather than utilising the Dairy Driveway for these movements, the [Access Review](#) identified the fact that some trucks were utilising the intersection of Bolong Road & Ethanol Driveway for this turning movement, i.e. that trucks were turning right to Ethanol Driveway from Bolong Road, then completing a U-Turn within the Ethanol Driveway and returning to the west.

In response, the [Access Review](#) provided a recommendation that a internal median and barrier fence/bollards be provided within the Ethanol Driveway so as to effectively prohibit the use of Ethanol Driveway for truck U-Turn movements, while retaining access for all approved Ethanol Driveway movements.

These recommended upgrade works have recently been completed by Manildra, as shown in **Figure 2.2.2.1**.

Figure 2.2.2.1 Ethanol Driveway Median Island Upgrade



In addition, the [Access Review](#) identified issues in regard to the narrow 'Service Driveway' running parallel to Bolong Road between Ethanol Driveway and the Starches Site eastern services areas (where much of the proposed Modification infrastructure will be provided). Our on-site observations showed that Services Driveway does not meet (width) requirements for two-way traffic, and further that appropriate turning paths for trucks to/from the Services Driveway are not available.

In response, the [Access Review](#) provided a recommendation that all access to the Starches Site eastern services area currently provided by Services Driveway be instead provided via the intersection of Bolong Road & Dairy Driveway, i.e. via a new internal access road linking the Dairy Driveway with the eastern services area, effectively allowing for the closure of Services Driveway for anything other than emergency access.

These recommended upgrade works have recently been completed by Manildra including the installation of an electric security gate which prevents all but emergency access to Services Driveway (as shown in **Figure 2.2.2.2**), and the provision of an informal travel path from the Dairy Driveway to the eastern services area. This travel path will be formalised as part of the Modification to provide all access to the newly proposed Eastern infrastructure via the Dairy Driveway.

Figure 2.2.2.2 Services Driveway Security Gate



2.3 Bolong Road & BOC

This access intersection provides a left turn deceleration lane from the west (Bolong Road to BOC Driveway) while the Bolong Road median adjacent to the BOC Driveway restricts movements to left in/left out only; as such, vehicles departing to the west utilise the Dairy Driveway U-Turn facility, while (the very low number of) vehicles arriving from the east would use either one of the Starches Site access driveways (east of Abernathy's Creek) or local intersections to return to the BOC Site.

Further to the Modification, this intersection would generate additional trips associated with the relocation of staff parking to the BOC Site from the previously approved Dairy Car Park, the potential impacts of which are detailed in **Section 3**.

2.4 Additional Site Intersections

Additional Shoalhaven Starches driveway intersections to Bolong Road include: -

- Interim Packing Plant access driveway

- Starches Site Car Park access driveway
- Western Driveway, which providing primary access to the Starches Site
- Administration Driveway

With reference to **Section 3**, the Modification is not expected to have any significant impact on the operation of any of these intersections. Simply, the Modification will result in very minor additional/redistributed traffic generation during the peak periods, and (at each of these driveways) those additional/redistributed trips would manifest as through trips rather than turning movements.

2.5 Traffic Flows

2.5.1 Site Traffic Flows

ARC has commissioned numerous survey of broader Site traffic flows over many years, which have then been utilised in detailed assessments such as those referenced in the **Introduction**. In regard to the key intersections relating to the Modification, 'current' (i.e. flows based on all approvals) Shoalhaven Starches flows are available for the Ethanol Driveway and Dairy Driveway, and have most recently been reported in the Packaging Plant TIA. These flows have been used for the assessment of base recreational peak flow conditions (for 2018 and 2028), noting that these flows include the higher trip generation of the Dairy Site given that they include the forecast generation of the Dairy Car Park.

Based on our observations and with reference to the available parking infrastructure on the BOC Site, the trip generation of the BOC Site would be relatively minor during peak periods, and certainly significantly lower than flows at the other SS Site driveways. An estimate of peak period flows has been provided by ARC for the assessment.

2.5.2 Bolong Road Traffic Data

Further to the commission of traffic surveys at the Starches Site and Dairy Site over many years, and in consultation with Council, ARC has over time developed peak hour (through movement) traffic flows in Bolong Road that reflect 120th Highest Hour (or 'recreational peak') conditions.

Importantly – and as referenced in recent assessments (for now approved Modifications) - ARC has specifically considered the redistribution of trips from Bolong Road further to the staged upgrades of the Princes Highway being undertaken by the RMS, a redistribution that is currently underway further to the recent opening of the Gerringong Bypass section of the Princes Highway.

The upgrade of the Princes Highway between Gerringong and Bomaderry has been considered in three primary projects – the Gerringong Bypass Project (completed); the Foxground & Berry Bypass Project (due for completion in 2018); and the Berry to Bomaderry Upgrade Project (detailed planning currently being finalised).

As these projects have developed, the RMS estimate of the number of trips that will 'transfer' from the Sandtrack (currently approximately 45% of through trips between Bomaderry and Gerringong and vice versa) to the Princes Highway (currently approximately 55% of through trips between Bomaderry and Gerringong and vice versa) has also developed.

Current RMS modelling concludes that the transfer from the Sandtrack to the upgraded Princes Highway will be very significant. Taking into account other factors (such as general background traffic growth) the future traffic flows to the Princes Highway and to the Sandtrack (and indeed specifically to Bolong Road at Meroo Road, i.e. immediately west of the Starches Site) are provided in **Table 2.5.2** below.

