APPENDIX Q9

Traffic impact assessment

See attached Traffic Impact Assessment Report prepared by Arup.

BHP Billiton

Olympic Dam Expansion Environmental Impact Statement

Traffic Impact Assessment

ARUP

BHP Billiton

Olympic Dam Expansion Environmental Impact Statement

Traffic Impact Assessment

October 2008

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Arup has been engaged by Arup/ENSR to undertake a Traffic Impact Assessment (TIA) as a part of the Environmental Impact Statement (EIS) for the proposed Olympic Dam Expansion (ODX). This report summarises the findings of the TIA and should be read in conjunction with the EIS.

The site is located around 570km north of Adelaide in South Australia. The expansion of the Olympic Dam (OD) site will generate additional road trips as part of the expanded operations as well as ancillary trips to and from nearby settlements that support the operation. The area of coverage of this TIA comprises:

- The road route from Adelaide to Olympic Dam, comprising the Princes Highway, Stuart Highway from Port Augusta to Pimba, Olympic Way and a number of minor roads supporting the site that surround Roxby Downs; and
- The rail corridor from Pimba to Adelaide and the rail corridor from Pimba to Darwin;

The metropolitan areas of Adelaide, Port Augusta, Alice Springs and Darwin are excluded from this TIA.

Existing Conditions

The roads identified in the TIA fall under the jurisdiction of the Federal and South Australian Governments. There are very few significant horizontal or vertical curves along the proposed road routes given the topography of the area. The vegetation in the vicinity of the road side is generally sparse, allowing excellent visibility along the route and at intersections. However, visibility does decrease within the increased vegetated areas surrounding Adelaide and the road alignment is less straight.

The section of the Princes Highway between northern Adelaide and Port Wakefield has two lanes in either direction. From Port Wakefield to Port Augusta, there are single lanes in either direction, but a number of overtaking lane facilities are provided. The Stuart Highway and Olympic Way provide single lanes in either direction.

All the above routes are permitted for use by heavy vehicles up to Double Road Trains (36.5m) with the route from Port Augusta to Olympic Dam permitted for use by triple road trains.

Traffic surveys were undertaken at key sections of the transport route using automatic traffic counters during July 2008. The routes were found to carry relatively little traffic outside of metropolitan areas and other than in the vicinity of Roxby Downs, to have an existing traffic Level of Service (LoS) of A on the LoS scale of A (best) to F (worst).

The baseline for this study includes both ongoing movements from the existing OD operations as well as background traffic growth but excludes all ODX related traffic. Background growth rates have been adopted as indicated in the AusLink Adelaide - Darwin Corridor Strategy prepared by the federal government, the Government of South Australian and the Northern Territory Government. This is considered a conservative approach since the government growth forecast already incorporates some allowance for increased movements associated with OD.

A spatial analysis of crashes has been undertaken along the proposed transport routes. On road routes this has highlighted eight key crash intersections generally occurring in metropolitan areas where the cause of a crash tends to vary and has been reported as being attributable to high turning movements or lack of awareness of signs and signals. Two mid-block locations have been identified between Woomera and Olympic Dam with inattention the main cause and four key crash lengths between Port Adelaide and Port Augusta. On the rail routes there have been a total of 13 crashes at level crossings in the past five years.

Future Road Improvements

The following road improvements are to be undertaken as part of existing highway works:

- Port River Expressway, completed mid 2008;
- Northern Expressway Project, including junction improvements on Port Wakefield Road and modifications to the Salisbury Highway Bridge. Works currently underway and completion by 2010;
- Northern Connector Route, planned to connect the Port River Expressway directly to Port Wakefield Road at the northern edge of the metropolitan area; and
- Pimba Rail Crossing Improvements, scheduled 2008/2009.

In addition, some issues have been identified along the Adelaide to Darwin road corridor by the State and Federal Governments. The provision of and the quality of this route as a public highway remains the responsibility of the federal and state governments and this study has assumed that these issues will be addressed as such. Some of the deficiencies are identified as short-term priorities to be actioned by the year 2015.

Future OD/ODX Transport Operation

The ODX project includes the operation of a rail/road intermodal facility at Pimba from 2012 onwards and the operation of a new train line from Pimba to Olympic Dam from 2016 onwards. Prior to the construction of the intermodal facility and the rail line, freight trips to the OD site will be undertaken by road. As the intermodal facility and rail line become available, almost all freight trips, including existing OD operations and ODX operations will convert to rail, lessening the volume of traffic movements.

These proposals will require additional rail services on the lines connecting Pimba to Adelaide and Darwin.

Generated Road Traffic

The additional traffic generated by ODX has been calculated and the impacts assessed. Generated traffic has been split into two categories:

- ODX Heavy Vehicles, which includes all movements associated with on-site construction, related off-site infrastructure projects, receipt of all additional mining commodities, export of all additional extracted and processed materials; and
- Ancillary, including private vehicle movements, servicing of the Roxby Downs and Hiltaba townships, and all other trips such as leisure trips.

The traffic volumes associated with each construction activity and needs for each commodity have been calculated. The volumes are included in Appendix D where the breakdown of each of the commodities together with the required tonnage is detailed as well as construction equipment and materials. This appendix also details the origin of commodities and construction vehicle movements and considers the role of the rail facilities in reducing haulage by road.

The calculation of ancillary trips assumes that the recorded volumes of traffic between Roxby Downs and Port Augusta that are not directly associated with the OD site will grow directly proportionally with the workforce numbers. This is with exception of heavy vehicles that are not directly related to the OD site. Ancillary heavy vehicles are assumed to grow at half that rate due to increased servicing efficiencies that would be assumed with a larger workforce.

The above assumptions are considered to provide a conservatively high estimate of ancillary traffic growth associated with ODX. Appendix E contains a summary of workforce numbers.

The calculation of traffic volumes north of Roxby Downs is based on projected mode share adjusted to incorporate BHP Billiton's bus strategy for workforce movements. It is also based on the shift patterns for the workforce.

The sequence of the Olympic Dam expansion means that a peak level of traffic activity will be reached during construction followed by a lower, steady state, achieved when construction is complete and operation is occurring at the expanded rate. The peak year has been identified as 2015 and the initial steady state year, 2020.

The total AADT volumes for future years has been calculated using the baseline and generated traffic flows for ODX and ancillary traffic for the peak and steady state years. However, the future flows account for the transfer of existing OD loads to rail when the intermodal facility and the rail link to the Olympic Dam become available (Base Traffic ODX). These flows are shown in Table A for all vehicles (All Veh) and heavy vehicles (HV).

Table A – Total AADT Volume

	2015				2020			
	Base Traffic (ODX)*		Total with ODX		Base Traffic (ODX)*		Total with ODX	
	All Veh	HV	All Veh	HV	All Veh	HV	All Veh	HV
Princes Highway (Two Wells)	7833	1259	7809	1235	8399	1345	8338	1285
Stuart Highway (mid point)	996	241	2041	270	1075	257	1823	233
Olympic Way (south of Roxby Downs)	661	155	1794	272	662	155	1409	132

* - *Includes transfer to rail at Pimba for existing OD operations*

Road Traffic Impact

Using the future calculated traffic volumes, an analysis of the Level of Service (LoS) for each link has been undertaken. An acceptable LoS for a link is between LoS A and LoS C inclusive. The results of this study show that for the vast majority of the road network considered, an LoS A is experienced (best). For some roads surrounding Roxby Downs, the LoS falls to C or in one case, D. This is a temporary case during the construction peak period and in all other years considered is shown to have LoS C.

Analysis has been undertaken on key intersections. Analysis of the traffic survey conducted on Olympic Way between Roxby Downs and the OD site identified that representative peak hours occur from 06:00 to 07:00 in the morning and 16:45 to 17:45 in the evening. Based on these peak hours and previously undertaken turning count surveys, intersection analysis has been undertaken using the SIDRA (Signalised & un-signalised Intersection Design and Research Aid) computer program for the following junctions in the base, 2015 peak and 2020 steady state years:

- Olympic Way/Heavy Vehicle Bypass (N);
- Heavy Vehicle Bypass/Andamooka Road; and
- Olympic Way/Heavy Vehicle Bypass (S).

The results of the SIDRA analysis are included in Appendix F and show that:

- All Degree of Saturation measurements are below 0.85;
- All LoS measurements are C or better; and
- All queue lengths are considered reasonable.

Based on these results, it is concluded that there would be no adverse impacts on these intersections.

During construction, items greater than 8m in width will be landed at Port Augusta and pre-assembled at a nearby facility before being moved to the OD. A dedicated haul route will be constructed between the landing facility, the pre-assembly yard and the Stuart Highway north of Port Augusta.

Most over dimensional loads that are between 5.5m and 8m in width will also be transported by sea to the landing facility near Port Augusta and will follow the same route as described above.

Those over-dimensional loads less than 5.5m in width will predominately originate in Adelaide and will be transported to the OD site along the Princes Highway, Stuart Highway and Olympic Way. These loads can be transported under permits or with pilot escort and are not expected to cause significant disruption to other road users.

For the movement of over dimensional loads between 5.5m and 8m in width from Port Augusta to Olympic Dam, a traffic management strategy would be developed to include the utilisation of the network of passing opportunities that are provided for the movement of loads greater than 8m in width. For the movement of over dimensional loads between 5.5m and 8m wide from Adelaide to Port Augusta, it is considered that the existing road network will provide adequate passing opportunities. The detailed traffic management strategy for the movement of over dimensional loads between 5.5m and 8m wide will depend upon government approvals as well as police operational direction and decisions where appropriate.

When the loads are greater than 8m in width, sections of road are temporarily closed between suitable lay-by areas in succession as the load is moved. When the load reaches the subsequent lay-by, it is held there whilst the road is reopened allowing traffic to pass before closing the next section of road. The delay this method causes to other road users has been estimated based on the current available road conditions and lay-by availability, assuming no mitigation. BHP Billiton are proposing additional measures to reduce the disruption to road users to a maximum of 45 minutes. In order to achieve this, the following are required:

- Nine passing bays on the Stuart Highway between Port Augusta and Pimba; and
- Six passing bays on Olympic Way between Pimba and OD.

Currently, there are 10 bays on the Stuart Highway (of various spacing) and none on Olympic Way. The exact location of the proposed bays is not yet known and would be subject to a detailed investigation to determine the required spacing and size to accommodate waiting traffic.

In addition to the above will be the implementation of a Traffic Management Plan for the safe movement of over-dimensional loads. Inconvenience to road users is likely to be reduced through the following measures:

- Obtaining approval for movement of materials from the appropriate authorities;
- Notification of over-dimensional loads movements and interruptions through regular community announcements;
- Aiming to transport loads at times that are outside of peak period;
- Installing sufficient bypass areas along the route to reduce disruptions to road users; and
- The provision of amenities, refreshments and information to motorists at each of the passing bays.

BHP Billiton are also discussing a number of measures with the South Australian Government to further reduce the level and frequency of disruption. These options include the use of convoy travel (multiple loads per road closure) and night travel.

Rail Traffic and Impact

An analysis of existing train movements and future train movements associated with ODX has been undertaken. It is proposed that as a result of the operation of the intermodal facility followed by the rail spur connecting to the OD site, an additional train service would go to and from Darwin per day and an additional two per day would go to and from Adelaide. These services are shown in Table B.

Table B – Existing and Future Proposed Train Movements

	Tarcoola – Darwin	Tarcoola – Pimba – Port Augusta	Port Augusta – Adelaide	Port Augusta – Whyalla / Port Bonython
Existing trains per week each way				
Current Traffic Levels	17	41	65	7
Additional trains per week each way				
ODX Proposed New Train Services	7	14	14	0

An analysis of the line operation with the proposed additional trains shows that the existing rail corridors will be able to accommodate this increase.

Safety

A risk assessment has been undertaken and is included as a separate chapter within the EIS. The scope of this assessment includes transport related risks.

Summary and Conclusions

The following is concluded:

- It is proposed to expand the operation of the OD site and this will generate additional road and rail trips;
- Surveys have been undertaken of existing road conditions, traffic volumes and rail routes;
- ODX generated trips by road and rail have been calculated based on data provided by BHP Billiton;
- The provision of an intermodal facility at Pimba from 2012 and the additional rail spur from Pimba to the OD site from 2016 will allow haulage to be transferred to rail reducing road impact;
- Ancillary trips generated by the townships of Roxby Down and Hiltaba, tourist, private and leisure trips have been calculated using workforce estimates and existing surveyed traffic flows;
- The impact of the expansion has been assessed for all roads included in the scope of the report during normal operation and it is found that there would be no significant impact on the LoS provided for the various road links and intersections;
- The impact of the movement of over-dimensional loads has been assessed. BHP Billiton are proposing a network of passing bays which aim to limit the maximum delay for road users to 45 minutes. A traffic management plan and further discussions with the government are also proposed to reduce the impact to road users and inform the community;
- The impact of the expansion has been calculated for the rail routes from Pimba to Darwin and Pimba to Adelaide. This has found that additional services can be accommodated within the existing rail corridor of each route; and
- An analysis of crashes in the past five years along the road route has been undertaken that revealed eight locations that met the criteria for the Federal Government's Black-Spot Programme. In addition, an analysis of all crashes at level crossings along the route of the rail revealed 13 crashes. A risk assessment that includes transport has been undertaken for ODX in a separate study that forms part of the EIS.

1 Introduction

BHP Billiton is proposing to expand its existing mining and minerals processing operation at Olympic Dam (OD), located approximately 570km northwest of Adelaide in South Australia (See Figure 1).

This traffic impact assessment provides an assessment of the traffic implications of the proposed expansion. The key objectives of this assessment are as follows:

- To establish and review the existing traffic conditions including the current road environment, existing traffic conditions along the public road network and the current traffic generated by the existing OD operation;
- To estimate traffic volumes as a part of existing operations for future years to establish a baseline (excluding ODX) for comparison with the impact of the proposed expansion;
- To estimate the peak additional traffic and rail movements generated during the Olympic Dam Expansion (ODX); and
- To provide an assessment of the impact of the additional road and rail movements associated with ODX.

This assessment includes a review of the traffic impacts of the proposed expansion from the years 2010 (dependant on government and BHP Billiton board approval) and 2020. From 2020 onwards, ODX is assumed to be operating in a steady state.

The traffic impacts for the operation of ODX depend on the number and frequency of transport trips. The impact of these trips to the road network is dependent on the mode of transport of the commodities and exports.

As a part of ODX, a number of transport infrastructure improvements are proposed, which aim to increase the viability of rail transport for commodities and exports. The transport infrastructure improvements and the timing relating to these improvements are broadly described in Table 1.

Table 1 – Major Proposed Transport Infrastructure Summary

Timing	Transport Infrastructure	Description
2010 to 2011	Existing road network	Generally all materials, equipment, infrastructure, commodities and exports are transported by road (current situation).
2012 to 2015	Pimba Road/Rail intermodal facility constructed during 2011 and operational from 2012.	Some commodities and exports to be transported by rail between Port Adelaide and Pimba and by road between Pimba and Olympic Dam. Remaining items transported by road.
2016+	Rail spur construction is completed in 2015 and begins operation in 2016.	Most commodities and exports to be transported by rail, with few items remaining on road.

The proposed expansion involves the movement of materials, equipment, commodities and exports locally, nationally and internationally. While the origins and destinations of these trips vary, a significant proportion of road transport will travel via Port Adelaide (See Table 2) as summarised from data provided by BHP Billiton (attached as Appendix D).

Table 2 – Road Trip Origins

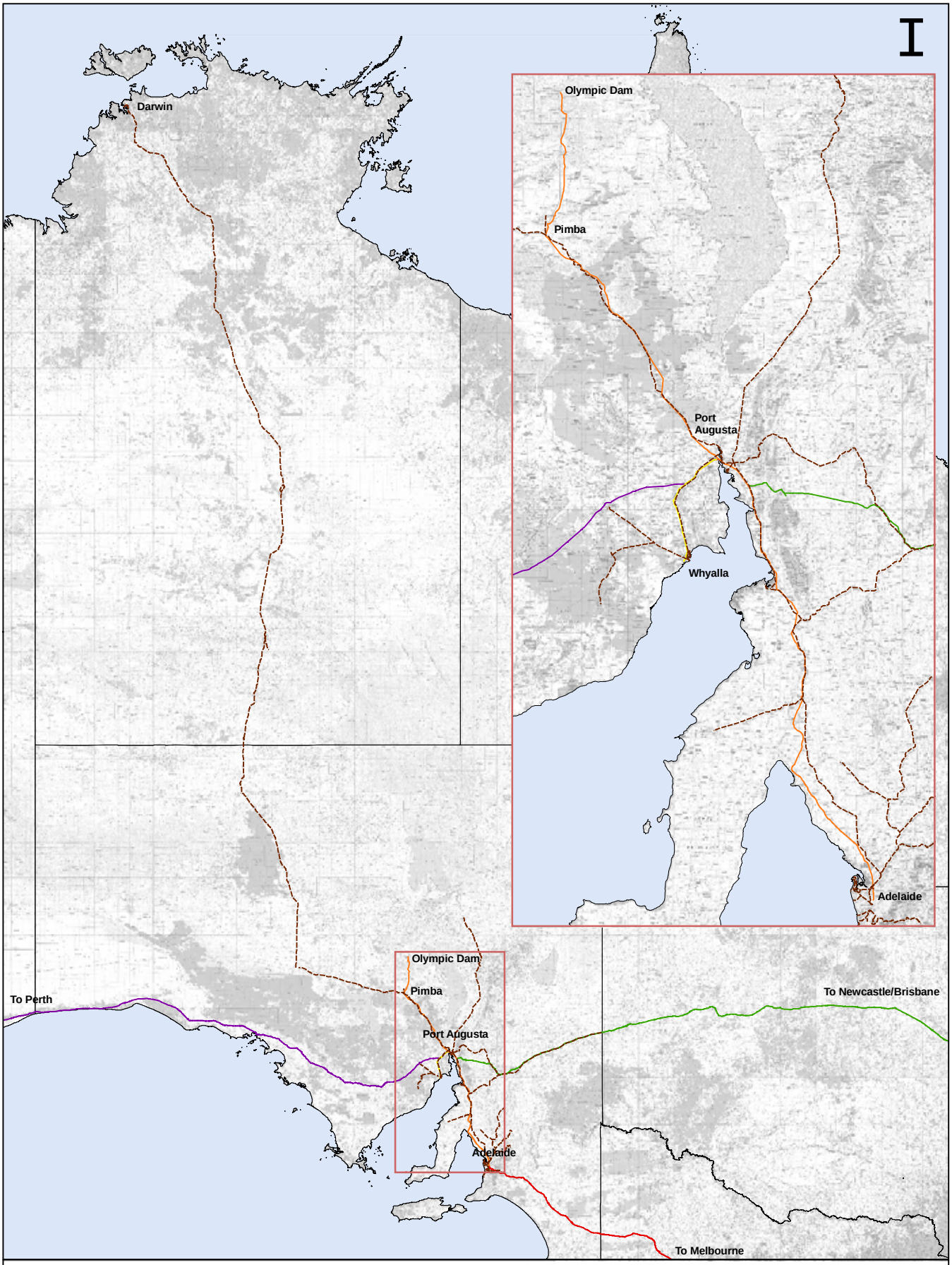
Origin	Percentage
Port Adelaide	50-55%
Port Augusta (including Landing Facility)	5-10%
Whyalla	Less than 1%
Victoria	20-25%
New South Wales	10-15%
Brisbane	Less than 1%
Perth	Less than 1%

Based on the above, any increase in operations at the OD site would have the most impact upon links between Port Adelaide to Port Augusta (which would include traffic from Victoria) and Port Augusta to Olympic Dam. While there will be some minor increases in traffic volumes on the remaining road links, the level of impact is assumed to be minimal and, accordingly, are not included within the scope of this report.

As the proposed expansion would result in additional train movements to Port Adelaide and the Port of Darwin, consideration is also given to the impact of the additional rail movements on the road network. These additional rail movements would occur following the completion of the intermodal facility at Pimba and the rail spur from Pimba to Olympic Dam.

The changes to future traffic and rail movements would also affect exposure to road safety issues. A risk analysis has been undertaken as part of the EIS study and is included as a separate appendix to the EIS.

The transport network forming the key scope of the report is shown in Figure 2.



Legend

- Rail
- Adelaide to Olympic Dam
- Melbourne to Olympic Dam
- Newcastle/Brisbane to Olympic Dam
- Whyalla to Olympic Dam
- Perth to Olympic Dam

FIGURE 1

Issue	Date	By	Chkd	Appd
P1	25-07-08	CJ	TK	PJC

Client
BHPBilliton

Job Title
Traffic Impact Assessment EIS

Drawing Title
Olympic Dam Location Plan

Kilometers
0 75 150 300

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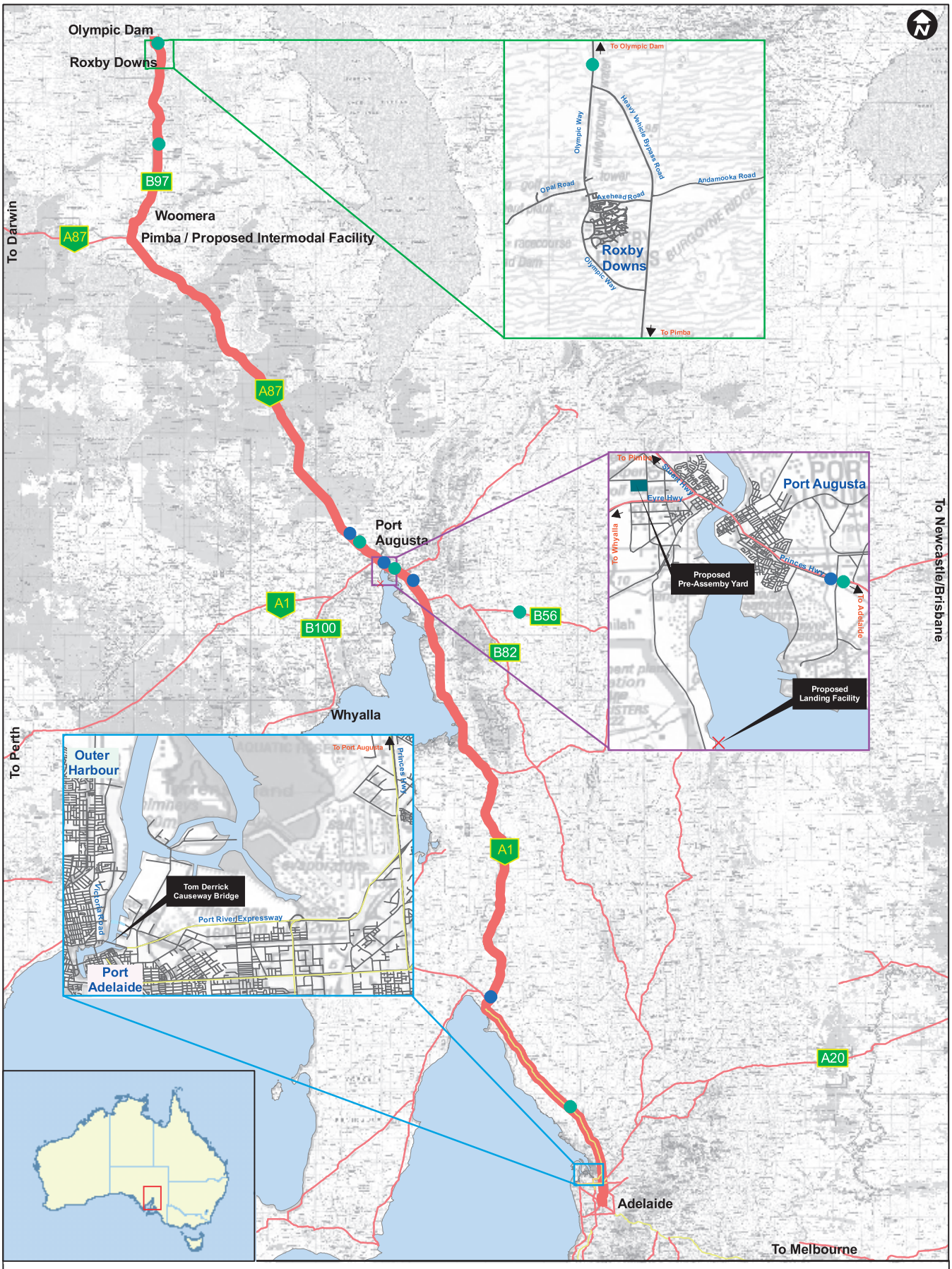
Scale at A4
1:12,500,000

Drawing Status
Draft

Job No	Drawing No	Issue
85200-01	001	P1

J:\85200-01\Traffic Impact Assessment\04-00-00_Arup Project Data\04-07-00_Maps\ArcGIS\Location Plan\Aust_map.mxd



Legend

- Adelaide To Olympic Dam
- Dual Carriageway
- Principal Roads
- Other Roads
- 2008 Survey Location
- Previous Survey Location

FIGURE 2

Issue	Date	By	Chkd	Appd
P1	25-07-08	CJ	TK	PJC

Client
BHP Billiton

Job Title
Traffic Impact Assessment EIS

Drawing Title
Report Scope and Survey Locations

Kilometers
0 15 30 60

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Scale at A4
1:2,300,000

Drawing Status
Draft

Job No	Drawing No	Issue
85200-01	001	P1

2 Existing Conditions

2.1 Road Network

2.1.1 Road Alignment

The proposed ODX project will require the movement of materials from various locations around Australia, with a particular focus on the road links from the Port of Adelaide to Port Augusta and then from Port Augusta to Olympic Dam via Pimba. The key roads that form part of the route from Port Adelaide to Olympic Dam are highlighted in Figure 2.

2.2 Road Classification, Responsibilities and Policies

2.2.1 Road Classes

South Australian State highways are categorised into A and B class roads. These classes are of a sliding scale representing the importance of the route in the State network, both in terms of the destination that it services and the type and volume of traffic that it carries.

State highways provide a sealed road surface and unrestricted access for all standard vehicle classes. Transport SA is responsible for the management and maintenance of the State highway network.

The most direct route between capital cities forms the National Highway System. The National Highway System is maintained by state governments through funding provided by the Federal Government. The route from Port Adelaide to Olympic Dam includes a number of roads, some of which are a part of the National Highway System. The authorities responsible for each of the key road links are as follows:

- Princes Highway (A1) also named Port Wakefield Road and Snowtown Road between Port Adelaide and Port Augusta;
- Stuart Highway (A87) between Port Augusta and Pimba; and
- Olympic Way (B97) from Pimba to Olympic Dam also known as the Roxby Downs Road between Pimba and Woomera.

The highways described above are the principal (and in the case of the Stuart Highway and Olympic Way, the only) travel routes between the respective townships. In addition to these key road links, there are a number of other roads in the vicinity of Port Adelaide that provide connection between Outer Harbour and Princes Highway. These road links include Victoria Road, Tom Derrick Causeway Bridge and the Port River Expressway. Each of these road links are part of the National Highway Network.

2.2.2 Key Strategic Studies and Policies

The transport network between Adelaide and Olympic Dam includes a number of key sections of the national transport network. There have been a number of studies undertaken of these transport links which have been used to provide a basis for governmental policy regarding the use of these roads. In addition each government prepares five yearly reports on infrastructure within its state / territory. Some of the key studies include:

- Adelaide to Darwin Corridor Strategy (2007). Relevant issues from this study are discussed in Section 2.6.5;
- The National Highway System: Investment Priorities and Safety, Australian Automobile Association (January 2002);
- Strategic Infrastructure Plan for South Australia, Government of South Australia (April 2005); and

- Infrastructure in South Australia Five Yearly Report to the Council of Australian Governments, Government of South Australia (February 2007).

The infrastructure in South Australia five-yearly report noted:

"Demand for rail freight services is expected to be driven by expansion in the mining and agribusiness industries. Specific examples are copper and uranium from OD, mineral sands from the Murray Mallee and Eyre Peninsula, the proposed development of a pulp mill near Penola in the south east and development of iron ore deposits on the Eyre Peninsula. These projects are expected to trigger the need for investment in rail infrastructure and drive the development of intermodal terminals".

The Strategic Infrastructure Plan for South Australia report observed that:

"Mining at Olympic Dam and in the Gawler Craton could see production more than double in five to 10 years, which may result in an additional 2.8 million tonnes per annum of gold, copper and associated products being transported through the region"; and

"Transport services to support Olympic Dam expansion including evaluation of options to augment transport services for expanded operations at Olympic Dam, have been deemed a Priority 1 task with the lead in development to be taken by both the private sector and the (SA) State Government."

The Adelaide to Darwin Corridor strategy looks at the current corridor and foreseeable changes up to the year 2030

2.2.3 Operational Policies, Regulations and Guidelines

Road transport operators are controlled by various policies and regulations. Of particular relevance are policies and regulations relating to:

- Carriage of dangerous goods. This is discussed further below; and
- Over-dimensional vehicles and loads – this is discussed further in Section 3.8.1.

The transportation of dangerous goods by road is regulated by the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). To facilitate the import and export of dangerous goods, the ADG Code has been restructured to align with the structure of the model regulations in the 15th edition of Recommendations on the Transport of Dangerous Goods: Model Regulations (UN 15), published in 2007 by the United Nations. The ADG Code details the legal requirements for the transport of dangerous goods within Australia.

Vehicles carrying dangerous goods are required to be marked externally as prescribed in the ADG Code.

Drivers of vehicles transporting dangerous goods in bulk are required to have completed an approved training course and must receive authorisation by a State Competent Authority.

The route for dangerous goods vehicles is dependent on the vehicle type. Under section 13.1.4 of the ADG Code, policy stipulates that:

- Routes for road vehicles transporting dangerous goods must be pre-planned whenever possible to the extent practicable;
- Routes should be selected to minimise the risk of personal injury or harm to the environment or property during the journey;
- Routes should wherever practicable avoid heavily populated or environmentally sensitive areas, congested crossings, tunnels, narrow streets, alleys, or sites where there may be a concentration of people; and

- A road vehicle transporting dangerous goods must observe any requirements or restrictions on the selection of routes or times of travel which have been determined by the Competent Authority.

The current operations of OD include the transport of dangerous goods within this framework.

2.3 Road Environment

2.3.1 General

There are very few significant horizontal or vertical road alignment curves between Port Adelaide and Olympic Dam. The vegetation in the vicinity of the road side is generally sparse from Port Augusta, allowing excellent visibility along the route and at intersections. Table 3 details the main characteristics for each link along the route from Adelaide to Port Augusta and onto Olympic Dam.

A number of photographs are referenced in Sections 2.3.2 to 2.3.4 below and are contained in Appendix A. These photographs were taken during a site visit undertaken between 9th and 12th July 2008

Table 3 – Existing Road Link Characteristics

Road Section	No. Lanes (either direction)	Lane Width (m)	Shoulder Type	Width of Shoulder (m)	Provision of Median	Over-taking Lanes	Speed Limit (km/h)
Princes Highway							
Outer Adelaide	2	3.5	Unsealed	2.0	Yes	n/a	110*
Outer Adelaide to Port Wakefield	2	3.65	Unsealed	2.0	Yes	n/a	110*
Port Wakefield to Port Augusta	1	3.65	Unsealed	2.0	No	28	110*
Port Augusta	2	3.8	Unsealed	2.0	Yes	n/a	50
Spencer Gulf Bridge	1	4.0	Sealed	0.5	No	0	50
Stuart Highway							
Port Augusta to Hesso	1	3.5	Unsealed	1.75	No	0	110
Hesso to Pimba	1	3.4	Unsealed	1.75	No	2	110
Olympic Way							
Pimba to Olympic Dam	1	3.5	Unsealed	1.75	No	0	110
Yorkeys Crossing							
Port Augusta (E) to Stuart Highway	1	3.0-4.0	n/a	n/a	No	n/a	n/a

** - Speed limit reduces to 50 km/h in built up areas*

2.3.2 (A1) Port Adelaide to Port Augusta

The A1 connects northern Adelaide to Port Augusta and is generally referred to as the Princes Highway. Details are provided in Table 3.

All intersections outside of the metropolitan areas are generally of three-arm priority control layouts (un-signalised three-arm junction) with merging and diverging lanes for turning traffic in accordance with Austroads standards. Typical layouts are shown in Photographs 1 to 4.

A number of overtaking lanes are provided in either direction along this stretch of the A1. Generally, these facilities provide one additional lane giving priority for one direction to overtake. The opposing direction is able to overtake when both lanes with priority are free of traffic. Examples of these road sections are shown in Photographs 5 to 6.

Typically, all main intersections on the A1 between Port Wakefield and Port Augusta are of the three-arm priority type with a reserved area for right-turning traffic from the main road and merging / diverging lanes for left turners. Some access roads form priority intersections with the A1 without such turning facilities. These are generally unsealed, low priority routes or access tracks to farms. Examples of these intersections are shown in Photographs 7 and 8.

2.3.3 Stuart Highway (A87), Roxby Downs Road and Olympic Way (B97) – Port Augusta to Olympic Dam

The road environment for the Stuart Highway (A87) and Olympic Way (B97) route are similar given the remoteness and topographies of the areas. Details are provided in Table 3 and an example of the typical cross sections for Stuart Highway and Olympic Way are provided in Photographs 9 and 10. The specific road widths and gradients between Port Augusta and Olympic Dam are shown in Figure 3 and Figure 4 respectively.

There are very few major intersections along the route. These locations generally provide protected right turn facilities along the major road. Similarly, the size of land holdings within the area is such that there are few property access points to the roads along the route outside the main township areas. Typical intersections are shown in Photographs 11 and 12 and a typical rest area is shown in Photograph 13.

Overtaking lanes are only provided where there is significant gradient. These are indicated on Figure 3 for the route section from Port Augusta to Pimba along with general road widths.

Pimba and Woomera

At Pimba, the route to Olympic Dam turns right from the Stuart Highway (A87) to Roxby Downs Road (B97). The route travels along Roxby Downs Road for eight kilometres before turning right onto Olympic Way (B97) just north of Woomera. These intersections are described in more detail in Section 2.3.4.

Roxby Downs and Olympic Dam

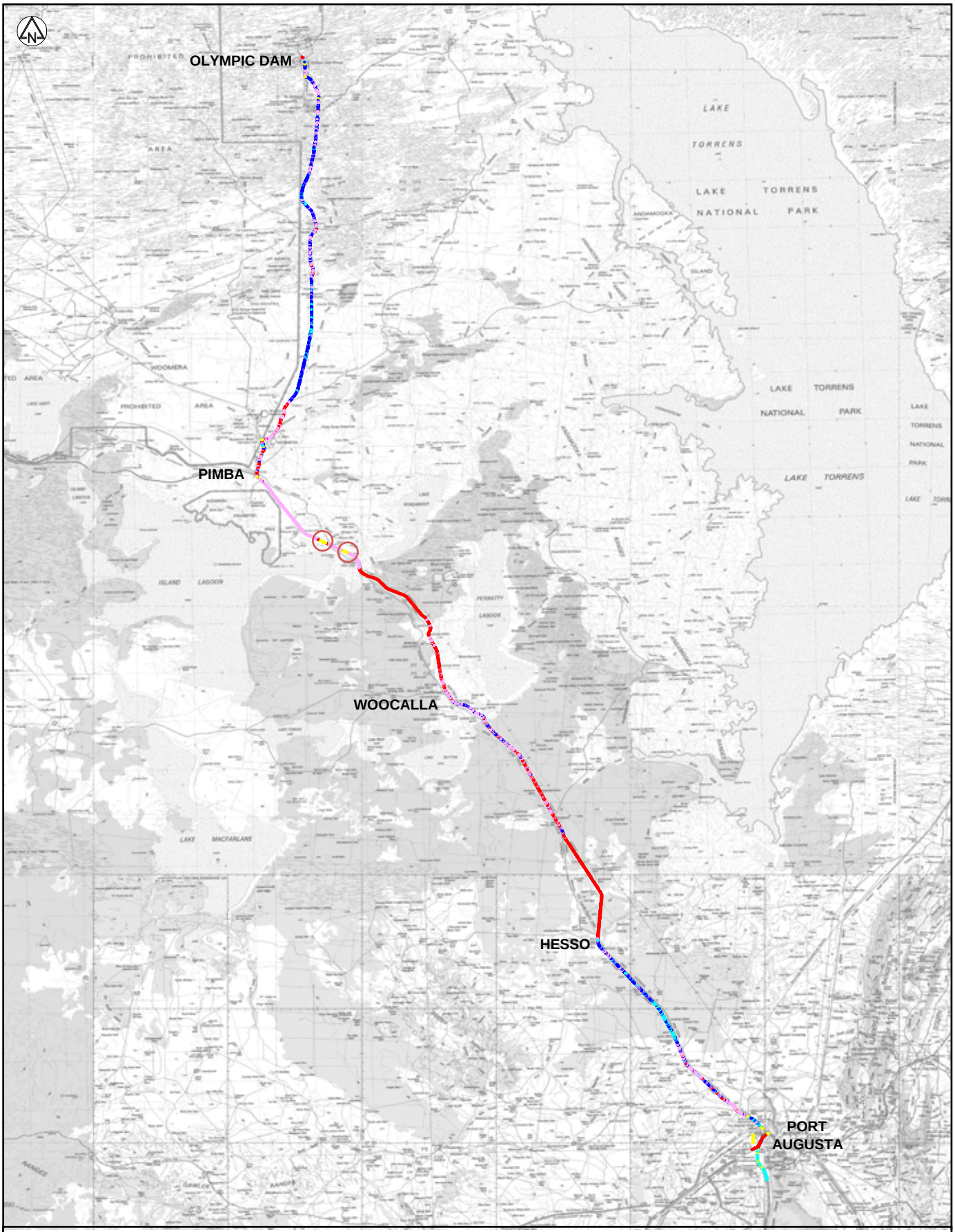
Olympic Way (B97) provides a route to Roxby Downs and continues up to Olympic Dam Airport and the OD site. Within the limits of Roxby Downs, a number of access routes connect with Olympic Way. Due to the number of heavy goods movements using this route, a bypass has been constructed around the periphery of Roxby Downs. The bypass now known as the Heavy Vehicle Bypass has limited access to Roxby Downs as indicated in Figure 2. This bypass has been constructed to a similar standard as Olympic Way. The two intersections where the bypass connects to Olympic Way are described in Section 2.3.4.

A security cordon is located three kilometres south of Olympic Dam. Warning lights signify when the security booths are manned and vehicles are expected to stop at this point to provide details of their visit together with the relevant paper work to gain access to the site. Photograph 14 shows the security cordon.

Yorkeys Crossing

Yorkeys Crossing is an unsealed track that provides a route connecting from east Port Augusta to the Stuart Highway north of Port Augusta. The bridge crossing Spencer Gulf in Port Augusta has a 4.0m width restriction and any loads wider than this need to use Yorkeys Crossing as an alternative route.

In order to access this route from the Princes Highway east of Port Augusta, Footner Road, Racecourse Road, Carlton Parade and Rogers Street are used which are sealed roads. At the western end of Yorkeys Crossing, the remaining 200m of this route is sealed and a priority intersection is formed with the Stuart Highway. This route is indicated on the DTEI Overmass and Oversize routes.



