PLANNING PROPOSAL
PARKES INDUSTRIAL ESTATE

PREPARED FOR
PARKES SHIRE COUNCIL – ECONOMIC DEVELOPMENT COMMITTEE

JUNE 2014

PLANNING PROPOSAL

PARKES INDUSTRIAL ESTATE

AMENDMENT TO PARKES LOCAL ENVIRONMENTAL PLAN 2012 TO REZONE 102 HECTARE OF LAND BOUNDED BY NEWELL HIGHWAY (EAST), SALEYARDS ROAD (NORTH) & PARKES-STOCKINBINGAL RAILWAY CORRIDOR (WEST)

PREPARED FOR:

PARKES SHIRE COUNCIL – ECONOMIC DEVELOPMENT COMMITTEE

JUNE 2014

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Geolyse Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and would not benefit from any of the recommendations outlined in this report.

The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

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Document Control

Version	Date	Status	Author	Reviewed	Approved
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Executive Summary

Geolyse has been commissioned by Parkes Shire Council (PSC) to prepare a Planning Proposal (PP) in respect of the proposed rezoning of land described as the Parkes Industrial Estate. The land the subject of the PP is described as being formed of the following allotments:

Lot/DP	Size (hectares)
Lot 549 in DP 657444	32.3
Lot 632 in DP 750179	46.41
Lot 7023 in DP 1054934	1.659
Part Lot 7022 in DP 1054934	2.991
Part Lot 101 in DP 1169531	16.86
Lot 19 in DP1047309	1.56
TOTAL	**101.78**

The land has frontages to the Newell Highway, Saleyards Road and Ackroyd Street, Parkes.

Pursuant to the *Parkes Local Environmental Plan 2012* (LEP) the land is zoned RU1 – Primary Production.

As a result of the PP the land would be rezoned predominantly to IN1 - General Industrial and the minimum lot size amended.

The land has an area of approximately 102 hectares and is bounded by the Newell Highway to the east (1.6km frontage), to the west by the Stockinbingal Parkes Railway and to the north by the existing Parkes industrial area.

A review of the site has been undertaken in accordance with the relevant parameters of the PP process. Various specialist reports including an Ecological Assessment and traffic impact assessment have been completed. Overall it is considered that the site is suitable for the proposed purpose.

Further investigations to support the PP, including a detailed contamination assessment, would be completed following the initial Gateway determination.

ABBREVIATIONS

Abbreviation	Full Name
AHD	Australian Height Datum
DPIFA	Department of Primary Industries, Fisheries and Aquaculture
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DoP	NSW Department of Planning
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environmental Protection Authority
LEP	Local Environmental Plan
LGA	Local Government Authority
OEH	Office of Environment and Heritage
PP	Planning Proposal
SEPP	State Environmental Planning Policy

Background

INTRODUCTION

Geolyse Pty Ltd has been commissioned by the applicant (Parkes Shire Council) to prepare a Planning Proposal (PP) to support a proposed amendment to the *Parkes Local Environmental Plan 2012*. The PP is lodged in relation to land as described in **Table 1**.

The land has frontages to the Newell Highway, Saleyards Road and Ackroyd Street, Parkes and has an area of approximately 102 hectares and is bounded by the Newell Highway to the east (1.6km frontage), to the west by the Stockinbingal Parkes Railway and to the north by the existing Parkes Industrial Estate.

Table 1 – Land details

Lot/DP	Size (hectares)
Lot 549 in DP 657444	32.3
Lot 632 in DP 750179	46.41
Lot 7023 in DP 1054934	1.659
Part Lot 7022 in DP 1054934	2.991
Part Lot 101 in DP 1169531	16.86
Lot 19 in DP1047309	1.56
TOTAL	**101.78**

Source: Six Maps

The PP seeks to rezone the site for industrial purposes (refer **Figure 1**). The site is currently zoned RU1 – Primary Production.

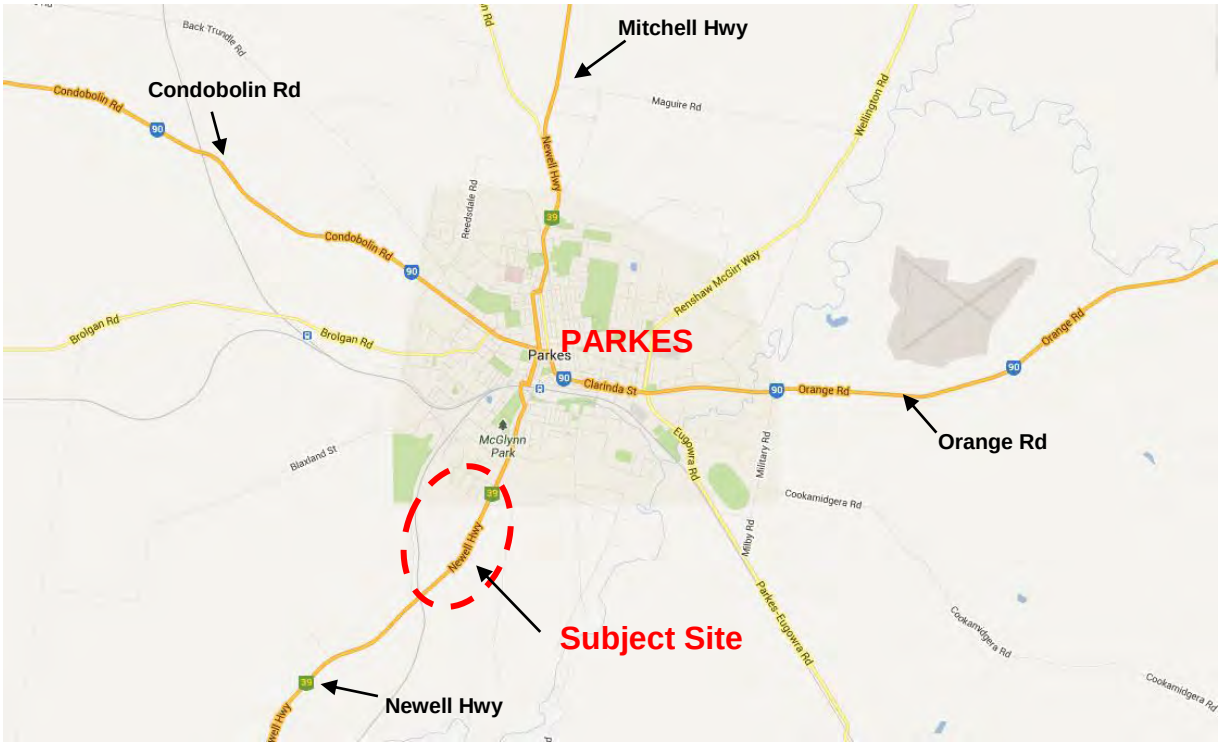

Figure 1: Context Location Plan (Source Google Maps)

SCOPE OF REPORT

This PP has been prepared in accordance with the NSW Department of Planning's (DoP) advisory documents *'A Guide to Preparing Local Environmental Plans'* and *'A Guide to Preparing Planning Proposals'*. The latter document requires the PP to be provided in five (5) parts, those being;

- *Part 1* – A statement of the objectives or intended outcomes of the proposed LEP;
- *Part 2* – An explanation of the provisions that are to be included in the proposed LEP;
- *Part 3* – The justification for those objectives, outcomes, and provisions and the process for their implementation;
- *Part 4* – discusses proposed mapping changes; and
- *Part 5* – Details of the community consultation that is to be undertaken on the PP.

Part 5 would be confirmed following a Gateway Determination of this PP by the DoP.

THE SUBJECT SITE

SITE DESCRIPTION AND LOCATION

The site the subject of this PP is formed of six lots (refer **Table 1**) with a total area of approximately 102 hectares. The site is located on the southern periphery of the town of Parkes and is bounded by the Newell Highway to the East, the Parkes-Stockinbingal Railway Line to the west and the existing Parkes Industrial Estate to the north (refer **Figure 1**).

Adjacent land to the east and south is currently developed for rural residential purposes, with low density dwellings located on large lots. To the west is the Parkes Golf Course, and to the south west is land in use for primary production purposes.

The land is owned by Parkes Shire Council (PSC) and is currently zoned RU1 – Primary Production.

Figure 2: Location plan showing current land zoning and Lot Numbers (Source: Byng Maps)

TOPOGRAPHY AND SOILS

King (1998) identifies the site as being within the Parkes Soils Landscape. This soil landscape is characterised by narrow crests and gently inclined sideslopes with slope gradients between 2-5% (King 1998).

In relation to urban land uses, the Parkes Soil Landscape has been identified as having:

> *Topsoils are unsuitable for structural earthworks. Subsoils are more suitable and some sub soils tested on this landscape have earthwork category ratings of B, C and D* (King 1998b).

The above mapping is undertaken at a broad scale. Existing industrial development on the adjacent land to the north illustrates structural earthworks can be undertaken. Soil testing would be undertaken at built form stage to determine slab types, however there is no indication that the site would be prohibitive to the proposed future land use.

FLORA AND FAUNA

An Ecological Assessment (EA) of the subject site was undertaken for the proposed rezoning by Flora Search Pty Ltd in September 2013 and is attached at **Appendix A**.

The EA notes that there were no threatened species of flora or fauna identified on the site, and there were three degraded remnant threatened ecological communities on site. The EA concludes that the remnants of all three communities comprise only scattered eucalypts and a few resilient ground cover species. They are all too degraded to qualify for protection under TSC or EPBC Acts. Consequently there is no requirement to avoid, mitigate or offset for removal of this vegetation.

The assessment concludes that the site does not contain any significant ecological constraints. It is therefore considered to be suitable for the PP as proposed.

HERITAGE

An Aboriginal Archaeological Assessment (AAA) was undertaken for the subject site by OzArk and is attached at **Appendix B**.

Indigenous Heritage

One Aboriginal site, identified as Parkes Industrial Estate – Scarred Tree 1, was recorded as a result of the current assessment.

The AAA makes the following conclusions and recommendations:

1. *Lots 19/DP1047309, part lot 101/DP1169531, part lot 7022/DP1054934, 7023/DP1054934, 632/DP750179 and 549/DP657444 do not present with any constraint on the basis of Aboriginal heritage.*
2. *It is recommended that the Proponent seek to avoid impact to Aboriginal site PIE-ST1.*
3. *High-visibility, temporary physical curtilage delineating a ten metre buffer zone which does not infringe within the drip-line of PIE-ST1 is recommended to ensure against inadvertent damage during construction works.*
4. *Any long term management of PIE-ST1 by means of permanent fencing or signage should first be discussed with Aboriginal community.*
5. *Should impacts to PIE-ST1 be unavoidable an Aboriginal Heritage Impact Permit (AHIP) must be sought from the Office of Environment and Heritage.*
6. *All land-disturbing activities must be confined to within the assessed Project Site.*
7. *As an additional mitigation measure, where possible any topsoil removed from within the Project Site during the construction phase of proposed works should be stockpiled for reuse in the immediate area.*
8. *The work crews in the initial ground breaking phase of construction should be made aware of the legislative protection of Aboriginal sites and objects.*
9. *In the unlikely event that objects are encountered that are suspected to be of Aboriginal origin (including skeletal material), the Unanticipated Finds Protocol (Appendix 3) should be followed.*

On the basis of the above conclusions and recommendations it is determined that the proposed development would not lead to any unacceptable impacts to matters of Indigenous heritage.

A copy of the above report has been provided to the Office of Environment and Heritage for their records.

Non-Indigenous Heritage

Parkes was originally founded in 1853 as the settlement Currajong, named for the abundance of kurrajong trees in the local area by the settlers, but was then known as Bushman's (from the local mine named Bushman's Lead) (Library.parkes.nsw.gov.au, 2013).

In August 1873, Henry Parkes (later Sir Henry) visited the area and in December 1873 the town was officially renamed Parkes in his honour (Library.parkes.nsw.gov.au, 2013). (Sir Henry Parkes is

recognised in Australia as having played an instrumental role in Australia becoming a unified and federated country.) In March 1885, Parkes was proclaimed a town.

Registered Historic Items

The State Heritage database is maintained by the NSW Heritage Office and lists all items that have been identified as of heritage value on Regional Environmental Plans and Local Environmental Plans throughout NSW.

The State Heritage Register lists those places which are of State Significance which have been listed by the NSW Heritage Office under the NSW Heritage Act. In contrast the NSW State Heritage Inventory contains items considered by Local Councils and State Government Agencies to be of heritage value.

NSW Heritage Register

Fourteen items in the local and broader Parkes Region have been given state significance through listing under the *NSW Heritage Branch.* Two of these items were listed under the NSW Heritage Act and the remaining twelve have been listed by Local Government and State Government. A review of these items confirms that there are no sites on or in the vicinity of the subject site.

Parkes Local Environmental Plan 2012

Schedule 5 of the LEP lists those items considered of significance at the local, state and national level. A review of those items confirms that there are no items on or in the vicinity of the subject site.

An inspection of the site on foot did not reveal any items of non-indigenous heritage significance. Three small fenced blocks about the middle of the eastern boundary formerly contained buildings whose only remains are concrete slabs, these however are not considered of any significance.

If, during the course of clearing work, significant European cultural heritage material is uncovered work should cease in that area immediately. The NSW Heritage Branch should be notified and works only recommence when an appropriate and approved management strategy instigated.

BUSHFIRE

The subject site is not bushfire prone in accordance with Parkes Shire Council's Bushfire Prone Land Maps. As such the provisions contained within the *Planning for Bushfire Protection Guidelines 2006* are not applicable to the subject site.

FLOODING

The subject site is located some 2km from the nearest watercourse, being Goobang Creek to the East. The subject site is not known to be affected by mainstream flooding.

CONTAMINATION

Envirowest Pty Ltd have undertaken a Preliminary Desktop Contamination Investigation (refer **Appendix C**) which involved a confirmation of previous land uses and a review of topographic maps, public notices, aerial photographs and historic parish maps.

The preliminary assessment identifies that there is the potential for contaminant sources to be located within the site, such as from historical mining activities, impact of saline soils, storage of fuels, oils or pesticides, stockpiling of imported materials and illegal disposal of waste. Neither the site nor its neighbours are listed on the EPA Contaminated Land Record or the list of NSW contaminated sites notified to the EPA.

Neighbouring land uses are not anticipated to impact on the contamination status of the land.

The report contains a recommendation that further investigations be undertaken, including site sampling and testing to determine if any contaminants exist, as set out in Section 8.4 of **Appendix C**. This additional reporting would be completed following the initial Gateway review of the PP.

TOPOGRAPHY & DRAINAGE

Elevation is 298m AHD at the southernmost tip of the site and increases to 332 m AHD in the north east and north west corners. There are no permanent watercourses on the study area. The main drainage line runs down the western boundary before traversing the southern paddock in a south easterly direction. A tributary of this drainage line carries water from the existing industrial area through the centre of the northern boundary of the study area in a south westerly direction to the western drainage line.

The NSW Resource Atlas reveals no registered water bores located on site but confirms a total of seven bores located within 1 kilometre of the site. These bores are licensed for stock and domestic purposes with water bearing zones from 50 metres in shale and weathered rock.

DEVELOPMENT INTENT

EXISTING SITE

Table 2 provides a breakdown of the individual lots that form part of this PP and their current development status.

Table 2 – Development Status

Lot/DP	Development Status	Size (ha)
Lot 549 in DP 657444	Vacant/primary production	32.3
Lot 632 in DP 750179	Vacant/primary production	46.41
Lot 7023 in DP 1054934	Vacant/primary production	1.659
Part Lot 7022 in DP 1054934	Vacant/primary production	2.991
Part Lot 101 in DP 1169531	Vacant/primary production	16.86
Lot 19 in DP1047309	Vacant/primary production	1.56
TOTAL		**101.78**

Source: Six Maps

REZONING REQUIREMENT

The LUS identifies the need to support existing and encourage emerging industry sectors in the Parkes Township. Freight, engineering and manufacturing industries are developing, and consequently there is a steady demand for industrial land and a need for adequate supplies of such land.

The six lots the subject of this proposal are zoned RU1 – Primary Production with an applicable minimum lot size for subdivision of 400 hectares. **Figure 2** identifies the existing zoning of the proposed industrial estate.

To accommodate the development of an industrial estate, an amendment of the LEP is required to rezone the land and reduce the minimum lot size. This PP proposed to predominantly rezone the land to IN1 – General Industrial to facilitate this. A small area of public recreation would be provided for the movement of stormwater. This would allow industrial lots to be created, and industrial development to take place subject to development consent from local authority.

Two conceptual layouts are attached as **Drawings 1 & 2**. Council have confirmed that it is their intention to stage the subsequent development of the land however specific staging details are not yet confirmed.

TRAFFIC

Two conceptual layouts have been prepared for the subdivision (refer **Drawings 1 & 2**) which displays the main proposed access points: one new access is proposed from the Newell Highway (south of the site) and a second access utilised existing Saleyards Road. A number of internal roads would be constructed as part of the subdivision. Specific design and layout would be prepared in advance of a subdivision application. The proposed southern access road intersection would be located between 200 – 400 metres north-east of the intersection of the Newell Highway and the Parkes Stockingbal Railway line.

A Traffic Impact Assessment (TIA) has been prepared to support the PP and confirms that the surrounding transport network contains sufficient capacity to accommodate the increased traffic generation (refer **Appendix D**). The TIA included modelling of the proposed and existing intersection between Saleyards Road and the Newell Highway, and confirms the likely level of changes required to support the development. Consultation with Council, as the local roads authority, and Roads and Maritime Services, as the roads authority for the Newell Highway, would be required to confirm the extent of intersection works required.

The increase in the number of vehicle trips to and from the subject site created by the proposed industrial estate would be high by comparison to existing figures, equating to a maximum of 729% increase on Saleyards Road and a maximum 178% increase on the Newell Highway. Whilst these figures are high, they remain within the overall capacity of these roads to accommodate.

Further discussion in respect of the TIA is provided at **Part 3, Section 10**.

Part 1 - Objectives or Intended Outcomes

GENERAL

The objective is to rezone six lots between the Parkes Stockinbingal Railway Line and the Newell Highway, Parkes, from RU1 – Primary Production to IN1 – General Industrial to facilitate the expansion of the existing Parkes industrial estate. The proposed IN1 zoning is consistent with the zoning of the land to the north and represents a logical pattern of development that accords with the identified strategic direction for the area.

Part 2 - Explanation of Provisions

GENERAL

The proposed outcome would be achieved through the amendment of Land Zoning Maps LZN_005B and LZN_005E of the *Parkes Local Environmental Plan 2012* by rezoning a parcel of land zoned as RU1 – Primary Production to IN1 – General Industrial as shown in **Figures 1** and **2**.

The objectives of the IN1 zone are:

- *To provide a wide range of industrial and warehouse land uses.*
- *To encourage employment opportunities.*
- *To minimise any adverse effect of industry on other land uses.*
- *To support and protect industrial land for industrial uses.*
- *To create high quality working and business environments.*
- *To locate industrial land that reinforces links between the Parkes Hub, the Parkes Industrial Estate and other key infrastructure.*
- *To encourage industrial development that responds to site characteristics, considers visual impacts of built form and does not conflict with adjoining land uses.*
- *To facilitate industrial development that supports regional economic influences.*
- *To support existing industry sectors in Parkes that are key economic drivers.*
- *To provide for industrial uses in close proximity to transport infrastructure.*
- *To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.*
- *To accommodate larger industries or those that could potentially create a nuisance in locations separated from residential areas but accessible to the workforce.*
- *To enable development that is associated with, ancillary to, or supportive of, industry or industrial employees.*
- *To encourage a range of uses that provide specialist goods and services to the region's farmers and agricultural enterprises.*

The location of the site would ensure that the above objectives are achieved. There are no known site attributes or constraints that would inhibit compliance with the above objectives.

The amendment would result in necessary changes to the mapping that accompanies the LEP – these changes are discussed further in **Part 4** of this proposal.

The PP would result in the amendment of the *Parkes Local Environment Plan 2012* Land Use Zoning Maps LZN_005B and LZN_005E together with the corresponding Lot Size Maps (refer **Part 4**). The subject site currently has a minimum lot size of 400 hectares, as per the provisions for discouraging non-primary production land use of the RU1 – Primary Production zoned land.

Part 3 - Justification

NEED FOR THE PLANNING PROPOSAL

Is the planning proposal a result of any strategic study or report?

This PP is informed by the Masterplan for the Parkes Industrial Estate, prepared for Parkes Shire Council by ADW Johnson in February 2013, attached as **Appendix E**. ADW Johnson was instructed by Parkes Shire Council to investigate, examine and evaluate the provision for industrial land and provide a Masterplan for the development of the Parkes Industrial Estate. The investigation had regard for the long term strategic objectives, market and development imperatives that influence projects of this nature.

The report identifies a significant locational characteristic for Parkes, being its position at the junction point of the Newell Highway and Orange Road (an arterial extension to the Great Western Highway) and the major Melbourne to Brisbane inland road link. It also connects directly to the national east/west rail corridor linking the east coast to Perth. It benefits from indirect rail network connections to the east coast cities of Brisbane, Sydney and Melbourne.

Much has been done in Parkes in recent times to facilitate and action industrial land supply, with the development of three distinct nodes, comprising:

1. the Parkes Industrial Hub (intermodal terminal),
2. the Parkes Industrial Estate, and
3. the Parkes Airport.

The Masterplan identifies the potential for the Parkes Industrial Estate to accommodate bulky goods, urban services, light industrial, general heavy industrial and railway related industrial development well into the future. These can all be accommodated within the proposed IN1 zone. Commercial and retail uses need not feature in future land use planning across the estate owing to the capacity and preference for these uses to be located in town.

The subject site is well positioned, having frontage to both the Newell Highway and the Parkes - Stockinbingal railway, and is within close proximity to existing town development.

This PP would facilitate the expansion of the existing Parkes Industrial Estate to the south, thereby accommodating the long term strategic objectives for the Shire.

Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Given the current RU1 zoning of the land, the proposed outcome of providing additional industrial land within close proximity to both the township and the existing industrial estate is not able to be achieved without first rezoning the land.

The proposed approach is considered the best means of achieving the desired outcome.

RELATIONSHIP TO STRATEGIC PLANNING FRAMEWORK

Is the planning proposal consistent with the objectives and actions of the applicable regional or sub-regional strategy?

No applicable regional or subregional strategies apply to the area the subject of this PP or the Parkes Local Government Area.

Is the planning proposal consistent with Council's local strategy or other local strategic plan?

Parkes Shire Council Land Use Strategy 2012

The *Parkes Land Use Strategy 2012* (LUS) represented the final stage in developing a strategy to assist PSC to review and update the former Parkes Local Environmental Plan 1990.

The LUS features seven key strategic principles. The following summary considers the PP in light of these principles.

1. *That agriculture continues to have a primary role in the shire's economy and that it supports sustainable use of natural resources, meets the needs of the farming community and remains robust to changes in climate as well as national and international market.*

Agriculture has a significant role in Parkes' economy, contributing to approximately 12.2% of the Gross Regional Product (GRP) in 2010/11 (AEC*group* 2012), refer **Figure 3**. Agriculture (combined with forestry and fishing) is second in contribution to the GRP only to the Mining industry.

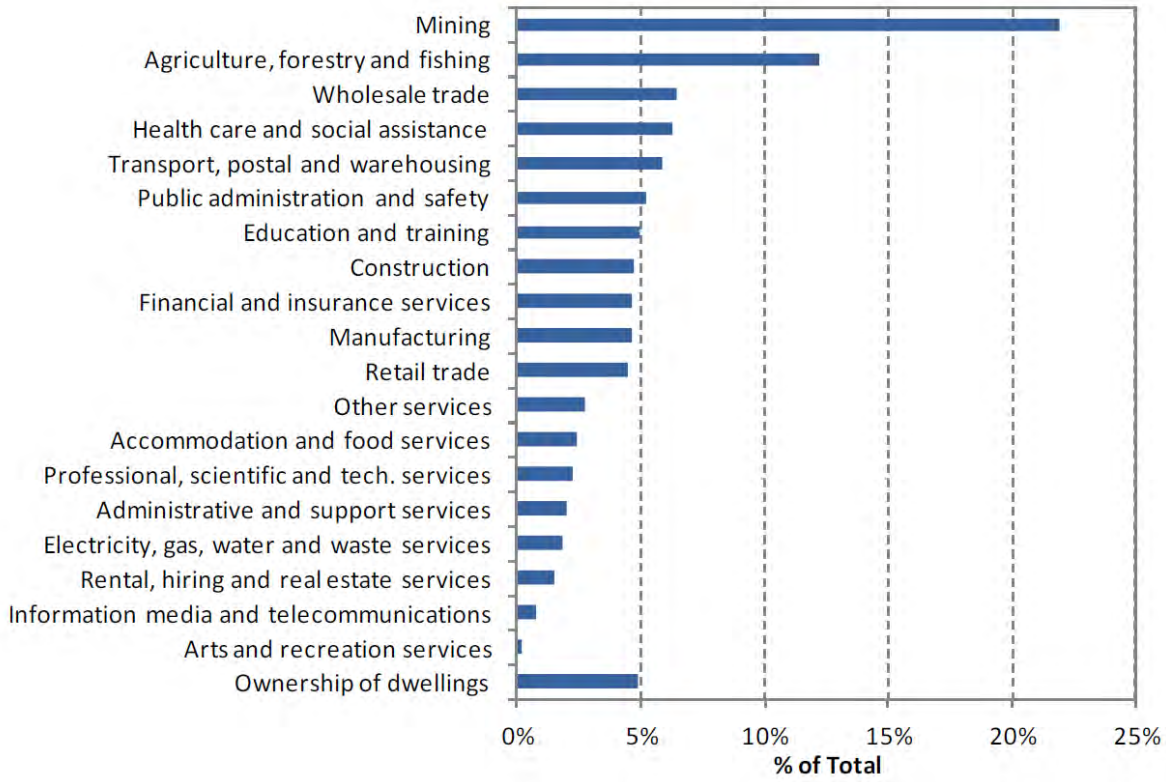

Figure 3: Contribution to GRP

Agriculture, Forestry and Fishing is consistently the largest employer within the Parkes LGA, accounting 22.4% of the total. This is followed by retail trade (10.7%) and healthcare and social services (10.4%). The transport, postal and warehousing sector supported 4.7% of jobs within the LGA within 2011 (AEC*group* 2012).

While the LUS identifies the importance of retaining agriculture as a primary role in the Shire's economy as a key strategic principle, it also identifies the need for the development of the Shire's industrial sector to be matched by adequate land supply for long term needs – refer point 3 below. These two competitive land uses need to be assessed together to determine the best possible outcome for the land use at the proposed industrial estate site. The Masterplan effectively assesses the need for providing adequate land supply for industrial purposes, at the expense of land available for agricultural purposes.

2. *The Parkes CBD and Shire villages are attractive places to live, work and shop, are highly accessible. Retain a sense of identity, have adequate parking and traffic management with adequate land as well as building stock that meets the needs of commercial and retail uses.*

The development of an Industrial Estate in the proposed location would have a number of beneficial effects in terms of generating employment and assisting to make Parkes Shire an attractive place to live, work and shop.

3. *The development of the Shire's industry is matched by adequate land supply for long term needs, is linked with key services and infrastructure, provides for a diversity of employment and increases the number of skilled jobs in the shire.*

Parkes sits within a relatively unique context in the Central West Region of New South Wales at the junction of the Newell Highway, Orange Road (arterial extension to the Great Western Highway) and national rail line links. These connections link Brisbane and Melbourne and Sydney and Perth and are powerful influences in an economic context.

Strategies for Parkes seek to gain leverage from the proximity of this valuable transport infrastructure. The town already accommodates a large intermodal facility, a regional airport, and the existing Parkes Industrial Estate. This allows Parkes to market and accommodate enquiry and activity across three broad levels:

- Local level in response to demand emanating from Parkes role as a regional service centre.
- Intermodal, transport and logistics oriented demand as a consequence of broader interregional, interstate and national activity.
- An airport with land capable of responding to airport related activity as well as opportunistic outcomes as a consequence or broader scale development at either the intermodal facility or Parkes Industrial Estate.

The proposed rezoning of RU1 – Primary Production land to IN1 – General Industrial is supported by the LUS and ensures that adequate industrial land is generated to accommodate the various tiers of economic activity as well as respond to potential change within the region.

Parkes is affected by significant triggers that would generally impact the economic wellbeing of the area, and specifically generated demand for additional industrial land, which include:

- Further development and investigations for the proposed Brisbane to Melbourne inland rail;
- Extension of operations at the North Parkes mine, until beyond 2030;
- Growth captured as a consequence of involvement in the PORTS initiative (Promote Our Regional Towns); and
- Growth across retail, residential and commercial sectors as a consequence of potential increase in population and associated activity.

The Masterplan and other studies have identified potential for the proposed Parkes Industrial Estate to accommodate bulky goods, urban services, light industrial, general heavy industrial and railway related industrial development well into the future.

Detailed staging and precinct planning can be reflective of contemporary market circumstances from time to time. The opportunity to "allocate" enquiry and development across Parkes Industrial Estate, the intermodal facility and potentially the airport would underwrite capacity for Parkes to be a focus for future development in the Central West Region.

4. *That residential land stocks meet the long term demands for housing choice and supply, are attractive places to live, are well serviced by essential infrastructure and open space and are planned to make efficient use of available land and infrastructure*.

Residential land stocks are not considered within the scope of this PP.

5. *Development of the Shire is undertaken in an ecologically sustainable manner and it contributes to long term improvements in social, environmental and economic outcomes for the Shire*.

Ecological sustainability is a core factor to development in NSW and the principles on which it is based directly influence development proposals. The overriding concept of ecologically sustainable development (ESD) is of *'development that that meets the needs of the present without compromising the ability of future generations to meet their own needs'*. This overarching concept is supported by a number of key principles, including the precautionary principle and conservation of biological diversity and ecological integrity. In preparing this PP it is acknowledged that the proposed development of this area for industrial purposes would result in a change to the physical environment.

To determine whether this change is acceptable an initial qualitative assessment has been completed to determine the likely extent of impacts. As a result of this initial assessment, it was determined that further detailed assessments would be required to determine the extent of impact to the ecological environment, the likely existing of matters of Indigenous heritage, the likely impact of contamination on the development and the impacts associated with traffic generation on the existing transport network.

As a consequence of these specialist investigations, it is determined, with the exception of the contamination investigations, that the development is acceptable in the context of its impact on the natural environment and the locality. Further investigations into the likelihood of contamination would be undertaken following the initial Gateway determination.

6. *The goals of economic prosperity and social justice are met through a wider range of jobs and educational opportunities, adequate health and social support services and ensuring equitable access to these services*.

The PP seeks to provide an adequate supply of industrial land within the town and Shire of Parkes, to ensure demand now and in the future is met. Given that industrial development within the shire is important for supporting the strong mining and agricultural sectors, the provision to increase the land to be developed for industry has the ability to have a positive effect on the economic prosperity of the Shire.

A net community benefit test has been prepared at **Table 3** and confirms that this increase in industry within the Parkes Industrial Estate would have a net positive effect on the employment opportunities within the shire, and on the economic prosperity as a whole.

7. *Increase the tourism profile of Parkes Shire to broaden the economic base, improving its attractiveness as a tourist destination, encourage longer stays, greater local spending and promote a wider understanding of the Shire as a place to live and invest.*

It is unlikely that the PP would affect the tourism profile of Parkes Shire.

The Parkes 2022 Community Strategic Plan (Reviewed 2012)

The Community Strategic Plan (CSP) is a high level 10 year plan developed collaboratively by Council and the Parkes Shire Community as part of its Community Engagement Continuum. This plan identifies the community's main priorities and aspirations for the future. It contains the Vision for the Parkes Shire and the 8 key Future Directions in achieving this vision by 2022.

Vision in 2022 Parkes would be - *"A progressive regional centre, embracing a national logistics hub, with vibrant communities, diverse opportunities, learning and healthy lifestyles".*

Future Directions:

1. *Develop Lifelong Learning Opportunities*

The PP does not affect the lifelong learning opportunities within the Shire.

2. *Improve Health and Wellbeing*

The PP does not affect the health and wellbeing within the Shire.

3. *Promote, Support and Grow Our Communities*

The development of Parkes' transport infrastructure in the 'Intermodal Hub', and the Parkes Airport has given Parkes an increased capacity for industrial development. The Parkes Industrial Estate has a significant frontage to the rail line and the Newell Highway and could assist in resourcing related growth.

The future development of the proposed inland rail from Brisbane to Melbourne would also have significant market demand effects on the industrial estate. Support for this rezoning would enable Parkes Council to move swiftly to respond to demand generated should this proceed.

4. *Grow and Diversify the Economic Base*

Figures available for the Parkes shire show that, in the 2010-2011 period, the mining industry was the largest contributor of industry gross value add (21.9%), with agriculture, forestry and fishing (12.2%) and wholesale trade (6.4%) completing the top three contributors. The transport, postal and warehousing industry contributed 5.9% of the catchment's overall gross value add, making it one of the larger contributing industries to the catchment's economy (AEC*group* 2012).

The transport and wholesale trade sector contribute over 12% of industry gross value add in the Parkes-Forbes-Condobolin Region. This reflects the importance of these sectors in supporting the large mining and agriculture industries. Transport infrastructure (including the Parkes Regional Airport) is crucial in facilitating the movement of products and staff and keeping the regional economy competitive.

The provision of more industrial zoned land, adjoining the existing industrial estate, would allow for the growth of the industrial sector, driven by the growth emanating from Parkes' development of the logistics hub, the airport, and the potential development of the inland railway.

5. *Develop Parkes as a National Logistics Hub*

The PP would support the success of the Parkes Logistics Hub. The Parkes Industrial Estate and the Logistics Hub would complement each other in terms of development and growth of industry.

6. *Enhance Recreation and Culture*

The PP does not affect the enhancement of recreation and culture within the shire.

7. *Care for the environment in a Changing Climate*

The PP would have a negligible effect on the changing climate.

8. *Maintain and Improve the Shire Assets and Infrastructure*

The development of the Parkes Industrial Estate would involve constructing new roads and augmenting sewerage, electricity and stormwater facilities within the vicinity of the subject site.

Is the planning proposal consistent with applicable State Environmental Planning Policies?

The PP is broadly compliant with all relevant State Environmental Planning Policies (SEPPs). The following specific comments are made in relation to applicable SEPPs.

State Environmental Planning Policy No 44 – Koala Habitat Protection

State Environmental Planning Policy 44 - Koala Habitat Protection (SEPP44) aims to:

> *...encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas, to ensure permanent free-living populations over their present range and to reverse the current trend of population decline...*

This policy applies to all LGAs within the known state wide distribution of the Koala, including the Parkes LGA. SEPP 44 defines 'potential koala habitat' as vegetation that incorporates a minimum of 15 percent of tree species (listed in Schedule 2 of SEPP 44) in the 'upper or lower strata of the tree component'.

The flora survey detected one tree koala feed tree, White Box (*Eucalyptus albens*) listed under Schedule 2 of SEPP 44. White Box may occupy over 15 percent of the tree canopy on the study area. However, there is no recent koala sighting closer than 4 km to the study area (BioNet 2013). In addition, searches for signs of koala activity revealed no poc marks, scats or individuals on the study area. Accordingly, there is no evidence of a breeding koala population, the study area is not core koala habitat and a SEPP 44 Plan of Management is not required.

State Environmental Planning Policy No 55 – Remediation of Lands

State Environmental Planning Policy 55– Remediation of Lands (SEPP55) aims to:

> *...promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment...*

This policy applies to the whole of the State, including the Parkes LGA. SEPP55 defines 'contaminated land' as per the definition in Part 5 of the *Contaminated Land Management Act 1997 No 140* as the presence in, on or under the land of a substance a concentration above the concentration at which the substance is normally present in, on, or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.

Envirowest Pty Ltd have undertaken a Preliminary Desktop Contamination Investigation (refer **Appendix C**) which involved a confirmation of previous land uses to have been undertaken, topographic maps, public notices, aerial photographs and historic parish maps.

The preliminary assessment identifies that there are potential contaminant sources located within the site such as from historical mining activities, impact of saline soils, storage of fuels, oils or pesticides, stockpiling of imported materials and illegal disposal of waste. Neither the site nor its neighbours are listed on the EPA Contaminated Land Record or the list of NSW contaminated sites notified to the EPA.

Neighbouring land uses are not anticipated to impact on the contamination status of the land.

The report contains a recommendation that further investigations be undertaken, including site sampling and testing to determine if any contaminants exist, as set out in Section 8.4 of **Appendix C**. This additional reporting would be completed following the initial Gateway review of the PP.

State Environmental Planning Policy (Infrastructure) 2007

The aim of the State Environmental Planning Policy (infrastructure) 2007 (ISEPP) is to facilitate the effective delivery of infrastructure across the state by:

a) *improving regulatory certainty and efficiency through a consistent planning regime for infrastructure and the provision of services*

b) *greater flexibility in the location of infrastructure and service facilities*

c) *allowing for the efficient development, redevelopment or disposal of surplus government owned land*

d) identifying the environmental assessment category into which different types of infrastructure and services development fall (including identifying certain development of minimal environmental impact as exempt development)

e) identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development

f) providing for consultation with relevant public authorities about certain development during the assessment process or prior to development commencing.

Clause 104 of the ISEPP specifies that traffic generating development requires referral to RTA (now Roads and Maritime Services, or RMS) where it meets certain triggers. These triggers are identified in Schedule 3 to the ISEPP. As the proposed development is within 90 metres of a classified road and would ultimately involve a subdivision of land that would create more than 50 lots and more than 5,000 square metres of industrial land, it is considered to be traffic generated development and referral to RMS is required. A TIA has been completed for the rezoning by reference to the concept subdivision plan and is submitted with this PP – refer **Appendix D**.

Due to the proximity to the Parkes Stockingbal Railway, the future development has the potential to impact the rail corridor. As such, clause 85 of the ISEPP would apply to any future development. Without more detailed development plans it is difficult to assess the extent to which development may impact on the rail network. Close collaboration with the rail network manager, John Holland Rail (JHR), would be necessary in the context of any future development.

The applicant has identified that there is a possibility that the western portion of the site may be utilised for rail specific industry uses. This may extend to the development of a siding within the subject land. This could be facilitated within the IN1 zoning and therefore specific consideration of possible impacts is not provided here. However, as above, close collaboration would be required with JHR to ensure that developments are appropriately managed to minimise impacts to the rail environment.

State Environmental Planning Policy (Rural Lands) 2008

In accordance with Clause 4 of Ministerial Direction 1.5 – Rural Lands, where a rezoning effects land located within a rural or environmental protection zone, the PP must be consistent with the Clause 7 – Rural Planning Principles contained in the State Environmental Planning Policy (Rural Lands) 2008.

Below is a summary of the proposal's compliance with the Rural Planning Principles;

(a) The promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas;

The portion of land proposed for rezoning is located within RU1 – Primary Production.

The site is geographically constrained by the Newell Highway to the east, the Parkes Stockingbal Railway to the west and the existing Parkes Industrial Estate to the north. It is considered that it would be difficult for this land to be developed and compete with larger rural activities elsewhere in generally unconstrained rural locations.

From an ecological perspective, the subject site is characterised by two broad vegetation types, being cleared grazing land and grazing land with scattered remnant trees.

The EA concluded that the site is suitable for the proposed development. There were no threatened flora species identified during a survey of the site. Any development would occur in accordance with the recommendations identified in the EA (**Appendix A**).

The site has been identified via the LUS as being strategically suitable for industrial land use and therefore the loss of primary production land is considered generally acceptable.

(b) Recognition of the importance of rural lands and agriculture and the changing nature of agriculture and of trends, demands and issues in agriculture in the area, region or State;

The portion of land proposed for rezoning is located within a rural part of Parkes. While the land is zoned RU1 – Primary Production, the Masterplan identifies the need for an increase in the availability of IN1 – General Industrial zoned land, as a result of the changing nature of the agriculture and industrial trends and requirements in the area.

(c) Recognition of the significance of rural land uses to the State and rural communities, including the social and economic benefits of rural land use and development;

The land is currently zoned RU1 – Primary Production under the LEP with a minimum lot size of 400 hectares, however it has been identified as future industrial land by the LUS. This is a reflection of the changing nature of the agriculture and development trends and requirements in the area.

(d) In planning for rural lands, to balance the social, economic and environmental interests of the community;

Parkes demonstrates a good diversification of activities that contribute to the local economy, with agriculture significantly contributing to the local economy (mainly livestock and grain); however agriculture is a smaller component of the Parkes economy than many other regional areas of NSW and Australia.

It has been recognised that Parkes economy is influence heavily by mining (Northparkes Mine) and industrial activities including the National Logistics Hub (transport, warehousing and manufacturing). Given that Parkes is located at the intersection of major national freight routes, including the transcontinental rail (Sydney-Perth), proposed inland rail (Melbourne-Brisbane) and also sits on the Newell Highway, this PP aims to develop provisions for the increased infrastructure capacity, at the expense of the availability of rural zoned land.

(e) The identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land,

Three ecologically endangered communities have been observed on the subject site. The effect on these communities would be managed as per the recommendations of the EA (**Appendix A**).

(f) The provision of opportunities for rural lifestyle, settlement and housing that contribute to the social and economic welfare of rural communities,

Rural lifestyle is not considered as part of this PP.

(g) The consideration of impacts on services and infrastructure and appropriate location when providing for rural housing,

Rural housing is not proposed as part of the PP.

(h) Ensuring consistency with any applicable regional strategy of the Department of Planning or any applicable local strategy endorsed by the Director-General.

Compliance with all applicable regional and local planning strategies can be achieved. Details as to how the PP can comply with such strategies are detailed throughout Part 3 of this PP.

Is the planning proposal consistent with applicable Ministerial Directions (s177 directions)?

Direction 1.1 – Business and Industrial Zones

In accordance with the following Clause 3(a) of Ministerial Direction 1.1 – Business and Industrial Zones as follows:

> *"a planning proposal that would affect land within an existing or proposed business or industrial zone (including the alteration of any existing business or industrial zone boundary)"*

This direction is applicable to the PP as the section of land proposed to be rezoned to IN1 – General Industrial is currently RU1 – Primary Production.

As Clause 3(a) of the Ministerial Direction 1.1 is applicable, the following Clause 4 factors of Ministerial Direction 1.1 are considered:

- 4(b) – *"Retain the areas and locations on existing businesses and industrial zones"*

  The PP would not affect the areas or locations of the existing environment, as it proposes additional scope for further development of industry rather than a modification to the existing industry.

- 4(c) – *"not reduce the total potential floor space area for employment uses and related public services in business zones.*

  The PP would not affect a business zone.

- 4(d) – *"not reduce the total potential floor space area for industrial uses in industrial zones*

  The PP aims to increase the potential floor space area for industrial uses and related industrial services rather than decrease.

- 4(e) – *"ensure that proposed new employment areas are in accordance with a strategy that is approved by the Director-General of the Department of Planning.*

  The rezoning of the subject land for industrial purposes would create employment areas and is in accordance with the LUS, approved by the DG of the DoP.

A proposal may be inconsistent with Direction 1.1 if any of the following applies:

"A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director General) that the provisions of the planning proposal that are inconsistent are:

(a) Justified by a strategy which:

i) Gives consideration to the objective of this direction, and

ii) Identifies the land which is the subject of the planning proposal (if the planning proposal relates to a particular site or sites), and

iii) Is approved by the Director-General of the department of planning, or

(b) Justified by a study (prepared in support of the planning proposal) which gives consideration to the objectives of this direction, or

(c) In accordance with the relevant Regional Strategy or Sub-Regional Strategy prepared by the Department of Planning which gives consideration to the objective of this direction, or

(d) Of minor significance.

As above, the site has been identified as being suitable for industrial development via the LUS, and is therefore acceptable in the context of Direction 1.1.

Direction 1.2 – Rural Zones

This direction applies when a relevant planning authority prepares a PP that will affect land within an existing or proposed rural zone. The objective of the direction is to protect the agricultural production value of rural land.

A PP must not rezone land from a rural zone to a residential, business, industrial, village or tourist zone unless the relevant planning authority can satisfy the Director-General of the Department of Planning that the provisions of the PP that are inconsistent are:

a) *justified by a strategy which:*

   i *gives consideration to the objectives of this direction,*

   ii *identifies the land which is the subject of the planning proposal (if the planning proposal relates to a particular site or sites), and*

   iii *is approved by the Director-General of the Department of Planning, or*

b) *justified by a study prepared in support of the planning proposal which gives consideration to the objectives of this direction, or (c) in accordance with the relevant Regional Strategy or Sub-Regional Strategy prepared by the Department of Planning which gives consideration to the objective of this direction, or*

c) *is of minor significance.*

The proposal demonstrates that whilst it would result in the loss of rural land, the site is a strategically positioned location for the expansion of the Parkes industrial area via its identification in the Parkes LUS 2012 and there is a demonstrated demand for expansion in this sector of the town. The site is positioned to ensure it does not cumulatively impact upon other land with agricultural production potential.

Direction 1.3 – Mining, Petroleum and Extractive Industries

This direction applies when a relevant planning authority prepares a PP that would have the effect of:

(b) restricting the potential development of resources of coal, other minerals, petroleum or extractive materials which are of State or regional significance by permitting a land use that is likely to be incompatible with such development.

The site is not known to contain any resources that are of state or regional significance.

Direction 1.5 – Rural Lands

In accordance with the following Clause 3(a) of Ministerial Direction 1.5 – Rural Lands as follows:

"This direction applies when:

(a) "A relevant planning authority prepares a planning proposal that would affect land within an existing or proposed rural or environmental protection zone (including the alteration of any existing rural or environmental protection zone boundary)" or

(b) "A relevant planning authority prepares a planning proposal that changes the existing minimum lot size on land within a rural or environmental protection zone.

This direction is applicable to the PP as the area of land proposed to be rezoned to IN1 – General Industrial is currently zoned as RU1 – Primary Production. Furthermore, the rezoning of the land to IN1 – General Industrial would also entail reducing the minimum lot size permissible for development from AF – 400 hectares to U – 1,500 square metres.

As per Clause 4 of Ministerial Direction 1.5 – Rural Lands:

"A planning proposal to which clauses 3(a) or 3(b) apply must be consistent with the Rural Planning Principles listed in State Environmental Planning Policy (Rural Lands) 2008"

As Clause 3(a) of the Ministerial Direction 1.5 is applicable.

A proposal may be inconsistent with Direction 1.5 if any of the following applies;

> *"A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the provisions of the planning proposal that are inconsistent are:*

(a) Justified by a strategy which:

- *gives consideration to the objectives of this direction,*
- *identifies the land which is the subject of the planning proposal (if the planning proposal relates to a particular site or sites, and*
- *is approved by the Director-General of the Department of Planning and is in force, or*

(b) Is of minor significance".