Table 2.5.2 Princes Highway Upgrade Future Flow Estimates

Ref.	Route Direction	Location	AADT											
			2013			2019			2029			2039		
			Base Year			Construction Opening			Opening +10			Design - Do Something		
			Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total
Princes Highway														
A	south of Berry	southbound	5,139	1,019	6,158	8,187	1,212	9,399	11,386	1,614	13,000	14,254	2,020	16,274
B		northbound	5,449	950	6,399	9,039	1,130	10,168	12,571	1,504	14,075	15,737	1,883	17,620
-		two-way	10,588	1,970	12,557	17,225	2,342	19,568	23,958	3,118	27,076	29,990	3,903	33,893
C	north of Meroo Rd	southbound	5,378	1,052	6,430	8,904	1,248	10,152	12,629	1,649	14,278	15,778	2,054	17,832
D		northbound	5,686	961	6,647	9,772	1,140	10,912	13,871	1,506	15,377	17,334	1,876	19,210
-		two-way	11,065	2,013	13,077	18,676	2,388	21,064	26,501	3,155	29,655	33,112	3,930	37,042
E	south of Abernethys Lane	southbound	4,897	926	5,823	8,345	1,102	9,447	11,941	1,469	13,410	14,960	1,841	16,801
F		northbound	5,207	840	6,047	9,215	1,000	10,215	13,185	1,333	14,518	16,519	1,669	18,189
-		two-way	10,104	1,766	11,870	17,560	2,102	19,662	25,126	2,802	27,928	31,479	3,510	34,990
S10	Meroo Road Interchange	southbound off ramp	599	155	754	695	180	876	857	222	1,079	1,018	264	1,282
N10		northbound on ramp	598	151	749	694	176	870	855	216	1,072	1,016	257	1,273
S11		southbound on ramp	117	30	147	136	34	171	168	42	210	199	50	250
N11		northbound off ramp	119	30	148	138	35	172	170	43	212	201	51	252
Local Roads														
G	Meroo Road - south of Princes Highway	southbound	718	186	903	834	216	1,049	1,027	266	1,293	1,220	316	1,536
H		northbound	715	181	896	831	210	1,041	1,023	259	1,282	1,216	307	1,523
-		two-way	1,433	367	1,799	1,664	426	2,090	2,050	525	2,575	2,436	623	3,059
I	Sandtrack - north of Meroo Road	southbound	4,544	467	5,011	2,304	551	2,855	2,688	724	3,412	3,339	899	4,238
J		northbound	4,404	386	4,790	2,432	455	2,887	2,837	599	3,435	3,524	744	4,267
-		two-way	8,948	853	9,801	4,736	1,006	5,742	5,525	1,323	6,848	6,862	1,643	8,505

Source: *Princes Highway Upgrade – Berry to Bomaderry Technical paper: Traffic and Transport 2013 AECOM Australia*

In real terms, these forecasts indicate that following the completion of the Princes Highway upgrades, the 2019 AADT in Bolong Road will represent less than 60% of the 2013 AADT, reducing from a 2013 AADT of some 9,800 vehicle trips per day (vpd) to a 2019 AADT of only 5,742 vpd. Even with background growth continuing after 2019, the 2029 AADT is estimated to represent only 70% of the 2013 AADT; and the 2039 AADT some 87% of 2013 AADT.

Notwithstanding these forecasts, in our discussions Council has suggested that their modelling of the sub-regional road network indicates that the redistribution of trips (from the Sandtrack to the Princes Highway) will not be as significant as indicated (and inherently validated) in the RMS modelling. Council has specifically cited the existing congestion through Bomaderry and at the Nowra Bridge crossing as factors which would result in a higher percentage of trips (than indicated in the RMS modelling) remaining via the Sandtrack, though it is noted that RMS planning of an upgrade of the Shoalhaven River crossings (which would alleviate much of this congestion) is currently well advanced.

Based on all available information, it is the opinion of ARC that there is no doubt that traffic flows in Bolong Road will be significantly reduced following the completion of the Princes Highway upgrades, and that indeed those reductions have likely commenced further to the opening of the Gerringong Bypass.

Notwithstanding, to provide some sensitivity in the assessment (based on the Council position) ARC has prepared base year 2017 Bolong Road through flows – i.e. the base year where the proposed Modification infrastructure is expected to be constructed and become operational – which represent a proportional reduction of 10% from 2013 AADT flows, i.e. accounting for the current redistribution further only to the Gerringong Bypass. With reference to the RMS forecasts, it is noted that these flows are expected to be the highest through flows in Bolong Road through approximately 2039.

A forecast year of 2027 has also been assessed, based on a 70% redistribution by 2019 with an annual increase of 1.5% (as determined in the Princes Highway Upgrade – Berry to Bomaderry Technical paper: Traffic and Transport) through to 2027.

With reference to **Section 2.7** below, ARC has also conducted sensitivity testing which assumes little if any redistribution of trips from the current split to the Princes Highway and Bolong Road.

2.6 Assessment Traffic Flows

With reference to sections above, the figures below provide base recreational peak hour traffic flows for the key intersections for both a base year (2018) and forecast year (2028).