Legend

Road Widths

- < 6.8 m
- 6.8 m - 7.0 m
- 7.0 m - 7.2 m
- 7.2 m - 7.6 m
- > 7.6 m
- Overtaking Lanes

FIGURE 3

Issue	Date	By	Chkd	Appd
P1	25-07-08	CJ	TK	BAJ

Client

BHP Biliton

Job Title

Traffic Impact Assessment EIS

Drawing Title

Road Width and Overtaking Lanes Port Augusta to Olympic Dam

0 10 20 30

Kilometres

ARUP

Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
www.arup.com.au

Scale at A4

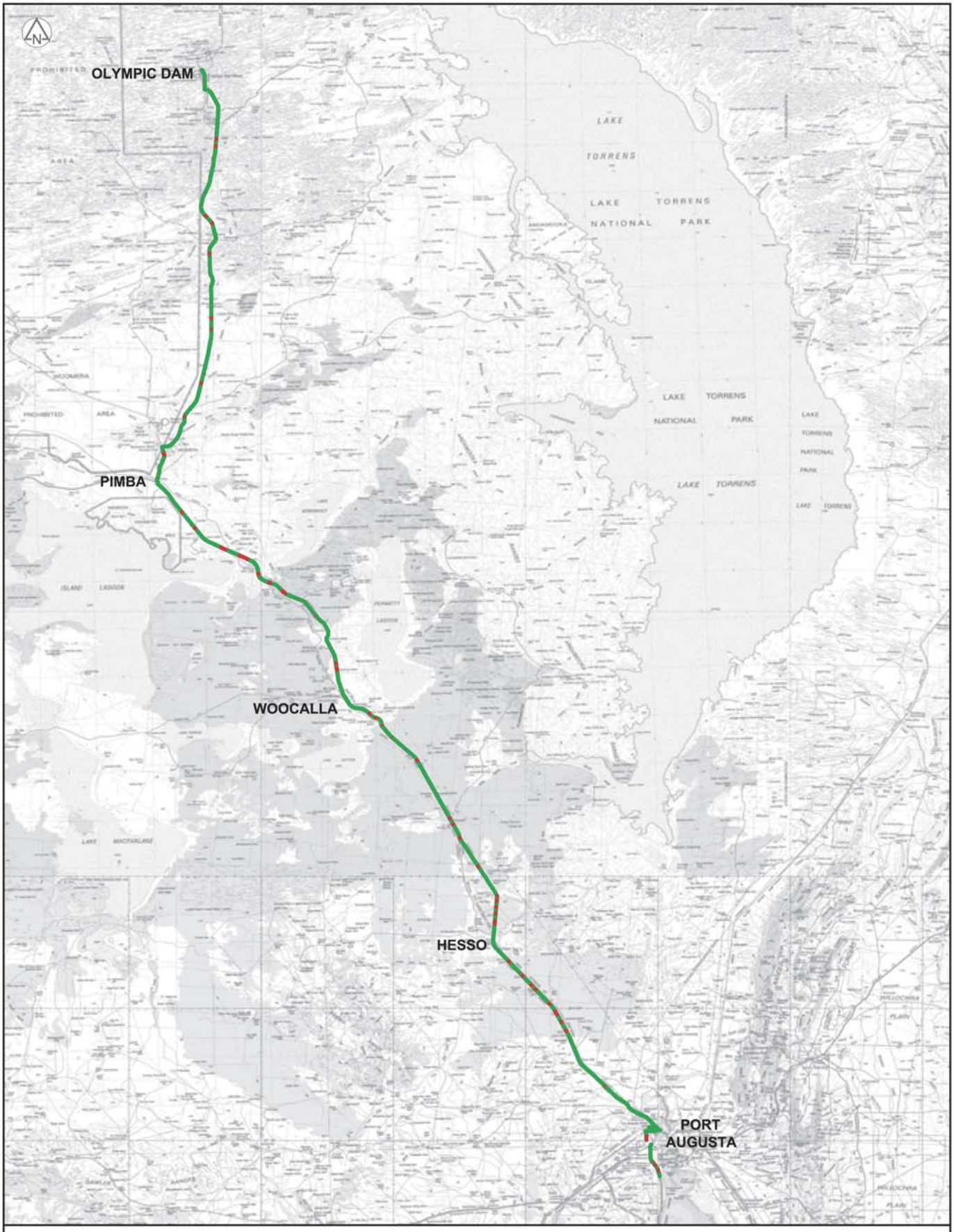
1:1,100,000

Drawing Status

Draft

Job No.	Drawing No.	Issue
85200-01	001	P1

J:\085967-00\04-00-00_Arup Project Data\04-06-00_Maps\ARRB 2007 AND 2008 Data.wor



Legend

Gradient

- 3% to 5%
- -3% to 3%
- -5% to -3%

FIGURE 4

Issue	Date	By	Chkd	Appd
P1	25-07-08	CJ	TK	BAJ

Client

BHP Biliton

Job Title

Traffic Impact Assessment EIS

Drawing Title

Road Gradient
Port Augusta to Olympic Dam

0 10 20 30
Kilometres

ARUP
Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
www.arup.com.au

Scale at A4

1:1,100,000

Drawing Status

Draft

Job No.	Drawing No.	Issue
85200-01	001	P1

2.3.4 Key Intersections and Features

There are a number of key intersections along the route from Port Adelaide to Olympic Dam that may be affected by the increase in traffic volumes or by use for the transport of over-dimensional loads.

Port Adelaide

The Port River Expressway now connects Port Wakefield Road (A1) to Francis Street. A signalised intersection is provided at the eastern end of this newly constructed road connecting with the A1 and signals are provided at the intersection with Ocean Steamers Road at the western end of the route. The new expressway provides two lanes in either direction and has a speed limit of 90km/h.

The recent construction of the Tom Derrick Causeway Bridge from the western end of Francis Street to Outer Harbour provides a continuation of the Port River Expressway directly to Outer Harbour utilising two lanes in either direction. Photographs 15 to 17 describe the main features of this route.

Port Augusta

The Princes Highway (A1) provides the main east to west through route for Port Augusta. This road enters the city from the east on a raised embankment crossing Bird Lake and many intersections provide access into the city. The main intersections are:

- Edinburgh Terrace – three arm priority;
- Carlton Parade – four arm signalised;
- Flinders Terrace – four arm signalised;
- Mackay Street – three arm priority;
- Caroona Road / Burgoyne Terrace – four arm signalised; and
- Eyre Highway (A1) / Stuart Highway (A87) – three arm priority.

Photographs 18 to 23 show each of the intersections. A bridge crosses a tributary into Spencer Gulf between Mackay Street and Caroona Road.

The placement of traffic lights at three of the above intersections suggests relatively high traffic volumes travelling along this section of the A1 and / or turning traffic onto the access routes into the town centre. The traffic lights also provide additional safety for pedestrians wishing to cross the road.

Port Augusta Landing Facility and Pre-Assembly Yard

Locations have been identified for a landing facility in Spencer Gulf and a pre-assembly yard close to the Stuart Highway. Existing roads link the landing facility to the pre-assembly yard, however it is proposed that access from the landing site would be onto a dedicated access corridor from the landing facility to the pre-assembly yard as described in Section 3.8.

Currently, heavy vehicles travelling from the pre-assembly yard location would join the Stuart Highway via Old Tarcoola Road. Old Tarcoola Road forms a priority intersection with the Stuart Highway as shown in Photographs 30 and 31. Old Tarcoola Road is currently used for access by road trains to an existing lay-down yard. No merging or diverging lanes are provided onto the main carriageway but large radii curves tangent the edges of the main and minor carriageways. A separate right turn lane for traffic turning from the Stuart Highway to Old Tarcoola Road is provided and visibility is good for all traffic.

Pimba and the Intermodal Transfer

The route from Port Augusta to Olympic Dam turns right from the Stuart Highway to Roxby Downs Road at Pimba. Pimba is a small township consisting of about six houses, a truck stop and a rail station which is currently only used as a passing loop. This intersection incorporates separate merging and diverging lanes for left turning traffic and a separate central lane for right turning traffic. This area is depicted in Photographs 32 to 36.

Roxby Downs and Bypass

Figure 2 shows the current layout of main roads at Roxby Downs. The Heavy Vehicle Bypass road beyond Roxby Downs to Olympic Way forms priority control intersections north and south of the town.

The intersection to the south of Roxby Downs allows priority for ongoing traffic to the bypass from Olympic Way. Local traffic turns left onto the continuation of Olympic Way to gain access to Roxby Downs. This intersection incorporates separate merging and diverging lanes for left turning traffic and a separate central lane for right turning traffic. Visibility is excellent in all directions. Photographs 37 to 39 show this intersection.

To the north of Roxby Downs, the intersection between the Heavy Vehicle Bypass Road and Olympic Way allows priority for ongoing traffic on Olympic Way. This intersection incorporates separate merging and diverging lanes for left turning traffic and a separate central lane for right turning traffic. Visibility is excellent in all directions. Photographs 40 to 42 show this intersection.

Between the two intersections of Olympic Way with the Heavy Vehicle Bypass, one access road known as Axehead Road connects the two main roads. This route allows direct access from the centre of Roxby Downs to either Olympic Way or the Heavy Vehicle Bypass. This includes bus routes from the neighbourhood centre. The two intersections are shown in Photographs 43 and 44.

Immediately to the north of the intersection with Axehead Road, a priority intersection with Andamooka Road lies on the Heavy Vehicle Bypass. This provides access to the village of Andamooka. This intersection incorporates separate auxiliary lanes for left turning traffic and a separate central lane for right turning traffic. Visibility is excellent in all directions

2.4 Traffic Data

2.4.1 Previously Undertaken Traffic Surveys

Existing traffic data obtained from the DTEI for previous Olympic Dam traffic studies are provided in Table 4. These surveys allow useful comparison to newly undertaken traffic surveys and the locations of both are shown in Figure 2.

Table 4 – Traffic Volumes

Road (Location)	Survey Period	Direction	Traffic Volume		Type (%)		
			5 day	7 day	Car*	Bus /LC	HV*
Stuart Highway (northwest of Yorkeys Crossing, north of Port Augusta)	Jan 1 – Dec 31, 2006	Two-way	803	784	75	5	20
		Northbound	401	400	-	-	-
		Southbound	402	385	-	-	-
Princes Highway (Snowtown Road), North of Port Wakefield	Jan 1 – Dec 31, 2006	Two-way	3,410	3,292	77	3	20
		Northbound	1,712	1,662	-	-	-
		Southbound	1,697	1,631	-	-	-
Olympic Way, northeast of Woomera	Aug 21 – Aug 27, 2006	Two-way	547	484	74	5	21
		Northbound	262	229	-	-	-
		Southbound	285	256	-	-	-

**Note: Car includes 'cars towing' (i.e. class 1 and 2 vehicles), Bus/LC is Bus and 2 Axle Trucks, HV is Heavy Vehicles*

2.4.2 Seasonal Variations

The results of the annual traffic count undertaken along Princes Highway and Stuart Highway in 2005 and 2006 show the weekly variation in traffic volumes over the year as shown in Figure 5 and Figure 6. The locations of these surveys were 400m north Port Wakefield (Princes Highway) and 1.1km north of Yorkeys Crossing (Stuart Highway) respectively. It is assumed the seasonal variation can be attributed to a number of factors including freight, tourism or agricultural seasonal variations

The profiles for the 2005 and 2006 variations are very similar for each highway. Where differences do occur between the two surveys, an average is taken between the two to be applied to the 2008 traffic surveys.

In order to establish AADT volumes the Weekly Average Daily Traffic (WADT) volumes need to be adjusted according to the seasonal factors calculated from Figure 5 and Figure 6. A Weekly Seasonal Factor (WSF) of 1.00 indicates a week where the WADT volume is equal to the AADT volumes. Essentially, the lowest WSF (below 1) has the greatest amount WADT volume for the year.

The WSF along the Princes and Stuart Highway ranges from 0.85 to 1.10 and 0.80 to 1.28 of the AADT respectively.

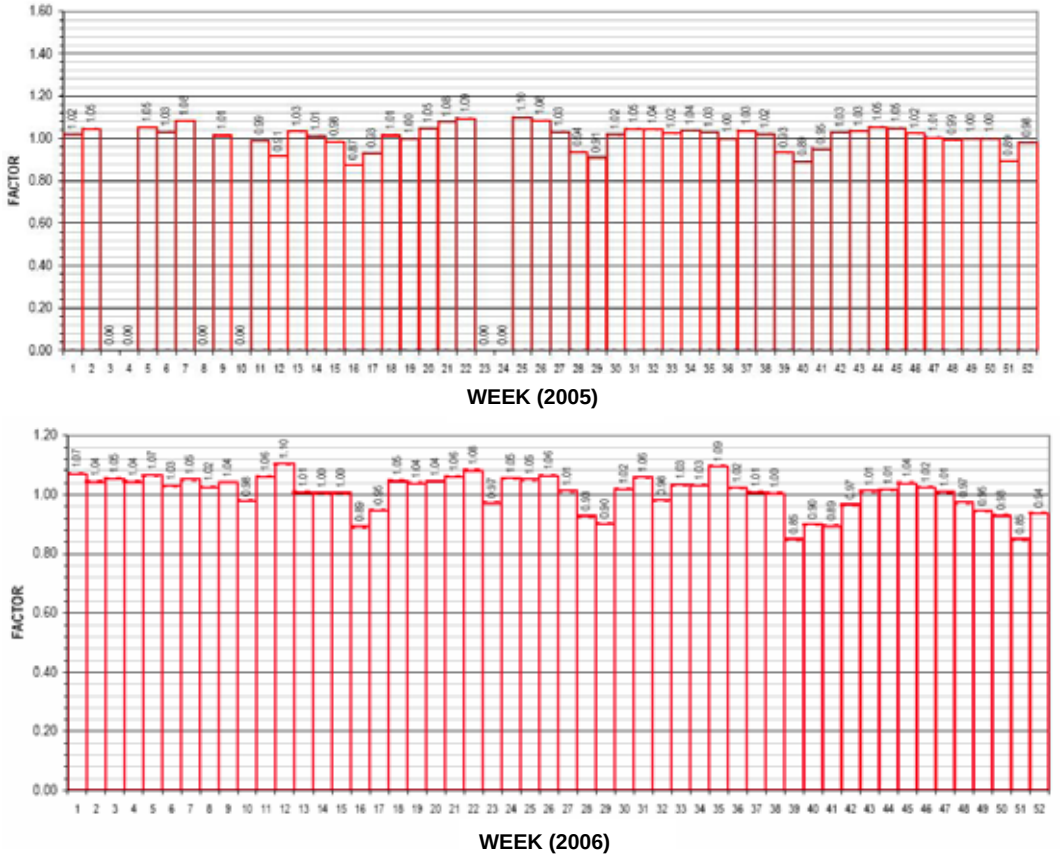


Figure 5 – Princes Highway Weekly Seasonal Factors for Calendar Year 2005 & 2006

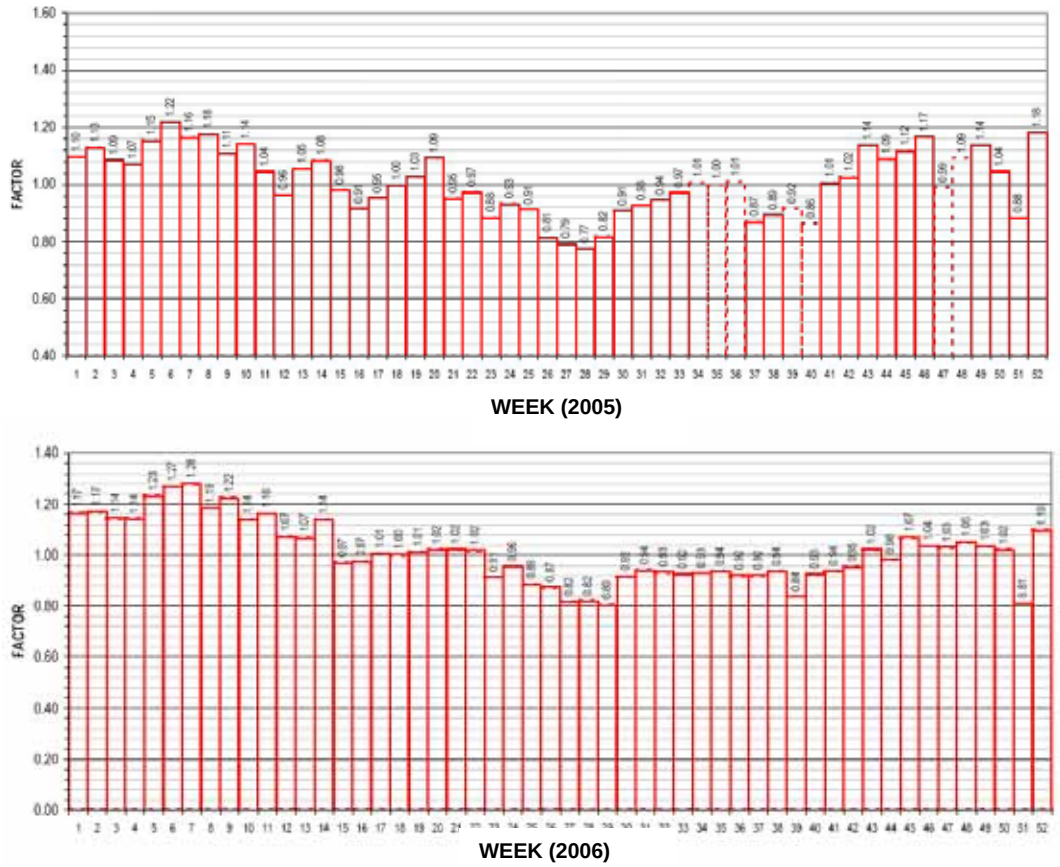


Figure 6 – Stuart Highway Weekly Seasonal Factors for Calendar Year 2005 & 2006

Traffic volumes along the Princes Highway are more consistent than Stuart Highway. The Stuart Highway has the greatest traffic volume between June and September, with almost every week during this period recording volumes above the overall weekly average for the year.

Consideration was also given to the seasonal variation along Olympic Way. However, as Olympic Dam is the predominant traffic generator for Olympic Way and operations at Olympic Dam are not seasonally dependent, there is likely to be no significant seasonal variation for traffic along Olympic Way.

2.4.3 2008 Traffic Surveys

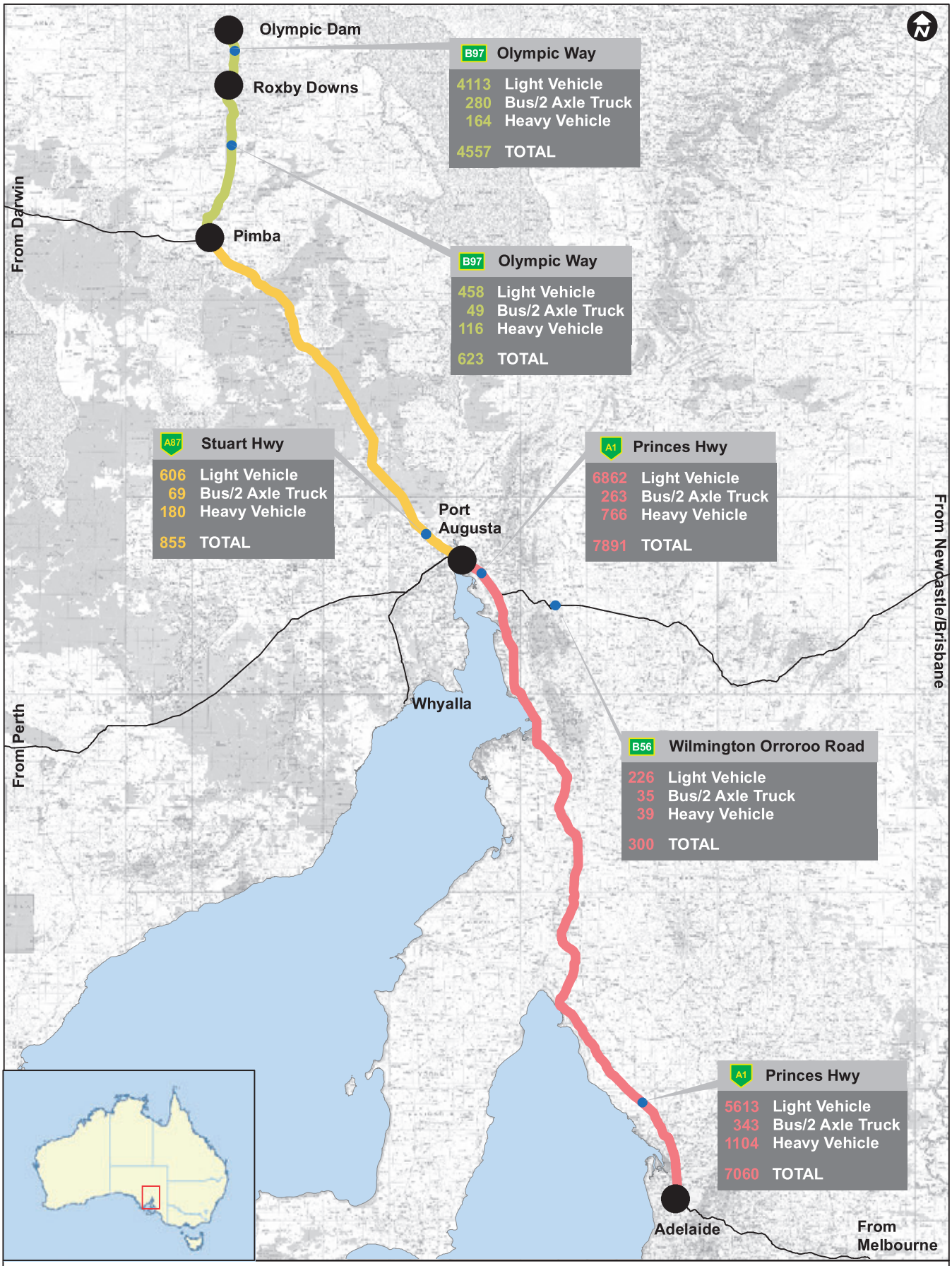
In order to identify the existing traffic conditions along the route, traffic counts were undertaken in July 2008 at six locations between Adelaide and Olympic Dam. The locations of these traffic counts and a summary of the results are provided in Table 5 and Figure 7.

The traffic survey results at the six different locations have been modified based on a Weekly Seasonal Factor (WSF) to achieve AADT volumes. Refer to Section 2.4.2 regarding the seasonal variation of traffic.

Table 5 – Seasonally Adjusted Daily Traffic Volumes 2008

Location	Survey Period	WSF[1]	Direction	Cars/ Car Towing	Bus/2 Axle Trucks	Heavy Vehicles Volume	Total AADT
Princes Highway (A1)							
2km North of Mallala Two Wells Road, Two Wells	21-25 July 2008	0.91 (Week 29)	Two-way	5613 (79%)	343 5%)	1104 (16%)	7060 (100%)
			Northbound	2856 (79%)	217 (6%)	542 (15%)	3615 (100%)
			Southbound	2756 (80%)	138 (4%)	551 (16%)	3445 (100%)
1.8km North of Range View Road, Stirling North	14-18 July 2008	0.90 (Week 29)	Two-way	6862 (87%)	263 (3%)	766 (10%)	7891 (100%)
			Northbound	3378 (86%)	143 (4%)	399 (10%)	3920 (100%)
			Southbound	3484 (88%)	121 (3%)	367 (9%)	3972 (100%)
Wilmington Orroroo Road (B56)							
500m East of Main North road, Wilmington	14-18 July 2008	0.90[2] (Week 29)	Two-way	226 (75%)	35 (12%)	39 (13%)	300 (100%)
			Westbound	98 (69%)	22 (16%)	21 (15%)	141 (100%)
			Eastbound	128 (81%)	12 (8%)	18 (11%)	158 (100%)
Stuart Highway (A87)							
1.1km Northwest of Yorkeys Crossing	14-18 July 2008	0.80 (Week 29)	Two-way	606 (71%)	69 (8%)	180 (21%)	855 (100%)
			Northbound	283 (68%)	38 (9%)	96 (23%)	417 (100%)
			Southbound	324 (74%)	31 (7%)	83 (19%)	438 (100%)
Olympic Way (B87)							
24.2km Northeast of Woomera	14-18 July 2008	n/a	Two-way	458 (73%)	49 (8%)	116 (19%)	623 (100%)
			Northbound	228 (74%)	26 (8%)	56 (18%)	310 (100%)
			Southbound	230 (74%)	23 (7%)	60 (19%)	313 (100%)
1.6km South of OD	14-18 July 2008	n/a	Two-way	4113 (90%)	280 (6%)	164 (4%)	4557 (100%)
			Northbound	2050 (90%)	154 (7%)	79 (3%)	2283 (100%)
			Southbound	2064 (91%)	126 (5%)	85 (4%)	2275 (100%)

[1] *Weekly Seasonal Factor, see Section 2.4.2*
[2] *Assumed similar to Princes Highway*



Legend

- B97 Olympic Way
- A87 Stuart Hwy
- A1 Princes Hwy
- Major Road Links
- Survey Locations

FIGURE 7

Note: AADT - Annual Average Daily Traffic

P1	28-07-08	CJ	TK	PJC
Issue	Date	By	Chkd	Appd

Client: BHP Billiton

Job Title: Traffic Impact Assessment EIS

Drawing Title: 2008 Traffic Surveys Two-Way AADT

Kilometers: 0 15 30 60

ARUP
Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
www.arup.com.au

Scale at A4: 1:2,300,000

Drawing Status: Draft

Job No	Drawing No	Issue
85200-01	001	P1

2.4.4 Background Traffic Growth

The background traffic growth for the Stuart Highway and Princes Highway adopted for this assessment are in accordance with the AusLink study "Demand Projections for AusLink Non Urban Corridors: Methodology and Projections" (Bureau of Transport and Regional Economics (BTRE) – Australian Government, 2006). The projected future annual average traffic growth factors are as follows:

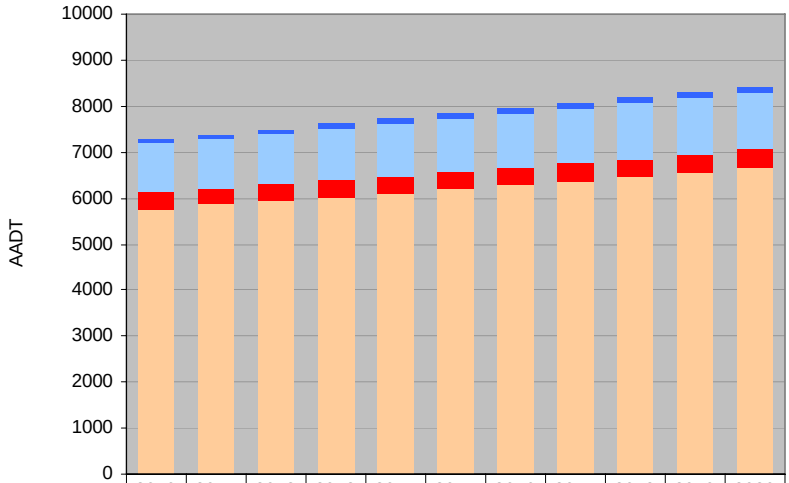
- Adelaide to Port Wakefield, Princes Highway – 1.42%;
- Port Wakefield to Port Augusta, Princes Highway – 1.33%; and
- Port Augusta to Pimba, Stuart Highway – 1.62%.

The above figures are calculated as compound growth rates. Traffic on Olympic Way (Pimba to Olympic Dam) is predicted to increase in line with growth of the OD site and township.

It is noted that the AusLink Adelaide to Darwin Corridor Strategy (2007) includes discussion on growth rates for this route and also refers to increased output from Olympic Dam. For the purpose of this assessment, a conservative approach has been adopted assuming that all future traffic increases at the OD site are in addition to background growth rates.

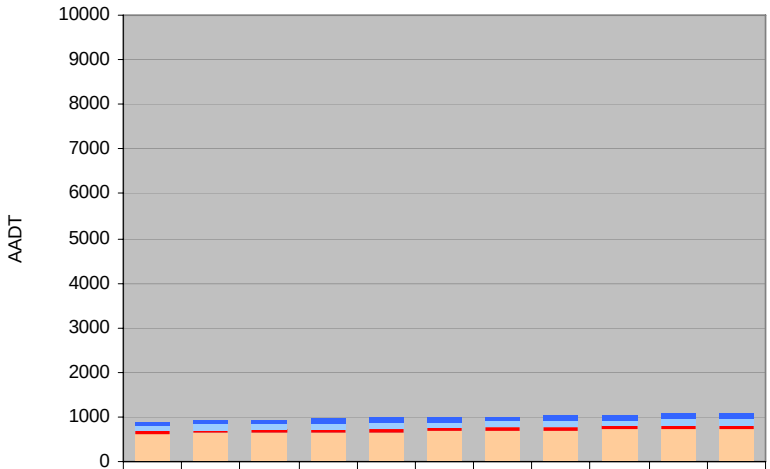
2.5 Baseline Traffic Flows

The summary of the baseline AADT traffic volumes, taking predicted traffic growth into account, are shown in Figure 8 to Figure 10 for the Princes Highway, Stuart Highway and Olympic Way south of Roxby Downs respectively. This includes the currently approved increase in activity at OD currently taking place but excludes ODX related traffic.



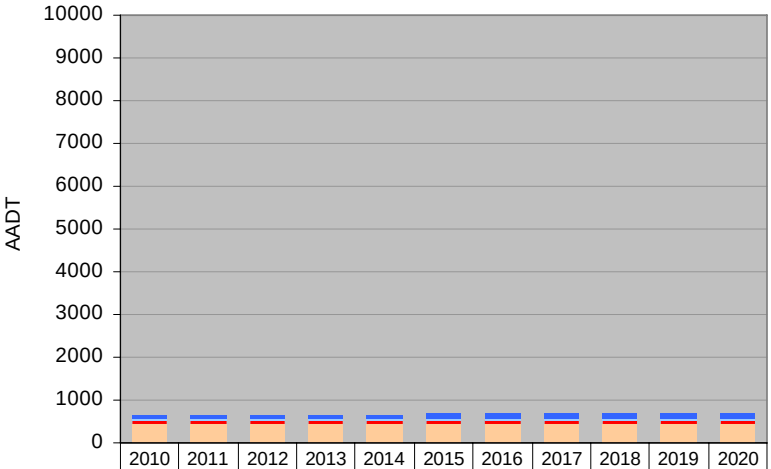
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heavy Vehicle - OD	72	75	72	104	104	106	108	107	105	105	104
Heavy Vehicle - Other	1069	1086	1102	1118	1135	1152	1170	1187	1205	1223	1241
Bus/2-Axle Truck	353	358	363	368	373	379	384	389	395	401	406
Light Vehicle	5773	5855	5939	6023	6108	6195	6283	6372	6463	6555	6648

Figure 8 – Baseline Traffic (No ODX): Princes Highway (Two Wells)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heavy Vehicle - OD	73	77	72	104	104	106	108	107	105	105	105
Heavy Vehicle - Other	120	123	126	129	132	135	138	142	145	149	152
Bus/2-Axle Truck	71	72	73	75	76	77	78	80	81	82	83
Light Vehicle	626	636	646	657	667	678	689	700	712	723	735

Figure 9 – Baseline Traffic (No ODX): Stuart Highway



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heavy Vehicle - OD	73	77	72	104	104	106	108	107	105	105	105
Heavy Vehicle - Other	50	50	50	50	50	50	50	50	50	50	50
Bus/2-Axle Truck	49	49	49	49	49	49	49	49	49	49	49
Light Vehicle	458	458	458	458	458	458	458	458	458	458	458

Figure 10 – Baseline Traffic (No ODX): Olympic Way, South of Roxby Downs

2.6 Future Road Network Improvements

The South Australian, Northern Territory and Federal Governments have undertaken a number of studies to assess the current and future traffic conditions for the key transport links of national significance (i.e. Princes Highway and Stuart Highway). These studies have identified road network improvements that are required to either address existing deficiencies or anticipated deficiencies having regard to the forecast traffic growth. The transport improvements that are either under construction or committed for the next five years include:

- Port River Expressway;
- Northern Expressway Project; and
- Pimba Rail Crossing Improvements.

The Port River Expressway and Northern Expressway projects are located within the Adelaide metropolitan area as shown in Figure 2. Although these two projects will have a significant influence on the performance of the existing road network, they have not been taken into consideration for the current traffic assessment as the influence of the OD site is minimal at these locations.

An overview of each of the above three projects is provided below. In addition, an overview is also provided of some of the remaining road network deficiencies identified in the AusLink Adelaide to Darwin Corridor Strategy 2007.

2.6.1 Port River Expressway

The Port River Expressway (PRExy) links South Australia's major port and rail terminals at the Port of Adelaide directly with the AusLink National Network to Perth and Darwin via Port Wakefield Road, the AusLink National Network to Sydney and Melbourne and the Interstate Mainline rail network.

The Port River Expressway is an important strategic transport route for South Australia and will contribute to South Australia's economic development by providing an expressway and new road and rail bridge connections across the Port River, linking the export enterprises and industrial areas with key transport routes and facilities.

The project is one of the key elements in the Strategic Infrastructure Plan for South Australia to improve international links, which will reduce the future costs of trade and support future growth in exports.

The Port River Expressway comprises three stages:

- Stage 1 consists of a 5.5 kilometre four-lane expressway link between South Road and Francis Street and with overpasses at each of the intersections with South Road, Hanson Road and Eastern Parade.
- Stage 2 consists of a four lane high-level, opening road bridge across the Port River between Docks 1 and 2, linking with Stage 1 at Francis Street to the east and Victoria Road to the west. Changes will be made to Nelson Street and Semaphore Road to connect to the expressway.
- Stage 3 consists of a single track, dual gauge, high-level, opening rail bridge across the Port River, north of the road bridge, with connections to the existing rail system.

Stage 1 was opened to traffic in July 2005. Stages 2 and 3 were opened early August 2008.

2.6.2 Northern Expressway Project

The proposed Northern Expressway Project consists of two components: the Northern Expressway (between Gawler and Port Wakefield Road) and the Port Wakefield Road Upgrade. The project will provide an improved highway and freight connection through

metropolitan Adelaide between the Sturt Highway at Gawler and the Port River Expressway. This project will improve freight access from the northern areas of the State and from the main highways, and link key centres in the north, east and west of Australia with the Port of Adelaide, South Australia's main shipping port.

The Northern Expressway component – 23 km of new four-lane expressway with restricted access and a speed limit of 110 km/h – will link to Port Wakefield Road with a new intersection to the north of Taylors Road, approximately 3 km north of the Waterloo Corner intersection. Port Wakefield Road will be upgraded at key locations between the new intersection and the existing intersection with the Salisbury Highway; some local roads will be diverted to service road access for improved safety. The Expressway will replace the section of Main North Road between Gawler and Gepps Cross as the designated AusLink National Network road link.

The Port Wakefield Road Upgrade will include:

- New signalised at-grade intersection with the Northern Expressway;
- Upgrade of Taylors Road and St Kilda Road intersections;
- Upgrade of existing signalised intersections at Waterloo Corner Road and Bolivar Road; and
- Additional southbound lane from Ryans Road to Salisbury Highway and additional northbound lane through the Globe Derby Drive intersection.

Work commenced on both the Port Wakefield Road Upgrade and the Northern Expressway in 2008 with the project due for completion by 2010.

2.6.3 Northern Connector Route

The Northern Connector is a road and rail proposal that is currently in the planning stages. The Northern Connector involves:

- the construction of an expressway standard road in a new corridor between the interchange connection of Port Wakefield Road and the Northern Expressway and Salisbury Highway (a distance of approximately 14 kilometres)
- an upgrade of Salisbury Highway between Port Wakefield Road and South Road (approximately 3 kilometres)
- a double track freight rail link from the Adelaide to Darwin/Perth rail line near Pellew Road, east of Port Wakefield Road, to Dry Creek, within the central corridor of the proposed new link road.

The proposed Northern Connector would run to the west of the existing Port Wakefield Road. This new road/rail corridor would reduce congestion on the existing Port Wakefield Road by providing an expressway standard road from the Port of Adelaide to regional destinations east and north of Adelaide.

Initial investigations undertaken by DTEI indicate that the Northern Connector would:

- reduce truck movements and traffic congestion on Port Wakefield Road and the Salisbury Highway
- improve access to Adelaide for road freight transport travelling via the Sturt Highway and Port Wakefield Road
- make other roads safer by diverting freight traffic away from the local road network and residential communities
- provide a new rail link that would remove often disruptive heavy freight trains and the interstate passenger trains from northern suburban areas such as Salisbury,

Parafield and Mawson Lakes. These long trains can cause major delays and traffic problems in peak hours, particularly in the vicinity of Park Terrace, Salisbury.

Port Wakefield Road would revert to an arterial road serving the industrial and commercial industries in the City of Salisbury. The adjacent industrial precinct would continue to operate as normal, with Port Wakefield Road providing easy movement and access to the connections for road and rail freight.

The planning and environmental assessment stages of the Northern Connector project are expected to be completed in late 2009/early 2010. At this stage is it expected that construction of the Northern Connector will be completed by 2016.

2.6.4 Pimba Rail Crossing Improvements

As a part of the State Government's Level Crossing Safety Program, the level crossing located on the Olympic Way near Pimba will be improved. Advance warning signs will be installed on the approaches to the crossing to improve motorists' awareness of the remote level crossing. These works are scheduled for the 2008/2009 financial year.

2.6.5 AusLink Adelaide to Darwin Corridor Strategy 2007

The AusLink Adelaide to Darwin Corridor Strategy 2007 provides an overview of the current and future challenges for the transport corridor. This study also summarises the short term deficiencies (to 2015) for the transport route. The key points highlighted in the report, which are relevant to the road links between Adelaide and Olympic Dam, include:

- Pavement sections between Port Augusta and Coober Pedy in South Australia are old and under-strength;
- Ongoing maintenance programmes will need to be strategically targeted to ensure that as pavements become old or weak these sections are treated and maintained to an appropriate fit for purpose condition;
- Inappropriately designed or poorly positioned rest areas;
- Inappropriately designed or poorly positioned truck bays;
- Access management to and off the Stuart Highway;
- Narrow lane widths over some sections of the corridor;
- Inadequate sealed shoulder width on significant lengths of the Stuart Highway;
- Flood immunity for some sections of the Stuart Highway;
- Level crossings at Berrimah Road in Darwin requiring separation from road and rail; this is targeted for works under the first five years of the AusLink Investment Programme through a jointly funded project to extend access and connectivity from the Stuart Highway into Darwin's East Arm Port; and
- Hesso level crossing in South Australia.

These existing issues have been identified by the state and federal governments. The provision of and the quality of this route as a public highway remains the responsibility of the federal and state governments and this study has assumed that these issues will be addressed as such. Some of the deficiencies, not necessarily specific to the above list, are identified as short-term priorities to be actioned by the year 2015.

2.7 Rail Network

2.7.1 Existing Rail Alignment

The main line to the south of Olympic Dam links Australia's eastern seaboard with Western Australia, and also Melbourne and Adelaide with Darwin. It carries the Indian Pacific and Ghan passenger trains that can travel at 115 km/h, a mixture of 110 km/h freight trains,

largely intermodal and some heavy axle load trains that travel at 80 km/h. The interstate line from Perth to Adelaide is controlled by ARTC, with the line north from Tarcoola to Darwin controlled by FreightLink.

The data in this report has been obtained from Australian Southern Railroad and other unofficial sources detailing crossing locations along the route. The information obtained was last updated in November 2007. It is possible that this is not an exhaustive data set and additional privately used, passive rail crossings may occur.

2.7.2 Port Adelaide – Port Augusta – Pimba

The distance by rail from Port Adelaide to Port Augusta is approximately 306km, including an eight kilometre section from Port Adelaide to the main line connection at Dry Creek. The railway line alignment passes through localities such as Bolivar, Two Wells, Mallala, Snowtown, Crystal Brook and Port Germein before reaching Port Augusta. The Pimba loop and sidings are located 181 rail kilometres from Port Augusta. From Pimba the rail line continues generally north-west to the junction at Tarcoola (412 rail kilometres from Port Augusta) where it turns directly north towards Alice Springs and Darwin or continues to Perth.

Location of Road and Rail Crossings

Four types of rail / road crossings occur:

- Grade separated, where road and rail pass under or over each other;
- Active level crossings type 1: having boom gates, ringing bells and signs;
- Active level crossings type 2: having ringing bells and signs only; and
- Passive level crossings, which comprise rail crossing signs only.

Between Port Adelaide and Pimba, there are grade separations at eleven locations.

The listing of crossings for the Adelaide to Tarcoola sections identify public crossings, including all active level crossings (identified by type) and all public passive crossings. Table 6 shows level crossing types divided active and passive locations as well as grade separated crossings.

Of the active level crossings, 43% (18 of 41) have boom gates. The majority of these are in the built up areas close to Adelaide and Port Augusta.

In addition to the 31 unprotected (signs only) road crossings listed between Port Adelaide and Pimba, other (unlisted) unprotected crossings may exist. These crossings, not being public roads, would carry extremely low daily traffic volumes, especially for those located north of Port Augusta.

Table 6 – Rail Crossing Types: Port Adelaide to Pimba

	Grade Separated Crossings	Active		Passive	
		Type 1 inc. boom gates	Type 2 inc. bells	Public	Private
Port Adelaide to Dry Creek	3	5	-	-	unknown
Dry Creek to Port Augusta	6	12	21	25	unknown
Port Augusta to Pimba	2	1	2	6	unknown
Total	11	18	23	31	unknown

2.7.3 Pimba – Darwin

The line from Tarcoola to Alice Springs was constructed in 1980 to replace the former narrow gauge railway. The line was upgraded as necessary as part of the construction of the link from Alice Springs to Darwin, completed in 2004.

Rail crossing information for the Tarcoola to Darwin section of the rail line to Pimba has been sourced from the Australian Rail Group Network Operating Guide for the Tarcoola to Darwin railway line (now FreightLink). The Network Operating Protocols for the route includes safe-working procedures, speed limited section locations, and rail crossing locations. Chainages used in this section reference distances from the Coonamia datum, which locates Port Augusta at 92km, Pimba at 273km and Alice Springs at approximately 1,335km by rail.

Location of Road and Rail Crossings

From Pimba the rail line runs west to Tarcoola (Coonamia datum 504 km) before turning north towards Alice Springs and Darwin. There is one road overpass along the route west of Pimba to the Northern Territory border.