An assessment has been undertaken against the Rural Planning Principles contained in the *State Environmental Planning Policy (Rural Lands) 2008* in **Part 3, Section 7**. The proposal has been found to be compliant with the Rural Planning Principles.

Direction 2.3 – Heritage Conservation

Ministerial Direction 2.3 is applicable to a PP when an item of local heritage significance is located on the site.

> *"A planning proposal must contain provisions that facilitate the conservation of:*
>
> *(a) items, places, buildings, works, relics, moveable objects or precincts of environmental heritage significance to an area, in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item, area, object or place, identified in a study of the environmental heritage of the area,*
>
> *(b) Aboriginal objects or Aboriginal places that are protected under the National Parks and Wildlife Act 1974, and*
>
> *(c) Aboriginal areas, Aboriginal objects, Aboriginal places or landscapes identified by an Aboriginal heritage survey prepared by or on behalf of an Aboriginal Land Council, Aboriginal body or public authority and provided to the relevant planning authority, which identifies the area, object, place or landscape as being of heritage significance to Aboriginal culture and people".*

Neither the LEP nor the State Heritage Register identifies the site as containing any items of local or state heritage significance.

The AAA identifies one matter of Indigenous significance, being a culturally modified tree. The AAA identifies that impacts to this can be suitably controlled via design measures, thereby ensuring the protection of this item.

Direction 3.4 – Integrating Land Use and Public Transport

Ministerial Direction 3.4 – Integrating Land Use and Public Transport is applicable as the PP would rezone land for industrial purposes (i.e. from RU1 – Primary Production to IN1 – General Industrial).

As per Clause 3 of Ministerial Direction 3.4:

> *"This direction applies when a relevant planning authority prepares a planning proposal that would create, alter or remove a zone or a provision relating to urban land, including land zoned for residential, business, industrial, village or tourist purposes".*

As per Clause 4 of Ministerial Direction 3.4, the rezoning of the subject site for industrial purposes must be consistent with the aims and objectives of the following documents:

> *"A planning proposal must locate zones for urban purposes and include provisions that give effect to and are consistent with the aims, objectives and principles of:*
>
> *(a) Improving Transport Choice – Guidelines for planning and development (DUAP 2001), and*
>
> *(b) The Right Place for Business and Services – Planning Policy (DUAP 2001)".*

A proposal may be inconsistent with Direction 3.4 if any of the following applies:

"A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director General) that the provisions of the planning proposal that are inconsistent are:

(a) Justified by a strategy which:

i) Gives consideration to the objective of this direction, and

ii) Identifies the land which is the subject of the planning proposal (if the planning proposal relates to a particular site or sites), and

iii) Is approved by the Director-General of the department of planning, or

(b) Justified by a study (prepared in support of the planning proposal) which gives consideration to the objectives of this direction, or

(c) In accordance with the relevant Regional Strategy or Sub-Regional Strategy prepared by the Department of Planning which gives consideration to the objective of this direction, or

(d) Of minor significance.

The site selection is justified via inclusion in the LUS.

<u>*Direction 6.1 – Approval and Referral Requirements*</u>

Ministerial Direction 6.1 – Approval and Referral Requirements applies to all PP's forwarded for Gateway Determination by a local authority.

To be compliant with Direction 6.1, a PP must be consistent with the following provisions;

"A planning proposal must:

(a) Minimise the inclusion of provisions that require the concurrence, consultation or referral of development applications to a Minister or public authority, and

(b) Not contain provisions requiring concurrence, consultation or referral of a Minister or public authority unless the relevant planning authority has obtained the approval of:

- *The appropriate Minister or public authority, and*
- *The Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), prior to undertaking community consultation in satisfaction of section 57 of the Act, and*

(a) Not identify development as designated development unless the relevant planning authority:

- *Can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the class of development is likely to have a significant impact on the environment, and*
- *Has obtained the approval of the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) prior to undertaking community consultation in satisfaction of section 57 of the Act".*

Given the nature of the proposal, the referral to the RMS would be required to address both traffic generation impacts and impacts associated with providing access to the Newell Highway, a classified road.

Detailed consultation with RMS would take place following the initial Gateway determination of this project.

Direction 6.2 – Reserving Land for Public Purposes

This direction applies when a relevant planning authority prepares a PP. The objectives of this direction are:

(a) to facilitate the provision of public services and facilities by reserving land for public purposes, and

(b) to facilitate the removal of reservations of land for public purposes where the land is no longer required for acquisition.

When this direction is applicable, the following applies:

(4) A planning proposal must not create, alter or reduce existing zonings or reservations of land for public purposes without the approval of the relevant public authority and the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General).

(5) When a Minister or public authority requests a relevant planning authority to reserve land for a public purpose in a planning proposal and the land would be required to be acquired under Division 3 of Part 2 of the Land Acquisition (Just Terms Compensation) Act 1991, the relevant planning authority must:

(a) reserve the land in accordance with the request, and

(b) include the land in a zone appropriate to its intended future use or a zone advised by the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), and

(c) identify the relevant acquiring authority for the land.

(6) When a Minister or public authority requests a relevant planning authority to include provisions in a planning proposal relating to the use of any land reserved for a public purpose before that land is acquired, the relevant planning authority must:

(a) include the requested provisions, or

(b) take such other action as advised by the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) with respect to the use of the land before it is acquired.

(7) When a Minister or public authority requests a relevant planning authority to include provisions in a planning proposal to rezone and/or remove a reservation of any land that is reserved for public purposes because the land is no longer designated by that public authority for acquisition, the relevant planning authority must rezone and/or remove the relevant reservation in accordance with the request.

The site is to be predominantly zoned IN1 – General Industrial however an area in south of the site, together with existing drainage corridors, would be zoned and dedicated as public recreation to facilitate the passage of stormwater. This land would ultimately be reserved for public purposes.

Direction 6.3 – Site Specific Provisions

Ministerial Direction 6.3 – Site Specific Provisions applies to all PPs forwarded for Gateway Determination by a local authority;

To be compliant with Direction 6.3, a PP must be consistent with the following provisions;

(a) A planning proposal that would amend another environmental planning instrument in order to allow a particular development proposal to be carried out must either:

- *Allow that land use to be carried out in the zone the land is situated on, or*
- *Rezone the site to an existing zone already applying in the environmental planning instrument that allows that land use without imposing any development standards or requirements in addition to those already contained in that zone, or*
- *Allow that land use on the relevant land without imposing any development standards or requirements in addition to those already contained in the principal environmental planning instrument being amended.*

(b) A planning proposal must not contain or refer to drawings that show details of the development proposal.

The parcel of land is currently zoned RU1 – Primary Production, in which an industrial estate is currently effectively prohibited. The rezoning of the land to IN1 – General Industrial would facilitate the future development of an industrial estate to occur, provided development consent is subsequently obtained from the local authority.

The PP does not propose to create any additional development standards in addition to those currently within the principal environmental planning instrument.

ENVIRONMENTAL, SOCIAL, AND ECONOMIC IMPACTS

Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, would be adversely affected as a result of the proposal?

The PP would entail clearing of vegetation on the subject site including levelling, road construction and service installation. An EA has been prepared in respect of the site, including both a desktop study and a field investigation in September 2013, and it concludes the land is suitable for the purpose proposed without causing detrimental impacts to the local environment – refer **Appendix A**.

Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

The parcel of land proposed for rezoning is currently zoned as RU1 – Primary Production, and largely consists of disturbed vacant grassland of no particular environmental value. The site is not bushfire or flood prone and as such there are no other known likely environmental effects.

An AAA has been completed (refer **Appendix B**) and confirms that the site is largely free of sites of Aboriginal heritage significance. One culturally modified tree was identified on the southern side of the Newell Highway opposite the site. This has the potential to be impacted by future road widening or intersection treatments that would support the project. The AAA recommends that the detailed design ensure the protection of this item through appropriate buffer distances. It is considered that that this can be reasonably accommodated within future detailed design.

A copy of the AAA has been forwarded to OEH for reference purposes.

Has the planning proposal adequately addressed any social and economic effects?

The *Draft Centres Policy 2009* (Policy) provides a number of questions that should be considered in determining whether to proceed with a rezoning; referred to as the Net Community Benefit Test. These questions together with a response are provided in **Table 3**.

The Policy identifies that if it is judged that the rezoning would produce a net community benefit, the proposal should proceed through the rezoning process. If no benefit is identified, the proposed rezoning should not proceed.

The outcome of the discussion provided in **Table 3** confirms that the rezoning would have a net community benefit and accordingly it is considered that the rezoning should proceed.

Table 3 – Net Community Benefit Test

EVALUATION CRITERIA	COMMUNITY COSTS AND BENEFITS			
	BASE CASE – CURRENT SITUATION	**PLANNING PROPOSAL**	**QUALITATIVE COMMUNITY BENEFIT PER CRITERIA**	**QUANTITATIVE COMMUNITY BENEFIT PER CRITERIA**
Would the LEP be compatible with agreed State and regional strategic direction for development in the area (eg land release, strategic corridors)?	There are no State or regional strategic plans or directions that address Parkes. Council's adopted LUS was adopted by Council in 2012. The LUS identifies the subject land being suitable for industrial land use. *3.4 There is a need to support existing and encourage emerging industry sectors in Parkes Township. Agricultural products processing (currently undergoing a decline), freight, engineering and manufacturing industries are developing. There is steady demand for industrial land and a need for adequate supplies of land.* *3. The development of the Shire's industry is matched by adequate land supply for long term needs, is linked with key services and infrastructure, provides for a diversity of employment and increases the number of skilled jobs in the Shire* Figure 5 of the LUS identifies the subject land as appropriate for industrial use.	The LEP seeks to rezone the subject land from RU1 – Primary Production to IN1 – Industrial	The qualitative benefits of the proposal are: • The creation of additional industrial land ensures adequate industrial land supply for long term needs • The increased supply of available industrial land, improves the viability of the town	No external cost to the community. Increased investment would be a benefit.
Is the LEP located in a global/regional city, strategic centre or corridor nominated within the Metropolitan Strategy or another regional/sub-regional strategy? Is the LEP likely to create a precedent or create or change the expectations of the landowner or other landholders?	Parkes is a regional hub, but is not identified in any Regional/Subregional study	The proposed LEP applies to a 102 hectare portion of land that has been identified as being a logical and suitable expansion of the existing industrial estate. The land is physically bounded by the Main Western Railway to the west and the Newell Highway to the east and these barriers minimise possible spread effects.	It would be difficult to establish a precedent from support for the LEP based on the characteristics of the proposal and the subject land. It is unlikely that expectations from other landowners, or the community at large, would be influenced by the LEP, due to its unique nature.	No external cost to the community

Table 3 – Net Community Benefit Test

EVALUATION CRITERIA	COMMUNITY COSTS AND BENEFITS			
	BASE CASE – CURRENT SITUATION	**PLANNING PROPOSAL**	**QUALITATIVE COMMUNITY BENEFIT PER CRITERIA**	**QUANTITATIVE COMMUNITY BENEFIT PER CRITERIA**
Have the cumulative effects of other spot rezoning proposals in the locality been considered? What was the outcome of these considerations?	Parkes Shire Council released its comprehensive LEP in 2012. There are no other relevant re-zonings that could cumulatively establish a pattern of change that requires consideration.	The proposed LEP has been prepared in response to the Council's resolution on at its meeting of XX to pursue the amendment to the LEP to rezone the land.	No external cost to the community	No external cost to the community
Would the LEP facilitate a permanent employment generating activity or result in a loss of employment lands?	Employment lands are commonly defined as industrial areas. The land is currently zoned RU1 – Primary Production and is therefore not considered employment lands. The proposal seeks to provide industrial zone and therefore provides additional employment lands. The LEP would facilitate employment generating activity.	The LEP seeks to provide additional employment lands which have the ability to facilitate employment generating activity. The LEP does not seek to remove any employment generating land uses form the land use table.	Provision of employment generating uses is an output of the LEP. Additionally, facilitating investment in construction would, in turn, facilitate employment in the construction sector.	No external cost to the community
Would the LEP impact upon the supply of residential land and therefore housing supply and affordability?	The land is currently zoned RU1 and dwellings are permitted within the zone subject to the minimum lot size map, which identifies a minimum of 400 hectares in this area. The land is formed of six lots, each with a size of less than 400 hectares and therefore no dwellings are currently permissible in the subject area. The proposed zone is IN1 within which residential accommodation is prohibited. In terms of housing provision there is therefore no change.	There is no change in terms of housing provision.	No external cost to the community	No external cost to the community
Is the existing public infrastructure (roads, rail, utilities) capable of servicing the proposed site? Is there good pedestrian and cycling access? Is public transport currently available or is there infrastructure capacity to support future public transport?	Parkes Shire Council is the utilities authority and the area is served by sewer, water and power. Public transport does not currently serve the site.	Cost of service provision would be borne by the Council. The development of the land would be staged to ensure a logical and cost effective provision of services.	An improved resource of industrial land would improve the viability of the town.	No external cost to the community

Table 3 – Net Community Benefit Test

EVALUATION CRITERIA	COMMUNITY COSTS AND BENEFITS			
	BASE CASE – CURRENT SITUATION	PLANNING PROPOSAL	QUALITATIVE COMMUNITY BENEFIT PER CRITERIA	QUANTITATIVE COMMUNITY BENEFIT PER CRITERIA
Would the proposal result in changes to the car distances travelled by customers, employees and suppliers? If so, what are the likely impacts in terms of greenhouse gas emissions, operating costs and road safety?	The range of uses allowed by the current zone generates minimal car based travel demand.	The LEP would increase the range of uses permissible within the area.	By developing the area as a logical extension of the existing industrial area of Parkes the likely increases to car distances travelled are considered negligible.	No external cost to the community
Are there significant Government investments in infrastructure or services in the area whose patronage would be affected by the proposal? If so, what is the expected impact?	The Newell Highway and Parkes Stockinbingal Railway Line bound the property to the east and west respectively.	The LEP seeks to provide additional employment lands, including an additional road access to the highway, which would give rise to increased traffic usage on the highway.	The increased provision of employment lands would benefit the town.	No external cost to the community
Would the proposal impact on land that the Government has identified a need to protect (eg land with high biodiversity values) or have other environmental impacts? Is the land constrained by environmental factors such as flooding?	An EA of the land. The land is not unduly constrained by environmental factors and is not identified for specific protection.	The EA concludes that the land is suitable for the proposed use.	No external cost to the community	No external cost to the community
Would the LEP be compatible/ complementary with surrounding land uses? What is the impact on amenity in the location and wider community? Would the public domain improve?	The land is bounded to the north by industrial land, being the existing Parkes Industrial estate. Land to the west is currently zoned for RU1 – Primary Production and land to the east for R5 – Large Lot Residential.	The LEP proposes a logical extension of the industrial zone in a southerly direction. The natural edge effects created by the Parkes Stockinbingal Railway Line and the Newell Highway ensure that the development would not 'creep' outside of the subject site.	Improved supply of accessible industrial land.	No external cost to the community
Would the proposal increase choice and competition by increasing the number of retail and commercial premises operating in the area?	No current commercial or retail land use.	The LEP would not increase retail or commercial function through a greater supply of general industrial land.	No external cost to the community	No external cost to the community
If a stand-alone proposal and not a centre, does the proposal have the potential to develop into a centre in the future?	Not relevant to this PP.			No external cost to the community

Table 3 – Net Community Benefit Test

EVALUATION CRITERIA	COMMUNITY COSTS AND BENEFITS			
	BASE CASE – CURRENT SITUATION	PLANNING PROPOSAL	QUALITATIVE COMMUNITY BENEFIT PER CRITERIA	QUANTITATIVE COMMUNITY BENEFIT PER CRITERIA
What are the public interest reasons for preparing the draft plan? What are the implications of not proceeding at that time?	Industry is not currently permissible in the zone.	Industry would be permissible via a change to the land use zone.	Public Interest is best served by increasing supply of industrial land within the township before demand becomes problematic.	Potential external cost to community if LEP does not proceed due to potential loss of economic opportunities noted above.
		Net Community Benefit =	**Positive**	**Positive**

Source: Draft Centres Policy 2009

The outcome of the above analysis confirms that the PP would have a net community benefit to the local area.

The social effect of the PP would be best gauged during the period of Community Consultation (refer **Part 5**). The subject site is bound to the east and west by a number of sensitive residential receivers. Adjacent to the subject site, east of the Newell Highway are a number of R5 – Large Lot Residential properties, with eight established homesteads within 500 metres of the boundary of the subject site. To the west of the subject site the land is Zoned RU1 – Primary Production, with two sensitive residential receivers within 500 metres of the subject site.

Land to the north of the subject site is zoned IN1 – General Industrial, consistent with the proposed land use of the PP.

There are no identified trees, monuments, or other items of aboriginal cultural heritage significance that would form a barrier to the development of this parcel of land.

STATE AND COMMONWEALTH INTERESTS

Is there adequate public infrastructure for the planning proposal?

The current state of the subject site, given its rural setting does not provide adequate public infrastructure for the PP. As per **Figure 3** the development of an Industrial Estate within the subject site would entail constructing new roads, drainage corridors, and a regional stormwater detention basin as part of the development. There are currently utilities to the boundary of the subject site, but these utilities would need to be extended to service the individual sites within the Industrial Estate.

The subject site has frontage onto the Newell Highway to the East, a major arterial road linking Melbourne and Brisbane, and frontage to the Parkes Stockinbingal Railway line. The development of an industrial estate would create an increase in traffic on both the adjacent Newell Highway and Saleyards Road. The TIA provided at **Appendix D** confirms that these roads have sufficient carrying capacity to accommodate the anticipated traffic increases.

The existing Saleyards Road/Newell Highway Intersection and the proposed intersection between the new southern access road and the Newell Highway have been shown to operate with a Level of Service between A-D with only minor upgrade requirements, based on maximum traffic generation levels. Within these intersections only one movement operates at an LOS of D (the southbound right turn movement from the Newell Highway into Saleyards Road). As the development approaches completion, it may be necessary to provide an upgrade to this intersection to improve the LOS of this movement. Modelling of a revised intersection treatment to provide a roundabout is shown to improve this LOS from D to B, with all other movements either LOS A or B. The proposed intersection and intersection upgrade should be constructed in accordance Parkes/AUSPEC and RMS guidelines.

It is unlikely that the development of an Industrial Estate at the subject site would increase the demand on public medical facilities. A number of employees or contractors associated with the Industrial Estate would already reside in Parkes and would already utilise the medical services available. As such only a limited additional demand would be placed on the health system.

It is not anticipated that the proposal would lead to unreasonable impacts to any other public infrastructure services.

What are the views of state and commonwealth public authorities consulted in accordance with the Gateway determination?

The views of state and commonwealth public authorities would be ascertained in accordance with the comments contained in the Gateway Determination.

Part 4 – Mapping

GENERAL

There are two necessary mapping changes resulting from the PP.

LEP Maps LZN_005B and LZN_005E would be amended as per **Figure 4** and **Figure 5** below to reflect the zone changed from RU1 to IN1.

LEP Maps LSZ_005B and LSZ_005E would be amended as per **Figure 6** and **Figure 7** to reduce the minimum lot size from 400 hectares to 1,500 square metres.

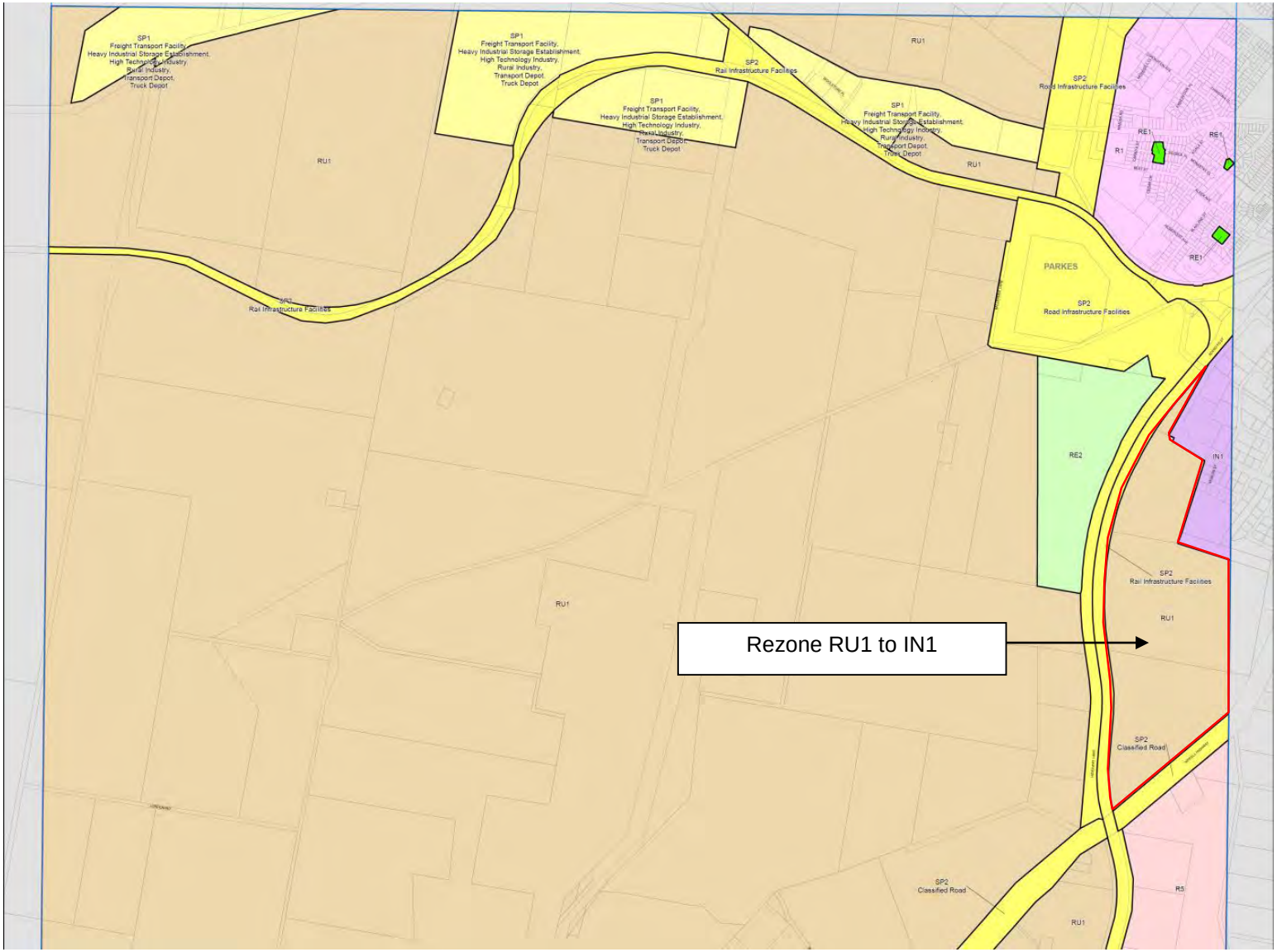
Rezone RU1 to IN1
PARKES
RU1
RE1
RE2
IN1
SP1
SP2
R5

Figure 4: Amendment to Land Zoning Map LZN_005B

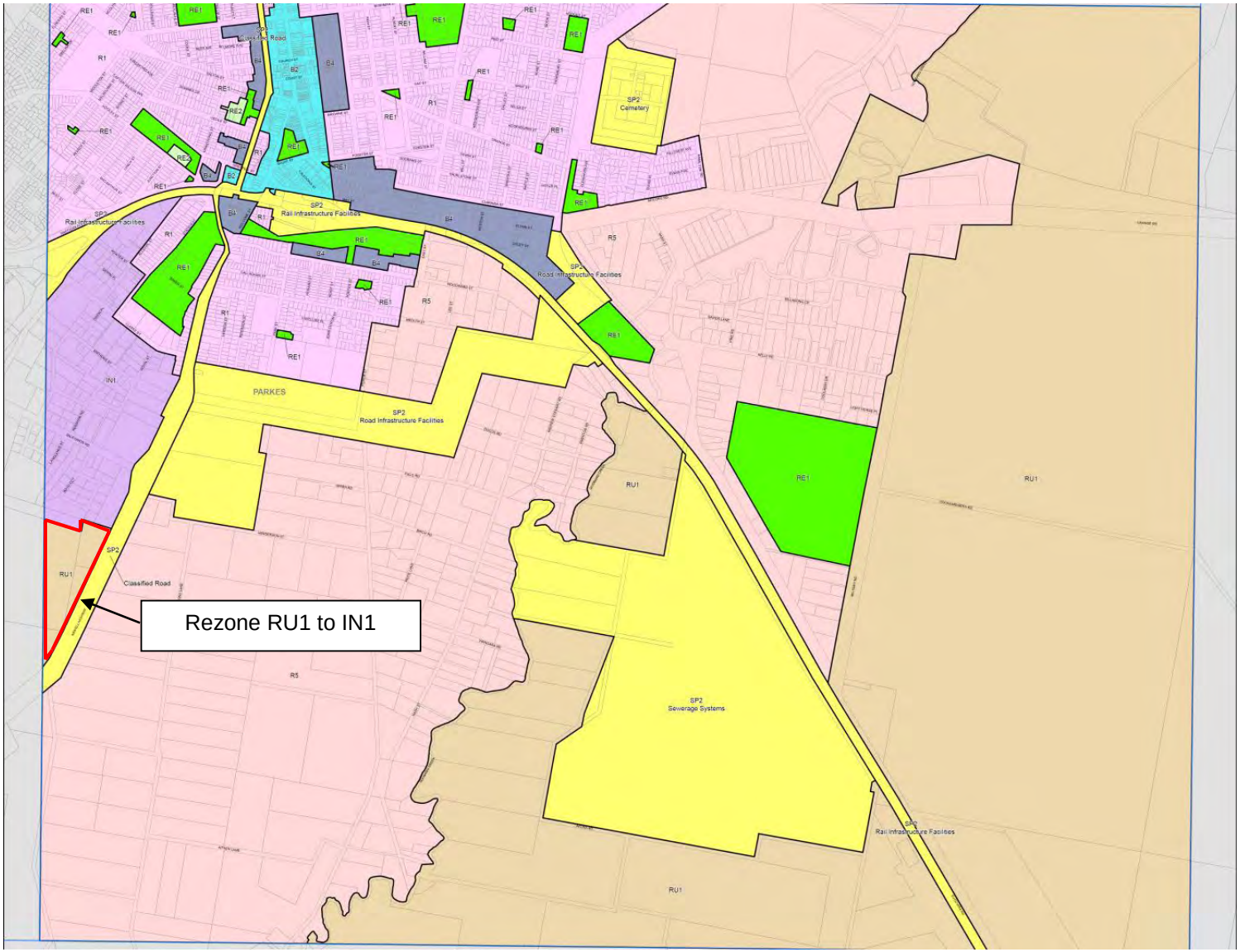
Rezone RU1 to IN1
PARKES
SP2
Road Infrastructure Facilities
SP2
Rail Infrastructure Facilities
SP2
Cemetery
SP2
Sewerage Systems
Classified Road
RU1
RE1
R5
IN1

Figure 5: Amendment to Land Zoning Map LZN_005E


Amend minimum lot size to 1,500 square metres
PARKES

Figure 6: Amendment to Minimum Lot Size Map 005B

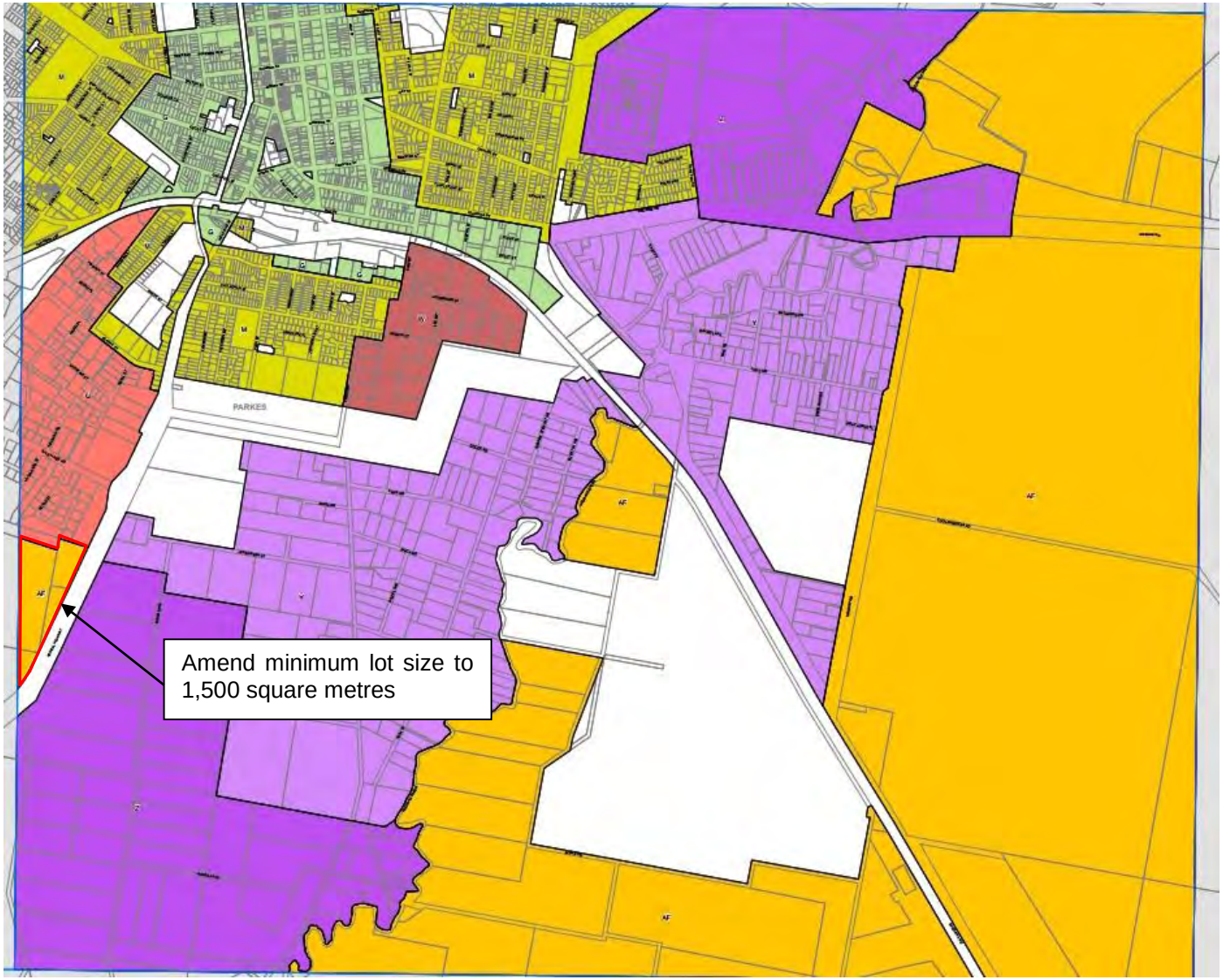

Figure 7: Amendment to Minimum Lot Size Map 005E

Part 5 - Community Consultation

TYPE OF COMMUNITY CONSULTATION REQUIRED

Section 5.5.2 of 'A Guide to Preparing Local Environmental Plans' identifies two different exhibition periods for community consultation;

- Low Impact Proposals – 14 days; and
- All other PPs (including any proposal to reclassify land) – 28 days.

The Guide describes Low Impact Proposals as having the following attributes;

- *A 'low' impact planning proposal is a planning proposal that, in the opinion of the person making the gateway determination, is;*
    - *Consistent with the pattern of surrounding land use zones and/or land uses;*

The proposed rezoning of the parcel of land to IN1 – General Industrial would be in accordance with zoning on the neighbouring allotments to the north, effectively allowing an extension of the industrial estate to the south.

- *Consistent with the strategic planning framework;*

Responses have been provided detailing the proposal's compliance with local and regional planning strategies, SEPPs, and ministerial directions.

- *Presents no issues with regard to infrastructure servicing;*

A extensive augmentation of existing services would be required to convert the area from a rural undeveloped area to an industrial estate. This servicing is however not considered to present any significant issues, due to a logical extension of existing services.

- *Not a principle LEP; and*

The PP is not for a principle LEP.

- *Does not reclassify public land.*

The PP does not seek to reclassify public land.

In accordance with the responses to the above points, the PP is considered to be of low impact. It is therefore considered that a community consultation period of 14 days is applicable.

References

AEC*group* (2012). *AEC Group Gross Regional Product Estimates, 2010-11.* Unpublished data.

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Beeton, JS (2007) Commonwealth Conservation Advice for Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, Threatened Species Scientific Committee, Canberra.

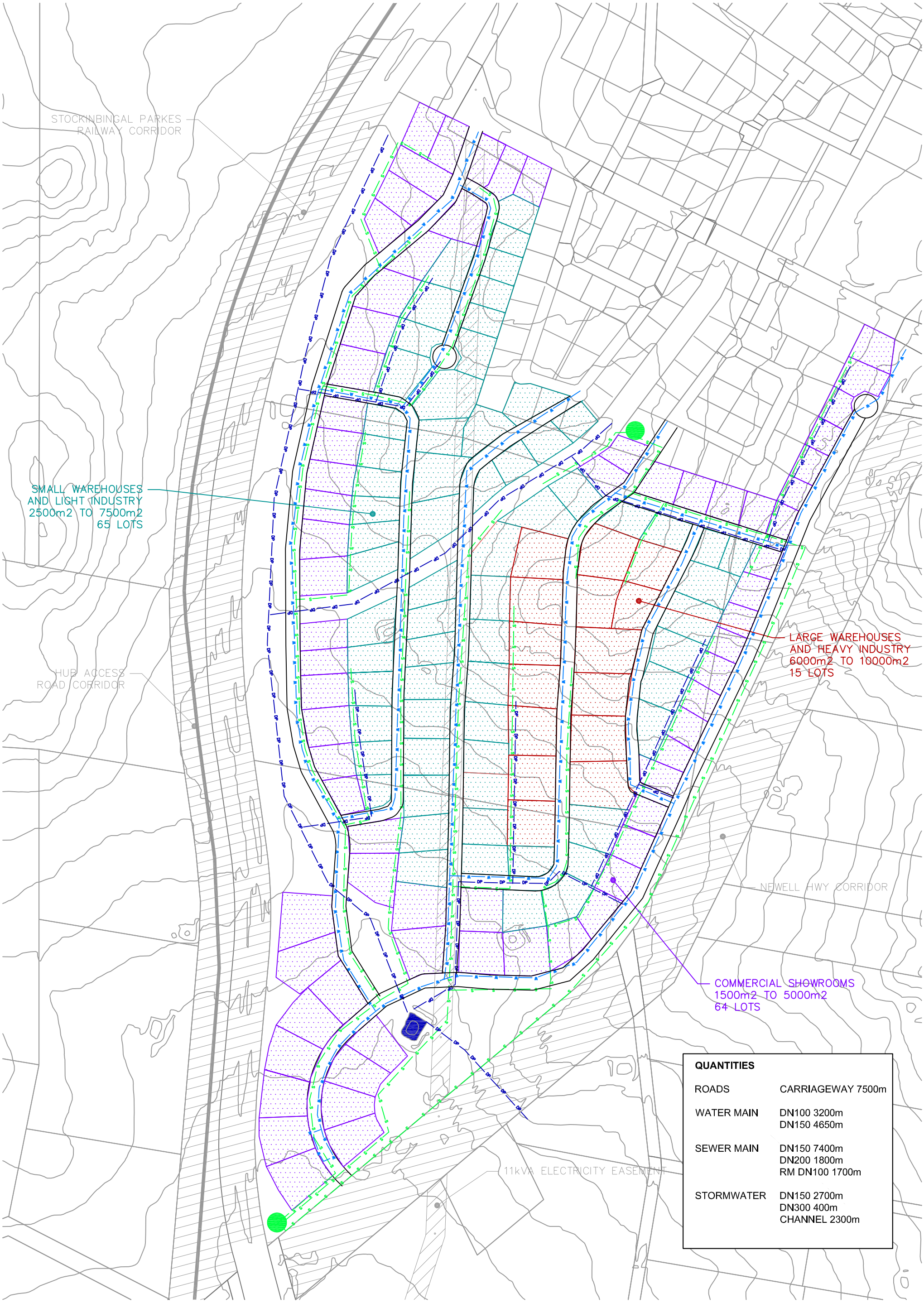
Morgan, G. and Terrey, J. 1992*, Nature conservation in western New South Wales*, National Parks Association, Sydney

NPWS (2002) Final determination to list White Box Yellow Box Blakely's Red Gum Woodland as an Endangered Ecological Community New South Wales Department of Environment and Conservation, Sydney.

NSW Department of Planning (DoP). 2009a, A Guide to Preparing Local Environmental Plans, DoP, Sydney.

NSW Department of Planning (DoP). 2009a, A Guide to Preparing Planning Proposals, DoP, Sydney.

Drawings



QUANTITIES

ROADS	CARRIAGEWAY 7500m
WATER MAIN	DN100 3200m DN150 4650m
SEWER MAIN	DN150 7400m DN200 1800m RM DN100 1700m
STORMWATER	DN150 2700m DN300 400m CHANNEL 2300m

No.	REVISION DETAILS	DRAWN	CHECKED	DATE
A	PRELIMINARY	RJH	PK	24/3/10

PARKES SHIRE COUNCIL
2 Cecile Street PARKES NSW 2870
Phone: (02) 6861 2333 | Fax: (02) 6862 3946
council@parkes.nsw.gov.au | www.parkes.nsw.gov.au

PIMP No: **200####**
PROJECT: **PARKES INDUSTRIAL ESTATE EXTENSION**
DRAWING: **OPTION 1**

30 0 30 60 90 120 150m
SCALE 1:6000

SHEET	DRAWING NUMBER	REVISION
A3		A

STOCKINBINGAL PARKES
RAILWAY CORRIDOR

COMMERCIAL SHOWROOMS
1500m2 TO 5000m2
5 LOTS

LARGE WAREHOUSES
AND HEAVY INDUSTRY
6000m2 TO 20000m2
10 LOTS

2x 1800m RAILWAY SIDINGS
2x 600m LOADING SIDINGS
2x 900m LOADING SIDINGS

HUB ACCESS
ROAD CORRIDOR

SMALL WAREHOUSES
AND LIGHT INDUSTRY
2500m2 TO 7500m2
36 LOTS

NEWELL HWY CORRIDOR

INTER-MODAL WAREHOUSES
AND HARDSTAND STORAGE
5000m2 TO 25000m2

COMMERCIAL SHOWROOMS
1500m2 TO 5000m2
25 LOTS

11kVA ELECTRICITY EASEMENT

QUANTITIES

ROADS	CARRIAGEWAY 3300m
WATER MAIN	DN100 1750m DN150 2300m
SEWER MAIN	DN150 3100m DN200 1800m DN100 RM 2000m
STORMWATER	DN150 2300m DN300 400m DN600 200m CHANNEL 2000m

NOTE: DOES NOT INCLUDE RAILWAY AND INTER-MODAL AREA

No.	REVISION DETAILS	DRAWN	CHECKED	DATE
A	PRELIMINARY	RJH	PK	24/3/10

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PIMP No: **200####**
PROJECT: **PARKES INDUSTRIAL ESTATE EXTENSION**
DRAWING: **OPTION 2**

30 0 30 60 90 120 150m
SCALE 1:6000

SHEET	DRAWING NUMBER	REVISION
A3		A

Appendix A

ECOLOGICAL ASSESSMENT

PROPOSED PARKES INDUSTRIAL ZONING - BIODIVERSITY ASSESSMENT

Prepared for
Parkes Shire Council
by Colin C. Bower PhD

September 2013

FloraSearch

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SUMMARY AND CONCLUSIONS

1. Flora and fauna surveys of land owned by Parkes Shire Council and proposed for rezoning to Industrial were conducted on 21 May and 26 August 2013.

2. The survey comprised thirteen 50 m flora transects, identification of all remnant native trees on the site, fauna habitat assessment, documentation of all trees with hollows, observations and searches for fauna species and searches for fauna tracks and traces.

3. Two broad vegetation types were identified on the study area and are described:

    a. Cleared grazing land
    b. Grazing land with scattered remnant trees

4. The survey recorded 64 vascular plant species on the study area, of which 26 (40.6%) are native and 38 (59.4%) are introduced. A complete list of plant species is given in Appendix B.

5. The main plant families represented are the Poaceae (Grasses) (16 species), Asteraceae (Daisies) (10 species), Brassicaceae (Cabbage family) (4 species), Faboideae (Pea flowers) (4 species) and Myrtaceae (Eucalypts) (4 species).

6. The original native vegetation has been almost completely eliminated from the study area by past clearing for agriculture, cropping and grazing. The ground cover vegetation on most of the study area is dominated by introduced grass and herb species with an average cover of 56.6 percent. Accordingly, the ground cover is in 'low' condition.

7. No threatened flora or fauna species were found by the surveys.

8. Degraded remnants of three threatened ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) occur on the study area:

    a. *White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community.* [The community is also listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) as the *White Box-Yellow Box-Blakely's Red Gum grassy woodlands and derived native grasslands Critically Endangered Ecological Community*.]

    b. *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions Endangered Ecological Community* Inland Grey Box Woodland). [The community is also listed under the EPBC Act as the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of Eastern Australia Endangered Ecological Community*.]

    c. *Fuzzy Box on alluvials of the South West Slopes, Darling Riverine Plains and the Brigalow Belt South Bioregions Endangered Ecological Community* (Fuzzy Box Woodland).

    However, the remnants of all three communities comprise only scattered eucalypts and a few resilient ground cover species. They are too degraded to qualify for protection under TSC or EPBC Acts. Consequently, there is no requirement to avoid, mitigate or offset for removal of this vegetation, and no need to formally assess the impact of such removal in this report.

10. Assessments for significance of Project impacts (Seven Part Tests) under s5A of the EP&A Act were conducted on 13 fauna species with potential to occur on the study area.

11. It is concluded from the assessments that clearing the study area may have a small impact on the availability of foraging resources for all the threatened fauna species and may reduce breeding opportunities for four of them. However, no local populations of any of the threatened species would be placed at risk of extinction.

12. No matters were identified requiring referral to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act 1999.*

INTRODUCTION

FloraSearch was commissioned by Parkes Shire Council to conduct a biodiversity survey and impact assessment for the proposed rezoning of land to the south of the existing Parkes Industrial Estate from rural to industrial (Figure 1). This survey and assessment follows on from preliminary flora and fauna survey work conducted by Geolyse. This report combines results obtained in the preliminary survey with new vegetation data and subjects the combined data set to an assessment of impact under Section 5a of the NSW *Environment Planning and Assessment Act 1979* (EP&A Act).

The objectives of the surveys and report are to:

- Determine the threatened species, populations, ecological communities and critical habitat, listed under the NSW *Threatened Species Conservation Act, 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act*, *1999* (EPBC Act) that may potentially occur on the study area from a review of relevant databases and previous literature.

- Sample the vegetation on the study area using standard flora survey techniques.

- Conduct searches for extant threatened flora species, populations, ecological communities and critical habitats, and identification of potential habitats for them, if any.

- Map the distribution of vegetation types identified by the survey and the locations of any threatened flora.

- Provide lists of flora and fauna species observed on the study area.

- Assess the likely impacts of development on threatened flora, populations, ecological communities and critical habitat, if any occur or have potential to occur on the study area, in accordance with Section 5a of the EP&A Act and the *Threatened Species Assessment Guidelines* (DECC, 2007).

Project Footprint

The study area comprises an area of 102 ha between the Newell Highway and the Parkes to Forbes railway line south of the existing Parkes Industrial Estate (Figure 1).

DESCRIPTION OF STUDY AREA

Land Use

The study area comprises a series of fenced grazing paddocks that have been cleared of their original native woodland vegetation, except for some scattered paddock trees (Figure 2). At the time of the survey the southern four fifths of the area was being grazed by sheep. A broad band of scattered native trees bisects this area from east to west. The north western fifth of the site is unfenced rank grassland with remnant native trees concentrated between an access track and the western boundary. Three small fenced blocks about the middle of the eastern boundary formerly contained buildings whose only remains are concrete slabs. These blocks have sparse plantings of various species of mainly native trees along their boundaries and internally. Along the western side of the Newell Highway outside the fence line of the study area are extensive amenity plantings of native trees and shrubs.

Topography and Drainage

Elevation is 299m AHD at the southernmost tip of the site and increases to 322 m AHD in the north east and north west corners. There are no permanent watercourses on the study area. The main drainage line runs down the western boundary before traversing the southern paddock in a south easterly direction. A tributary of this drainage line carries water from the existing industrial area through the centre of the northern boundary of the study area in a south westerly direction to the western drainage line.

Geology and Soils

The study area is underlain by the Ordovician age sedimentary Cotton Formation which is dominated by well-bedded laminated siltstones and chert with minor sandstone (Sherwin 2000). The Cotton Formation does not outcrop on the study area where it comprises colluvial sheetwash and weathered bedrock, often with surface quartz (Gibson and Lyons 2000). The Cotton Formation gives rise in part to the Parkes Soil Landscape (King 1998), whose soil types include Red Earths on upper slopes, Red Podzolic Soils and Non-calcic Brown Soils on lower slopes with Brown Solodic Soils along drainage lines.

Botanical and Biogeographical Regions

The study area lies in the centre north of the South Western Slopes Bioregion (Thackway and Cresswell, 1995) and in the centre of the Central Western Slopes Botanical Division (Anderson, 1961).

Climate

The climate of the study area is subhumid with hot summers and no dry season (Sahukar *et al*. 2003).

The nearest official long-running meteorological station at a similar altitude to the study area is the Macarthur Street, Parkes Bureau of Meteorology (BOM) Station 065026 (324 m AHD), which ran from 1889 to 2012. The mean daily maximum temperatures vary from 14.0 degrees Celsius (°C) in July to 32.3°C in January (BOM, 2013). The corresponding mean daily minimum temperatures vary from 4.0°C in July to 17.9°C in January (BOM, 2013). Frosts may be common in winter. Average annual rainfall is 587.5 mm and is spread fairly evenly through the year with slight summer dominance (BOM, 2013). The lowest rainfall tends to be in April with an average of 41.4 mm (BOM, 2013). The highest average rainfall is in January (57.6 mm), followed by December (53.0 mm) (BOM, 2013).

Previous Flora and Fauna Studies

Previous vegetation and fauna studies around the Parkes region include:

- A comprehensive popular compilation of the flora and fauna of Parkes Shire was published by the Parkes Naturalist Group (Schrader, 1987) for the Bicentennial in 1988.