Figure 2.6.1 2017 AM Peak Base Traffic Flows

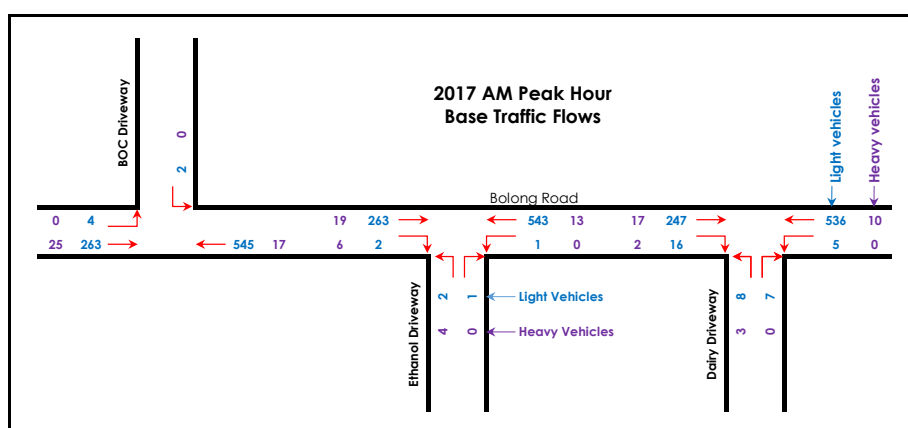


Figure 2.6.2 2017 AM Peak Base Traffic Flows

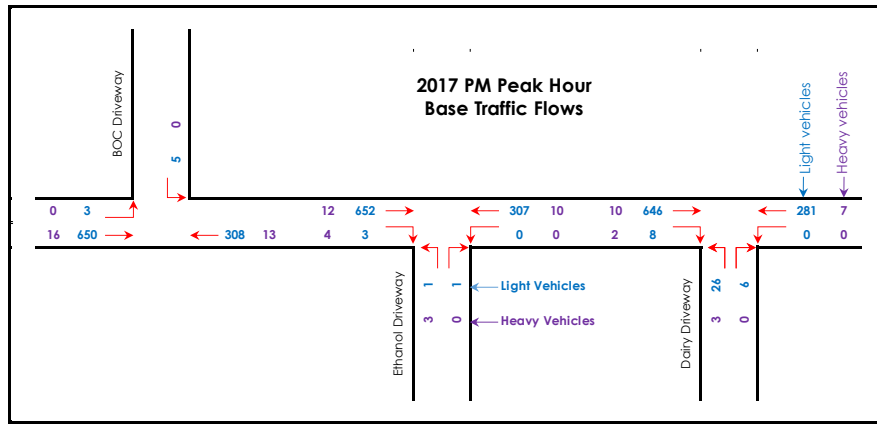


Figure 2.6.3 2027 AM Peak Base Traffic Flows

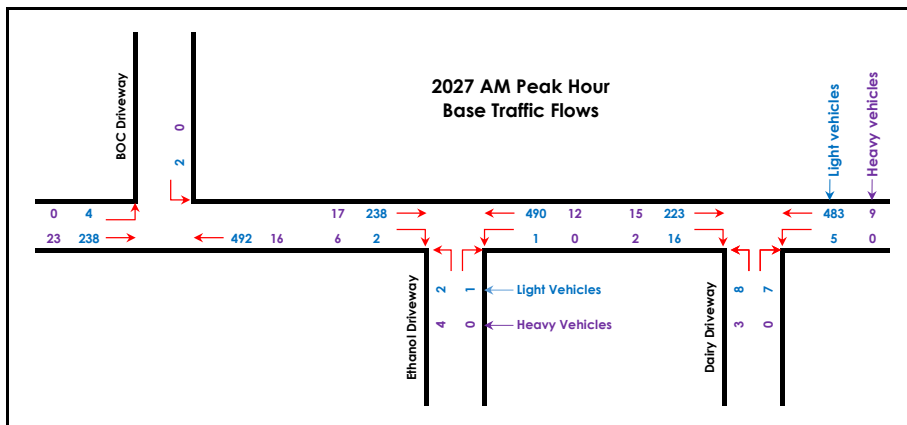
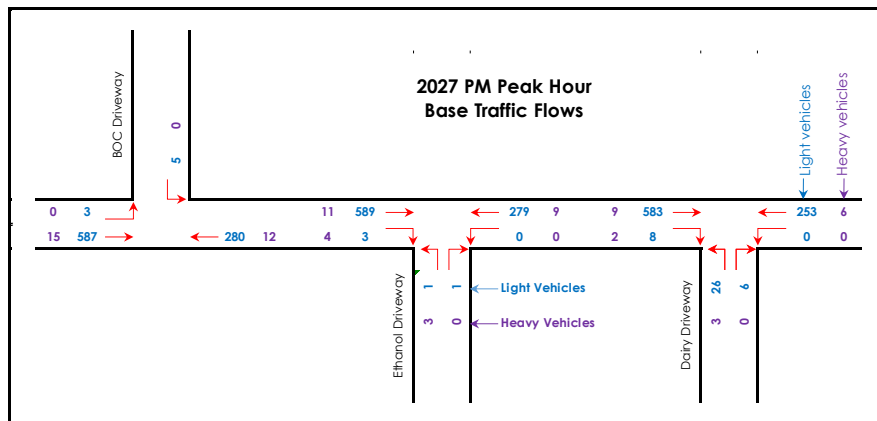


Figure 2.6.4 2027 PM Peak Base Traffic Flows



2.7 Existing Intersection Operations

2.7.1 SIDRA Intersection Modelling

The operations of the key access intersection identified in sections above have been determined using the SIDRA intersection model (Version 7.0). SIDRA reports key intersection performance indicators including: -

- **Level of Service**

Level of service is a basic performance indicator assigned to an intersection based on average delay. For signalised and roundabout intersections, level of service is based on the average delay to all vehicles, while at priority controlled intersections level of service is based on the worst approach delay.

- **Degree of Saturation**

Degree of Saturation is defined as the ratio of demand (arrival) flow to capacity. A degree of saturation above 1.0 represent over-saturated conditions (demand flows exceed capacity) and degrees of saturation below 1.0 represent under-saturated conditions (demand flows are below capacity). The capacity of the movement with the highest degree of saturation is reported.

- **Delay**

Delay represents the difference between interrupted and uninterrupted travel times through an intersection, and is measured in seconds per vehicle in this assessment. Delays include queued vehicles accelerating and decelerating from/to the intersection stop, as well as general delays to all vehicles travelling through the intersection. With reference to the LoS criteria above, the average intersection delay for signals and roundabouts represents an average of delays to all vehicles on all approaches, while for priority intersections the average delay for the worst approach is used.

- **Queue Length**

Queue length is the number of vehicles waiting at the stop line, and in this assessment is based on the 95th percentile back of queue length in metres. It is measured as the number of queued vehicles per traffic lane at the start of the green period (signals) or queued vehicles in each 'gap acceptance cycle' for roundabouts and priority intersections (i.e. the longest period in which no vehicles from the minor movement can enter the opposing primary flow).

2.7.2 Base Traffic Flows Intersection Operations

The results of the SIDRA analysis are provided in the tables below; again, it is noted that these 'base' operations reflect the traffic flows provided in **Section 2.6** above, i.e. they include all trips provided for to/from the key access intersections further to all current Starches Site and Dairy Site approvals, as well as the flow estimates at the BOC Site.