From Pimba to the Northern Territory border there are no active rail crossings. It is estimated that there are 10 passive rail crossings of significance (excluding minor property access crossings).

There are eight boom gate rail crossing locations in the Northern Territory, six of which are located within 100km of Darwin. In all there are 30 locations with bells and signs alerting road users. The Stuart Highway crosses the rail line on an overpass at only one location – chainage 1322.9 (south of Alice Springs); this location has bells and signs but not boom gates. There are 15 remaining passive crossings locations between the border and Darwin, a distance of almost 1,700 km.

Table 7 – Rail Crossing Types: Pimba to Darwin

Railway section	Active		Passive	
	Type 1: boom gates, bells and signs	Type 2: bells and signs	Public roads	Other – public and private
Pimba (chg. 273) to Tarcoola (chg. 504)	0	0	10	unknown
Tarcoola (chg. 504) to SA / NT border (chg. 1067)	0	0	12	81
SA / NT border (chg. 1067) to Darwin (chg. 2750)	8	22	34	151

2.8 Rail Operations

2.8.1 Existing Rail Frequencies

Two trans-continental passenger trains use the track between Adelaide and Pimba:

- The “Ghan” from Adelaide to Darwin twice per week all year around arriving in Adelaide on Fridays and Mondays and departing on Sundays and Wednesdays; and
- The “Indian Pacific” (Perth – Adelaide – Sydney) departs twice per week, all year round for Perth from Adelaide on Thursdays and Sundays and arrives from Perth into Adelaide on Tuesdays and Fridays.

Trips on the section between Pimba and Adelaide due to passenger trains are therefore one eastbound train on Mondays, one on Tuesdays and two on Fridays; and two westbound trains on Sundays, one on Wednesdays and one on Thursdays.

The train's average speed is listed at 85 km/h with a maximum speed of 115 km/h and is 686m in length.

Train frequencies, including passenger and freight trains, at different points along the track between Adelaide and Darwin (current as of March 2008) are shown in Table 8 as per the ARTC freight train schedule (note FreightLink schedule was not available). In total, there are around 80 two-way timetabled trains during the week at Pimba. The train frequency is lower for the section from north of Tarcoola. Whilst all 17 each-way movements run on the section Katherine to Darwin – with fewer movements south of Katherine – any additional trains are required to be slotted within the existing schedule of 17 trains.

Table 8 – Existing Train Movements (Each Way)

	Tarcoola – Darwin	Tarcoola – Pimba – Port Augusta	Port Augusta – Adelaide	Port Augusta – Whyalla / Port Bonython
Trains per week (general mid-points on each section)	17	41	65	7

2.8.2 At-Grade Level Crossing Conformity

A high level analysis of level crossing conformity to Australian Standard AS1742.7 has been undertaken. This analysis is included as Appendix B and should be considered a broad estimation of compliance with sight distance requirements. Based on this analysis it is estimated that:

- 25% of all crossings are active and 75% are passive;
- 100% of active crossings appear to conform to sight line standards;
- 90% of passive crossings appear to conform to sight line standards; and
- 5% of all crossings do not appear to conform to sight line standards.

2.9 Crash Analysis

A crash analysis has been undertaken along the key road links between Port Adelaide and Olympic Dam and for the level crossings between Port Adelaide and Darwin.

A separate risk assessment has been undertaken for ODX. This includes projected changes in the likelihood of crashes occurring as a result of changes in traffic volumes on all main routes. This assessment can be found as an additional appendix to the EIS.

2.9.1 Crashes on Road Routes

The analysis of crashes on the road links between Port Adelaide and Olympic Dam has been undertaken using data provided by Transport SA. Data was obtained to show the number of reported casualty crashes along the route for the five year period 2003 to 2007.

Over the complete area included as part of the scope of this study, the analysis indicates that there have been a total of 702 reported casualty crashes. Of these crashes, 17 have resulted in a fatality, 146 serious injuries and 539 other injury.

The data was analysed to identify intersections that are considered to be key crash locations. These locations have been determined to meet the criteria of the Federal Government's Black-spot Programme, where 'black-spots' are defined as intersections or mid block road sections of less than 3km that have had three or more casualty crashes in

the previous five year period. In addition, back-spot road lengths are found where 0.2 casualty accidents are calculated per km per year over the five year analysis period.

The crash data along the route from Port Adelaide to Olympic Dam was assessed to identify crash locations that meet the above criteria. This excludes the Adelaide metropolitan area. While the results of this analysis are shown in detail in Figure 11, the key findings are as follows:

- All eight key crash locations were at intersections along the main route between Port Gawler and Port Augusta;
- Nine mid-block key crash locations have been identified. One is located on Roxby Downs Road between Pimba and Woomera, one is located on Olympic Way between Roxby Downs and Olympic Dam and the remaining seven are on the Princes Highway between Adelaide and Port Augusta. The causes for these are:
    - 62% - inattention;
    - 10% - excessive speed;
    - 10% - overtaking; and
    - 18% - other.
- There are four sections of road that met the criteria for 'black-spot' road lengths:
    - A1 Port Gawler to Port Wakefield;
    - A1 Crystal Brook to Port Pirie;
    - A1 Baroota to Mambray Creek; and
    - A1 Stirling North to Port Augusta West.
- Police records show the main causes of these crashes are:
    - Inattention 53%;
    - Fail to give way 8%;
    - Following too closely 8%; and
    - Driving under the influence 6%.

It is noted that there have been no reported casualty crashes involving cyclists for the period 2003 to 2007. Appendix C contains photographs of each intersection location with a summary of the key crash data.

- 8 Accidents (11 casualties/1serious) in 5 years at the junction of A1/Flinders Terrace
- Crash Error: 4 accidents fail to stand/giveway

- 7 Accidents (8 casualties/2 serious) in 5 years at the junction of A1/Carlton Parade
- Crash Error: 4 accidents fail to stand

- 3 Accidents (3 casualties) in 5 years at the junction of A1/Edinburgh Terrace
- Crash Error: Various

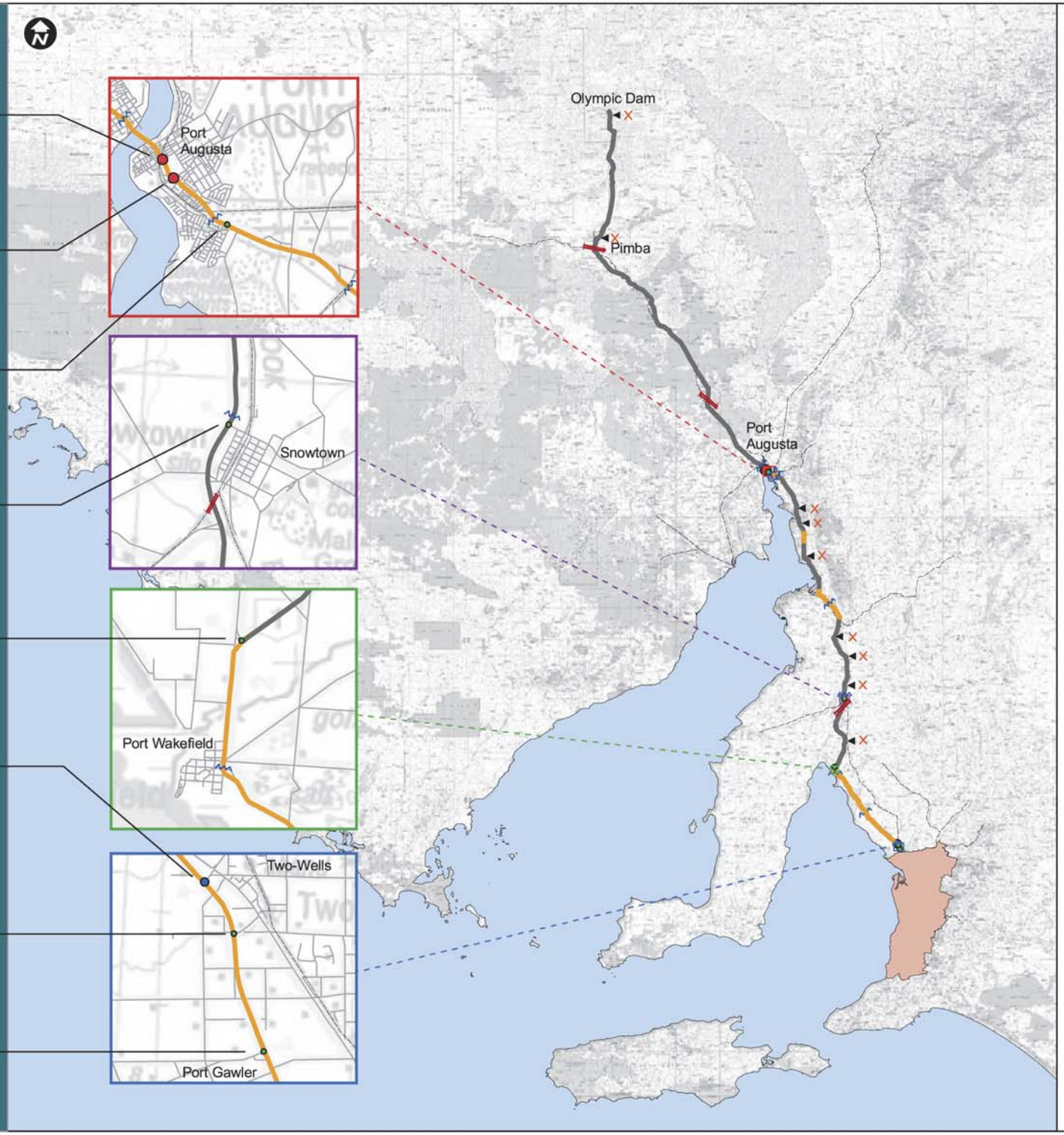
- 3 Accidents (6 casualties/1serious) in 5 years at the T-junction of A1/Brinkworth Rd
- Crash Error: All accidents fail to giveway

- 3 Accidents (2 casualties/1serious) in 5 years at the T-junction of A1/Pt Wakefield Access Rd
- Crash Error: Various

- 5 Accidents (15 casualties/2 serious) in 5 years at the T-junction of A1/Mallala-Two Wells Rd
- Crash Error: 4 accidents fail to giveway/stand

- 3 Accidents (4 casualties) in 5 years at the T-junction of A1/Brooks Rd
- Crash Error: 2 accidents fail to giveway

- 3 Accidents (4 casualties/1 serious) in 5 years at the T-junction of A1/Port Gawler Rd
- Crash Error: 2 accidents fail to giveway



Legend

Key Crash Location

- 3 Crashes in 5 years
- 4 Crashes in 5 years
- 5 Crashes in 5 years
- > 5 Crashes in 5 years
- Midblock Key Crash Location
- Key Crash Road Length
- Adelaide To Olympic Dam
- Railways
- Other Roads
- Adelaide Metro Area
- At Grade Rail Crossing
- Pedestrian Hit

FIGURE 11

Note: - Key crash road length must be greater than or equal to 0.2 crashes/km/year over 5 years for a length greater than 3km;
- Midblock key location requires 3 or more crashes within a 3km length of road.

Issue	Date	By	Chkd	Appd
P1	26-07-08	CJ	TK	BAJ

Kilometers
0 50 100

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Client
BHP Billiton

Job Title
Traffic Impact Assessment

Drawing Title
Road Accident Key Locations

Scale at A4
1:3,000,000

Drawing Status
Draft

Job No	Drawing No	Issue
000000-00	001	P1

2.9.2 Road Crashes at Rail Crossings

An analysis of rail safety has been undertaken. The following rail routes have been considered as part of this study:

- Pimba to Darwin;
- Pimba to Port Augusta; and
- Port Augusta to Adelaide.

Data on all reported road casualty crashes has been provided by Department of Transport Road Safety for the Northern Territory and Department for Transport, Energy and Infrastructure for South Australia for the following periods:

- 01/01/2003 to 31/12/2007 for the Northern Territory (five years); and
- 01/01/2003 to 31/12/2007 for South Australia (five years).

From this data, crashes at level crossings has been isolated using ArcGIS software to limit the data to crashes within 50m of a level crossing where the type of crash was either train strike, hit object, right angle or rear end. These crashes (11 locations, 13 in total), have been plotted on Figure 12 and summarised in Table 9 for the Northern Territory and South Australia.

Table 9 – Level Crossing Crashes

Ref	Section	Injury	Date	Type
1	Pimba to Darwin	Slight	22/2/2007	Rear End
2	Pimba to Darwin	Slight	20/10/2006	Train Strike
3	Pimba to Darwin	Serious	28/7/2006	Train Strike
4	Pimba to Darwin	Serious	12/12/2006	Train Strike
5	Pimba to Darwin	Damage Only	17/8/2003	Rear End
6	Port Augusta to Adelaide	Slight	24/6/2006	Hit Object
7	Port Augusta to Adelaide	Serious	28/5/2007	Hit Object
8	Port Augusta to Adelaide	Serious	17/12/2005	Right Angle
9	Port Augusta to Adelaide	Fatal	5/11/2005	Right Angle
10	Port Augusta to Adelaide	Serious	10/7/2004	Right Angle
11	Port Augusta to Adelaide	Slight	18/3/2004	Rear End
11	Port Augusta to Adelaide	Slight	8/3/2005	Rear End
11	Port Augusta to Adelaide	Slight	2/9/2006	Right Angle

The length of rail and annual average number of crashes per 1,000km per year is:

- Darwin to Tarcoola: 2,480km in length – 0.40 crashes / 1,000km / year;
- Tarcoola to Pimba: 190km – No crashes;
- Pimba to Port Augusta: 183km – No crashes; and
- Port Augusta to Adelaide: 310Kms – 5.2 crashes / 1,000km / year

Therefore 13 crashes have occurred across 2,973km of rail track over a five year period. Based on the above information and the existing numbers of trains services carried on these lines detailed in Table 8, a crash rate can be derived for each section of line as shown in Table 10.

Table 10 – Rail Line Crash Rates

Section	Length (Km)	Existing Rail (Km)	Crashes, 1yr Average	Crashes/1,000 Rail (Km)
Pimba to Tarcoola	190	779,000	0.0	0.0000
Tarcoola to Darwin	2,290	3,893,000	1.0	0.0003
Pimba to Port Augusta	183	750,300	0.0	0.0000
Port Augusta to Adelaide	310	2,015,000	1.2	0.0016
Total	2,973	7,437,300	2.2	0.0003

The rail lines under consideration have a low crash rate. As demonstrated in Figure 12 and Table 10, in the majority of cases, crashes happen in metropolitan areas. The sparsely populated interior of the country experiences few crashes.

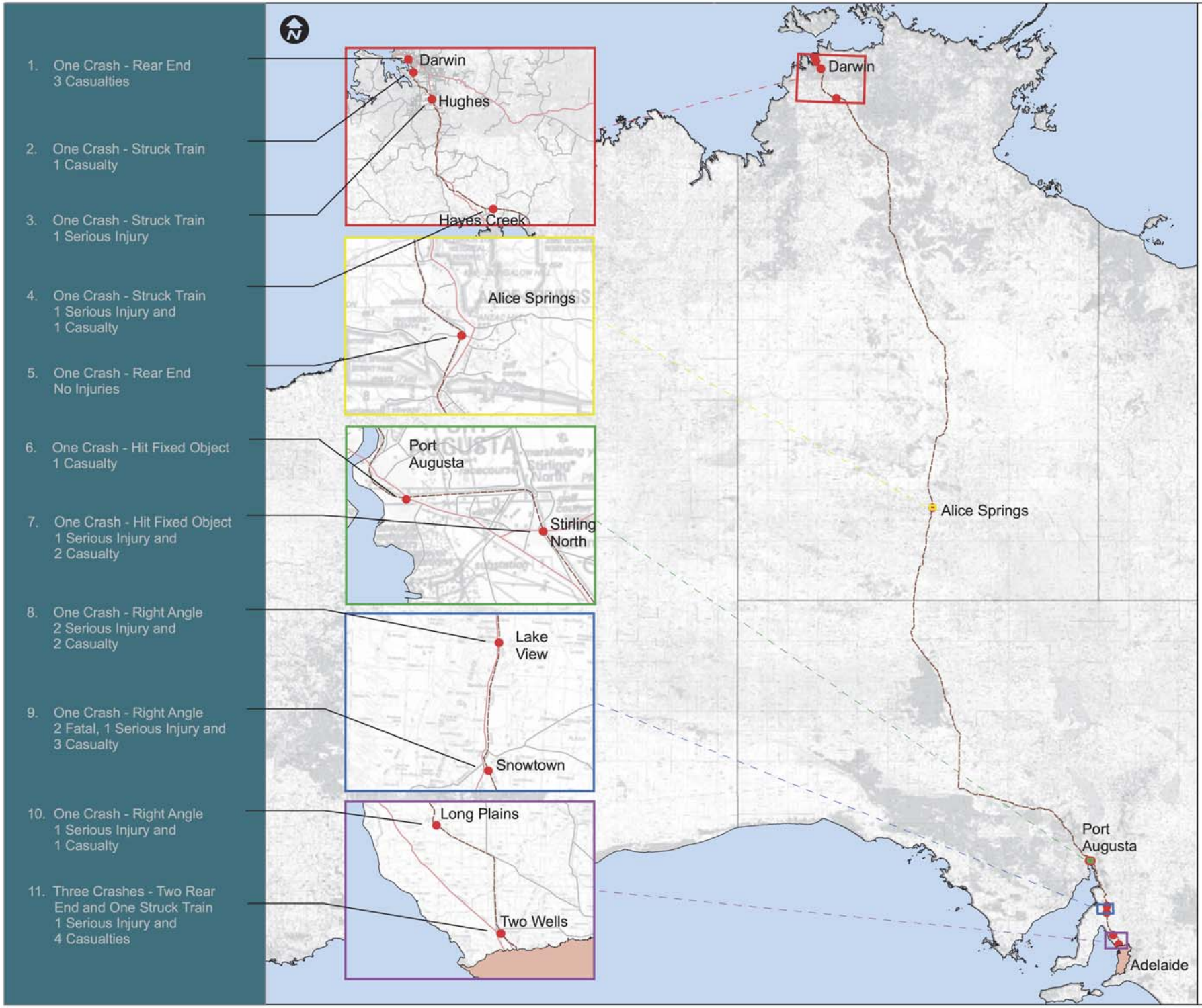

FIGURE 12

Issue	Date	By	Chkd	Appd
P1	26-07-08	CJ	TK	BAJ

Kilometers

0 250 500

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Job Title

Traffic Impact Assessment

Drawing Title

Rail Accident Spatial Analysis

Scale at A4

1:14,500,000

Drawing Status

Draft

Job No	Drawing No	Issue
000000-00	001	P1

3 Proposed Olympic Dam Expansion

3.1 Overview

The proposed expansion includes construction at the site to allow increased output from the Olympic Dam (OD) site. Details of the proposal are shown in Figure 13. In addition to the infrastructure expansion of the OD site, there are a number of additional infrastructure requirements that will be required to provide for the expansion and an increase in workforce numbers (e.g. water supply pipeline, transmission line). The calculation of future traffic generation in this report is separated into two categories:

- ODX Traffic - the total expansion traffic volumes associated with on-site construction and commodity import and some of the key off-site infrastructure projects supporting the expansion; and
- Ancillary Traffic - the future volume of traffic movements associated with a newly expanded workforce and other town servicing or leisure trips. The routing of these trips has been considered between Olympic Dam and Port Augusta only as minimal ancillary trips are assumed to start or end beyond Port Augusta.

For the off-site infrastructure items, the following are included as part of ODX traffic calculations:

- A 270 km, transmission line from Port Augusta to Olympic Dam and / or an on-site combined cycle gas turbine (CCGT) power station and gas pipeline from Moomba;
- A new workers' accommodation village (Hiltaba Village) to be located between Roxby Downs and Andamooka; and
- The expansion of the Roxby Downs township.

The following off-site infrastructure items are not included as part of the ODX traffic calculations as insufficient information is currently available on construction requirements and timing:

- A desalination plant located at Point Lowly, and associated 320 km water supply pipeline between the proposed desalination plant and Olympic Dam
- A new intermodal rail / freight terminal to be constructed at Pimba;
- A new airport to be located adjacent to the proposed Hiltaba Village;
- A new heavy industrial area;
- A new landing facility in Spencer Gulf adjacent to Shack Road (see Section 3.8.3); and
- A pre-assembly yard adjacent to Hamilton Road (see Section 3.8.3).

Although it is not currently possible to calculate the construction trips related to the above, it is assumed that each of these items will be completed prior to the OD site reaching maximum output and peak occupation of the supporting townships. Therefore, these trips should not coincide with the peak levels of traffic.

Some of these infrastructure facilities will have on-going activities will generate workforce trips, for example, the intermodal facility at Pimba will be manned. However, these trips will be very small and potential effects on the road network are considered negligible.

A summary of the key assumptions made regarding trip generation and distribution can be found in Appendix G.

3.2 Olympic Dam Site Expansion Heavy Vehicles AADT

The expansion requires the movement of materials, plant and equipment to and from the OD site. Prior to the development of the rail spur to Olympic Dam, these will occur by road, where vehicle trips related to construction are required, they will be undertaken using B-Double vehicles primarily, however, there will also be a number of over-dimensional load movements. To reduce road traffic, an intermodal facility will be constructed at Pimba and materials will be moved by rail to Pimba where practicable.

As the operation expands, there will be a greater demand for commodities and exports. At this time, the rail spur will be operational and the majority of loads will be transported by rail. Road transport will continue and it is assumed that the required road trips to Olympic Dam will be undertaken using B-Doubles.

3.2.1 Movement of Expansion Plant and Commodities

The expansion will generate movements by the following key categories of vehicles:

- Operational heavy vehicles including commodity deliveries. Some of these vehicles are then back-loaded with export;
- Construction heavy vehicles delivering materials, equipment and other plant to the site; and
- Over-dimensional heavy vehicles delivering materials, equipment and other plant that require permits, escort and / or road closures.

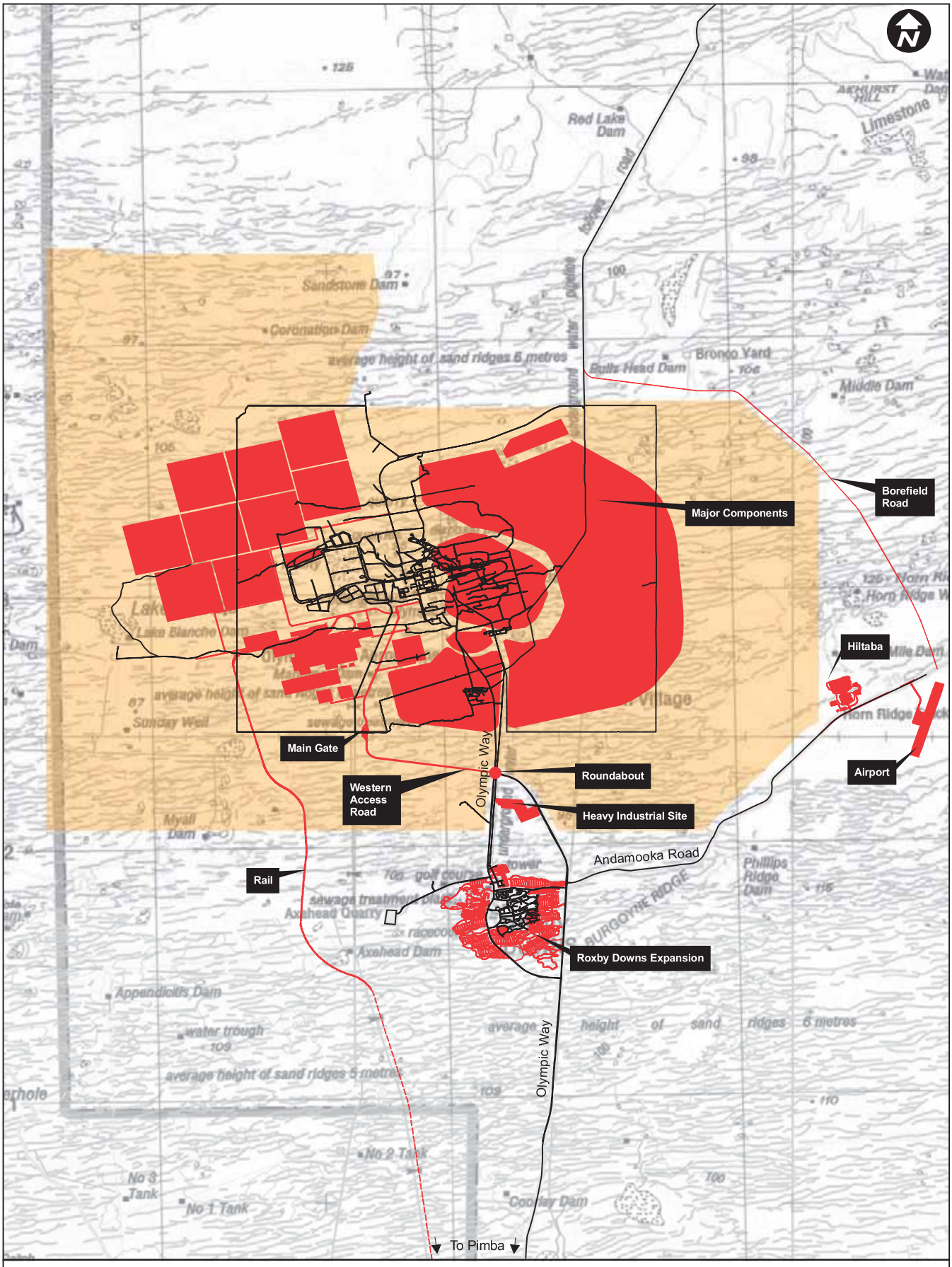
The volumes of traffic associated with each construction activity and needs for each commodity have been calculated and are included in Appendix D where the breakdown of each of the commodities with the required tonnage is detailed as well as construction equipment and materials. In this appendix, it is also possible to see the anticipated origin of the commodities and construction equipment whilst an indication of where the loads are moved by road or rail is given.

It should be noted that the movement of commodities shown in Appendix D are one-way vehicle flows and that some of these vehicles will be back-loaded with export material. It is assumed these vehicles will be rerouted back to the same origin point. Similarly, it is assumed that empty vehicles will also be routed back to their same origin point, therefore all vehicles recorded in Appendix D can be easily converted to two-way movements.

The traffic volume data at Appendix D includes the operation of a rail/road intermodal facility at Pimba from 2012 onwards and the operation of a new train line from Pimba to Olympic Dam from 2016 onwards. Therefore, prior to the construction of the intermodal facility and the rail line, trips to the site would be undertaken by road. As the intermodal facility and rail line become available, most trips will convert to rail lessening the volume of traffic movements. Some commodities, including diesel, have been assumed to remain on road.

The destination of all trips associated with the off-site infrastructure that is included as part of the ODX traffic calculations would be to a variety of locations between Port Augusta and Olympic Dam. In the case of power supply and the rail connection, construction would be at a variety of locations. In order to simplify the calculations in this study, it has been assumed that the destination for these trips would be the OD site.

Some over-dimensional materials and equipment will arrive by sea to a new landing facility in Port Augusta. Further discussion on over-dimensional loads is provided in Section 3.8 and details of vehicle movement origins are provided in Appendix D.



Legend

- Proposed Olympic Dam Mining Lease
- ODX - Major Components
- ODX - Infrastructure
- Existing Infrastructure

FIGURE 13

Issue	Date	By	Chkd	Appd
P1	12-08-08	CJ	TK	PJC

Client
BHPBilliton

Job Title
Traffic Impact Assessment EIS

Drawing Title
Olympic Dam Expansion Details

Kilometers
0 1.5 3 6

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Scale at A4
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Drawing Status
Draft

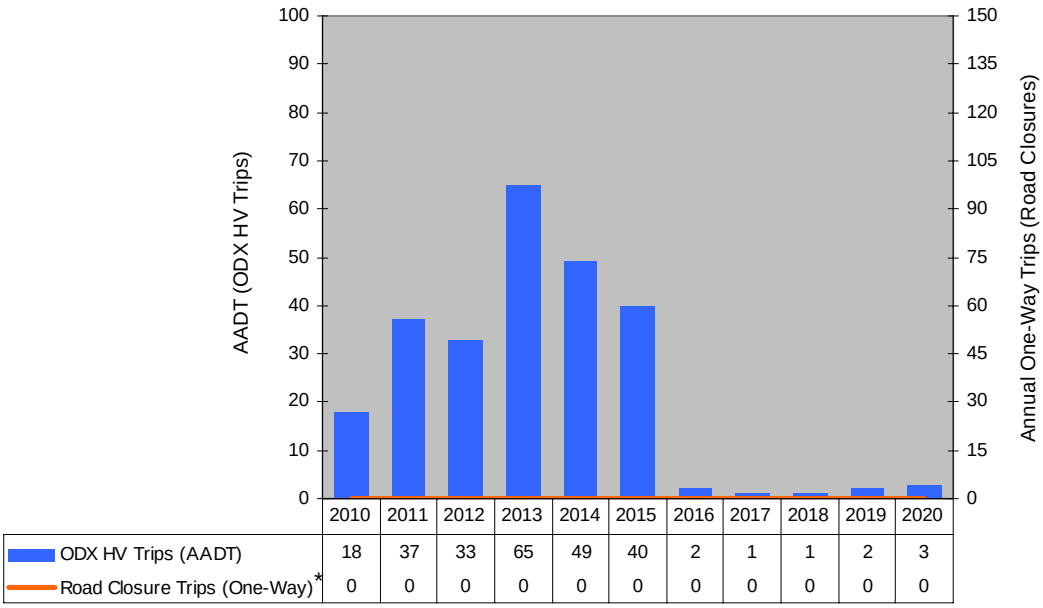
Job No	Drawing No	Issue
85200-01	001	P1

3.2.2 Summary of ODX Heavy Vehicle Movements

Based on current estimates, the Annual Average Daily Traffic (AADT) for the various movements detailed above has been assessed. The distribution of vehicles associated with the expansion is derived from the information provided in Appendix D.

The total construction and operational heavy vehicle movements are shown on Figure 14, Figure 15 and Figure 16 for the Princes Highway, Stuart Highway and Olympic Way respectively. In order to assess the impact of over-dimensional vehicles that are greater than 8m in width and require temporary road closures, this data has been overlaid on the figures for the Stuart Highway and Olympic Way. Over-dimensional loads have been discussed in more detail in Section 3.8.

BHP Billiton have advised that the transport logistics for the OD site are operational 350 days a year and Annual Average Daily Traffic volumes (AADT) have been calculated to reflect this. It should also be noted that all heavy vehicle calculations include over-dimensional load vehicle movements.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX HV Trips (AADT)	18	37	33	65	49	40	2	1	1	2	3
Road Closure Trips (One-Way)*	0	0	0	0	0	0	0	0	0	0	0

* - *No road closures required for the Princes Highway*

Figure 14 – Heavy Vehicle Trips (ODX): Princes Highway (Two Wells)

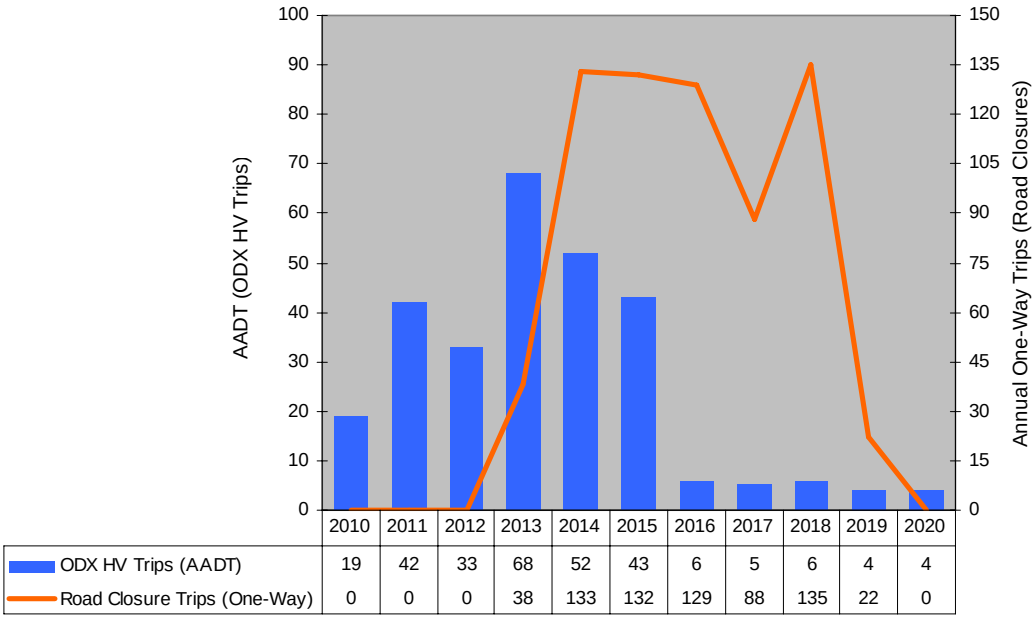


Figure 15 – Heavy Vehicle Trips (ODX): Stuart Highway

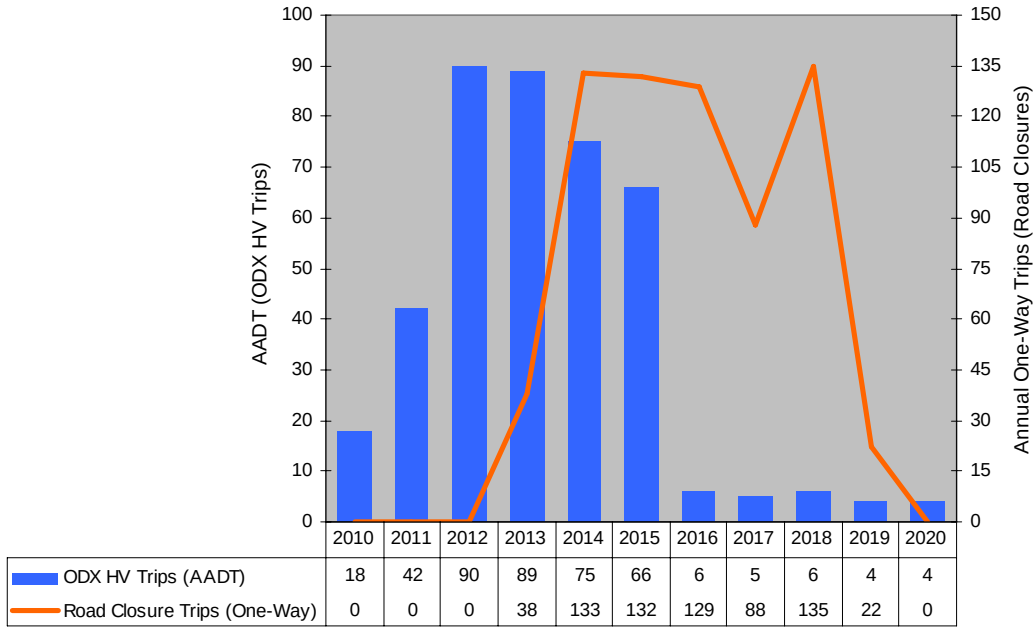


Figure 16 – Heavy Vehicle Trips (ODX): Olympic Way

It is noted that in comparison to trips on the Princes Highway and Stuart Highway, additional vehicle movements will occur on Olympic Way as a result of goods transferred to road at the intermodal facility in Pimba up to the year 2015. Following construction of the new rail spur from Pimba to Olympic Dam, movements by road will decrease considerably from the year 2016 onwards.

As discussed in Section 1, this project will require movement by a number of over-dimensional loads. The total number of over-dimensional loads has been categorised to those that require primarily escort by pilot, escort by pilot and police, and those that require a temporary road closure. These are shown in Figure 17 and discussed in more detail in Section 3.8.

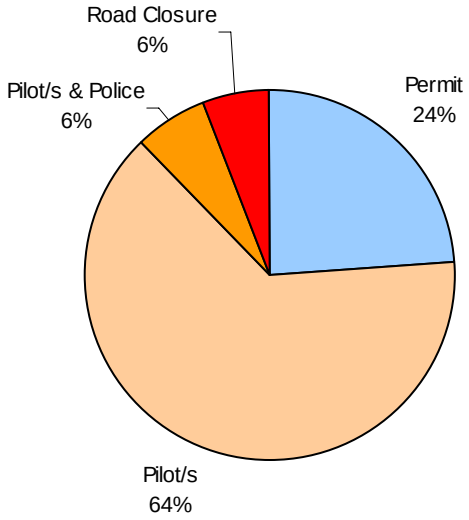
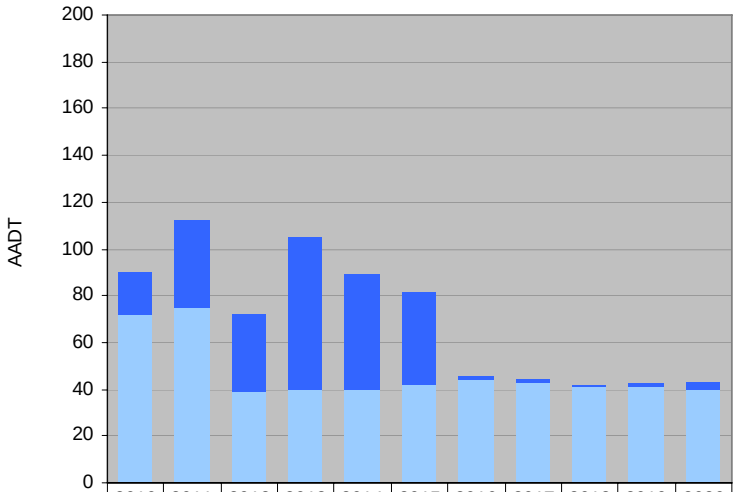


Figure 17 – Categories for Over-Dimensional Loads

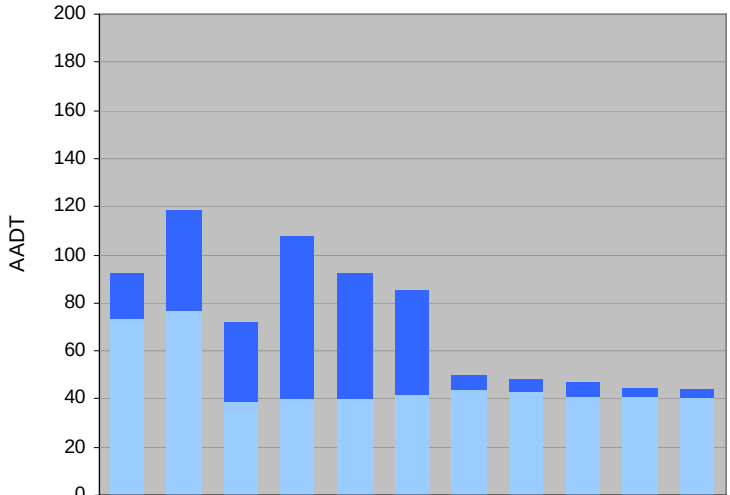
The total generated ODX heavy vehicles have been added to the existing ongoing OD heavy vehicle movements that have been adjusted to account for existing loads to be transferred to rail as the Pimba intermodal facility and the rail link to the Olympic Dam become available. Figure 18, Figure 19 and Figure 20 show these total generated heavy vehicle numbers for the Princes Highway, Stuart Highway and Olympic Way respectively. It is clear from these figures that the addition of the rail facilities reduces the number of heavy vehicles on these roads.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX (HVs only)	18	37	33	65	49	40	2	1	1	2	3
OD HVs (with ODX)*	72	75	39	40	40	42	44	43	41	41	40

** - Refer to Glossary for definition.*

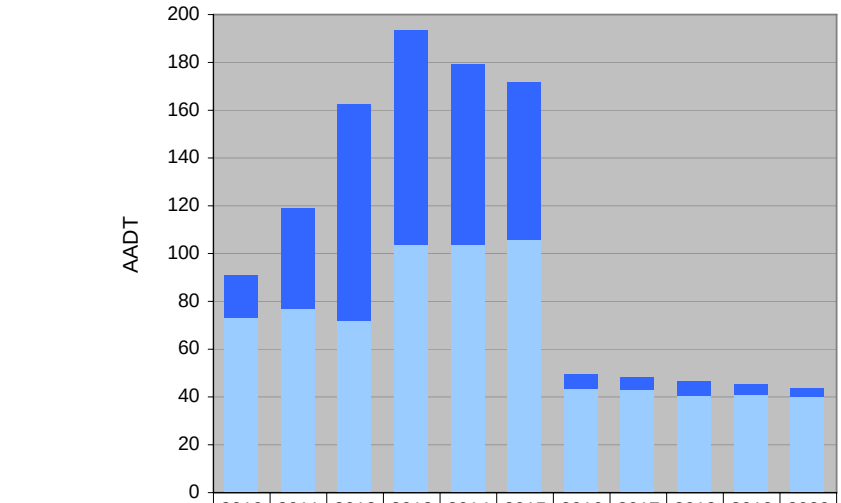
Figure 18– Total ODX and OD Base Traffic HVs, Princes Highway (Two Wells)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX (HVs only)	19	42	33	68	52	43	6	5	6	4	4
OD HVs (with ODX)*	73	77	39	40	40	42	44	43	41	41	40

** - Refer to Glossary for definition*

Figure 19– Total ODX and OD Base Traffic HVs, Stuart Highway



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX (HVs only)	18	42	90	89	75	66	6	5	6	4	4
OD HVs (with ODX)*	73	77	72	104	104	106	44	43	41	41	40

** - Refer to Glossary for definition*

Figure 20– Total ODX and OD Base Traffic HVs, Olympic Way

3.3 Ancillary Traffic AADT

3.3.1 Overview

In addition to the traffic generated by ODX for construction and operational uses, there is also a wide range of traffic associated with the movement of the workforce and servicing of the townships that serve the OD site. For the purposes of this report, these movements are grouped under the heading of 'Ancillary Traffic'.