- Sivertsen and Metcalfe (1995) surveyed the natural vegetation of the Cargelligo 1:250 000 Map which includes the Parkes area. They concluded that 84 percent of the original native vegetation had been cleared on the map sheet and that the remainder was in danger of being substantially lost or degraded through further clearing, grazing and fragmentation.

- A CSIRO Division of Wildlife and Ecology study of the native vegetation of the central Lachlan River catchment (Austin *et al*. 2000) used predictive modelling to determine the pre-European vegetation distribution and estimated the amounts of each vegetation type that had been lost since white settlement. Among its conclusions this study found that nine vegetation alliances

had less than 10 percent of their original vegetation remaining, much of the remaining vegetation is in poor condition, and some communities, such as Box-Gum Woodlands, have less than one percent of their original area remaining in good condition.

- The NSW Department of Environment and Conservation (2006) used existing data sources to map the extant vegetation of the Lachlan Valley and to reconstruct the original vegetation distribution for the Lachlan Catchment Management Authority (CMA). It was estimated that around 40 percent of the Lachlan CMA is currently vegetated to some degree and 60 percent has been cleared. There are an estimated eight vegetation types with less than 1,000 ha of their reconstructed extent remaining, 24 with less than 30 percent remaining, 16 with between 30 and 70 percent remaining, and 18 with more than 70 percent of their reconstructed extent existing today (DEC, 2006).

THREATENED FLORA AND FAUNA

Lists of threatened species, populations, ecological communities and critical habitat that are known, or have potential to occur on the study area were derived by consulting the following sources. The following database were searched within a 20 × 20 km square centred on the study area (accessed August 2013);

- BioNet website (www.bionet.nsw.gov.au) incorporating searches of the databases of the Atlas of NSW Wildlife and Royal Botanic Gardens, Domain Trust, Forests NSW and the Australian Museum.
- Protected Matters Search Tool (http://www.environment.gov.au/epbc/pmst/index.html) (Commonwealth Department of Sustainability, Environment, Water, Population and Communities).
- Schedules of the TSC Act and the EPBC Act.
- Preliminary and Final Determinations of the NSW Scientific Committee (http://www.environment.nsw.gov.au/committee/schedulesthreatenedspeciesconservationact.htm).

Endangered Ecological Communities

Three endangered ecological communities listed in the schedules of the NSW *Threatened Species Conservation Act 1995*, are considered to have potential to occur on the study area (Table 1), viz:

- *White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community.* [The community is also listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* as the *White Box-Yellow Box-Blakely's Red Gum grassy woodlands and derived native grasslands Critically Endangered Ecological Community*.]

- *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions Endangered Ecological Community*. [The community is also listed under the Commonwealth EPBC Act as the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of Eastern Australia Endangered Ecological Community.*]

- *Fuzzy Box on alluvials of the South West Slopes, Darling Riverine Plains and the Brigalow Belt South Bioregions Endangered Ecological Community.*

Table 1
Threatened Plant Communities Returned by Database Searches of the Region Around the Study Area

Community name		Conservation Status		Known Distribution	Potential Habitats	Likelihood of Occurrence
TSC Act[1]	EPBC Act[2]	TSC Act[1]	EPBC Act[2]			
Fuzzy Box on alluvials of the South West Slopes, Darling Riverine Plains and the Brigalow Belt South Bioregions	-	E	-	Mainly in the Dubbo-Narromine-Parkes-Forbes area (OEH, 2013a).	Occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. It also occurs on colluvial soils on lower slopes and valley flats (OEH, 2013a).	Moderate (Study area is within the known distribution of the community)
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Inland Grey Box Woodland)	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of Eastern Australia (equivalent to Inland Grey Box Woodland)	E	E	Lower western slopes and plains from the Victorian border to Queensland (OEH, 2013a). At a Commonwealth level it also occurs in Victoria and South Australia (SEWPaC, 2013a).	Inland Grey Box Woodland occurs on fertile soils of the western slopes and plains of NSW (OEH, 2013a). It often occurs on productive soils derived from alluvial or colluvial materials but may occur on a range of other substrates (SEWPaC, 2013a).	High (Study area is within the known distribution of the community)
Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion	-	E	-			Nil (This community is not known to occur close to the study area)
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray Darling Depression, Riverina and NSW South western Slopes Bioregions	Weeping Myall Woodlands	E	E	Scattered across the eastern parts of the alluvial plains of the Murray-Darling river system (OEH, 2013a) on the NSW western slopes and plains.	Occurs on red-brown earths and heavy textured grey and brown alluvial soils (OEH, 2013a) that become waterlogged in winter.	Nil (The study area soils are colluvial rather than alluvial)
White Box, Yellow Box, Blakely's Red Gum Woodland (Box-Gum Woodland)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (equivalent to Box-Gum Woodland)	E	CE	Occurs mainly on the tablelands and western slopes of NSW (OEH, 2013a).	Generally occurs on fertile lower parts of the landscape where resources such as water and nutrients are abundant.	High (The study area is within the known distribution of this community)

1 Threatened Ecological Community status under NSW *TSC Act* (current to July 2013).

2 Threatened Ecological Community status under Commonwealth *EPBC Act* (current to July 2013).

E – Endangered; CE - Critically Endangered.

Table 2
Threatened Plant Species that may Potentially Occur on the Study Area

Family Name	Scientific Name	Status		Habitat	Distribution	Likelihood of Occurrence
		TSC Act[1]	EPBC Act[2]			
Apocynaceae	*Tylophora linearis*	V	E	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of *Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla* and *Allocasuarina luehmannii* (OEH, 2013a). On coarse-grained sediments.	Distributed to the north east of the study area from the Pilliga Scrub to Peak Hill and Dubbo.	Nil (Known communities and soils absent from study area)
Fabaceae	*Swainsona murrayana*	V	V	Occurs on flat inland floodplains and depressions on clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams (OEH, 2013a).	Occurs principally on the NSW South West Plains (NSW Flora Online, 2013). There is one record south west of Forbes beside the Newell Highway and several in the West Wyalong-Quandialla area. There are no records close to Parkes.	Nil (Habitat absent from study area)
	Swainsona sericea	V	-	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines *Callitris* spp. (OEH 2013).	Recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains (OEH 2013a).	Moderate (Is likely to have formerly occurred on the study area.)
Poaceae	*Austrostipa metatoris*		V	Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils.	Most records occur in the Murray Valley. Also occurs in central NSW including Lake Cargelligo, east of Goolgowi, Condobolin and south west of Nymagee.	Nil (Soils and habitats absent from the study area.)
	Austrostipa wakoolica	E	E	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp; creek banks in grey, silty clay; open Cypress Pine forest on low sandy range; and a low, rocky rise (OEH 2013a).	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW. Not known close to Parkes; occurs in the Marsden to West Wyalong area south west of Forbes.	Nil (Main habitats and substrates are absent from the study area.)
	Bothriochloa biloba	-	V	It grows in cleared eucalypt forests and relict grassland, on heavier-textured soils such as brown or black clays (SEWPaC, 2008).	Lobed Blue-grass is known from the Darling Downs district in Queensland, south along the western slopes of the Great Dividing Range to Dubbo, Merriwa and the Upper Hunter Valley in NSW (SEWPaC, 2008).	Nil (Heavy clay soils are absent on the study area.).
Rutaceae	*Philotheca ericifolia*	-	V	Habitats include heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops (SEWPaC, 2013a). Tends to occur on coarse-grained sediments, which are absent from the study area.	Occurs from the upper Hunter Valley and Pilliga to the Peak Hill, Dubbo and West Wyalong districts of NSW.	Nil (lack of suitable soils and habitat)

[1] Threatened species status under the NSW *TSC Act,* (current to September 2013).

[2] Threatened species status under the Commonwealth *EPBC Act*, (current to September 2013).

E - Endangered; V - Vulnerable.

Endangered Populations

Twenty five plant populations are listed as endangered under the NSW *Threatened Species Conservation Act 1995*, as at September 2013 (OEH, 2013a). None are applicable to the study area.

Threatened Flora Species

Database searches returned seven threatened flora species known or considered likely to occur in the region around the study area (Table 2). The distribution and habitats of each species was determined from the PlantNet website (Royal Botanic Gardens and Domain Trust Sydney, 2013), OEH Threatened Species Profiles (OEH, 2013a), SEWPaC listing and conservation advices (2013) and specialist publications. The habitats and/or substrate requirements of six of the species are absent from the study area (Table 2). Accordingly, they are not considered further here. One species is considered likely to have formerly occurred on the study area based on its known distribution and habitats, the Silky Swainson-pea, *Swainsona sericea*. This species was specifically targeted during the survey conducted for this study.

Threatened Fauna Species

The database searches returned 39 threatened fauna species with potential to occur on the study area based on observational records in the surrounding region (Table 3). Threatened fauna species known to occur in the region included two fish, one reptile, 29 birds and seven mammals.

The literature on each of these species was consulted to determine whether their habitat requirements are matched by the resources on the study area. For most species important habitat factors essential to their survival are missing from the study area (Table 3). Accordingly, it is considered that 26 species have a nil likelihood of occurring on the study area owing to a lack of essential resources. Seven species are considered to have a low potential to occur; in most cases they are wide ranging predatory, nomadic or migratory species whose breeding requirements are lacking on the study area, although at times they may be able to forage there for food. These include the Grey Falcon (*Falco hypoleucos*), Black Falcon (*Falco subniger*), Swift Parrot (*Lathamus discolour*), Barking Owl (*Ninox connivens*), Regent Honeyeater (*Xanthochaera phrygia*), Scarlet Robin (*Petroica boodang*), Flame Robin (*Petroica phoenicea*) and Diamond Firetail (*Stagonopleura guttata*).

Three species are considered to have a moderate likelihood of utilising the study area. The Spotted Harrier often forages over grassy open paddocks and is likely to utilise the study area at times as part of a much larger foraging territory. The Superb Parrot and Little Pied Bat (*Chalinolobus picatus*) may be able to nest in the hollow-bearing old growth trees on the study area and forage in the area.

Two species, the Little Eagle (*Hieraaetus morphnoides*) and the Little Lorikeet (*Glossopsitta pusilla*) are considered to have a high likelihood of utilising the study area for foraging. The Little Eagle frequently hunts for prey (rabbits, mice etc.) over open grazing paddocks such as those on the study area. The Little Lorikeet is a nomadic nectar feeding species that is likely to visit the paddock eucalypts to feed when they are in flower and less likely may utilise hollows for nesting.

The 13 threatened fauna species identified in Table 3 as having some potential to utilise the study area were targeted in field surveys of the site. The potential impacts on the 13 species of clearing the study area for development are considered below in the impact assessment sections of this report.

Table 3
Threatened Fauna Species Returned by Database Searches of the Surrounding Region

Class	Family Name	Scientific Name	Common Name	Conservation Status		Likelihood to be on Study Area	Justification
				TSC Act[1]	EPBC Act[2]		
Actinopterygii (ray-finned fishes)[3]	Percichthyidae	*Maccullochella macquariensis*	Trout Cod	E	E	Nil	The two fish species listed here only occur in large permanent rivers with deep waterholes (SEWPaC, 2013). Such habitat does not occur on the study area.
		Maccullochella peelii	Murray Cod	-	V	Nil	
Reptilia (reptiles)	Pygopodidae	*Aprasia parapulchella*	Pink-tailed Legless Lizard	V	V	Nil	The Pink-tailed Legless Lizard inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Similar habitat does not occur on the study area (OEH, 2013a).
Aves (birds)	Megapodiidae	*Leipoa ocellata*	Mallee Fowl	E	V	Nil	Mallee Fowl are found in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. A sandy substrate and abundance of leaf litter are required for breeding (Benshemesh, 2007). Suitable habitat is absent from the study area and surrounds.
	Anatidae	*Stictonetta naevosa*	Freckled Duck	V	-	Nil	It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. It prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Known to occur sporadically at the Parkes Sewage Farm. Unlikely to utilise the very small dams on the study area.
	Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern		E	Nil	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. They favour permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Suitable habitat is absent from the study area.
	Accipitridae	*Circus assimilis*	Spotted Harrier	V	-	Moderate	The Spotted Harrier occurs in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats (OEH, 2013a). It may potentially forage over the grazing paddocks on the study area.
		Hieraaetus morphnoides	Little Eagle	V	-	High	Little Eagle occurs throughout NSW and soars over open country looking for prey (Blakers *et al*., 1984). There are several records in the region around Parkes in BioNet (2013). It is likely to hunt over the grazing paddocks on the study area.

Class	Family Name	Scientific Name	Common Name	Conservation Status		Likelihood to be on Study Area	Justification
				TSC Act[1]	EPBC Act[2]		
Aves (birds) cont.	Falconidae	*Falco hypoleucos*	Grey Falcon	E		Low	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin (OEH 2013a). Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands. Usually nests high in a living eucalypt near water or a watercourse. There are two historic records in the Parkes area (BioNet 2013). Suitable nesting habitat is absent from the study area.
		Falco subniger	Black Falcon	V	-	Low	Black Falcons occur primarily along inland watercourses and forage for bird prey in eucalypt woodland (Blakers *et al*. 1984). There is one record near Parkes. A low potential exists for this species to forage in wooded parts of the study area.
	Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E	-	Nil	Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber (OEH 2013a). Suitable habitat is absent from the study area.
	Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E	Nil	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber (OEH 2013a). Suitable habitat is absent from the study area.
	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	-	Nil	The Curlew Sandpiper is a migratory species distributed around most of the coastline of Australia, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats such as intertidal mudflats. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland. There are records for the Parkes Sewage Farm. There is no habitat for this species on the study area.
		Limosa limosa	Black-tailed Godwit	V	-	Nil	The Black-tailed Godwit is a migratory wading bird that mainly occurs on the coast, usually in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats (OEH 2013). Further inland, it can be found on mudflats, in water less than 10 cm deep, around muddy lakes and swamps. It has been recorded at the Parkes Sewage Farm (BioNet 2013). Suitable habitat is absent from the study area.
	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V	-	High	The Little Lorikeet is a nomadic nectar feeding species that is regularly recorded in bushland around Parkes (BioNet, 2013). It can be expected to occur on the study area when eucalypts are in flower.
		Lathamus discolor	Swift Parrot	E	E	Low	The Swift Parrot is a migratory species that breeds in Tasmania and winters on the mainland, where it feeds on flowering eucalypts (OEH, 2013a). There are multiple records in bushland areas south east of Parkes (BioNet, 2013), probably related to feeding on Mugga Ironbarks. It may potentially feed on flowering White Box trees on the study area.

Class	Family Name	Scientific Name	Common Name	Conservation Status		Likelihood to be on Study Area	Justification
				TSC Act[1]	EPBC Act[2]		
Aves (birds) cont.	Psittacidae cont.	*Polytelis swainsonii*	Superb Parrot	V	V	Moderate	The Superb Parrot occurs in tall woodlands and forests west of the Tablelands (Blakers *et al*., 1984). There are multiple records of the species close to Parkes. There are old growth eucalypt trees with hollow limbs on the study area that may potentially provide nesting habitat for this species.
		Neophema pulchella	Turquoise Parrot	V	-	Nil	Lives on the edges of relatively undisturbed eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. There are no records in BioNet (2013) close to Parkes, although a population is known in Back Yamma State Forest, south of Parkes. Suitable habitat is absent from the study area.
	Strigidae	*Ninox connivens*	Barking Owl	V	-	Low	The Barking Owl occurs in eucalypt woodland and is widespread in eastern NSW. It is known to occur in the region around Parkes (BioNet, 2013). Requires very large foraging areas (2000+ ha) and large trees for roosting and nesting (OEH, 2013a). The study area may form part of a larger foraging territory but is unlikely to serve as breeding habitat.
	Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V	-	Nil	The Brown Treecreeper is widespread in bushland remnants with old growth trees around Parkes (BioNet, 2013). It inhabits grassy woodlands with rough-barked trees at close to natural densities, sparse shrub cover and fallen timber on the ground (OEH, 2013a). Suitable habitat does not occur on the study area.
	Acanthizidae	*Chthonicola sagittata*	Speckled Warbler	V	-	Nil	A sedentary species of natural relatively undisturbed open woodland on rocky ridges or in gullies (OEH, 2013a). Recorded sparsely but widely in the surrounding region in larger blocks of remnant woodland, including on the outskirts of Parkes (BioNet, 2013). Suitable habitat is lacking on the study area.
	Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater	V	-	Nil	A nomadic species of the arid zone, inhabiting wattle shrub, primarily Mulga, mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes, mistletoes and other shrubs; also eats saltbush fruit, berries, seed, flowers and insects. Suitable resources are absent from the study area for this species.
		Anthochaera phrygia	Regent Honeyeater	E	E	Low	A nomadic nectar-dependent species found in flowering eucalypts, which has been recorded rarely in the region to the south of the study area (Back Yamma State Forest) (BioNet, 2013). It has potential to visit the study area when Eucalypts are flowering, especially Yellow Box (OEH, 2013a).
		Ephianura albifrons	White-fronted Chat	V	-	Nil	There is one record for the White-fronted Chat in the Parkes area at the sewage works (BioNet, 2013). The preferred habitat is wet grasslands or marshes (OEH, 2013a), of which there are none on the study area.

Class	Family Name	Scientific Name	Common Name	Conservation Status		Likelihood to be on Study Area	Justification
				TSC Act[1]	EPBC Act[2]		
Aves (birds) cont.	Meliphagidae cont.	*Melithreptus gularis*	Black-chinned Honeyeater	V	-	Nil	The Black-chinned Honeyeater is occasionally observed in bushland areas to the south (Back Yamma State Forest) and south east of Parkes (Cookamidgera State Forest) (BioNet, 2013). It requires relatively large feeding areas and tends to occur mainly in larger bushland remnants (OEH, 2013a). Suitable mature woodland habitat is absent from the study area.
	Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V	-	Nil	The Grey-crowned Babbler is relatively common in the Parkes region (BioNet, 2013). It prefers open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains, all with dense low trees below the canopy (OEH, 2013a). Suitable habitat does not occur on the study area.
	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V	-	Nil	Birds of woodlands and open forests, usually with rough-barked eucalypts (OEH, 2013a). Sporadically recorded in the Parkes region (BioNet, 2013), but confined to remnant woodlands with mature trees. Unlikely to occur on the study area.
	Pachycephalidae	*Pachycephala inornata*	Gilbert's Whistler	V	-	Nil	The Gilbert's Whistler occurs in a range of habitats, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests. The nearest known population to Parkes is in Back Yamma State Forest (BioNet 2013). Suitable habitat is absent from the study area.
	Petroicidae	*Melanodryas cucullata*	Hooded Robin	V	-	Nil	The Hooded Robin occurs sparingly in the Parkes region (BioNet, 2013). It favours open eucalypt woodlands with saplings, shrubs and native grasses (OEH, 2013a). It has been recorded from State Forests west and south of Parkes. Suitable habitat is absent on the study area.
		Petroica boodang	Scarlet Robin	V	-	Low	The Scarlet Robin inhabits dry eucalypt forests and woodlands with an open grassy understorey, having few shrubs, but abundant logs and fallen timber (OEH 2013). It breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions. Although primarily a resident in forests and woodlands, some adults and young birds disperse in autumn and winter to more open habitats; such as open grassy woodlands, grasslands or grazed paddocks with scattered trees.There is one record of this species in the Parkes region (Back Yamma State Forest) (BioNet 2013). Breeding habitat is absent on the study area, but it may be utilised occasionally by dispersing individuals.
		Petroica phoenicea	Flame Robin	V	-	Low	Breeds in tall moist eucalypt forests and woodlands in upland areas (OEH 2013). In winter, many birds move to the inland slopes and plains to drier more open habitats in the lowlands, where it utilises dry forests, open woodlands, pastures and native grasslands, with or without scattered trees. There are multiple records of the Flame Robin in the Parkes region (BioNet 2013). Although it would not be able to breed on the study area, it may visit occasionally in winter to forage.

Class	Family Name	Scientific Name	Common Name	Conservation Status		Likelihood to be on Study Area	Justification
				TSC Act[1]	EPBC Act[2]		
Aves (birds) cont.	Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V	-	Low	Widespread in open forest and woodland mostly on the inland side of the Great Dividing Range in eastern NSW (Blakers *et al*., 1984). Recorded regularly in open native woodland or semi-cleared land around Parkes (BioNet, 2013). It has limited potential to occur on the study area owing to its highly cleared condition and lack of native ground cover diversity.
Mammalia (mammals)	Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	Nil	There are no records of the Spotted-tailed Quoll close to Parkes, although there is one record from 2004 in the Cookamidgera area (BioNet 2013). Individual animals require hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites (OEH, 2013a). Den resources are lacking on the study area.
	Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	Nil	Koalas are widespread in eastern NSW and have been recorded sparingly in the region south of Parkes (BioNet, 2013). White Box which occurs on the study area is a preferred food tree of the Koala west of the Great Dividing Range. Koalas require large mature trees in which to roost and feed and suitable trees are present on the study area. Although the study could potentially support Koalas, no population is known to occur in the vicinity.
	Macropodidae	*Petrogale penicillata*	Brush-tailed Rock Wallaby	E	V	Nil	Inhabits rocky areas in sclerophyll forest, usually slopes that receive direct sunlight for most of the day and with caves, crevices or jumbled boulders to provide shelter (Maynes and Sharman, 1983). No such habitat occurs on the study area.
	Muridae	*Pseudomys novaehollandiae*	New Holland Mouse	-	V	Nil	Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes (SEWPaC 2013). Such habitats are absent from the study area.
	Vespertilionidae	*Chalinolobus picatus*	Little Pied Bat	V	V	Low	There are three records of the Little Pied Bat to the north and south of Parkes (BioNet, 2013). It occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest, and mallee and Bimbil box woodlands. It roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings (OEH, 2013a). There is potential for it to nest or roost on the study area in old growth trees with hollows, and it may potentially forage among the remnant trees.
		Nyctophilus corbeni	South-eastern Long-eared Bat	V	V	Nil	The South-eastern Long-eared Bat inhabits large areas of remnant bushland and is absent from cleared farming country. It requires trees with hollows or strips of shedding bark for roosting (OEH, 2013a). There are no records of the species close to Parkes, the nearest records being in the Hervey Range to the north east and the Nangar Range to the south east (BioNet, 2013). It is unlikely to occur on the study area.

[1] NSW *Threatened Species Conservation Act, 1995.*

[2] Commonwealth *Environment Protection and Biodiversity Conservation Act*, *1999.*

[3] NSW *Fisheries Management Act 1994.*

E Endangered; CE Critically Endangered; V Vulnerable.

METHODS

The methods used in this survey and assessment are appropriate to the highly cleared nature of the study area. They are adapted from *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC, 2004), the *BioMetric Terrestrial Biodiversity Assessment Tool* (Gibbons *et al*. (2005) and *Threatened species assessment guidelines: the assessment of significance* (DECC, 2007).

The entire study area was driven by 4WD, with closer inspection on foot, in order to determine whether there was any actual or potential habitat for threatened flora and fauna species or ecological communities.

Survey Timing and Conditions

The field survey was conducted over two days; 21 May and 26 August 2013. Prior to the May survey there had been well above average rainfall in March, although April and early May were dry (Table 4). Record rainfall fell in June 2013 and July was also well above average, such that extensive germination and growth of ground cover flora species was present for the August survey.

Table 4
Rainfall (mm) recorded at Parkes Airport in 2013
(Bureau of Meteorology Station No. 065068)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
2013	19.4	15.2	81.6	1.6	34.0	176.4	71.8	17.0
Long Term Mean	61.8	66.1	49.6	30.4	48.8	53.3	49.3	45.3

Flora Sampling

Vegetation communities

All remnant trees on the study area were identified to species in order to determine the original native vegetation communities that formerly occurred there. This approach was feasible because native forest and woodland communities are defined and named by the dominant trees in the uppermost vegetation stratum.

Grassland transects

Flora sampling methods were determined by the nature of the vegetation. The study area is cleared grazing land and it was not considered necessary to conduct full flora quadrat samples in degraded mixed exotic and native pasture. The primary objective of the flora sampling was to determine whether the pastures were dominated by native or introduced species. That is, to determine whether the ground cover is in 'good' or 'low' condition as defined by the BioMetric methodology. Ground vegetation is considered to be in 'low' condition if more than 50 percent of cover comprises introduced species, or in 'good' condition if more than 50 percent of cover is native species.

Ground cover condition was determined by sampling 13 transects (50 m long tape) in areas with the highest representations of native grass and/or herb cover (Plate 1). The samples were conducted on 26 August 2013 and distributed across the whole study area (Figure 1). At one metre intervals on each transect, the vegetation below the tape was determined and recorded as predominantly native or introduced. The percentage of native versus introduced cover was calculated from this data for each transect.

Transect 1

Transect 4

Transect 11

Transect 2

Transect 8

Transect 12

Transect 3

Transect 10

Transect 13

Plate 1. Photographs of typical grassland transects.

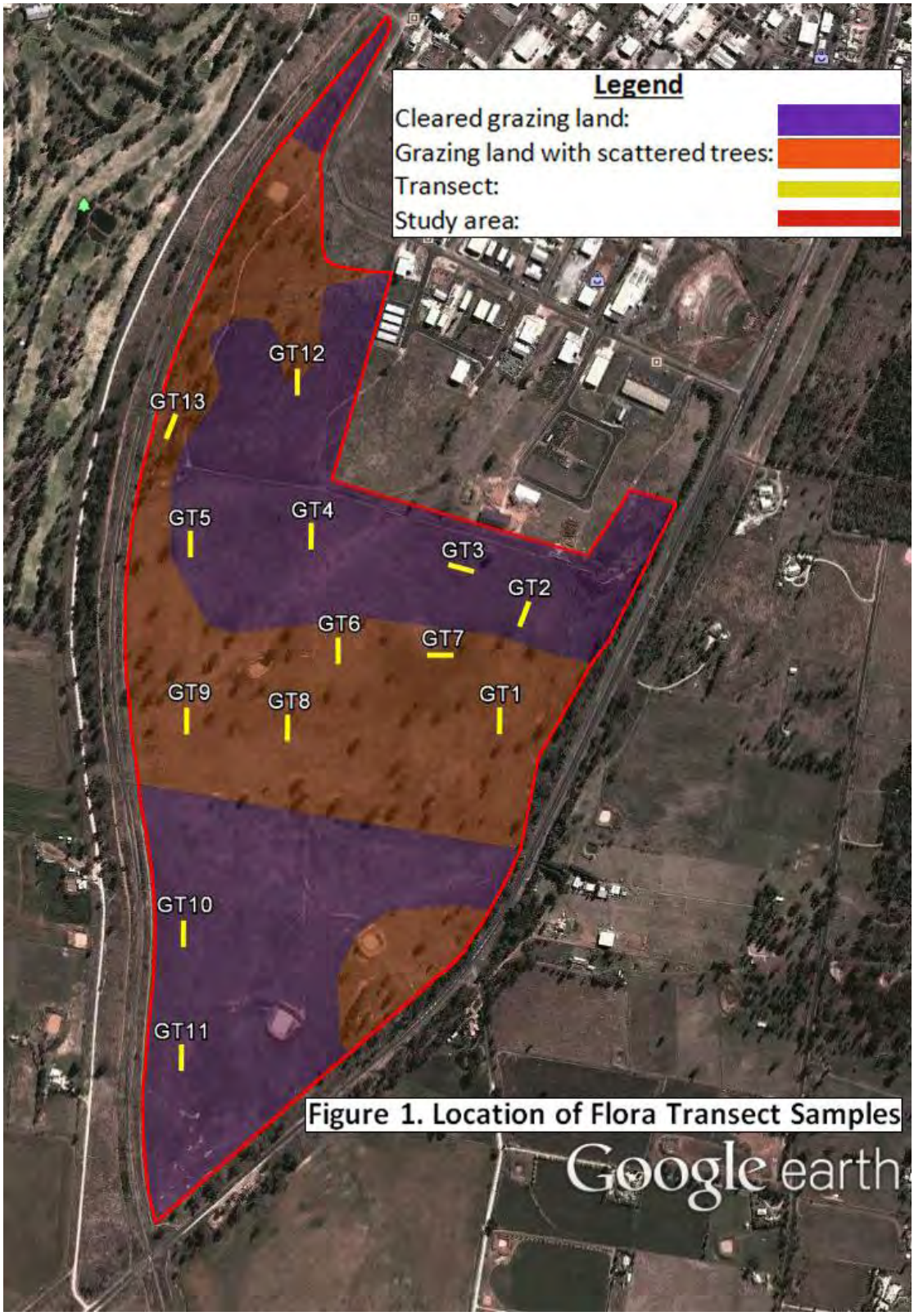

Figure 1. Location of Flora Transect Samples

Figure 2: Aerial view of land use and hollow bearing trees

In addition, a complete list of the plant species present in an area of 50 × 2 m (1 m on either side of the tape) was recorded for each transect (Appendix 1). Each species was given a rating for its relative abundance on the following scale:

Code	Descriptor
a	abundant
c	common
o	occasional
u	uncommon
r	rare

Threatened flora species

No specific targeted searches for threatened flora species were conducted owing to the highly degraded condition of the study area and lack of habitat for the Silky Swainson-pea (*Swainsona sericea*). However, the flora was examined for threatened species in the course of visits to all parts of the site for grassland transects, tree identification and fauna survey work.

Fauna Sampling

Owing to the high degree of clearing and habitat modification on the study area, the fauna survey was confined to diurnal searches, opportunistic sightings and habitat assessment on May 21 2013.

Birds

All bird species seen or heard during the survey were identified using commercially available avifauna field guides. Three point surveys were undertaken at locations considered likely to provide bird habitat.

Frogs

Optimum weather conditions for amphibian surveys that include rainfall events were not encountered, and the survey fell outside the optimum sampling period (between mid-September and February). Diurnal searches were undertaken in areas of suitable habitat over two person hours.

Herpetofauna

Searches of potential reptile habitats were conducted by hand rock rolling and lifting logs and debris.

General observations

Opportunistic sightings of fauna species and secondary indications (scats, scratches, diggings, tracks etc.) were recorded and included;

- Searches for whitewash from birds of prey
- Prey remains
- Regurgitation pellets from owls
- Fruit remains from feeding fruit doves
- Scratches on tree trunks consistent with use by arboreal mammals, and
- Characteristic scats, e.g. koala

RESULTS AND DISCUSSION

FLORA

Flora Species

A complete list of the plant species identified on the study area in August 2013 is given in Appendices A and B. A total of 64 species was recorded, of which 26 (40.6%) are native and 38 (59.4%) are introduced (Appendix B). The main plant families represented are the Poaceae (Grasses) (16 species), Asteraceae (Daisies) (10 species), Brassicaceae (Cabbage family) (4 species), Faboideae (Pea flowers) (4 species) and Myrtaceae (Eucalypts) (4 species).

Vegetation Communities

The existing vegetation on the study area can be classified into two broad vegetation types (Figure 1):

1. Cleared grazing land
2. Grazing land with scattered trees

Cleared grazing land

Approximately half the study area is completely treeless grazing land (Figure 1). The north western arm of the study area, where Grassland Transects 12 and 13 are located, is unfenced and appears to have been ungrazed for many years. The grassland in this area is tall, dense and overmature. It is heavily dominated by introduced grass species, especially Wild Oats (*Avena* spp.), Bromes (*Bromus* spp.) and Paspalum (*Paspalum dilatatum*).

The grassland areas on the rest of the study area, including the remainder of the transects (Figure 1), were being grazed by a large flock of sheep at the time of the second survey. Except for the dried tussocks of native grasses, the sheep had grazed the pasture almost to ground level (see Plate 1). Nevertheless, sufficient growth had been stimulated by above average rain in June and July to allow the dominant plants to be identified.

Apart from perennial grasses, very few native species occur in the cleared grasslands. A few grazing tolerant native herbs are present; mainly Australian Stonecrop (*Crassula sieberiana*), Yellow Buttons (*Chrysocephalum apiculatum*), an Oxalis (*Oxalis perennans*), a Fuzzweed (*Vittadinia* sp.), Swamp Dock (*Rumex brownii*) and a Bindweed (*Convolvulus graminetinus*). The most common native herb was Blue Crowfoot (*Erodium crinitum*), which was germinating and growing profusely over much of the study area, indicating that spring 2013 is a 'Crowfoot Year' when this species can dominate the pasture providing abundant fodder for stock (Cunningham *et al.* 1980). However, the seeds can penetrate sheep skin and contaminate wool (Auld and Medd 1987).

It was not possible to identify all of the native grasses to the species level as they were not flowering or seeding at the time of the survey. However, they included Purple Wire-grass (*Aristida personata*), a large Spear Grass (*Austrostipa* sp. [possibly Plains Grass, *A. aristiglumis*]), Rough Spear-grass (*Austrostipa scabra*), an unidentified Spear-grass (*Austrostipa* sp.), Umbrella Grass (*Enteropogon acicularis*), and a Wallaby Grass (*Rytidosperma* sp.).

Introduced herbs and grasses were prominent in terms of both species numbers and ground cover. The main introduced herb species were Paterson's Curse (*Echium plantagineum*), Milk Thistle (*Sonchus oleraceus*), Horehound (*Marrubium vulgare*), Flatweed (*Hypochaeris radicata*), Mouse-ear Chickweed (*Ceratium glomeratum*), Capeweed (*Arctotheca calendula*), Wild Sage (*Salvia verbenaca*), Shepherd's Purse (*Capsella bursa-pastoris*), several clover species (*Trifolium* spp.) and several Medic species (*Medicago* spp.). Introduced grasses included mainly Stinkgrass (*Eragrostis cilianensis*),

Wimmera Ryegrass (*Lolium rigidum*), Perennial Ryegrass (*Lolium perenne*) and Rats Tail Fescues (*Vulpia* spp.).

Grazing land with scattered trees

Scattered remnant native trees occur across about half the study area (Figures 1 and 2). The following species are present:

- White Box (*Eucalyptus albens*)
- Yellow Box (*Eucalyptus melliodora*)
- Inland Grey Box (*Eucalyptus microcarpa*)
- Fuzzy Box (*Eucalyptus conica*)
- White Cypress Pine (*Callitris glaucophylla*)

White Box dominates on the higher parts of the study area, while Yellow Box and Inland Grey Box are more common on the lower slopes and the drainage line in the north west corner. Fuzzy Box is confined to the patch of trees on the north west drainage line. Tall shrubs are absent, although the grazing tolerant low native shrubs, Eastern Cotton Bush (*Maireana microphylla*) and Smooth Senna (*Senna barclayana*) occur sporadically across the whole study area.

The ground cover composition of the pasture with scattered trees is similar to the areas without trees (Appendix A).

Pre-European Vegetation Types

The remnant eucalypts on the study area are all species of native Box trees indicating the original vegetation across the whole study area comprised Box Woodlands. Woodlands dominated by Box trees generally occur on soils suitable for agriculture which is reflected in the fact that the study area has been cleared of nearly all of its original vegetation cover. The study area Box trees are all indicator species for one or other of three different ecological communities, all of which are listed as endangered under the TSC Act, and two are also listed as endangered under the EPBC Act, as follows;

- *White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community* (Box-Gum Woodland). [The community is also listed under the EPBC Act as the *White Box-Yellow Box-Blakely's Red Gum grassy woodlands and derived native grasslands Critically Endangered Ecological Community*.]

- *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions Endangered Ecological Community* Inland Grey Box Woodland). [The community is also listed under the EPBC Act as the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of Eastern Australia Endangered Ecological Community.*]

- *Fuzzy Box on alluvials of the South West Slopes, Darling Riverine Plains and the Brigalow Belt South Bioregions Endangered Ecological Community* (Fuzzy Box Woodland).

Accordingly, the remnant native vegetation on the study area is potentially part of the three above Endangered Ecological Communities (EECs) and may require assessment under the TSC and EPBC Acts. In addition to the areas with remnant Box trees, the wholly cleared grassland areas may also be part of two of the EECs, since the Commonwealth listing includes 'derived grasslands', i.e. native grasslands that result from the clearing of the Box Woodland tree cover.

Whether or not the remnant native vegetation on the study area is part of the above listed Endangered Ecological Communities (EECs) depends on the current condition of the vegetation, which is covered in the next section.

Vegetation Condition

The condition of the ground cover vegetation on the study area was assessed with 13 ground cover transects adapted from the BioMetric methodology (Gibbons *et al*. 2005). The estimated cover by native grasses, native shrubs (<1m high), native forbs and exotic plants is given in Table 5. In order to ensure that areas with the highest potential for native plant diversity were examined, the transects were conducted in areas with the highest visual presence of native grasses or herbs.

Table 5
Percentage of Ground Cover Comprising Native and Introduced Species

Transect No.	Native grasses	Native shrubs	Native forbs	Exotic plants
Cleared grazing land				
2	16	0	14	70
3	40	0	34	26
4	40	0	8	52
5	34	0	12	54
10	32	0	20	48
11	28	0	18	54
12	10	0	0	90
Total	200	0	106	394
Mean	28.6	0	15.1	56.3
Grazing land with scattered trees				
1	28	0	4	68
6	28	2	4	66
7	0	0	92	8
8	38	4	4	54
9	14	0	0	86
13	36	0	2	60
Total	144	6	106	342
Mean	24.0	1.0	17.7	57.0
OVERALL TOTAL	344	6	212	736
OVERALL MEAN	26.5	0.5	16.3	56.6

The average results were very similar between areas with remnant trees and those without trees (Table 5). Accordingly, the following discussion considers the results across the whole study area.

Native grass cover percentages varied from 0 to 40 percent, while native forb cover varied more widely from 0 to 92 percent (Table 5). The highest levels of native forb cover were all related to the prolific growth of Blue Crowfoot (*Erodium crinitum*) (Plate 2). Consequently, the relatively high levels of native forbs on some transects are due to one resilient species that shows eruptive growth in certain seasons. The record rainfall in June 2013 (Table 4) is responsible for this phenomenon. Without Blue Crowfoot native forb cover levels would have been very low throughout the study area.

Exotic species dominated on most transects, ranging from 8 to 86 percent cover (Table 5). Low cover of exotic species occurred on transects where Blue Crowfoot was abundant, e.g. transects 3 and 7. On all except three transects the cover by exotic species exceeded 50 percent and the average

across all 13 transects was 56.6 percent. Without the Blue Crowfoot eruption the percentage of exotic cover would undoubtedly have been higher.

Plate 2. Hilltop in the centre north of the study area (near transect 7) showing a carpet of Blue Crowfoot (*Erodium crinitum*).

However, even with the elevated levels of native forb cover provided by Blue Crowfoot, the transect data indicates the ground cover is in 'low' condition, with less than 50 percent native cover, even on those parts of the study area with the highest visible levels of native grass cover. If the transects had been distributed randomly, the native cover levels would have been significantly lower. Accordingly, it is clear that the vegetation condition throughout the study area is 'low' reflecting the long history of grazing over the whole site and likely former cropping across the lower paddocks.

Threatened Flora Species

No flora species listed as threatened under the TSC or EPBC Acts (Table 2) was recorded by the surveys.

Threatened Ecological Communities

Remnants of three threatened ecological communities occur on the study area; Box-Gum Woodland, Inland Grey Box Woodland and possibly Fuzzy Box Woodland. However, the remnant Box trees have been thinned out to very low densities, the former tall shrub layers have been completely eliminated, the ground cover is in 'low' condition and the diversity of native forbs is very low. Table 6 determines whether the condition of the vegetation on the study area meets the State or Commonwealth guidelines for acceptance as part of the Box-Gum Woodland EEC (NSW) (NPWS 2002) or CEEC (Commonwealth) (DEH 2006). Of the eight criteria in Table 6 for establishing a remnant as part of the Box-Gum Woodland EEC/CEEC, the vegetation on the study area conforms to only two criteria under each jurisdiction.

Accordingly, it is clear that the remnant native vegetation on the study area is too degraded to be regarded as part of any of the three threatened ecological communities under either the TSC or EPBC Acts. Consequently, there is no requirement to avoid, mitigate or offset for removal of this vegetation, and no need to formally assess the impact of such removal in this report.

Table 6.
Agreement of Study Area Vegetation with Identification Criteria for Box-Gum Woodland Remnants Protected under the TSC and EPBC Acts.

Category	TSC Act		EPBC Act	
	Criterion	Conforms?	Criterion	Conforms?
Native understorey	Any native species present [The NSW BioBanking condition criterion is the same as under the EPBC Act and is used here.]	No	Predominantly native ground cover defined as 'at least 50 percent of the perennial vegetation cover in the ground layer is made up of native species'.	No
Resilience	Site is 'likely to respond to assisted natural regeneration'	No	NA	-
Trees	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes
Ground cover	Predominantly grassy (native not introduced grasses)	No	Native tussock grasses and herbs, and a sparse, scattered shrub layer.	No
Shrubs	'Shrubs are generally sparse or absent, though they may be locally common.' 'Shrubby woodlands, which generally occur in upper or midslope situations on shallower soils, are not part of the EEC'.	Yes	Patches with 'a continuous shrub layer of more than 30 percent cover' are excluded from the CEEC.	Yes
Important species	NA	-	Twelve or more native (non grass) understorey species present, including at least one 'important' species.	No
Disturbance	Natural soil and associated seed bank are still or at least partially intact.	No	Site is still the CEEC even if treeless, provided it has 'an intact native ground layer with a high diversity of native plant species'.	No
Size	Not important	-	At least 0.1 ha with more than 12 native understorey species (not grasses) OR greater than 2 ha with an average of 20+ trees per ha, or active tree regeneration.	No

FAUNA

Habitat Resources

The site supports two broad habitat types being grassland and open woodland. These habitat types are relatively well represented within the locality and discussed below.

Grassland

Grassland occupies a large section of the site and includes dam bank habitat.

When present, canopy species such as *Callitris* or *Eucalypt* provide seasonal foraging resources for nectarivorous birds and mammals. The variety of tree species would provide suitable feeding/foraging resources for folivorous fauna species such as the brushtail possum and insectivorous birds such as treecreepers.

The groundcover species of grasses and herbivorous species would provide stem and seed resources for herbivorous and granivorous fauna species.

The low occurrence of fallen timber and scattered rock habitat provides limited shelter areas for small ground-dwelling mammals and reptiles. The disturbed grassland does not support any hollow bearing trees or large tracts of woodland.

A minor area of sedgeland and rushland associated with two dams on site provides suitable habitat for granivorous and herbivorous species. The remaining dams on site do not support permanent instream vegetation or snags. Habitat is available for frogs and other riparian fauna within three of the five dams on site containing water.

Open Woodland

The myrtaceous tree species in the canopy would provide seasonal foraging resources for nectarivorous birds and mammals when flowering.

A high number of hollow-bearing trees concentrated along the western boundary of the site (refer to Figure 2 and Table 8).

The grasses within the groundcover provide suitable seed and stem resources for granivorous and herbivorous species.

The fallen timber, leaf litter and scattered rocks in open woodland provide shelter resources for small ground-dwelling mammals and reptiles.

Birds

A total of 36 bird species was recorded on the study area of which 34 are native and two are introduced (Appendix C). All are common species found in farmland with scattered trees or small woodlots. Some of the birds observed in this survey can be considered year round residents of the study area, although many are likely to range more widely with the study area being part of their home range. Others, including the Rufous Whistler, Rufous Songlark and Silvereye are nomadic or migratory species that spend only part of their lives in the region.

Mammals, Reptiles and Frogs

The mammals, reptiles and frogs observed in the survey are listed in Table 7. One native mammal was recorded during the survey. A mob of approximately 6 Eastern Grey Kangaroos was observed in the unfenced grassland in the north west of the study area. Four introduced mammals were recorded in this survey, domestic sheep, the European Hare, Rabbit and Red Fox (Table 7). Four common native reptiles were recorded; Robust Ctenotus, Tree Skink, Shingleback and Lace Monitor.

Table 7
Mammals, Reptiles and Frogs Recorded on the Study Area

Scientific Name	Common Name	Comment
MAMMALIA - Marsupialia/Diprotodontia		
Macropodidae		
Macropus giganteus	Eastern Grey Kangaroo	A small mob in the unfenced areas.
Eutheria/Ruminantia		
Bovidae		
***Ovis aries*	Sheep	
Eutheria/Carnivora		
Canidae		
**Vulpes Vulpes*	Red Fox	
Eutheria/Lagomorpha		
Leporidae		
**Lepus timidus*	European Hare	
**Oryctolagus caniculus*	Rabbit	
AMPHIBIA - Anura		
Hylidae		
Litoria peronii	Peron's Tree Frog	
Limnodynastidae		
Limnodynastes tasmaniensis	Spotted Grass Frog	
Myobatrachidae		
Crinia signifera	Common Eastern Froglet	
REPTILIA – Squamata/Sauria		
Scincidae		
Ctenotus robustus	Robust Ctenotus	
Egernia striolata	Tree Skink	
Tiliqua rugosa	Shingleback	
Varanidae		
Varanus varius	Lace Monitor	

* Introduced species

Good rainfall in the first quarter of 2013 filled the farm dams, providing habitat for native amphibians. Three common species of native frogs were calling during the survey; Peron's Tree Frog, the Spotted Grass Frog and the Common Eastern Froglet.

Habitat Trees

Twenty two of the remnant eucalypt trees on the study area bore hollows suitable for wildlife. The locations of hollow bearing trees are given in Figure 2 and their characteristics are detailed in Table 8. These trees have the potential to provide dens for shelter and breeding of a range of native mammal, bat and bird species.

Table 8
Hollow Bearing Trees

Identifier	Species	No. Hollows	Size (cm)	Occupancy	DBH
1	*Eucalyptus microcarpa*	2	10-20	-	0.8
2	stag	multiple	5-10, 10-20	-	0.8
3	*Eucalyptus melliodora*	multiple	10-20	-	1.1
4	*Eucalyptus microcarpa*	multiple	5-10, 10-20, 20-30	-	1
5	*Eucalyptus microcarpa*	multiple	5-10	-	0.8
6	*Eucalyptus microcarpa*	multiple	10	-	0.7
7	*Eucalyptus microcarpa*	multiple	10	-	0.6
8	*Eucalyptus microcarpa*	multiple	10	-	0.6
9	*Eucalyptus albens*	3	10	-	0.6
10	*Eucalyptus melliodora*	multiple	10	-	0.8
11	*Eucalyptus melliodora*	multiple	10-15	-	0.6
12	*Eucalyptus melliodora*	3	10	-	0.7
13	*Eucalyptus microcarpa*	multiple	10-20	-	0.6
14	Stag	multiple	5-10, 10-15	-	0.6
15	*Eucalyptus albens*	multiple	10-15	galah	0.5
16	*Eucalyptus melliodora*	multiple	10-20	-	0.6
17	*Eucalyptus microcarpa*	multiple	5-10	-	0.4
18	*Eucalyptus albens*	multiple	10-20	-	0.6
19	*Eucalyptus microcarpa*	1	20	-	0.6
20	*Eucalyptus albens*	2	10	-	0.5
21	Stag	multiple	5-10	-	0.4
22	*Eucalyptus albens*	multiple	10-15	-	0.7

Threatened Fauna Species

No threatened fauna species were detected on the study area by the survey.