Table 2.7.2.1 2017 Base Traffic Flows Intersection Operations

2017 Traffic Flows Intersection Operations	Level of Service		Average Delay (s)		Worst Delay (s)		Degree of Saturation		Queue Length (m)	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Bolong Road & Dairy Driveway	A	A	0.4	0.2	9.8	12.1	0.301	0.358	0.7	0.5
Bolong Road & Ethanol Driveway	A	B	0.2	0.2	14.4	17.9	0.305	0.363	0.7	0.4
Bolong Road & BOC Driveway	A	A	0.1	0.1	5.6	5.6	0.309	0.365	0.0	0.2

Table 2.7.2.2 2027 Base Traffic Flows Intersection Operations

2027 Traffic Flows Intersection Operations	Level of Service		Average Delay (s)		Worst Delay (s)		Degree of Saturation		Queue Length (m)	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Bolong Road & Dairy Driveway	A	A	0.4	0.2	9.4	9.7	0.272	0.323	0.6	0.4
Bolong Road & Ethanol Driveway	A	B	0.2	0.2	12.8	15.3	0.276	0.328	0.6	0.3
Bolong Road & BOC Driveway	A	A	0.1	0.1	5.6	5.6	0.280	0.330	0.0	0.2

With reference to the table above, all the key access intersections operate at a good level of service - with minimal delays or queue lengths, and significant spare capacity – in both 2017 and the forecast year 2027.

As discussed in **Section 2.5.2**, ARC has also conducted sensitivity testing of the operations of these key intersections further to there being no significant change in the distribution of trips (between the Princes Highway and Bolong Road/The Sandtrack) further to the Princes Highway upgrades. This sensitivity testing indicates that the intersections of Bolong Road with both Dairy Driveway and with Ethanol Driveway would operate at a slightly lower Level of Service (B). Critically though, these (potential higher future) levels of service were identified in past modification assessments (which did not consider the Princes Highway upgrades) and – given the subsequent approval of those past modifications – must inherently be considered acceptable.

2.8 Rail Operations

Shoalhaven Starches uses rail for the majority of transport operations, including incoming raw materials and outgoing product. This has very significant benefits in reducing vehicle trip generation, and specifically heavy vehicle trip generation; it is estimated that existing rail movements equate to the generation of some 100 heavy vehicle trips per day.

The Modification will not result in any increase in rail movements over those provided for under the SSEP approval.

3 The Modification Proposal

3.1 The Modification

As stated in the **Introduction**, Manildra proposes a Modification to Project Approval MP06_0228 to undertake modifications to the existing ethanol distillation plant to enable the plant to produce up to 110ML per year of beverage grade ethanol. The Modification will not involve an increase in overall ethanol production above the current approved 300 ML per year, but would provide greater flexibility in the type of ethanol that is produced from the plant.