3.3.2 Workforce and Township Servicing – Ancillary Traffic Classification

In addition to the traffic volumes directly related to the construction and expanded operation of Olympic Dam, the township and workforce supporting the ODX construction and operations will also expand. Currently, there are approximately 66 two way heavy vehicle movements between Adelaide and Port Augusta that are part of the current Olympic Dam mining operations. However, as discussed in Section 2.4, the existing traffic volumes along Olympic Way between Woomera and Roxby Downs are approximately 620 AADT (two-way). Therefore, heavy vehicle traffic that is a part of the actual OD operations is approximately 11% of all traffic along Olympic Way.

Given that Roxby Downs and the Olympic Dam operation are the principal destinations, it is assumed that the majority of the remaining 89% of traffic travelling along Olympic Way are trips that are ancillary to the township and mining operation. It is noted that some of these trips may be related to movements to and from Andamooka. In summary, the remaining 89% of vehicles are assumed to include:

- Township servicing trips (e.g. supermarket, golf course, other businesses);
- Temporary and casual employment trips;
- Mining bus-in/bus-out trips from Port Augusta;
- Workforce drive-in/drive-out trips from Port Augusta;

- Trips to and from Andamooka and the wider region; and
- Tourism / leisure trips.

It is also assumed that the majority of these trips occurring on Olympic Way, south of Roxby Downs originate in Port Augusta. The vehicles that make up this traffic are classified as follows:

- Light Vehicles – these vehicles refer to any journeys made by employees and/or their families by private and some servicing of the townships. A conservative approach has been adopted that these vehicles will increase in a direct proportion to the workforce population. In reality, some of these vehicles (e.g. town servicing and related tourism) will not increase at this rate;
- Buses –it is assumed that bus journeys will also increase directly proportional to workforce population for Roxby Downs and Hiltaba; and
- Heavy Vehicles – some heavy vehicle movements are associated with the operation of the townships, such as delivery of food to the supermarkets, refuse collection vehicles, etc. Since the management of these vehicles is likely to be consolidated as part of the increased workforce between the two townships of Roxby Downs and Hiltaba, it is assumed that the growth of heavy vehicles would be 50% of the workforce growth due to improved freight efficiencies.

Based on the assumptions above and using the base and projected workforce as a guide, the estimated increase in ancillary traffic for the period 2010 to 2020 has been determined. The forecast workforce population and traffic volumes are detailed in Appendix E.

Table 11 provides a summary of the estimated traffic increase associated with the operation of the Roxby Downs and Hiltaba during the period that will see the workforce increasing from around 4,700 to over 12,500. Light vehicle and bus movements are assumed to rise proportionally to the workforce population (i.e. by a factor of 1.0). Heavy vehicle movements are assumed to rise at half that rate since servicing of the town would be consolidated (i.e. by a factor of 0.5).

It should be noted that these estimates are conservative. The volume of traffic recorded on Olympic Way includes traffic associated with the supporting townships of Roxby Downs and Hiltaba as well as tourist / leisure trips as well as all movements to and from Andamooka. As it is not possible to differentiate between OD related and other trips, the latter have also been factored as part of this assessment.

Table 11 – Estimated Ancillary Traffic – AADT

Year	OD and ODX Workforce	Light Vehicles 1.0	Buses 1.0	Heavy Vehicles 0.5	Total
2010	5700*	175	19	10	203
2011	7100*	332	35	18	385
2012	7984*	431	46	23	501
2013	9800*	631	67	34	733
2014	11100	783	83	43	909
2015	12300	918	98	50	1066
2016	12600	943	100	51	1094
2017	11900	865	92	47	1004
2018	11900	869	92	47	1009
2019	12200	895	95	49	1039
2020	10400	697	74	38	809

* - *Includes workforce population at Olympic Village*

3.3.3 Summary of Ancillary Traffic South of Roxby Downs

The generated ancillary traffic includes private journeys by employees and / or their families, servicing traffic, leisure / tourism trips and all movements to and from Andamooka. Figure 21 and Figure 22 detail these traffic flows for the Stuart Highway and Olympic Way.

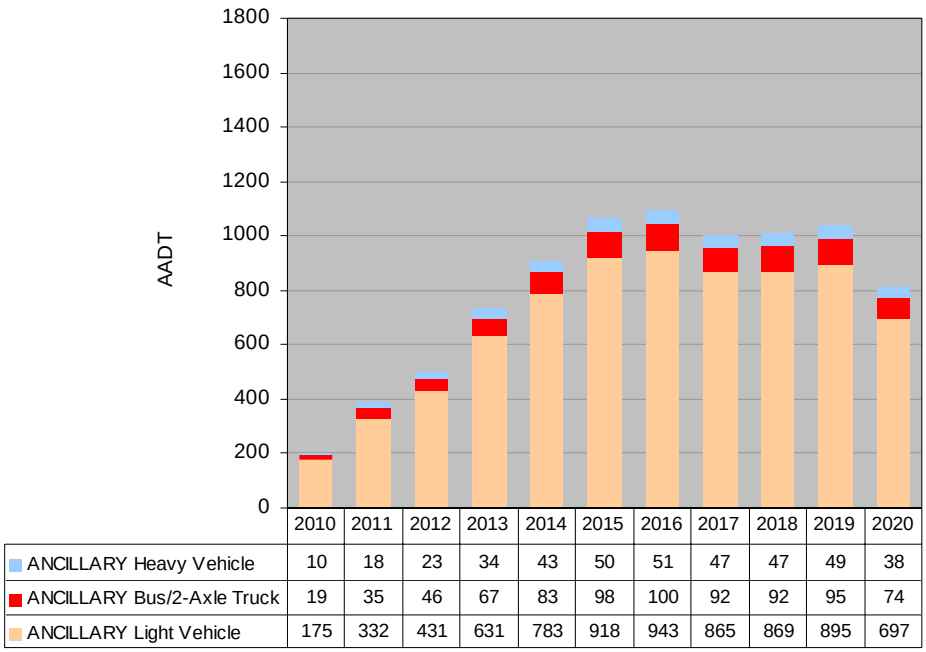
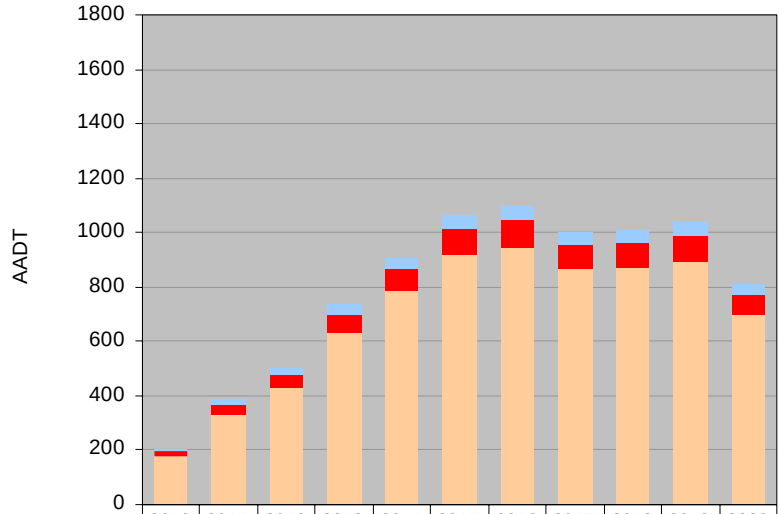


Figure 21 – Ancillary Generated Traffic: Stuart Highway



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ANCILLARY Heavy Vehicle	10	18	23	34	43	50	51	47	47	49	38
ANCILLARY Bus/2-Axle Truck	19	35	46	67	83	98	100	92	92	95	74
ANCILLARY Light Vehicle	175	332	431	631	783	918	943	865	869	895	697

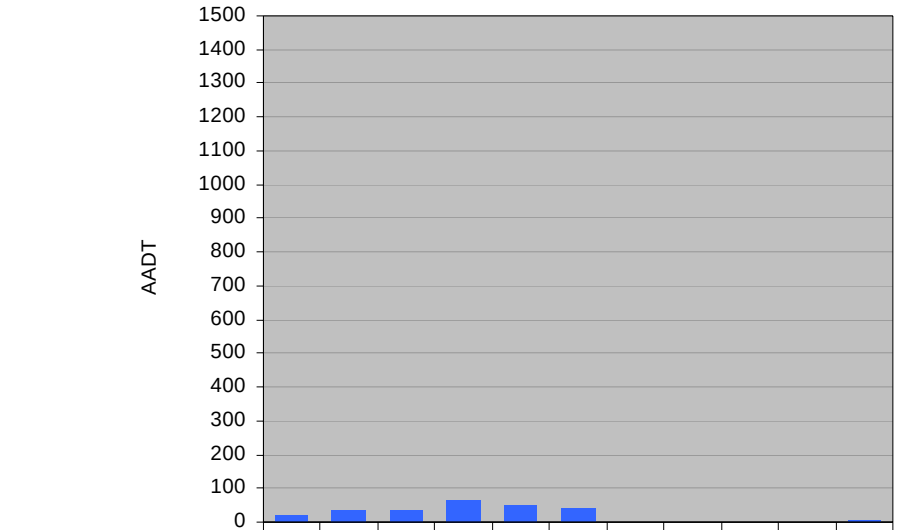
Figure 22 – Ancillary Generated Traffic: Olympic Way

3.4 Total AADT

3.4.1 Total Generated and Future AADT

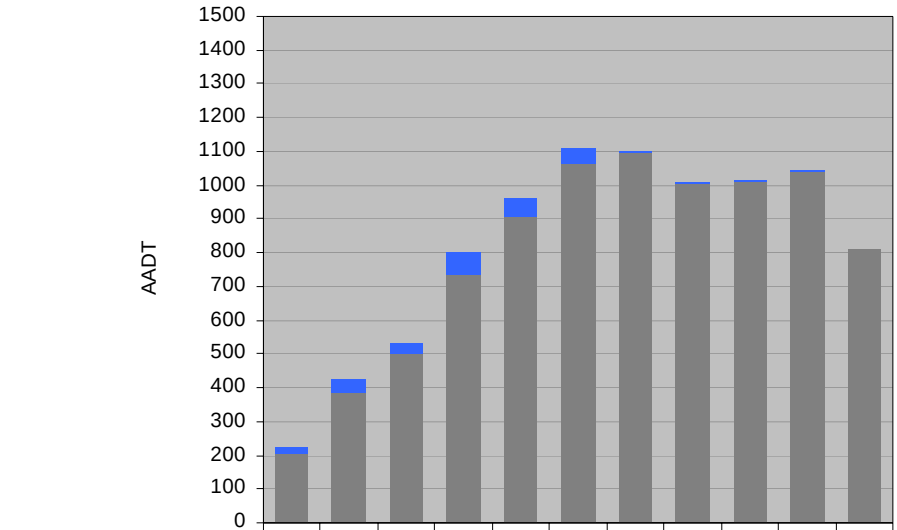
For this assessment, the estimated traffic generation between Adelaide and Olympic Dam includes the ODX and ancillary traffic associated with the expanded workforce in Roxby Downs and Hiltaba Village. Figure 23, Figure 24 and Figure 25 detail the total generated traffic on the Princes Highway, Stuart Highway and Olympic Way respectively. Based on these results, the peak traffic generation will occur in the year 2015. Anticipated traffic generation is assumed to be stable from the year 2020 onwards.

Figure 26 and Figure 27 detail the total generated volumes for the peak and steady state years.



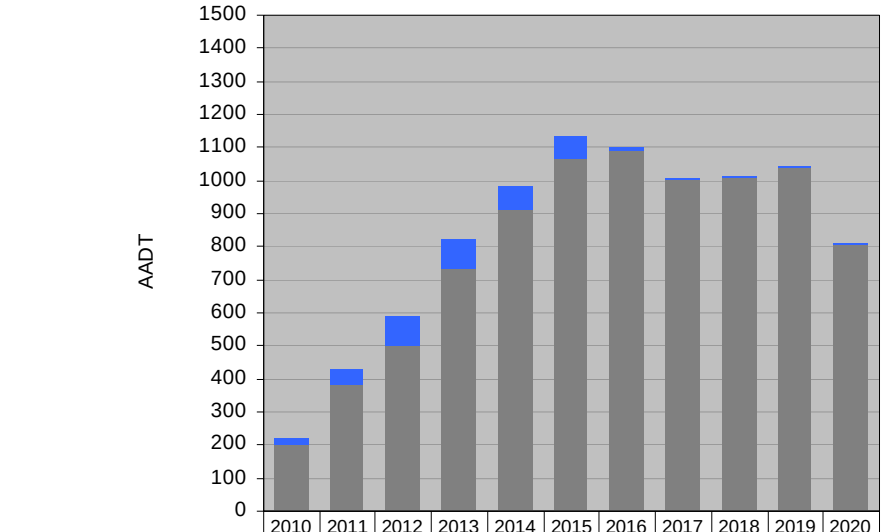
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX Heavy Vehicles	18	37	33	65	49	40	2	1	1	2	3
Ancillary - Combined Modes	0	0	0	0	0	0	0	0	0	0	0

Figure 23 – Total Generated Traffic: Princes Highway



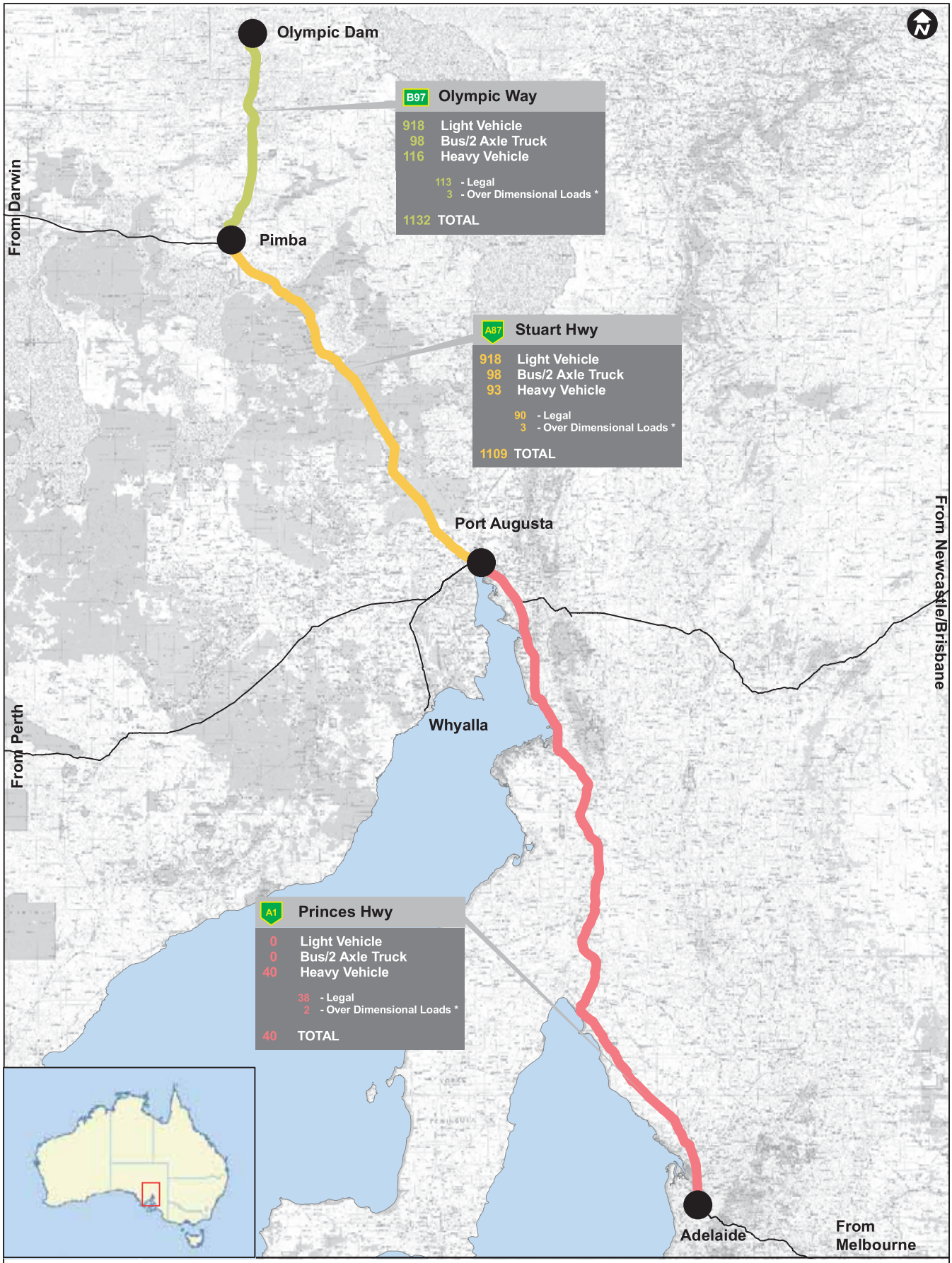
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX Heavy Vehicles	19	42	33	68	52	43	6	5	6	4	4
Ancillary - Combined Modes	203	385	501	733	909	1066	1094	1004	1009	1039	809

Figure 24 – Total Generated Traffic: Stuart Highway



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX Heavy Vehicles	18	42	90	89	75	66	6	5	6	4	4
Ancillary - Combined Modes	203	385	501	733	909	1066	1094	1004	1009	1039	809

Figure 25 – Total Generated Traffic: Olympic Way



Legend

- B97 Olympic Way
- A87 Stuart Hwy
- A1 Princes Hwy
- Major Road Links

FIGURE 26

Note: AADT - Annual Average Daily Traffic
* Over dimensional vehicles return as legal heavy vehicles

Issue	Date	By	Chkd	Appd
P1	14-07-08	CJ	TK	PJC

Client: BHP Billiton

Job Title: Traffic Impact Assessment EIS

Drawing Title: ODX Generated Traffic, AADT 2015 (Peak Year)

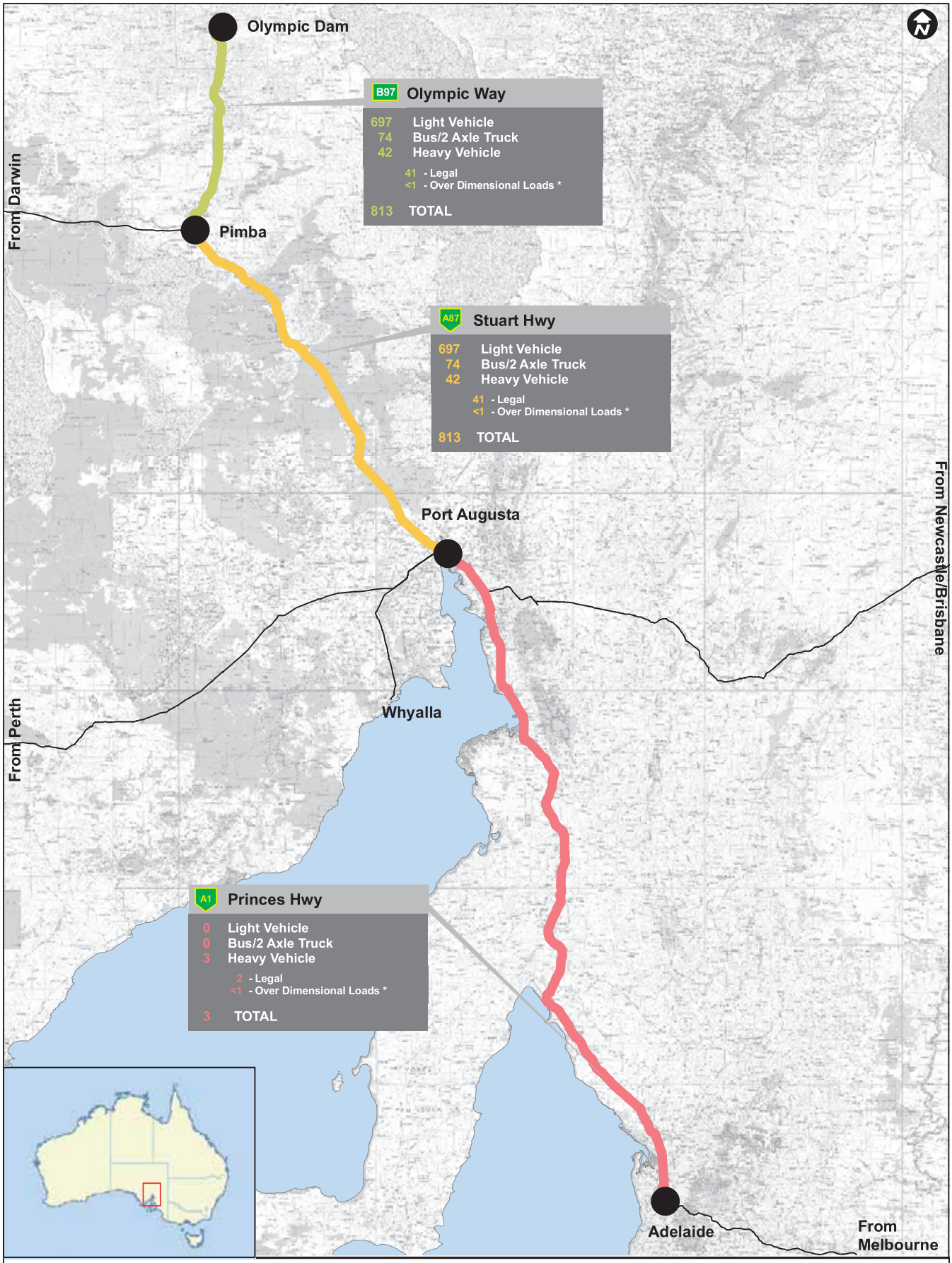
Kilometers
0 15 30 60

ARUP
Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
www.arup.com.au

Scale at A4: 1:2,300,000

Drawing Status: Draft

Job No	Drawing No	Issue
85200-01	001	P1



Legend

- B97 Olympic Way
- A87 Stuart Hwy
- A1 Princes Hwy
- Major Road Links

FIGURE 27

Note: AADT - Annual Average Daily Traffic
* Over dimensional vehicles return as legal heavy vehicles

Issue	Date	By	Chkd	Appd
P1	14-07-08	CJ	TK	PJC

Client: BHP Billiton

Job Title: Traffic Impact Assessment EIS

Drawing Title: ODX Generated Traffic, AADT 2020 (Steady State)

Kilometers
0 15 30 60

ARUP
Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
www.arup.com.au

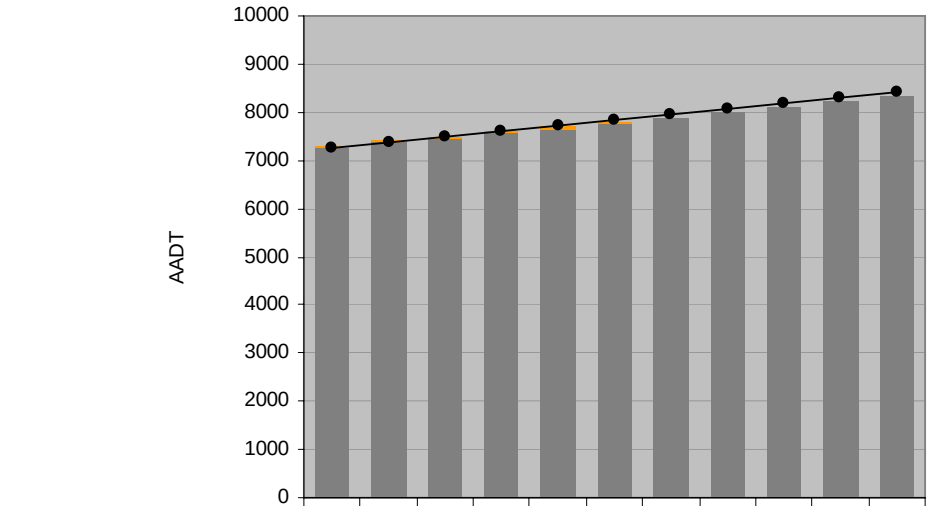
Scale at A4: 1:2,300,000

Drawing Status: Draft

Job No	Drawing No	Issue
85200-01	001	P1

The above total generated traffic has been added to the base traffic (ODX) flows in order to calculate future traffic flows. The base traffic (ODX) flows are calculated using the baseline but with an adjustment to account for the transfer of a portion of existing OD loads to rail as part of ODX infrastructure improvements (i.e. intermodal facility at Pimba in 2012 and new rail spur from Pimba to Olympic Dam from 2016).

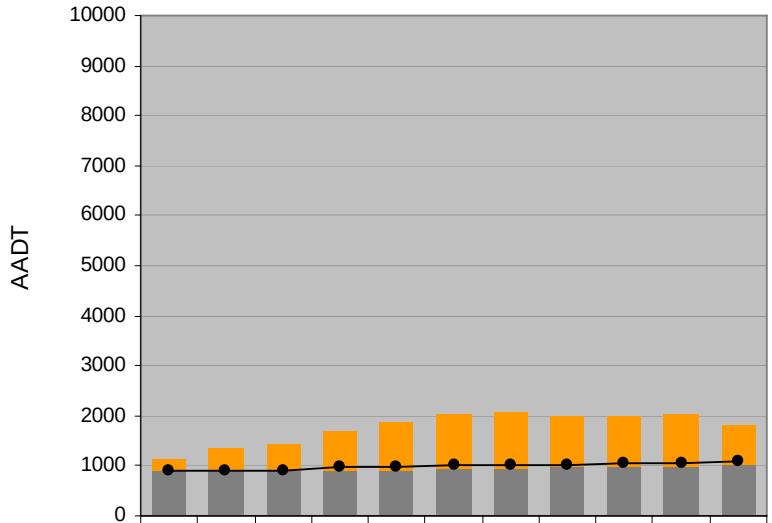
The resulting traffic flows are shown in Figure 28, Figure 29 and Figure 30 for the Princes Highway, Stuart Highway and Olympic Way respectively. These numbers are also shown geographically on Figure 31 and Figure 32 for the peak year (2015) and steady state year (i.e.2020 onwards) respectively.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX Proposed Expansion	18	37	33	65	49	40	2	1	1	2	3
Base Traffic (ODX)*	7268	7374	7442	7549	7657	7768	7881	7992	8104	8219	8335
Baseline*	7268	7374	7475	7613	7721	7832	7945	8056	8168	8283	8399

** - See Glossary for definitions of Baseline and Base Traffic (ODX)*

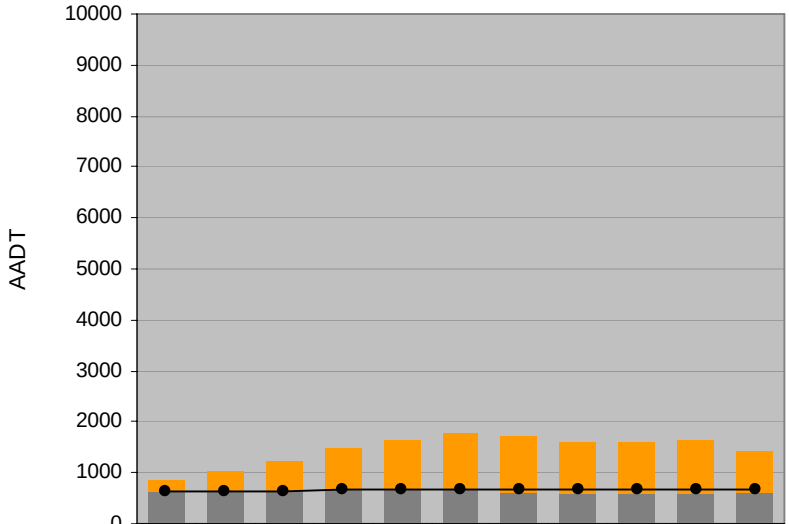
Figure 28 – Total Future Traffic: Princes Highway (Two Wells)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX Proposed Expansion	222	427	534	801	961	1109	1100	1009	1015	1043	813
Base Traffic (ODX)*	889	908	884	900	915	932	950	965	979	995	1010
Baseline*	889	908	917	964	979	996	1014	1029	1043	1059	1075

** - See Glossary for definitions of Baseline and Base Traffic (ODX)*

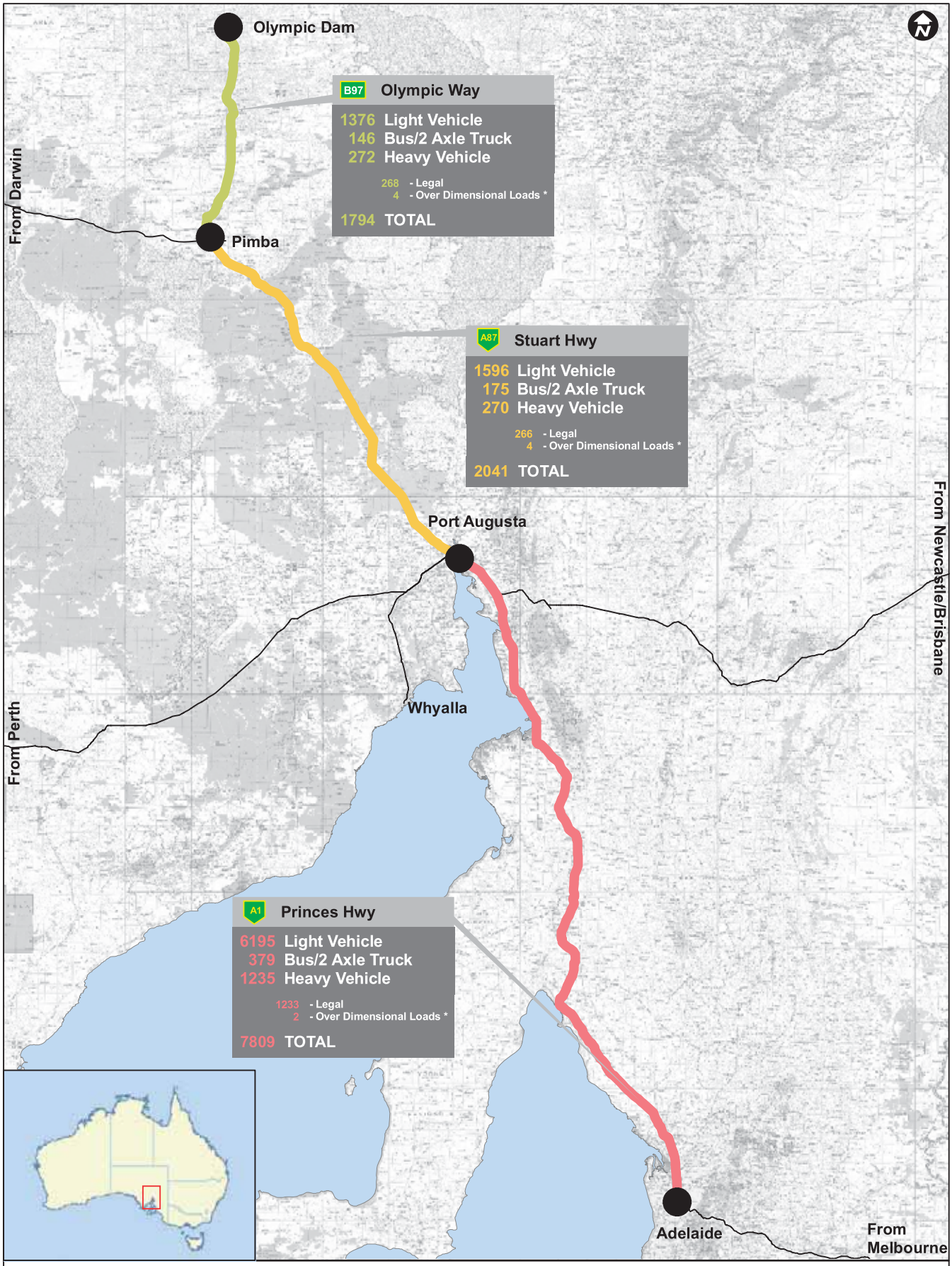
Figure 29 – Total Future Traffic: Stuart Highway



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ODX Proposed Expansion	221	427	591	822	984	1132	1100	1009	1015	1043	813
Base Traffic (ODX)*	629	633	628	660	660	662	600	599	597	597	596
Baseline*	629	633	628	660	660	662	664	663	661	661	661

** - See Glossary for definitions of Baseline and Base Traffic (ODX)*

Figure 30 – Total Future Traffic: Olympic Way



Legend

- B97 Olympic Way
- A87 Stuart Hwy
- A1 Princes Hwy
- Major Road Links

FIGURE 31

Note: AADT - Annual Average Daily Traffic
* Over dimensional vehicles return as legal heavy vehicles

Issue	Date	By	Chkd	Appd
P1	12-08-08	CJ	TK	PJC

Client: BHP Billiton

Job Title: Traffic Impact Assessment EIS

Drawing Title: Total Traffic, AADT 2015 (Peak Year)

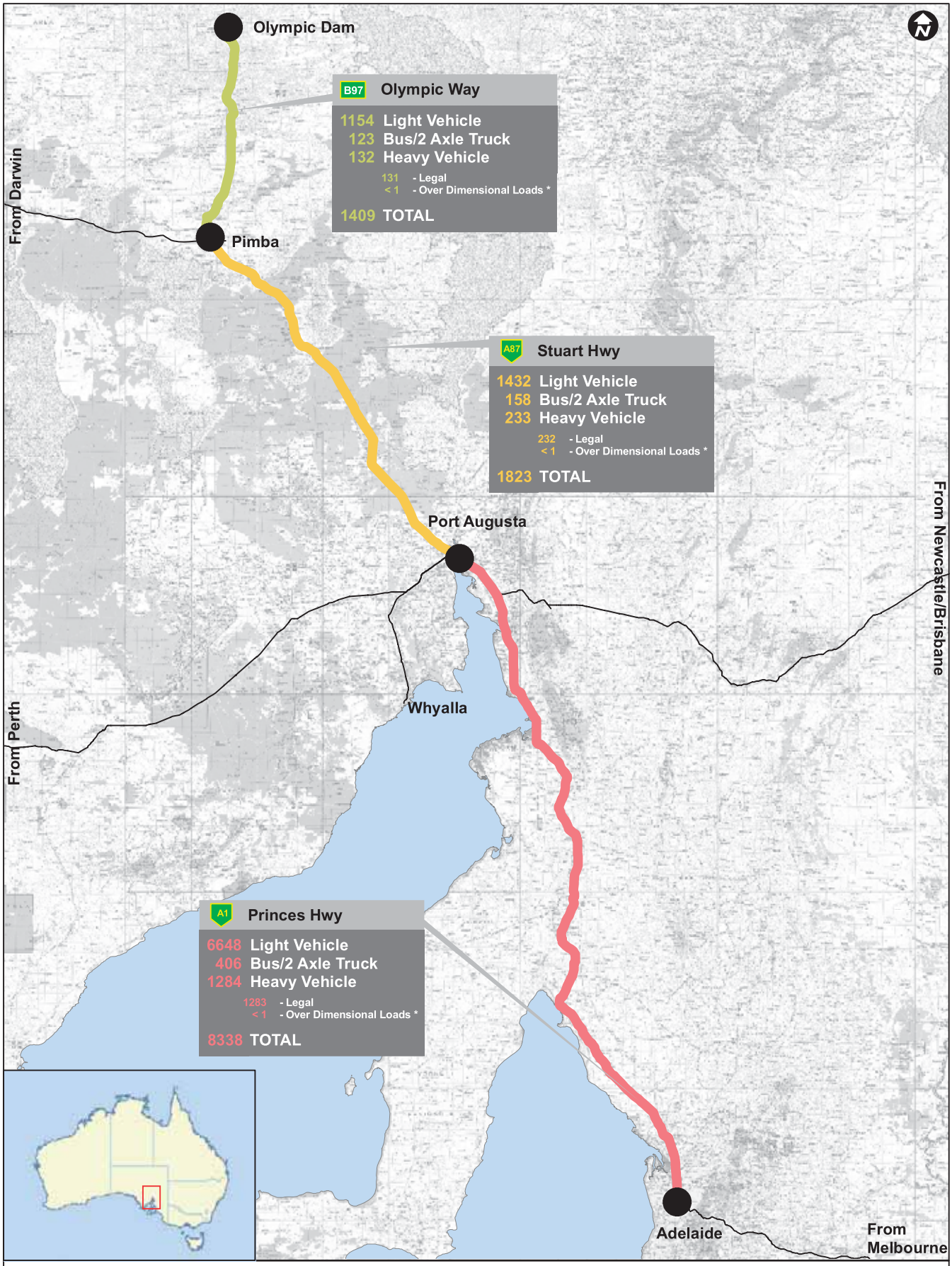
Kilometers: 0 15 30 60

ARUP
Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
www.arup.com.au

Scale at A4: 1:2,300,000

Drawing Status: Draft

Job No	Drawing No	Issue
85200-01	001	P1



Legend

- B97 Olympic Way
- A87 Stuart Hwy
- A1 Princes Hwy
- Major Road Links

FIGURE 32

Note: AADT - Annual Average Daily Traffic
* Over dimensional vehicles return as legal heavy vehicles

Issue	Date	By	Chkd	Appd
P1	13-08-08	CJ	TK	PJC

Client: BHP Billiton

Job Title: Traffic Impact Assessment EIS

Drawing Title: Total Traffic, AADT 2020 (Steady State)

Kilometers: 0 15 30 60

ARUP
Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
www.arup.com.au

Scale at A4: 1:2,300,000

Drawing Status: Draft

Job No	Drawing No	Issue
85200-01	001	P1

It is noted that the introduction of the intermodal facility and new rail line significantly reduces the anticipated traffic volumes after the year 2015 and a steady state of operation is achieved by 2020.

3.4.2 Origins and Destinations

Table 12 and Table 13 detail all traffic movement according to their origins or destinations for the peak and steady state years, respectively.

Table 12 – Vehicle Movements 2015 (Peak Year): Two-Way AADT

		Adelaide	Brisbane	Melbourne	Newcastle	Port Augusta	Whyalla	Pimba*
ODX	Heavy Vehicles	39	*less than 1*	1	*less than 1*	3	*less than 1*	23
Ancillary ODX	Light Vehicles	N/A	N/A	N/A	N/A	918	N/A	N/A
	Buses / 2 Axle trucks	N/A	N/A	N/A	N/A	98	N/A	N/A
	Heavy Vehicles	N/A	N/A	N/A	N/A	50	N/A	N/A
	Total	39	*less than 1*	1	*less than 1*	1069	*less than 1*	23

** - Trips from Pimba originate at the intermodal facility after travelling to Pimba by rail from a number of Australia-wide origins*

Table 13 – Vehicle Movements 2020 (Steady State): Two-Way AADT

		Adelaide	Brisbane	Melbourne	Newcastle	Port Augusta	Whyalla	Pimba
ODX	Heavy Vehicles	3	*less than 1*	0	*less than 1*	0	0	0
Ancillary ODX	Light Vehicles	N/A	N/A	N/A	N/A	697	N/A	N/A
	Buses / 2 Axle Trucks	N/A	N/A	N/A	N/A	74	N/A	N/A
	Heavy Vehicles	N/A	N/A	N/A	N/A	38	N/A	N/A
	Total	3	*less than 1*	0	*less than 1*	809	0	0

** - Trips from Pimba originate at the intermodal facility after travelling to Pimba by rail from a number of Australia-wide origins*

3.4.3 Vehicle Classification

Table 14 to Table 15 detail the classification of vehicles according to each route section from Adelaide through to Olympic Dam.