SEPP 44 Koala Habitat Assessment

The flora survey detected on tree koala feed tree, White Box (*Eucalyptus albens*) listed under Schedule 2 of SEPP 44. White Box may occupy over 15 percent of the tree canopy on the study area. However, there is no recent koala sighting closer than 4 km to the study area (BioNet 2013). In addition, searches for signs of koala activity revealed no poc marks, scats or individuals on the study area. Accordingly, there is no evidence of a breeding koala population, the study area is not core koala habitat and a SEPP 44 Plan of Management is not required.

IMPACT ASSESSMENT

This section provides an assessment of the impacts of the proposed project on threatened flora based on the preceding survey findings. The assessment is conducted in accordance with Section 5A of the NSW *Environmental Planning and Assessment Act (1979)* (EP&A Act). This requires the application of the Seven Part Test based on *The Threatened Species Assessment Guideline – The Assessment of Significance* (DECC, 2007). The guideline identifies factors that must be considered when assessing potential impacts on threatened species, populations, or ecological communities, or their habitats, for development applications. To determine whether Project impacts are likely to have a significant effect on threatened flora, the following seven assessment criteria are evaluated (DECC, 2007):

(a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

(b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.*

(c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

  (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

  (ii) *is likely to substantially and adversely modify the composition of the ecological* community such that its local occurrence is likely to be placed at risk of extinction,

(d) *In relation to the habitat of a threatened species, population or ecological community:*

  (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

  (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

  (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

(e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*

(f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*

(g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Biodiversity Requiring Assessment

Threatened Flora species

The study area is likely to have previously supported populations of the Silky Swainson-pea (Table 2). However, over 150 years of intensive agriculture and grazing has eliminated the Silky Swainson-pea and all but a few resilient native plant species. No Silky Swainson-pea plants were observed during the surveys and suitable habitat for it is lacking. Consequently, the Silky Swainson-pea does not require an impact assessment for this site.

Threatened Ecological Communities

The study area formerly supported three threatened ecological communities (Table 1). These communities have lost almost all of their original biodiversity, are highly degraded, would not be able to recover through assisted natural regeneration and do not meet the guidelines for recognition as part of the listed EECs or CEEC (Table 6). Accordingly, an assessment of the impact of vegetation removal on the three threatened ecological communities is not required.

Threatened Fauna

Table 3 analyses the potential for threatened fauna species to utilise the study area. This analysis concluded there were 13 arboreal fauna species that may occasionally visit the study area to feed. All but one, a microbat, are birds that move through the landscape as nomads or seasonal migrants. Only one, the Superb Parrot, has potential for breeding on the area. Table 9 lists these species and indicates how they may use the study area. These species are subjected to an assessment of impact below.

Table 9
Threatened Fauna Species that may Utilise the Study Area

Species	Breed	Forage
Spotted Harrier		Predator
Little Eagle		Predator
Grey Falcon		Predator
Black Falcon		Predator
Little Lorikeet	✓ (tree hollows)	Nectar
Swift Parrot		Nectar
Superb Parrot	✓ (tree hollows)	Grass and shrub seeds
Barking Owl	✓ (tree hollows)	Predator
Regent Honeyeater		Nectar
Scarlet Robin		Insectivore
Flame Robin		Insectivore
Diamond Firetail		Grass seeds
Little Pied Bat	✓ (tree hollows)	Insectivore

Factors of Assessment

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The thirteen threatened fauna species have potential to forage on the study area, and four have some potential to breed there (Table 9). The main potential impact of conversion of the subject land to an industrial estate may be a reduction in available food resources for visiting threatened fauna. The main potential food resources that may be affected are nectar from flowering eucalypts, prey such as mice and rabbits from grazing paddocks and seeds from native grasses. However, no individuals of these species would be able to glean all their food requirements from the study area which lacks the size and diversity to support any of the species all year round. Consequently, visits to the area would be temporary and confined to limited periods when food resources are available, e.g. during a mouse plague, or when eucalypts are flowering.

Since none of the migratory or nomadic species is known or likely to depend on the study area for maintaining an existing viable population, it is highly unlikely that a future development could put such a population at risk. Rather, the study area would most likely function as a minor occasional supplementary source of food. While this is obviously useful, it is not likely to be critical to the survival of populations of these species, which depend on the availability of food over a wide area. Local populations of such migratory and nomadic species may encompass very large areas. Their success is often more dependent on climatic conditions than the availability of resources at a point source.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered

population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. As at May 2013, no Endangered Populations have been declared for any of these species in the Lachlan CMA area (NSW Scientific Committee, 2013).

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

***(ii) is likely to substantially and adversely modify the composition of the ecological* community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The study area lacks high quality native bushland or prime breeding habitat for all 13 threatened species, with the possible exceptions of the four hollow-nesting species. However, there is no known breeding population of any of the four on the study area. Two of the hollow nesting species are quite conspicuous and would have been detected by the survey had they been present. However, one of these, the Little Lorikeet, is a highly nomadic species which may occur only sporadically. The other two species, the Barking Owl and the Little Pied Bat, are nocturnal and difficult to detect. Consequently, whether or not they are present or absent is less certain. Accordingly, proposed future development of the study area may remove nesting and/or roosting habitat for the latter two species, if they are present. However, removal of a small amount of nesting habitat is unlikely to be critical to the long term survival of the species, even though it would result in a small decline in overall resources and may affect a small number of individuals.

In the event that tree hollows on the study are occupied, it will be important to have the removal of trees supervised by a wildlife expert so that appropriate care can be given to any fauna individuals directly affected. It would also be important to relocate trees and stags with hollows to areas where they can continue to provide denning and nesting opportunities for wildlife.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitat, as defined by the TSC Act or the EPBC Act, has not been declared for any of the subject species on the NSW Critical Habitat register (OEH, 2013b) or the Commonwealth Register of Critical Habitat (SEWPaC, 2013d) in the study area or surrounds.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Recovery plans have been prepared only for the Swift Parrot (Swift Parrot Recovery Team, 2001) and Regent Honeyeater (Menkhorst *et al.,* 1999). On ground recovery actions are listed, among many other recommendations, for the 13 species in their profiles on the threatened species pages of the NSW OEH website (OEH, 2013a) summarised as follows;

Action	Spotted Harrier	Little Eagle	Grey Falcon	Black Falcon	Little Lorikeet	Swift Parrot	Superb Parrot	Barking Owl	Regent Honeyeater	Scarlet Robin[1]	Flame Robin	Diamond Firetail	Little Pied Bat
Raise awareness about poisoning of non-target species from baiting and rodenticides.	✓		✓	✓									
Encourage retention of intact foraging and breeding habitat through PVP process.	✓		✓	✓									
Protect areas of habitat from overgrazing			✓	✓				✓					
Protect known populations and areas of potential habitat from clearing, fragmentation or disturbance, including grazing		✓						✓		✓			
Retain and protect nesting, roosting and foraging habitat, including standing dead trees, hollow bearing trees, feeding trees		✓		✓				✓	✓	✓			
Buffer or fence habitat areas from the impacts of other activities		✓						✓		✓			
Rehabilitate known and potential habitat, increase remnant size		✓							✓	✓			
Develop management strategies for water flow regimes to protect riparian areas.			✓										
Ensure implementation of management strategies that reduce disturbance of riparian areas.			✓										
Address the threat of illegal collection by establishing sand plots, cameras, etc to record the presence of thieves at suspected sites.			✓										
Protect all located nest trees and establish a program to monitor reproduction at each nest site (via landholders).			✓	✓									
Protect and monitor known nest sites.				✓									
Protect old stick nests (e.g., those of corvids and raptors) that have the potential to be used as nest sites.				✓									
Protect and facilitate the recruitment of large old trees, a resource that is critical for nesting and hunting.				✓									
Encourage retention of old-growth and hollow-bearing trees through community engagement and other mechanisms including PVPs, BioBanking and EIA.					✓								
Avoid burning woodland with old-growth and hollow-bearing trees.					✓								
Identify and map the extent and quality of foraging and roosting habitat on private and public land.						✓	✓						
Protect, manage and restore habitat on private land through conservation agreements, management agreements and incentive payments.						✓	✓						
Reduce collisions in areas where birds are foraging by closing window blinds etc.						✓							
Retain stands of preferred feed-trees, particularly large mature individuals and mistletoe						✓			✓				
Revegetate with preferred feeding tree species						✓							
Participate in surveys to locate the winter foraging areas						✓							
Local Councils must give consideration to nesting and foraging habitat within their LEPs							✓						
Ensure that forestry prescriptions and harvesting plans provided effective protection from direct and indirect impacts to nest sites, including buffers for							✓						

Action	Spotted Harrier	Little Eagle	Grey Falcon	Black Falcon	Little Lorikeet	Swift Parrot	Superb Parrot	Barking Owl	Regent Honeyeater	Scarlet Robin[1]	Flame Robin	Diamond Firetail	Little Pied Bat
all nest trees and protection from planned burns													
Encourage landholders/managers to remove or reduce grazing in known Box-Gum Woodland foraging habitat using incentives							✓						
Apply mosaic pattern hazard reduction techniques								✓					
Retain and enhance vegetation along watercourses and surrounds, remove stock			✓					✓	✓				
Maintain a captive population									✓				
Use incentives on private land to encourage landholders to manage key areas			✓						✓				
No further loss of woodland and forest habitat from development							✓		✓				
Conduct research into non-breeding habitat and long distance movements						✓	✓		✓				
Investigate impacts of interspecific competition and nest predation									✓				
Retain dead timber on the ground in open forests and woodlands							✓			✓	✓		
Avoid exotic berry-producing shrubs to minimise predation by Currawongs										✓	✓		
Control domestic cats near habitat										✓			
Implement a cool patch burning regime in appropriate habitat and appropriate fire management practices.											✓		
Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.												✓	
Conduct annual monitoring of key populations that are managed under property agreements or are within OEH estate, conservation reserves, council reserves and crown reserves.												✓	
Implement sympathetic habitat mangement in OEH estate, conservation reserves, council reserves and crown reserves where the Diamond Firetail occurs.												✓	
Ensure the largest hollow bearing trees and standing dead trees (inc. small dead trees such as mulga, gidgee, leopardwood) are given highest priority for retention in PVP assessments or other land assessment tools.													✓
Identify areas of private land that contain high densities of trees with hollows and dead standing trees as areas of high conservation value for planning and land management instruments.													✓

Potential future developments on the study area may be counter to some of the above 42 recovery actions, particularly those related to habitat clearing or tree loss. The impacts of such clearing would be slight, given that none of the threatened fauna species under consideration is known or likely to have a permanent local population on the study area. Accordingly, the main likely impact of clearing vegetation would be a slight reduction in potential foraging habitat for migratory or nomadic species, for which similar habitat occurs widely in the surrounding region.

The loss of hollow-bearing trees would reduce potential nesting and denning resources for wildlife overall, including four of the threatened fauna species under consideration here. It takes at least 80 to 100 years for eucalypts to develop hollows suitable for larger arboreal mammals and birds. Hollows are used not only by some threatened species, but also many common species that characterise the Australian landscape. It would therefore be desirable to minimise the loss of hollow-bearing trees from the site, or, if it is unavoidable, to relocate the trees to reserves or other areas where they can continue to provide wildlife habitat.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes that may be relevant to future developments on the study area include:

- Clearing of native vegetation,
- Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*), and
- Removal of dead wood and dead trees

No naturally occurring vegetation in good condition remains on the study area relative to pristine habitat, owing to past land uses. However, clearing of remnant old growth, hollow-bearing Box trees would occur as part of the development, as would the removal of dead stags.

Future development is likely to decrease potential habitat for rabbits rather than increasing it.

Consequently, future developments on the study area would slightly increase the impact of the first and last key threatening processes.

Conclusion.

It is concluded that proposed future developments on the study area would not significantly affect local populations of the 13 threatened fauna species under consideration here. None are known to have local populations that include the study area. However, there is a small potential that breeding habitat for four of the species, Little Lorikeet, Superb Parrot, Barking Owl and Little Pied Bat occurs on the study area. Loss of this habitat may result in a small reduction in overall breeding resources for these species, but is unlikely to be critical to species survival in the long term. In addition, future developments that affect food resources for the 13 threatened fauna species may result in a slight decrease in the foraging habitat available regionally.

EPBC Act

No matters requiring referral to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities relating to Commonwealth listed threatened species and ecological communities, migratory species or wetlands of international importance, were revealed by this study.

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APPENDICES A and B

FLORA SPECIES LISTS

LEGEND:

Letter codes in Transect columns are:

a – abundant

c – common

o – occasional

u – uncommon

r – rare

Presence of a species is recorded with a dot in samples that were not rated for abundance.

Introduced species are preceded by an asterisk.

Appendix A
Flora Species and their Relative Abundance on Thirteen Grassland Transects

Scientific Name	Transect No. / Common Name	GT1	GT2	GT3	GT4	GT5	GT6	GT7	GT8	GT9	GT10	GT11	GT12	GT13
CLASS CONIFEROPSIDA														
Cupressaceae														
Callitris glaucophylla	White Cypress Pine													u
CLASS MAGNOLIOPSIDA														
SUBCLASS MAGNOLIIDAE														
Asteraceae														
**Arctotheca calendula*	Capeweed		o						u		c	c		
**Carthamus lanatus*	Saffron Thistle	c					u				u	u	u	
**Chondrilla juncea*	Skeleton Weed	c										a		
Chrysocephalum apiculatum	Yellow Buttons			o					u		o	o		
**Cirsium vulgare*	Spear Thistle				r	o	u							u
**Conyza* sp.					u									
**Hypochaeris radicata*	Catsear		o		u									
**Sonchus asper*	Prickly Sowthistle		u											
**Sonchus oleraceus*	Common Sowthistle	u	o		u	u	u		u	u				
Vittadinia sp.		u												
Boraginaceae														
**Echium plantagineum*	Paterson's Curse	c	c	o	a	a	c	o	a	a	a	a	c	c
Brassicaceae														
**Capsella bursa-pastoris*	Shepherd's Purse		r			o		u						
**Erophila verna*	Whitlow Grass	r												
**Rapistrum rugosum*	Turnip Weed	o												
**Sisymbrium* sp.			r			o								o
Caryophyllaceae														
**Cerastium glomeratum*	Mouse-ear Chickweed	a	o	c	c				o	c		c		
Chenopodiaceae														
Einadia nutans subsp. *linifolia*														u
Maireana microphylla	Eastern Cottonbush		u	u		u			u					u
Sclerolaena muricata	Black Rolypoly													r
Convolvulaceae														
Convolvulus graminetinus				r										

Scientific Name	Transect No. / Common Name	GT1	GT2	GT3	GT4	GT5	GT6	GT7	GT8	GT9	GT10	GT11	GT12	GT13
Crassulaceae														
Crassula sieberiana	Australian Stonecrop	a	a	c	u						o	c		
Fabaceae: Caesalpinioideae														
Senna barclayana	Smooth Senna		u				o		o	o		u		
Fabaceae: Faboideae														
**Medicago* sp.		a	a	c			u		c	a	c	o	o	c
**Trifolium arvense*	Haresfoot Clover		o			o								
**Trifolium* sp.		a	a				a							
**Trifolium subterraneum*	Subterranean Clover				c	o				u	u			
Fumariaceae														
**Fumaria bastardii*	Bastards Fumitory									r				
**Fumaria densiflora*	Narrow-leaved Fumitory										c			
Geraniaceae														
**Erodium cicutarium*	Common Storksbill	c	c			c	a		o					
Erodium crinitum	Blue Storksbill	u	c	a	c	c	a	aa	c		a	c		o
Lamiaceae														
**Lamium amplexicaule*	Dead Nettle					u								
**Marrubium vulgare*	White Horehound	o	o	u	u	o	o	o	c				c	c
**Salvia verbenaca*	Vervain	a	u	u					u		o	o		
Malvaceae														
**Malva parviflora*	Small-flowered Mallow													u
**Modiola caroliniana*	Red-flowered Mallow									o				
**Sida rhombifolia*	Paddy's Lucerne									r				
Myrtaceae														
Eucalyptus conica	Fuzzy Box													1
Eucalyptus melliodora	Yellow Box													1
Nyctaginaceae														
Boerhavia dominii	Tarvine	u												
Oxalidaceae														
Oxalis perennans		u			r	u	c		u	u			c	
Plantaginaceae														
Veronica sp.		r												
Polygonaceae														
**Polygonum aviculare*	Wireweed			r										

Scientific Name	Transect No. / Common Name	GT1	GT2	GT3	GT4	GT5	GT6	GT7	GT8	GT9	GT10	GT11	GT12	GT13
Rumex brownii	Swamp Dock		u			u	o						o	
Rosaceae														
**Aphanes arvensis*	Parsley-piert	u		u			u							
SUBCLASS LILIIDAE														
Asphodelaceae														
**Asphodelus fistulosus*	Onion Weed		r											
Iridaceae														
**Romulea rosea*	Onion Grass				r						u		o	
Poaceae														
Aristida personata	Purple Wire-grass	u	c	u		c		o	o	a				
Austrostipa scabra	Speargrass	u									o		c	
Austrostipa sp.	(Medium heads)	a	r	a	a	c	a		a			o		o
Austrostipa sp.	(Large Heads)						c							
Austrostipa verticillata	Slender Bamboo Grass												o	o
**Avena fatua*	Wild Oats												aa	
**Bromus catharticus*	Prairie Grass													c
**Bromus diandrus*	Great Brome												o	
Elymus scaber	Wheat Grass									o			u	o
Enteropogon acicularis	Umbrella Grass	o	c	a	o		o		u	a	o	c		c
**Eragrostis cilianensis*	Stinkgrass	u					c		o	u	a	c		
**Eragrostis curvula*	African Lovegrass		u				r							
**Hordeum leporinum*	Barley Grass					c	o							
**Lolium* sp.	Ryegrass	c	c					c	o				o	c
Rytidosperma sp.	Wallaby Grass				c	c			c		a	c		
**Vulpia* sp.	A Rats Tail Fescue	a	a	a	a	a	a		a	a		a		

* Introduced Species

No. Native Species	24
No. Introduced Species	39
Total Species	63

Appendix B
Total Flora Species Listed According to Vegetation Type -
[Grazing Land with Scattered Trees versus Cleared Grazing Land]

Scientific Name	Vegetation Type Common Name	Trees	No trees
CLASS CONIFEROPSIDA			
Cupressaceae			
Callitris glaucophylla	White Cypress Pine	●	
CLASS MAGNOLIOPSIDA			
SUBCLASS MAGNOLIIDAE			
Asteraceae			
**Arctotheca calendula*	Capeweed	●	●
**Carthamus lanatus*	Saffron Thistle	●	●
**Chondrilla juncea*	Skeleton Weed	●	●
Chrysocephalum apiculatum	Yellow Buttons	●	●
**Cirsium vulgare*	Spear Thistle	●	●
**Conyza* sp.			●
**Hypochaeris radicata*	Catsear		●
**Sonchus asper*	Prickly Sowthistle		●
**Sonchus oleraceus*	Common Sowthistle	●	●
Vittadinia sp.		●	
Boraginaceae			
**Echium plantagineum*	Paterson's Curse	●	●
Brassicaceae			
**Capsella bursa-pastoris*	Shepherd's Purse	●	●
**Erophila verna*	Whitlow Grass	●	
**Rapistrum rugosum*	Turnip Weed	●	
**Sisymbrium* sp.		●	●
Caryophyllaceae			
**Cerastium glomeratum*	Mouse-ear Chickweed	●	●
Chenopodiaceae			
Einadia nutans subsp. *linifolia*		●	
Maireana microphylla	Small-leaf Bluebush	●	●
Sclerolaena muricata	Black Rolypoly	●	
Convolvulaceae			
Convolvulus graminetinus			●
Crassulaceae			
Crassula sieberiana	Australian Stonecrop	●	●
Fabaceae: Caesalpinioideae			
Senna barclayana	Smooth Senna	●	●
Fabaceae: Faboideae			
**Medicago* sp.		●	●
**Trifolium arvense*	Haresfoot Clover		●
**Trifolium* sp.		●	●
**Trifolium subterraneum*	Subterranean Clover	●	●
Fumariaceae			
**Fumaria bastardii*	Bastards Fumitory	●	
**Fumaria densiflora*	Narrow-leaved Fumitory		●
Geraniaceae			
**Erodium cicutarium*	Common Storksbill	●	●
Erodium crinitum	Blue Storksbill	●	●
Lamiaceae			
**Lamium amplexicaule*	Dead Nettle		●
**Marrubium vulgare*	White Horehound	●	●
**Salvia verbenaca*	Vervain	●	●

Scientific Name	Vegetation Type / Common Name	Trees	No trees
Malvaceae			
**Malva parviflora*	Small-flowered Mallow	●	
**Modiola caroliniana*	Red-flowered Mallow	●	
**Sida rhombifolia*	Paddy's Lucerne	●	
Myrtaceae			
Eucalyptus albens	White Box	●	
Eucalyptus conica	Fuzzy Box	●	
Eucalyptus melliodora	Yellow Box	●	
Eucalyptus microcarpa	Inland Grey Box	●	
Nyctaginaceae			
Boerhavia dominii	Tarvine	●	
Oxalidaceae			
Oxalis perennans		●	●
Plantaginaceae			
Veronica sp.		●	
Polygonaceae			
**Polygonum aviculare*	Wireweed		●
Rumex brownii	Swamp Dock	●	●
Rosaceae			
**Aphanes arvensis*	Parsley-piert	●	●
SUBCLASS LILIIDAE			
Asphodelaceae			
**Asphodelus fistulosus*	Onion Weed		●
Iridaceae			
**Romulea rosea*	Onion Grass		●
Poaceae			
Aristida personata	Purple Wire-grass	●	●
Austrostipa scabra	Speargrass	●	●
Austrostipa sp.		●	●
Austrostipa sp.	Large Heads	●	
Austrostipa verticillata	Slender Bamboo Grass	●	●
**Avena fatua*	Wild Oats		●
**Bromus catharticus*	Prairie Grass	●	
**Bromus diandrus*	Great Brome		●
Elymus scaber		●	●
Enteropogon acicularis		●	●
**Eragrostis cilianensis*	Stinkgrass	●	●
**Eragrostis curvula*	African Lovegrass	●	●
**Hordeum leporinum*	Barley Grass	●	●
**Lolium* sp.		●	●
Rytidosperma sp.		●	●
**Vulpia* sp.		●	●

* Introduced Species

No. Native Species	26	25	15
No. Introduced Species	38	28	32
Total Species	64	53	47

APPENDIX C

BIRD SPECIES LIST

Introduced species are preceded by an asterisk.

APPENDIX C

BIRD SPECIES LIST

Scientific Name	Common Name
Ocyphaps lophotes	Crested Pigeon
Coturnix ypsilophora	Brown Quail
Cacatua galerita	Sulphur-crested Cockatoo
Eolophus roseicapilla	Galah
Dacelo novaeguineae	Laughing Kookaburra
Gymnorhina tibicen	Australian Magpie
Hirundo neoxena	Welcome Swallow
Platycercus eximius	Eastern Rosella
Psephotus haematonotus	Red-rumped Parrot
Petrochelidon arial	Fairy Martin
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Microeca leucophaea	Jacky Winter
Pachycephala rufiventris	Rufous Whistler
Rhipidura albiscapa	Grey Fantail
Rhipidura leucophrys	Willy Wagtail
Cinclorhamphus mathewsi	Rufous Songlark
Malurus cyaneus	Superb Blue Wren
Smicrornis brevirostris	Weebill
Acanthiza chrysorrhoa	Yellow-rumped Thornbill
Cormobates leucophaeus	White-throated Treecreeper
Philemon corniculatus	Noisy Friarbird
Philemon citreogularis	Little Friarbird
Manorina melanocephala	Noisy Miner
Lichenostomus leucotis	White-eared Honeyeater
Pardolotus striatus	Striated Pardalote
Zosterops lateralis	Silvereye
**Passer domesticus*	Sparrow
Taeniopygia bichenovii	Double-barred Finch
Taeniopygia guttata	Zebra Finch
Vanellus miles	Masked Lapwing
Struthidea cinerea	Apostlebird
**Sturnus vulgaris*	Common Starling
Corcorax melanorhamphus	White-winged Chough
Strepera graculina	Pied Currawong
Grallina cyanoleuca	Magpie-lark
Corvus coronoides	Australian Raven

Appendix B

ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

PARKES INDUSTRIAL ESTATE – SCARRED TREE 1.

ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

PARKES INDUSTRIAL ESTATE

PARKES SHIRE LOCAL GOVERNMENT AREA

NOVEMBER 2013

Report Prepared by
OzArk Environmental & Heritage Management Pty Ltd
for Geolyse Pty Ltd
on behalf of
Parkes Shire Council

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EXECUTIVE SUMMARY

OzArk Environmental Heritage & Management (OzArk) was commissioned by Geolyse Pty Ltd (the Client) on behalf of Parkes Shire Council (the Proponent) to undertake an assessment of land provisionally identified for re-zoning from rural to industrial land for the development of the Parkes Industrial Estate, Parkes Shire Local Government Area, NSW.

The Proponent intends to re-zone the Project Site from rural to industrial to allow for development of the Parkes Industrial Estate. A final project has not yet been finalised as the current assessment has been completed only to facilitate re-zoning. The final project design will be informed by the current assessment and the heritage constraints identified herein.

The Project Site is approximately 102 hectares of undeveloped land, two kilometres south of Parkes. The Project Site is bounded by the existing industrial area and Saleyards Road in the north, the Newell Highway to the east, and the Parkes-Stockinbingal railway corridor in the west. The Project Site includes Lots 19/DP1047309, 7023/DP1054934, 632/DP750179 and 549/DP657444, part lots 101/DP1169531 and 7022/DP1054934, and a portion of land either side of the Newell Highway. The Project Site identified is consistent with the Study Area of the *Masterplan Development Study for the Parkes Industrial Estate* (Masterplan; ADW Johnson 2013). Consistent with the Masterplan, a portion of land within the Newell Highway road reserve is also included within Project Site, thereby ensuring that the scope of this study is sufficient to accommodate any possible future road widening or intersection works for site access.

One Aboriginal site, Parkes Industrial Estate – Scarred Tree 1, was recorded as a result of the current assessment.

Given the early status of proposed Parkes Industrial Estate project, it is anticipated that the final project design will enable complete avoidance of impacts to PIE-ST1. Any proposed works in the vicinity of PIE-ST1should maintain a minimum ten metre buffer surrounding the site and should not infringe within the drip-line of the tree.

Recommendations concerning the Project Site are as follows.

1. Lots 19/DP1047309, 7023/DP1054934, 632/DP750179 and 549/DP657444, and part lots 101/DP1169531 and 7022/DP1054934 do not present with any constraint on the basis of Aboriginal heritage.
2. It is recommended that the Proponent seek to avoid impact to Aboriginal site PIE-ST1.
    a. High-visibility, temporary physical curtilage delineating a ten metre buffer zone which does not infringe within the drip-line of PIE-ST1 is recommended to ensure against inadvertent damage during construction works.
    b. Any long term management of PIE-ST1 by means of permanent fencing or signage should first be discussed with Aboriginal community.

3. Should impacts to PIE-ST1 be unavoidable an Aboriginal Heritage Impact Permit (AHIP) must be sought from the Office of Environment and Heritage.
4. All land-disturbing activities must be confined to within the assessed Project Site.
5. As an additional mitigation measure, where possible any topsoil removed from within the Project Site during the construction phase of proposed works should be stockpiled for reuse in the immediate area.
6. The work crews in the initial ground breaking phase of construction should be made aware of the legislative protection of Aboriginal sites and objects.
7. In the unlikely event that objects are encountered that are suspected to be of Aboriginal origin (including skeletal material), the Unanticipated Finds Protocol (**Appendix 3**) should be followed.

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FIGURES

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PLATES

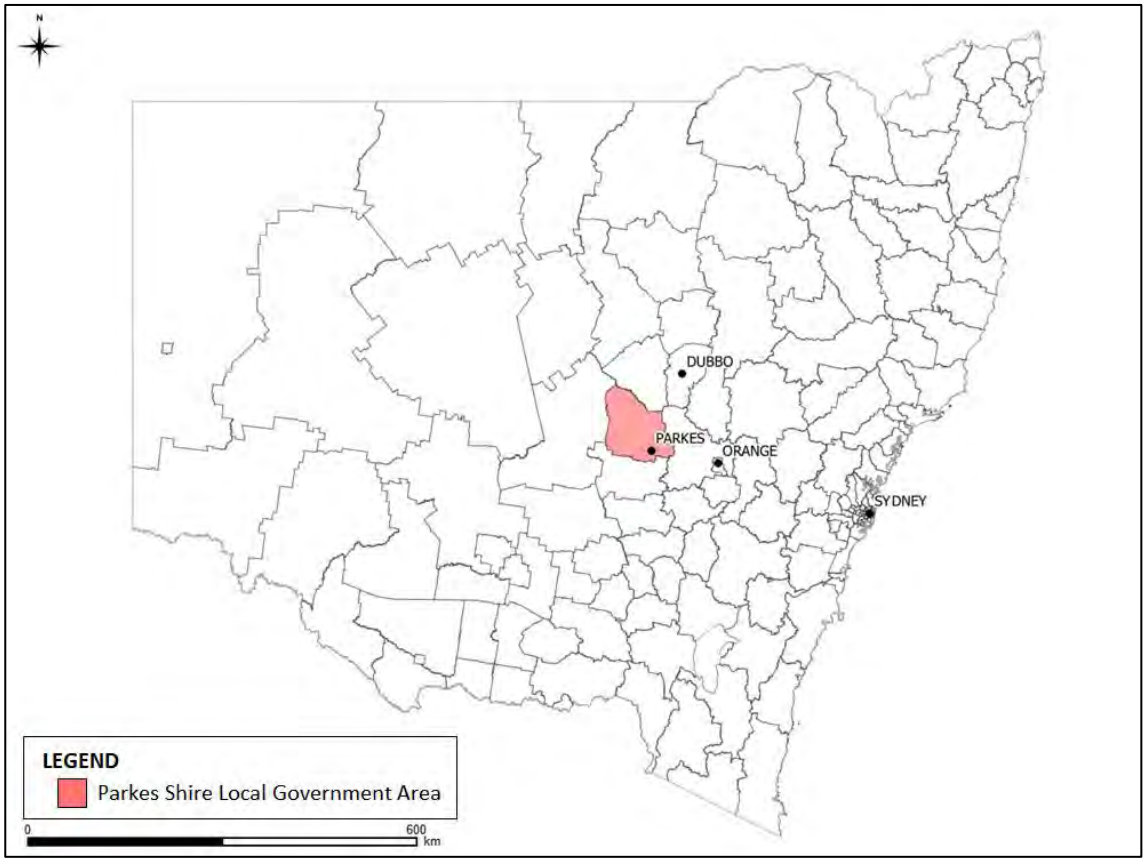
APPENDICES

1 INTRODUCTION

1.1 BRIEF DESCRIPTION OF THE PROPOSAL

OzArk Environmental Heritage & Management (OzArk) was commissioned by Geolyse Pty Ltd (the Client) on behalf of Parkes Shire Council (the Proponent) to undertake an assessment of land provisionally identified for re-zoning from rural to industrial land for the development of the Parkes Industrial Estate, Parkes Shire Local Government Area, NSW (**Figure 1-1**).

Figure 1-1: Location Map – Parkes Shire LGA and Localities.



1.2 PROPOSED WORKS

The Proponent intends to re-zone the Project Site from rural to industrial to allow for development of the Parkes Industrial Estate. A final project has not yet been finalised as the current assessment has been completed only to facilitate re-zoning. The final project design will be informed by the current assessment and the heritage constraints identified herein.

1.3 THE PROJECT SITE

The Project Site is approximately 102 hectares of undeveloped land, two kilometres south of Parkes (**Figure 1-2**). The Project Site is bounded by the existing industrial area and Saleyards Road in the north, the Newell Highway to the east, and the Parkes-Stockinbingal railway corridor in the west (**Figure 1-3**). The Project Site includes Lots 19/DP1047309, 7023/DP1054934, 632/DP750179 and 549/DP657444, part lots 101/DP1169531 and 7022/DP1054934, and a portion of land either side of the Newell Highway.

Figure 1-2: Location Map – Parkes township and the Project Site.

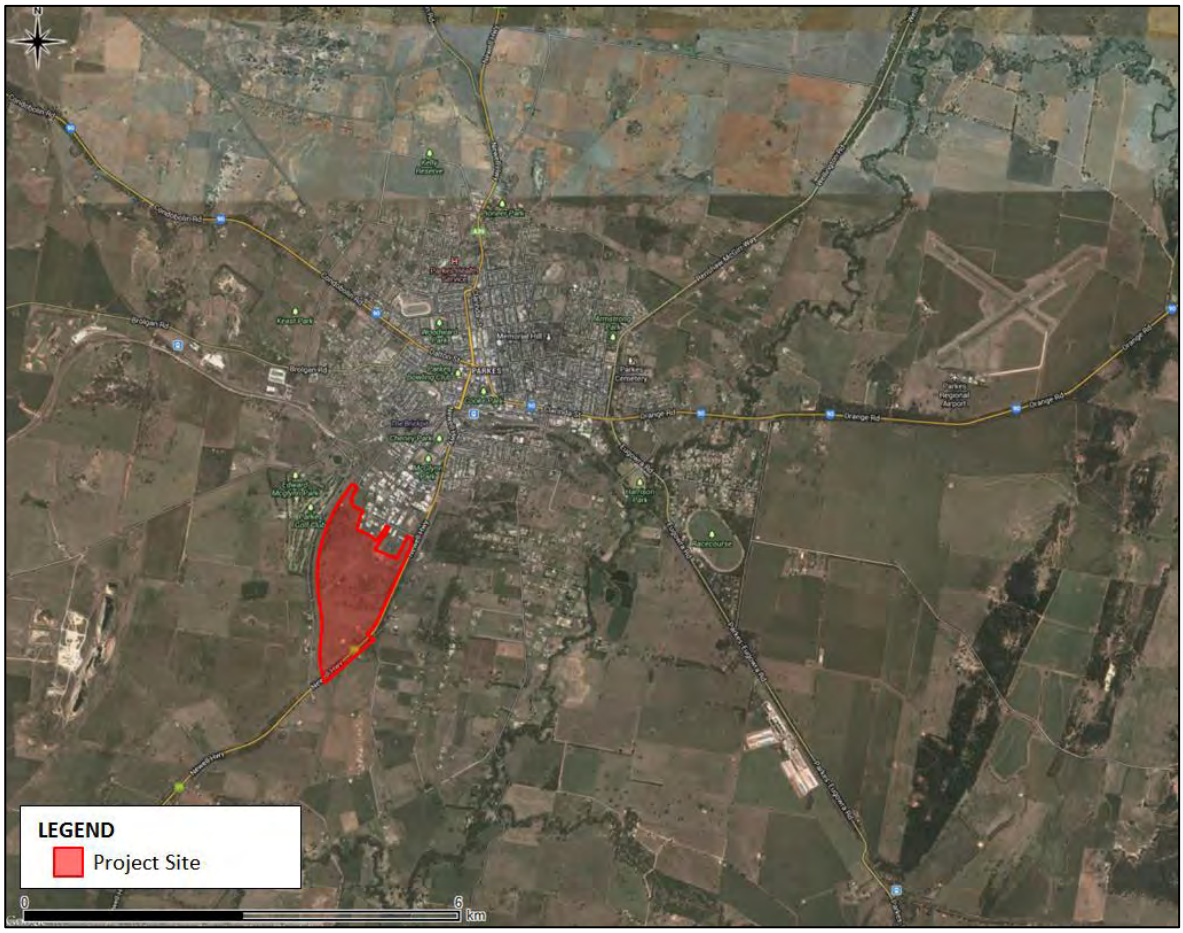


Figure 1-3: The Project Site.

1.4 RELEVANT LEGISLATION

Cultural heritage is managed by a number of state and national acts. Baseline principles for the conservation of heritage places and relics can be found in the Burra Charter (Australia ICOMOS 1988). The Burra Charter has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The Burra Charter generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a state level.

A number of acts of parliament provide for the protection of Aboriginal heritage at various levels of government;

1.4.1 State Legislation

***Environmental Planning and Assessment Act 1979* (EP&A Act)**

This Act established requirements relating to land use and planning. The five areas controlled by the EP&A Act are:

- **Part 3:** Environmental planning instruments, including cultural heritage;
- **Part 4:** Local government development assessments, including heritage. May include schedules of heritage items;
- **Part 4.1:** Approvals process for state significant development;
- **Part 5:** Environmental impact assessment requirements for state-owned heritage items listed on Local Environment Plans; and
- **Part 5.1:** Approvals process for state significant infrastructure.

***National Parks and Wildlife Act 1974* (NPW Act)**

Amended during 2010, the NPW Act provides for the protection of Aboriginal objects (sites, objects and cultural material) and Aboriginal places. Under the Act (S.5), an Aboriginal object is defined as: any deposit, object or material evidence (not being a handicraft for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.

An Aboriginal place is defined under the NPW Act as an area which has been declared by the Minister administering the Act as a place of special significance for Aboriginal culture. It may or may not contain physical Aboriginal objects.

As of 1 October 2010, it is an offence under Section 86 of the NPW Act to 'harm or desecrate an object the person knows is an Aboriginal object'. It is also a strict liability offence to 'harm an Aboriginal object' or to 'harm or desecrate an Aboriginal place', whether knowingly or unknowingly. Section 87 of the Act provides a series of defences against the offences listed in Section 86, viz.:

- The harm was authorised by and conducted in accordance with the requirements of an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the Act;
- The defendant exercised 'due diligence' to determine whether the action would harm an Aboriginal object; or
- The harm to the Aboriginal object occurred during the undertaking of a 'low impact activity' (as defined in the regulations).

Under Section 89A of the Act, it is a requirement to notify the OEH Director-General of the location of an Aboriginal object. Identified Aboriginal items and sites are registered on AHIMS.

1.4.2 Commonwealth Legislation

***Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

Amendments in 2003 established the National Heritage List and the Commonwealth Heritage List, both administered by the Commonwealth Department of the Environment. Ministerial approval is required under the EPBC Act for proposals involving significant impacts to National/Commonwealth heritage places.

1.4.3 Applicability to the Project Site

Any Aboriginal sites within the Project Site are afforded legislative protection under the NPW Act.

Commonwealth legislation does not apply to Aboriginal cultural heritage within the Project Site.

1.5 ASSESSMENT APPROACH

The current assessment will blend use of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010a) and the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b).

The current assessment will apply *Due Diligence* (DECCW 2010a) to those portions of the Project Site to which it is determined appropriate, and ensure that those areas which require further investigation as per the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) are examined as such.

2 THE ARCHAEOLOGICAL ASSESSMENT

2.1 PURPOSE AND OBJECTIVES

The purpose of the current study is to identify and assess Aboriginal heritage constraints relevant to the proposed works.

The objectives of the current study are:

Objective One: To identify portions of the Project Site to be assessed as per the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010a);

Objective Two: To survey those portions of the Project Site requiring further assessment as per the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b);

Objective Three: To assess the significance of any recorded Aboriginal sites, objects or places; and

Objective Four: To assess the likely impacts of the proposed works to any recorded Aboriginal sites, objects or places and provide management recommendations.

2.2 DATE OF ARCHAEOLOGICAL ASSESSMENT

The fieldwork component of this assessment was undertaken on 18 November 2013.

2.3 ABORIGINAL COMMUNITY INVOLVEMENT

Anthony Wilson attended the field inspection as a representative of the Peak Hill Local Aboriginal Land Council (PHLALC). A log and copies of correspondence with PHLAC is presented in **Appendix 1**.

2.4 OZARK EHM INVOLVEMENT

2.4.1 Field Assessment

The Fieldwork Director of the current project is Morgan Wilcox (OzArk Archaeologist; BArch [Hons] La Trobe University).

2.4.2 Reporting

The report author is Morgan Wilcox.

Reviewed by Ben Churcher (OzArk Senior Archaeologist; BA [Hons], University of Queensland, Dip Ed, University of Sydney).

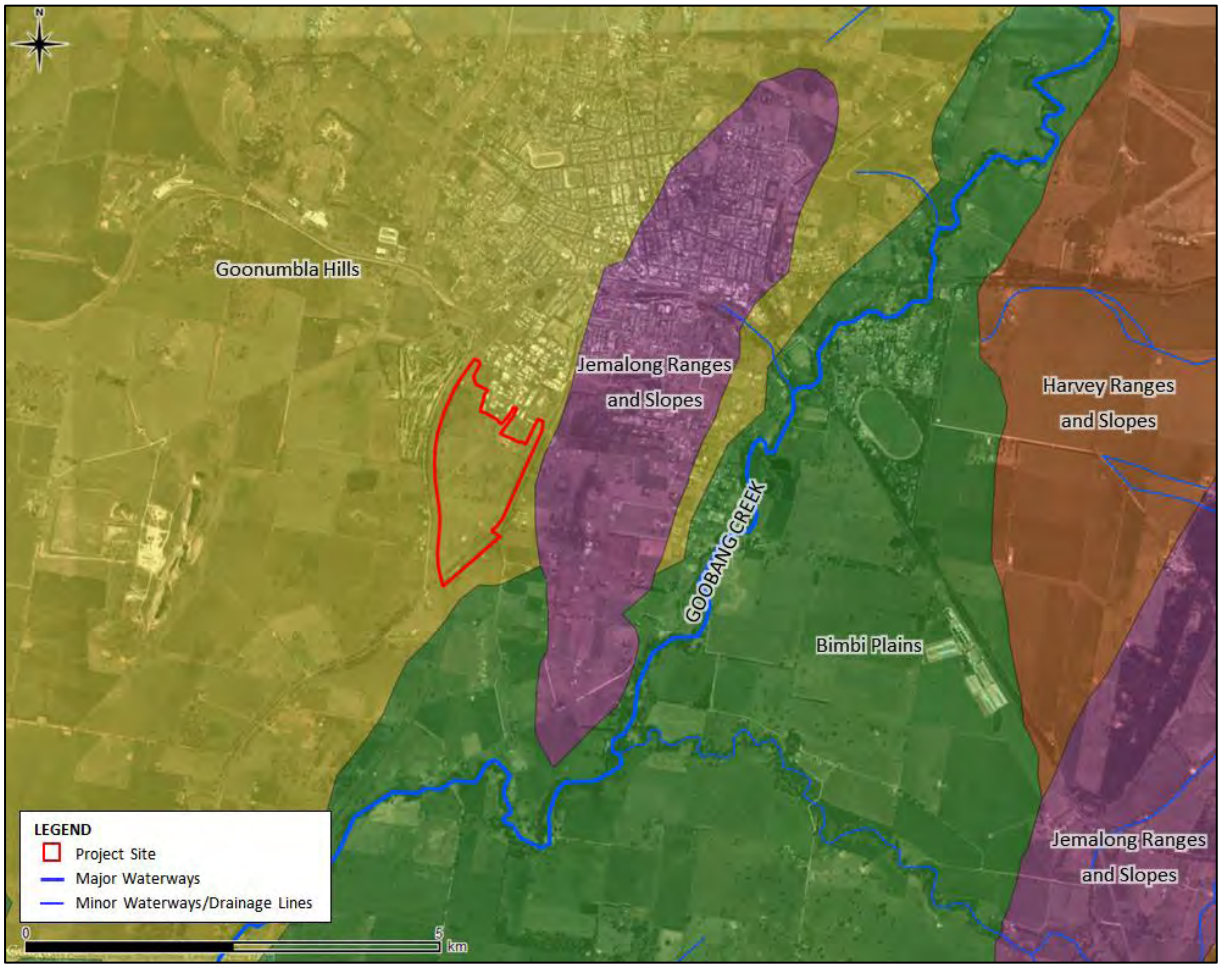
3 LANDSCAPE CONTEXT

An understanding of the environmental contexts of a Project Site is requisite in any Aboriginal archaeological investigation (DECCW 2010b). It is a particularly important consideration in the development and implementation of survey strategies for the detection of archaeological sites. In addition, natural geomorphic processes of erosion and/or deposition, as well as humanly activated landscape processes, influence the degree to which these material culture remains are retained in the landscape as archaeological sites; and the degree to which they are preserved, revealed and/or conserved in present environmental settings.

3.1 TOPOGRAPHY

The Project Site falls within the South West Slopes Bioregion, within the Lower Slopes ecosystem, and is comprised wholly of the Goonumbla Hills landscape unit (Mitchell 2002:60; **Figure 3-1**).

Figure 3-1: The Project Site - Mitchell Landscapes and Hydrology.



The NSW South Western Slopes Bioregion is an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria (OEH 2013)

The topography of the Goonumbla Hills is typified by extensive undulating low hills (Mitchell 2002:60; **Plate 1**). General elevation across this landscape type ranges from 290 to 390 metres, with a local relief of up to 70 metres.

The topography of the Project Site is undulating plain which recedes to the south punctuated by a number of slight knolls in the northern and eastern portions of the Project Site.

3.2 GEOLOGY AND SOILS

The NSW South Western Slopes Bioregion lies wholly in the eastern part of the Lachlan Fold Belt which consists of a complex series of north to north-westerly trending sedimentary and volcanic rocks (OEH 2013). Within this bioregion, common materials include quartz and quartzites, basalt, and granites with generally softer rocks such as shale or slate in the valleys between ranges and occasional limestone outcrops. A large number of mineral deposits have supported the mining industry in this region over the past 150 years (OEH 2013).

Sedimentology of the Goonumbla Hills is defined by stony yellow earths, thin brown structured loams on the hills merging with red-brown and red texture-contrast soils on the flats (Mitchell 2002:60).

The soil of the Project Site was at the time of assessment classed as a red, coarse, sandy loam which was highly friable. Stone material evident within exposures was predominantly small pebbly gravel and soft shale-type materials with outcrops of large basalt pieces and occasional coarse quartz (**Plate 2**).

3.3 HYDROLOGY

The only hydrological feature within the Project Site is a highly ephemeral drainage line / eroded cutting which transects the centre of the property and feeds into four man-made dams on the property. The nearest waterway to the Project Site is Goobang Creek, located two kilometres from the eastern boundary (**Figure 3-1**). Goobang Creek is a tributary of the Lachlan River, which it joins to the west at Condobolin.