The Modification would include the following components: -

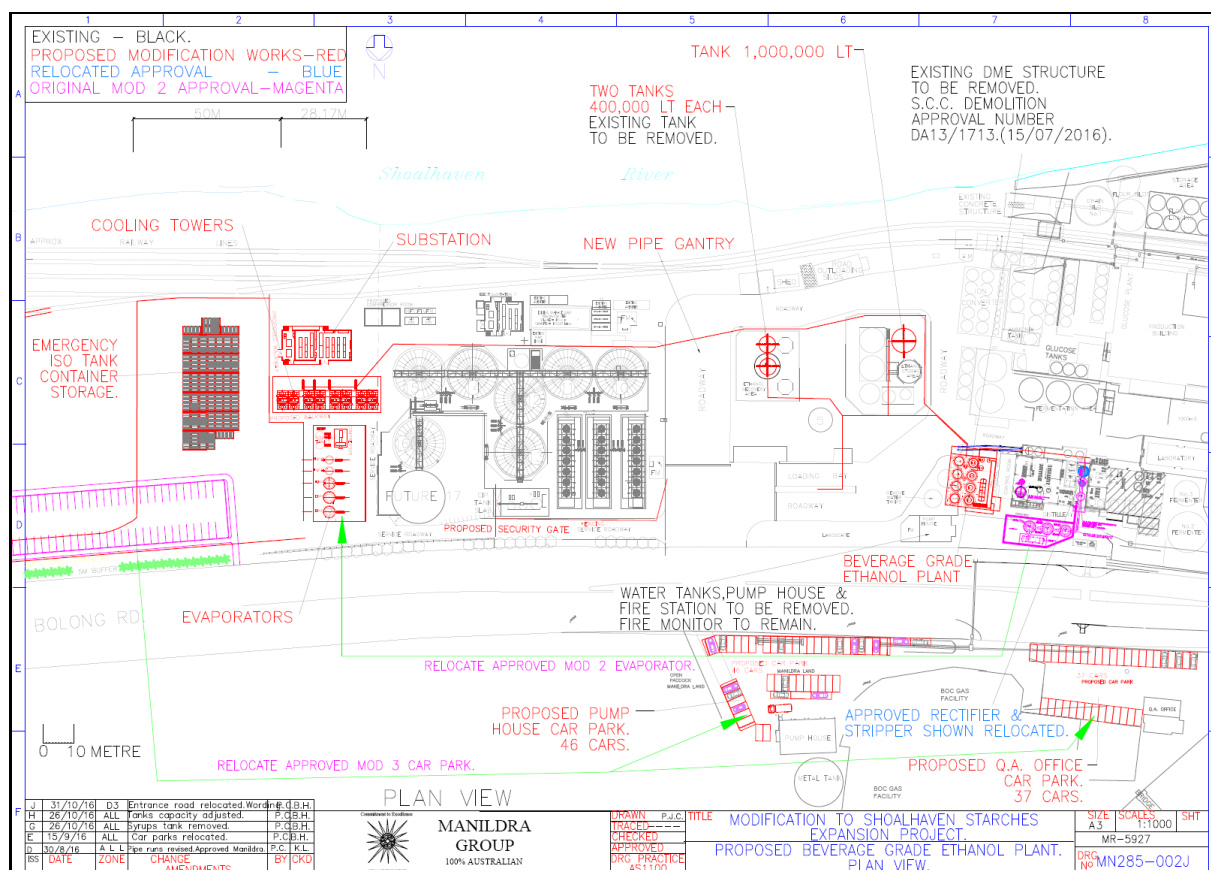
Central and Eastern Plant Areas

- Relocation of previously approved Evaporator;
- Construction of a Beverage Grade Ethanol Plant. Existing structures on the site of the proposed Beverage Grade Ethanol Plant (two water tanks, diesel above ground tanks, a brick pump house, and redundant former plant) will be demolished as part of these works;
- Installation of three above ground tanks. Two 400kL tanks (tanks 1 and 2) will be installed in the ethanol recovery area, with an existing tank to be removed to make room for one of these tanks. A 1,000kL tank (tank 8) will be installed in the ethanol storage area.
- Cooling towers;
- New gantry pipe connecting the ethanol plant, tanks and cooling towers;
- Electrical substation;
- Emergency ISO tank container storage area, including extension of an access road from the former Dairy Farmers complex;
- An internal access road to and from the ISO tank container storage;
- Two railway sidings will be extended along the south-eastern side of the former Dairy Farmers site. To accommodate the extension of the railway siding, existing water treatment tanks, pump house and piping will be removed, and existing water treatment ponds will be filled in.

Adjacent to the Bolong Road BOC Gas Facility

- Construction of a new staff car park, including the redevelopment of the existing paved car parking in this area of the site, and re-laying of additional pavement for parking purposes.

Figure 3.1 provides an overview of the Modification, while full details of each of the components of the Modification are provided within the broader Environment Assessment that this assessment accompanies.

Figure 3.1 The Modification

Source: Manildra

3.2 Access

All access to the various infrastructure sites will remain via existing intersections to Bolong Road.

3.2.1 Bolong Road & Dairy Driveway

The (very minor) additional operational access demands to the proposed Eastern infrastructure will be via the intersection of Bolong Road & Dairy Driveway, and then via an internal driveway (as provided for in the previous Dairy Car Park approval). No access to the Eastern infrastructure area will be provided by Services Driveway.

3.2.2 Bolong Road & Ethanol Driveway

The Modification would not change the existing access demands at Ethanol Driveway, noting that the Modification would essentially replace a proportion of (existing and approved) ethanol tanker truck movements with ISO container trucks, which have the same turning path requirements.

3.2.3 Bolong Road & BOC Driveway

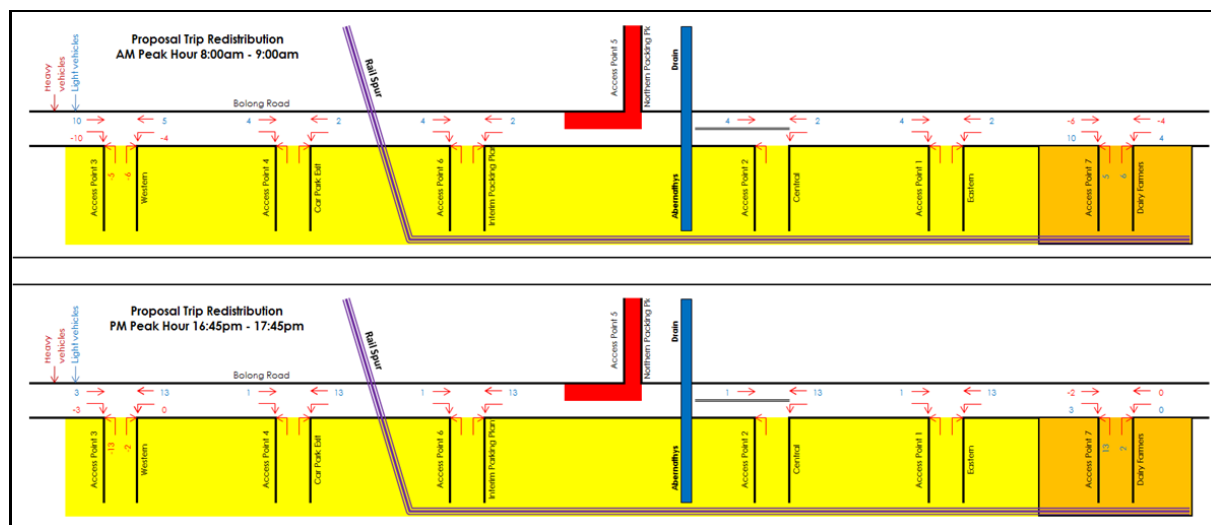
All access to the proposed BOC Site staff car park will be via the intersection of Bolong Road & BOC Driveway.

3.3 Operational Trip Generation & Distribution

3.3.1 Bolong Road & Dairy Driveway

Further to the Modification, the Dairy Site will no longer attract trips associated with the previously approved Dairy Car Park, with those trips instead being redistributed to the BOC Site. The assignment of trips to the Dairy Car Park was detailed in Figure 2.2 of the Dairy Car Park TIA, reproduced below: -

Figure 3.3.1 Dairy Car Park Trip Redistribution



Source: Dairy Car Park TIA

These trips will instead be redistributed to/from the BOC Site. As such, at the intersection of Bolong Road & Dairy Driveway these trips would in the future present as: -

- Westbound through trips (arrival trips from the east)
- Eastbound through trips (departure trips to the east)
- Right turn trips, Bolong Road to Dairy Site (departures trips to the west)
- Arrival trips from the west would not travel through the intersection.

In addition to these redistributed staff (car park) trips, the new infrastructure is expected to generate a very minor level of daily trips associated with maintenance; and occasional trips associated with the emergency ISO container storage area. In total, it is estimated that no more than 10 trips per day would be generated by these operations, or perhaps 1 vehicle trip in a peak hour. These additional trips would be generated almost exclusively to/from the west.