Table 14 – Traffic Volumes 2015 (Peak Period)

	Classification	Daily Traffic Generated by ODX in 2015	Baseline Daily Traffic Volumes in 2015	Proposed Total Daily Traffic Volumes 2015 (ODX)[2]
Princes Highway (Two Wells)	Light Vehicles	0	6195	6195
	Buses / 2 Axle Trucks	0	379	379
	Heavy Vehicles[1]	40	1259	1235
	- B-Doubles	*38*	*1258*	*1233*
	- Over-Dimensional Loads[1]	*2*	*1*	*2*
	AADT	40	7833	7809
Stuart Highway	Light Vehicles	918	678	1596
	Buses / 2 Axle Trucks	98	77	175
	Heavy Vehicles[1]	93	241	270
	- B-Doubles	*90*	*240*	*266*
	- Over-Dimensional Loads[1]	*3*	*1*	*4*
	AADT	1109	996	2041
Olympic Way	Light Vehicles	918	458	1376
	Buses / 2 Axle Trucks	98	49	146
	Heavy Vehicles[1]	116	155	272
	- B-Doubles	*113*	*154*	*268*
	- Over-Dimensional Loads[1]	*3*	*1*	*4*
	AADT	1132	661	1794

[1] *- Over dimensional vehicles return from OD as regular heavy vehicles*

[2] *- Sum of Base Traffic (ODX), ODX HVs and ancillary traffic (See glossary).*

Table 15 – Traffic Volumes 2020 (Steady State)

	Classification	Daily Traffic Generated by ODX in 2020	Baseline Daily Traffic Volumes in 2020	Proposed Total Daily Traffic Volumes 2020 (ODX)
Princes Highway	Light Vehicles	0	6648	6648
	Buses / 2 Axle Trucks	0	406	406
	Heavy Vehicles[1]	3	1345	1284
	- B-Doubles	*2*	*1345*	*1283*
	- Over-Dimensional Loads[1]	*Less than 1*	*0*	*Less than 1*
	AADT	3	8399	8338
Stuart Highway	Light Vehicles	697	735	1432
	Buses / 2 Axle Trucks	74	83	158
	Heavy Vehicles[1]	42	257	233
	- B-Doubles	*41*	*257*	*232*
	- Over-Dimensional Loads[1]	*Less than 1*	*0*	*Less than 1*
	AADT	813	1075	1823
Olympic Way	Light Vehicles	697	458	1154
	Buses / 2 Axle Trucks	74	49	123
	Heavy Vehicles[1]	42	155	132
	- B-Doubles	*41*	*155*	*131*
	- Over-Dimensional Loads[1]	*Less than 1*	*0*	*Less than 1*
	AADT	813	662	1409

[1] *- Over dimensional vehicles return from OD as regular heavy vehicles*

[2] *- Sum of Base Traffic (ODX), ODX HVs and ancillary traffic (See glossary).*

3.5 Traffic Movements Between Townships and Olympic Dam

This section details changes to traffic movement north of Roxby Downs that includes all workforce movements, between Roxby Downs / Hiltaba and the OD site. The estimated workforce population has been used to determine the estimated level of ancillary traffic generation and calculations are based on the following assumptions:

- Workforce profile as shown in Appendix E;
- Employees associated with construction located in Hiltaba Village will work 28 days on seven days off;
- 5% of the Hiltaba workforce is assumed to be facility management staff and not counted in trips to the OD site;
- Employees associated with ODX operations located in Roxby Downs will work four days on four days off;
- Vehicle occupancy will be 50 persons per bus (average bus size, 50 persons[1], 1.1 persons per vehicle[1];
- Mode share for Roxby Downs and Hiltaba Village will be as shown in Table 16;
- 70% of staff work day shift, 30% staff work night shift;
- The AM peak period will occur over two hours (5.45-7.45am) with the peak hour from 6am-7am and generating approximately 65% of all peak period traffic (based on 2008 traffic surveys);
- The PM peak period will occur over two hours (4.30-6.30pm) with the peak hour from 4:45pm-5:45pm and generating approximately 60% of all peak period traffic (based on 2008 traffic surveys); and
- All bus trips in the minor direction are equal to that of the major directional flow.

The calculations showing the application of each of the above assumptions is shown at Appendix E. Table 16 details the assumed modal share.

Table 16 – Township Modal Share

Township	2008 – Existing	ODX 2015 Peak Construction	2020 Ongoing Operation
Existing Roxby Downs Township	100% light vehicle	100% light vehicle	Existing residents 100% light vehicle (OD) ODX residents 80% bus 20% light vehicle
Roxby Village Expanded (Axehead Road, Village 6 & Village 3)	100% light vehicle	95% bus 5% light vehicle	95% bus 5% light vehicle
Hiltaba Village	NA	95% bus 5% light vehicle	95% bus 5% light vehicle

Due to the characteristics of vehicle movement associated with shift changes at the OD site, it is necessary to determine the peak hour movements and consider the intersections that will carry the workforce, ODX and ancillary traffic.

[1] *Workforce Bus and Transport Study – Arup August 2007*

3.5.1 Daily Profiles

The traffic volumes collected as part of the surveys described in Section 2.4.2 provide hourly traffic flows at each survey location. In particular, the survey location on Olympic Way north of Roxby Downs provides hourly summaries that accurately reflect the workforce changeover patterns and heavy vehicle movements.

The hourly profile derived from the traffic survey is shown in Figure 33 below. This clearly shows a morning peak hour occurring between 06:00 and 07:00 and an evening peak hour occurring between 16:45 and 17:45. The ODX and ancillary generated traffic along Olympic Way has been converted to peak hour movements in accordance to the profile shown in Figure 33.

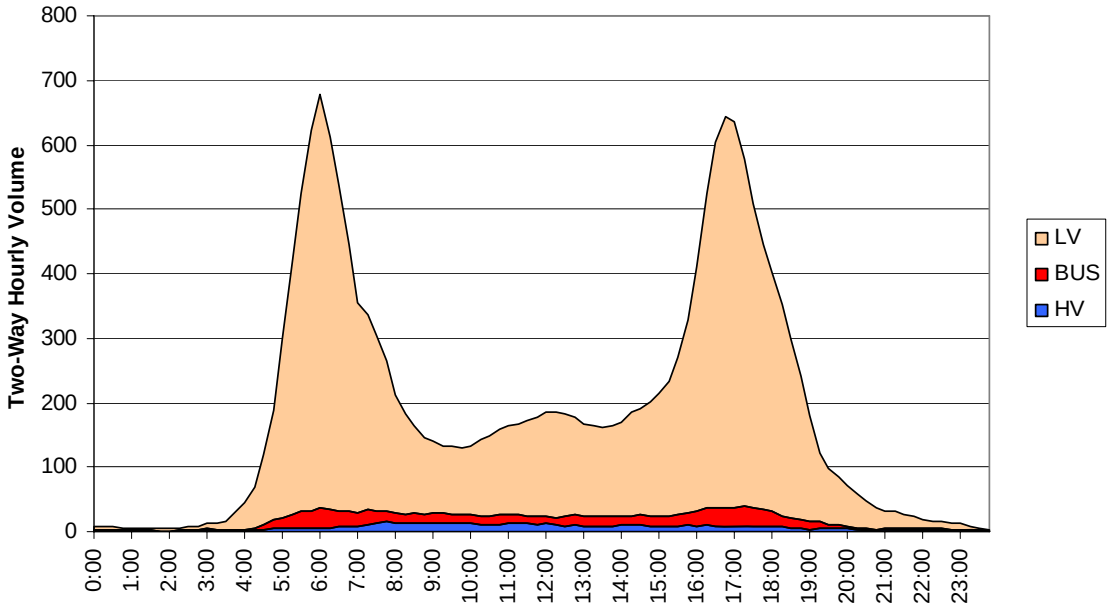


Figure 33 – Daily Traffic Profile by Mode, Olympic Way (1.6km South of the Main Gate)

3.5.2 Traffic Distribution

The distribution of estimated future trips has been based on the following assumptions:

- All turning movements (ODX, ancillary and base traffic flows) at the two intersections of Olympic Way and the Heavy Vehicle Bypass will use turning proportions derived from turning counts surveyed in August 2006. These turning proportions are included in Appendix E;
- All traffic using the intersection of Olympic Way with the Heavy Vehicle Bypass, north of Roxby Downs, turning to or from Olympic Way north will be rerouted to the proposed western access road;
- All traffic movements associated with shift changes between the OD site and Hiltaba village will use Andamooka Road, turning north onto the Heavy Vehicle Bypass, heading west across the new roundabout with Olympic Way;
- All traffic servicing Hiltaba Village will approach along Olympic Way, then the Heavy Vehicle Bypass before turning right into Andamooka Road; and
- All return trips will be the reverse of the above.

3.5.3 Turning Counts

The ODX generated and future peak hour turning counts for each of the key intersections is detailed in Table 17 to Table 22 for Olympic Way / Heavy Vehicle Bypass South, Olympic Way / Heavy Vehicle Bypass North and Heavy Vehicle Bypass/Andamooka Road respectively.

Table 17 – Future Turning Counts with ODX 2015 (Peak Year): Olympic Way/Heavy Vehicle Bypass (South)

From/To	Olympic Way (S)		Olympic Way (W)		Heavy Vehicle Bypass	
	AM	PM	AM	PM	AM	PM
Olympic Way (S)	-	-	8	13	22	59
Olympic Way (W)	3	15	-	-	n/a	n/a
Heavy Vehicle Bypass	27	57	n/a	n/a	-	-

Table 18 – Future Turning Counts with ODX 2015 (Peak Year): Heavy Vehicle Bypass / Andamooka Road

From/To	Heavy Vehicle Bypass (S)		Heavy Vehicle Bypass (N)		Andamooka Road	
	AM	PM	AM	PM	AM	PM
Heavy Vehicle Bypass (S)	-	-	25	46	6	45
Heavy Vehicle Bypass (N)	55	34	-	-	72	119
Andamooka Road	42	60	156	77	-	-

Table 19 – Future Turning Counts with ODX 2015 (Peak Year): Olympic Way / Heavy Vehicle Bypass (North)

From/To	Olympic Way (S)		Western Access Road		Heavy Vehicle Bypass	
	AM	PM	AM	PM	AM	PM
Olympic Way (S)	-	-	746	290	n/a	n/a
Western Access Road	312	706	-	-	127	154
Heavy Vehicle Bypass	n/a	n/a	180	122	-	-

Table 20 – Future Turning Counts with ODX 2020 (Steady State): Olympic Way/Heavy Vehicle Bypass (South)

From/To	Olympic Way (S)		Olympic Way (W)		Heavy Vehicle Bypass	
	AM	PM	AM	PM	AM	PM
Olympic Way (S)	-	-	8	11	18	48
Olympic Way (W)	3	12	-	-	n/a	n/a
Heavy Vehicle Bypass	22	47	n/a	n/a	-	-

Table 21 – Future Turning Counts with ODX 2020 (Steady State): Heavy Vehicle Bypass / Andamooka Road

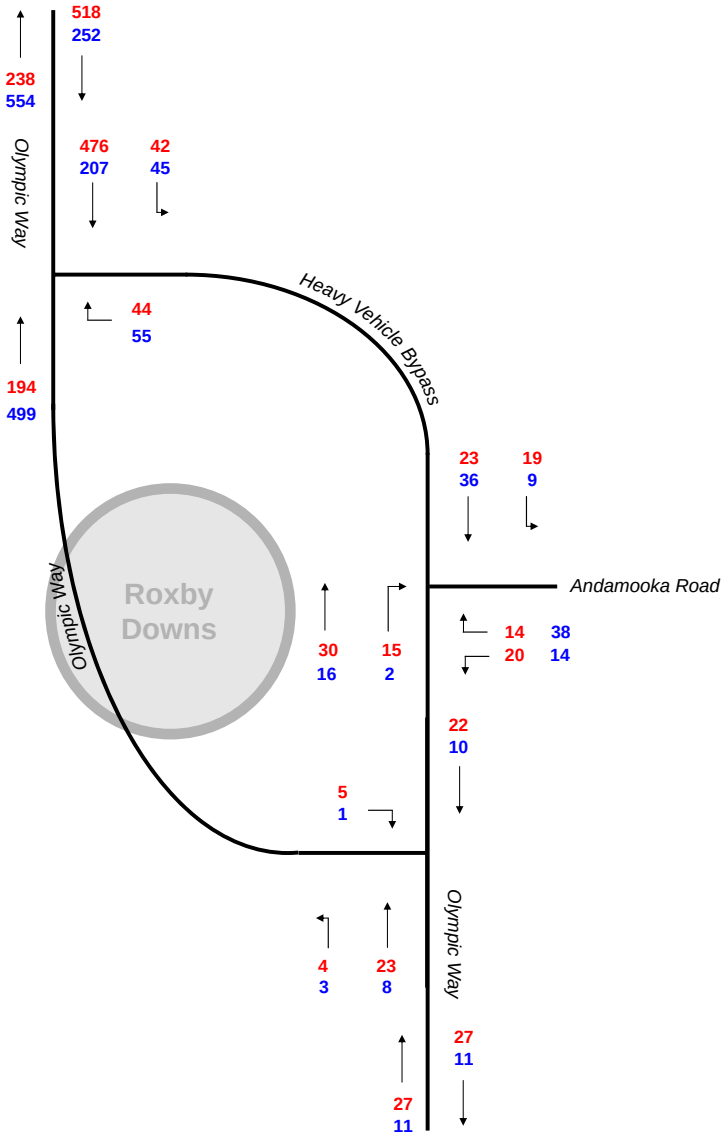
From/To	Heavy Vehicle Bypass (S)		Heavy Vehicle Bypass (N)		Andamooka Road	
	AM	PM	AM	PM	AM	PM
Heavy Vehicle Bypass (S)	-	-	20	36	6	45
Heavy Vehicle Bypass (N)	46	26	-	-	34	58
Andamooka Road	42	60	84	39	-	-

Table 22 – Future Turning Counts with ODX 2020 (Steady State): Olympic Way / Heavy Vehicle Bypass (North)

From/To	Olympic Way (S)		Western Access Road		Heavy Vehicle Bypass	
	AM	PM	AM	PM	AM	PM
Olympic Way (S)	-	-	611	243	n/a	n/a
Western Access Road	312	706	-	-	127	154
Heavy Vehicle Bypass	n/a	n/a	104	75	-	-

The baseline (no ODX) and future turning counts are also presented in Figure 34 and Figure 35.

2015 Base Line (No ODX): Peak Hours (AM in Blue and PM in Red)



2020 Base Line (No ODX): Peak Hours (AM in Blue and PM in Red)

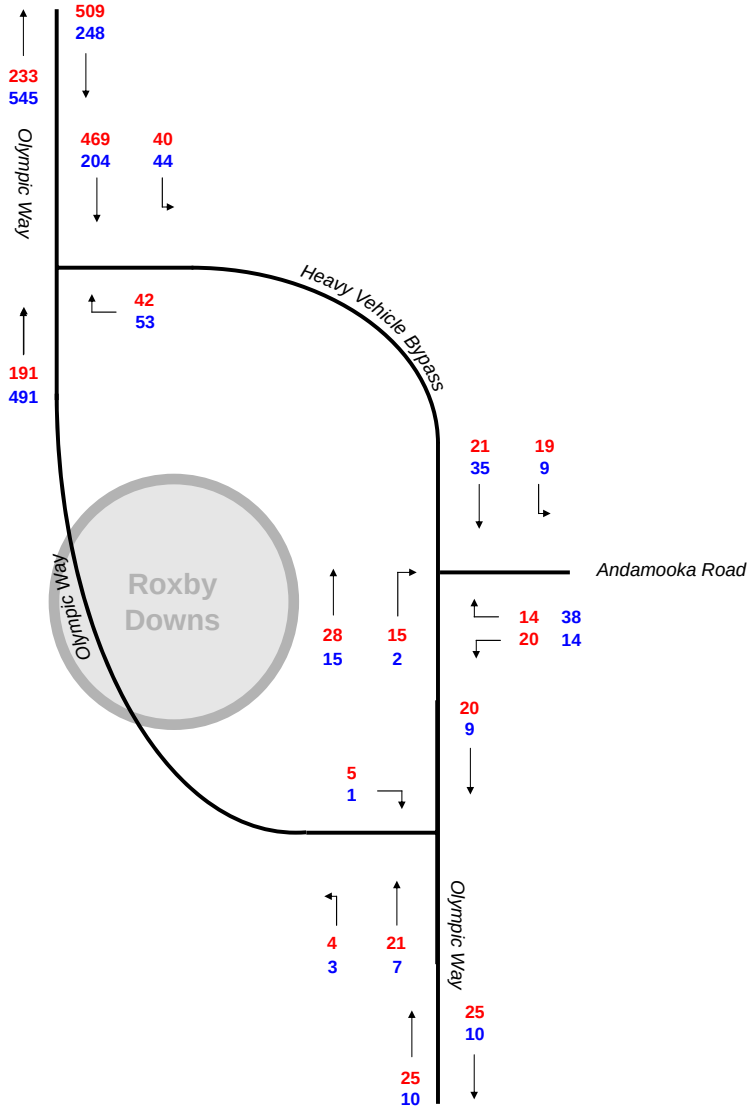


Figure 34: Base Turn Counts for the Roxby Area (assumes no expansion)

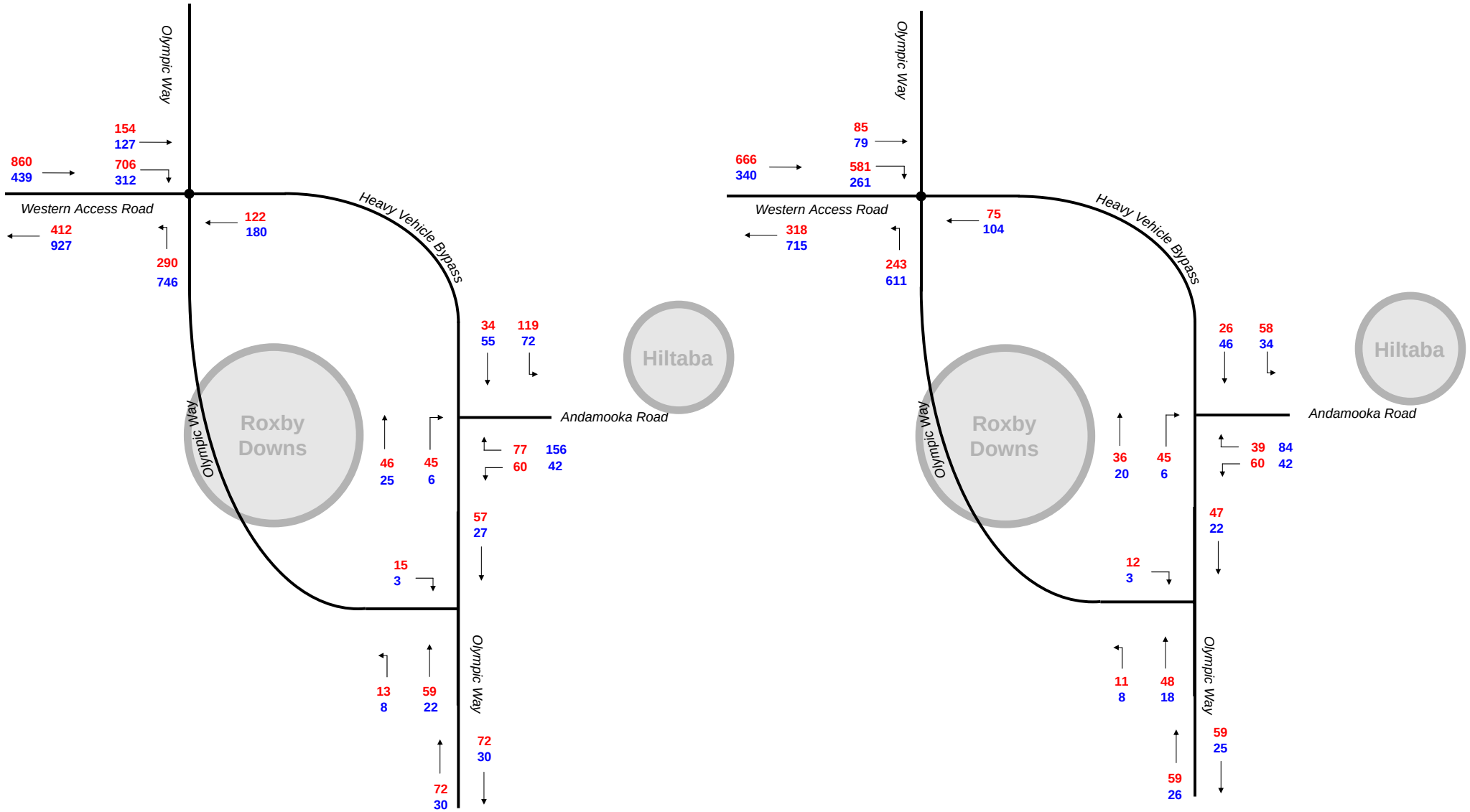


Figure 35: Total Turn Counts with ODX for Roxby Downs Area

3.6 Road Link Level of Service - Impact

Level of Service (LoS) is a measure of operational conditions within a stream of traffic. Austroads 1988[1] provides a description of each LoS as outlined in Table 23. The actual traffic volumes that result in each LoS are dependent on a number of factors, including number of traffic lanes provided in each direction, traffic speeds, road width, and the proportions of buses and heavy vehicles.

Table 23 – Level of Service Definitions

Level of Service	Description
A	Is a condition of free flow in which individual drivers are virtually unaffected by the presence of other drivers. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
B	Is in the stream of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with LoS A.
C	Is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
D	Is close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
E	Occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause break-down.
F	Is in the zone of forced flow.

The approach for determining the LoS along a road length is initially dependent on the number of traffic lanes provided in each direction. As discussed in Section 2.3, the road network from Adelaide to Olympic Dam generally provides for two lane, two-way traffic movements. However, the cross section changes along Port Wakefield Road (Port Wakefield to Adelaide) to provide divided four lane two-way traffic movements. This section of the Princes Highway was individually assessed.

The LoS for the sections of highway providing two lane two-way traffic movements has been determined based on the following assumptions and the traffic data shown in Section 3.4:

- Each of the highways provides level terrain and exhibit high vehicle speeds (110km/h);
- The horizontal and vertical geometry in the region of the hauling route is such that the available sight distance (for overtaking) is not less than 450m along the length of the route;
- The proportion of buses and heavy vehicles is determined from the traffic surveys (discussed in Section 2.4) and anticipated traffic movements. The adopted average passenger vehicle equivalents are 2 per truck and 1.8 per bus; and
- The geometry of the roads is such that 3.3m lanes and 2m shoulders are provided along the route.

[1] *Austroads 1988, Guide to Traffic Engineering Practice, Roadway Capacity – Part 2, Sydney Australia*

The LoS for the section of highway providing four lane two-way traffic movements has been determined based on the following assumptions and the traffic data shown in Section 3.4:

- Each of the highways provides level terrain and exhibit high vehicle speeds (110km/h);
- The clearance to lateral obstructions is greater than 2m and the traffic lanes are generally 3.3m in width;
- The proportion of buses and heavy vehicles is determined from the traffic surveys and (discussed in Section 2.4) anticipated traffic movements. The adopted average passenger vehicle equivalents are 1.7 per truck and 1.5 per bus;
- The abutting development environment can be considered to be suburban (conservative); and
- The driver population along the route is unfamiliar, non-regular users.

It is proposed that as a part of the expansion, a four lane two-way divided OD site access road will be constructed to link the intersection of Olympic Way with the proposed ore processing plant as shown earlier in Figure 13. This western link will extend from the proposed roundabout to the new OD site access. The clearance to lateral obstructions on this link is assumed to be greater than 2.0m and the traffic lanes will generally be 3.3m in width. The baseline conditions have been assessed according to the existing road cross section, which is two lane, two way. The proposed conditions have been assessed assuming that this traffic is switched to the new western access road.

The AM peak hour turning movements described in Section 3.5.3 have been adopted to determine the peak traffic volumes along for the roads surrounding Roxby Downs (i.e. Olympic Way and the Heavy Vehicle Bypass). The AM peak hour has been adopted as the traffic volumes are greater and it is therefore the more critical peak period.

The additional traffic volumes as a result of the proposed expansion have been estimated as described in Section 3.4. The traffic volumes along the Princes Highway (north of Port Wakefield) were based on the existing traffic volumes and growth rates discussed in Section 2.4 and the existing OD operations traffic and the estimated future traffic on the Princes Highway.

Table 24 identifies the percentage peak hour of AWDT that are used to convert the measured AADT traffic volumes to peak hour volumes for the LoS analysis for the roads between Adelaide and Roxby Downs. Based on the traffic surveys discussed in Section 2.4, the daily profile for these roads is such that the traffic peaks generally occur through the middle of the day (i.e. one peak period).

Table 24 – Traffic Assumptions

Road Link	Section/Location	AM Peak Hour Directional Split	Peak Hour % of AWDT
Olympic Way	Heavy Vehicle Bypass to OD site access gate	70/30	-
Heavy Vehicle Bypass	Andamooka Road to Olympic Way	60/40	-
Olympic Way	Roxby Downs to Heavy Vehicle Bypass	70/30	-
Olympic Way	Pimba to Roxby Downs	60/40	8.4%
Stuart Highway	Port Augusta to Pimba	50/50	8.9%
Princes Highway	North of Port Wakefield	50/50	6.0%
Princes Highway	Lower Light	50/50	7.7%

The LoS for the peak traffic year (2015) and for ongoing operations (2020) was determined and compared to the baseline (no ODX) for each of these years. The baseline includes the projected background traffic growth and ongoing operations of the OD site without the expansion as discussed in Section 2.5. A summary of the results of this analysis is shown in Table 25 and in Figure 36.

Table 25 – Road Link Mid Block Level of Service

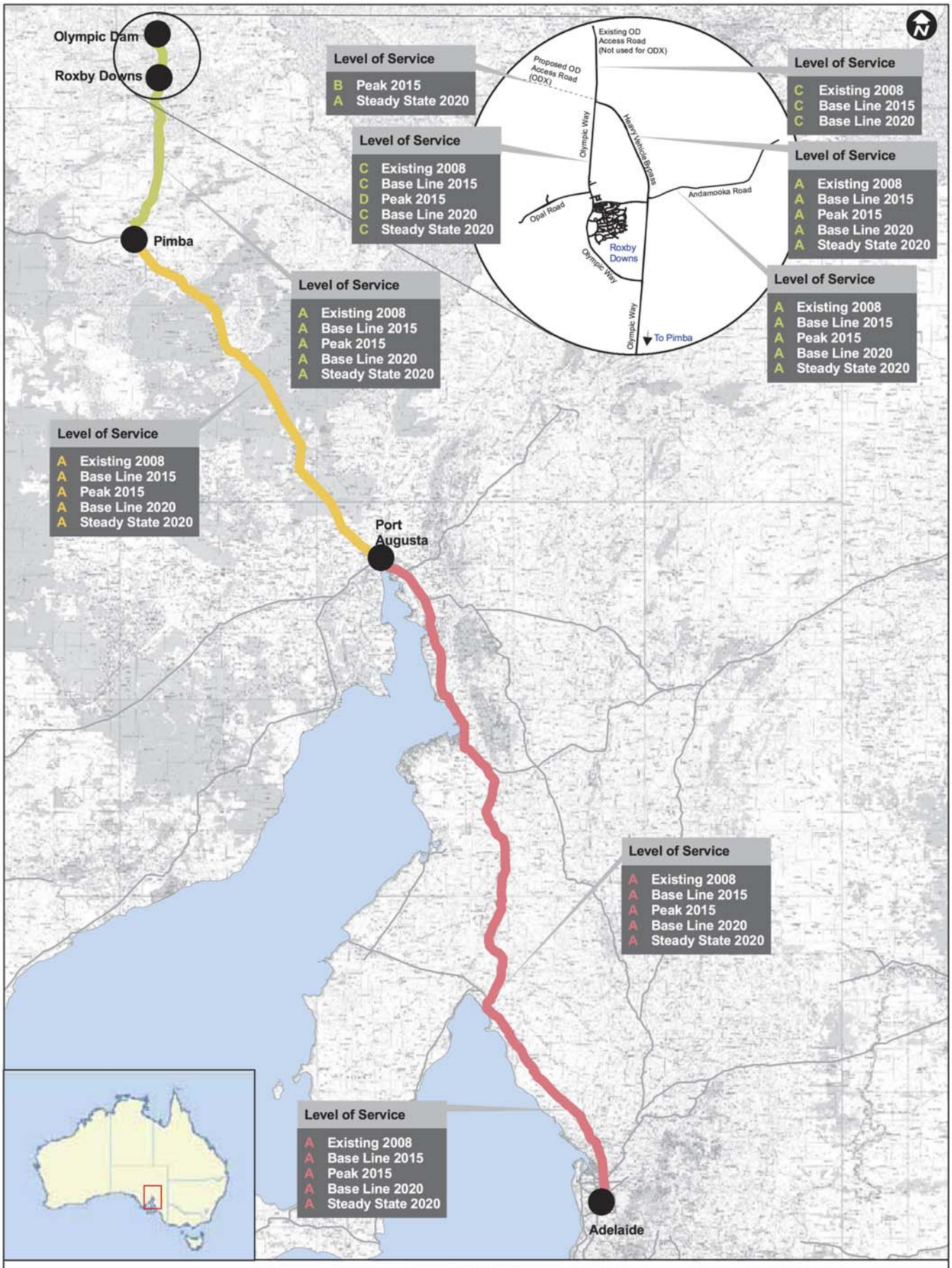
Road Link	Section/Location	Existing (2008)	Base Line (2015)	Peak (2015)	Base Line (2020)	Steady State (2020)
Olympic Way	Heavy Vehicle Bypass to existing OD site access	C	C	n/a	C	n/a
Western Access Road	Heavy Vehicle Bypass to new OD site access	n/a	n/a	B	n/a	A
Andamooka Road	Hiltaba to the Heavy Vehicle Bypass	A	A	A	A	A
Heavy Vehicle Bypass	Andamooka Road to Olympic Way	A	A	A	A	A
Olympic Way	Roxby Downs to Heavy Vehicle Bypass	C	C	D*	C	C
Olympic Way	Pimba to Roxby Downs	A	A	A	A	A
Stuart Highway	Port Augusta to Pimba	A	A	A	A	A
Princes Highway	North of Port Wakefield	A	A	A	A	A
Princes Highway	Lower Light	A	A	A	A	A

** It is noted that this is only slightly below the boundary of LoS C*

It is clear from Table 25 that the LoS along each of the road links will not change significantly as a result of the proposed OD site expansion with the exception of Olympic Way in the vicinity of the OD site.

The drop in LoS in the vicinity of the OD site is attributed to the greater peak hour traffic demand due to shift change over at the OD site. The LoS along Olympic Way between Roxby Downs and the Heavy Vehicle Bypass will drop to LoS D in the peak periods. While this LoS is poor, it is noted that this is only slightly below the cusp of LoS C.

From the proposed roundabout to the OD site gate the road link is duplicated and the LoS improves. Table 25 indicates that, with the expansion, the LoS along this new link will only drop to LoS B even though it carries a greater traffic volume than Olympic Way between Roxby Downs and the Heavy Vehicle Bypass.



Legend

- A1 Princes Hwy
- A87 Stuart Hwy
- B97 Olympic Way
- Principal Road

FIGURE 36

Issue	Date	By	Chkd	Appd
P1	25-07-08	CJ	TK	PJC

Client
BHP Billiton

Job Title
Traffic Impact Assessment EIS

Drawing Title
Level of Service

Kilometers
0 15 30 60

ARUP
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Tel (03) 9668 5500 Fax (03) 9668 5415
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Scale at A4
1:2,300,000

Drawing Status
Draft

Job No	Drawing No	Issue
85200-01	001	P1

3.7 Key Intersections, Peak Hour Traffic and Impacts

3.7.1 Overview

In order to provide an analysis of key intersections, a daily profile and traffic distribution is required to derive peak hours and turning as determined in Section 3.5.

3.7.2 Intersection Location and Layout

Three key intersections have been identified that will experience significant changes to traffic volumes and patterns. These changes are primarily due to the anticipated workforce movements between Roxby Downs, Hiltaba Village and the OD site. All three intersections are in the vicinity of Roxby Downs and are as follows:

- Intersection of Olympic Way with the Heavy Vehicle Bypass, south of Roxby Downs. This is a three arm priority intersection with the main road priority between Olympic Way south and the bypass as described in Section 2.3.4. The main road provides access to the OD site, whilst the minor arm provides access to Roxby Downs;
- Intersection of Heavy Vehicle Bypass and Andamooka Road. This is a three-arm priority intersection with the Heavy Vehicle Bypass as the main road and Andamooka Road as the minor road. Andamooka Road will become the access to Hiltaba Village; and
- Intersection of Olympic Way with the Heavy Vehicle Bypass, north of Roxby Downs. This is currently a three-arm priority intersection with the main road priority along Olympic Way and the bypass on the minor road as described in Section 2.3.4. As part of the expansion, it is proposed to upgrade this intersection to a four-arm roundabout with access to the OD site switching to a new road heading west from the roundabout. The western access road in shown in Figure 13.

The locations and configurations of these intersections are shown in Figure 2. In the case of the northern intersection between Olympic Way and the Heavy Vehicle Bypass, the proposed configuration of a roundabout is shown.

3.7.3 Road Intersection Impact

Total generated traffic flows have been calculated and added to the base traffic flows to estimate future traffic movements. Table 26 shows the total inflow to each of the key intersections.

Table 26 – Key Intersection Total Inflow

	2015 Baseline		2015 Peak Traffic	
	AM Peak	PM Peak	AM Peak	PM Peak
Olympic Way/Heavy Vehicle Bypass (N)	806	756	1365	1272
Heavy Vehicle Bypass/Andamooka Road	115	121	556	381
Olympic Way/Heavy Vehicle Bypass (S)	22	54	60	144

Of the intersections identified in Table 26, the following have been analysed using the SIDRA[1] computer software:

[1] *Signalised & un-signalised Intersection Design and Research Aid. A computer program used to analyse the performance of road intersections.*

- Olympic Way/Heavy Vehicle Bypass (N);
- Heavy Vehicle Bypass/Andamooka Road; and
- Olympic Way/Heavy Vehicle Bypass (S).

The output of this analysis is contained in Tables F1 to F24 within Appendix F. Table 27 below identifies each testing scenario.

Table 27 – References to Intersection Analysis in Appendix F

	2015 Baseline		2015 Peak Traffic	
	AM Peak	PM Peak	AM Peak	PM Peak
Olympic Way/Heavy Vehicle Bypass (N)	Table F1	Table F2	Table F3	Table F4
Heavy Vehicle Bypass/Andamooka Road	Table F5	Table F6	Table F7	Table F8
Olympic Way/Heavy Vehicle Bypass (S)	Table F9	Table F10	Table F11	Table F12
	2020 Baseline		2020 Peak Traffic	
	AM Peak	PM Peak	AM Peak	PM Peak
Olympic Way/Heavy Vehicle Bypass (N)	Table F13	Table F14	Table F15	Table F16
Heavy Vehicle Bypass/Andamooka Road	Table F17	Table F18	Table F19	Table F20
Olympic Way/Heavy Vehicle Bypass (S)	Table F21	Table F22	Table F23	Table F24

The SIDRA analysis provides a Degree of Saturation (DoS) of each arm of each intersection. For the intersection to operate within capacity, this is expected to be below 1.0. However, due to daily fluctuations in traffic volumes, it is not expected to rise above 0.85 and remain 'within capacity'. The SIDRA analysis also outputs a Level of Service (LoS) that is calculated using a differing set of variables to that used in mid-block LoS. Table 23 defines each LoS. During normal operation, an LoS C or better is considered satisfactory.

The output of the SIDRA analysis, in relation to the key performance criteria for intersections, shows that for all the assessed intersections:

- All DoS measurements are below 0.85;
- All LoS measurements are C or better; and
- All queue lengths are considered reasonable and can be accommodated within the intersection layouts.

Based on the above results, it is concluded that there would be no adverse impacts on these intersections.

3.8 Over-Dimensional Load Movements and Impacts

It is proposed that a proportion of equipment and plant be pre-fabricated and pre-assembled prior to delivery to Olympic Dam. The pre-assemblies vary in width and therefore constitute a variety of classifications of over-dimensional loads. In addition to classification, the dimensions of over-dimensional loads also determine the traffic management measures that are required.

The size of some of the over-dimensional loads is such that some loads will occupy the entire road carriageway, necessitating disruption to both following and opposing traffic streams during the period of transportation.

3.8.1 Policies and Guidelines

There are a number of policies and guidelines that provide a framework for the movement of over-dimensional loads within South Australia. These requirements are generally outlined by the South Australian Department of Transport, Energy and Infrastructure (DTEI). The key DTEI policies and guidelines for the movement of oversize/non-divisible loads include:

- Heavy Vehicle Access Framework (July 2006);
- Policy for the Transport of Oversize and Over-mass Indivisible Loads and Vehicles (June 2006);
- Route Assessment Guidelines for Restricted Access Vehicles (June 2007); and
- Escort Guidelines for Oversize and Over-mass Vehicles and Loads (May 2006).

In addition to the above, further detail regarding traffic management techniques is provided within the Australian Standard Manual of Uniform Traffic Control Devices, Part 3: Traffic Control Devices for Works on Roads (AS 1742.3-2002). While this standard applies to works on roads, the techniques are relevant for closing roads or managing a mobile road closure.

The above documents provide a framework for the consideration of oversize and over-mass loads. The key elements for consideration are highlighted as follows:

- A vehicle is considered to be over-dimensional where either the load and/or the vehicle combination itself exceed a length of 19.0 metres and/or a width of 2.5 metres and/or a height of 4.3 metres. However, Gazette Notice allows Restricted Access Vehicles (RAVs) to operate on approved route networks in South Australia provided that the terms and conditions of the Notice have been met. RAVs include road trains, B-Doubles, car carriers etc. It is noted that the route from Port Augusta to Olympic Dam is approved for RAV road trains up to 53.5m in length, 2.5m in width and 4.6m in height;
- Over-dimensional loads greater than 8m in width require special assessment;
- Pilot vehicles are used to warn approaching road-users that a large vehicle is on the road;
- Police escorts to ensure safe traffic control and movements in and around these large vehicles which often need to travel in adjacent and opposing traffic lanes in conflict with other traffic;
- Travel at night is generally undesirable on road safety grounds. However, where the movement of a vehicle/load may cause excessive traffic disruption during daylight hours an application for a permit to travel during hours of darkness will be considered on its merits taking into account the safety implications, the size and nature of the vehicle/load and the route characteristics;
- Travel times will be restricted to times of very low traffic density as determined by DTEI;

- Maximum allowable speed is 60km/h where the vehicle and load is greater than 8.0m in width or the mass is greater than 100 tonnes;
- Convoy travel (two separate permit loads) will be permitted in most country areas; and
- Whyalla to Port Augusta, Port Augusta to Olympic Dam and Adelaide to Port Augusta are all principal routes for oversize and over-mass loads.

These considerations are key elements for the development of traffic management measures to control the movement of over-dimensional loads.

It is estimated that there will be approximately 11,400 over-dimensional loads between the years of 2010 and 2020 inclusive. The width (and length) of the over-dimensional loads will determine the traffic management measures that are required to provide for the safe movement of these loads. Categorisation of over-dimensional loads is provided by the South Australian Government document "Policy for the Transport of Oversize and Over-Mass Indivisible Loads and Vehicles". The categories are defined by the width and length of the load and by the measures required to facilitate the safe movement of the loads, as outlined in Figure 37. This figure shows the classification for vehicles travelling through Adelaide. The classifications are more generous for travel in South Australia country areas.

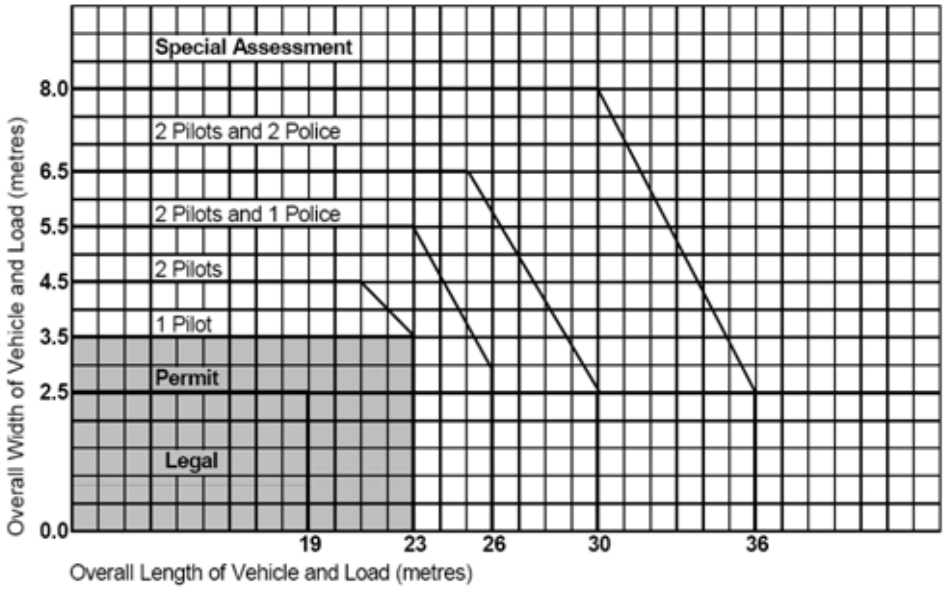


Figure 37 – Categorisation of Non-divisible Loads

3.8.2 Number of Over-Dimensional Load Movements

The predicted number of loads in each year for each of the following categories is shown in Table 28.