3.4 VEGETATION

Vegetation within the Project Site has been highly modified by extensive clearing, grazing and cultivation since the commencement of non-Indigenous settlement in the region. The majority of the Project Site has been cleared and as such is comprised predominantly of grass species, including remnant cereal material from prior cultivation of the area. There is very limited mid-storey vegetation i.e. shrubs and bushes, and those that are present are limited to the north-eastern limits of the Project Site. There is a large number of standing mature Eucalypts across the Project Site, predominantly Grey Box species with occasional Bimble Box and White Cyprus Pine fringing the Newell Highway to the east and the Parkes-Stockinbingal railway to the west.

3.5 CLIMATE

Climate statistics from Parkes Airport, located approximately seven kilometres northeast of the Project Site indicates the area has a mild climate with average temperatures ranging from 2.4ºC to 33.5ºC. The locality receives an average rainfall of 612.1 millimetres annually (BOM 2013).

3.6 LAND–USE HISTORY

Disturbance, cultural or natural, potentially alters the archaeologically record. It can do this in a variety of ways, directly or indirectly. For example, land clearing directly removes a particular site type - usually scarred trees or stone arrangements. Indirectly, land clearing accelerates soil erosion, potentially resulting in previously buried occupation / activity sites becoming exposed and altered / damaged.

Aboriginal people in prehistory are known to have used fire-stick farming, or controlled burns, to alter vegetation ecosystems to promote the growth of desirable plants. Though it cannot be said at this time whether fire-stick farming was undertaken within the Study Area, it is becoming increasingly believed that Aboriginal fire regimes were widespread (Gammage 2011) and therefore should be considered as a possible early land-use practice.

Land-use history and associated disturbance levels across the Project Site are summarised below:

- **Agriculture and Pastoralism.** Farming and grazing are fundamental to the local economy and dominate land-use throughout the area. The Project Site is wholly contained within farming and grazing land which has had the following impacts:
    - **Vegetation Removal.** It appears that the Project Site has been subject to significant levels of vegetation removal;
    - **Grazing.** The presence of hoofed livestock is likely to have resulted in trampling and compaction of the ground surface. A large number of sheep were being grazed on the property at the time of assessment; and
    - **Cultivation.** Whilst grazing appears to have been the primary agricultural land-use within the Project Site, plough lines as a result of cultivation across the Project Site are evident on aerial photography. Repeated cultivation of land since the commencement of non-Indigenous settlement in the region will have altered soil profiles, disturbing sub-surface archaeological deposits;
    - **Farm Infrastructure.** An overall low level of disturbance is generated by the construction of farm tracks, dams and fence lines. In the case of tracks, this disturbance also tends to provide exposures, thus enabling the identification of otherwise obscured artefacts.
- **Infrastructure Provision**
    - **Transport.** Numerous sealed and unsealed roads and tracks intersect the Project Site (**Plate 3**). Major roadway, the Newell Highway, borders the Project

Site to the east, and a small portion of the highway is included within the south-eastern most portion of the Project Site. The Parkes-Stockinbingal railway borders the Project Site to the west. The construction of these transport corridors has likely had an impact upon the Project Site, and at a minimum has impacted upon the integrity of the surrounding landscape context of the Project Site.

- **Utilities.** The Project Site is crossed by a number of utilities provision impacts, including transmission lines and underground service cables.

- **Industrial, Residential and Recreational Development.** The Project Site is surrounded by low density rural housing, the Parkes Golf Course development to the west, and moderate to high density residential and industrial development to the north.
- **Miscellaneous Disturbances**. Other ground surface disturbances evident across the Project Site include eroded scalds as well as earth moving activities which have left large mounds of soil and waste predominantly in the northern areas of the Project Site (**Plate 4**).

3.7 CONCLUSION

The landscape of the Project Site is likely to have been hospitable to Aboriginal people in antiquity, however relative to surrounding landscapes it does not contain features most likely to attract more substantial Aboriginal occupation of the space (i.e. permanent water supply). As such, the size and density of Aboriginal open sites located within the Project Site are likely to be smaller and sparser than those assemblages which you would expect to the east in closer proximity to Goobang Creek (refer to **Section 4.4** predictive modeling of Aboriginal site locations).

Furthermore, the high level of ground surface disturbance across the entirety of the Project Site from activities such as vegetation clearance, cultivation and grazing would have affected the intactness of any deposit based archaeological sites. As such, unobtrusive sites such as open artefact scatters, if present, are likely to be disturbed.

Broad-scale vegetation clearance characteristic of the area reduces the likelihood that culturally modified trees remain *in-situ;* however the presence of a large number of standing mature Eucalypts across the Project Site substantially increases the possibility of this site type (refer to **Section 4.4** predictive modeling of Aboriginal site locations).

4 ABORIGINAL ARCHAEOLOGY BACKGROUND

4.1 ETHNO-HISTORIC SOURCES OF REGIONAL ABORIGINAL CULTURE

At the time of European settlement, the Project Site is situated within the territory of people belonging to the Wiradjuri tribal and linguistic group (Tindale 1974). The Wiradjuri tribal area is situated within the Murray Darling Basin, covering three primary physiographic divisions: the riverine plains in the west, the transitional western slopes in between and the highlands or central tablelands in the east (White 1986).

The potential study corridors fall within the central division, being the transitional western slopes into the central tablelands, the heart of Wiradjuri territory.

Episodes of early contact between Indigenous and European cultures from the nearby Lachlan Valley (approximately 30 kilometres south) were documented by the explorers Oxley and Cunningham in May 1817.

Oxley (1817; as cited in Whitehead 2003: 105) writes:

> *"About a mile from this place we fell in with a small tribe of natives, consisting of eight men; their women we did not see. They did not appear any way alarmed at the sight of us, but came boldly up: they were covered with cloaks made from opossum skins; their faces daubed with a red and yellow pigment, with neatly worked nets bound round their hair: the front tooth in the upper row was wanting in them all: they were unarmed, having nothing with them but their stone hatchets. It appeared from their conduct that they had either seen or heard of white people before, and were anxious to depart, accompanying the motion of going with a wave of their hand."*

Cunningham (1817; as cited in Whitehead 2003: 105) reported:

> *"Calling to one another we were answered by strange voices, which left us in no doubt of natives being near us. It was a great point we should all join in again, which at length we did, after some time had passed over several miles on a cross-course, the labour of which might have been saved. Our people came up with seven or eight of the natives, who were clothed in mantles of skin reddened with a pigment from the river. There appeared not the most distant symptoms of hostility among them! They evidently had seen a horse before, and could pronounce some words in English, such as bread, and they had every appearance of having been with those at the Lachlan depot, from which we are now 54 miles west. From the columns of smoke ascending from the trees to which these harmless beings were advancing there is no doubts of their encampment being these situated, and it might be inferred that their gins or wives were there, from their evident objection to our people attempting to accompany them to their fires. The delay and loss of time occasioned*

by the above adventure had allowed our boatmen to work themselves through all the numerous windings of the river and overtake us"

Closer to the western end of the current Project Site but somewhat later (1835) came accounts of contact with native groups by the Mitchell expedition, which had set out to explore the Bogan River (Unger nd: 3; Kass 2003: 6). In April 1835 Mitchell's party encountered a group of natives on the outskirts of what is today the town of Parkes. From this meeting, Mitchell learned that what had been named the Hervey Range by Oxley in 1817 was in fact known to the locals as 'Goobang', which derived from the Aboriginal word Coleong Coobung, which meant place of many wattles (Kass 2003: 9). Mitchell's group camped within earshot of the Aboriginal camp and his account is quoted by Unger (nd: 4):

"The natives who we met here were fine looking men, enjoying contentment and happiness within the precincts of their native woods. Their enjoyment seemed so derived from nature, that it almost excited a feeling of regret, that civilised men, enervated by luxury and all its concomitant diseases, should ever disturb the haunts of these rude happy beings. The countenance of the first man who came up to me was a fine specimen of man in an independent state of nature. He had nothing artificial about him, save the badge of mourning for the dead, a white band (his was very white), round his brow. His manner was grave, his eye keen and intelligent, and, as our people were encamping, he seemed to watch the moment when they wanted fire, when he took a burning stick, which one of the natives had brought, and presented it in a manner expressive or welcome, and an unaffected wish to contribute to our wants. Sat a distance, their gins sat at fires, and we heard the domestic sounds of squalling children."

When Mitchell's party left their camping spot, several natives reportedly followed them, one of whom speared a large kangaroo, while others used new tomahawks to extract honey from tree branches. It is recorded that the natives accompanied the expedition for four days before retreating upon the appearance of further natives. This was interpreted by Mitchell as the original group of natives having reached their tribal boundary (Unger nd: 5).

Ethnographic information gleaned from this expedition noted the primary meat portion of their diet consisted of possum, kangaroo and emu; women fished using a moveable dam of twisted dry grass to corral fish so they could be picked out of the water and collected freshwater mussels; and starchy plant roots were eaten (Kass 2003: 6):

As in most parts of NSW, foreign diseases were a precursor to white settlement and the population encountered by early settlers was already impacted by this. Tales of early white settlement include stories of clashes including massacres of the natives and revenge attacks.

4.2 REGIONAL ARCHAEOLOGICAL CONTEXT

Within the Wiradjuri region, the presence of Aborigines in the Darling Basin has been dated to 40,000 years ago (Hope 1981; as cited in Haglund 1985). A spread east into the mountains is thought to have occurred between 14,000 to 12,000 years ago.

Systematic, regional based archaeological studies incorporating the Project Site have not been undertaken. Several research driven studies have, however, been carried out in nearby areas that have similar topographic features. Results of these projects can therefore be extrapolated to the Project Site. The most relevant research studies are Pearson (1981) and Koettig (1985). Together these provide baseline data for placing past Aboriginal sites within a regional landscape context. Following is a summary of the salient points learned from these studies:

Pearson (1981) worked primarily in the Upper Macquarie region, the western boundary of his Project Site being Wellington. The majority of Pearson's field coverage was directed by information from informants and was thus skewed toward large or obtrusive sites, which had been recognised by local residents. Pearson excavated three rock shelter sites (Botobolar 5, and Granites 1 and 2) which provided a regional record of Aboriginal occupation dating back to around 5,000 years before present. Pearson's analysis of the patterns of Aboriginal occupation involved an examination of site location characteristics in four sample areas.

According to Pearson archaeological sites could be divided into two main categories, occupation sites and non-occupation sites (which included grinding grooves, scarred or carved trees, ceremonial and burial sites etc.). An analysis of the location of these sites led him to build a model for site prediction along the following lines (Pearson 1981: 101):

- Site distance to water varied from 10 to 500 meters, but in general larger sites are found closer to water;
- Good soil drainage and views over watercourses are important site location criteria;
- Most sites were located in contexts, which would originally have supported open woodlands;
- Burial sites and grinding grooves were situated as close to habitation areas as geological constraints would allow;
- Ceremonial sites such as earth rings ('bora grounds') were located away from campsites;
- Stone arrangements were also located away from campsites in isolated places and tended to be associated with small hills or knolls or were on flat land;
- Quarry sites were located where stone outcrops with desirable working qualities were recognised and were reasonably accessible;

- Based on ethno-historic information, Pearson suggests that Aboriginal campsites were seldom used for longer than three nights and that large archaeological sites probably represent accumulations of material over a series of short visits.

The location of non-occupation sites was dependent on various factors relating to site function. For example, grinding grooves only occur where there is appropriate outcropping sandstone, but as close to the occupation site as possible. Scarred trees were variably located with no obvious patterning, other than proximity to watercourses, where camps were more frequently located.

Although a useful study, Koettig (1985:49-50) considers Pearson's findings as preliminary, mainly due to the unsystematic nature of the recording of most sites used in the analysis. In her view, this would have skewed both site type (obvious manifestations) and location (areas of disturbance), therefore biasing the sample. Further the sample size of both the Wellington and other areas were considered too small to yield significant results.

Koettig (1985) undertook a comprehensive study of evidence relating to Aboriginal occupation within the Dubbo region. As a result of the desktop component of this study, Koettig determined there was need for systematic survey to ensure that all topographic landform units and different stream order associations were explored in terms of site type and location. This field work included detailed recording of various site types, ensuring the presence of comparative, quantifiable data.

As a result of this study, Koettig (1985:81-82) concluded that:

- Aboriginal sites may be expected throughout all the landscape units surveyed.
- The most frequently occurring site types were open artefact scatters, scar trees and grinding grooves.
- The location of sites and their relative size were determined by various factors, predominantly environmental and social. Although social factors cannot be explained through archaeological research, some of the environmental issues may be. These are:
    - Proximity to water: the largest campsites were located close to permanent water, nonetheless, sites were found all over the landscape including hills and ridges away from obvious water.
    - Geological formation: Certain sites require specific conditions, e.g. grinding grooves occur where appropriate sandstone outcrops, quarries are found where suitable stone resources are accessible, burials tend to be found in sandy sediments such as alluvial flats etc.
    - Availability of food resources: The widest range of potential foods was found along the main water courses due to the supply of permanent water. Some foods would have been seasonal and required foraging away from water courses.

In predicting intensity of occupation, Koettig suggests that larger and more constantly occupied sites are likely to occur along permanent watercourses, while less intense and sporadic occupation evidence is seen along ridge tops or temporary water sources e.g. creek headwaters.

The predictive model for site location developed as a result of this study can be summarised as follows:

- All site types can be found along watercourses;
- Stone arrangements occur most frequently on knolls or prominent landscape features;
- Larger campsites are most frequent along permanent watercourses, near springs or wetlands, although small campsites may be found anywhere. Because occupation was more intensive along major watercourses, more site complexes will be found there;
- Scarred trees may be found anywhere, but especially where there are remnant stands of native trees;
- Campsites would become smaller and more sporadic near the headwaters of creeks;
- Grinding grooves are most frequent in association with appropriate sandstone, i.e., north and east of the Macquarie River; and
- Quarries may be found wherever there is a reliable sources of suitable stone.

4.3 LOCAL ARCHAEOLOGICAL CONTEXT

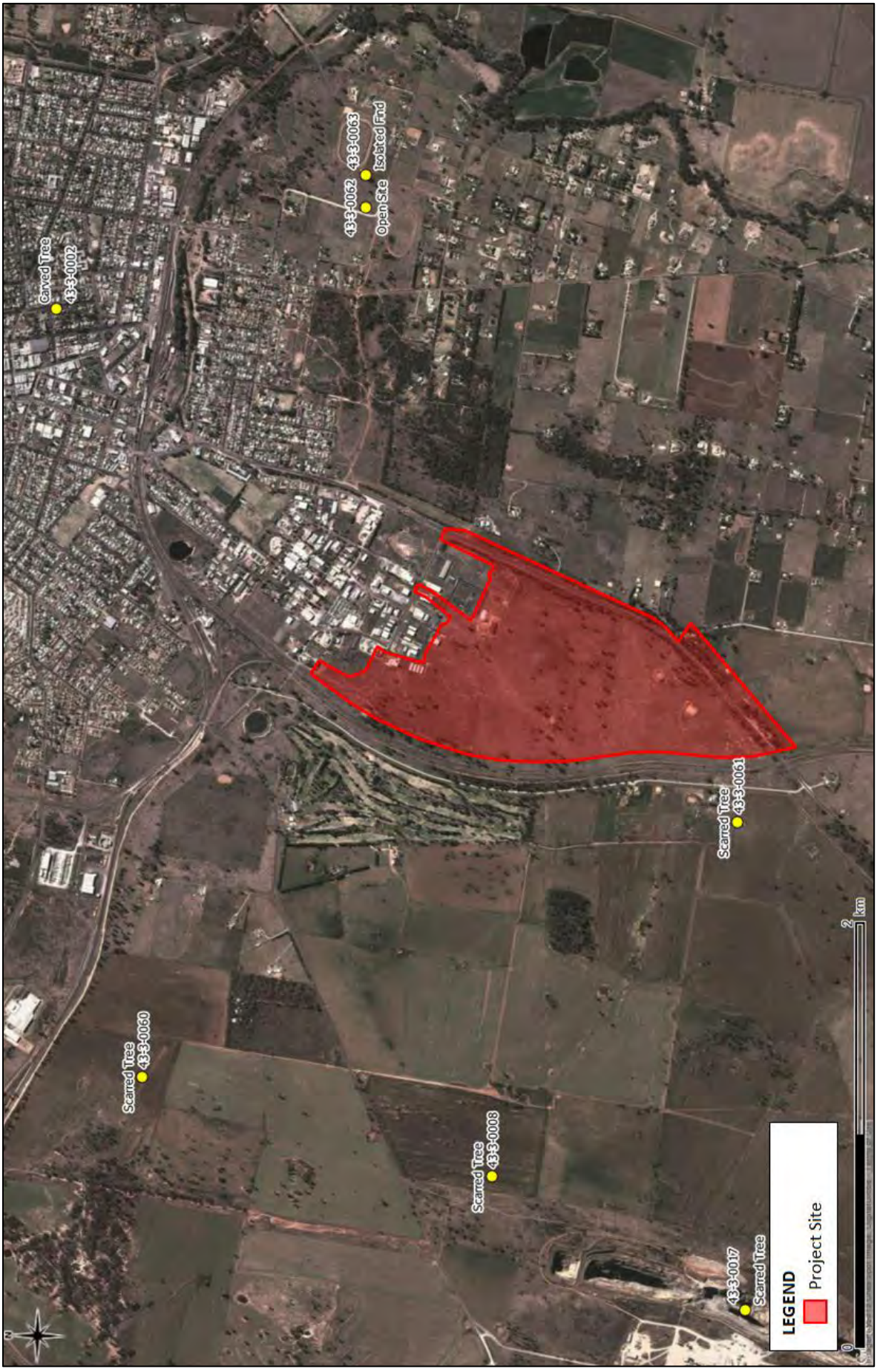
4.3.1 Desktop Database Searches Conducted

A desktop search was conducted on the following databases to identify any potential issues. The results of this search are summarised here in **Table 4-1** and presented in detail in **Appendix 2**.

Table 4-1: Desktop-Database Search Results.

Name of Database Searched	Date of Search	Type of Search	Comment
Australian Heritage Database	12.11.2013	Parkes Shire LGA.	No places on the search are within the Project Site.
NSW Heritage Office State Heritage Register and State Heritage Inventory	12.11.2013	Parkes Shire LGA.	No places on the search are within the Project Site.
National Native Title Claims Search	12.11.2013	NSW	No Native Title Claims cover the Project Site.
Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS);	12.11.2013	10 x 10 km centred on the Project Site	Search returned seven AHIMS sites. None of these sites are within the Project Site (**Figure 4-1**).
Local Environment Plan	12.11.2013	Parkes Shire LEP of 2012	None of the Aboriginal places noted occur near the Project Site.
S170 RMS Heritage and Conservation Register	12.11.2013	Western Region	No places on the search are within the Project Site.

Figure 4-1: AHIMS Search Results and the Project Site.



A search of the OEH administered AHIMS database returned seven records for Aboriginal heritage sites within the designated search area (approximately 10 square kilometres centred on the Project Site; **Figure 4–1**). None of the previously recorded sites occur within the Project Site.

Scarred trees "PH2" (#43-3-0060) and "PH1-1" (#43-3-0061 were recorded by Jillian Comber in 2004 as a result of the *Parkes Hub Archaeological Survey*, an assessment completed on behalf of Parkes Shire Council for the Multi-Modal Freight Logistics Hub to be located in west Parkes. Both scarred trees recorded were Grey Box Eucalypts displaying multiple scars, "PH2" with two scars and "PH1-1" with three scars (Comber 2004a:12-13).

Open site "Parkes 1" (#43-3-0062) and isolated find "Parkes 2-IF" (#43-3-0063) were recorded following an additional 2004 survey *"Archaeological Survey at Parkes"* completed by Jillian Comber on behalf of Country House and Land Sales (2004b). Open site "Parkes 1" (#43-3-0062) is noted to consist of two artefacts, a basalt core and a possible sandstone hammerstone, and seven nodules of white ochre. The site covers an area of 150 by 80 metres and is situated approximately one kilometre west of Goobang Creek. "Parkes 2-IF" is an isolated broken river cobble with a ground edge.

Carved tree "Parkes" (#43-3-0002) was recorded by David Bell as a result of a research survey of Aboriginal carved trees (Bell 1979). The survey *"Aboriginal Carved Trees in NSW – A Survey Report (Parts 1 and 2)"* was funded by a grant given to NSW National Parks and Wildlife Service by the Australian Heritage Commission (Bell 1980:1). Appendix C (Bell 1979:85) lists the carved tree as a possible burial now located in the Australian Museum (E5514).

Lastly, "LV 1" (#43-3-0008) and "LV 11" (#43-3-0017) are two of a total of ten scarred trees recorded in 1987 by Mary Dallas Consulting Archaeologists as a result of an archaeological assessment for the London-Victoria Gold Project, located five kilometres southwest of Parkes (Dallas 1987). Bimble Box Eucalypt and Cypress Pine were both reported as species bearing scars.

4.4 PREDICTIVE MODEL FOR SITE LOCATION

Across Australia, numerous archaeological studies in widely varying environmental zones and contexts have demonstrated a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including: plant and animal foods; stone and ochre resources and rock shelters; as well as by their general proximity to other sites/places of cultural/mythological significance. Consequently sites tend to be found along permanent and ephemeral water sources, along access or trade routes or in areas that have good flora/fauna resources and appropriate shelter.

In formulating a predictive model for Aboriginal archaeological site location within any landscape it is also necessary to consider post-depositional influences on Aboriginal material culture. In all but the best preservation conditions very little of the organic material culture remains of ancestral Aboriginal communities survives to the present. Generally it is the more durable materials such as stone artefacts, stone hearths, shell, and some bones that remain preserved in the current landscape. Even these however may not be found in their original depositional context since these may be subject to either (a) the effects of wind and water erosion/transport - both over short and long time scales or (b) the historical impacts associated with the introduction of European farming practices including: grazing and cropping; land degradation associated with exotic pests such as goats and rabbits and the installation of farm related infrastructure including water-storage, utilities, roads, fences, stockyards and residential quarters. Scarred trees may survive for up to several hundred years but rarely beyond.

Knowledge of the environmental contexts of the Project Site and a desktop review of the known local and regional archaeological record, the most likely sites to be encountered are:

- Scarred and caved trees present as the dominant site type for the locality and hence are possible within the Project Site where mature trees of scar bearing type exist;
- Open camp sites are possible on elevated ground however due to the high level of disturbance across the Project Site this site type, if present, has a high likelihood of being disturbed and/or of low integrity; and
- Isolated finds may occur anywhere, especially in disturbed locations.

5 APPLICATION OF THE DUE DILIGENCE CODE OF PRACTICE

5.1 INTRODUCTION

In late 2010, changes were made to the National Parks and Wildlife Act 1974 (NPW Act 1974) via the Omnibus Bill. As of October 2010, the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a) was instituted to assist developers to exercise the appropriate level of caution when carrying out activities that could cause harm to Aboriginal heritage.

5.2 DEFENCES UNDER THE NPW REGULATIONS 2009

The first step before application of the Due Diligence process itself is to determine whether the proposed activity is a "low impact activity" for which there is a defence in the NPW regulations 2009. The exemptions are listed in Section 7.5 of the Regulations (DECCW 2010a:6).

The activities of the Proponent do not fall into any of these exemption categories. Therefore the Due Diligence process must be applied.

Relevant to this process is the assessed levels of previous land-use disturbance.

The regulations (DECCW 2010a:18) define disturbed land as follows:

> *Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable.*
>
> *Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks.*

5.3 APPLICATION OF THE DUE DILIGENCE CODE OF PRACTICE TO THE PROPOSED DEVELOPMENT

To follow the generic Due Diligence process, a series of steps in a question answer flowchart format (DECCW 2010a:10) are applied to the project impacts and Project Site and the responses documented.

The following paragraphs address this due diligence for the *Parkes Industrial Estate.*

Step 1: Will the activity disturb the ground surface or any culturally modified trees?

Yes. Whilst the final project design is yet to be finalised and will be informed by the findings contained herein, it is likely that the proposed activity will disturb the ground. Go to Step 2.

Step 2: Are there any:

a) relevant confirmed site records or other associated landscape feature information on AHIMS? and/or

b) any other sources of information of which a person is already aware? and/or

c) landscape features that are likely to indicate presence of Aboriginal objects? Landscape features noted here include:

- **within 200 metres of waters, or**
- **located within a sand dune system, or**
- **located on a ridge top, ridge line or headland, or**
- **located within 200 metres below or above a cliff face, or**
- **within 20 metres of or in a cave, rock shelter, or a cave mouth**

and' is on land that is not disturbed land then you must go to Step 3.

a) No.

A search of the AHIMS database revealed no previously recorded sites within the Project Site. The AHIMS Web Service search covered the following area, Latitude -33.176 to -33.1446, Longitude 148.137 to 148.1869 with a Buffer of 1,000 meters (see **Appendix 2**).

b) No.

A review of ethnographic information of the area has not identified any direct association to or with the Project Site. Further, it is noteworthy that Aboriginal community consultation is not a formal requirement of the Due Diligence process, however, the Proponent elected to have a representative of the PHLALC (refer to **Section 2.3**) attend the assessment so that they may assist in informing decision making.

c) No.

The Project Site does not contain any of the above noted landscape features and further has been subject to disturbances (primarily agricultural and industrial) which have resulted in clear and observable modification of the ground surface as per the DECCW 2010a definitions.

The 'no' answer for Question 2 a-c, removes the project from the Due Diligence Process at this step, moving it through to this outcome (DECCW 2010a:10):

> *AHIP application not necessary. Proceed with caution. If any Aboriginal objects are found, stop work and notify OEH (Office of Environment and Heritage). If human remains are found, stop work, secure the site and notify NSW Police and OEH.*

The Proponent has elected to apply the precautionary principle and proceed to visual inspection of the Project Site (**Section 6**) in order to ground-truth the findings of the above desktop level assessment.

6 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

6.1 METHODOLOGY

Pedestrian and vehicle-based visual inspection was employed to reconnoitre the location of proposed works and to capture a representative sample of the Project Site. All mature trees of scar-bearing type within the Project Site were inspected for cultural modification.

The in-field recording of data was completed utilising a hand held differential GPS.

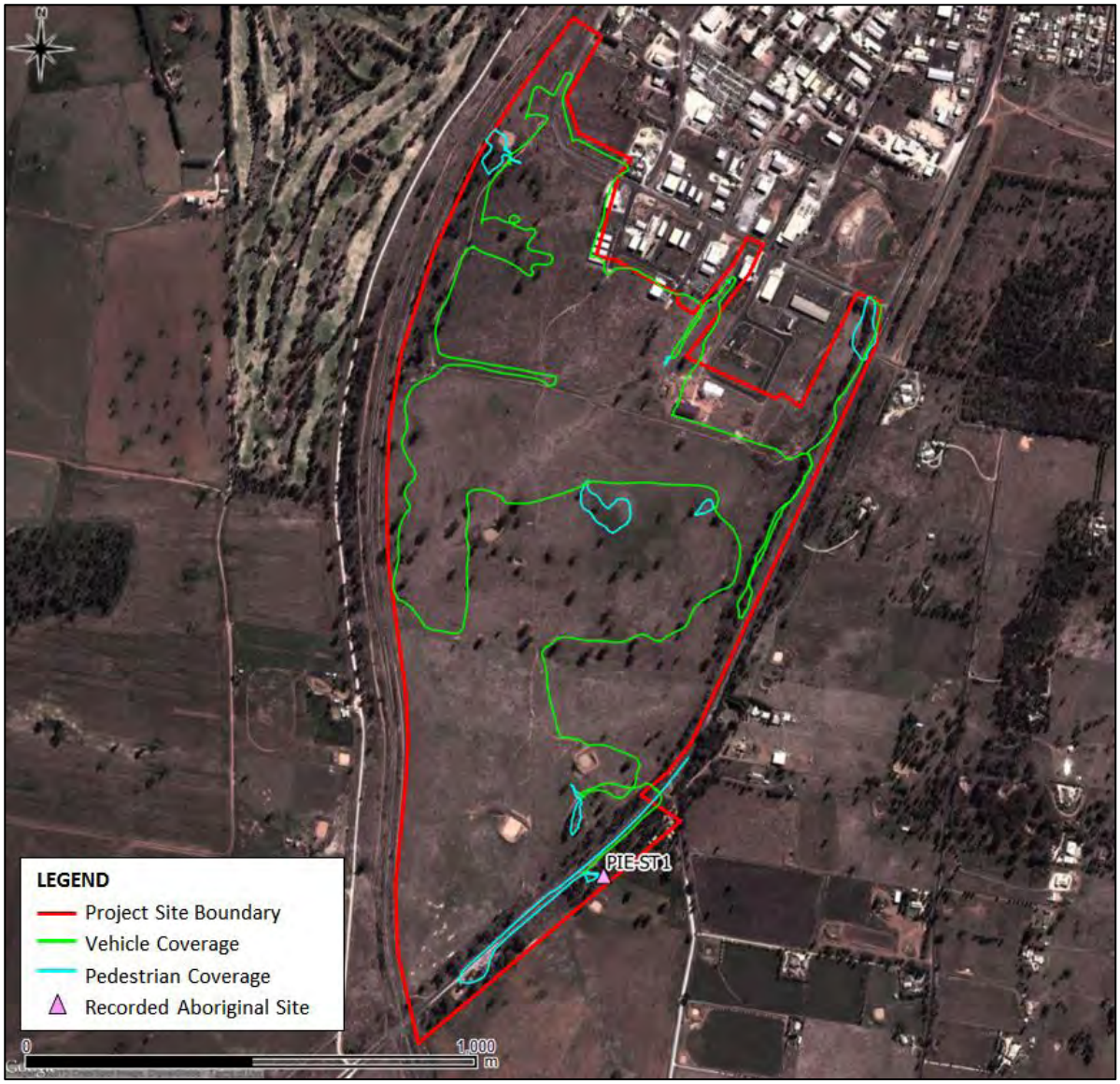
6.2 CONSTRAINTS

Ground surface visibility (GSV) was highly variable across the Project Site (0% to 80%; **Plate 5**) and exposures were presented by graded cuttings, livestock eroded areas, in addition to ground disturbing works associated with construction (i.e. dams and utilities provision)

6.3 RESULTS

Figure 6-1 demonstrates pedestrian coverage of the Project Site during the visual inspection.

Figure 6-1: Survey coverage.



6.3.1 Aboriginal Sites Recorded

Parkes Industrial Estate – Scarred Tree 1 (PIE-ST1)

Site Type: Scarred Tree

GPS Coordinates: GDA 55 608082.798E, 6329633.752N

Location of Site: Located approximately 30 metres east of the Newell Highway, within the nature strip, 550 metres northeast of the Parkes-Stockinbingal railway intersection (refer to **Figures 6-1** and **6-2)**.

Description of Site: PIE-ST1 is a standing Grey Box Eucalypt, approximately 15 metres tall in very good, healthy condition. PIE-ST1 displays a single regular ovoid shaped scar oriented to the south (**Plate 6**). The feature does not display any discernible axe markings or associated artefacts and the potential for associated sub-surface deposits is low. Dimensions of the feature are as follows:

Max. scar length (incl. regrowth):	125cm	Min. scar length (excl. regrowth):	113cm
Max. scar width (incl. regrowth):	32cm	Min. scar width (excl. regrowth):	25cm
Max. width of regrowth:	9cm	Max. depth of regrowth:	12cm

Figure 6-2: Location of PIE-ST1.

6.4 ABORIGINAL COMMUNITY INPUT

Results of the field assessment were discussed between Anthony Wilson (PHLALC) and Morgan Wilcox (OzArk Archaeologist and Fieldwork Director). Anthony was satisfied that the level of assessment across the Project Site was adequate and had captured a good sample of the Project Site. Further, Anthony concurred that the likelihood of undetected Aboriginal sites, potential archaeological deposits (PAD) or archaeologically sensitive landforms within the Project Site was low.

6.5 DISCUSSION

The findings of the current assessment concur with previously recorded site type frequencies within the locality and predictive modelling as outlined in **Sections 4.3** and **4.4**.

6.6 ASSESSMENT OF SIGNIFICANCE

6.6.1 Introduction

The appropriate management of cultural heritage items is usually determined on the basis of their assessed significance as well as the likely impacts of any proposed developments. Scientific, cultural and public significance are identified as baseline elements of significance assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

Social or Cultural Value

This area of assessment concerns the importance of a site or features to the relevant cultural group: in this case the Aboriginal community. Aspects of social value include assessment of sites, items, and landscapes that are traditionally significant or that have contemporary importance to the Aboriginal community. This importance involves both traditional links with specific areas, as well as an overall concern by Aboriginal people for their sites generally and the continued protection of these. This type of value may not be in accord with interpretations made by the archaeologist: a site may have low archaeological value but high social value, or vice versa.

Archaeological/Scientific Value

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of value relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether or not a site can contribute to current

research also involves defining 'research potential' and 'representativeness'. Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region?

Aesthetic Value

This refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with the social values. It may consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use (Australia ICOMOS 1988).

Historic Value

Historic value refers to the associations of a place with a historically important person, event, phase or activity in an Aboriginal community. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have 'shared' historic values with other (non-Aboriginal) communities.

Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage. Consequently the Aboriginal involvement and contribution to important regional historical themes is often missing from accepted historical narratives. This means it is often necessary to collect oral histories along with archival or documentary research to gain a sufficient understanding of historic values.

6.6.2 Assessed Significance of the Recorded Sites

Social or Cultural Value

The social value of Aboriginal sites is generally determined through consultation with Aboriginal people. Scarred tree PIE-ST1 is not currently the focus of spiritual, political, national or other cultural sentiment, however, Aboriginal heritage is of great value to many people and the sites therefore have social value.

Anthony Wilson (PHLALC) expressed on behalf of Aboriginal community that all Aboriginal sites, including the scarred tree in question, have high social and cultural significance to Aboriginal community and as such, PIE-ST1 has been assessed as holding high social/cultural value.

Archaeological/Scientific Value

PIE-ST1 is well preserved, provides a good representation of this site type and is an example of the creative and technical innovation of Aboriginal people and their approach to subsistence and use of natural resources within this landscape. However, the context of the site is highly disturbed with no associated artefacts and is not considered to have any associated sub-surface deposit. As such PIE-ST1 is unlikely to yield further data for the advancement of

archaeological and scientific understanding of this site type. As such PIE-ST1 has been assessed as holding moderate archaeological/scientific value.

Aesthetic Value

The aesthetic value of an Aboriginal site is largely derived from its relationship to and position within the surrounding landscape. The landscape surrounding PIE-ST1 has been highly modified which has lowered its level aesthetic appeal. However, the scar feature itself is well preserved and provides a good example of this site type. As such PIE-ST1 has been assessed as holding moderate aesthetic value.

Historic Value

PIE-ST1 has no apparent relationship to known historic Aboriginal sites (such as missions or massacre sites) and as such has been assessed as holding low historic value.

6.7 LIKELY IMPACTS TO ABORIGINAL HERITAGE FROM THE PROPOSAL

The final project design for the proposed Parkes Industrial Estate has not yet been finalised as the current assessment has been completed to facilitate re-zoning only at this stage. Final project design and associated impacts to the Project Site will however be informed by the current assessment and the heritage constraints identified herein.

PIE-ST1 presents as the only heritage constraint within the Project Site and it is recommended that impact to this site be avoided in accordance with the management and mitigation principles outlined in **Section 7**. In the unlikely event that site avoidance is not possible, the Proponent will need to apply for an AHIP from OEH (refer to **Section 7**).

7 MANAGEMENT AND MITIGATION

7.1 GENERAL PRINCIPLES FOR THE MANAGEMENT OF ABORIGINAL SITES

Appropriate management of cultural heritage items is primarily determined on the basis of their assessed significance as well as the likely impacts of the proposed development.

The following management options are general principles in terms of best practice and desired outcomes, rather than mitigating measures against individual site disturbance.

- Avoid impact by altering the Impact Footprint of the proposed works or, in this case, by avoiding impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed.
- If impact is unavoidable, then an AHIP may be applied for from OEH. The granting of an AHIP will depend on many factors, including the site's assessed significance. To obtain an AHIP, Aboriginal community consultation will need to occur following the OEH *Aboriginal Cultural Heritage Consultation Requirements* (DECCW 2010, ACHCRs). If an AHIP is granted, the local Aboriginal communities may wish to collect or relocate any evidence of past Aboriginal occupation, whether temporarily or permanently, if necessary[1].

7.2 MANAGEMENT AND MITIGATION OF RECORDED ABORIGINAL SITES

Given the early status of proposed Parkes Industrial Estate project, it is anticipated that the final project design will enable complete avoidance of impacts to PIE-ST1. Any proposed works in the vicinity of PIE-ST1 should maintain a minimum ten metre buffer surrounding the site and should not infringe within the drip-line of the tree.

High-visibility, temporary physical curtilage delineating the buffer zone surrounding PIE-ST1 is recommended to ensure against inadvertent damage during construction works.

Aboriginal community will often elect for scarred trees to remain unidentified within the landscape in order to deter against vandalism or other unwanted impacts. As such, any long term management of PIE-ST1 by means of permanent fencing or signage should first be discussed with Aboriginal community.

In the unlikely event that site avoidance is not possible the Proponent will need to apply for an AHIP from the OEH as per **Section 7.1**.

[1] The fate of all artefacts remains within the statutory control of the NSW OEH. A care and control permit may be issued to local Aboriginal groups or, with Aboriginal community consent, to other party, for educational or display purposes.

8 RECOMMENDATIONS

The following recommendations are made on the basis of, and with regards to:

- Legal requirements under the terms of the NPW Act whereby it is illegal to damage, deface or destroy an Aboriginal place or object without the prior written consent from OEH;
- The findings of the current assessment; and
- The interests interests of the Aboriginal and wider community.

Recommendations concerning the Project Site are as follows.

1. Lots 19/DP1047309, 7023/DP1054934, 632/DP750179 and 549/DP657444, and part lots 101/DP1169531 and 7022/DP1054934 do not present with any constraint on the basis of Aboriginal heritage.
2. It is recommended that the Proponent seek to avoid impact to Aboriginal site PIE-ST1.
    a. High-visibility, temporary physical curtilage delineating a ten metre buffer zone which does not infringe within the drip-line of PIE-ST1 is recommended to ensure against inadvertent damage during construction works.
    b. Any long term management of PIE-ST1 by means of permanent fencing or signage should first be discussed with Aboriginal community.
3. Should impacts to PIE-ST1 be unavoidable an Aboriginal Heritage Impact Permit must be sought from the Office of Environment and Heritage.
4. All land-disturbing activities must be confined to within the assessed Project Site.
5. As an additional mitigative measure, where possible any topsoil removed from within the Project Site during the construction phase of proposed works should be stockpiled for reuse in the immediate area.
6. The work crews in the initial ground breaking phase of construction should be made aware of the legislative protection of Aboriginal sites and objects.
7. In the unlikely event that objects are encountered that are suspected to be of Aboriginal origin (including skeletal material), the Unanticipated Finds Protocol (**Appendix 3**) should be followed.

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PLATES

Plate 1: The Project Site – landscape.

Plate 2: The Project Site – geology and soils.

Plate 3: The Project Site – transport infrastructure.

Plate 4: The Project Site – miscellaneous disturbances.

Plate 5: The Project Site – ground surface visibility.

Plate 6: Parkes Industrial Estate – Scarred Tree 1 (PIE-ST1).

APPENDIX 1: COMMUNITY CONSULTATION

CONSULTATION LOG - Parkes Industrial Estate				
Date	**Organisation**	**Contact Name**	**Comment**	**OzArk Staff/ Method**
11.11.13	Peak Hill LALC	Cherie Keed Peak Hill LALC	SB rang and the phone rang out	phone
11.11.13	Peak Hill LALC	Anthony Wilson	SB rang Anthony and left a message for him to call. He was driving at the time	phone
11.11.13	Peak Hill LALC	Anthony Wilson	Anthony returned phone call and spoke to MW and JB. Confirmed availability and attendance for site work on Monday 18th November 2013. JB informed that we require current W/C insurance certificate as the copy we have has expired. Anthony requested that details for Monday be sent through to Cherie Keed at LALC and she will send through W/C to OzArk	phone
12.11.13	Peak Hill LALC	Cherie Keed Peak Hill LALC	SB emailed letter and posted an invite to Cherie for field work. SB also reiterated the need of the W/C cert or site work will not be able to occur.	email/post
13.11.13	Peak Hill LALC	Cherie Keed Peak Hill LALC	SB received phone call from Cherie - requesting whether one or two site officers required on Monday. SB confirmed only one. SB discussed W/C cert, Cherie to chase up with insurance company and send through.	Phone
15.11.13	Peak Hill LALC	Cherie Keed Peak Hill LALC	Message on voicemail from Cherie, that she needed fax number to send W/C to SB.	phone
15.11.13	Peak Hill LALC	Cherie Keed Peak Hill LALC	SB rang the PH LALC, Cherie has left for Dubbo and will slip W/C cert under the door.	phone

Record of Aboriginal Representative Participation in Cultural Heritage Fieldwork

Project Name: Parkes Industrial Estate

Client Name: Arthon Geolyst (Orange)

Client Address:

Name of Aboriginal Organisation: PLACL

Name of Representative(s): Anthony Wilkin

Name of Archaeologist: Morgan Wilcox (OzArk)

Address of Archaeologist: 145 Wingewarra St, Dubbo

Type of participation:

- [x] Guided inspection of study area or sites
- [ ] Accompanied and participated in the archaeological survey of the study area
- [ ] Undertook a separate inspection of the study area
- [ ] Participated in excavation programme

Period of participation:

Dates	Start	Finish
18.11.13	900	12:30

Were sites recorded? Yes Scared Tree.

Issues Discussed: No Dad.
→ Discussed likelihood of undetected sites or PADs in study area. Anthony concurred low probability and happy with acreage.

Signed Aboriginal Representative:

Signed Archaeologist:

APPENDIX 2: DATABASE SEARCH RESULTS

Office of Environment & Heritage
NSW GOVERNMENT

AHIMS Web Services (AWS)
Search Result

Your Ref Number : 945
Client Service ID : 116542

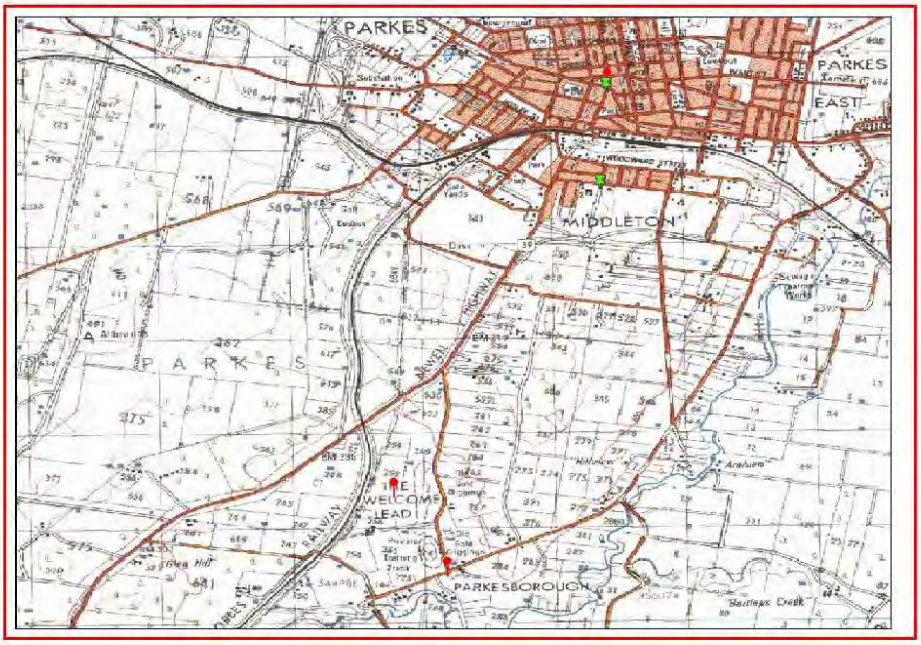
OzArk Cultural Heritage Management
PO Box 2069
Dubbo New South Wales 2830
Attention: Morgan Wilcox
Email: morgan@ozarkehm.com.au

Date: 12 November 2013

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.176, 148.137 - Lat, Long To : -33.1446, 148.1869 with a Buffer of 1000 meters, conducted by Morgan Wilcox on 12 November 2013.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

7	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

APPENDIX 3: UNANTICIPATED FINDS PROTOCOL

An Aboriginal artefact is anything which is the result of past Aboriginal activity. This includes stone (artefacts, rock engravings etc.), plant (culturally scarred trees) and animal (if showing signs of modification; i.e. smoothing, use). Human bone (skeletal) remains may also be uncovered while onsite.

Cultural heritage significance is assessed by the Aboriginal community and is typically based on traditional and contemporary lore, spiritual values, and oral history, and may also take into account scientific and educational value.

Protocol to be followed in the event that previously unrecorded or unanticipated Aboriginal object(s) are encountered:

1. All ground surface disturbance in the area of the finds should cease immediately the finds are uncovered.
    a) The discoverer of the find(s) will notify machinery operators in the immediate vicinity of the find(s) so that work can be halted; and
    b) The site supervisor will be informed of the find(s).
2. If there is substantial doubt regarding an Aboriginal origin for the finds, then gain a qualified opinion from an archaeologist as soon as possible. This can circumvent proceeding further along the protocol for items which turn out not to be archaeological. If a quick opinion cannot be gained, or the identification is positive, then proceed to the next step.
3. Immediately notify the following authorities or personnel of the discovery:
    a) OEH; and
    b) Relevant Aboriginal community representatives.
4. Facilitate, in co-operation with the appropriate authorities and relevant Aboriginal community representatives:
    a) The recording and assessment of the finds;
    b) Fulfilling any legal constraints arising from the find(s). This will include complying with OEH directions; and
    c) The development and conduct of appropriate management strategies. Strategies will depend on consultation with stakeholders and the assessment of the significance of the find(s).
5. Where the find(s) are determined to be Aboriginal Objects, any re-commencement of construction related ground surface disturbance may only resume in the area of the find(s) following compliance with any consequential legal requirements and gaining written approval from OEH (as required).