Finally, and as discussed with Council, the trip generation of the Meat Plant has been significantly lower than originally estimated in the Meat Plant TIA, primarily a function of lower than (forecast) capacity operations. While the (peak capacity) trips assigned in the Meat Plant TIA to the intersection (and to the adjacent intersections) have not been removed from the analysis below, consideration of current conditions would suggest even further reductions to the turning movements at the intersection from those assessed in sections below.

3.3.2 Bolong Road & Ethanol Driveway

No additional operational trips are expected to be generated to the Ethanol Driveway further to the Modification, though there would be minor changes in through flows (in Bolong Road) as a result of the changed distribution paths to/from the staff parking to be provided on the BOC Site. As previously stated, the Modification would provide for a proportion of existing and approved ethanol tanker trucks to in the future carry ISO containers instead, with no net increase in movements forecast.

3.3.3 Bolong Road & BOC Driveway

The trips redistributed from the Dairy Car Park (per **Figure 2.3.1** above) will instead be generated to/from the BOC Site. For arrivals from the east, it is expected that vehicles will complete a turn either at one of the Starches Site driveways or in Railway Street, while departure trips to the east would be direct to Bolong Road. Arrival trips from the west would also be direct from Bolong Road, while departure trips to the west would turn right to Dairy Site from Bolong Road, complete a turn using the on-site turn facility, and then depart to Bolong Road.

3.3.4 Trip Assignment

With reference to sections above, the future total flows at the key intersections are detailed in the figures below for both 2017 and for the forecast year 2027.

Figure 3.3.4.1 2017 AM Peak Hour Future Traffic Flows

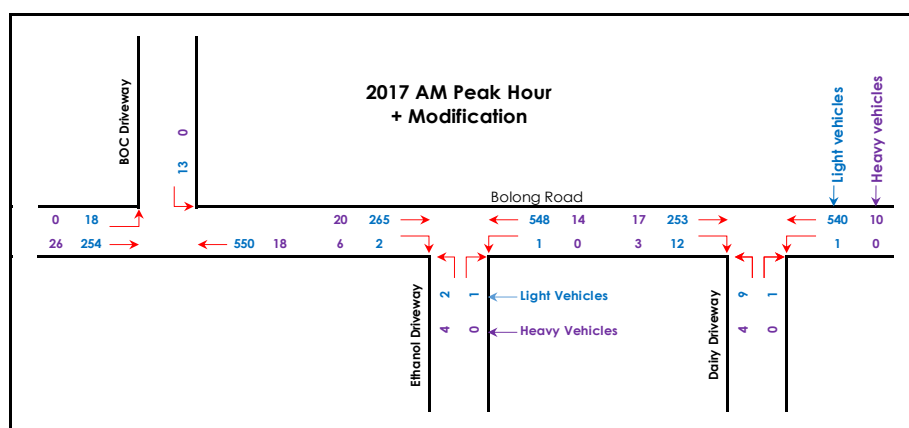


Figure 3.3.4.2 2017 PM Peak Hour Future Traffic Flows

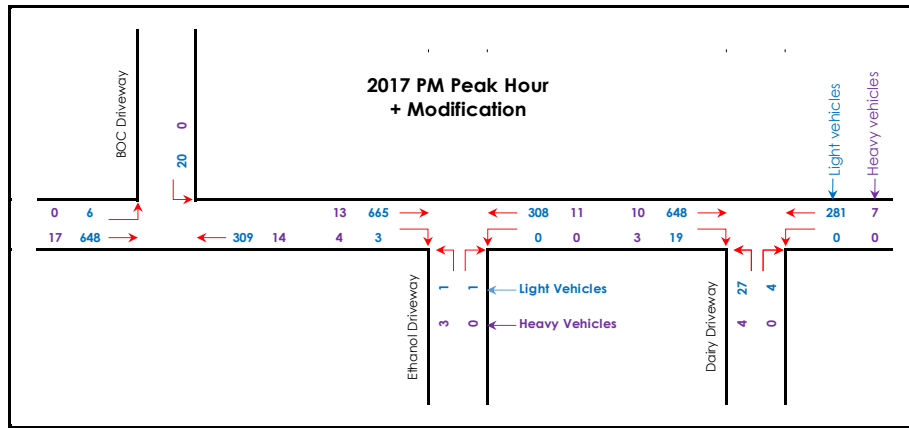


Figure 3.3.4.3 2027 AM Peak Hour Future Traffic Flows

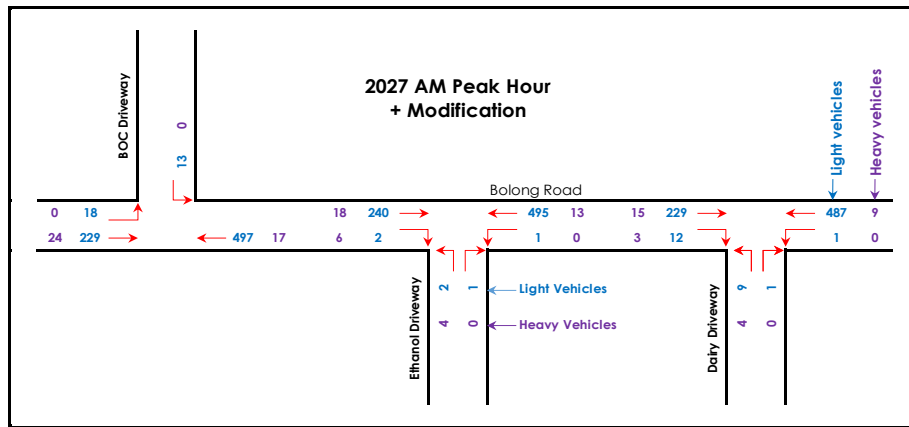
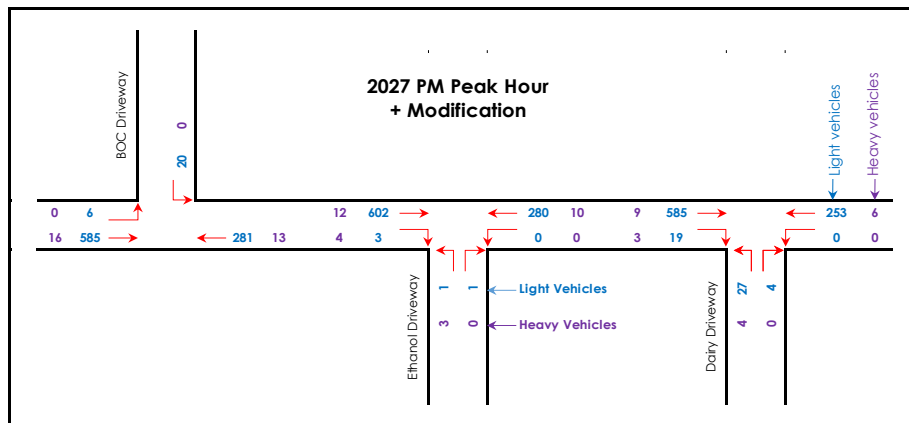