- Loads greater than 8m in width requiring a temporary road closure;
- Loads requiring both pilot and police escort;
- Loads requiring pilot escort only; and Number of Over-dimensional Loads; and
- Over-dimensional loads requiring no escorts (permit only).

Table 28 – Summary of Over-Dimensional Loads

Year	Category				
	Permit Only	Pilot Only	Police and Pilot	Greater than 8m Wide	All
2010	770	650	89	0	1509
2011	974	1296	37	0	2307
2012	772	1265	31	0	2068
2013	23	469	39	38	569
2014	50	1150	122	133	1455
2015	34	844	165	132	1175
2016	34	575	68	129	806
2017	27	285	57	88	457
2018	42	418	92	135	687
2019	7	272	15	22	316
2020	0	57	0	0	57
Total	2733	7281	715	677	11406
Percentage	24%	64%	6%	6%	100%

For the purpose of traffic management, loads that are less than 8m in width are manageable within existing policies and guidelines even if they require escort by either pilot vehicles or both police and pilot vehicles.

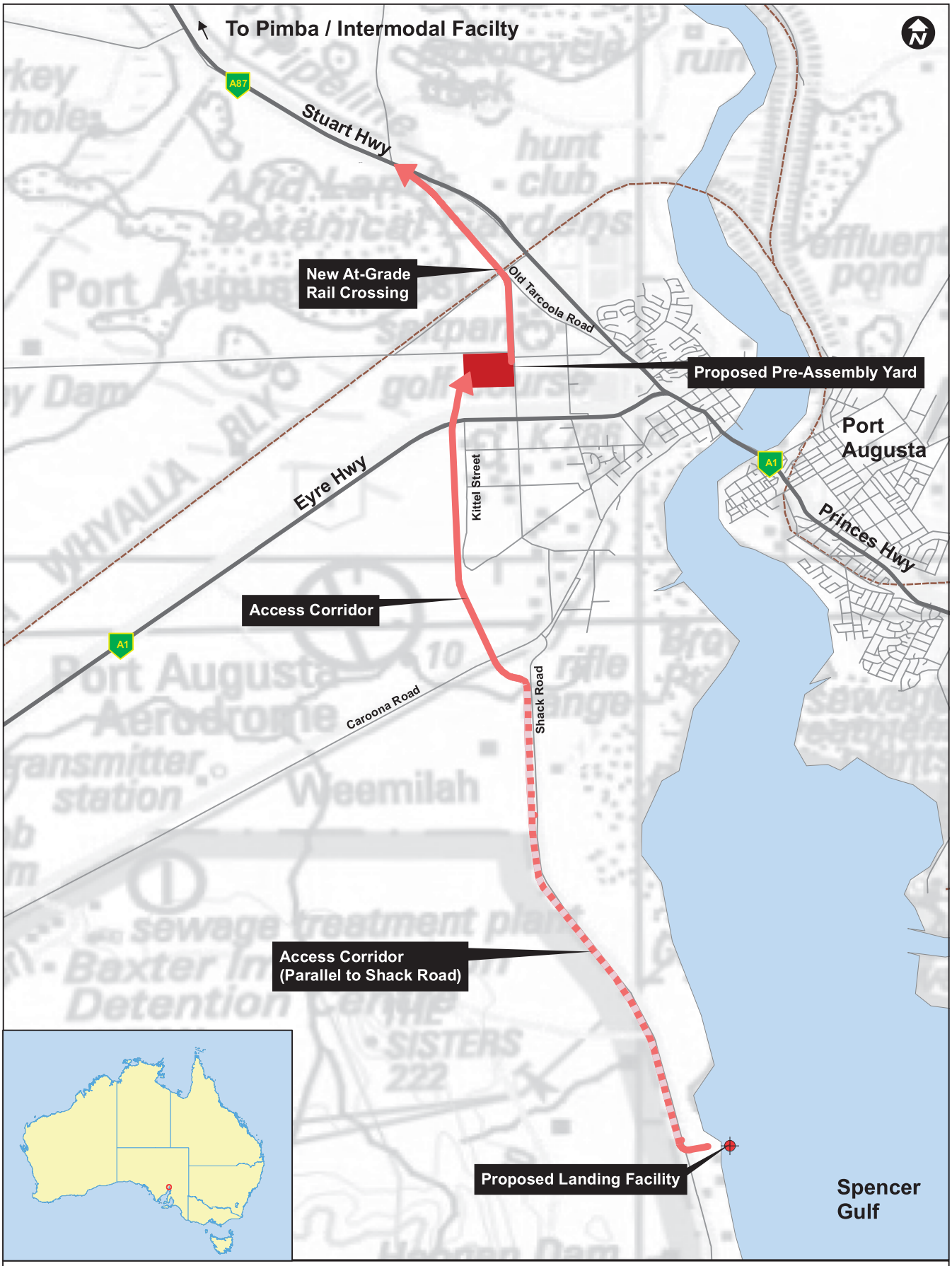
Loads greater than 8m in width require special assessment by DTEI and therefore these loads are the primary focus of the traffic management assessment. Based on Table 28, the peak for the movement of these loads occurs over the period 2014 to 2016 where there are approximately 130 loads per year. While the number of these loads increases again in the year 2018 to 135 loads, the level of general traffic on the road network at this time will have decreased significantly as a result of the construction of the rail line from Pimba to Olympic Dam.

3.8.3 Over-Dimensional Transport Route

Over-dimensional loads greater than 8m in width (and some less than 8m in width) are proposed to be transported by sea to the landing facility near Port Augusta and along the dedicated access corridor to the pre-assembly yard. Following preassembly, these over-dimensional loads will be transported from the pre-assembly yard to Old Tarcoola Road and then along a new road and level crossing, which will be an extension of Old Tarcoola Road, to connect to the Stuart Highway. From the Stuart Highway, the over dimensional loads are proposed to follow the same route as the general traffic travelling from Port Augusta to Olympic Dam i.e. Stuart Highway, Roxby Downs Road, Olympic Way and finally to Olympic Dam via the Heavy Vehicle Bypass. The proposed route in the vicinity of Port Augusta is shown in Figure 38.

Similarly, most over dimensional loads that are between 5.5m and 8m in width will also be transported by sea to the landing facility near Port Augusta and will follow the same route as described above and shown in Figure 38.

The over-dimensional loads less than 5.5m in width will predominately originate in Adelaide and will be transported to the OD site along the Princes Highway, Stuart Highway and Olympic Way.



Legend

- Proposed Landing Facility
- Proposed Pre-Assembly Yard
- Access Corridor
- Access Corridor (Parallel to Shack Road)
- Railway
- A1 and A87 National Highway
- Other Roads

FIGURE 38

Issue	Date	By	Chkd	Appd
P1	07-08-08	CJ	TK	PJC

Client: **BHPBilliton**

Job Title: **Traffic Impact Assessment EIS**

Drawing Title: **Proposed Landing Facilty and Pre-assembly Yard**

Kilometers: 0 0.5 1 2

ARUP
Level 17,
1 Nicholson Street
Melbourne VIC 3000
Tel (03) 9668 5500 Fax (03) 9668 5415
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Scale at A4: **1:70,000**

Drawing Status: **Draft**

Job No	Drawing No	Issue
85200-01	001	P1

3.8.4 Traffic Management for Over-Dimensional Loads Less Than 8m Wide

The loads narrower than 8m in width (but greater than 3.5m in width) can operate within existing policies and guidelines. As described in Section 2.3, the formation width along the route between Adelaide and Olympic Dam is generally between 10m and 12m wide (i.e. two 3.4m to 4m traffic lanes and 1.5m to 2m shoulders). In these instances, the available formation width is greater than the width of the load. Traffic management for these over-dimensional loads is expected to adopt the traffic management approach that is outlined within the DTEI document "Escort Guidelines for Oversize and Over-Mass Vehicles and Loads (May 2006)". These guidelines outline the approach for a number of road and escort configurations, including a scenario with one lane in each direction and two police escorts. The traffic management approach is described as follows:

- The over-dimensional load is accompanied by two police escort vehicles and two pilot vehicles;
- The first pilot vehicle is the lead vehicle travelling on the correct side of the road. The first police vehicle travels in advance of the over-dimensional load along the opposite side of the road between the lead pilot vehicle and the over-dimensional load. The driver of the police vehicle motions with his/her arm out the window advising approaching drivers (travelling in the opposite direction) to move over to the shoulder and stop to allow the load to pass;
- Traffic that had moved off the road, including trucks, stops on the shoulder until the load convoy passes, at which time the vehicles resume their journey;
- The second pilot vehicle travels behind the load on the correct side of the road. The second police vehicle travels behind the over-dimensional load on the opposite side of the road behind the trailing pilot vehicle; and
- Traffic travelling behind the convoy does not have any opportunity to pass until the load stops and vehicles are directed around the load or the load leaves the road.

This approach outlined above, as described in "Escort Guidelines for Oversize and Over-mass Vehicles and Loads (May 2006)", is shown in Figure 39.

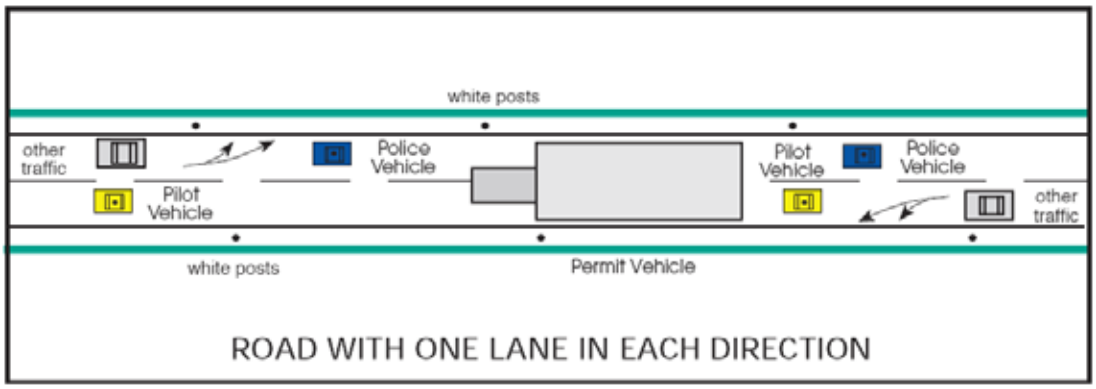


Figure 39 – DTEI Escort Guidelines for Oversize and Over-mass Vehicles and Loads

Therefore, the road would not need to be closed where the formation is between 10m and 12m in width and the load is less than 8m in width. Instead, counter-direction traffic would be required to slow and stop on the road shoulder temporarily while the load passes by.

3.8.5 Traffic Management for Over-Dimensional Loads Greater Than 8m Wide

Loads greater than 8m will occupy (or overhang) the entire carriageway leaving less than 3m of available remaining width. Therefore, highway vehicles will not be able to physically pass these over-dimensional loads, except at fixed locations where passing opportunities are provided to store affected public traffic and then allow traffic to pass the over-dimensional loads.

This traffic management approach has been developed based on the principles of the relevant DTEI/Transport SA policies and guidelines, and also with regard to the movement of over-dimensional loads in the previous Olympic Dam expansion in 1997-1998. The traffic management approach allows traffic travelling in the same direction as the load to follow the load at a distance behind it instead of being stopped while the load is moving between parking bays. Traffic travelling in the opposing direction is held at the passing location until the load reaches the passing bay and traffic can safely pass.

The process for managing the interaction with traffic and for facilitating the safe closure of the road is shown in Figure 40 to Figure 43, which shows successive stages of the conceptual plan as it is proposed to be implemented.

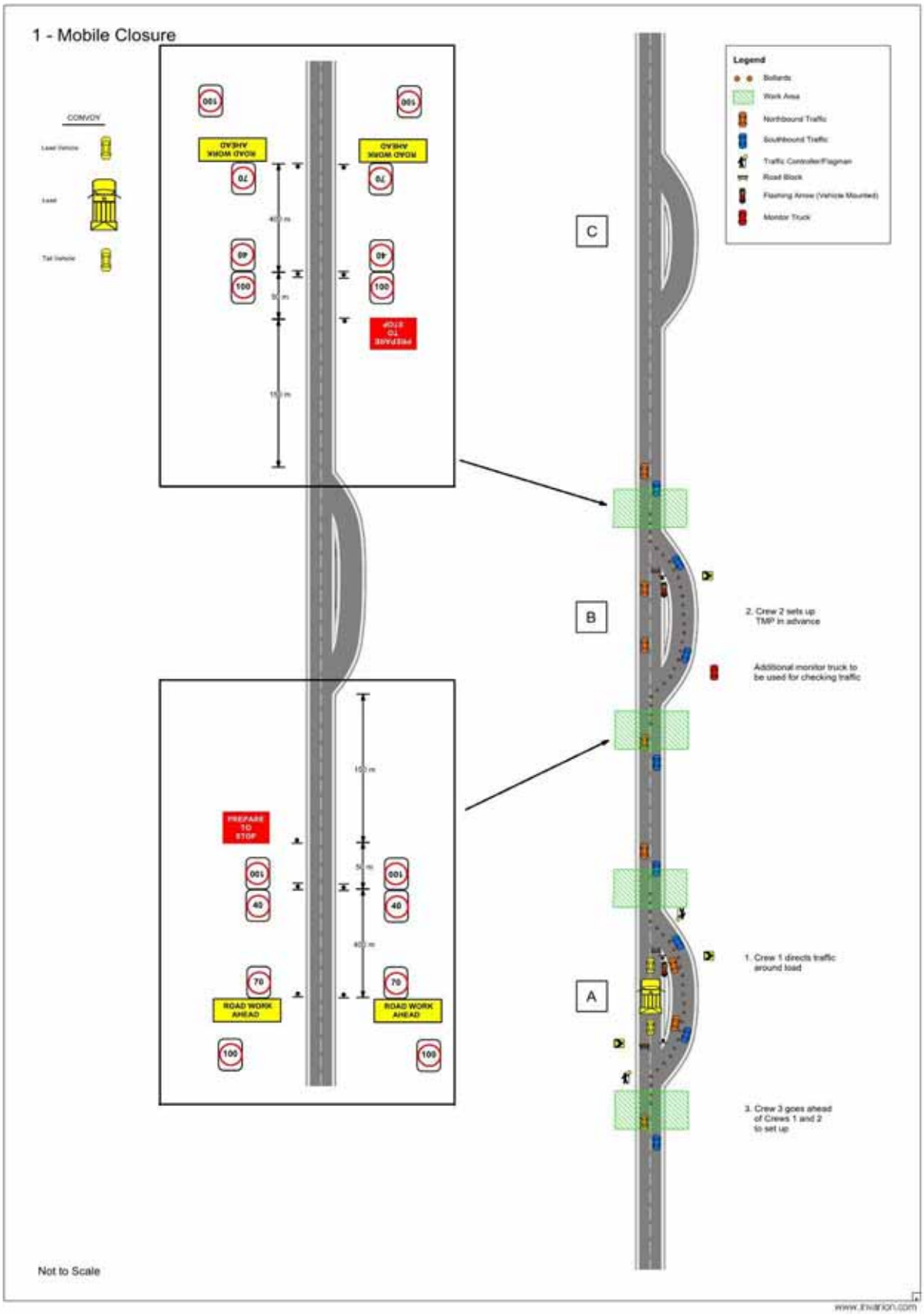


Figure 40 – Traffic Management Plan: Plan 1

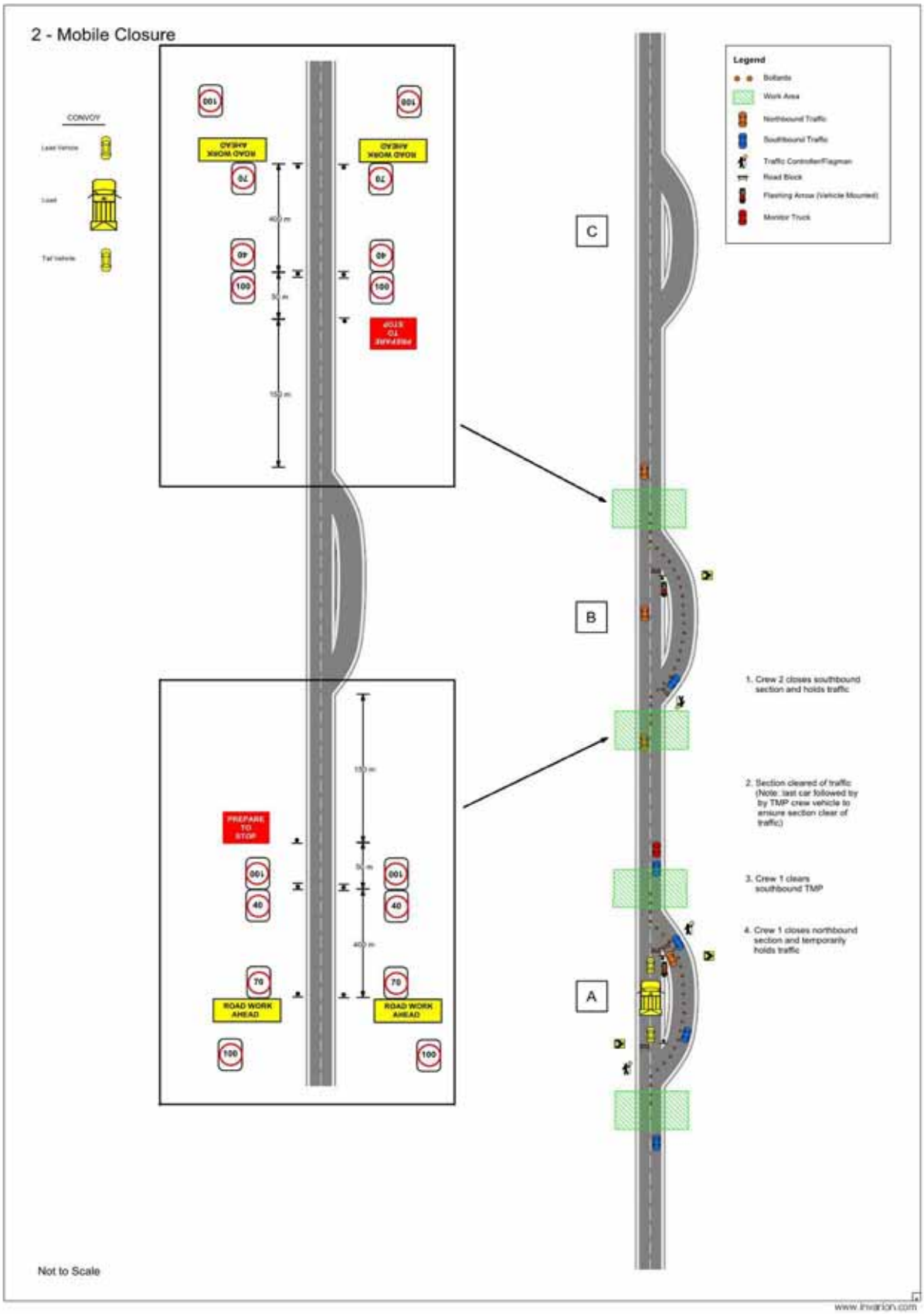


Figure 41 – Traffic Management Plan: Plan 2

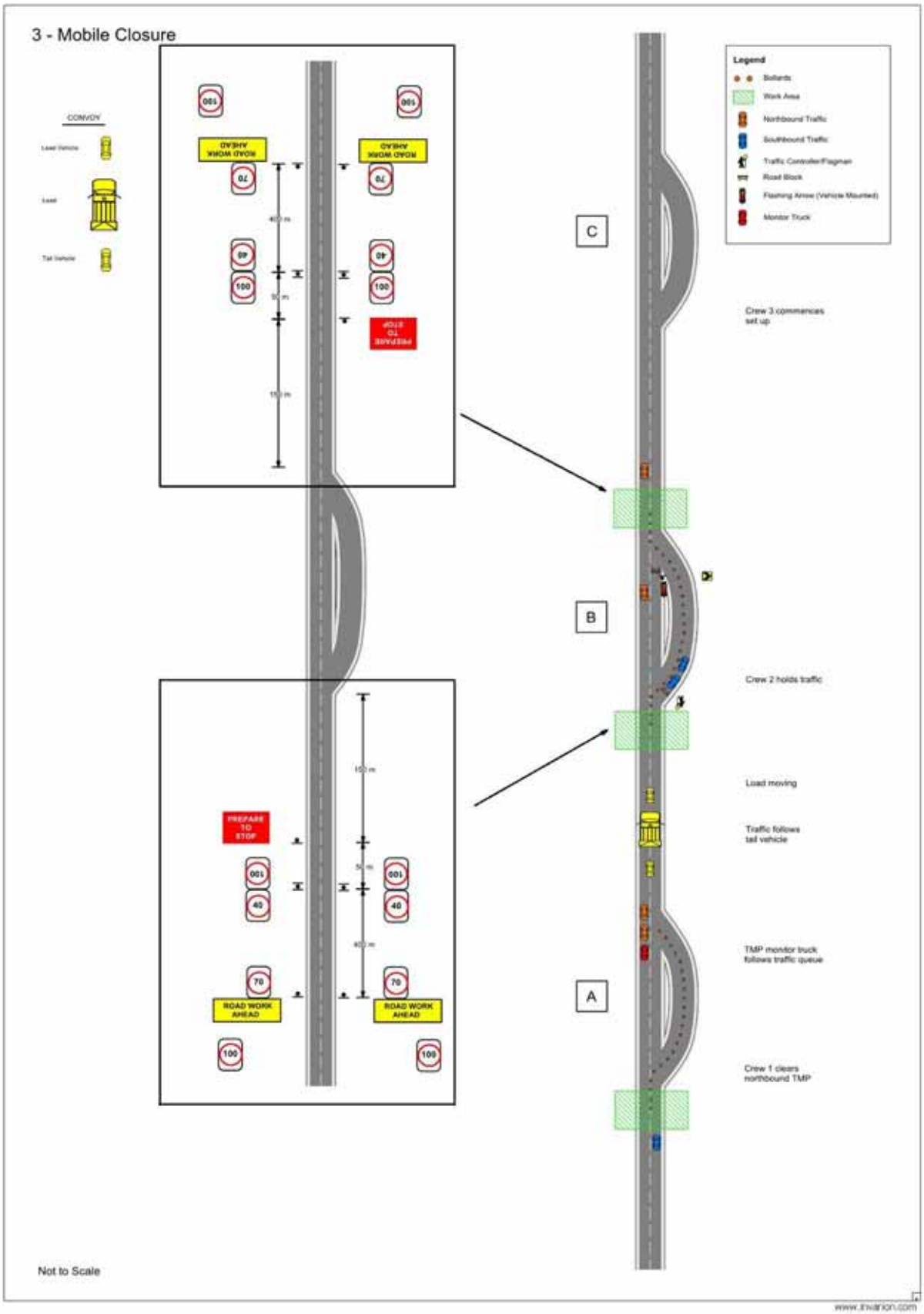


Figure 42 – Traffic Management Plan: Plan 3

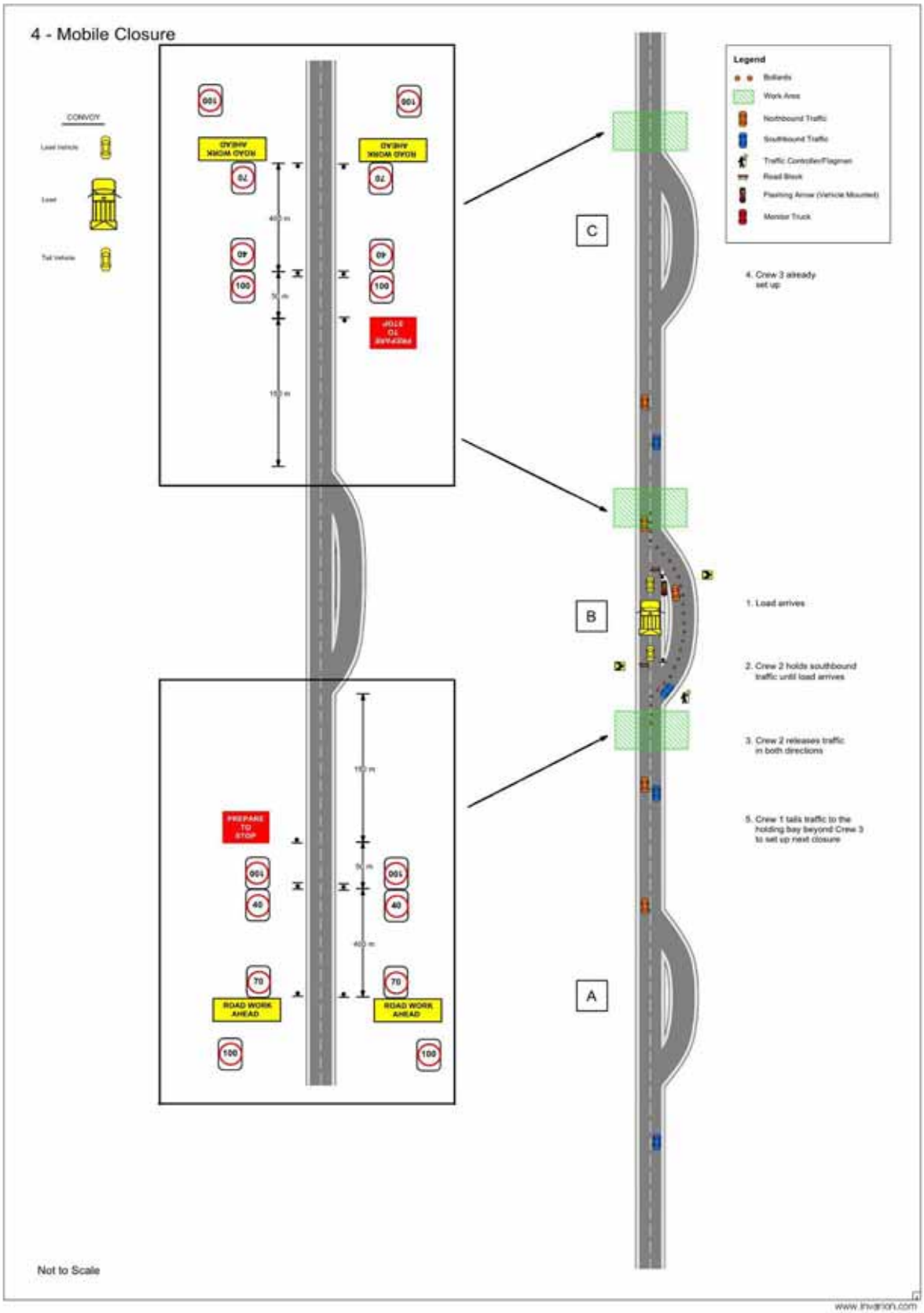


Figure 43 – Traffic Management Plan: Plan 4

The traffic management option outlined above allows northbound traffic to travel behind the convoy, whilst southbound traffic is held at the passing locations at fixed intervals along the route. The following key elements are highlighted for the proposed traffic management technique:

- The concept traffic management plan includes measures to reduce traffic speed in the vicinity of the passing opportunities, provides advance warning to motorists and safe storage of vehicles off the main highway;
- While the progression of the convoy and the following traffic is slow (30km/h), the delay to northbound motorists is reduced; and
- The queuing and platoons that are created by the convoy are released at a controlled point in isolation from the southbound platoon of vehicles.

This strategy can also be applied for night travel with some minor adjustments to traffic management equipment and increased lighting.

3.8.6 Traffic Impacts for Over-Dimensional Loads Less Than 8m Wide

Minor delays are expected for traffic travelling in the opposite direction to the over-dimensional loads less than 8m wide and are not considered significant. Where the over dimensional load is 5.5m to 8m wide vehicles approaching the load in the opposing direction will be directed by police onto the shoulder until the load passes.

For traffic travelling in the same direction as the over dimensional load some delays are expected to occur. However, where the speed of the load is particularly low or where opportunities to pass are limited, traffic management procedures would be implemented to allow vehicles to pass. For the movement of over dimensional loads less than 8m wide (particularly those between 5.5m and 8m in width) from Port Augusta to Olympic Dam, this strategy would include the utilisation of the network of passing opportunities that are provided for the movement of loads greater than 8m in width. The detailed traffic management strategy will depend upon government approvals as well as police operational direction and decisions.

For the movement of over dimensional loads less than 8m wide from Adelaide to Port Augusta, it is considered that the existing road network will provide adequate passing opportunities. The road links between the metropolitan area and Port Wakefield generally provide 4-lane two-way dual carriageways and could provide passing opportunities for loads between 5.5m and 8m in width. From 3km south of Port Wakefield to 3km east of Port Augusta, there are a total of 28 overtaking lanes, over a total distance of 210km with the spacing of lanes becoming further apart toward Port Augusta. Generally the overtaking lanes are 1.5km in length. At these overtaking locations, the combined width of the traffic lanes and shoulder will provide opportunities for vehicles following the load to pass. Similar to the above, the detailed traffic management strategy along this section of the route will depend upon government approvals as well as police operational direction and decisions.

3.8.7 Traffic Impacts for Over-Dimensional Loads Greater Than 8m Wide

Passing locations provide the opportunity for motorists to pass the over-dimensional loads at fixed points along the route. Along the route, these passing areas are typically gravel, localised treatments which were constructed as part of the previous Olympic Dam expansion. The locations of existing passing opportunities along the route and the spacing between these areas are shown in Figure 44.

3.8.7.1 General Traffic Volumes for Assessment

In order to assess the traffic impacts of the temporary road closures, it is necessary to estimate the future peak hourly traffic volumes along the route (i.e. Stuart Highway and Olympic Way) during the peak for the movement of over-dimensional loads.

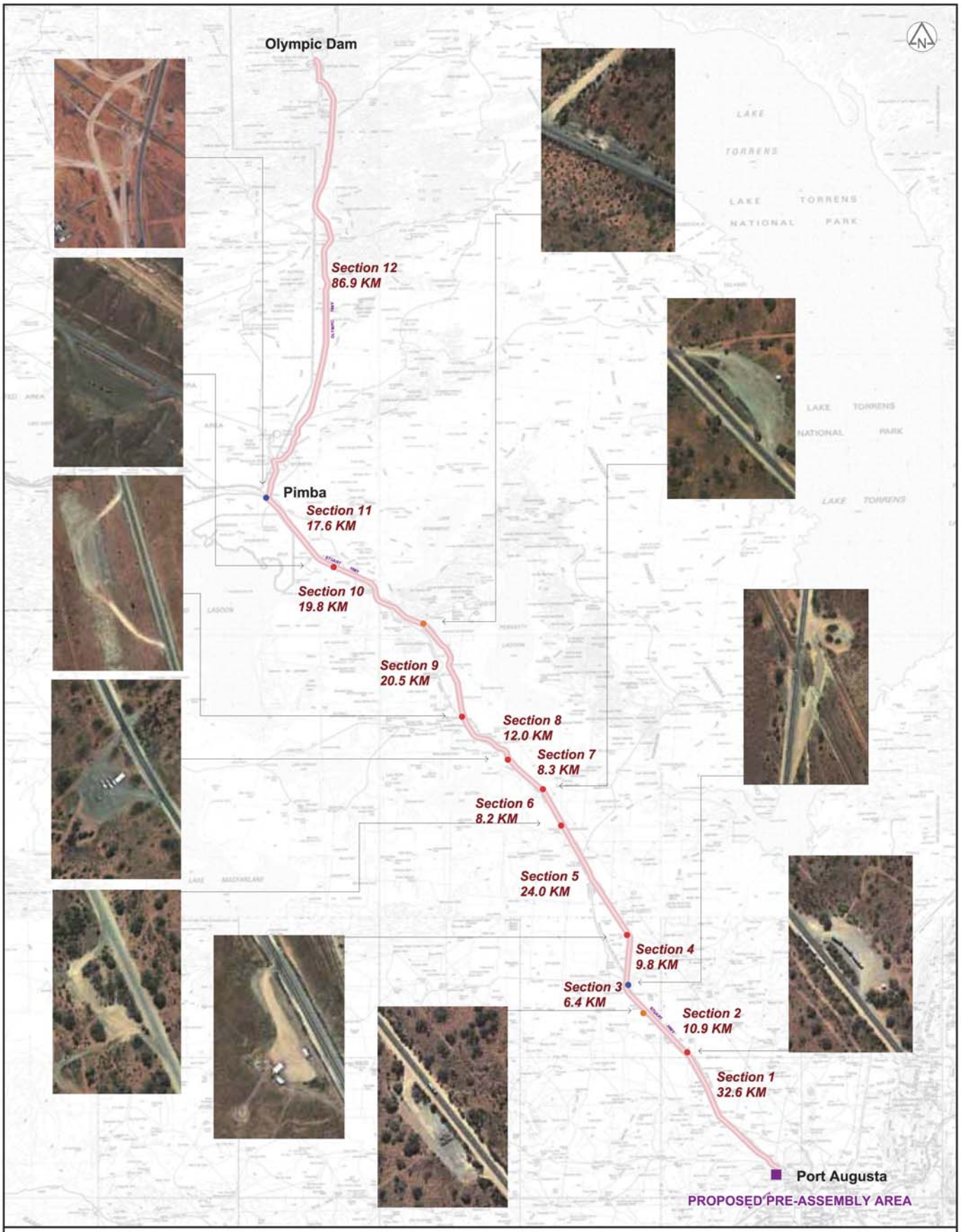
Given that the peak for over-dimensional loads generally occurs in the period 2014 to 2016 and the peak for other traffic movements occur in the year 2015, the adopted year of analysis for the impact of over-dimensional loads is the year 2015 (see 3.4.1 for further detail).

The hourly traffic volumes for the year 2015 have been estimated using the current peak hourly volumes and factoring these volumes based on the anticipated change in annual average daily traffic (AADT) volumes from the existing conditions to 2015. This data is summarised in Table 29.

Table 29 – Peak Hourly Traffic Volumes (Existing and 2015)

Road	Stuart Highway	Olympic Way – South of Roxby Downs
Maximum Hourly Traffic Volume (% AWDT)	10.0%	9.3%
Existing AADT	855	622
2015 Maximum Hourly Traffic Volume	204	179
2015 AADT	2,041	1,792

There are a number of impacts as a result of the proposed road closures and the traffic management strategy, including the delay to motorists and vehicle queuing. The extent of the delay and queuing is dependent on the duration of closure, which is determined by the spacing of the existing passing opportunities. The level of impact varies for each section of the route given the differing traffic volumes and spacing of passing opportunities.



Legend

- Existing Gravel Storage Area
- Existing Rest Area
- Existing Level Crossing Bypass
- 16.8 KM Distance between Passing Opportunities

FIGURE 44

Issue	Date	By	Chkd	Appd
P1	25-07-08	CJ	TK	BAJ

Client

BHP Biliton

Job Title

Traffic Impact Assessment EIS

Drawing Title

Existing Passing Opportunities

0 10 20 30

Kilometres

ARUP
Level 17,
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Scale at A4

1:1,100,000

Drawing Status

Draft

Job No.	Drawing No.	Issue
85200-01	001	P1

An analysis of the traffic impacts for the existing network of passing opportunities has been undertaken based on the traffic data shown in Table 29 and the following assumptions:

- The average travel speed of the convoy is 30km/h;
- The time required for traffic to clear the section to be closed is based on the spacing of the passing opportunities and an assumed travel speed of 90km/h;
- Three traffic management crews are provided, which allows for a crew to be set-up in advance of the closure that is currently operating; and
- The time required between closures to allow the traffic management set-up to be completed and the convoy to prepare to leave is 10 minutes. It is noted that this time is not included in the closure time but does affect the overall convoy travel time.

The above assumptions were used to determine the road closure time and number of vehicles delayed for each of the sections identified in Figure 44. The results of this analysis are shown in Table 30.

Table 30 – Calculated Delay Based on Existing Passing Opportunities

Section	Chainage from Port Augusta Pre-Assembly Yard (km)	Existing Passing Bay Spacing (km)	Road Closure Time (min)	Approximate number of vehicles delayed during day time travel (at one end of queue)*
1	32.6	32.6	87	148
2	43.5	10.9	29	49
3	49.9	6.4	17	29
4	59.7	9.8	26	44
5	83.7	24	64	109
6	91.9	8.2	22	37
7	100.2	8.3	22	38
8	112.2	12	32	54
9	132.7	20.5	55	93
10	152.5	19.8	53	90
11	170.1	17.6	47	80
12	257.0	86.9	232	394

It should be noted that not all vehicles will be delayed for the full length of road closure and that there will be a time saving for northbound motorists as progression along the route is maintained as these vehicles follow behind the convoy. Additionally, Table 30 highlights the delay to vehicles travelling along Olympic Way as there are currently no suitable passing opportunities north of Pimba. Note that this would primarily affect traffic movements associated with the OD site and Roxby Downs.

Based on the use of existing passing opportunities, the delay to motorists travelling the route will be dependent on the section in which each motorist reaches the load and the amount of time already elapsed for the particular road closure.

Proposed Improvements

Given the analysis shown in Table 30, BHP Billiton is proposing additional measures to reduce the disruption for road users to a maximum of 45 minutes. In order to achieve this, the frequency of passing bays required is as follows:

- Nine bays on the Stuart Highway between Port Augusta and Pimba; and
- Six bays on Olympic Way between Pimba and OD.

Currently, there are 10 bays (of varying spacing) on the Stuart Highway and none on Olympic Way. The exact location of the proposed bays is not yet known and would be subject to a detailed investigation to determine the required spacing and size of the bays to accommodate waiting traffic.

In addition to the above would be the implementation of a Traffic Management Plan for the safe movement of over-dimensional loads. Inconvenience to road users is likely to be reduced through the following measures:

- Obtaining approval for movement of materials from the appropriate authorities;
- Notification of over-dimensional loads movements and interruptions through regular community announcements;
- Aiming to transport loads at times that are outside of peak period; and
- The provision of amenities, refreshments and information to motorists at each of the passing bays.

BHP Billiton are also discussing a number of measures with the South Australian Government to further reduce the level and frequency of disruption. These options include the use of convoy travel (multiple loads per road closure) and night travel.

3.9 Road Safety

A review of the existing crash history based on the previous five years of traffic data was undertaken in Section 2.9.

Relevant improvements proposed by AusLink's Adelaide to Darwin Strategy are outlined in Section 2.2.2.

A risk assessment has been undertaken for ODX. This includes projected changes in the likelihood of crashes occurring as a result of changes in traffic volumes on all main routes. This assessment can be found as an additional appendix to the EIS.

3.10 Rail Movements and Impacts

The current logistics proposal for bulk goods and intermodal traffic (container trains) is for one train per day each way for each type between Adelaide and Olympic Dam (or Pimba). In addition, transportation of copper concentrate is proposed at one train per day to Darwin.

3.10.1 Proposed Rail Frequencies

It is assumed that the two existing passenger trains will retain their twice-weekly frequencies into the future.

The additional freight train services for Olympic Dam have been proposed as follows:

- Adelaide to Pimba – Two northbound and two southbound trains per day: a total of four trains per day;
- Darwin to Pimba – One northbound and one southbound train per day: a total of two trains per day; and
- Pimba to Olympic Dam – Three northbound and three southbound trains per day: a total of six trains per day.

Table 31 summarises the potential rail line increases from the proposed Olympic Dam rail traffic.

Table 31 – Potential Olympic Dam Rail Traffic Levels by Route Section

Scenario	Tarcoola – Darwin	Tarcoola – Pimba	Olympic Dam – Pimba	Pimba – Port Augusta	Port Augusta – Adelaide	Port Augusta – Whyalla / Port Bonython
Current Weekly Traffic Levels	17	41	0	41	65	7
Future Additional Weekly Traffic Levels	7	7	21	14	14	0
Total	24	48	21	55	79	7

The length of trains would be either 1,200 m long or 1,800 m long with an expectation that most trains will be 1,200m long. The assumed maximum speed of existing and future freight trains is 80km/h.

3.10.2 Rail Impact

From the increases in train movements discussed above in Section 3.10.1, the following are observed:

- **Perth, Tarcoola and Darwin Line (FreightLink) –** the addition of one train per day each way, or seven trains per week each way, of copper concentrate on top of a current traffic level of 17 trains per week each way will be likely to require some form of improvement to maintain the current LoS on this line. It has been identified that the existing rail corridor would be able to accommodate any such improvements required and BHP Billiton are proposing further discussions in this regard; and
- **Tarcoola, Pimba, Port Augusta, and Adelaide Line (ARTC)** – the addition of two trains per day each way between Pimba and Adelaide has been tested, discussed with ARTC and example paths have been developed.