Appendix C

DESKTOP CONTAMINATION REPORT

Envirowest Consulting *Pty Ltd* ABN 18 103 955 246
• 9 Cameron Place, PO Box 8158, Orange NSW 2800 • Tel (02) 6361 4954 •
• Fax (02) 6360 3960 • Email admin@envirowest.net.au • Web www.envirowest.net.au •

Environmental
Geotechnical
Asbestos
Services

22 August 2013

Geolyse Pty Ltd
PO Box 1963
Orange NSW 2800
Attn: David Walker

Ref: Q13189

Dear David,

Detailed contamination investigation at Lot 549 DP657444, Lot 632 DP750179, Lots 7022 & 7023 DP1054934, Lot 101 DP1169531 and Lot 19 DP1047309 Newell Highway, Parkes NSW

1. Background

Rezoning of Lot 549 DP657444, Lot 632 DP750179, Lots 7022 & 7023 DP1054934, Lot 101 DP1169531 and Lot 19 DP1047309 Newell Highway, Parkes NSW from RU1 rural to IN1 general industrial is proporsed by Parkes Shire Council. A preliminary contamination investigation undertaken by Envirowest Consulting Pty Ltd in June 2013 (report number R13230c) identified the following areas requiring additional investigations:

- Northern section of site (possible mine waste or salinity)
- Stockpiles (unknown source)
- Infrastructure (fill and pesticides)
- Central section of Lot 632 (possible former mine location)

Additional investigations included a site inspection and soil sampling to confirm the contamination status.

2. Objectives

The detailed contamination investigation to undertake:

- Site inspection for evidence of contamination
- Sampling of the northern section of the site, stockpiles, infrastructure and central section of Lot 632
- Preparation of a detailed contamination investigation report

3. Site location

The site is Lot 549 DP657444, Lot 632 DP750179, Lots 7022 & 7023 DP1054934, Lot 101 DP1169531 and Lot 19 DP1047309 Newell Highway, Parkes NSW. The site inspection will be undertaken over the whole site for evidence of contamination. Soil samples will be collected from the northern section of the site, stockpiles, infrastructure and central section of Lot 632 as identified in the preliminary contamination investigation (Envirowest Consulting Pty Ltd report number R13230c).

4. Assessment

The detailed contamination investigation will require:

- Site inspection for evidence of contamination. If evidence of contamination is identified, soil sampling will be required.
- Soil sampling of the northern section of the site will be undertaken on a systematic grid pattern with 56 discrete soil samples collected and combined to form 14 composite samples for analysis of contaminants of concern (heavy metals, cyanide and salinity)
- Soil sampling of the stockpiles will be undertaken at a density of 1 sample per 100m^3. It is estimated the stockpiles contain approximately 1,200m^3 of material. Thirteen discrete soil samples will be collected and analysed for contaminants of concern (metals, total petroleum hydrocarbon (TPH), benzene, toluene, ethylbenzene (BTEX), organochlorine pesticides (OCP) and polycyclic biphenyls(PCB)).

- Sampling around the infrastructure will be undertaken on a judgemental pattern with 6 soil samples collected. The soil samples will be analysed for contaminants of concern (metals and OCP).
- Soil sampling of the central section of Lot 632 will be undertaken on a systematic sampling pattern with 11 discrete soil samples collected and analysed for contaminants of concern (metals and cyanide).
- Quality control sampling will also be undertaken
- A report will be prepared detailing the results of the investigation and recommendations for suitability of the proposed land-use.

5. Fee proposal

Our fee for the project as described above is $8,592 ($9,451.20 including GST). If contamination is identified then additional costs will be incurred for assessments.

Terms are 28 days after the completion of the report.

6. Timing

We are able to commence the project within 3 weeks of approval. Field work, laboratory analysis and reporting will require around 5 weeks.

7. Other

The project will be supervised by Greg Madafiglio who has experience in contamination investigations. Greg is accredited with the Soil Science Society of Australia as a certified professional soil scientist.

Envirowest Consulting Pty Ltd has professional indemnity insurance, public liability and workers compensation insurance.

Thank you for your invitation to quote on this project.

Please call if you require further information,

Regards,

Greg Madafiglio
Senior soil scientist

Appendix D

TRAFFIC IMPACT ASSESSMENT

TRAFFIC IMPACT ASSESSMENT
TO SUPPORT PLANNING PROPOSAL

PREPARED FOR

PARKES SHIRE COUNCIL – ECONOMIC DEVELOPMENT COMMITTEE

JUNE 2014

TRAFFIC IMPACT ASSESSMENT

TO SUPPORT PLANNING PROPOSAL

PROPOSAL TO REZONE SIX (6) LOTS BOUNDED BY NEWELL HIGHWAY (EAST), SALEYARDS ROAD (NORTH) & PARKES-STOCKINBINGAL RAILWAY CORRIDOR (WEST) FROM PRIMARY PRODUCTION TO GENERAL INDUSTRIAL

PREPARED FOR:

PARKES SHIRE COUNCIL – ECONOMIC DEVELOPMENT COMMITTEE

JUNE 2014

GEOLYSE

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Report Title:	*Traffic Impact Assessment*
Project:	*To support Planning Proposal*
Client:	*Parkes Shire Council – Economic Development Committee*
Report Ref.:	*113076_TIA_001C.docx*
Status:	*Final*
Issued:	*11 June 2014*

Geolyse Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

All information contained within this report is prepared for the exclusive use of Parkes Shire Council – Economic Development Committee to accompany this report for the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes apart from those stated therein.

Geolyse Pty Ltd accepts no responsibility for any loss, damage suffered or inconveniences arising from, any person or entity using the plans or information in this study for purposes other than those stated above.

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Introduction

1.1 BACKGROUND

Parkes Shire Council intends to develop a staged industrial subdivision on the southern approaches to the town to extend the existing Saleyards Road Industrial Estate. In order to facilitate the subdivision an amendment to the Parkes Local Environmental Plan 2012 is required to rezone the subject land from RU1 – Primary Production to IN1 – General Industrial.

The subject land is formed of six lots, as set out in **Table 1.1**, and has an overall area of approximately 102 hectares.

The land is roughly triangular in shape and is bounded by the Parkes Stockingbal Railway to the west, the Newell Highway to the east and the existing Saleyards Road Industrial Estate to the north.

The subject land would be developed with internal local roads and these would be accessed from Saleyards Road in the north and the Newell Highway in the south-east. Existing local roads linking to Saleyards Road have been developed and would be extended as a result of the development.

Two concept designs for the estate have been provided to provide an indicative understanding of the potential development level. Option 1 contains more lots with a smaller average size and Option 2 contains less lots but with a larger average size. Option 2 also incorporates a number of rail sidings and associated railway industry land. The two concept layout plans are attached as **Drawings 01 & 02**.

Depending on the approach taken, the development would eventually comprise between 96 and 144 lots ranging in size from 1,500 square metres to 25,000 square metres.

It is intended that the development would incorporate interallotment drainage and a detention basin in the south of the site. It is intended that a sewage pump station to service the subdivision would be located in the southern extent of the site.

A staging plan has not yet been formulated, however it is understood that Council intend to introduce new lots gradually to the market, to account for demand requirements, without over saturation.

1.2 SITE LOCATION

The subdivision development site is located on the southern side of Parkes, to the south of the existing Saleyards Road Industrial Estate.

Saleyards Road is on the southern fringe of Parkes' existing industrial area.

The cadastral description of the land is set out in **Table 1.1**.

The location of the subject site is indicated on **Figure 1**.

Table 1.1 – Existing Lot details

Lot/DP	Size (hectares)
Lot 549 in DP 657444	32.3
Lot 632 in DP 750179	46.41
Lot 7023 in DP 1054934	1.659
Part Lot 7022 in DP 1054934	2.991
Part Lot 101 in DP 1169531	16.86
Lot 19 in DP1047309	1.56
TOTAL	**101.78**

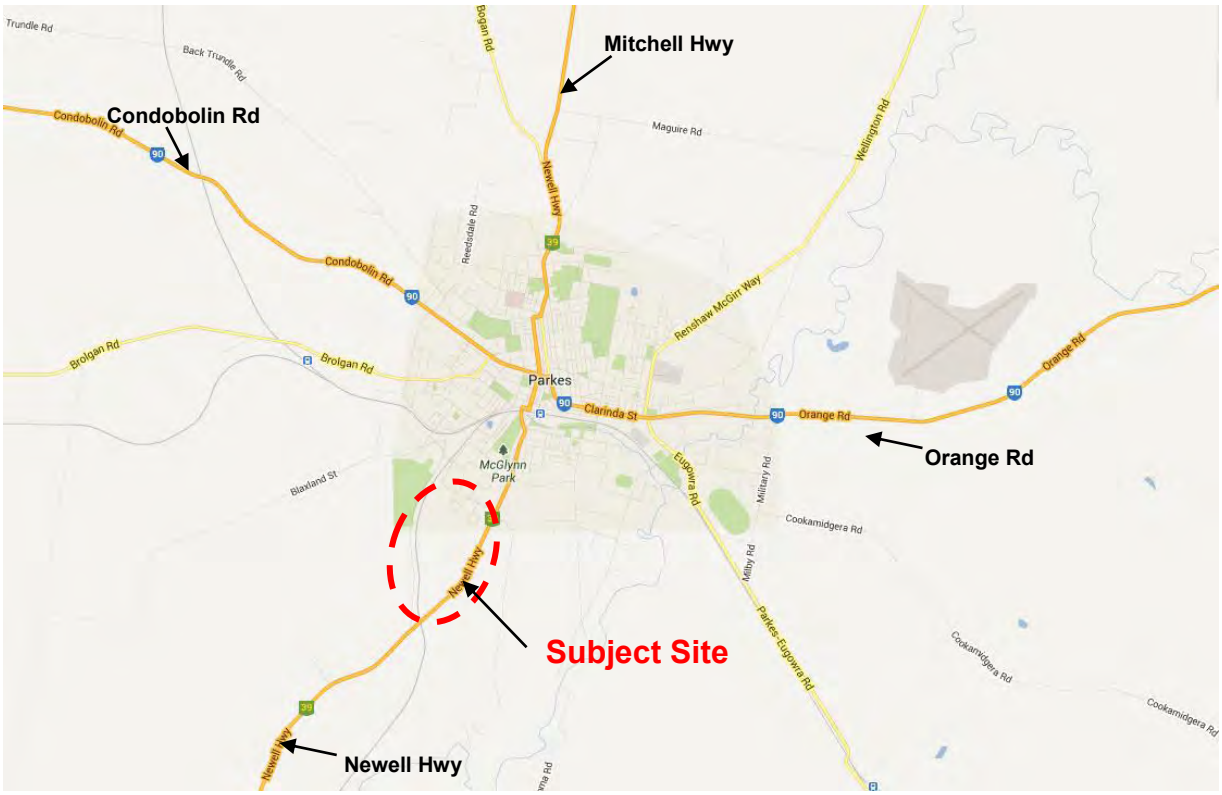


Figure 1: Context Location Plan (Source Google Maps)

1.3 TRAFFIC IMPACT ASSESSMENT

By reference to clause 104 of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP), the resulting proposed industrial subdivision would be classified as a Schedule 1 traffic generating development. The matter is therefore referrable to Roads and Maritime Services (RMS) and a Traffic Impact Assessment necessary to gauge the degree of impact of the project.

This Traffic Impact Assessment (TIA) investigates the impact of the development of the industrial subdivision on the surrounding road network. The TIA will determine if additional traffic management facilities are required to safely and efficiently control the movement of all vehicular traffic to and from the site.

This TIA will address the following specific issues:

- The potential levels of traffic generation as a result of the proposed rezoning;
- Points of access to and from the Newell Highway and from Hanlon Street, Langlands Street and Boyd Circuit;
- Impact on road safety;
- Impact on safety and amenity of the surrounding road network; and
- Movement and operation of service/delivery vehicles.

1.4 METHODOLOGY

The proposal to rezone the land would result in the potential for the development of an industrial subdivision. This eventual subdivision would generate an increase in the volume of traffic movements onto the Newell Highway, both directly and via Saleyards Road. The provision of safe and efficient means of access to the development will be necessary to ensure the satisfactory operation of the development.

In carrying out the TIA, three (3) broad issues would need to be addressed as outlined below:

i. Consideration of statutory framework

ii. Existing Traffic Conditions

- Road network hierarchy surrounding the development;
- Existing roadway conditions;
- Existing road capacity;
- Annual Average Daily Traffic;
- Peak hour traffic; and
- Intersection operations

iii. Traffic Generation and Impacts

- Traffic generation from the industrial subdivision;
- Traffic distribution within and external to the development;
- Impact of generated traffic from the industrial subdivision on traffic volumes; and
- Local area traffic management.

The methodology for preparing the TIA is outlined below:

i. Review of existing traffic volume data held by Council and the Roads and Maritime Services for roads surrounding the development site.

ii. Determination of the traffic generating potential of the industrial subdivision development and calculation of the peak hour and peak daily traffic volumes to be added to the existing traffic volumes on the roads surrounding the development site.

iii. Assessment of the impact of the additional traffic generated by the industrial subdivision development on the surrounding road network through the use of SIDRA modelling. The impact assessment will be carried out in terms of:

- Road capacity; and
- Level of Service.

In summary, this Traffic Impact Assessment will assess:

- the existing traffic movements on the existing road network, including the Newell Highway and Saleyards Road;
- the expected traffic volumes generated by the proposed industrial subdivision;
- the effect of the generated traffic on the surrounding roads; and
- proposed intersection design to accommodate anticipated volumes.

Consideration of ISEPP

2.1 GENERAL

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) provides two Schedules for classifying various types of developments based upon their potential to generate additional traffic onto the surrounding road network.

Developments listed in Schedule 3 of the ISEPP require referral to the Roads and Maritime Services where they meet the relevant threshold. The project would result in the development of greater than 5,000 square metres of industry within 90 metres of a classified road and greater than 20,000 square metres in any event. By virtue of meeting these thresholds, referral to the RMS is required.

In addition to the above, subdivisions generally are captured by Schedule 3 where they involve the creation of 50 or more lots and are located within 90 metres of a classified road. This trigger is also met in relation to this project.

Additionally, there is the potential for future developments on individual lots within the future industrial estate may be subject to further traffic assessment as part of the development approval process for that particular development. It would be preferable if such traffic assessment was carried out upfront on a holistic basis during the approval process for the overall industrial subdivision.

In any case, the proposed southern access road directly connects to the Newell Highway and would therefore require referral of the development to the RMS for comment and assessment; preferably supported by a TIA.

Existing Traffic Conditions

3.1 ROAD NETWORK HIERARCHY

The Roads and Traffic Authority (2008) proposes four basic road classes as the basis for the functional hierarchy of a road network.

Functional classifications take into account the relative balance of the traffic mobility function and amenity/access functions of streets and roads and defines the purpose of a road within the context of an urban area.

The four road classes are motorways, arterial, sub-arterial and local roads and are defined below.

- Motorways
- This is the highest form of arterial road and is considered separately due primarily to traffic function and strict access control via grade separate interchanges. These roads provide for major inter-regional traffic movements in a safe and operationally efficient manner.
- Arterial Roads

  Roads whose main function is to carry through traffic from one region to another forming the principal means of communication for major traffic movements. Access to land should be limited.
- Sub-Arterial Roads

  Those roads which supplement the arterial roads in providing for through traffic movement to an individually determined limit that is sensitive to both roadway characteristics and adjoining land uses.
- Local Roads

  Roads that distribute traffic between the arterial roads and the local street system and provide access to adjoining property.

By definition, State Highway No. 17 (Newell Highway) providing access to the project area is classified as an Arterial Road, Saleyards Road would be classified as a Collector Road and the proposed subdivision roads would be classified as Local Roads.

3.2 EXISTING ROADWAY CONDITIONS

The Newell Highway adjacent to the subject site consists of a three lane two way rural highway. In the vicinity of the site, there is access from the Newell Highway to Saleyards road, consisting of an overtaking lane for southbound vehicles fully developed at the intersection and an overtaking lane for northbound vehicles terminating north of the intersection.

The Newell Highway at the intersection with Saleyards Road is speed limited to 80km/hr. The transition from the Parkes built up speed limit of 50km/hr to the 80km/hr speed zone occurs approximately 450m north of the intersection. .

The overtaking lane for southbound vehicles commences approximately 185m north of the intersection of Saleyards Road and is fully developed for a distance of approximately 120m north of the intersection. The southbound overtaking lane is fully developed for a distance of approximately 200m south of the intersection and transitions to a single southbound lane over an additional 50m.

The transition from the 80km/hr to a 110km/hr speed limit on the Newell Highway occurs approximately 300m south of the intersection with Saleyards Road.

The overtaking lane for northbound vehicles on the Newell Highway commences approximately 800m south of the intersection with Saleyards Road and is fully developed to a point located approximately 55m north of the intersection and transitions to a single northbound lane over an additional 50m.

The intersection of the Newell Highway and Saleyards Road has street lighting provided.

Saleyards Road currently comprises a two lane two way rural type road with a bitumen seal width of approximately 9 metres for the majority its length, and 17 metre seal for the portion of the road between the Harvey Norman store and Hanlon Street. A 1m wide gravel shoulder is on the northern side of the road whilst substantial works have been carried out to construct a new gravel pavement on the southern side of the road.

Boyd Circuit, Langlands Road and Hanlon Streets are two lane two way local roads, featuring kerbing and guttering on both sides.

Saleyards Road continues west past the existing subdivision and crosses the Parkes Stockingbal Railway Line via a non active crossing; thereafter linking through to London and Hartigan Roads. Hartigan Road links with the Newell Highway in the east and the Brolgan Road in the west. It is anticipated that a proportion of traffic, particularly those arriving from the west, would utilise this route to enter the subdivision. As this road is not identified on the RMS Restricted Access Vehicle (RAV) Route maps, vehicles using this access option would be light vehicles only.

All roads within the existing Parkes Industrial Subdivision are identified on the RMS RAV route maps as being accessible by longer (but not high) vehicles up to 26 metres in length; high vehicles are restricted to main roads only. It is anticipated that the proposed internal roads, including the proposed new southern access road, would also be added to the RAV routes.

3.3 EXISTING ROAD CAPACITY

The provision of roads within an urban area provides four main functions:

i. to cater for moving vehicles;

ii. to cater for parked vehicles;

iii. to cater for pedestrians and bicycle traffic; and

iv. to allow for development and to provide access to adjoining property.

In carrying out the above functions, a road must also be capable of handling the traffic demands placed on it. Roads have varying capacities dependent on the function they are performing. The United States Highway Capacity Manual defines capacity as follows:

> *…the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions.*

The physical characteristics of a roadway such as lane width, alignment, frequency of intersections etc make up the prevailing roadway conditions.

Based upon its capacity and a driver's expectations of the operational characteristics of a traffic stream is a qualitative measure denoted as the level of service of a road.

Level of service definitions combine such factors as speed, travel time, safety, convenience and traffic interruptions and fall into six levels of service categories ranging from A down to F.

The *AUSTROADS Guide to Traffic Management, Part 3 – Traffic Studies and Analysis* describes Level of Service A as:

A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. 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.

The categories are graduated from Level of Service A down through six levels to Level of Service F that is a zone of forced flow. The amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdowns occur and queuing and delays result.

Level of Service criteria for interrupted flow roads can be determined based upon the following classifications:

- Percent time delayed; and
- Average speed.

The percent time delayed is defined as the average percent time that all vehicles are delayed whilst travelling in groups due to their inability to overtake.

Level of Service criteria for Class I and Class II roads are shown in **Table 3.1**. Class I roads are two-lane highways on which motorists expect to travel at relatively high speeds. Class I facilities often serve long distance trips. Class II are two-lane highways on which motorists do not necessarily expect to travel at high speeds, and most often serve relatively short trips, the beginning and ending portion of longer trips, or trips for which sightseeing plays a significant role.

Table 3.1 – Level of Service Criteria

Level of Service	Class I			Class II	
	Per Cent Time Delayed/Following	Average Speed (km/hr)	Maximum Service Flow Rates (pc/h)	Per Cent Time Delayed/Following	Average Speed (km/hr)
A	<35	>90	490	<40	<90
B	<50	>80	780	<55	<80
C	<65	>70	1,190	<70	<70
D	<80	>60	1,830	<85	<60
E	<100	<60	3,200	-	-
F	Volumes lower than capacity and speeds highly variable				

Source: ***AUSTROADS Guide to Traffic Management, Part 3 – Traffic Studies and Analysis***

* pc/h – passenger cars per hour

The Newell Highway provides an efficient means for vehicles travelling to and from Parkes to access the project site; it is considered to constitute a Class II highway in this capacity. Where the highway serves as a connection for the site and the broader region, ie, south to Forbes, it is considered to represent a Class I highway.

The connection of the Newell Highway to other major roads within the Parkes urban area ensures that the traffic generated by the industrial subdivision can be readily absorbed into the surrounding road network.

Based on the physical configuration of the Newell Highway adjacent to the intersection with Saleyards Road and the methodology outlined in *AUSTROADS Guide to Traffic Management, Part 3 – Traffic Studies and Analysis* , the capacity of the Newell Highway (in a rural highway situation) has been assessed and is summarised in **Appendix A**. It is calculated that the highway has an existing capacity of 1,848 vehicles per hour.

It should be noted that the calculation of the capacity of the Newell Highway adjacent to the intersection of Saleyards Road has been carried out on the basis of a single lane only for southbound and

northbound vehicles. In actual fact, given the overtaking lanes that are available in this location, the capacity of the highway would be greater than the figure indicated above.

The capacity of Saleyards Road in its current configuration can be determined directly from *AUSTROADS Guide to Traffic Management, Part 3 – Traffic Studies and Analysis*. The current two way capacity of Saleyards Road is 970.2 veh/hr.

3.4 ANNUAL AVERAGE DAILY TRAFFIC

Annual Average Daily Traffic (AADT) is defined as the total volume of traffic passing a roadside observation point over a period of a year divided by the number of days in a year.

Site specific traffic data was not collected on individual roads surrounding the subdivision site for the preparation of this TIA. However, the Roads and Maritime Services and Parkes Shire Council were able to provide details of traffic data on both the Newell Highway and Saleyards Road.

The closes RMS recording station on the Newell Highway is station 93.122, located approximately 16km north of Forbes on the boundary between the Forbes and Parkes Council areas. The daily vehicle volume at the recording stations is provided in **Table 3.2**, broken down by vehicle types.

Table 3.2 – Average Annual Daily Traffic

Vehicle Types	Station 93.122
Passenger vehicles	2546
Heavy vehicles	1091
TOTAL	**3637**

Source: Roads and Maritime Services

Parkes Shire Council has provided details of vehicle counts undertaken on Saleyards Road. The link counts were carried out using a traffic classifier from approximately 15.46 on Monday 19 March 2012 to 13.58 Wednesday 28 March 2012. The raw traffic data provided by Council is attached in **Appendix B**. As per the above, heavy vehicles account for approximately 30% of traffic on the Newell Highway. This figure would be used for modelling purposes across all traffic movements.

Link counts measure the number of vehicles passing an observation point on the road over a given period of time and the use of the traffic classifier can provide information relating to the class (size) of the vehicle and the speed it was travelling when recorded.

The 9 days of data collected by Council has been condensed into hourly counts representing a "virtual week" of traffic volumes. The traffic data information is summarised in **Table 3.3**.

Table 3.3 – Summary of Traffic Data on Saleyards Road

Item	Mon	Tue	Wed	Thur	Fri	Sat	Sun
24 hour Daily Average Vehicles	521.5	456.5	387.5	559.0	616.0	308.0	256.0
5 Day (Mon to Fri) Total Vehicles	2,540.5						
5 Day (Mon to Fri) Average Vehicles	508.1						
7 Day (Mon to Sun) Total Vehicles	3,104.5						
7 Day (Mon to Sun) Average Vehicles	443.5						
Morning Peak Hour Vehicles	44	44.5	23	47	54	37	34
Afternoon Peak Hour Vehicles	53	52	61	66	57	31	27
5 Day (Mon to Fri) Average Morning Peak Hour Vehicles	36.3						
5 Day (Mon to Fri) Average Evening Peak Hour Vehicles	53						

Table 3.3 – Summary of Traffic Data on Saleyards Road

Item	Mon	Tue	Wed	Thur	Fri	Sat	Sun
7 Day (Mon to Sun) Average Morning Peak Hour Vehicles	35.2						
7 Day (Mon to Sun) Average Evening Peak Hour Vehicles	46						

The data indicates that over a given 7 day period approximately 3,105 vehicles used Saleyards Road and the average daily total using the road is approximately 444 vehicles per day. Based on the information provided by Parkes Shire Council, the average daily vehicles using Saleyards Road will be adopted as the AADT for the road.

Due to the short term nature of the recording period and the need to apply a seasonal adjustment factor to the observed traffic volume to account traffic volume fluctuations during the year, the stated AADT of 444 vehicles per day does not represent a true indication of AADT but is satisfactory for the purposes of this TIA.

3.5 PEAK HOUR TRAFFIC

In the absence of peak hour traffic data for the Newell Highway, an accepted RMS procedure is to adopt 15% of an AADT traffic volume as an estimate of the peak hour traffic volume on a road. Based on the AADT as 3,637, as per **Table 3.2**, the peak hour traffic volume on the Newell Highway is 545 vehicles per hour.

From the traffic count data provided by Parkes Shire Council and included in **Appendix B**, a summary of the peak hour vehicles and peak hour times is presented in **Table 3.4.**

Table 3.4 – Summary of Peak Hour Traffic on Saleyards Road

Day	Morning Peak Hour	No. of Vehicles	Evening Peak Hour	No. of Vehicles
Monday	11.00am to 12.00pm	44	1.00pm to 2.00pm	53
Tuesday	10.00am to 11.00pm	44.5	2.00pm to 3.00pm	52
Wednesday	11.00am to 12.00pm	23	2.00pm to 3.00pm	61
Thursday	10.00am to 11.00am	48	1.00pm to 2.00pm	66
Friday	11.00am to 12.00pm	54	4.00pm to 5.00pm	57
Saturday	11.00am to 12.00pm	37	12.00pm to 1.00pm	31
Sunday	10.00am to 11.00am	34	4.00pm to 5.00pm	27
5 Day Average	10.00am to 11.00pm	36.3	2.00pm to 3.00pm	53
7 Day Average	10.00am to 11.00pm	35.2	2.00pm to 3.00pm	46

The data indicates that over a given 7 day period the average peak hour traffic using Saleyards Road ranges from 35 to 46 vehicles per hour.

Given the non-residential nature of the existing development in Saleyards Road, the timing of the observed peak hour traffic would appear to be correct and will be adopted for further analysis in this TIA.

It is expected that during the AM peak hour, the majority of traffic (i.e., 80%) would be travelling into the subdivision, and that during the PM peak hour, 80% of the traffic would be travelling out of the subdivision.

3.6 EXISTING INTERSECTION OPERATIONS

3.6.1 INTRODUCTION

Intersections are critical points which control the capacity of the road network. This is due to the need for conflicting traffic movements to share the same road space at these locations. The operation of the intersections in the vicinity of the site have been analysed using SIDRA Intersection. SIDRA Intersection is a computerised traffic evaluation tool which is used in the assessment and design of intersection treatments in terms of capacity and operation. The program provides outputs which include delays, queue lengths, total capacities, travel times, and average speeds. SIDRA Intersection is the preferred intersection analysis tool of RMS and many Local Government Authorities.

As part of the intersection analysis, the SIDRA Intersection model provides an "Average Control Delay" for each approach of the intersection. This control delay is the average delay per vehicle over the peak hour as a result of the intersection and is grouped into six bands labelled A through to F (with 'A' being best and 'F' being over capacity), termed Level of Service (LOS). The overall LOS for a 'Give Way' intersection is the LOS result for the worst case turning movement.

3.6.2 NEWELL HIGHWAY AND SALEYARDS ROAD

An assessment of the Newell Highway/Saleyard Road intersection was undertaken using SIDRA. It was based on the pre development peak hour traffic volumes from the traffic count as outlined in **Sections 3.4 and 3.5**. The following assumptions were included in the SIDRA analysis:

- Intersection traffic and turning movements: refer **Figure 2**
- Total vehicles entering/leaving: refer **Section 4.2**
- Control type: Give Way: Saleyard Road to Newell Highway
- Lane widths assumed: Newell Highway - 3.7m, Local Roads – 3.2m
- Approach lengths on Newell Highway
  - 500m northbound
  - 500m southbound through
  - 80m southbound right
- Approach length on Saleyards Road: 500m eastbound
- Approach and exit cruise speeds:
  - 50kph approach and exit for Saleyards Road and Newell Highway
  - 80kph cruise speed for Newell Highway
- Heavy Vehicle percentage: 30%, as per RMS traffic count – refer **Table 3.2**

Based on the above assumptions, a SIDRA Intersection analysis was carried out for the intersection for the existing AM and PM peaks with the output from the PM peak assessment summarised in **Table 3.5** and turning movements shown in **Figure 2**. The results of the SIDRA analysis are provided in **Appendix C**.

MOVEMENT SUMMARY

Site: Existing PM Peak

Newell Highway/Saleyards Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Newell Highway											
1	L2	1	30.0	0.001	11.8	LOS A	0.0	0.0	0.00	0.69	43.2
2	T1	287	30.0	0.176	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		288	30.0	0.176	0.1	NA	0.0	0.0	0.00	0.00	49.9
North: Newell Highway											
8	T1	287	30.0	0.176	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	8	30.0	0.010	14.1	LOS A	0.0	0.3	0.42	0.67	41.4
Approach		296	30.0	0.176	0.4	NA	0.0	0.3	0.01	0.02	49.7
West: Saleyards Road											
10	L2	35	30.0	0.004	11.8	LOS A	0.0	0.0	0.00	0.69	43.2
12	R2	4	30.0	0.004	11.8	LOS A	0.0	0.0	0.00	0.69	43.2
Approach		39	30.0	0.004	11.8	NA	0.0	0.0	0.00	0.69	43.2
All Vehicles		623	30.0	0.176	1.0	NA	0.0	0.3	0.01	0.05	49.3

Figure 2: Existing PM Peak hour traffic movements

Table 3.5 – Newell Highway/Saleyards Road Post Development – PM Peak

Scenario	Average Control Delay (Seconds)	Level of Service (LOS)	Largest 95% Queue Length (vehicles)	Largest 95% Queue Length (metres)
From Newell Highway North				
Southbound	0.0	A	0.0	0.0
Right into Saleyards Road	14.1	A	0.0	0.3
From Newell Highway South				
Left into Saleyards Road	11.8	A	0.0	0.0
Northbound	0.0	A	0.0	0.0
From Saleyards Road				
Left onto Newell Highway (north)	11.8	A	0.0	0.0
Right onto Newell Highway (south)	11.8	A	0.0	0.0

From the above table, it is noted that the current worst movement is the right turn from the Newell Highway into Saleyards Road, with an LOS of A and an average delay of 14.1 seconds. All movements operate with a LOS of A.

Traffic Generation and Impacts

4.1 TRAFFIC DISTRIBUTION ASSUMPTIONS

For the purposes of further assessment, the following assumptions have been made about traffic generation and peaks.

For traffic generation:

- 85% of traffic would originate from Newell Highway North (Parkes)
- 10% of the traffic would originate from Newell Highway South (Forbes)
- 5% of traffic would originate from Saleyards Road (west)

For peaks:

- Newell Highway
  - AM Peaks: 50% Northbound and 50% Southbound
  - PM Peaks: 50% Northbound and 50% Southbound

Saleyards Road

  - AM peak: 80% entering the subdivision and 20% leaving the subdivision
  - PM Peak: 20% entering the subdivision and 80% leaving the subdivision

Proposed new southern access road

  - AM peak: 80% entering the subdivision and 20% leaving the subdivision
  - PM Peak: 20% entering the subdivision and 80% leaving the subdivision

4.2 TRAFFIC GENERATION

The RTA first published a *Guide to Traffic Generating Developments* in 1991, before its revision in 2001. It is currently being revised and as in interim measure RMS has published updated traffic survey data for a range of development types. Of relevance to this TIA is data provided in relation to business parks and industrial estates. The summary figures are provided for the Sydney area and regional areas. The regional areas surveyed included four sites in the Lower Hunter, one in the Illawarra and one in Dubbo. The figures for regional areas are relevant to this TIA and are reproduced below.

Table 4.1 – Summary of land use traffic generation – Business Parks and Industrial Estates

Weekday Rates	Regional Average	Regional Range
AM Peak (1 hour) vehicle trips per 100 square metres of GFA	0.70	0.32-1.20
PM Peak (1 hour) vehicle trips per 100 square metres of GFA	0.78	0.39-1.30
Daily total vehicle trips per 100 square metres of GFA	7.83	3.78-11.99

Source: RMS Guide to Traffic Generating Developments – updated traffic surveys August 2013

The average figures above have been used for the purposes of this TIA.

The applicable generation RMS rates reproduced in **Table 4.1** require details of the gross floor area of each building to be known in order to determine overall traffic generation figures. As it is not possible at this stage of the assessment process to determine exactly the size of the proposed buildings to be constructed on each lot, the following average traffic generation rates will be adopted for estimating

the additional traffic to be generated by the eventual development of the site (based on a building with an average GFA of 750 square metres):

- Daily vehicles trips 60 trips per lot per day
- Peak hour vehicle trips 5.5 trips per lot per hour

Given the variations in lot yield between the two concept plans, it is proposed to use an average of the two anticipated yields, which equates to a yield of 120 lots.

Traffic generation projections are provided on an overall basis and then also broken down on the basis of the two existing (Saleyards Road and Newell Highway) and one proposed roads (new southern access road), on a daily and hourly basis.

Based on the stated traffic generation rates and the assumed average yield, the traffic generated by the development of the industrial subdivision is:

Daily Vehicle Trips:

120 lots x 60 trips per lot per day = 7,200 vehicle trips per day

Peak Hour Trips:

120 lots x 5.5 trips per lot per hour = 660 vehicle trips per hour

Based on the stated traffic distribution, the following traffic generation data can be determined for the Saleyards Road Industrial Estate:

Daily Traffic Distribution – Total (AADT):

Daily Traffic Generation: 7,200 trips per day

Daily trips to and from Parkes (northerly direction): 6,480 trips per day

Daily trips to and from the southerly direction: 720 trips per day

Daily Traffic Distribution – Newell Highway:

Daily Traffic Generation: 6,480 trips per day

Daily trips to and from Parkes (northerly direction): 5,832 trips per day

Daily trips to and from the southerly direction: 648 trips per day

Daily Traffic Distribution – Saleyards Road (west):

Daily Traffic Generation: 720 trips per day

Daily Traffic Distribution – Saleyards Road (east):

Daily Traffic Generation: 3,240 trips per day

Daily trips to and from Parkes (northerly direction): 2,916 trips per day

Daily trips to and from the southerly direction: 324 trips per day

Daily Traffic Distribution – Proposed New Access Road:

Daily Traffic Generation: 3,240 trips per day

Daily trips to and from Parkes (northerly direction): 2,916 trips per day

Daily trips to and from the southerly direction: 324 trips per day

Peak Hour Traffic Distribution – Newell Highway:

Peak Hour Traffic Generation:	648 trips per hour
Peak hour trips to and from Parkes (northerly direction):	583 trips per hour
Peak hour trips to and from the southerly direction:	65 trips per hour

Peak Hour Traffic Distribution – Saleyards Road:

Peak Hour Traffic Generation:	324 trips per hour
Peak hour trips to and from Parkes (northerly direction):	292 trips per hour
Peak hour trips to and from the southerly direction:	32 trips per hour

Peak Hour Traffic Distribution – New Road:

Peak Hour Traffic Generation:	324 trips per hour
Peak hour trips to and from Parkes (northerly direction):	292 trips per hour
Peak hour trips to and from the southerly direction:	32 trips per hour

4.3 TRAFFIC IMPACTS

4.3.1 BASIS OF ASSESSMENT

The impact of the traffic generated by the development of the Saleyards Road Industrial Estate on Saleyards Road and the Newell Highway will be assessed in terms of:

i. Traffic volume; and

ii. Intersection capacity.

The increase in AADT on Saleyards Road and the Newell Highway will be evaluated and an assessment will be made on the planned intersection works at the entries to the industrial Estate (being Saleyards Road and the proposed southern access road), on possible intersection upgrading works on the Newell Highway to cater for the peak hour traffic movements at the intersection of Saleyards Road and the Newell Highway and on the proposed intersection configuration for the new southern access road.

The exact location of the new southern access road is not confirmed however it is understood, by reference to the concept subdivision plans provided by Council, to be sited approximately 200-400 metres north-east of the Parkes Stockingbal Railway line.

4.3.2 TRAFFIC VOLUME

4.3.2.1 Average Annual Daily Traffic

The expected daily traffic volume generated from the project will impact on the existing AADT traffic volume on Saleyards Road and the Newell Highway. The increase in daily traffic volume on these two roads is summarised in **Table 4.2**.

Table 4.2 – Pre and Post Development AADT Volumes

Road	Pre Development AADT (veh/day)	Development Traffic (veh/day)	Post Development AADT (veh/day)	Change % AADT (veh/day)
Newell Highway	3,637	6,480	10,117	178%
Saleyards Road	444	3,240	3,684	729%
Proposed southern access road	0	3,240	3,240	-

From the information presented in **Table 4.1**, the percentage increase in AADT in Saleyards Road following the completion of the development of the industrial subdivision will be approximately 729% whilst on the Newell Highway, the increase in AADT is approximately 178%. A new road connection with the Newell Highway would also be provided and it is assumed that this would cater for 50% of the overall estate traffic. The remaining 50% would be assumed to use Saleyards Road, as outlined in **Table 4.2**.

Whilst the percentage increases in AADT may seem large, based on the road capacity information presented in **Appendix A**, the majority of the movements from and to the Newell Highway will operate between a Level of Service A and C following the completion of the industrial subdivision. The only exception to this is the right turn movement from the Newell Highway into Saleyards Road; this would operate at a level of service D – refer **Figure 3**.

Based on information presented in the *2002 RTA Guide to Traffic Generating Developments*, the operation of an arterial road at a Level of Service C is satisfactory.

An alternative intersection design, such as a roundabout is shown to improve the right turn LOS from LOS D to LOS B, however the costs involved in this may be prohibitive.

4.3.2.2 Peak Hour Traffic

The expected peak hour traffic volume generated from the Saleyards Road Industrial Estate will impact on the existing peak hour traffic volume on Saleyards Road and the Newell Highway. The increase in peak hour traffic volume on these two roads is summarised in **Table 4.3**.

Table 4.3 – Summary of Increase in PM Peak Hour Traffic Volume

Road	Pre Development Volume (veh/hr)	Development Traffic (veh/hr)	Post Development Volume (veh/hr)	Change % (veh/day)
Newell Highway	546	627	1,173	114%
Saleyards Road	46	313.5	359.5	681%
Proposed southern access road	0	313.5	313.5	

Note: the PM peak has been used in this table as it represents the higher of the two peak figures

From the information presented in **Table 4.3**, the percentage increase in peak hour traffic volume in Saleyards Road following the completion of the development of the industrial subdivision will be approximately 681%, whilst on the Newell Highway, the increase in peak hour volume is approximately 114%.

Whilst the percentage increase on Saleyards Road appears significant, it remains well below the road's capacity – refer **Appendix A**. Further the increase appears significant as current traffic levels utilising the road are low.

4.3.3 INTERSECTION ANALYSIS

4.3.3.1 Introduction

Based on the assumptions outlined in Section 4.1, a SIDRA analysis was carried out for the intersection pre and post development for both the AM and PM peaks, with the output from the PM assessment summarised below. Results from both the AM and PM peak models are provided in **Appendix C**.

4.3.3.2 Newell Highway and Saleyards Road

Figure 3 illustrates the post development PM peak LOS for the Newell Highway/Saleyards Road intersection and **Table 4.4** outlines the results of the SIDRA intersection analysis.

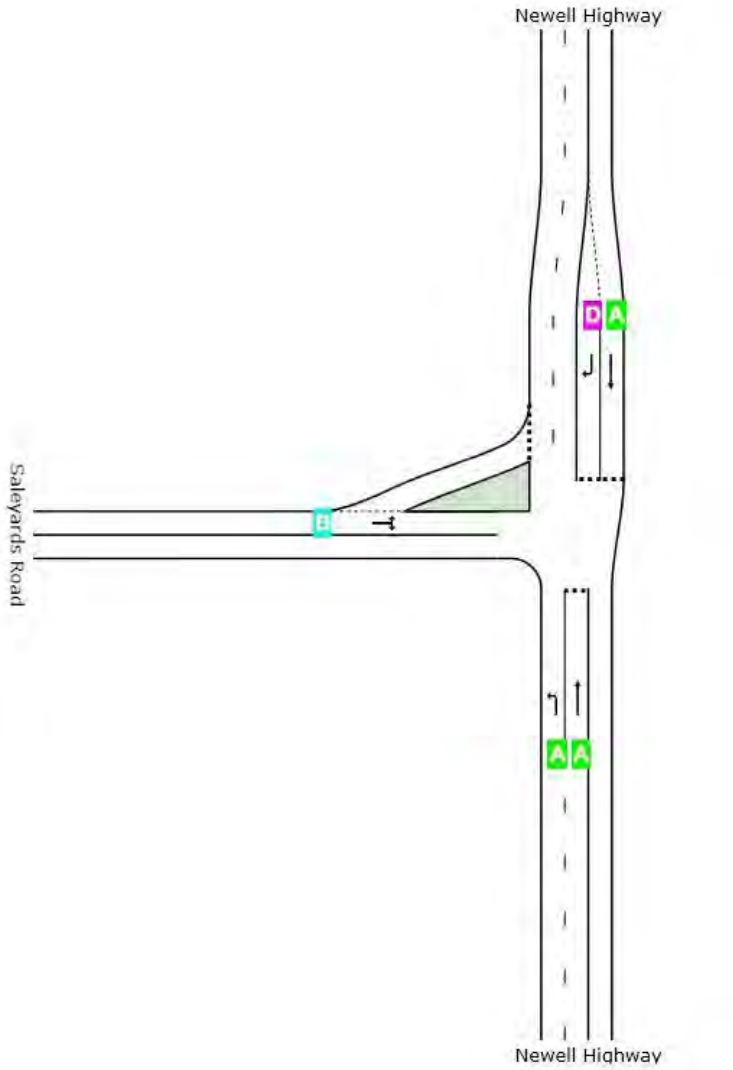


Figure 3: Post Development PM Peak LOS for Saleyards Road/Newell Highway

Table 4.4 – Newell Highway/Saleyards Road Post Development – PM Peak

Scenario	Average Control Delay (Seconds)	Level of Service (LOS)	Largest 95% Queue Length (vehicles)	Largest 95% Queue Length (metres)
From Newell Highway North				
Southbound	5.0	A	4.4	38.9
Right into Saleyards Road	47.5	D	2.0	17.4
From Newell Highway South				
Left into Saleyards Road	11.8	A	0.0	0.0
Northbound	0.3	A	2.7	24.1
From Saleyards Road				
Left onto Newell Highway (north)	24.7	B	4.8	42.5
Right onto Newell Highway (south)	24.7	B	4.8	42.5

From the above table it can be seen that the worst movement would be, as expected, the right turn from the Newell Highway into Saleyards Road, with an average delay control of 47.5 seconds and an LOS of D. All other movements have an LOS of either A or B, which is considered acceptable.

Modelling of alternative intersection designs confirms that provision of a roundabout in this location would improve the LOS of the southbound right turn from a D to a B; however it is unknown if this design solution would be acceptable to Council and the RMS. Modelling output for this design option is provided in **Appendix C**.

4.3.3.3 Newell Highway and proposed new southern access road

Figure 4 illustrates the post development PM peak LOS for the Newell Highway/Saleyards Road intersection and **Table 4.5** outlines the results of the SIDRA intersection analysis.

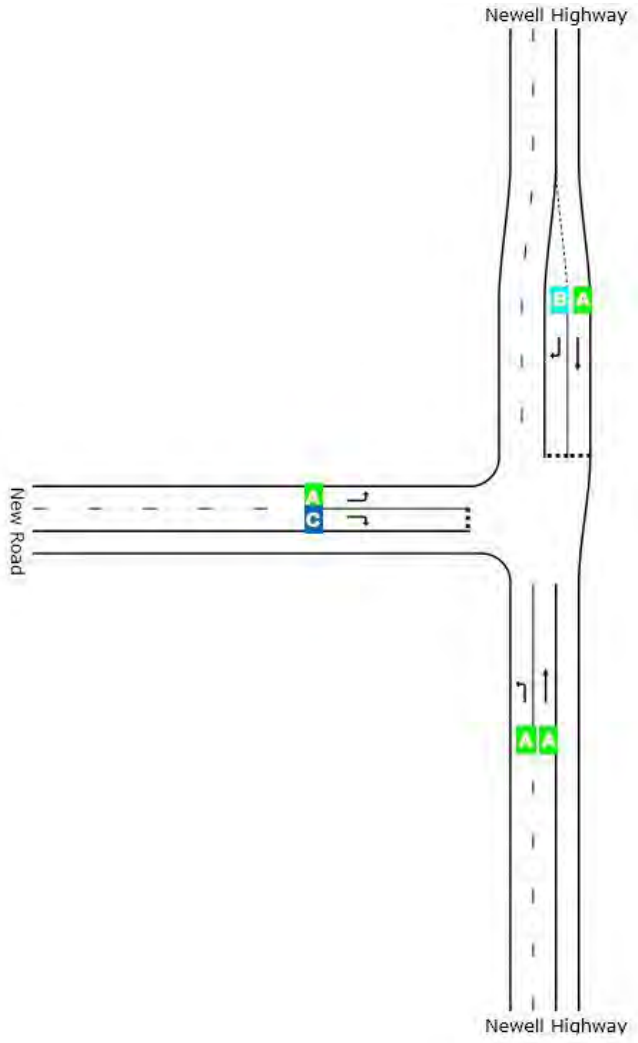


Figure 4: Post Development PM Peak LOS for new access road/Newell Highway

Table 4.5 – Newell Highway/new Road Post Development – PM Peak

Scenario	Average Control Delay (Seconds)	Level of Service (LOS)	Largest 95% Queue Length (vehicles)	Largest 95% Queue Length (metres)
From Newell Highway North				
Southbound	0.1	A	0.0	0.0
Right into new road	22.4	B	0.8	6.6
From Newell Highway South				
Left into new road	11.8	A	0.0	0.0
Northbound	0.1	A	0.0	0.0
From New Road				
Left onto Newell Highway (north)	11.8	A	0.0	0.0
Right onto Newell Highway (south)	29.5	C	0.5	4.0

From the above table it can be seen that the new access road would operate for all movements with an LOS between A and C. This is considered acceptable.

An amended intersection design featuring other controls and/or a reduction in vehicle speeds would no doubt improve the LOS for the above movements. For the purposes of this assessment, it is considered that the above results demonstrate that the proposed development would not have an unacceptable impact on the traffic environment.