Figure 3.3.4.4 2027 PM Peak Hour Total Future Flows



3.4 Operation Intersection Performance

3.4.1 Intersection Performance

In order to determine the future operations of the key intersections further to the Modification, ARC has re-examined the operations of these intersections using SIDRA. The results of this assessment are provided in the tables below.

Table 3.4.1.1 2017 Future Traffic Flows Intersection Operations

2017 Future Traffic Flows Intersection Operations	Level of Service		Average Delay (s)		Worst Delay (s)		Degree of Saturation		Queue Length (m)	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Bolong Road & Dairy Driveway	A	A	0.2	0.3	10.3	12.3	0.301	0.359	0.6	0.6
Bolong Road & Ethanol Driveway	B	B	0.2	0.2	14.6	18.4	0.309	0.371	0.7	0.4
Bolong Road & BOC Driveway	A	A	0.2	0.1	5.6	5.6	0.313	0.365	0.3	0.7

Table 3.4.1.2 2027 Future Traffic Flows Intersection Operations

2027 Future Traffic Flows Intersection Operations	Level of Service		Average Delay (s)		Worst Delay (s)		Degree of Saturation		Queue Length (m)	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Bolong Road & Dairy Driveway	A	A	0.2	0.3	9.8	9.9	0.271	0.324	0.6	0.6
Bolong Road & Ethanol Driveway	A	B	0.2	0.2	12.9	15.8	0.279	0.336	0.6	0.3
Bolong Road & BOC Driveway	A	A	0.2	0.1	5.6	5.6	0.283	0.330	0.3	0.6

With reference to the tables above, the Modification would have little if any impact on the operation of the key intersections, all of which would continue to operate at a good level of service with significant spare capacity, and very minor delays and queue lengths.

ARC has conducted sensitivity testing of the future operations of these key intersections further to there being no significant change in the distribution of trips (between the Princes Highway and Bolong Road/The Sandtrack) further to the Princes Highway upgrades. This sensitivity testing indicates that the intersections of Bolong Road with both Dairy Driveway and Ethanol Driveway would operate at a lower Level of Service (B) under such conditions, noting that the reduction in traffic flows to the critical right turn movement Dairy Driveway to Bolong Road (further to the relocation of the Dairy Car Park) actually reduces delays at this intersection (from those previously determined and approved).

Again, these (potential higher future) levels of service are not different to those identified in past modification assessments (which did not consider the Princes Highway upgrades) and – given the subsequent approval of those past modifications, and the fact that the Modification would not reduce the performance of these intersections from those previously determined levels of service – must inherently be considered acceptable.

3.4.2 Intersection Infrastructure

The intersection of Bolong Road & Ethanol Driveway and Bolong Road & BOC Driveway are both provided with auxiliary infrastructure which, within the urban speed environment, will appropriately provide for the additional and redistributed trips associated with the Modification.

Importantly, and as agreed with Council (see **Section 2.1**), the Modification will actually reduce the previously determined requirement for an auxiliary left turn lane, Bolong Road to Dairy Driveway. The redistribution of previously determined trips to the Dairy Car Park from the east (as through trips rather than left turn trips) reduces the left turn demand to Dairy Driveway to very minimal (and indeed virtually non-existent in the peak periods) flows, flows which would not trigger the Austroads GRD4A warrants for the provision of an AUL.

It is noted further that the Meat Plant generates little if any trips to this movement in the peak periods, such that even based on the capacity operations of the Meat Plant (as assessed in the Meat Plant TIA) this warrant would not be triggered. As noted by Council, any future capacity increases (above those assessed in the Meat Plant TIA) or future Dairy Site projects which increase trip generation would require an additional assessment of warrants for this lane.

Finally, and with specific regard to the additional information requests provided by Council: -

- The Modification will utilise existing access points to Bolong Road. The sight distance provisions at these intersections have been inherently approved (given that these intersections have been approved and constructed) but nonetheless provide appropriate sight distance based on the adjacent vehicle speeds in Bolong Road.
- The Modification will utilise heavy vehicles with identical maximum turning paths as those currently utilised at the key intersections, the appropriate turning paths for which have been specifically considered in the (approved and constructed) design of these intersections.

3.5 Staff Parking

3.5.1 Parking Requirement

The approved Dairy Car Park was provided in specific response to Condition 31(b) of the SSDA which states: -

31. The Proponent shall...

b) construct at least 60 new parking spaces on the factory site to the south of Bolong Road within 12 months of this approval

3.5.2 Parking Provision

As discussed, the Modification provides for the relocation of the parking spaces from the approved Dairy Car Park to the BOC Site. The Modification will provide a total of a minimum 60 new parking spaces on the BOC Site, which will be provided on hardstand material, with all aisles and parking spaces to be appropriately delineated (either line marked or with discs) in accordance with the requirements of [AS 2890.1](#).

3.6 Construction Traffic

The only period during which the Modification is expected to generate any (relatively) significant number of additional vehicle trips would be during construction of the proposed Modification infrastructure.