Overall the addition of three trains per day should not significantly affect the existing operating efficiency of the rail line.

Rail Crossings – At-Grade Signalised Level Crossings

Closure times for rail crossings relate to train lengths and speeds. The majority of freight trains to Kalgoorlie (via Pimba) are likely to be the maximum 1,800m long because of efficiencies through transporting fewer trains.

The proposed additional freight train movements for ODX are of either 1,200 m or 1,800 m length configuration. Boom gates close for 30 seconds prior to the arrival of a train as stipulated in ARTC's Track and Civil Code of Practice Appendix EFT-16-01. Table 32 shows total closure times for a maximum train speed of 80 km/h and for a speed of 70 km/h. The total delay to road traffic at an at-grade level crossing for these length trains at or close to their operating speed of 80 km/h is in the order of 90 to 120 seconds.

Table 32 – Closure Times for Different Train Lengths

Train length	Train speed	Closure time (secs)	TOTAL
80 km/h (max. speed)			
1200m train	54	30	84 sec
1800m train	81	30	111 sec
70 km/h			
1200m train	62	30	92 sec
1800m train	93	30	123 sec

4 Conclusions

Overview

It is proposed to expand the mining operation at the Olympic Dam site in South Australia. This report has provided an assessment of the impacts to road and rail that would be experienced by this proposal.

The scope of the assessment is between the years 2010 and 2020 during which expansion of the site should be completed. With the exception of metropolitan areas, the scope includes the route from Adelaide to Olympic Dam along the following roads:

- Princes Highway;
- Stuart Highway;
- Olympic Way; and
- Heavy Vehicle Bypass Road adjacent to Roxby Downs.

Future Road Improvements

The following road improvements are to be undertaken as part of existing highway works:

- Port River Expressway, completed mid 2008;
- Northern Expressway Project, works currently underway and completion by 2010; and
- Pimba Rail Crossing Improvements, scheduled 2008/2009.

In addition, some issues have been identified along the Adelaide to Darwin road corridor, as identified by the State and Federal Governments. The provision of and the quality of this route as a public highway remains the responsibility of the federal and state governments and this study has assumed that these issues will be addressed as such. Some of the deficiencies are identified as short-term priorities to be actioned by the year 2015.

Road

The estimation of road trips has been split into two categories:

- Olympic Dam Expansion (ODX) Traffic – the total expansion traffic volumes associated with on-site construction and commodity import; and
- Ancillary Traffic – the future volume of traffic movements associated with the expanded workforce townships of Roxby Downs and the proposed village of Hiltaba. This includes town servicing, tourism, private and leisure trips as well as traffic travelling to and from Andamooka.

The ODX traffic calculations have been based on estimations of construction and commodity movements prepared by BHP Billiton. Ancillary traffic has been based on the estimated workforce increase at the OD site and surveys of the current levels of traffic on roads surrounding Roxby Downs.

It has been identified that the proposed schedule for the expansion of the mine would include construction of a road / rail intermodal facility at Pimba to allow ODX traffic to be transferred to rail from the year 2012 onwards. Furthermore, a new rail spur would be constructed from Pimba to the OD site to allow rail transfer on-site from the year 2016 onwards. These elements of the expansion would considerably reduce loads carried by road.

The assessment has found that the generated road trips, in addition to the baseline traffic (no ODX), would reach a peak in the year 2015. It is assumed that the OD site is operating in a steady state by the year 2020. The peak hours of traffic movement that would occur on

a daily basis have also been calculated based on a daily profile derived from a survey conducted between Roxby Downs and the OD site.

A Level of Service (LoS) assessment has been undertaken for each of the routes included as part of the scope. The results show that for the vast majority of the road network considered, a LoS A is experienced (best). For some roads surrounding Roxby Downs, the LoS falls to C or in one case, D. This is a temporary case during the construction peak period and in all other years considered is shown to have LoS C.

An assessment of the operation of key intersections surrounding Roxby Downs was undertaken using the SIDRA computer program. Each of the intersections was found to operate satisfactorily based on the following criteria:

- All DoS measurements were below 0.85;
- All LoS measurements were C or better; and
- All queue lengths were considered reasonable.

Over-Dimensional Loads

The Olympic Dam expansion will require the movement of over-dimensional loads between Adelaide, Port Augusta and Olympic Dam. The majority of these loads will require either a permit only, pilot escort vehicles and/or a police escort. Some of the loads will require temporary road closures due to the size of the loads required (greater than 8m in width). These loads that require temporary road closures are only applicable to movements between Port Augusta and Olympic Dam.

An assessment has been undertaken to calculate the delays caused to other road users whilst temporary road closures are in place. It is proposed to limit delays to 45 minutes for other road users by providing new passing opportunities at fixed intervals to allow other vehicles to pass the over-dimensional loads. In order to achieve this, the following are required:

- Stuart Highway: nine passing bays; and
- Olympic Way: six passing bays.

Currently, there are 10 bays (of various spacing) on the Stuart Highway and none on Olympic Way. The exact location of the proposed bays is not yet known and would be subject to a detailed investigation that would determine the required spacing and size to accommodate waiting traffic.

Further to the above, other measures are proposed to mitigate the effect of road closure. These are generally centred on government approvals and good communication with the public so that motorists can plan their journeys accordingly.

Rail

An assessment of the impact of the site proposals was undertaken for the rail network. The existing number of services using the rail lines was obtained from timetable data supplied by ATRC for the line running from Pimba to Adelaide and FreightLink for the line running from Pimba to Darwin. With the additional services added, the following were concluded:

- **Perth, Tarcoola and Darwin Line (FreightLink) –** the addition of one train per day each way, or seven trains per week each way, of copper concentrate on top of a current traffic level of 17 trains per week each way will be likely to require some form of improvement to maintain the current LoS on this line. It has been identified that the existing rail corridor would be able to accommodate any such improvements required and BHP Billitonare proposing further discussions in this regard.

- **Tarcoola, Pimba, Port Augusta, and Adelaide Line (ARTC)** – the addition of two trains per day between Pimba and Adelaide has been tested, discussed with ARTC and example paths have been developed.

Safety

An assessment of the existing road and rail safety issues was undertaken covering the past five year period. Eight intersections were found on the road route from Adelaide to Olympic Dam that met the criteria for the Federal Government's Black-spot programme. In addition, two mid-block 'black-spots' and 'four black' road lengths were found using the same criteria. 13 crashes at level crossings were identified along the rail route.

A risk assessment has been undertaken for ODX. This includes projected changes in the likelihood of crashes occurring as a result of changes in traffic volumes on all main routes. This assessment can be found as an additional appendix to the EIS.

5 Glossary

AADT	Annual Average Daily Traffic. Provides an average daily traffic flow based on calculations including surveyed traffic flows and / or estimated future traffic flows.
Ancillary Traffic	Conservatively assessed traffic related to ODX that includes servicing of the supporting townships, private and leisure trips associated with Olympic Dam.
AWDT	Average Weekday Daily Traffic. Measure of average daily traffic flow that excludes weekend traffic.
ARTC	Australian Rail Track Corporation
Baseline Traffic Flows	Includes all surveyed traffic flows plus any additional growth forecast by the government and ongoing operations of the existing OD site (no ODX).
Base Traffic Flows (ODX)	Includes all surveyed traffic flows plus any additional growth forecast by the government but with a portion of traffic associated with ongoing operations of the existing OD site transferred to rail as the intermodal facility at Pimba and the new rail line to Olympic Dam become available.
DoS	Degree of Saturation. A measure to compare the use of an intersection to its capacity.
HV	Heavy vehicles (class 4 and above) including, semi-trailer heavy goods vehicles, B-Doubles and all vehicles carrying over-dimensional loads.
LoS	Level of Service. Predefined descriptions of levels of performance for roads and / or pedestrian footpaths ranging from A (best) to F (worst).
LV	Light vehicles including all cars, utility vehicles and light goods vehicles.
OD	Olympic Dam and in the case of vehicle movements, all existing and ongoing vehicle movements in and out of the site as part of the existing consented operation.
OD HVs (with ODX)	Heavy vehicle traffic associated with ongoing operations of the existing OD site but with a portion of trips transferred to rail as the intermodal facility at Pimba and the new rail line to Olympic Dam become available.
ODX	Olympic Dam Expansion and in the case of vehicle movements, all those associated with the expansion project.
ODX HVs	Heavy vehicle traffic associated with the Olympic Dam Expansion operations.
Off-site infrastructure	Includes all projects associated with ODX that are not part of the Olympic Dam site.
Olympic Way	As part of the scope of this report includes the alignment of the B87 between the intersections with Roxby Downs Road north of Woomera to the Olympic Dam site.
Over-Dimensional Loads	The transportation by road of goods that exceed the dimensions set by the highway authority.
Heavy Vehicle Bypass	Refers to the section of road that passes to the east of the town of Roxby Downs and connects to Olympic Way both north and south of Roxby Downs.

Princes Highway	As part of the scope of this report includes the route of the A1 from the edge of the Adelaide metropolitan area to the junction with the Stuart Highway in Port Augusta.
Priority Control Intersection	An intersection where control is administered by give-way markings and / or fixed stop signs.
Roxby Downs Road	As part of the scope of this report includes the section of the B87 from the junction with the A87 at Pimba to the junction with the B87 Olympic Way north of Woomera.
SIDRA	Signalised & unsignalised Intersection Design and Research Aid. A computer program used to analyse the performance of road intersections.
Stuart Highway	As part of the scope of this report includes the section of the A87 between the junction with the A1 Princes Highway and the junction with the B87 at Pimba.

Appendix A

Site Visit Photographs

A1 Photographs Recorded on Site Visit 9th to 12th July 2008

	**Photograph 1** **Port Wakefield Road, typical carriageway section**
	**Photograph 2** **Port Wakefield Road, typical intersection detail**
	**Photograph 3** **Port Wakefield Road, typical merging lane**
	**Photograph 4** **Port Wakefield Road, typical diverging lane**

	**Photograph 5** **Snowtown Road / Princes Highway, typical carriageway section**
	**Photograph 6** **Snowtown Road / Princes Highway, typical carriageway section with overtaking lane**
	**Photograph 7** **Typical priority intersection with right-turn reserve and merging / diverging lanes**
	**Photograph 8** **Typical minor priority intersection without right-turn reserve and merging / diverging lanes**

	**Photograph 9** **Stuart Highway** **(Port Augusta to Pimba)**
	**Photograph 10** **Olympic Way** **(Pimba to Olympic Dam)**
	**Photograph 11** **Typical priority intersection with right-turn reserve and merging / diverging lanes**
	**Photograph 12** **Typical minor priority intersection without right-turn reserve and merging / diverging lanes**

	**Photograph 13** **Typical rest area**
	**Photograph 14** **Security Cordon South of Olympic Dam**
	**Photograph 15** **Signalised intersection of the A1 and Port River Expressway**
	**Photograph 16** **Port River Expressway**

	**Photograph 17** **New bridge connecting to Outer Harbour**
	**Photograph 18** **Edinburgh Terrace intersection**
	**Photograph 19** **Carlton Parade intersection**
	**Photograph 20** **Flinders Terrace intersection**

	**Photograph 21** **Mackay Street intersection**
	**Photograph 22** **Caroona Road / Burgoyne intersection**
	**Photograph 23** **Stuart Highway / Eyre Highway intersection**
	**Photograph 24** **Possible access location to new landing facility**

	**Photograph 25** **Location of new route between Caroona Road and the Eyre Highway**
	**Photograph 26** **Access from Hamilton Road to new pre-assembly yard**
	**Photograph 27** **Intersection of Hamilton Road and the Eyre Highway looking south**
	**Photograph 28** **Intersection of Hamilton Road and the Eyre Highway looking west**

	**Photograph 29** **Intersection of Hamilton Road and the Eyre Highway looking east**
	**Photograph 30** **Intersection of the Stuart Highway and Old Tarcoola Road looking west**
	**Photograph 31** **Intersection of the Stuart Highway and Old Tarcoola Road looking south**
	**Photograph 32** **Intersection of the Stuart highway and Roxby Downs Road looking west**

	**Photograph 33** **Intersection of the Stuart highway and Roxby Downs Road looking south**
	**Photograph 34** **Intersection of the Stuart highway and Roxby Downs Road looking north**
	**Photograph 35** **Pimba intermodal facility**
	**Photograph 36** **Pimba intermodal facility**

	**Photograph 37** **Intersection of Olympic Way and Heavy Vehicle bypass looking east**
	**Photograph 38** **Intersection of Olympic Way and Heavy Vehicle bypass looking north**
	**Photograph 39** **Intersection of Olympic Way and Heavy Vehicle bypass looking south**
	**Photograph 40** **Intersection of Olympic Way and Heavy Vehicle bypass looking west**

	**Photograph 41** **Intersection of Olympic Way and Heavy Vehicle bypass looking north**
	**Photograph 42** **Intersection of Olympic Way and Heavy Vehicle bypass looking south**
	**Photograph 43** **Intersection of Axehead Road and Olympic Way**
	**Photograph 44** **Intersection of Axehead Road and Heavy Vehicle bypass**

Appendix B

At-Grade Rail Crossing Survey

Rail Level Crossing: Sight Line Analysis - Pimba to Darwin

ARUP

NUMBER	EXISTING TYPE	CONFORMS?	TYPE for conformity	S1	S2	S3	COMMENTS
2	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
3	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
5	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
13	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
20	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
22	GIVE WAY	YES	GIVE WAY	YES	YES	NO	
23	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
24	GIVE WAY	NO	STOP	YES	NO	YES	STOP REQUIRED, OR VEGITATION CLEARANCE
35	GIVE WAY	YES	GIVE WAY	YES	YES	NO	
36	SIGNALISED	YES	SIGNALISED	YES	NO	NO	
37	GIVE WAY	NO	STOP	YES	NO	YES	STOP REQUIRED, OR VEGITATION CLEARANCE
38	STOP	YES	GIVE WAY	YES	YES	NO	
39	STOP	NO	SIGNALISED	YES	NO	NO	SIGNAL REQUIRED, OR VEGITATION CLEARANCE
40	STOP	YES	GIVE WAY	YES	YES	NO	
42	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
44	SIGNALISED	YES	STOP	YES	NO	YES	
45	SIGNALISED	YES	SIGNALISED	YES	NO	NO	
46	SIGNALISED	YES	STOP	YES	NO	YES	
48	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
49	SIGNALISED	YES	STOP	YES	NO	YES	
52	GIVE WAY	NO	STOP	YES	NO	YES	STOP REQUIRED, OR VEGITATION CLEARANCE
53	GIVE WAY	NO	STOP	YES	NO	YES	STOP REQUIRED, OR VEGITATION CLEARANCE
56	STOP	YES	STOP	YES	NO	YES	
58	STOP	YES	STOP	YES	NO	YES	
61	SIGNALISED	YES	STOP	YES	NO	YES	
66	STOP	YES	GIVE WAY	YES	YES	YES	
73	STOP	YES	STOP	YES	NO	YES	
75	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
76	STOP	YES	GIVE WAY	YES	YES	YES	
82	STOP	YES	GIVE WAY	YES	YES	NO	
83	STOP	NO	SIGNALISED	YES	NO	NO	SIGNAL REQUIRED, OR VEGITATION CLEARANCE
84	STOP	YES	STOP	YES	NO	YES	
86	STOP	YES	GIVE WAY	YES	YES	YES	
89	STOP	YES	GIVE WAY	YES	YES	YES	
90	STOP	YES	STOP	YES	NO	YES	
93	STOP	YES	STOP	YES	NO	YES	
94	STOP	YES	GIVE WAY	YES	YES	YES	
95	STOP	YES	GIVE WAY	YES	YES	YES	
97	STOP	YES	GIVE WAY	YES	YES	YES	
98	STOP	YES	GIVE WAY	YES	YES	YES	
99	SIGNALISED	YES	STOP	YES	NO	YES	
100	STOP	YES	GIVE WAY	YES	YES	YES	
101	STOP	YES	GIVE WAY	YES	YES	YES	
102	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
103	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
120	STOP	YES	GIVE WAY	YES	YES	YES	
121	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
123	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
134	STOP	YES	GIVE WAY	YES	YES	YES	
139	STOP	YES	GIVE WAY	YES	YES	YES	
144	STOP	YES	GIVE WAY	YES	YES	YES	
165	STOP	YES	GIVE WAY	YES	YES	YES	
166	GIVE WAY	NO	STOP	YES	NO	YES	STOP REQUIRED
167	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
171	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
172	STOP	YES	GIVE WAY	YES	YES	YES	
176	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
178	STOP	YES	GIVE WAY	YES	YES	YES	
179	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
193	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
196	SIGNALISED	YES	SIGNALISED	YES	NO	NO	
198	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
201	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
202	STOP	YES	GIVE WAY	YES	YES	YES	
203	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
204	STOP	YES	GIVE WAY	YES	YES	YES	
205	STOP	YES	GIVE WAY	YES	YES	YES	
207	STOP	YES	GIVE WAY	YES	YES	YES	
208	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
209	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
210	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
214	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
215	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
216	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
217	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
300	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
219	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
220	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
221	GIVE WAY	NO	STOP	YES	NO	YES	STOP REQUIRED, OR VEGITATION CLEARANCE
222	STOP	NO	SIGNALISED	YES	NO	NO	SIGNAL REQUIRED, OR VEGITATION CLEARANCE
223	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
224	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
225	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
226	SIGNALISED	YES	GIVE WAY	YES	YES	NO	
227	SIGNALISED	YES	STOP	YES	NO	YES	
228	SIGNALISED	YES	STOP	YES	NO	YES	

RLXNUMBER	EXISTING TYPE	CONFORMS?	TYPE for conformity	S1	S2	S3	COMMENTS
RLX0658	SIGNALISED	YES	GIVE WAY	YES	YES	YES	
RLX0659	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0660	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0662	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0663	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0664	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0665	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0666	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0667	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0668	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0669	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0670	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0680	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0681	STOP	YES	GIVE WAY	YES	YES	YES	
RLX0683	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX0684	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX0685	STOP	YES	GIVE WAY	YES	YES	YES	
RLX1799	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1800	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1801	STOP	YES	GIVE WAY	YES	YES	YES	
RLX1802	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1803	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1804	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1805	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1806	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1807	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1808	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1809	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1810	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1812	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1813	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1814	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1815	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1816	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1818	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1819	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1820	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1821	STOP	YES	GIVE WAY	YES	YES	YES	
RLX1822	STOP	YES	GIVE WAY	YES	YES	YES	
RLX1826	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1827	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1828	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1829	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1830	STOP	YES	GIVE WAY	YES	YES	YES	
RLX1831	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1832	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1834	STOP	YES	GIVE WAY	YES	YES	YES	
RLX1835	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1876	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX2118	GIVE WAY	YES	GIVE WAY	YES	YES	YES	
RLX1877	GIVE WAY	YES	GIVE WAY	YES	YES	YES	

Appendix C

Key Crash Location Photographs

C1 Photographs at Key Crash Locations Recorded on Site Visit 9th to 12th July 2008

Location 1 - A1/Port Gawler Rd, Port Gawler

Photograph 45

Intersection: Two Staged T-Junction
Crashes in last five years: 3 Severity and number of injured people:

- Slight: 5
- Serious: 0
- Fatal: 0

Error: Failure to give way in two of three crashes.

Location 2 - A1/Brooks Rd, Two Wells

Photograph 46

Intersection: Seagull island T-junction
Crashes in last five years: 3 Severity and number of injured people:

- Slight: 4
- Serious: 0
- Fatal: 0

Error: Failure to give way in two of three crashes.

Location 3 - A1/Mallala-Two Wells Rd, Two Wells

Photograph 47

Intersection: Seagull island T-junction
Crashes in last five years: 5 Severity and number of injured people:

- Slight: 15
- Serious: 2
- Fatal: 0

Error: Failure to give way in four of five crashes.

Location 4 - A1/Port Wakefield Access Rd, Port Wakefield

Photograph 48

Intersection: Seagull island T-junction
Crashes in last five years: 3 Severity and number of injured people:

- Slight: 2
- Serious: 1
- Fatal: 0

Error: All different causes

Location 5 - A1/Snowtown Brinkworth Rd, Snowtown

Photograph 49

Intersection: Seagull island T-junction
Crashes in last five years: 5 Severity and number of injured people:

- Slight: 6
- Serious: 1
- Fatal: 0

Error: Failure to give way in all crashes.

Location 6 - A1/Edinburgh Terrace, Port Augusta

Photograph 50

Intersection: Two-staged T-junction
Crashes in last five years: 3 Severity and number of injured people:

- Slight: 3
- Serious: 0
- Fatal: 0

Error: All different causes

Location 7 - A1/Carlton Parade, Port Augusta

Photograph 51

Intersection: Signalised Crashes in last five years: 7 Severity and number of injured people:

- Slight: 8
- Serious: 2
- Fatal: 0

Error: Failure to stand during right turn in four of seven crashes

Location 8 - A1/Flinders Terrace, Port Augusta

Photograph 52

Intersection: Signalised Crashes in last five years: 8 Severity and number of injured people:

- Slight: 11
- Serious: 1
- Fatal: 0

Error: All different causes

Appendix D

Summary of ODX Heavy Vehicle Movements

Appendix D

Summary of ODX Heavy Vehicle Movements

Appendix D: Summary of ODX Heavy Vehicle Movements

2015 ODX Heavy Vehicle Data

Key Assumptions:
All exports and return goods are back loaded, all vehicles return to origin
Over dimensional loads only travel one-way (to the mine), the return trip is assumed legal

Area	Activity	Item	Permit & Escort Requirements	Trucks	Origin of Transport	MODE	
						PA - P	P - OD
Pioneer Mining	Mining Equipment	793 Haul Trucks	Permits = 1/mach + Pilots/body	125	MELBOURNE to WHYALLA	ROAD	ROAD
			Permits/Pilots/Police = 1/mach + 1/body	75	WHYALLA to OLYMPIC DAM	ROAD	ROAD
		Hydraulic Shovels	Permits/Pilots= 3/mach	30	MELBOURNE	ROAD	ROAD
		Associated Equipment	Permits = 50%/piolits	10	MELBOURNE	ROAD	ROAD
		Camp + Support Materials	Permits = 50%/piolits in 2010 & 2013 only.	50	ADELAIDE	ROAD	ROAD
	Spare Parts	CAT spare parts (annual requirement)	0	25	MELBOURNE	ROAD	ROAD
	Haul Trucks	CAT 797	Permits/Pilots= 2/mach(1 Pilot/1Per) 3/body (1 pilot/2 per`	40	MELBOURNE	ROAD	ROAD
		CAT 789D	Permits/Pilots= 2/pilot 1/per	12	MELBOURNE	ROAD	ROAD
	Loaders	CAT 988	Permits/Pilots= 1/mach	4	MELBOURNE	ROAD	ROAD
		CAT 994	Permits = 1/Pilot 3 permits	6	MELBOURNE	ROAD	ROAD
	Dozers	CAT D11	Permits= 1/ Pilot	6	BRISBANE ?	ROAD	ROAD
	Grader	CAT 24	Permits= 1/ piolit	4	BRISBANE ?	ROAD	ROAD
	Drills	P&H XP250	Police= 2/ mach	2	BRISBANE ?	ROAD	ROAD
Mining Consumables	Diesel	Mining Fuel_Contractor_ODX	45	4852	ADELAIDE	ROAD	ROAD
	Ammonium Nitrate	Bulk 20ft contrs @ 44t B-Doubles	45	1656	NEWCASTLE	RAIL	ROAD
	Emulsion	Tankers @ 20ft b-doubles	0	750	NEWCASTLE	RAIL	ROAD
	Dust Suppression Emulsion	Dust Suppression Chemical - Cooee DustBloc (Assumption Ltrs	0	111	NEWCASTLE	RAIL	ROAD
	Drilling Accessories	Bits, Rods, Subs, Stabilizers and Deck Bushes	40	14	MELBOURNE	RAIL	ROAD
	CAT Spares	Estimate	50	250	MELBOURNE	RAIL	ROAD
	Lubricants	Differential Oil 1_ODX	40	14	MELBOURNE ?	RAIL	ROAD
		Differential Oil 2_ODX	40	14	MELBOURNE ?	RAIL	ROAD
		Engine Oil_ODX	40	32	MELBOURNE ?	RAIL	ROAD
		Gears Oil_ODX	40	22	MELBOURNE ?	RAIL	ROAD
		Hydraulic Oil_ODX	40	24	MELBOURNE ?	RAIL	ROAD
		Coolant_ODX	40	11	MELBOURNE ?	RAIL	ROAD
		Engine Oil_ODX	40	1	MELBOURNE ?	RAIL	ROAD
		Hydraulic Oil_ODX	40	2	MELBOURNE ?	RAIL	ROAD
		Grease_ODX	40	13	MELBOURNE ?	RAIL	ROAD
	Package Explosives	Assume 30 tonne lots ***** ROAD DELIVERIES ONLY *****	0	5	NSW	ROAD	ROAD
	Tyres	CAT 797	0	296	ADELAIDE	RAIL	ROAD
		CAT 789	0	36	ADELAIDE	RAIL	ROAD
		CAT 988	0	6	ADELAIDE	RAIL	ROAD
		CAT 994	0	3	ADELAIDE	RAIL	ROAD
		CAT 854	0	14	ADELAIDE	RAIL	ROAD
		CAT 24H	0	2	ADELAIDE	RAIL	ROAD

	Roxbury Downs Sub-division	2010 - 300 2011 - 400 2012 - 500	Permits= 50% require permits (2-4m width) 10% of annual total (50)	200	SOUTH AUSTRALIA	ROAD	ROAD
	Desalination Plant	Based on Pre-Assemblies	police loads	3	VIA SEA TO UPPER SPENCER GULF	ROAD	ROAD
			escort loads	1	VIA SEA TO UPPER SPENCER GULF	ROAD	ROAD
			Permit	1	VIA SEA TO UPPER SPENCER GULF	ROAD	ROAD
			0	42	VIA SEA TO UPPER SPENCER GULF	ROAD	ROAD
	CCGT	CY14 - 4,000 tonnes CY15 - 4,000 tonnes CY16 - 4,000 tonnes	Road closuses	5	SOUTH AUSTRALIA	ROAD	ROAD
			police loads	6	SOUTH AUSTRALIA	ROAD	ROAD
			escort loads	10	SOUTH AUSTRALIA	ROAD	ROAD
			0	25	SOUTH AUSTRALIA	ROAD	ROAD
	Cement	CY15	0	420	SOUTH AUSTRALIA	RAIL	ROAD
Ore Processing	Construction Equipment	Based on Pre-Assemblies	Road closuses	127	VIA SEA TO UPPER SPENCER GULF	ROAD	ROAD
			police loads	79	VIA SEA TO UPPER SPENCER GULF	ROAD	ROAD
			escort loads	346	VIA SEA TO UPPER SPENCER GULF	ROAD	ROAD
			permit	33	SOUTH AUSTRALIA	ROAD	ROAD
			normal	1163	SOUTH AUSTRALIA	ROAD	ROAD
Vehicles, Cranes & Misc	General Freight	General Freight CY10 - 14: 5,000t CY16+ :20,000t	0	125	SOUTH AUSTRALIA	RAIL	ROAD
Processing & Infrastructure Commodities		Diesel_Buses_ODX	0	128	SOUTH AUSTRALIA	RAIL	ROAD
		Small Vehicle Fleet/Misc_ODX	0	21	SOUTH AUSTRALIA	RAIL	ROAD
		Freight North_ODX	0	63	SOUTH AUSTRALIA	RAIL	ROAD
		Maintenance Freight_ODX	0	63	NEWCASTLE	RAIL	ROAD

Appendix D: Summary of ODX Heavy Vehicle Movements

2020 ODX Heavy Vehicle Data

Key Assumptions:
All exports and return goods are back loaded, all vehicles return to origin
Over dimensional loads only travel one-way (to the mine), the return trip is assumed legal

Area	Activity	Item	Permit & Escort Requirements	Trucks	Origin of Transport	MODE	
						PA - P	P - OD
	Shovel	P&H 4100	Permits/Pilots=5/shvl	54	ADELAIDE	ROAD	ROAD
	Dozers	CAT 854 (Rubber Tyred Dozers)	Permits= 1/Pilot	3	BRISBANE ?	ROAD	ROAD
Mining Consumables	Diesel	Mining Fuel_Contractor_ODX	45	5884	ADELAIDE	RAIL	RAIL
	Ammonium Nitrate	Bulk 20ft contrs @ 44t B-Doubles	45	1993	NEWCASTLE	RAIL	RAIL
	Emulsion	Tankers @ 20ft b-doubles	0	750	NEWCASTLE	RAIL	RAIL
	Dust Suppression Emulsion	Dust Suppression Chemical - Cooee DustBloc (Assumption Ltrs	0	111	NEWCASTLE	RAIL	RAIL
	Drilling Accessories	Bits, Rods, Subs, Stabilizers and Deck Bushes	40	18	MELBOURNE	RAIL	RAIL
	CAT Spares	Estimate	50	250	MELBOURNE	RAIL	RAIL
	Lubricants	Differential Oil 1_ODX	40	14	MELBOURNE ?	RAIL	RAIL
		Differential Oil 2_ODX	40	14	MELBOURNE ?	RAIL	RAIL
		Engine Oil_ODX	40	34	MELBOURNE ?	RAIL	RAIL
		Gears Oil_ODX	40	23	MELBOURNE ?	RAIL	RAIL
		Hydraulic Oil_ODX	40	25	MELBOURNE ?	RAIL	RAIL
		Coolant_ODX	40	11	MELBOURNE ?	RAIL	RAIL
		Engine Oil_ODX	40	1	MELBOURNE ?	RAIL	RAIL
		Gears Oil_ODX	40	1	MELBOURNE ?	RAIL	RAIL
		Hydraulic Oil_ODX	40	2	MELBOURNE ?	RAIL	RAIL
		Grease_ODX	40	14	MELBOURNE ?	RAIL	RAIL
	Package Explosives	Assume 30 tonne lots ***** ROAD DELIVERIES ONLY *****	0	5	NSW	ROAD	ROAD
	Tyres	CAT 797	0	324	ADELAIDE	RAIL	RAIL
		CAT 789	0	38	ADELAIDE	RAIL	RAIL
		CAT 988	0	6	ADELAIDE	RAIL	RAIL
		CAT 994	0	5	ADELAIDE	RAIL	RAIL
		CAT 854	0	13	ADELAIDE	RAIL	RAIL
		CAT 24H	0	3	ADELAIDE	RAIL	RAIL
Vehicles, Cranes & Misc	Cranes	16 - 150t cranes (7 trucks) 7 - 300t cranes (12 trucks)	CY10 - 10 Vehicles CY11 - 20 CY12 - 20	328	SOUTH AUSTRALIA	ROAD	ROAD
	General Freight	General Freight CY10 - 14: 5,000t CY16+ :20,000t	0	250	SOUTH AUSTRALIA	RAIL	RAIL
						RAIL	*RAIL*
		Ammonia_ODX	0	117	SOUTH AUSTRALIA	RAIL	RAIL
		Annode Moulds_Nth_ODX	0	10	SOUTH AUSTRALIA	RAIL	RAIL
		Caustic Soda_ODX	0	283	SOUTH AUSTRALIA	RAIL	RAIL
		Hydrate Lime_ODX	0	5	ANGUSTON	RAIL	RAIL
		Coke_ODX	0	238	WHYALLA	RAIL	RAIL
		Diluent_Shellsol_2046_ODX	0	259	MELBOUNRE	RAIL	RAIL
		Ethanol_ODX	0	213	NSW	RAIL	RAIL
		Electrode Paste_ODX	0	15	SOUTH AUSTRALIA	RAIL	RAIL

Processing & Infrastructure Commodities		MAG.E10 _ODX	0	105	SOUTH AUSTRALIA	RAIL	RAIL
		MAG.919_ODX	0	30	SOUTH AUSTRALIA	RAIL	RAIL
		Diesel_Ore Processing_ODX	0	339	SOUTH AUSTRALIA	RAIL	RAIL
		Diesel_Infrastructiure (Rail terminal)_ODX	0	27	SOUTH AUSTRALIA	RAIL	RAIL
		Diesel_Buses_ODX	0	85	SOUTH AUSTRALIA	RAIL	RAIL
		Small Vehicle Fleet/Misc_ODX	0	21	SOUTH AUSTRALIA	RAIL	RAIL
		Frother Interfraoth 754_ODX	0	30	SOUTH AUSTRALIA	RAIL	RAIL
		Freight North_ODX	0	375	SOUTH AUSTRALIA	RAIL	RAIL
		Maintenance Freight_ODX	0	375	NEWCASTLE	RAIL	RAIL
		Grinding Media_ODX	0	48	SOUTH AUSTRALIA	RAIL	RAIL
		Hydrogen Peroxide_ODX	0	16	SOUTH AUSTRALIA	RAIL	RAIL
		Polysil_RM 1250_ODX	0	105	SOUTH AUSTRALIA	RAIL	RAIL
		Promoter CMS2500_ODX	0	30	SOUTH AUSTRALIA	RAIL	RAIL
		Mill Liners_ODX	0	163	SOUTH AUSTRALIA	RAIL	RAIL
		Amine_Uranium SX__ODX	0	18	SOUTH AUSTRALIA	RAIL	RAIL
		Soda Ash_Uranium SX__ODX	0	104	SOUTH AUSTRALIA	RAIL	RAIL
		Isodecanol_Uranium SX__ODX	0	8	SOUTH AUSTRALIA	RAIL	RAIL
		Ferrous Sulphate Anhydrous_ODX	0	3	SOUTH AUSTRALIA	RAIL	RAIL
		Nitric Acid_ODX	0	5	SOUTH AUSTRALIA	RAIL	RAIL
		Sodium Cyanide_ODX	0	10	SOUTH AUSTRALIA	RAIL	RAIL
		Zinc Dust_ODX	0	3	SOUTH AUSTRALIA	RAIL	RAIL
		SMB_Floatation Modifer_ODX	0	15	SOUTH AUSTRALIA	RAIL	RAIL
		Sodium Chlorate_ODX	0	970	SOUTH AUSTRALIA	RAIL	RAIL
		Sulphur Pril_ODX	0	25000	IMPORTED INTO ADELAIDE	RAIL	RAIL
		Xanthate_ODX	0	30	SOUTH AUSTRALIA	RAIL	RAIL
ODX Exports		Copper Concentrates_ODX	0	20000	TRUCK OR RAIL TO DARWIN	RAIL	RAIL

Appendix E

Workforce Trip Generation

Table E1: Projected Workforce Population

Population Splits for Workforce			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Roxby - RES OPERATIONS	OD	2577	2669	2745	2745	2745	2745	2745	2745	2745	2745	2745
		ODX	57	189	571	970	1161	1378	1487	1652	1663	1784	1888
		TOTAL	2634	2857	3316	3715	3906	4123	4232	4397	4408	4529	4633
	Roxby - LDC OPERATIONS	OD	507	525	540	540	540	540	540	540	540	540	540
		ODX	181	435	818	1341	1653	1955	2068	2145	2157	2192	2064
		Village 3	360	360	360	360	1215	1215	1215	1215	1215	1215	1215
		TOTAL	1048	1320	1718	2241	3408	3710	3823	3900	3912	3947	3819
	Hiltaba	OD	0	0	0	0	0	0	0	0	0	0	0
		ODX	0	911	949	2174	3491	4185	4181	3246	3256	3334	1577
		FM Staff	500	500	500	500	340	340	340	340	340	340	340
		TOTAL	500	1411	1449	2674	3831	4525	4521	3586	3596	3674	1917
	Olympic Village	OD	781	821	855	855	0	0	0	0	0	0	0
		ODX	719	679	645	295	0	0	0	0	0	0	0
		TOTAL	1500	1500	1500	1150	0	0	0	0	0	0	0
	Total Population*	TOTAL	5682	7089	7984	9780	11145	12358	12576	11883	11916	12149	10369

note: Olympic Village (OV) workforce is counted in the total workforce population.