4.3.4 IMPACT SUMMARY

The assessment of the impact of the traffic generated by the development of the Saleyards Road Industrial Estate on the surrounding road network has determined that the impact on:

i. Traffic Volume; and

ii. Intersection Capacity

Whilst the percentage increases in peak hour traffic volume may seem large, based on the road capacity information presented in **Appendix A,** and the modelling results provided in **Section 4.3**, the estimated post development peak hour volume of 359.5 vehicles per hour in Saleyards Road is well below the 970 vehicle per hour capacity of the road in its current configuration. The estimated post development peak hour volume of 1,173 vehicles per hour on the Newell Highway is between a Level of Service A and D and would operate satisfactorily. Introducing an alternative design, such as a roundabout, is shown to improve the LOS to A and B; however if necessary, this would likely be undertaken in the latter stages of the development, when volumes were approaching maximum levels.

The increase in daily traffic volume on Saleyards Road is expected to be approximately 729% and on the Newell Highway approximately 178%.

The increase in peak hour traffic volume on Saleyards Road is expected to be approximately 681% and on the Newell Highway approximately 114%.

Whilst the expected increases in traffic volume are large, the capacity of the existing roads is sufficient to cater for the post development traffic volumes and to disperse such traffic into the surrounding road network with generally minimal impacts.

4.4 RELATED DEVELOPMENTS

From discussions with the proponent, it is understood that the development of Stage 1 of an arterial feeder road (hereafter to referred to as the southern ring road) is likely to be completed by June 2014. This road would intersect with the Newell Highway approximately 400 metres north of the Newell Highway/Saleyards Road intersection.

The development of the southern ring road is understood to be linked to the development of the Parkes Hospital, currently the subject of a State Significant Development Application with the Department of Planning (reference SSD 13_6107). Director General Requirements for the development have been issued. The timing for determination of the application is not known.

The anticipated implications of the development of the southern ring road are identified as follows:

- A reduction in the posted speed limit on the Newell Highway from 80 kilometres per hour (kph) to 60 kph frm Clarke Street to Henderson Street;
- The proposed 60kph zone would transition directly into the 110kph zone at approximately the same location as the current 80 – 110 kph transition location;
- The development of a new intersection treatment at the point of intersection with the Newell Highway (likely to be a seagull style, or roundabout, dependent on RMS input).
- It is assumed that updated traffic count data would be required at the development site to inform the intersection design and, given the proximity to the subject site, this data would provide the opportunity for more detailed modelling in relation to the subject development. This would be

completed, if required, in conjunction with detailed subdivision design that would follow a positive Gateway decision.

Conclusion

This Traffic Impact Assessment has evaluated the traffic generating potential of the Saleyards Road Industrial Estate at Parkes and has assessed the impact of the additional traffic generated by the industrial subdivision on Saleyards Road and the Newell Highway. The TIA has determined that the impact on traffic volume would be acceptable without significant change to current intersection designs. The introduction of a roundabout would further improve the LOS of the Saleyards Road intersection to between A and B.

The increase in daily traffic volume on Saleyards Road is expected to be approximately 729% and on the Newell Highway approximately 178%.

The increase in peak hour traffic volume on Saleyards Road is expected to be approximately 681% and on the Newell Highway approximately 114%.

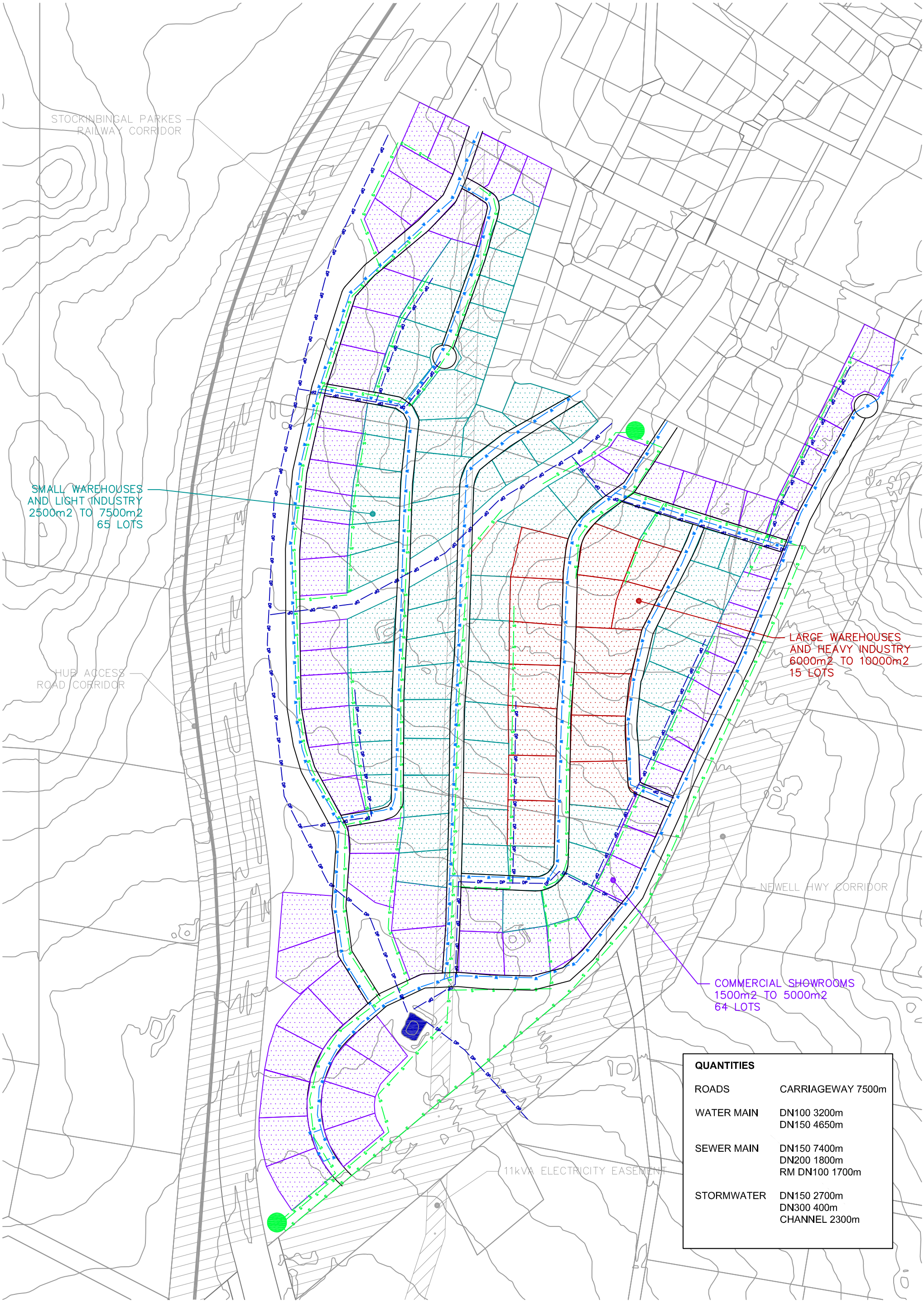
Whilst the expected increases in traffic volume are large, the capacity of the existing roads is sufficient to cater for the post development traffic volumes and to disperse such traffic into the surrounding road network with generally minimal impacts. The development would not trigger a change in the functional classification of either the Newell Highway or Saleyards Road.

The implementation of the outcomes of this TIA during the detailed design phase of the Saleyards Road Industrial Estate will see the development of a subdivision with minimal impact on the surrounding road network.

References

AUSTROADS (1988) Guide to Traffic Engineering Practice. Part 2. Roadway Capacity.
AUSTROADS (1988) Guide to Traffic Engineering Practice. Part 3. Traffic Studies.
AUSTROADS (1988) Guide to Traffic Engineering Practice. Part 5. Intersections at Grade.
AUSTROADS (1988) Guide to Traffic Engineering Practice. Part 10 Local Area Traffic Management.
Ogden, K.W. and Bennett, D.W. (Eds) 1984) Traffic Engineering Practice. Third Edition. Dept of Civil Engineering Monash University.
Roads and Maritime Services (2013) Guide to Traffic Generating Developments
Roads and Traffic Authority (2008) Network and Corridor Planning Practise Notes
Roads and Traffic Authority (2002) Guide to Traffic Generating Developments.
Traffic Authority of NSW (1985) Policies Guidelines and Procedures for Traffic Generating Developments. Part F.
Traffic Authority of NSW (1985b) Policies Guidelines and Procedures for Traffic Generating Developments. Part B.
Roads and Traffic Authority Road Design Guide 1991 Section 4 - Intersections at Grade.
Queensland Streets - Design Guidelines for Subdivisional Streetworks IMEA (Qld) 1993.

Drawings



QUANTITIES

ROADS	CARRIAGEWAY 7500m
WATER MAIN	DN100 3200m DN150 4650m
SEWER MAIN	DN150 7400m DN200 1800m RM DN100 1700m
STORMWATER	DN150 2700m DN300 400m CHANNEL 2300m

No.	REVISION DETAILS	DRAWN	CHECKED	DATE
A	PRELIMINARY	RJH	PK	24/3/10

PARKES SHIRE COUNCIL
2 Cecile Street PARKES NSW 2870
Phone: (02) 6861 2333 | Fax: (02) 6862 3946
council@parkes.nsw.gov.au | www.parkes.nsw.gov.au

PIMP No: **200####**
PROJECT: **PARKES INDUSTRIAL ESTATE EXTENSION**
DRAWING: **OPTION 1**

30 0 30 60 90 120 150m
SCALE 1:6000

SHEET	DRAWING NUMBER	REVISION
A3		A

STOCKINBINGAL PARKES
RAILWAY CORRIDOR

COMMERCIAL SHOWROOMS
1500m2 TO 5000m2
5 LOTS

LARGE WAREHOUSES
AND HEAVY INDUSTRY
6000m2 TO 20000m2
10 LOTS

2x 1800m RAILWAY SIDINGS
2x 600m LOADING SIDINGS
2x 900m LOADING SIDINGS

HUB ACCESS
ROAD CORRIDOR

SMALL WAREHOUSES
AND LIGHT INDUSTRY
2500m2 TO 7500m2
36 LOTS

NEWELL HWY CORRIDOR

INTER-MODAL WAREHOUSES
AND HARDSTAND STORAGE
5000m2 TO 25000m2

COMMERCIAL SHOWROOMS
1500m2 TO 5000m2
25 LOTS

11kVA ELECTRICITY EASEMENT

QUANTITIES

ROADS	CARRIAGEWAY 3300m
WATER MAIN	DN100 1750m DN150 2300m
SEWER MAIN	DN150 3100m DN200 1800m DN100 RM 2000m
STORMWATER	DN150 2300m DN300 400m DN600 200m CHANNEL 2000m

NOTE: DOES NOT INCLUDE RAILWAY AND INTER-MODAL AREA

No.	REVISION DETAILS	DRAWN	CHECKED	DATE
A	PRELIMINARY	RJH	PK	24/3/10

PARKES SHIRE COUNCIL
2 Cecile Street PARKES NSW 2870
Phone: (02) 6861 2333 | Fax: (02) 6862 3946
council@parkes.nsw.gov.au | www.parkes.nsw.gov.au

PIMP No: **200####**
PROJECT: **PARKES INDUSTRIAL ESTATE EXTENSION**
DRAWING: **OPTION 2**

30 0 30 60 90 120 150m
SCALE 1:6000

SHEET	DRAWING NUMBER	REVISION
A3		A

Appendix A

CAPACITY ANALYSIS OF THE NEWELL HIGHWAY

EXISTING ROADWAY CAPACITY ANALYSIS

All factors, formulae, Table references and data referred to in this Appendix are from AUSTROADS Guide to Traffic Management Part 3: Traffic Studies and Analysis.

Capacity is determined on the basis of a maximum amount of vehicles per hour. Studies into capacity for single lane roads have produced varied results ranging from 1000 to 4800 vehicles per hour, but with most results between 1500 and 2400 vph. The figure of 2400 vph equates to one vehicle every 1.5 seconds and is considered reasonable for a single traffic lane moving at relatively high speed. As this is the case for the subject site, this figure has been adopted for the capacity analysis of the Newell Highway. For Saleyards Road, a more conservative figure of 1400 vph has been adopted, reflecting the lower speed limit and narrower road design.

The capacity of a significant length of a single traffic lane for the prevailing roadway and traffic conditions can be calculated by using the following equation:

$$C = vph\ f_W\ f_{HV}$$

where

C = capacity in vehicles per hour under prevailing roadway and traffic conditions

f_W = adjustment factor for narrow lanes and lateral clearances, obtained from Table 4.1

f_{HV} = adjustment factor for heavy vehicles = $1/[1+ P_{HV} (E_{HV} – 1)]$

P_{HV} = the proportion of heavy vehicles in the traffic stream, expressed as a decimal

E_{HV} = the average passenger car equivalents for heavy vehicles obtained from Table 4.2.

Newell Highway

f_W = 1.00 (from Table 4.1 for 3.7m lane width and 2 metre lateral clearance)

f_{HV} = 1/[1+0.3(2.0-1) = 0.77

P_{HV} = 0.3 (for 30% heavy vehicles)

E_{HV} = 2.0 (from Table 4.2 for level grade)

C = 2,400 x 1 x 0.77

= 1,848

Saleyards Road

f_W = 0.90 (from Table 4.1 for 3.2m lane width and 2 metre lateral clearance)

f_{HV} = 1/[1+0.3(2.0-1) = 0.77

P_{HV} = 0.3 (for 30% heavy vehicles)

E_{HV} = 2.0 (from Table 4.2 for level grade)

C = 1,400 x 1.0 x 0.77

= 1078

Appendix B

PSC TRAFFIC COUNT DATA (SALEYARDS ROAD)

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-49 -- English (ENA)

Datasets:

Site: **[20120319A] Saleyards Rd**
Direction: 6 - West bound A>B, East bound B>A., **Lane:** 0
Survey Duration: 15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012
File: G:\Infrastructure\MetroCountV321\Editted\Saleyards Rd - U3230\Saleyards Rd 2012 \20120319A28Mar2012.EC0 (Plus)
Identifier: P083J0KF MC56-L4 [MC55] (c)Microcom 19Sep03
Algorithm: Factory default
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time: **15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range: 10 - 160 km/h.
Direction: North, East, South, West (bound)
Separation: All - (Headway)
Name: Factory default profile
Scheme: Vehicle classification (AustRoads94)
Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)
In profile: Vehicles = 3879 / 3893 (99.64%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-49
Site: 20120319A.0EW
Description: **Saleyards Rd**
Filter time: **15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	0.0	0.0	0.0	0.0	0.0	3.0	1.0	0.0	0.4
0100-0200	1.0	0.5	0.0	1.0	1.0	0.0	0.0	0.6	0.4
0200-0300	1.0	1.0	0.0	0.0	1.0	0.0	2.0	0.6	0.7
0300-0400	0.0	1.0	0.5	0.0	0.0	2.0	2.0	0.4	0.8
0400-0500	1.0	1.5	2.0	2.0	1.0	0.0	2.0	1.6	1.4
0500-0600	3.0	4.0	3.0	1.0	5.0	2.0	1.0	3.3	2.9
0600-0700	22.0	23.5	9.0	18.0	21.0	5.0	0.0	18.0	14.6
0700-0800	33.0	36.5	10.0	25.0	35.0	10.0	5.0	26.6	22.3
0800-0900	34.0	40.5	17.5	43.0	54.0	21.0	12.0	35.3	31.1
0900-1000	34.0	40.0	17.0	37.0	54.0	26.0	15.0	34.1	31.1
1000-1100	44.0	**44.5<**	18.5	**48.0<**	36.0	29.0	**34.0<**	**36.3<**	**35.2<**
1100-1200	**44.0<**	29.5	**23.0<**	38.0	**54.0<**	**37.0<**	22.0	34.4	33.3
1200-1300	48.0	40.0	33.0	43.0	36.0	**31.0<**	24.0	39.0	36.4
1300-1400	**53.0<**	43.5	33.0	**66.0<**	41.0	19.0	21.0	44.7	39.2
1400-1500	52.0	**52.0<**	**61.0<**	44.0	57.0	24.0	26.0	**53.0<**	**46.0<**
1500-1600	24.5	28.0	54.0	55.0	55.0	27.0	20.0	38.4	35.1
1600-1700	43.5	25.0	36.0	63.0	**57.0<**	23.0	**27.0<**	41.9	38.1
1700-1800	35.0	15.5	31.0	32.0	30.0	14.0	15.0	27.7	24.8
1800-1900	20.5	6.5	16.0	18.0	50.0	16.0	12.0	19.7	18.4
1900-2000	9.5	11.0	15.0	10.0	6.0	9.0	3.0	10.3	9.3
2000-2100	7.0	5.0	5.0	6.0	7.0	3.0	5.0	6.0	5.6
2100-2200	7.0	0.5	0.0	2.0	6.0	2.0	5.0	3.3	3.3
2200-2300	2.5	4.0	2.0	3.0	5.0	3.0	1.0	3.3	3.0
2300-2400	2.0	3.0	1.0	4.0	4.0	2.0	1.0	2.7	2.4
Totals									
0700-1900	465.5	401.5	350.0	512.0	559.0	277.0	233.0	431.1	391.2
0600-2200	511.0	441.5	379.0	548.0	599.0	296.0	246.0	468.7	424.0
0600-0000	515.5	448.5	382.0	555.0	608.0	301.0	248.0	474.7	429.4
0000-0000	521.5	456.5	387.5	559.0	616.0	308.0	256.0	481.1	436.1
AM Peak	1100	1000	1100	1000	1100	1100	1000		
	44.0	44.5	23.0	48.0	54.0	37.0	34.0		
PM Peak	1300	1400	1400	1300	1600	1200	1600		
	53.0	52.0	61.0	66.0	57.0	31.0	27.0		

*** - No data.**

MetroCount Traffic Executive
Vehicle Counts (Virtual Day)

VirtVehicleCount-48 -- English (ENA)

Datasets:

Site: **[20120319A] Saleyards Rd**
Direction: 6 - West bound A>B, East bound B>A., **Lane:** 0
Survey Duration: 15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012
File: G:\Infrastructure\MetroCountV321\Editted\Saleyards Rd - U3230\Saleyards Rd 2012 \20120319A28Mar2012.EC0 (Plus)
Identifier: P083J0KF MC56-L4 [MC55] (c)Microcom 19Sep03
Algorithm: Factory default
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time: **15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range: 10 - 160 km/h.
Direction: North, East, South, West (bound)
Separation: All - (Headway)
Name: Factory default profile
Scheme: Vehicle classification (AustRoads94)
Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)
In profile: Vehicles = 3879 / 3893 (99.64%)

*** Virtual Day - Total=441, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**1**	**1**	**1**	**3**	**15**	**22**	**31**	**31**	**35**	**33**	**36**	**40**	**46**	**39**	**38**	**25**	**18**	**9**	**6**	**3**	**3**	**2**
0	0	0	0	0	1	1	4	9	9	9	**8**	9	10	10	**12**	10	8	5	2	2	1	0	1
0	0	0	0	0	0	3	5	8	7	9	**10**	8	9	**11**	9	8	7	4	2	1	1	1	0
0	0	0	0	0	1	4	5	7	7	**8**	7	10	10	**12**	10	10	7	4	3	1	1	0	0
0	0	0	0	1	1	7	8	8	9	**9**	8	9	11	**13**	8	10	3	5	2	1	0	1	0

AM Peak 1030 - 1130 (36), AM PHF=0.89 PM Peak 1415 - 1515 (48), PM PHF=0.92

Numbers have been rounded to the nearest integer.

MetroCount Traffic Executive
Speed Statistics

SpeedStat-50 -- English (ENA)

Datasets:

Site:	**[20120319A] Saleyards Rd**
Direction:	6 - West bound A>B, East bound B>A., **Lane:** 0
Survey Duration:	15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012
File:	G:\Infrastructure\MetroCountV321\Editted\Saleyards Rd - U3230\Saleyards Rd 2012\20120319A28Mar2012.EC0 (Plus)
Identifier:	P083J0KF MC56-L4 [MC55] (c)Microcom 19Sep03
Algorithm:	Factory default
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound)
Separation:	All - (Headway)
Name:	Factory default profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (meter, kilometer, m/s, km/h, kg, tonne)
In profile:	Vehicles = 3879 / 3893 (99.64%)

Speed Statistics

SpeedStat-50
Site: 20120319A.0EW
Description: **Saleyards Rd**
Filter time: **15:46 Monday, 19 March 2012 => 13:58 Wednesday, 28 March 2012**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

Vehicles = 3879
Posted speed limit = 50 km/h, Exceeding = 1681 (43.34%), Mean Exceeding = 56.82 km/h
Maximum = 87.1 km/h, **Minimum** = 10.2 km/h, **Mean** = 48.4 km/h
85% Speed = 57.6 km/h, **95% Speed** = 63.7 km/h, **Median** = 48.2 km/h
20 km/h Pace = 39 - 59, **Number in Pace** = 2857 (73.65%)
Variance = 90.31, **Standard Deviation** = 9.50 km/h

Speed Bins (Partial days)

Speed	Bin		Below		Above		Energy	vMult	n * vMult
0 - **10**	0	0.0%	0	0.0%	3879	100.0%	0.00	0.00	0.00
10 - **20**	23	0.6%	23	0.6%	3856	99.4%	0.00	0.00	0.00
20 - **30**	85	2.2%	108	2.8%	3771	97.2%	0.00	0.00	0.00
30 - **40**	559	14.4%	667	17.2%	3212	82.8%	0.00	0.00	0.00
40 - **50**	1531	39.5%	2198	56.7%	1681	43.3%	0.00	0.00	0.00
50 - **60**	1290	33.3%	3488	89.9%	391	10.1%	0.00	0.00	0.00
60 - **70**	333	8.6%	3821	98.5%	58	1.5%	0.00	0.00	0.00
70 - **80**	54	1.4%	3875	99.9%	4	0.1%	0.00	0.00	0.00
80 - **90**	4	0.1%	3879	100.0%	0	0.0%	0.00	0.00	0.00
90 - **100**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
100 - **110**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
110 - **120**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
120 - **130**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
130 - **140**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
140 - **150**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
150 - **160**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
160 - **170**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
170 - **180**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
180 - **190**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00
190 - **200**	0	0.0%	3879	100.0%	0	0.0%	0.00	0.00	0.00

Total Speed Rating = 0.00
Total Moving Energy (Estimated) = 0.00

Speed limit fields (Partial days)

	Limit	Below		Above	
0	50 (PSL)	2198	56.7%	1681	43.3%

Appendix C

SIDRA ANALYSIS DATA

DETAILED OUTPUT

Site: Existing AM Peak

Newell Highway/Saleyards Road
Giveway / Yield (Two-Way)

OUTPUT TABLE LINKS

Movements

Intersection Negotiation Data
Site:Existing AM Peak

Intersection ID: 1
Give-Way Sign Controlled Intersection

INTERSECTION NEGOTIATION DATA

From Approach	To Exit	Turn	Negn Radius m	Negn Speed km/h	Negn Dist. m	Appr. Dist. m	Downstream m	Distance User Spec?
South: Newell Highway								
	West	L2	10.0	20.2	15.7	500	231	No
	North	T1	S	80.0	10.0	500	1757	No
North: Newell Highway								
	South	T1	S	80.0	10.0	500	1757	No
	West	R2	8.4	18.9	13.2	500	230	No
West: Saleyards Road								
	North	L2	10.0	20.2	15.7	500	232	No
	South	R2	8.4	18.9	13.2	500	228	No

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

MOVEMENT SPEEDS AND GEOMETRIC DELAY

Mov ID	Turn	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Newell Highway										
1	L2	50.0	20.2	20.2	50.0			43.2	43.2	11.8
2	T1	80.0	80.0	80.0	80.0			79.9	79.9	0.0
North: Newell Highway										
8	T1	80.0	80.0	80.0	80.0			79.9	79.9	0.0
9	R2	50.0	18.9	18.9	50.0	18.9		41.6	41.4	12.2
West: Saleyards Road										

```
 10  L2      50.0  20.2   20.2  50.0                   43.2    43.2    11.8
 12  R2      50.0  18.9   18.9  50.0                   43.2    43.2    12.2
------------------------------------------------------------------------------
  "Running Speed" is the average speed excluding stopped periods.
```

Go to Table Links (Top)

Gap Acceptance Parameters
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

------------------------------------------------------------------------------
                        Critical Gap                        Intra
                  Opng  ------------   Foll-up   Entry     Bunch    Propn
  Opd     Dest    Flow  Hdwy    Dist   Headway    HV       Hdwy     Bnchd
  Lane            pcu/h  sec     m       sec     Equiv     sec
------------------------------------------------------------------------------
 South: Newell Highway

  No opposed movements on this approach.
------------------------------------------------------------------------------
 North: Newell Highway
      2      W     335     5.17     0.0     2.88     1.15   1.63    0.051
------------------------------------------------------------------------------
 West: Saleyards Road
      1      S       0+    0.00     0.0     0.00     0.00   0.00    0.000
      1      N       0+    0.00     0.0     0.00     0.00   0.00    0.000
------------------------------------------------------------------------------

  Values in this table are adjusted for heavy vehicles in the entry stream.
  Use the Pedestrians and Priorities input dialogs to specify opposing pedestrian movements.
  +  Percentage of exiting flow included in opposing vehicle flow
```

Go to Table Links (Top)

Movement Capacity and Performance Parameters
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


MOVEMENT CAPACITY PARAMETERS

----------------------------------------------------------------
 Mov Turn Mov         Opng Movement  Total  Prac.  Prac.  Deg.
 ID       Cl.  Arv           Adjust.  Cap.  Deg.   Spare  Satn
               Flow  Flow    Flow           Satn   Cap.
               veh/h veh/h   pcu/h   veh/h   xp      %      x
----------------------------------------------------------------
South: Newell Highway
  1  L2   #       3      0      0    1530   0.98   ****  0.002
  2  T1   #     287      0      0    1632   0.98    456  0.176*
----------------------------------------------------------------
North: Newell Highway
  8  T1   #     287      0      0    1632   0.98    456  0.176*
  9  R2   #      26      0      0     844   0.98   3043  0.031
----------------------------------------------------------------
West: Saleyards Road
 10  L2   #       6      0      0    8571   0.98   ****  0.001
 12  R2   #       1      0      0    1428   0.98   ****  0.001
----------------------------------------------------------------
  *  Maximum degree of saturation
  # Combined Movement Capacity parameters are shown for all Movement Classes.


MOVEMENT PERFORMANCE

------------------------------------------------------------------------------------
 Mov Turn Total    Total   Aver.  Eff.  Total  Perf. Tot.Trav. Tot.Trav. Aver.
 ID       Delay    Delay   Delay  Stop  Stops  Index Distance    Time    Speed
        (veh-h/h)(pers-h/h)(sec)  Rate               (veh-km/h)(veh-h/h) (km/h)
------------------------------------------------------------------------------------
South: Newell Highway
  1  L2    0.00    0.00    11.8   0.69     2.2  0.06      1.8     0.0     43.2
  2  T1    0.00    0.00     0.0   0.00     0.0  3.09    246.9     3.1     79.9
------------------------------------------------------------------------------------
North: Newell Highway
  8  T1    0.00    0.00     0.0   0.00     0.0  3.09    246.9     3.1     79.9
  9  R2    0.03    0.04    14.2   0.70    18.4  0.51     15.3     0.4     41.4
------------------------------------------------------------------------------------
West: Saleyards Road
 10  L2    0.01    0.01    11.9   0.70     4.4  0.12      3.7     0.1     43.2
 12  R2    0.00    0.00    11.9   0.70     0.7  0.02      0.6     0.0     43.2
------------------------------------------------------------------------------------
```

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


FUEL CONSUMPTION, EMISSIONS AND COST (TOTAL)

-------------------------------------------------------------
 Mov  Turn       Cost    Fuel     CO2     CO      HC      NOX
 ID              Total   Total   Total   Total   Total   Total
                 $/h       L/h   kg/h    kg/h    kg/h    kg/h
-------------------------------------------------------------
South: Newell Highway
  1  L2            1.88    0.3     0.8    0.00   0.000   0.004
  2  T1          262.22   71.6   174.4    0.24   0.016   0.977
               ----------------------------------------------
                 264.10   71.9   175.2    0.24   0.017   0.981
-------------------------------------------------------------
North: Newell Highway
  8  T1          262.22   71.6   174.4    0.24   0.016   0.977
  9  R2           16.20    2.7     6.6    0.01   0.001   0.034
               ----------------------------------------------
                 278.41   74.3   181.0    0.25   0.018   1.011
-------------------------------------------------------------
West: Saleyards Road
 10  L2            3.77    0.6     1.6    0.00   0.000   0.008
 12  R2            0.63    0.1     0.3    0.00   0.000   0.001
               ----------------------------------------------
                   4.39    0.8     1.8    0.00   0.000   0.009
-------------------------------------------------------------
 INTERSECTION:   546.91  147.0   358.0    0.49   0.035   2.002
-------------------------------------------------------------


FUEL CONSUMPTION, EMISSIONS AND COST (RATE)

-------------------------------------------------------------
 Mov  Turn       Cost    Fuel     CO2     CO      HC      NOX
 ID              Rate    Rate    Rate    Rate    Rate    Rate
                 $/km   L/100km  g/km    g/km    g/km    g/km
-------------------------------------------------------------
South: Newell Highway
  1  L2            1.02   17.5   425.0    0.82   0.083   2.203
  2  T1            1.06   29.0   706.4    0.95   0.066   3.958
               ----------------------------------------------
                   1.06   28.9   704.4    0.95   0.066   3.945
-------------------------------------------------------------
North: Newell Highway
  8  T1            1.06   29.0   706.4    0.95   0.066   3.958
  9  R2            1.06   17.7   431.6    0.85   0.087   2.237
               ----------------------------------------------
                   1.06   28.4   690.4    0.95   0.067   3.858
-------------------------------------------------------------
West: Saleyards Road
 10  L2            1.02   17.5   425.3    0.82   0.083   2.205
 12  R2            1.02   17.5   425.3    0.82   0.083   2.205
               ----------------------------------------------
                   1.02   17.5   425.3    0.82   0.083   2.205
-------------------------------------------------------------
 INTERSECTION:     0.88   23.8   579.1    0.79   0.056   3.238
-------------------------------------------------------------
```

Go to Table Links (Top)

Lanes

Lane Performance and Capacity Information
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE PERFORMANCE

-------------------------------------------------------------
                                        Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.    95% Back      Lane
 Lane                 Satn  Delay  Stop  -----------   Length
 No.      veh/h veh/h   x    sec    Rate    veh     m       m
-------------------------------------------------------------
 South: Newell Highway
 1           3  1530 0.002   11.8  0.69                  500.0
 2         287  1632 0.176    0.0  0.00                  500.0
```

```
------------------------------------------------------------
 North: Newell Highway
 1         287  1632 0.176    0.0  0.00                   500.0
 2          26   844 0.031   14.2  0.70    0.1    1.0     80.0T
------------------------------------------------------------
 West: Saleyards Road
 1           7  9999 0.001   11.9  0.70                   500.0
------------------------------------------------------------
  T  Short lane due to specification of Turn Bay


LANE FLOW AND CAPACITY INFORMATION

----------------------------------------
 Lane   Total     Min   Tot   Deg.  Lane
 No.    Arv Flow  Cap   Cap   Satn  Util
        (veh/h)  veh/h veh/h    x     %
----------------------------------------
 South: Newell Highway
 1          3       3  1530  0.002  100
 2        287     287  1632  0.176  100
----------------------------------------
 North: Newell Highway
 1        287     287  1632  0.176  100
 2         26      26   844  0.031  100
----------------------------------------
 West: Saleyards Road
 1          7       7  9999  0.001  100
----------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Go to Table Links (Top)

Lane Delays
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE DELAYS

------------------------------------------------------------------------------
                      ----------------  Delay (seconds/veh)  ----------------
        Deg.  Prog.    Stop-line Delay  Acc.   Queuing   Stopd
 Lane    Satn  Factor   1st   2nd Total  Dec.  Total MvUp (Idle) Geom Control
 No.       x            d1    d2   dSL   dn    dq   dqm    di    dig   dic
------------------------------------------------------------------------------
 South: Newell Highway
 1      0.002              0.0                          11.8   11.8
 2      0.176              0.0                           0.0    0.0
------------------------------------------------------------------------------
 North: Newell Highway
 1      0.176              0.0                           0.0    0.0
 2      0.031  1.000    1.9   0.0   1.9   1.7   0.3   0.0   0.3  12.2   14.2
------------------------------------------------------------------------------
 West: Saleyards Road
 1      0.001              0.0                          11.9   11.9
------------------------------------------------------------------------------
  SIDRA Standard Delay Model is used.  Control Delay is the sum of Stop-line Delay
  and Geometric Delay.
  dSL: Stop-line delay (=d1+d2)
  dn: Average stop-start delay for all vehicles queued and unqueued
  dq: Queuing delay (the part of the stop-line delay that includes
      stopped delay and queue move-up delay)
  dqm: Queue move-up delay
  di: Stopped delay (stopped (idling) time at near-zero speed)
  dig: Geometric delay
  dic: Control delay


LANE DELAY PERCENTILES

------------------------------------------------------------
        Deg.                 Percentile Delay
 Lane   Satn  ------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
------------------------------------------------------------
 South: Newell Highway
 1      NA - Continuous Movement
 2      NA - Continuous Movement
------------------------------------------------------------
 North: Newell Highway
 1      NA - Continuous Movement
 2     0.031   14.2   14.5   15.1   15.4   15.7   16.0   16.2
------------------------------------------------------------
 West: Saleyards Road
```

```
 1      NA - Continuous Movement
-------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queues
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUES (VEHICLES)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (veh)     Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   ------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc     95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 2     0.031  1.000    0.0     0.0    0.0    0.0    0.1   0.01    0.0  100.0    0.0     0.0
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
-------------------------------------------------------------------------------------------------



LANE QUEUES (DISTANCE)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (m)       Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   ------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc     95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 2     0.031  1.000    0.0     0.4    0.0    0.4    1.0   0.01    0.0  100.0    0.1     0.2
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
-------------------------------------------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queue Percentiles
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUE PERCENTILES (VEHICLES)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (veh)
 Lane   Satn  ------------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------
 North: Newell Highway
 2     0.031    0.0    0.1    0.1    0.1    0.1    0.1    0.1
-------------------------------------------------------------
 West: Saleyards Road
-------------------------------------------------------------



LANE QUEUE PERCENTILES (DISTANCE)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (metres)
 Lane   Satn  ------------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------
 North: Newell Highway
 2     0.031    0.4    0.5    0.8    0.9    1.0    1.2    1.2
-------------------------------------------------------------
 West: Saleyards Road
-------------------------------------------------------------
```

Go to Table Links (Top)

Lane Stops
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

-------------------------------------------------------------------------------
                                                 Queue   Total
       Deg.  Prog.   -- Effective Stop Rate --   Total  Move-up  Queue   Prop.
 Lane   Satn  Factor              Geom. Overall  Stops   Rate  Move-ups Queued
 No.      x           he1   he2   hig     h       H      hqm     Hqm     pq
-------------------------------------------------------------------------------
 South: Newell Highway
 1     0.002  1.000               0.69   0.69      2.2
 2     0.176  1.000               0.00   0.00      0.0
-------------------------------------------------------------------------------
 North: Newell Highway
 1     0.176  1.000               0.00   0.00      0.0
 2     0.031  1.000   0.29  0.00  0.41   0.70     18.4    0.00     0.0   0.43
-------------------------------------------------------------------------------
 West: Saleyards Road
 1     0.001  1.000               0.70   0.70      5.1
-------------------------------------------------------------------------------
  hig is the average value for all movements in a shared lane
  hqm is average queue move-up rate for all vehicles queued and unqueued
```

Go to Table Links (Top)

Flow Rates

Origin-Destination Flow Rates (Total)
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


TOTAL FLOW RATES (ALL MOVEMENT CLASSES)

------------------------------------------------
 From SOUTH To:                W       N
 Turn:                         L2      T1     TOT
 Flow Rate                    3.2   287.4   290.5
 %HV (all designations)      30.0    30.0    30.0
------------------------------------------------
 From NORTH To:                S       W
 Turn:                         T1      R2     TOT
 Flow Rate                  287.4    26.3   313.7
 %HV (all designations)      30.0    30.0    30.0
------------------------------------------------
 From WEST To:                 N       S
 Turn:                         L2      R2     TOT
 Flow Rate                    6.3     1.1     7.4
 %HV (all designations)      30.0    30.0    30.0
------------------------------------------------
```

Go to Table Links (Top)

Origin-Destination Flow Rates by Movement Class
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


FLOW RATES FOR Light Vehicles

-----------------------------------------
 From SOUTH To:          W       N
 Turn:                   L2      T1     TOT
-----------------------------------------
 Flow Rate - Veh        2.2   201.2   203.4
 Mov Class %           70.0    70.0    70.0
 Flow Scale - Fixed    1.00    1.00
 Flow Scale - Var      1.00    1.00
 Peak Flow Factor      0.95    0.95
-----------------------------------------
 From NORTH To:          S       W
 Turn:                   T1      R2     TOT
-----------------------------------------
 Flow Rate - Veh      201.2    18.4   219.6
 Mov Class %           70.0    70.0    70.0
 Flow Scale - Fixed    1.00    1.00
 Flow Scale - Var      1.00    1.00
 Peak Flow Factor      0.95    0.95
```

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	4.4	0.7	5.2
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

FLOW RATES FOR Heavy Vehicles

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate - Veh	0.9	86.2	87.2
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	86.2	7.9	94.1
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	1.9	0.3	2.2
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

Go to Table Links (Top)

Lane Flow Rates
Site:Existing AM Peak

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE FLOW RATES AT STOP LINE

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Lane 1			
LV	2.2	*	2.2
HV	0.9	*	0.9
Total	3.2	*	3.2
Lane 2			
LV	*	201.2	201.2
HV	*	86.2	86.2
Total	*	287.4	287.4
Approach	3.2	287.4	290.5

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Lane 1			
LV	201.2	*	201.2
HV	86.2	*	86.2
Total	287.4	*	287.4
Lane 2			
LV	*	18.4	18.4
HV	*	7.9	7.9
Total	*	26.3	26.3
Approach	287.4	26.3	313.7

From WEST To:	N	S	
Turn:	L2	R2	TOT
Lane 1			
LV	4.4	0.7	5.2
HV	1.9	0.3	2.2
Total	6.3	1.1	7.4

```
 Approach            6.3     1.1     7.4
----------------------------------------
  *  Movement not allocated to the lane


EXIT LANE FLOW RATES

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           201.9    86.5
Total              201.9    86.5
---------------------------------
 Exit: NORTH
Lane:  1           205.6    88.1
Lane:  2             0.0     0.0
Total              205.6    88.1
---------------------------------
 Exit: WEST
Lane:  1            20.6     8.8
Total               20.6     8.8
---------------------------------
  *  Movement not allocated to the lane


DOWNSTREAM LANE FLOW RATES FOR EXIT ROADS

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           201.9    86.5
Total              201.9    86.5
---------------------------------
 Exit: NORTH
Lane:  1           205.6    88.1
Total              205.6    88.1
---------------------------------
 Exit: WEST
Lane:  1            20.6     8.8
Total               20.6     8.8
---------------------------------
  *  Movement not allocated to the lane

Unit Time for Volumes =  60 minutes
Peak Flow Period =  30 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings Summary
Site:Existing AM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

* Basic Parameters:
  Intersection Type: Unsignalised - Give Way
  Driving on the left-hand side of the road
  Input data specified in Metric units
  Model Defaults: New South Wales
  Peak Flow Period (for performance): 30 minutes
  Unit time (for volumes): 60 minutes.
  SIDRA Standard Delay model used
  SIDRA Standard Queue model used
  Level of Service based on: Delay (RTA NSW)
  Queue percentile: 95%
```

Go to Table Links (Top)

Diagnostics
Site:Existing AM Peak

Go to Table Links (Top)

DETAILED OUTPUT

Site: Existing PM Peak

Newell Highway/Saleyards Road
Giveway / Yield (Two-Way)

OUTPUT TABLE LINKS

Movements

Intersection Negotiation Data
Site:Existing PM Peak

Intersection ID: 1
Give-Way Sign Controlled Intersection

INTERSECTION NEGOTIATION DATA

From Approach	To Exit	Turn	Negn Radius m	Negn Speed km/h	Negn Dist. m	Appr. Dist. m	Downstream m	Distance User Spec?
South: Newell Highway								
	West	L2	10.0	20.2	15.7	500	231	No
	North	T1	S	80.0	10.0	500	354	No
North: Newell Highway								
	South	T1	S	80.0	10.0	500	354	No
	West	R2	8.4	18.9	13.2	500	230	No
West: Saleyards Road								
	North	L2	10.0	20.2	15.7	500	231	No
	South	R2	8.4	18.9	13.2	500	228	No

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

MOVEMENT SPEEDS AND GEOMETRIC DELAY

Mov ID	Turn	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Newell Highway										
1	L2	50.0	20.2	20.2	50.0			43.2	43.2	11.8
2	T1	50.0	50.0	80.0	80.0			50.0	50.0	0.0
North: Newell Highway										
8	T1	50.0	50.0	80.0	80.0			50.0	50.0	0.0
9	R2	50.0	18.9	18.9	50.0	18.9		41.6	41.4	12.2
West: Saleyards Road										

```
 10  L2      50.0  20.2   20.2  50.0                   43.2    43.2    11.8
 12  R2      50.0  18.9   18.9  50.0                   43.2    43.2    12.2
--------------------------------------------------------------------------------
  "Running Speed" is the average speed excluding stopped periods.
```

Go to Table Links (Top)

Gap Acceptance Parameters
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

--------------------------------------------------------------------------------
                        Critical Gap                        Intra
                  Opng  ------------   Foll-up   Entry    Bunch   Propn
  Opd     Dest    Flow  Hdwy    Dist   Headway    HV      Hdwy    Bnchd
  Lane            pcu/h  sec     m       sec     Equiv     sec
--------------------------------------------------------------------------------
 South: Newell Highway

  No opposed movements on this approach.
--------------------------------------------------------------------------------
 North: Newell Highway
      2      W     337     5.18     0.0     2.88     1.15   1.61    0.051
--------------------------------------------------------------------------------
 West: Saleyards Road
      1      S       0+    0.00     0.0     0.00     0.00   0.00    0.000
      1      N       0+    0.00     0.0     0.00     0.00   0.00    0.000
--------------------------------------------------------------------------------

  Values in this table are adjusted for heavy vehicles in the entry stream.
  Use the Pedestrians and Priorities input dialogs to specify opposing pedestrian movements.
  +  Percentage of exiting flow included in opposing vehicle flow
```

Go to Table Links (Top)

Movement Capacity and Performance Parameters
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


MOVEMENT CAPACITY PARAMETERS

----------------------------------------------------------------
 Mov Turn Mov         Opng Movement  Total  Prac.  Prac.  Deg.
 ID       Cl.  Arv           Adjust.  Cap.  Deg.   Spare  Satn
               Flow   Flow   Flow           Satn   Cap.
               veh/h  veh/h  pcu/h   veh/h   xp      %      x
----------------------------------------------------------------
South: Newell Highway
  1  L2   #       1      0      0    1530   0.98   ****  0.001
  2  T1   #     287      0      0    1632   0.98    456  0.176*
----------------------------------------------------------------
North: Newell Highway
  8  T1   #     287      0      0    1632   0.98    456  0.176*
  9  R2   #       8      0      0     843   0.98   9710  0.010
----------------------------------------------------------------
West: Saleyards Road
 10  L2   #      35      0      0    8918   0.98   ****  0.004
 12  R2   #       4      0      0    1081   0.98   ****  0.004
----------------------------------------------------------------
  *  Maximum degree of saturation
  # Combined Movement Capacity parameters are shown for all Movement Classes.