3.6.1 Construction Schedule & Requirements

The construction of the Eastern infrastructure is estimated to occur over some 6 months, and would require: -

- Up to 10 construction staff on-site daily
- Up to 5 construction material carrying heavy vehicles per day

The construction of the Beverage Grade Ethanol Plant is estimated to occur over some 6 months (which includes the time required for the demolition of existing structures on the Beverage Grade Ethanol Plant site), and would require: -

- Up to 10 construction staff on-site daily
- Up to 5 construction material carrying heavy vehicles per day

The construction of the new staff car park on the BOC Site is estimated to occur over some 4 weeks, and would require: -

- Up to 5 construction staff on-site daily
- Up to 2 construction material carrying heavy vehicles per day

The potential exists for these construction projects to occur simultaneously.

3.6.2 Construction Access

All construction vehicle access to the Eastern infrastructure construction area will be via the intersection of Bolong Road & Dairy Driveway, noting that temporary staff and heavy vehicle parking will be provided within the area provided for the future ISO container storage works area, which would not be operational until after the construction works are completed.

All construction heavy vehicle access to the Beverage Grade Ethanol Plant construction area will be via the intersection of Bolong Road & Ethanol Driveway; these vehicles would travel through the existing security gates and then 'around' to the construction area, which will be appropriately separated from existing operational areas. All construction staff vehicle access will be via the intersection of Bolong Road & Dairy Driveway, noting that parking for these staff would also be provided within the future ISO container storage area.

All construction vehicle access to the BOC Site (car park) construction works area will be via the intersection of Bolong Road & BOC Driveway, noting that a mix of existing (unused) and temporary parking will be provided for these construction staff within the BOC Site during the construction period.

It is anticipated that the majority of construction staff vehicle trips, and all construction heavy vehicle trips, would be to/from the west.

3.6.3 Construction Traffic Generation

As has been the case for previous construction projects, specialist construction staff completing the primary infrastructure works on the SS Site will be transported to and from the SS Site daily by mini-bus (from Wollongong). Allowing for a small number of ancillary light vehicle trips on a daily basis, the daily generation of the Eastern and Central construction works is estimated to be no more than 25 - 30 (total light and heavy) vehicle trips per day. In the existing peak periods, the trip generation of the Eastern and Central construction works is estimated to be no more than 3 - 4 vehicle trips per hour.

The minor BOC Site car park construction works are expected to generate up to 15 vehicle trips per day (noting that these construction staff are more likely to arrive in separate vehicles). In the existing peak periods, the trip generation of the primary construction works is estimated to be no more than 1 - 2 vehicle trips per hour.

3.6.4 Construction Traffic Impacts

It is in our opinion immediately apparent that the construction period will have little if any significant impact on the local road network simply as a factor of the minimal generation and duration of the construction phase.

Essentially, traffic flows at the key intersections during the construction phase would be little different to those forecast during the future operational phase as described in **Section 3.3**, and as such have the same (minimal) impact on the operation of the key intersections, i.e. each of the key intersections would continue to operate at a good level of service through the construction period.

3.6.5 Construction Management

Notwithstanding the findings above, it remains that the case that the construction phase will need to be governed by an appropriate set of management procedures.

In relation to access, traffic and parking requirements during the construction phase, ARC recommends the following initiatives, which essentially mirror the Construction Traffic Management Plan (CTMP) prepared by ARC for the construction requirements of past Shoalhaven Starches projects, including those most recently adopted for the construction of the Packaging Plant: -

- All parking for construction staff and construction heavy vehicles must be contained within an appropriately secure on-site environment so as not to impact or be impacted by existing Shoalhaven Starches operations; or on the off-site traffic environment.
- While it is not anticipated that Restricted Access Vehicles (RAVs) will be required as part of the construction task, it is nonetheless the case that any such vehicles would be required to utilise the existing approved RAV route between the Dairy Driveway and the Princes Highway via Bolong Road; access for such vehicles via Railway Avenue is not permitted.
- Construction work hours are generally between 6:00am/7:00am and 5:00pm/6:00pm Monday to Friday, with an earlier finish time on Saturdays and no work on Sundays. Construction hours are most often established to minimise amenity impacts on neighbouring residential areas, and will require finalisation further to consultation with the DP&E and Council.

4 Conclusions & Recommendations

4.1 Conclusions

Following a detailed and independent assessment of the potential access, traffic and parking conditions associated with the Modification, ARC has concluded that the Modification is acceptable in regard to access, traffic and parking considerations. In summary: -

- All vehicle access will be provided to existing access points to Bolong Road.
- The Modification provides for the further upgrade of the intersection of Bolong Road & Dairy Driveway to address existing design issues as identified by Council, to the satisfaction of Council. As agreed with Council, the Modification will remove the warrant for a left turn auxiliary lane, Bolong Road to Dairy Driveway, as previously identified further to the construction of a Dairy Car Park.
- The Modification will result primarily in a redistribution of vehicle trips to the local road network rather than increases in vehicle trips to the local road network.
- The performance of all key intersections further to the Modification would remain good, with all intersections operating with minor delays and queues, and retaining significant spare capacity. As importantly, sensitivity testing of higher Bolong Road through movements indicates that the intersections would operate at the same general levels of service as identified in past assessments of (subsequently) approved modifications.
- The required staff car parking previously proposed in the Dairy Car Park will be relocated to the BOC Site, with an additional 60 parking spaces to be constructed to provide compliance with SSEP Approval.
- The construction of the proposed Modification infrastructure would have no significant impact on the operation of the local road network, generating minimal and temporary traffic flows to existing access points, and providing for all construction parking off-street.

4.2 Recommendations

Further to the recommendations outlined above, ARC provides the following Recommendations: -

- That the intersection of Bolong Road & Dairy Driveway be upgraded with reference to the Concept Layout Plan and further to a Council approval of final design plans.
- That the Services Driveway continue to provide for emergency only access, with all vehicle trips associated with existing and future operations in the eastern part of the Starches Site to utilise the proposed new access road via Dairy Driveway.
- That all new parking spaces and parking aisles be designed with reference to [AS 2890.1](#).
- That an appropriate Construction Traffic Management Plan be prepared to govern the construction of the proposed Modification infrastructure.