The OV population is removed for future calculations due to close proximity to mine and assumption that all OV residents are transported by means other than private vehicles

Table E2: Projected Workforce - Mode split, assumptions of workforce travelling by each mode

Mode Splits	OD	Roxby - RES OPERATIONS	LV	100%									
			BUS	0%									
		Roxby - LDC OPERATIONS	LV	100%	100%	100%	100%	100%	80%	70%	60%	50%	40%	20%
			BUS	0%	0%	0%	0%	0%	20%	30%	40%	50%	60%	80%
		Hiltaba	LV	5%									
			BUS	95%									
		Olympic Village	LV	0%									
			BUS	100%									
Mode Splits	ODX	Roxby - RES OPERATIONS	LV	0%	100%	100%	100%	100%	80%	70%	60%	50%	40%	20%
			BUS	0%	0%	0%	0%	0%	20%	30%	40%	50%	60%	80%
		Roxby - LDC OPERATIONS	LV	5%									
			BUS	95%									
		Hiltaba	LV	5%									
			BUS	95%									
		Olympic Village	LV	0%									
			BUS	100%									

note: Mode splits applied to population to determine the workforce numbers dependant on each mode and from where.
Assumption that "Base Line" includes OD(a) & OD(b)

Table E3: Mode splits for light vehicles and bus applied to workforce. Numbers represent workforce dependant on each mode

				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population dependant on Mod	OD(b)	Roxby - RES OPERATIONS OD	LV	168	259	336	336	336	336	336	336	336	336	336
			BUS	0	0	0	0	0	0	0	0	0	0	0
			TOTAL	168	259	336	336	336	336	336	336	336	336	336
		Roxby - LDC OPERATIONS	LV	33	51	66	66	66	53	46	40	33	26	13
			BUS	0	0	0	0	0	13	20	26	33	40	53
			TOTAL	33	51	66	66	66	66	66	66	66	66	66
		Olympic Village	LV	0	0	0	0	0	0	0	0	0	0	0
			BUS	0	0	0	0	0	0	0	0	0	0	0
			TOTAL	0	0	0	0	0	0	0	0	0	0	0
			LV	201	310	402	402	402	388	382	375	369	362	349
			BUS	0	0	0	0	0	13	20	26	33	40	53
Population dependant on Mode	ODX	Roxby - RES OPERATIONS	LV	0	189	571	970	1161	1102	1041	991	831	713	378
			BUS	0	0	0	0	0	276	446	661	831	1070	1510
			TOTAL	0	189	571	970	1161	1378	1487	1652	1663	1784	1888
		Roxby - LDC OPERATIONS	LV	27	40	59	85	143	158	164	168	169	170	164
			BUS	514	756	1120	1616	2725	3011	3119	3192	3203	3237	3115
			TOTAL	541	795	1178	1701	2868	3170	3283	3360	3372	3407	3279
		Hiltaba	LV	0	46	47	109	175	209	209	162	163	167	79
			BUS	0	866	902	2065	3316	3976	3972	3084	3094	3167	1498
			TOTAL	0	911	949	2174	3491	4185	4181	3246	3256	3334	1577
		Olympic Village	LV	0	0	0	0	0	0	0	0	0	0	0
			BUS	719	679	645	295	0	0	0	0	0	0	0
			TOTAL	719	679	645	295	0	0	0	0	0	0	0
			LV	27	274	677	1164	1479	1470	1414	1322	1163	1050	620
			BUS	514	1621	2021	3681	6041	7262	7537	6937	7128	7474	6123

note: The baseline is the sum of OD(a) and OD(b)
OD(b) is the "Future Operation of Existing OD site (no ODX)"

Table E4: Projected Workforce - Occupancy rates of each mode type applied to convert workforce population into vehicles

			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population dependant on Mod	OD(b)	Roxby - RES OPERATIONS OD	LV	153	236	305	305	305	305	305	305	305	305	305
			BUS	0	0	0	0	0	0	0	0	0	0	0
			TOTAL	153	236	305	305	305	305	305	305	305	305	305
		Roxby - LDC OPERATIONS	LV	30	46	60	60	60	48	42	36	30	24	12
			BUS	0	0	0	0	0	0	0	1	1	1	1
			TOTAL	30	46	60	60	60	48	42	37	31	25	13
		Olympic Village	LV	0	0	0	0	0	0	0	0	0	0	0
			BUS	0	0	0	0	0	0	0	0	0	0	0
			TOTAL	0	0	0	0	0	0	0	0	0	0	0
			LV	183	282	365	365	365	353	347	341	335	329	317
			BUS	0	0	0	0	0	0	0	1	1	1	1
Population dependant on Mode	ODX	Roxby - RES OPERATIONS	LV	52	171	519	882	1055	1002	946	901	756	649	343
			BUS	0	0	0	0	0	6	9	13	17	21	30
			TOTAL	52	171	519	882	1055	1008	955	914	772	670	373
		Roxby - LDC OPERATIONS	LV	25	36	54	77	130	144	149	153	153	155	149
			BUS	10	15	22	32	55	60	62	64	64	65	62
			TOTAL	35	51	76	110	185	204	212	217	217	220	211
		Hiltaba	LV	0	41	43	99	159	190	190	148	148	152	72
			BUS	0	17	18	41	66	80	79	62	62	63	30
			TOTAL	0	59	61	140	225	270	270	209	210	215	102
		Olympic Village	LV	0	0	0	0	0	0	0	0	0	0	0
			BUS	14	14	13	6	0	0	0	0	0	0	0
			TOTAL	14	14	13	6	0	0	0	0	0	0	0
			LV	76	249	616	1058	1345	1336	1285	1201	1057	955	564
			BUS	10	32	40	74	121	145	151	139	143	149	122

note: Occupancy rates applied to entire workforce population to determine number of vehicle trips required for the entire workforce.
OD(b) is the "Future Operation of Existing OD site (no ODX)"

	ODX	Occupancy (ave. per vehicle)	LV
			BUS

Table E5: Projected workforce - Operational rostering applied to generate traffic on any given day

				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population dependant on Mod	OD(b)	Roxby - RES OPERATIONS OD	LV	76	118	153	153	153	153	153	153	153	153	153
			BUS	0	0	0	0	0	0	0	0	0	0	0
			TOTAL	76	118	153	153	153	153	153	153	153	153	153
		Roxby - LDC OPERATIONS	LV	15	23	30	30	30	24	21	18	15	12	6
			BUS	0	0	0	0	0	0	0	0	0	0	1
			TOTAL	15	23	30	30	30	24	21	18	15	12	7
		Olympic Village	LV	0	0	0	0	0	0	0	0	0	0	0
			BUS	0	0	0	0	0	0	0	0	0	0	0
			TOTAL	0	0	0	0	0	0	0	0	0	0	0
			LV	91	141	183	183	183	177	174	171	168	165	159
			BUS	0	0	0	0	0	0	0	0	0	0	1
Population dependant on Mode	ODX	Roxby - RES OPERATIONS	LV	0	86	260	441	528	501	473	451	378	324	172
			BUS	0	0	0	0	0	3	4	7	8	11	15
			TOTAL	0	86	260	441	528	504	477	457	386	335	187
		Roxby - LDC OPERATIONS	LV	12	18	27	39	65	72	75	76	77	77	75
			BUS	5	8	11	16	27	30	31	32	32	32	31
			TOTAL	17	26	38	55	92	102	106	108	109	110	106
		Hiltaba	LV	0	33	35	79	127	152	152	118	118	121	57
			BUS	0	14	14	33	53	64	64	49	49	51	24
			TOTAL	0	47	49	112	180	216	216	167	168	172	81
		Olympic Village	LV	0	0	0	0	0	0	0	0	0	0	0
			BUS	12	11	10	5	0	0	0	0	0	0	0
			TOTAL	12	11	10	5	0	0	0	0	0	0	0
			LV	12	137	321	559	720	725	700	645	573	523	303
			BUS	5	21	26	49	80	96	99	88	90	94	70

Pop working on any given day	Con	80%	Assuming all construction operate on 28x7 roster
	Opr	50%	Assuming all operation operate on a 4x4 roster

note: Rostering of workforce determines percentage of population working on any given day. This provides a number of trips from each mode daily due to the workforce.
OD(b) is the "Future Operation of Existing OD site (no ODX)"

Table E6a: Projected Workforce - 2015 AM Peak Hour

2015 AM PEAK

	Peak Period	2015
OD(a)	Light Vehicles	1005
	Bus & 2-axle Trucks	50
	Total	**1055**
OD(b)	Light Vehicles	177
	Bus & 2-axle Trucks	0
	Total	**177**
ODX	Light Vehicles	725
	Bus & 2-axle Trucks	96
	Total	**822**

→ Surveyed Traffic Volumes

→ Future Operation Volumes (Existing & ODX) from Workforce Growth

64% **Peak Hr Factor**

- Percentage of peak "period" (05:45 to 07:45) vehicles travelling in the peak "hour" (06:00 to 07:00)
- *Based on 2008 traffic survey north of Roxby Downs (Pimba-Olympic Dam Road, 1.6km south of Olympic Dam)*

	30%	**SOUTHBOUND**
	369	LV
	67	Bus
	436	**TOTAL**

LV	856	
Bus	67	
TOTAL	**924**	
NORTHBOUND	**70%**	

NORTHBOUND		**LV**	**Bus**		**TOTAL**
OD(a)	Total	449	21	*includes all Class 3 vehicles*	471
OD(b)	Roxby Resdiential	69	0		69
	Roxby Villages	11	1		12
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	225	2		227
	Roxby Villages	33	14		47
	Hiltaba	69	29		98
		856	**67**		**924**

SOUTHBOUND		**LV**	**Bus**		**TOTAL**
OD(a)	Total	193	21	*includes all Class 3 vehicles*	214
OD(b)	Roxby Resdiential	30	0		30
	Roxby Villages	5	1		6
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	97	2		99
	Roxby Villages	14	14		28
	Hiltaba	30	29		59
		369	**67**		**436**

note: The baseline is the sum of OD(a) and OD(b)
OD(a) is the "Surveyed Traffic Volumes(2008)"
OD(b) is the "Future Operation of Existing OD site (no ODX)"

Table E6b: Projected Workforce - 2020 AM Peak Hour

2020 AM PEAK

	Peak Period	2020
OD(a)	Light Vehicles	1005
	Bus & 2-axle Trucks	50
	Total	**1055**
OD(b)	Light Vehicles	159
	Bus & 2-axle Trucks	1
	Total	**159**
ODX	Light Vehicles	303
	Bus & 2-axle Trucks	70
	Total	**374**

→ Surveyed Traffic Volumes

→ Future Operation Volumes (Existing & ODX) from Workforce Growth

64% **Peak Hr Factor**

- Percentage of peak "period" (05:45 to 07:45) vehicles travelling in the peak "hour" (06:00 to 07:00)
- *Based on 2008 traffic survey north of Roxby Downs (Pimba-Olympic Dam Road, 1.6km south of Olympic Dam)*

	30%	**SOUTHBOUND**
	285	LV
	54	Bus
	339	**TOTAL**

LV	658	
Bus	54	
TOTAL	**713**	
NORTHBOUND	**70%**	

NORTHBOUND		**LV**	**Bus**		**TOTAL**
OD(a)	Total	449	21	*includes all Class 3 vehicles*	471
OD(b)	Roxby Resdiential	69	0		69
	Roxby Villages	3	1		4
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	77	7		84
	Roxby Villages	34	14		48
	Hiltaba	26	11		37
		658	**54**		**713**

SOUTHBOUND		**LV**	**Bus**		**TOTAL**
OD(a)	Total	193	21	*includes all Class 3 vehicles*	214
OD(b)	Roxby Resdiential	30	0		30
	Roxby Villages	2	1		3
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	33	7		40
	Roxby Villages	15	14		29
	Hiltaba	12	11		23
		285	**54**		**339**

note: The baseline is the sum of OD(a) and OD(b)
OD(a) is the "Surveyed Traffic Volumes(2008)"
OD(b) is the "Future Operation of Existing OD site (no ODX)"

Table E7a: Projected Workforce - 2015 PM Peak Hour

2015 PM PEAK

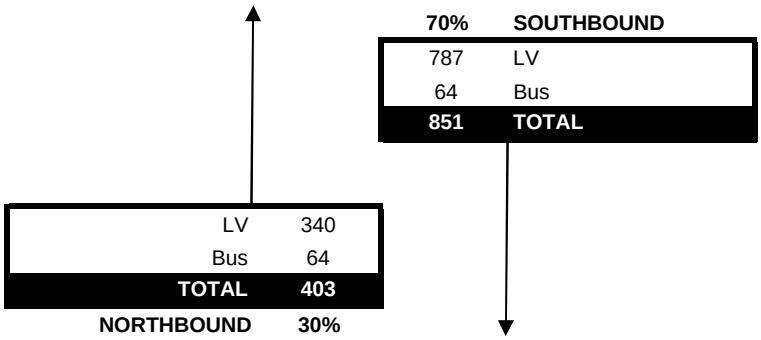
	Peak Period	2015
OD(a)	Light Vehicles	1036
	Bus & 2-axle Trucks	58
	Total	**1094**
OD(b)	Light Vehicles	177
	Bus & 2-axle Trucks	0
	Total	**177**
ODX	Light Vehicles	725
	Bus & 2-axle Trucks	96
	Total	**822**

→ Surveyed Traffic Volumes

→ Future Operation Volumes (Existing & ODX) from Workforce Growth

58% **Peak Hr Factor**

- Percentage of peak "period" (16:30 to 18:30) vehicles travelling in the peak "hour" (17:45 to 18:45)
- *Based on 2008 traffic survey north of Roxby Downs (Pimba-Olympic Dam Road, 1.6km south of Olympic Dam)*



NORTHBOUND		LV	Bus		TOTAL
OD(a)	Total	180	22	*includes all Class 3 vehicles*	201
OD(b)	Roxby Resdiential	27	0		27
	Roxby Villages	5	1		6
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	88	2		90
	Roxby Villages	13	13		26
	Hiltaba	27	26		53
		340	**64**		**403**

SOUTHBOUND		LV	Bus		TOTAL
OD(a)	Total	419	22	*includes all Class 3 vehicles*	441
OD(b)	Roxby Resdiential	62	0		62
	Roxby Villages	10	1		11
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	204	2		206
	Roxby Villages	30	13		43
	Hiltaba	62	26		88
		787	**64**		**851**

note: The baseline is the sum of OD(a) and OD(b)
OD(a) is the "Surveyed Traffic Volumes(2008)"
OD(b) is the "Future Operation of Existing OD site (no ODX)"

Table E7b: Projected Workforce - 2020 PM Peak Hour

2020 PM PEAK

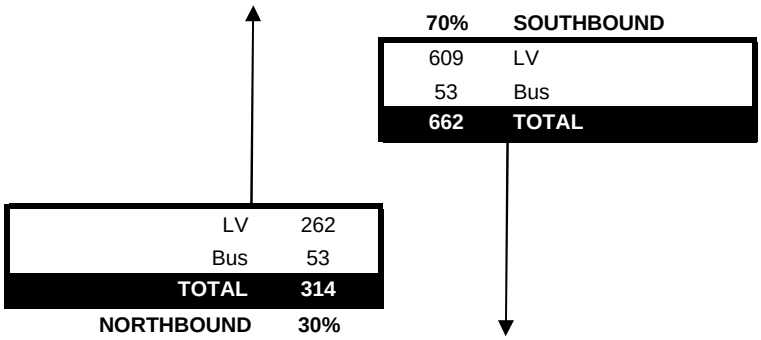
	Peak Period	2020
OD(a)	Light Vehicles	1036
	Bus & 2-axle Trucks	58
	Total	**1094**
OD(b)	Light Vehicles	159
	Bus & 2-axle Trucks	1
	Total	**159**
ODX	Light Vehicles	303
	Bus & 2-axle Trucks	70
	Total	**374**

→ Surveyed Traffic Volumes

→ Future Operation Volumes (Existing & ODX) from Workforce Growth

58% **Peak Hr Factor**

- Percentage of peak "period" (16:30 to 18:30) vehicles travelling in the peak "hour" (17:45 to 18:45)
- *Based on 2008 traffic survey north of Roxby Downs (Pimba-Olympic Dam Road, 1.6km south of Olympic Dam)*



NORTHBOUND		LV	Bus		TOTAL
OD(a)	Total	180	22	*includes all Class 3 vehicles*	201
OD(b)	Roxby Resdiential	27	0		27
	Roxby Villages	2	1		3
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	30	7		37
	Roxby Villages	13	13		26
	Hiltaba	10	10		20
		262	**53**		**314**

SOUTHBOUND		LV	Bus		TOTAL
OD(a)	Total	419	22	*includes all Class 3 vehicles*	441
OD(b)	Roxby Resdiential	62	0		62
	Roxby Villages	3	1		4
	Hiltaba	n/a	n/a		n/a
ODX	Roxby Resdiential	70	7		77
	Roxby Villages	31	13		44
	Hiltaba	24	10		34
		609	**53**		**662**

note: The baseline is the sum of OD(a) and OD(b)
OD(a) is the "Surveyed Traffic Volumes(2008)"
OD(b) is the "Future Operation of Existing OD site (no ODX)"

Appendix F

SIDRA Analysis

Table F1 - SIDRA RESULTS: 2015 Baseline for Olympic Way/Heavy Vehicle Bypass Road (North) Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Olympic Way (S)													
2	T	525	4.0	0.276	0.0	LOS A	0	204	9.8	0.111	0.0	LOS A	0
3	R	5	0.0	0.005	9.4	LOS A	0	5	0.0	0.006	10.9	LOS A	0
Approach		**530**	**4.0**	**0.276**	**0.1**	**LOS A**	**0**	**209**	**9.6**	**0.111**	**0.3**	**LOS A**	**0**
Heavy Vehicle Bypass Road													
4	L	5	0.0	0.250	22.2	LOS A	9	5	0.0	0.227	24.5	LOS A	9
6	R	58	6.9	0.246	22.9	LOS A	9	46	17.4	0.231	25.6	LOS A	9
Approach		**63**	**6.3**	**0.246**	**22.9**	**LOS A**	**9**	**51**	**15.7**	**0.232**	**25.5**	**LOS A**	**9**
Olympic Way (N)													
7	L	47	12.8	0.028	7.9	LOS A	0	44	13.6	0.026	8.0	LOS A	0
8	T	218	8.7	0.118	0.0	LOS A	0	501	4.4	0.264	0.0	LOS A	0
Approach		**265**	**9.4**	**0.118**	**1.4**	**LOS A**		**545**	**5.1**	**0.264**	**0.6**	**LOS A**	
All Vehicles		**858**	**5.8**	**0.276**	**2.2**	**N/A**	**9**	**805**	**7.0**	**0.264**	**2.1**	**N/A**	**9**

Table F2 - SIDRA RESULTS: 2015 Total Proposed (inc ODX) for Olympic Way/ Heavy Vehicle Bypass Road (North) Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Olympic Way (S)													
1	L	942	4.7	0.673	7.1	LOS A	60	366	10.7	0.267	6.1	LOS A	17
2	T	6	0.0	0.011	5.2	LOS A	0	6	0.0	0.011	5.0	LOS A	0
3	R	6	0.0	0.011	12.0	LOS B	0	6	0.0	0.011	11.9	LOS B	0
Approach		**954**	**4.6**	**0.673**	**7.2**	**LOS A**	**60**	**378**	**10.3**	**0.267**	**6.1**	**LOS A**	**17**
Heavy Vehicle Bypass Road													
4	L	6	0.0	0.115	5.7	LOS A	5	6	0.0	0.133	9.6	LOS A	8
5	T	227	19.8	0.116	5.4	LOS A	5	154	33.8	0.133	10.0	LOS A	8
6	R	6	0.0	0.115	13.1	LOS B	5	6	0.0	0.133	18.0	LOS B	7
Approach		**239**	**18.8**	**0.116**	**5.6**	**LOS A**	**5**	**166**	**31.3**	**0.133**	**10.2**	**LOS B**	**8**
Olympic Way (N)													
7	L	6	0.0	0.009	5.3	LOS A	0	6	0.0	0.011	7.0	LOS A	0
8	T	6	0.0	0.009	3.6	LOS A	0	6	0.0	0.011	5.2	LOS A	0
9	R	6	0.0	0.006	12.8	LOS B	0	6	0.0	0.008	14.8	LOS B	0
Approach		**18**	**0.0**	**0.009**	**7.2**	**LOS A**	**0**	**18**	**0.0**	**0.011**	**9.0**	**LOS A**	**0**
Proposed Western Access Road													
10	L	6	0.0	0.158	5.7	LOS A	8	6	0.0	0.207	5.7	LOS A	10
11	T	160	30.6	0.159	4.0	LOS A	8	195	24.6	0.208	3.9	LOS A	10
12	R	394	10.2	0.245	11.5	LOS B	12	892	4.9	0.516	11.4	LOS B	33
Approach		**560**	**15.9**	**0.245**	**9.3**	**LOS A**	**12**	**1093**	**8.4**	**0.516**	**10.0**	**LOS B**	**33**
All Vehicles		**1771**	**10.1**	**0.673**	**7.6**	**LOS A**	**60**	**1655**	**11.1**	**0.516**	**9.2**	**LOS A**	**33**

Table F3 - SIDRA RESULTS: 2015 Baseline for Heavy Vehicle Bypass Road/Andamooka Road Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Heavy Vehicle Bypass Road (S)													
2	T	17	17.6	0.010	0.0	LOS A	0	32	22.6	0.018	0.0	LOS A	0
3	R	2	0.0	0.002	13.1	LOS A	0	16	0.0	0.013	13.0	LOS A	0
Approach		**19**	**15.8**	**0.010**	**1.4**	**LOS A**	**0**	**47**	**14.9**	**0.018**	**4.4**	**LOS A**	**0**
Andamooka Road													
4	L	15	0.0	0.045	13.8	LOS A	2	21	0.0	0.026	13.8	LOS A	1
6	R	40	5.0	0.044	14.2	LOS A	2	15	6.7	0.026	14.3	LOS A	1
Approach		**55**	**3.6**	**0.045**	**14.1**	**LOS A**	**2**	**36**	**2.8**	**0.026**	**14.0**	**LOS A**	**1**
Heavy Vehicle Bypass Road (N)													
7	L	9	11.1	0.006	14.9	LOS A	0	20	5.0	0.015	14.4	LOS A	1
8	T	38	13.2	0.021	0.0	LOS A	0	24	20.8	0.014	0.0	LOS A	0
Approach		**47**	**12.8**	**0.021**	**2.9**	**LOS A**	**0**	**44**	**13.6**	**0.015**	**6.6**	**LOS A**	**1**
All Vehicles		**121**	**9.1**	**0.045**	**7.7**	**N/A**	**2**	**127**	**11.0**	**0.026**	**7.9**	**N/A**	**1**

Table F4 - SIDRA RESULTS: 2015 Total Proposed (inc ODX) for Heavy Vehicle Bypass Road/Andamooka Road Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Heavy Vehicle Bypass Road (S)													
2	T	26	15.4	0.015	0.0	LOS A	0	48	22.4	0.029	0.0	LOS A	0
3	R	6	0.0	0.005	13.1	LOS A	0	47	0.0	0.037	13.1	LOS A	1
Approach		**32**	**12.5**	**0.015**	**2.5**	**LOS A**	**0**	**96**	**11.5**	**0.037**	**6.4**	**LOS A**	**1**
Andamooka Road													
4	L	44	0.0	0.217	14.6	LOS A	10	63	0.0	0.164	15.1	LOS A	8
6	R	164	20.6	0.217	16.5	LOS A	10	81	40.7	0.164	19.0	LOS A	8
Approach		**209**	**16.3**	**0.217**	**16.1**	**LOS A**	**10**	**144**	**22.9**	**0.164**	**17.3**	**LOS A**	**8**
Heavy Vehicle Bypass Road (N)													
7	L	76	42.1	0.066	17.7	LOS A	3	125	25.4	0.117	16.4	LOS A	5
8	T	58	14.0	0.032	0.0	LOS A	0	36	20.0	0.020	0.0	LOS A	0
Approach		**133**	**30.1**	**0.066**	**10.1**	**LOS A**	**3**	**161**	**24.2**	**0.117**	**12.9**	**LOS A**	**5**
All Vehicles		**374**	**20.9**	**0.217**	**12.8**	**N/A**	**10**	**401**	**20.7**	**0.164**	**12.9**	**N/A**	**8**

Table F5 - SIDRA RESULTS: 2015 Baseline for Olympic Way/Heavy Vehicle Bypass Road (South) Intersection

Approach	Movement	AM Peak Hour Demand (veh/hr)	AM Peak Hour Heavy Vehicle (%)	AM Peak Hour Degree of Saturation	AM Peak Hour Average Delay (seconds)	AM Peak Hour Level of Service	AM Peak Hour Queue Length (m)	PM Peak Hour Demand (veh/hr)	PM Peak Hour Heavy Vehicle (%)	PM Peak Hour Degree of Saturation	PM Peak Hour Average Delay (seconds)	PM Peak Hour Level of Service	PM Peak Hour Queue Length (m)
Heavy Vehicle Bypass Road (S)													
1	L	3	33.3	0.002	16.9	LOS C	0	4	25.0	0.003	16.1	LOS C	0
2	T	8	37.5	0.005	0.0	LOS A	0	24	29.2	0.015	0.0	LOS A	0
Approach		**11**	**36.4**	**0.005**	**4.6**	**LOS A**		**28**	**28.6**	**0.015**	**2.3**	**LOS A**	
Heavy Vehicle Bypass Road (N)													
8	T	11	40.0	0.006	0.0	LOS A	0	23	30.4	0.014	0.0	LOS A	0
9	R	5	0.0	0.004	13.0	LOS B	0	5	0.0	0.004	13.0	LOS B	0
Approach		**15**	**26.7**	**0.006**	**4.3**	**LOS A**	**0**	**28**	**25.0**	**0.014**	**2.3**	**LOS A**	**0**
Olympic Way													
10	L	5	0.0	0.007	13.8	LOS B	0	5	0.0	0.010	13.9	LOS B	0
12	R	1	100.0	0.007	23.8	LOS C	0	5	0.0	0.010	13.5	LOS B	0
Approach		**6**	**16.7**	**0.007**	**15.4**	**LOS C**	**0**	**10**	**0.0**	**0.010**	**13.7**	**LOS B**	**0**
All Vehicles		**32**	**28.1**	**0.007**	**6.5**	**N/A**	**0**	**66**	**22.7**	**0.015**	**4.0**	**N/A**	**0**

Table F6 - SIDRA RESULTS: 2015 Total Proposed (inc ODX) for Olympic Way/Heavy Vehicle Bypass Road (South) Intersection

Approach	Movement	AM Peak Hour Demand (veh/hr)	AM Peak Hour Heavy Vehicle (%)	AM Peak Hour Degree of Saturation	AM Peak Hour Average Delay (seconds)	AM Peak Hour Level of Service	AM Peak Hour Queue Length (m)	PM Peak Hour Demand (veh/hr)	PM Peak Hour Heavy Vehicle (%)	PM Peak Hour Degree of Saturation	PM Peak Hour Average Delay (seconds)	PM Peak Hour Level of Service	PM Peak Hour Queue Length (m)
Heavy Vehicle Bypass Road (S)													
1	L	8	12.5	0.005	15.0	LOS A	0	14	14.3	0.008	15.3	LOS A	0
2	T	23	30.4	0.014	0.0	LOS A	0	62	24.2	0.037	0.0	LOS A	0
Approach		**31**	**25.8**	**0.014**	**3.9**	**LOS A**		**76**	**22.4**	**0.037**	**2.8**	**LOS A**	
Heavy Vehicle Bypass Road (N)													
8	T	28	25.0	0.017	0.0	LOS A	0	60	25.0	0.036	0.0	LOS A	0
9	R	5	0.0	0.004	13.0	LOS A	0	5	0.0	0.004	13.2	LOS A	0
Approach		**33**	**21.2**	**0.017**	**2.0**	**LOS A**	**0**	**65**	**23.1**	**0.036**	**1.0**	**LOS A**	**0**
Olympic Way													
10	L	5	0.0	0.009	14.0	LOS A	0	5	0.0	0.029	14.9	LOS A	1
12	R	3	33.3	0.009	17.1	LOS A	0	16	12.5	0.029	15.9	LOS A	1
Approach		**8**	**12.5**	**0.009**	**15.2**	**LOS A**	**0**	**21**	**9.5**	**0.029**	**15.7**	**LOS A**	**1**
All Vehicles		**72**	**22.2**	**0.017**	**4.3**	**N/A**	**0**	**162**	**21.0**	**0.037**	**3.8**	**N/A**	**1**

Table F7 - SIDRA RESULTS: 2020 Baseline for Olympic Way/Heavy Vehicle Bypass Road (North) Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Olympic Way (S)													
2	T	517	4.1	0.272	0.0	LOS A	0	201	10.0	0.110	0.0	LOS A	0
3	R	5	0.0	0.005	9.4	LOS A	0	5	0.0	0.006	10.8	LOS B	0
Approach		**522**	**4.0**	**0.272**	**0.1**	**LOS A**	**0**	**206**	**9.7**	**0.110**	**0.3**	**LOS A**	**0**
Heavy Vehicle Bypass Road													
4	L	5	0.0	0.238	21.8	LOS C	8	5	0.0	0.217	23.0	LOS C	8
6	R	57	7.0	0.237	22.4	LOS C	8	45	15.6	0.213	24.0	LOS C	8
Approach		**62**	**6.5**	**0.237**	**22.4**	**LOS C**	**8**	**50**	**14.0**	**0.213**	**23.9**	**LOS C**	**8**
Olympic Way (N)													
7	L	46	10.9	0.027	7.9	LOS A	0	42	9.5	0.024	7.9	LOS A	0
8	T	215	8.8	0.117	0.0	LOS A	0	494	4.5	0.261	0.0	LOS A	0
Approach		**261**	**9.2**	**0.117**	**1.4**	**LOS A**		**536**	**4.9**	**0.261**	**0.6**	**LOS A**	
All Vehicles			**846**	**5.9**	**0.272**	**2.1**	**N/A**	**8**	**793**	**6.8**	**0.261**	**2.0**	**N/A**

Table F8 - SIDRA RESULTS: 2020 Total Proposed (inc ODX) for Olympic Way/Heavy Vehicle Bypass Road (North) Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Olympic Way (S)													
1	L	772	5.7	0.500	5.9	LOS A	37	307	14.3	0.222	5.8	LOS A	14
2	T	6	0.0	0.010	4.8	LOS A	0	6	0.0	0.010	4.8	LOS A	0
3	R	6	0.0	0.010	11.7	LOS B	0	6	0.0	0.010	11.6	LOS B	0
Approach		**784**	**5.6**	**0.500**	**5.9**	**LOS A**	**37**	**319**	**13.8**	**0.222**	**5.9**	**LOS A**	**14**
Heavy Vehicle Bypass Road													
4	L	6	0.0	0.064	5.4	LOS A	3	6	0.0	0.071	7.8	LOS A	4
5	T	131	16.0	0.064	4.9	LOS A	3	95	28.4	0.071	7.8	LOS A	4
6	R	6	0.0	0.064	12.7	LOS B	3	6	0.0	0.071	15.7	LOS B	4
Approach		**143**	**14.7**	**0.064**	**5.3**	**LOS A**	**3**	**107**	**25.2**	**0.071**	**8.2**	**LOS A**	**4**
Olympic Way (N)													
7	L	6	0.0	0.009	5.1	LOS A	0	6	0.0	0.011	6.3	LOS A	0
8	T	6	0.0	0.009	3.4	LOS A	0	6	0.0	0.011	4.5	LOS A	0
9	R	6	0.0	0.006	12.5	LOS B	0	6	0.0	0.007	14.0	LOS B	0
Approach		**18**	**0.0**	**0.009**	**7.0**	**LOS A**	**0**	**18**	**0.0**	**0.011**	**8.2**	**LOS A**	**0**
Proposed Western Access Road													
10	L	6	0.0	0.105	5.7	LOS A	5	6	0.0	0.115	5.7	LOS A	5
11	T	100	25.0	0.105	3.9	LOS A	5	107	19.6	0.116	3.8	LOS A	5
12	R	330	13.7	0.213	11.6	LOS B	10	734	6.7	0.433	11.4	LOS B	25
Approach		**435**	**16.1**	**0.213**	**9.7**	**LOS A**	**10**	**847**	**8.3**	**0.433**	**10.4**	**LOS B**	**25**
All Vehicles		**1380**	**9.8**	**0.500**	**7.1**	**LOS A**	**37**	**1291**	**10.9**	**0.433**	**9.1**	**LOS A**	**25**

Table F9 - SIDRA RESULTS: 2020 Baseline for Heavy Vehicle Bypass Road/Andamooka Road Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Heavy Vehicle Bypass Road (S)													
2	T	17	17.6	0.010	0.0	LOS A	0	31	20.0	0.017	0.0	LOS A	0
3	R	2	0.0	0.002	13.1	LOS B	0	16	0.0	0.013	13.0	LOS B	0
Approach		**19**	**15.8**	**0.010**	**1.4**	**LOS A**	**0**	**46**	**13.0**	**0.017**	**4.5**	**LOS A**	**0**
Andamooka Road													
4	L	15	0.0	0.045	13.8	LOS B	2	21	0.0	0.026	13.8	LOS B	1
6	R	40	5.0	0.044	14.2	LOS B	2	15	6.7	0.026	14.3	LOS B	1
Approach		**55**	**3.6**	**0.045**	**14.1**	**LOS B**	**2**	**36**	**2.8**	**0.026**	**14.0**	**LOS B**	**1**
Heavy Vehicle Bypass Road (N)													
7	L	9	11.1	0.006	14.9	LOS B	0	20	5.0	0.012	14.4	LOS B	0
8	T	38	13.2	0.021	0.0	LOS A	0	23	17.4	0.013	0.0	LOS A	0
Approach		**47**	**12.8**	**0.021**	**2.9**	**LOS A**	**0**	**43**	**11.6**	**0.013**	**6.7**	**LOS A**	**0**
All Vehicles		**121**	**9.1**	**0.045**	**7.7**	**N/A**	**2**	**125**	**9.6**	**0.026**	**8.0**	**N/A**	

Table F10 - SIDRA RESULTS: 2020 Total Proposed (inc ODX) for Heavy Vehicle Bypass Road/Andamooka Road Intersection

Approach	Movement	AM Peak Hour						PM Peak Hour					
		Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)	Demand (veh/hr)	Heavy Vehicle (%)	Degree of Saturation	Average Delay (seconds)	Level of Service	Queue Length (m)
Heavy Vehicle Bypass Road (S)													
2	T	21	14.3	0.012	0.0	LOS A	0	38	21.6	0.022	0.0	LOS A	0
3	R	6	0.0	0.005	13.1	LOS B	0	47	0.0	0.037	13.1	LOS A	1
Approach		**27**	**11.1**	**0.012**	**2.9**	**LOS A**	**0**	**84**	**9.5**	**0.037**	**7.3**	**LOS A**	**1**
Andamooka Road													
4	L	44	0.0	0.120	14.1	LOS B	5	63	0.0	0.093	14.3	LOS A	4
6	R	88	16.9	0.120	15.6	LOS C	5	41	36.6	0.093	17.7	LOS A	4
Approach		**133**	**11.3**	**0.120**	**15.1**	**LOS C**	**5**	**104**	**14.4**	**0.093**	**15.6**	**LOS A**	**4**
Heavy Vehicle Bypass Road (N)													
7	L	36	36.1	0.030	17.1	LOS C	1	61	23.0	0.045	16.1	LOS A	2
8	T	48	16.7	0.027	0.0	LOS A	0	27	18.5	0.016	0.0	LOS A	0
Approach		**84**	**25.0**	**0.030**	**7.3**	**LOS A**	**1**	**88**	**21.6**	**0.045**	**11.2**	**LOS A**	**2**
All Vehicles		**244**	**16.0**	**0.120**	**11.1**	**N/A**	**5**	**276**	**15.2**	**0.093**	**11.7**	**N/A**	**4**

Table F11 - SIDRA RESULTS: 2020 Baseline for Olympic Way/Heavy Vehicle Bypass Road (South) Intersection

Approach	Movement	AM Peak Hour Demand (veh/hr)	AM Peak Hour Heavy Vehicle (%)	AM Peak Hour Degree of Saturation	AM Peak Hour Average Delay (seconds)	AM Peak Hour Level of Service	AM Peak Hour Queue Length (m)	PM Peak Hour Demand (veh/hr)	PM Peak Hour Heavy Vehicle (%)	PM Peak Hour Degree of Saturation	PM Peak Hour Average Delay (seconds)	PM Peak Hour Level of Service	PM Peak Hour Queue Length (m)
Heavy Vehicle Bypass Road (S)													
1	L	3	33.3	0.002	16.9	LOS C	0	4	25.0	0.003	16.1	LOS C	0
2	T	9	44.4	0.006	0.0	LOS A	0	23	21.7	0.013	0.0	LOS A	0
Approach		**12**	**41.7**	**0.006**	**4.2**	**LOS A**		**27**	**22.2**	**0.013**	**2.4**	**LOS A**	**0**
Heavy Vehicle Bypass Road (N)													
8	T	12	45.5	0.007	0.0	LOS A	0	22	27.3	0.013	0.0	LOS A	0
9	R	5	0.0	0.004	13.0	LOS B	0	5	0.0	0.004	13.0	LOS B	0
Approach		**16**	**31.2**	**0.007**	**4.1**	**LOS A**	**0**	**27**	**22.2**	**0.013**	**2.4**	**LOS A**	**0**
Olympic Way													
10	L	5	0.0	0.010	13.7	LOS B	0	5	0.0	0.011	14.0	LOS B	0
12	R	5	0.0	0.010	13.3	LOS B	0	5	20.0	0.011	15.6	LOS C	0
Approach		**10**	**0.0**	**0.010**	**13.5**	**LOS B**	**0**	**10**	**10.0**	**0.011**	**14.8**	**LOS B**	**0**
All Vehicles		**38**	**26.3**	**0.010**	**6.6**	**N/A**	**0**	**64**	**20.3**	**0.013**	**4.3**	**N/A**	**0**

Table F12 - SIDRA RESULTS: 2020 Total Proposed (inc ODX) for Olympic Way/Heavy Vehicle Bypass Road (South) Intersection

Approach	Movement	AM Peak Hour Demand (veh/hr)	AM Peak Hour Heavy Vehicle (%)	AM Peak Hour Degree of Saturation	AM Peak Hour Average Delay (seconds)	AM Peak Hour Level of Service	AM Peak Hour Queue Length (m)	PM Peak Hour Demand (veh/hr)	PM Peak Hour Heavy Vehicle (%)	PM Peak Hour Degree of Saturation	PM Peak Hour Average Delay (seconds)	PM Peak Hour Level of Service	PM Peak Hour Queue Length (m)
Heavy Vehicle Bypass Road (S)													
1	L	7	14.3	0.004	15.2	LOS A	0	12	18.2	0.007	15.5	LOS A	0
2	T	19	31.6	0.012	0.0	LOS A	0	51	21.6	0.030	0.0	LOS A	0
Approach		**26**	**26.9**	**0.012**	**4.1**	**LOS A**		**62**	**21.0**	**0.030**	**2.8**	**LOS A**	
Heavy Vehicle Bypass Road (N)													
8	T	23	26.1	0.014	0.0	LOS A	0	49	22.0	0.029	0.0	LOS A	0
9	R	5	0.0	0.004	13.0	LOS A	0	5	0.0	0.004	13.1	LOS A	0
Approach		**28**	**21.4**	**0.014**	**2.3**	**LOS A**	**0**	**55**	**20.0**	**0.029**	**1.2**	**LOS A**	**0**
Olympic Way													
10	L	5	0.0	0.009	13.9	LOS A	0	5	0.0	0.024	14.7	LOS A	1
12	R	3	33.3	0.009	17.0	LOS A	0	13	15.4	0.024	16.0	LOS A	1
Approach		**8**	**12.5**	**0.009**	**15.1**	**LOS A**	**0**	**18**	**11.1**	**0.024**	**15.6**	**LOS A**	**1**
All Vehicles		**62**	**22.6**	**0.014**	**4.7**	**N/A**	**0**	**135**	**19.3**	**0.030**	**3.8**	**N/A**	**1**

Appendix G

Trip Generation and Distribution Assumptions

G1 Trip Generation and Distribution Assumptions

The following assumptions have been made in the calculations of trip generation and distribution related to the proposed Olympic Dam Expansion as well as changes to the background traffic and existing OD operations.

G1.1 Background Traffic and Existing OD Operations

- Federal Government estimated background growth rates have been applied to the Princes Highway and Stuart Highway;
- Seasonal factors have been applied to Princes Highway and Stuart Highway based on seasonal factors indicated in traffic survey data provided by DTEI.
- No background growth rates or seasonal factors have been applied to Olympic Way as Olympic Dam operations are the main traffic generator; and
- When rail operations to Pimba and Olympic Dam become available, some existing OD loads will be transferred to rail as indicated by BHP Billiton.

G1.2 ODX Traffic Generation

- All loads are assumed to return to their point of origin with some vehicles back loaded with export material.
- Trip generation is based on the numbers supplied by BHP Billiton in the spreadsheet "ODX_Trip Planning_Case 14_v1.0_01Jul08.xls" which is summararised in Appendix D;
- Where the likely origin of the load is not yet known, the loads will originate in Port Adelaide;
- All over-dimensional loads transported to Port Augusta by sea will land at the proposed landing site adjacent to Shack Road, Port Augusta;
- All loads are expected to travel via Port Augusta along the Stuart Highway, Roxby Downs Road, Olympic Way and the Heavy Vehicle Bypass;
- All loads originating in Victoria and Adelaide are expected to use the Princes Highway to Port Augusta;
- All loads from Queensland and New South Wales are expected to approach Port Augusta via the Main North Road and the Princes Highway; and
- All loads will be diverted from Olympic Way, south of Olympic Dam, to the proposed Western Access Road.

G1.3 Ancillary Traffic Generation

- Conservatively, ancillary traffic on Olympic Way south of Roxby Downs will change in proportion to the workforce population with the exception of heavy vehicles which will increase at half that rate;

G1.4 Traffic Movements Between Townships and Olympic Dam

- Workforce profile will be that shown in Appendix E;
- Employees associated with construction located in Hiltaba Village will work 28 days on seven days off;
- 5% of the Hiltaba workforce will be facility management staff and not counted in trips to the OD site;

- Employees associated with ODX operations located in Roxby Downs will work four days on four days off;
- Vehicle occupancy will be 50 persons per bus (average bus size, 50 persons, 1.1 persons per vehicle;
- Mode share for Roxby Downs and Hiltaba Village will be as shown in Table 16;
- 70% of staff work day shift, 30% staff work night shift;
- The AM peak period will occur over two hours (5.45-7.45am) with the peak hour from 6am-7am and generating approximately 65% of all peak period traffic (based on 2008 traffic surveys);
- The PM peak period will occur over two hours (4.30-6.30pm) with the peak hour from 4:45pm-5:45pm and generating approximately 60% of all peak period traffic (based on 2008 traffic surveys); and
- All bus trips in the minor direction are equal to that of the major directional flow.
- All turning movements (ODX, ancillary and base traffic flows) at the two intersections of Olympic Way and the Heavy Vehicle Bypass will use turning proportions derived from turning counts surveyed in August 2006. These turning proportions are included in Appendix E;
- All traffic using the intersection of Olympic Way with the Heavy Vehicle Bypass, north of Roxby Downs, turning to or from Olympic Way north will be rerouted to the proposed western access road;
- All traffic movements associated with shift changes between the OD site and Hiltaba village will use Andamooka Road, turning north onto the Heavy Vehicle Bypass, heading west across the new roundabout with Olympic Way;
- All traffic servicing Hiltaba Village will approach along Olympic Way, then the Heavy Vehicle Bypass before turning right into Andamooka Road; and
- All return trips will be the reverse of the above.

- Employees associated with ODX operations located in Roxby Downs will work four days on four days off;
- Vehicle occupancy will be 50 persons per bus (average bus size, 50 persons, 1.1 persons per vehicle;
- Mode share for Roxby Downs and Hiltaba Village will be as shown in Table 16;
- 70% of staff work day shift, 30% staff work night shift;
- The AM peak period will occur over two hours (5.45-7.45am) with the peak hour from 6am-7am and generating approximately 65% of all peak period traffic (based on 2008 traffic surveys);
- The PM peak period will occur over two hours (4.30-6.30pm) with the peak hour from 4:45pm-5:45pm and generating approximately 60% of all peak period traffic (based on 2008 traffic surveys); and
- All bus trips in the minor direction are equal to that of the major directional flow.
- All turning movements (ODX, ancillary and base traffic flows) at the two intersections of Olympic Way and the Heavy Vehicle Bypass will use turning proportions derived from turning counts surveyed in August 2006. These turning proportions are included in Appendix E;
- All traffic using the intersection of Olympic Way with the Heavy Vehicle Bypass, north of Roxby Downs, turning to or from Olympic Way north will be rerouted to the proposed western access road;
- All traffic movements associated with shift changes between the OD site and Hiltaba village will use Andamooka Road, turning north onto the Heavy Vehicle Bypass, heading west across the new roundabout with Olympic Way;
- All traffic servicing Hiltaba Village will approach along Olympic Way, then the Heavy Vehicle Bypass before turning right into Andamooka Road; and
- All return trips will be the reverse of the above.