MOVEMENT PERFORMANCE

--------------------------------------------------------------------------------
 Mov Turn Total    Total   Aver.  Eff.  Total  Perf. Tot.Trav. Tot.Trav. Aver.
 ID       Delay    Delay   Delay  Stop  Stops  Index Distance    Time    Speed
        (veh-h/h)(pers-h/h)(sec)  Rate                (veh-km/h)(veh-h/h) (km/h)
--------------------------------------------------------------------------------
South: Newell Highway
  1  L2    0.00    0.00    11.8   0.69     0.7  0.02      0.6     0.0     43.2
  2  T1    0.00    0.00     0.0   0.00     0.0  3.32    166.0     3.3     50.0
--------------------------------------------------------------------------------
North: Newell Highway
  8  T1    0.00    0.00     0.0   0.00     0.0  3.32    166.0     3.3     50.0
  9  R2    0.01    0.01    14.1   0.67     5.6  0.16      4.9     0.1     41.4
--------------------------------------------------------------------------------
West: Saleyards Road
 10  L2    0.03    0.04    11.8   0.69    24.1  0.65     20.3     0.5     43.2
 12  R2    0.00    0.01    11.8   0.69     2.9  0.08      2.5     0.1     43.2
--------------------------------------------------------------------------------
```

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


FUEL CONSUMPTION, EMISSIONS AND COST (TOTAL)

-------------------------------------------------------------
 Mov  Turn       Cost    Fuel     CO2     CO      HC      NOX
 ID              Total   Total   Total   Total   Total   Total
                 $/h       L/h   kg/h    kg/h    kg/h    kg/h
-------------------------------------------------------------
South: Newell Highway
  1  L2            0.63    0.1     0.3    0.00   0.000   0.001
  2  T1          145.73   27.5    66.8    0.12   0.011   0.344
               ----------------------------------------------
                146.36   27.6    67.1    0.12   0.011   0.345
-------------------------------------------------------------
North: Newell Highway
  8  T1          145.73   27.5    66.8    0.12   0.011   0.344
  9  R2            5.18    0.9     2.1    0.00   0.000   0.011
               ----------------------------------------------
                150.91   28.3    69.0    0.12   0.012   0.355
-------------------------------------------------------------
West: Saleyards Road
 10  L2           20.70    3.5     8.6    0.02   0.002   0.045
 12  R2            2.51    0.4     1.0    0.00   0.000   0.005
               ----------------------------------------------
                23.21    4.0     9.7    0.02   0.002   0.050
-------------------------------------------------------------
 INTERSECTION:  320.48   59.8   145.7    0.26   0.025   0.750
-------------------------------------------------------------


FUEL CONSUMPTION, EMISSIONS AND COST (RATE)

-------------------------------------------------------------
 Mov  Turn       Cost    Fuel     CO2     CO      HC      NOX
 ID              Rate    Rate    Rate    Rate    Rate    Rate
                 $/km   L/100km  g/km    g/km    g/km    g/km
-------------------------------------------------------------
South: Newell Highway
  1  L2            1.02   17.5   425.0    0.82   0.083   2.203
  2  T1            0.88   16.5   402.6    0.72   0.068   2.071
               ----------------------------------------------
                   0.88   16.5   402.7    0.72   0.068   2.072
-------------------------------------------------------------
North: Newell Highway
  8  T1            0.88   16.5   402.6    0.72   0.068   2.071
  9  R2            1.06   17.7   431.5    0.85   0.086   2.237
               ----------------------------------------------
                   0.88   16.6   403.4    0.72   0.068   2.076
-------------------------------------------------------------
West: Saleyards Road
 10  L2            1.02   17.5   425.2    0.82   0.083   2.204
 12  R2            1.02   17.5   425.2    0.82   0.083   2.204
               ----------------------------------------------
                   1.02   17.5   425.2    0.82   0.083   2.204
-------------------------------------------------------------
 INTERSECTION:     0.74   13.8   337.1    0.61   0.057   1.735
-------------------------------------------------------------
```

Go to Table Links (Top)

Lanes

Lane Performance and Capacity Information
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE PERFORMANCE

-------------------------------------------------------------
                                        Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.    95% Back      Lane
 Lane                 Satn  Delay  Stop  ------------   Length
 No.      veh/h veh/h   x    sec    Rate    veh     m       m
-------------------------------------------------------------
 South: Newell Highway
 1           1  1530 0.001   11.8  0.69                  500.0
 2         287  1632 0.176    0.0  0.00                  500.0
```

```
------------------------------------------------------------
 North: Newell Highway
 1         287  1632 0.176    0.0  0.00                   500.0
 2           8   843 0.010   14.1  0.67    0.0    0.3     80.0T
------------------------------------------------------------
 West: Saleyards Road
 1          39  9999 0.004   11.8  0.69                   500.0
------------------------------------------------------------
  T  Short lane due to specification of Turn Bay


LANE FLOW AND CAPACITY INFORMATION

----------------------------------------
 Lane   Total     Min   Tot   Deg.  Lane
 No.    Arv Flow  Cap   Cap   Satn  Util
        (veh/h)  veh/h veh/h    x     %
----------------------------------------
 South: Newell Highway
 1          1       1  1530  0.001  100
 2        287     287  1632  0.176  100
----------------------------------------
 North: Newell Highway
 1        287     287  1632  0.176  100
 2          8       8   843  0.010  100
----------------------------------------
 West: Saleyards Road
 1         39      39  9999  0.004  100
----------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Go to Table Links (Top)

Lane Delays
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE DELAYS

------------------------------------------------------------------------------
                      ----------------  Delay (seconds/veh)  ----------------
        Deg.  Prog.    Stop-line Delay  Acc.   Queuing   Stopd
 Lane    Satn  Factor   1st   2nd Total  Dec.  Total MvUp (Idle) Geom Control
 No.       x            d1    d2   dSL   dn    dq   dqm    di    dig   dic
------------------------------------------------------------------------------
 South: Newell Highway
 1      0.001              0.0                          11.8   11.8
 2      0.176              0.0                           0.0    0.0
------------------------------------------------------------------------------
 North: Newell Highway
 1      0.176              0.0                           0.0    0.0
 2      0.010  1.000    1.8   0.0   1.8   1.6   0.2   0.0   0.2  12.2   14.1
------------------------------------------------------------------------------
 West: Saleyards Road
 1      0.004              0.0                          11.8   11.8
------------------------------------------------------------------------------
  SIDRA Standard Delay Model is used.  Control Delay is the sum of Stop-line Delay
  and Geometric Delay.
  dSL: Stop-line delay (=d1+d2)
  dn: Average stop-start delay for all vehicles queued and unqueued
  dq: Queuing delay (the part of the stop-line delay that includes
      stopped delay and queue move-up delay)
  dqm: Queue move-up delay
  di: Stopped delay (stopped (idling) time at near-zero speed)
  dig: Geometric delay
  dic: Control delay


LANE DELAY PERCENTILES

------------------------------------------------------------
        Deg.                 Percentile Delay
 Lane   Satn  ------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
------------------------------------------------------------
 South: Newell Highway
 1      NA - Continuous Movement
 2      NA - Continuous Movement
------------------------------------------------------------
 North: Newell Highway
 1      NA - Continuous Movement
 2     0.010   14.1   14.4   15.0   15.3   15.6   15.8   16.0
------------------------------------------------------------
 West: Saleyards Road
```

```
 1      NA - Continuous Movement
------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queues
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUES (VEHICLES)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (veh)     Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   ------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc     95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 2     0.010  1.000    0.0     0.0    0.0    0.0    0.0   0.00    0.0  100.0    0.0     0.0
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
-------------------------------------------------------------------------------------------------



LANE QUEUES (DISTANCE)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (m)       Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   ------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc     95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 2     0.010  1.000    0.0     0.1    0.0    0.1    0.3   0.00    0.0  100.0    0.0     0.1
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
-------------------------------------------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queue Percentiles
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUE PERCENTILES (VEHICLES)

------------------------------------------------------------
        Deg.           Percentile Back of Queue (veh)
 Lane   Satn  ---------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
------------------------------------------------------------
 South: Newell Highway
------------------------------------------------------------
 North: Newell Highway
 2     0.010    0.0    0.0    0.0    0.0    0.0    0.0
------------------------------------------------------------
 West: Saleyards Road
------------------------------------------------------------



LANE QUEUE PERCENTILES (DISTANCE)

------------------------------------------------------------
        Deg.           Percentile Back of Queue (metres)
 Lane   Satn  ---------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
------------------------------------------------------------
 South: Newell Highway
------------------------------------------------------------
 North: Newell Highway
 2     0.010    0.1    0.2    0.2    0.3    0.3    0.4    0.4
------------------------------------------------------------
 West: Saleyards Road
------------------------------------------------------------
```

Go to Table Links (Top)

Lane Stops
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

-------------------------------------------------------------------------------
                                                 Queue   Total
       Deg.  Prog.   -- Effective Stop Rate --   Total  Move-up  Queue   Prop.
 Lane   Satn  Factor              Geom. Overall  Stops   Rate  Move-ups Queued
 No.     x            he1   he2   hig     h       H      hqm     Hqm     pq
-------------------------------------------------------------------------------
 South: Newell Highway
 1     0.001  1.000               0.69   0.69      0.7
 2     0.176  1.000               0.00   0.00      0.0
-------------------------------------------------------------------------------
 North: Newell Highway
 1     0.176  1.000               0.00   0.00      0.0
 2     0.010  1.000   0.26  0.00  0.41   0.67      5.6    0.00     0.0   0.42
-------------------------------------------------------------------------------
 West: Saleyards Road
 1     0.004  1.000               0.69   0.69     27.1
-------------------------------------------------------------------------------
  hig is the average value for all movements in a shared lane
  hqm is average queue move-up rate for all vehicles queued and unqueued
```

Go to Table Links (Top)

Flow Rates

Origin-Destination Flow Rates (Total)
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


TOTAL FLOW RATES (ALL MOVEMENT CLASSES)

------------------------------------------------
 From SOUTH To:                W       N
 Turn:                         L2      T1     TOT
 Flow Rate                    1.1   287.4   288.4
 %HV (all designations)      30.0    30.0    30.0
------------------------------------------------
 From NORTH To:                S       W
 Turn:                         T1      R2     TOT
 Flow Rate                  287.4     8.4   295.8
 %HV (all designations)      30.0    30.0    30.0
------------------------------------------------
 From WEST To:                 N       S
 Turn:                         L2      R2     TOT
 Flow Rate                  34.7     4.2    38.9
 %HV (all designations)      30.0    30.0    30.0
------------------------------------------------
```

Go to Table Links (Top)

Origin-Destination Flow Rates by Movement Class
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


FLOW RATES FOR Light Vehicles

-----------------------------------------
 From SOUTH To:          W       N
 Turn:                   L2      T1     TOT
-----------------------------------------
 Flow Rate - Veh        0.7   201.2   201.9
 Mov Class %           70.0    70.0    70.0
 Flow Scale - Fixed    1.00    1.00
 Flow Scale - Var      1.00    1.00
 Peak Flow Factor      0.95    0.95
-----------------------------------------
 From NORTH To:          S       W
 Turn:                   T1      R2     TOT
-----------------------------------------
 Flow Rate - Veh      201.2     5.9   207.1
 Mov Class %           70.0    70.0    70.0
 Flow Scale - Fixed    1.00    1.00
 Flow Scale - Var      1.00    1.00
 Peak Flow Factor      0.95    0.95
```

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	24.3	2.9	27.3
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

FLOW RATES FOR Heavy Vehicles

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate - Veh	0.3	86.2	86.5
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	86.2	2.5	88.7
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	10.4	1.3	11.7
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

Go to Table Links (Top)

Lane Flow Rates
Site:Existing PM Peak

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE FLOW RATES AT STOP LINE

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Lane 1			
LV	0.7	*	0.7
HV	0.3	*	0.3
Total	1.1	*	1.1
Lane 2			
LV	*	201.2	201.2
HV	*	86.2	86.2
Total	*	287.4	287.4
Approach	1.1	287.4	288.4

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Lane 1			
LV	201.2	*	201.2
HV	86.2	*	86.2
Total	287.4	*	287.4
Lane 2			
LV	*	5.9	5.9
HV	*	2.5	2.5
Total	*	8.4	8.4
Approach	287.4	8.4	295.8

From WEST To:	N	S	
Turn:	L2	R2	TOT
Lane 1			
LV	24.3	2.9	27.3
HV	10.4	1.3	11.7
Total	34.7	4.2	38.9

```
 Approach           34.7     4.2    38.9
----------------------------------------
  *  Movement not allocated to the lane


EXIT LANE FLOW RATES

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           204.1    87.5
Total              204.1    87.5
---------------------------------
 Exit: NORTH
Lane:  1           225.5    96.6
Lane:  2             0.0     0.0
Total              225.5    96.6
---------------------------------
 Exit: WEST
Lane:  1             6.6     2.8
Total                6.6     2.8
---------------------------------
  *  Movement not allocated to the lane


DOWNSTREAM LANE FLOW RATES FOR EXIT ROADS

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           204.1    87.5
Total              204.1    87.5
---------------------------------
 Exit: NORTH
Lane:  1           225.5    96.6
Total              225.5    96.6
---------------------------------
 Exit: WEST
Lane:  1             6.6     2.8
Total                6.6     2.8
---------------------------------
  *  Movement not allocated to the lane

Unit Time for Volumes =  60 minutes
Peak Flow Period =  30 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings Summary
Site:Existing PM Peak

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

* Basic Parameters:
  Intersection Type: Unsignalised - Give Way
  Driving on the left-hand side of the road
  Input data specified in Metric units
  Model Defaults: New South Wales
  Peak Flow Period (for performance): 30 minutes
  Unit time (for volumes): 60 minutes.
  SIDRA Standard Delay model used
  SIDRA Standard Queue model used
  Level of Service based on: Delay (RTA NSW)
  Queue percentile: 95%
```

Go to Table Links (Top)

Diagnostics
Site:Existing PM Peak

Go to Table Links (Top)

DETAILED OUTPUT

Site: AM Newell/Saleyards

Newell Highway and Saleyards Road
Giveway / Yield (Two-Way)

OUTPUT TABLE LINKS

Movements

Intersection Negotiation Data
Site:AM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

INTERSECTION NEGOTIATION DATA

From Approach	To Exit	Turn	Negn Radius m	Negn Speed km/h	Negn Dist. m	Appr. Dist. m	Downstream m	Distance User Spec?
South: Newell Highway								
	West	L2	10.0	20.2	15.7	500	231	No
	North	T1	S	80.0	10.0	500	1113	No
North: Newell Highway								
	South	T1	S	80.0	10.0	500	1113	No
	West	R2	8.4	18.9	13.2	500	230	No
West: Saleyards Road								
	North	L2	15.0	23.5	23.6	500	235	No
	South	R2	8.4	18.9	13.2	500	220	No

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

MOVEMENT SPEEDS AND GEOMETRIC DELAY

Mov ID	Turn	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Newell Highway										
1	L2	50.0	20.2	20.2	50.0			43.2	43.2	11.8
2	T1	80.0	80.0	80.0	80.0	80.0		78.1	78.1	0.0
North: Newell Highway										
8	T1	80.0	80.0	80.0	80.0	50.7		70.0	70.0	0.0
9	R2	50.0	18.9	18.9	50.0	16.0		34.0	26.2	12.2
West: Saleyards Road										

```
 10  L2      50.0  23.5   23.5  50.0    16.9            41.6    40.6    10.7
 12  R2      50.0  18.9   18.9  50.0    16.9            41.6    40.6    12.2
------------------------------------------------------------------------------
  "Running Speed" is the average speed excluding stopped periods.
```

Go to Table Links (Top)

Gap Acceptance Parameters
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

-------------------------------------------------------------------------
                        Critical Gap                        Intra
                  Opng  ------------   Foll-up   Entry     Bunch   Propn
  Opd     Dest    Flow  Hdwy    Dist   Headway    HV       Hdwy    Bnchd
  Lane            pcu/h  sec     m       sec     Equiv     sec
-------------------------------------------------------------------------
 South: Newell Highway
      2      N       8    5.17    0.0     2.88     1.15    1.80    0.001
-------------------------------------------------------------------------
 North: Newell Highway
      1      S      47+   7.48    0.0     4.03     1.15    1.31    0.003
      2      W     480+   8.05    0.0     4.60     1.15    1.27    0.058
-------------------------------------------------------------------------
 West: Saleyards Road
      1      N     416+   5.75    0.0     3.45     1.15    1.55    0.042
-------------------------------------------------------------------------

  Values in this table are adjusted for heavy vehicles in the entry stream.
  Use the Pedestrians and Priorities input dialogs to specify opposing pedestrian movements.
  +  Percentage of exiting flow included in opposing vehicle flow
```

Go to Table Links (Top)

Movement Capacity and Performance Parameters
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


MOVEMENT CAPACITY PARAMETERS

----------------------------------------------------------------
 Mov Turn Mov         Opng Movement  Total  Prac.  Prac.  Deg.
 ID       Cl.  Arv          Adjust.  Cap.  Deg.   Spare  Satn
               Flow   Flow   Flow          Satn   Cap.
               veh/h  veh/h  pcu/h   veh/h   xp      %      x
----------------------------------------------------------------
South: Newell Highway
  1  L2   #      29      0      0    1530   0.98   4987  0.019
  2  T1   #     347      0      0    1241   0.80    186  0.280
----------------------------------------------------------------
North: Newell Highway
  8  T1   #     525      0      0     832   0.80     27  0.631
  9  R2   #     263      0      0     314   0.80     -4  0.838*
----------------------------------------------------------------
West: Saleyards Road
 10  L2   #      66      0      0     574   0.80    592  0.116
 12  R2   #       7      0      0      64   0.98    748  0.116
----------------------------------------------------------------
  *  Maximum degree of saturation
  # Combined Movement Capacity parameters are shown for all Movement Classes.


MOVEMENT PERFORMANCE

------------------------------------------------------------------------------
 Mov Turn Total    Total   Aver.  Eff.  Total  Perf. Tot.Trav. Tot.Trav. Aver.
 ID       Delay    Delay   Delay  Stop  Stops  Index Distance    Time    Speed
       (veh-h/h)(pers-h/h)(sec)  Rate               (veh-km/h)(veh-h/h) (km/h)
------------------------------------------------------------------------------
South: Newell Highway
  1  L2    0.03    0.03    11.8   0.69    20.4  0.55     17.2     0.4     43.2
  2  T1    0.00    0.00     0.1   0.00     1.3  4.92    298.8     3.8     78.1
------------------------------------------------------------------------------
North: Newell Highway
  8  T1    0.05    0.06     1.2   0.08    42.7 10.74    451.8     6.5     70.0
  9  R2    0.95    1.15    43.5   1.60   422.2 15.93    153.1     5.8     26.2
------------------------------------------------------------------------------
West: Saleyards Road
 10  L2    0.08    0.09    14.4   0.73    48.1  1.67     39.0     1.0     40.6
 12  R2    0.01    0.01    14.4   0.73     5.3  0.15      4.3     0.1     40.6
------------------------------------------------------------------------------
```

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost
Site:AM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

FUEL CONSUMPTION, EMISSIONS AND COST (TOTAL)

Mov ID	Turn	Cost Total $/h	Fuel Total L/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Newell Highway							
1	L2	17.56	3.0	7.3	0.01	0.001	0.038
2	T1	324.58	87.3	212.6	0.29	0.021	1.193
		342.14	90.3	219.9	0.30	0.022	1.231
North: Newell Highway							
8	T1	543.48	136.1	331.3	0.48	0.037	1.870
9	R2	224.60	31.2	76.1	0.17	0.020	0.385
		768.09	167.3	407.4	0.65	0.056	2.255
West: Saleyards Road							
10	L2	41.21	6.9	16.7	0.03	0.003	0.086
12	R2	4.58	0.8	1.9	0.00	0.000	0.010
		45.79	7.6	18.5	0.04	0.004	0.096
INTERSECTION:		1156.01	265.3	645.9	0.99	0.082	3.582

FUEL CONSUMPTION, EMISSIONS AND COST (RATE)

Mov ID	Turn	Cost Rate $/km	Fuel Rate L/100km	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Newell Highway							
1	L2	1.02	17.5	425.0	0.82	0.083	2.202
2	T1	1.09	29.2	711.7	0.97	0.069	3.993
		1.08	28.6	696.1	0.96	0.070	3.896
North: Newell Highway							
8	T1	1.20	30.1	733.4	1.07	0.081	4.140
9	R2	1.47	20.4	496.8	1.09	0.128	2.513
		1.27	27.7	673.5	1.07	0.093	3.728
West: Saleyards Road							
10	L2	1.06	17.6	428.1	0.84	0.087	2.209
12	R2	1.06	17.6	428.1	0.84	0.087	2.209
		1.06	17.6	428.1	0.84	0.087	2.209
INTERSECTION:		1.00	22.9	558.2	0.86	0.071	3.096

Go to Table Links (Top)

Lanes

Lane Performance and Capacity Information
Site:AM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE PERFORMANCE

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back m	Lane Length m
South: Newell Highway								
1	29	1530	0.019	11.8	0.69			500.0
2	347	1241	0.280	0.1	0.00	1.5	12.8	500.0

```
------------------------------------------------------------
 North: Newell Highway
 1         525   832 0.631    1.2  0.08    5.8   51.2    500.0
 2         263   314 0.838   43.5  1.60    9.1   80.2     80.0T
------------------------------------------------------------
 West: Saleyards Road
 1          74   638 0.116   14.4  0.73    0.4    3.9    500.0
------------------------------------------------------------
  T  Short lane due to specification of Turn Bay


LANE FLOW AND CAPACITY INFORMATION

----------------------------------------
 Lane   Total     Min   Tot   Deg.  Lane
 No.    Arv Flow  Cap   Cap   Satn  Util
        (veh/h)  veh/h veh/h    x     %
----------------------------------------
 South: Newell Highway
 1         29      29  1530  0.019  100
 2        347      60  1241  0.280  100
----------------------------------------
 North: Newell Highway
 1        525      60   832  0.631  100
 2        263      60   314  0.838  100
----------------------------------------
 West: Saleyards Road
 1         74      66   638  0.116  100
----------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Go to Table Links (Top)

Lane Delays
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE DELAYS

------------------------------------------------------------------------------
                      ----------------  Delay (seconds/veh)  ----------------
        Deg.  Prog.    Stop-line Delay  Acc.   Queuing   Stopd
 Lane    Satn  Factor   1st   2nd Total  Dec.  Total MvUp (Idle) Geom Control
 No.       x            d1    d2   dSL   dn    dq   dqm    di    dig   dic
------------------------------------------------------------------------------
 South: Newell Highway
 1      0.019                0.0                          11.8   11.8
 2      0.280  1.000    0.1   0.0   0.1   0.9   0.0   0.0   0.0   0.0    0.1
------------------------------------------------------------------------------
 North: Newell Highway
 1      0.631  1.000    1.2   0.0   1.2   5.5   0.0   0.0   0.0   0.0    1.2
 2      0.838  1.000   14.2  17.1  31.3   3.5  27.8   9.4  18.4  12.2   43.5
------------------------------------------------------------------------------
 West: Saleyards Road
 1      0.116  1.000    3.6   0.0   3.6   2.3   1.3   0.0   1.3  10.8   14.4
------------------------------------------------------------------------------
  SIDRA Standard Delay Model is used.  Control Delay is the sum of Stop-line Delay
  and Geometric Delay.
  dSL: Stop-line delay (=d1+d2)
  dn: Average stop-start delay for all vehicles queued and unqueued
  dq: Queuing delay (the part of the stop-line delay that includes
      stopped delay and queue move-up delay)
  dqm: Queue move-up delay
  di: Stopped delay (stopped (idling) time at near-zero speed)
  dig: Geometric delay
  dic: Control delay


LANE DELAY PERCENTILES

------------------------------------------------------------
        Deg.                 Percentile Delay
 Lane   Satn  ---------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
------------------------------------------------------------
 South: Newell Highway
 1      NA - Continuous Movement
 2     0.280    0.1    0.1    0.1    0.1    0.1    0.1    0.1
------------------------------------------------------------
 North: Newell Highway
 1     0.631    1.2    1.4    1.7    1.9    2.1    2.3    2.4
 2     0.838   43.5   49.4   58.6   63.2   69.0   73.1   76.1
------------------------------------------------------------
 West: Saleyards Road
```

```
 1     0.116   14.4   15.1   16.1   16.7   17.3   17.8   18.2
-------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queues
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUES (VEHICLES)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (veh)      Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   -------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc      95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
 2     0.280  1.000    0.0     0.6    0.0    0.6    1.5   0.01    0.0  100.0    0.0     0.0
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.631  1.000    0.0     2.3    0.0    2.3    5.8   0.04    0.0  100.0    0.2     0.3
 2     0.838  1.000    1.4     1.7    2.0    3.7    9.1   0.40    5.1   94.9    2.3     4.1
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
 1     0.116  1.000    0.0     0.2    0.0    0.2    0.4   0.00    0.0  100.0    0.1     0.1
-------------------------------------------------------------------------------------------------



LANE QUEUES (DISTANCE)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (m)        Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   -------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc      95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
 2     0.280  1.000    0.0     5.1    0.0    5.1   12.8   0.01    0.0  100.0    0.0     0.1
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.631  1.000    0.0    20.6    0.0   20.6   51.2   0.04    0.0  100.0    1.5     2.7
 2     0.838  1.000   12.4    15.1   17.2   32.3   80.2   0.40    5.1   94.9   20.1    36.5
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
 1     0.116  1.000    0.0     1.6    0.0    1.6    3.9   0.00    0.0  100.0    0.6     1.2
-------------------------------------------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queue Percentiles
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUE PERCENTILES (VEHICLES)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (veh)
 Lane   Satn  ----------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
 2     0.280    0.6    0.8    1.1    1.2    1.5    1.6    1.7
-------------------------------------------------------------
 North: Newell Highway
 1     0.631    2.3    3.0    4.3    5.0    5.8    6.5    6.9
 2     0.838    3.7    4.7    6.7    7.8    9.1   10.1*  10.9*
-------------------------------------------------------------
 West: Saleyards Road
 1     0.116    0.2    0.2    0.3    0.4    0.4    0.5    0.5
-------------------------------------------------------------

  *  Percentile Queue length exceeds short lane length.
     For calculation of this statistic, you may specify the lane with full length.


LANE QUEUE PERCENTILES (DISTANCE)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (metres)
 Lane   Satn  ----------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
```

```
 South: Newell Highway
 2     0.280    5.1    6.7    9.4   10.9   12.8   14.2   15.2
-------------------------------------------------------------
 North: Newell Highway
 1     0.631   20.6   26.7   37.6   43.6   51.2   56.9   61.1
 2     0.838   32.3   41.8   58.9   68.2   80.2   89.0*  95.7*
-------------------------------------------------------------
 West: Saleyards Road
 1     0.116    1.6    2.0    2.9    3.3    3.9    4.3    4.6
-------------------------------------------------------------

  *  Percentile Queue length exceeds short lane length.
     For calculation of this statistic, you may specify the lane with full length.
```

Go to Table Links (Top)

Lane Stops
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

-------------------------------------------------------------------------------
                                                 Queue   Total
        Deg.  Prog.    -- Effective Stop Rate --  Total  Move-up  Queue   Prop.
 Lane   Satn  Factor                Geom. Overall  Stops   Rate  Move-ups Queued
 No.      x            he1   he2    hig     h       H      hqm     Hqm     pq
-------------------------------------------------------------------------------
 South: Newell Highway
 1     0.019  1.000                0.69   0.69     20.4
 2     0.280  1.000   0.00  0.00   0.00   0.00      1.3    0.00     0.0   0.06
-------------------------------------------------------------------------------
 North: Newell Highway
 1     0.631  1.000   0.08  0.00   0.00   0.08     42.7    0.00     0.0   0.39
 2     0.838  1.000   0.90  0.63   0.07   1.60    422.2    1.69   443.6   0.90
-------------------------------------------------------------------------------
 West: Saleyards Road
 1     0.116  1.000   0.41  0.00   0.32   0.73     53.4    0.00     0.0   0.50
-------------------------------------------------------------------------------
  hig is the average value for all movements in a shared lane
  hqm is average queue move-up rate for all vehicles queued and unqueued
```

Go to Table Links (Top)

Flow Rates

Origin-Destination Flow Rates (Total)
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


TOTAL FLOW RATES (ALL MOVEMENT CLASSES)

-------------------------------------------------
 From SOUTH To:                W       N
 Turn:                         L2      T1     TOT
 Flow Rate                   29.5   347.4   376.8
 %HV (all designations)      30.0    30.0    30.0
-------------------------------------------------
 From NORTH To:                S       W
 Turn:                         T1      R2     TOT
 Flow Rate                  525.3   263.2   788.4
 %HV (all designations)      30.0    30.0    30.0
-------------------------------------------------
 From WEST To:                 N       S
 Turn:                         L2      R2     TOT
 Flow Rate                   66.3     7.4    73.7
 %HV (all designations)      30.0    30.0    30.0
-------------------------------------------------
```

Go to Table Links (Top)

Origin-Destination Flow Rates by Movement Class
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


FLOW RATES FOR Light Vehicles

-----------------------------------------
 From SOUTH To:         W       N
```

Turn:	L2	T1	TOT
Flow Rate - Veh	20.6	243.2	263.8
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	367.7	184.2	551.9
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	46.4	5.2	51.6
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

FLOW RATES FOR Heavy Vehicles

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate - Veh	8.8	104.2	113.1
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	157.6	78.9	236.5
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	19.9	2.2	22.1
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

Go to Table Links (Top)

Lane Flow Rates
Site:AM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE FLOW RATES AT STOP LINE

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Lane 1			
LV	20.6	*	20.6
HV	8.8	*	8.8
Total	29.5	*	29.5
Lane 2			
LV	*	243.2	243.2
HV	*	104.2	104.2
Total	*	347.4	347.4
Approach	29.5	347.4	376.8

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Lane 1			
LV	367.7	*	367.7
HV	157.6	*	157.6

```
   Total          525.3       *   525.3
 Lane  2
   LV                *   184.2   184.2
   HV                *    78.9    78.9
   Total             *   263.2   263.2
----------------------------------------
 Approach         525.3   263.2   788.4
----------------------------------------
 From WEST To:        N       S
 Turn:               L2      R2     TOT
----------------------------------------
 Lane  1
   LV              46.4     5.2    51.6
   HV              19.9     2.2    22.1
   Total           66.3     7.4    73.7
----------------------------------------
 Approach          66.3     7.4    73.7
----------------------------------------
  *  Movement not allocated to the lane


EXIT LANE FLOW RATES

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1          372.8   159.8
Total             372.8   159.8
---------------------------------
 Exit: NORTH
Lane:  1          289.6   124.1
Lane:  2            0.0     0.0
Total             289.6   124.1
---------------------------------
 Exit: WEST
Lane:  1          204.8    87.8
Total             204.8    87.8
---------------------------------
  *  Movement not allocated to the lane


DOWNSTREAM LANE FLOW RATES FOR EXIT ROADS

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1          372.8   159.8
Total             372.8   159.8
---------------------------------
 Exit: NORTH
Lane:  1          289.6   124.1
Total             289.6   124.1
---------------------------------
 Exit: WEST
Lane:  1          204.8    87.8
Total             204.8    87.8
---------------------------------
  *  Movement not allocated to the lane

Unit Time for Volumes =  60 minutes
Peak Flow Period =  30 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings Summary
Site:AM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

* Basic Parameters:
  Intersection Type: Unsignalised - Give Way
  Driving on the left-hand side of the road
  Input data specified in Metric units
  Model Defaults: New South Wales
  Peak Flow Period (for performance): 30 minutes
  Unit time (for volumes): 60 minutes.
  SIDRA Standard Delay model used
  SIDRA Standard Queue model used
  Level of Service based on: Delay (RTA NSW)
  Queue percentile: 95%
```

Go to Table Links (Top)

Diagnostics
Site:AM Newell/Saleyards

Go to Table Links (Top)

DETAILED OUTPUT

Site: PM Newell/Saleyards

Newell Highway and Saleyards Road
Giveway / Yield (Two-Way)

OUTPUT TABLE LINKS

Movements

Intersection Negotiation Data
Site:PM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

INTERSECTION NEGOTIATION DATA

From Approach	To Exit	Turn	Negn Radius m	Negn Speed km/h	Negn Dist. m	Appr. Dist. m	Downstream m	Distance User Spec?
South: Newell Highway								
	West	L2	10.0	20.2	15.7	500	231	No
	North	T1	S	80.0	10.0	500	1113	No
North: Newell Highway								
	South	T1	S	80.0	10.0	500	1113	No
	West	R2	8.4	18.9	13.2	500	230	No
West: Saleyards Road								
	North	L2	15.0	23.5	23.6	500	235	No
	South	R2	8.4	18.9	13.2	500	220	No

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

MOVEMENT SPEEDS AND GEOMETRIC DELAY

Mov ID	Turn	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Newell Highway										
1	L2	50.0	20.2	20.2	50.0			43.2	43.2	11.8
2	T1	80.0	80.0	80.0	80.0	70.0		75.0	75.0	0.0
North: Newell Highway										
8	T1	80.0	80.0	80.0	80.0	25.6		65.8	65.8	0.0
9	R2	50.0	18.9	18.9	50.0	13.1		38.9	24.9	12.2
West: Saleyards Road										

```
 10  L2      50.0  23.5   23.5  50.0    14.0            37.7    33.9    10.7
 12  R2      50.0  18.9   18.9  50.0    14.0            37.7    33.9    12.2
------------------------------------------------------------------------------
  "Running Speed" is the average speed excluding stopped periods.
```

Go to Table Links (Top)

Gap Acceptance Parameters
Site:PM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

------------------------------------------------------------------------------
                        Critical Gap                        Intra
                  Opng  ------------   Foll-up   Entry     Bunch    Propn
  Opd     Dest    Flow  Hdwy    Dist   Headway    HV       Hdwy     Bnchd
  Lane            pcu/h  sec     m       sec     Equiv     sec
------------------------------------------------------------------------------
 South: Newell Highway
      2      N      34    5.18    0.0     2.88     1.15    1.80     0.003
------------------------------------------------------------------------------
 North: Newell Highway
      1      S     190+   7.47    0.0     4.02     1.15    1.31     0.015
      2      W     803+   8.05    0.0     4.60     1.15    1.20     0.099
------------------------------------------------------------------------------
 West: Saleyards Road
      1      N     608+   5.75    0.0     3.45     1.15    1.68     0.073
------------------------------------------------------------------------------

  Values in this table are adjusted for heavy vehicles in the entry stream.
  Use the Pedestrians and Priorities input dialogs to specify opposing pedestrian movements.
  +  Percentage of exiting flow included in opposing vehicle flow
```

Go to Table Links (Top)

Movement Capacity and Performance Parameters
Site:PM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


MOVEMENT CAPACITY PARAMETERS

----------------------------------------------------------------
 Mov Turn Mov         Opng Movement  Total  Prac.  Prac.  Deg.
 ID       Cl.  Arv          Adjust.  Cap.  Deg.   Spare  Satn
               Flow   Flow   Flow          Satn   Cap.
               veh/h  veh/h  pcu/h   veh/h   xp      %      x
----------------------------------------------------------------
South: Newell Highway
  1  L2   #       7      0      0    1530   0.98   ****  0.005
  2  T1   #     525      0      0    1208   0.80     84  0.435
----------------------------------------------------------------
North: Newell Highway
  8  T1   #     337      0      0     656   0.80     56  0.513
  9  R2   #      68      0      0     143   0.80     67  0.479
----------------------------------------------------------------
West: Saleyards Road
 10  L2   #     272      0      0     411   0.80     21  0.661*
 12  R2   #      29      0      0      45   0.98     48  0.661*
----------------------------------------------------------------
  *  Maximum degree of saturation
  # Combined Movement Capacity parameters are shown for all Movement Classes.


MOVEMENT PERFORMANCE

------------------------------------------------------------------------------
 Mov Turn Total    Total   Aver.  Eff.  Total  Perf. Tot.Trav. Tot.Trav. Aver.
 ID       Delay    Delay   Delay  Stop  Stops  Index Distance    Time    Speed
       (veh-h/h)(pers-h/h)(sec)  Rate               (veh-km/h)(veh-h/h) (km/h)
------------------------------------------------------------------------------
South: Newell Highway
  1  L2    0.01    0.01    11.8   0.69     5.1  0.14      4.3     0.1     43.2
  2  T1    0.01    0.01     0.3   0.02    10.3  7.95    451.8     6.0     75.0
------------------------------------------------------------------------------
North: Newell Highway
  8  T1    0.14    0.17     5.0   0.40   134.4  8.40    289.7     4.4     65.8
  9  R2    0.27    0.33    47.5   1.08    73.9  3.70     39.8     1.6     24.9
------------------------------------------------------------------------------
West: Saleyards Road
 10  L2    0.56    0.67    24.7   1.11   302.7 10.61    159.6     4.7     33.9
 12  R2    0.06    0.08    24.7   1.11    32.9  0.74     17.3     0.5     33.9
------------------------------------------------------------------------------
```

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost
Site:PM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

FUEL CONSUMPTION, EMISSIONS AND COST (TOTAL)

Mov ID	Turn	Cost Total $/h	Fuel Total L/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Newell Highway							
1	L2	4.39	0.8	1.8	0.00	0.000	0.009
2	T1	509.58	133.5	325.0	0.45	0.033	1.828
		513.97	134.2	326.9	0.46	0.033	1.837
North: Newell Highway							
8	T1	369.32	88.8	216.3	0.33	0.026	1.226
9	R2	58.89	8.1	19.6	0.04	0.005	0.098
		428.21	96.9	236.0	0.37	0.031	1.324
West: Saleyards Road							
10	L2	192.39	29.6	72.1	0.15	0.016	0.369
12	R2	20.88	3.2	7.8	0.02	0.002	0.040
		213.27	32.8	80.0	0.17	0.018	0.409
INTERSECTION:		1155.45	264.0	642.8	0.99	0.082	3.570

FUEL CONSUMPTION, EMISSIONS AND COST (RATE)

Mov ID	Turn	Cost Rate $/km	Fuel Rate L/100km	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Newell Highway							
1	L2	1.02	17.5	425.0	0.82	0.083	2.203
2	T1	1.13	29.5	719.4	1.01	0.073	4.045
		1.13	29.4	716.7	1.00	0.073	4.028
North: Newell Highway							
8	T1	1.27	30.7	746.7	1.12	0.089	4.230
9	R2	1.48	20.3	493.4	1.09	0.129	2.470
		1.30	29.4	716.1	1.12	0.094	4.018
West: Saleyards Road							
10	L2	1.21	18.6	452.1	0.93	0.102	2.315
12	R2	1.21	18.6	452.1	0.93	0.102	2.315
		1.21	18.6	452.1	0.93	0.102	2.315
INTERSECTION:		1.00	22.9	556.5	0.86	0.071	3.091

Go to Table Links (Top)

Lanes

Lane Performance and Capacity Information
Site:PM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE PERFORMANCE

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back m	Lane Length m
South: Newell Highway								
1	7	1530	0.005	11.8	0.69			500.0
2	525	1208	0.435	0.3	0.02	2.7	24.1	500.0

```
------------------------------------------------------------
 North: Newell Highway
 1         337   656 0.513    5.0  0.40    4.4   38.9    500.0
 2          68   143 0.479   47.5  1.08    2.0   17.4     80.0T
------------------------------------------------------------
 West: Saleyards Road
 1         301   455 0.661   24.7  1.11    4.8   42.5    500.0
------------------------------------------------------------
  T  Short lane due to specification of Turn Bay


LANE FLOW AND CAPACITY INFORMATION

----------------------------------------
 Lane   Total     Min   Tot   Deg.  Lane
 No.    Arv Flow  Cap   Cap   Satn  Util
        (veh/h)  veh/h veh/h    x     %
----------------------------------------
 South: Newell Highway
 1          7       7  1530  0.005  100
 2        525      60  1208  0.435  100
----------------------------------------
 North: Newell Highway
 1        337      60   656  0.513  100
 2         68      60   143  0.479  100
----------------------------------------
 West: Saleyards Road
 1        301      66   455  0.661  100
----------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Go to Table Links (Top)

Lane Delays
Site:PM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE DELAYS

------------------------------------------------------------------------------
                      ----------------  Delay (seconds/veh)  ----------------
        Deg.  Prog.    Stop-line Delay  Acc.   Queuing   Stopd
 Lane    Satn  Factor   1st   2nd Total  Dec.  Total MvUp (Idle) Geom Control
 No.       x            d1    d2   dSL   dn    dq   dqm    di    dig   dic
------------------------------------------------------------------------------
 South: Newell Highway
 1      0.005               0.0                           11.8   11.8
 2      0.435  1.000    0.3   0.0   0.3   2.6   0.0   0.0   0.0   0.0    0.3
------------------------------------------------------------------------------
 North: Newell Highway
 1      0.513  1.000    3.6   1.5   5.0   8.3   0.0   0.0   0.0   0.0    5.0
 2      0.479  1.000   27.2   8.1  35.3   3.5  31.8   1.7  30.1  12.2   47.5
------------------------------------------------------------------------------
 West: Saleyards Road
 1      0.661  1.000    9.3   4.6  13.9   3.8  10.1   3.8   6.3  10.8   24.7
------------------------------------------------------------------------------
  SIDRA Standard Delay Model is used.  Control Delay is the sum of Stop-line Delay
  and Geometric Delay.
  dSL: Stop-line delay (=d1+d2)
  dn: Average stop-start delay for all vehicles queued and unqueued
  dq: Queuing delay (the part of the stop-line delay that includes
      stopped delay and queue move-up delay)
  dqm: Queue move-up delay
  di: Stopped delay (stopped (idling) time at near-zero speed)
  dig: Geometric delay
  dic: Control delay


LANE DELAY PERCENTILES

------------------------------------------------------------
        Deg.                 Percentile Delay
 Lane   Satn  ---------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
------------------------------------------------------------
 South: Newell Highway
 1      NA - Continuous Movement
 2     0.435    0.3    0.3    0.4    0.5    0.5    0.5    0.6
------------------------------------------------------------
 North: Newell Highway
 1     0.513    5.0    6.0    7.5    8.2    9.1    9.8   10.3
 2     0.479   47.5   54.1   64.5   69.7   76.2   80.8   84.3
------------------------------------------------------------
 West: Saleyards Road
```

```
 1     0.661   24.7   27.3   31.4   33.4   36.0   37.8   39.2
-------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queues
Site:PM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUES (VEHICLES)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (veh)      Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   -------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc      95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
 2     0.435  1.000    0.0     1.1    0.0    1.1    2.7   0.02    0.0  100.0    0.0     0.1
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.513  1.000    0.2     1.3    0.5    1.8    4.4   0.03    0.0  100.0    0.5     0.9
 2     0.479  1.000    0.2     0.7    0.1    0.8    2.0   0.09    0.0  100.0    0.7     1.2
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
 1     0.661  1.000    0.5     1.3    0.7    1.9    4.8   0.03    0.0  100.0    1.2     2.1
-------------------------------------------------------------------------------------------------



LANE QUEUES (DISTANCE)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (m)        Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   -------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc      95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
 2     0.435  1.000    0.0     9.7    0.0    9.7   24.1   0.02    0.0  100.0    0.4     0.7
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.513  1.000    1.7    11.1    4.6   15.7   38.9   0.03    0.0  100.0    4.1     7.5
 2     0.479  1.000    1.7     5.8    1.2    7.0   17.4   0.09    0.0  100.0    5.9    10.7
-------------------------------------------------------------------------------------------------
 West: Saleyards Road
 1     0.661  1.000    4.6    11.2    6.0   17.1   42.5   0.03    0.0  100.0   10.2    18.5
-------------------------------------------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queue Percentiles
Site:PM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUE PERCENTILES (VEHICLES)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (veh)
 Lane   Satn  ----------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
 2     0.435    1.1    1.4    2.0    2.3    2.7    3.0    3.3
-------------------------------------------------------------
 North: Newell Highway
 1     0.513    1.8    2.3    3.2    3.8    4.4    4.9    5.3
 2     0.479    0.8    1.0    1.4    1.7    2.0    2.2    2.4
-------------------------------------------------------------
 West: Saleyards Road
 1     0.661    1.9    2.5    3.5    4.1    4.8    5.4    5.8
-------------------------------------------------------------



LANE QUEUE PERCENTILES (DISTANCE)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (metres)
 Lane   Satn  ----------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
 2     0.435    9.7   12.5   17.7   20.5   24.1   26.7   28.7
```

North: Newell Highway								
1	0.513	15.7	20.3	28.6	33.1	38.9	43.2	46.4
2	0.479	7.0	9.0	12.7	14.8	17.4	19.3	20.7
West: Saleyards Road								
1	0.661	17.1	22.2	31.2	36.2	42.5	47.2	50.7

Go to Table Links (Top)

Lane Stops
Site:PM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

Lane No.	Deg. Satn x	Prog. Factor	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Queue Total Stops H	Move-up Rate hqm	Queue Move-ups Hqm	Prop. Queued pq
South: Newell Highway										
1	0.005	1.000			0.69	0.69	5.1			
2	0.435	1.000	0.02	0.00	0.00	0.02	10.3	0.00	0.0	0.18
North: Newell Highway										
1	0.513	1.000	0.35	0.05	0.00	0.40	134.4	0.17	58.6	0.58
2	0.479	1.000	0.90	0.11	0.07	1.08	73.9	0.35	23.7	0.90
West: Saleyards Road										
1	0.661	1.000	0.75	0.26	0.10	1.11	335.6	0.78	233.4	0.84

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

Go to Table Links (Top)

Flow Rates

Origin-Destination Flow Rates (Total)
Site:PM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

TOTAL FLOW RATES (ALL MOVEMENT CLASSES)

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate	7.4	525.3	532.6
%HV (all designations)	30.0	30.0	30.0
From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate	336.8	68.4	405.3
%HV (all designations)	30.0	30.0	30.0
From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate	271.6	29.5	301.1
%HV (all designations)	30.0	30.0	30.0

Go to Table Links (Top)

Origin-Destination Flow Rates by Movement Class
Site:PM Newell/Saleyards

Intersection ID: 1
Give-Way Sign Controlled Intersection

FLOW RATES FOR Light Vehicles

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate - Veh	5.2	367.7	372.8
Mov Class %	70.0	70.0	70.0

```
 Flow Scale - Fixed   1.00    1.00
 Flow Scale - Var     1.00    1.00
 Peak Flow Factor     0.95    0.95
-----------------------------------------
 From NORTH To:         S       W
 Turn:                  T1      R2     TOT
-----------------------------------------
 Flow Rate - Veh     235.8    47.9   283.7
 Mov Class %          70.0    70.0    70.0
 Flow Scale - Fixed   1.00    1.00
 Flow Scale - Var     1.00    1.00
 Peak Flow Factor     0.95    0.95
-----------------------------------------
 From WEST To:          N       S
 Turn:                  L2      R2     TOT
-----------------------------------------
 Flow Rate - Veh     190.1    20.6   210.7
 Mov Class %          70.0    70.0    70.0
 Flow Scale - Fixed   1.00    1.00
 Flow Scale - Var     1.00    1.00
 Peak Flow Factor     0.95    0.95
-----------------------------------------

FLOW RATES FOR Heavy Vehicles

-----------------------------------------
 From SOUTH To:         W       N
 Turn:                  L2      T1     TOT
-----------------------------------------
 Flow Rate - Veh       2.2   157.6   159.8
 Mov Class %          30.0    30.0    30.0
 Flow Scale - Fixed   1.00    1.00
 Flow Scale - Var     1.00    1.00
 Peak Flow Factor     0.95    0.95
-----------------------------------------
 From NORTH To:         S       W
 Turn:                  T1      R2     TOT
-----------------------------------------
 Flow Rate - Veh     101.1    20.5   121.6
 Mov Class %          30.0    30.0    30.0
 Flow Scale - Fixed   1.00    1.00
 Flow Scale - Var     1.00    1.00
 Peak Flow Factor     0.95    0.95
-----------------------------------------
 From WEST To:          N       S
 Turn:                  L2      R2     TOT
-----------------------------------------
 Flow Rate - Veh      81.5     8.8    90.3
 Mov Class %          30.0    30.0    30.0
 Flow Scale - Fixed   1.00    1.00
 Flow Scale - Var     1.00    1.00
 Peak Flow Factor     0.95    0.95
-----------------------------------------
```

Go to Table Links (Top)

Lane Flow Rates
Site:PM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE FLOW RATES AT STOP LINE

-----------------------------------------
 From SOUTH To:       W       N
 Turn:                L2      T1     TOT
-----------------------------------------
 Lane  1
   LV               5.2       *     5.2
   HV               2.2       *     2.2
   Total            7.4       *     7.4
 Lane  2
   LV                 *   367.7   367.7
   HV                 *   157.6   157.6
   Total              *   525.3   525.3
-----------------------------------------
 Approach           7.4   525.3   532.6
-----------------------------------------
 From NORTH To:       S       W
 Turn:                T1      R2     TOT
-----------------------------------------
 Lane  1
   LV             235.8       *   235.8
   HV             101.1       *   101.1
   Total          336.8       *   336.8
 Lane  2
   LV                 *    47.9    47.9
   HV                 *    20.5    20.5
```

```
   Total                *    68.4    68.4
----------------------------------------
 Approach          336.8    68.4   405.3
----------------------------------------
 From WEST To:         N       S
 Turn:                 L2      R2     TOT
----------------------------------------
 Lane  1
   LV              190.1    20.6   210.7
   HV               81.5     8.8    90.3
   Total           271.6    29.5   301.1
----------------------------------------
 Approach          271.6    29.5   301.1
----------------------------------------
  *  Movement not allocated to the lane


EXIT LANE FLOW RATES

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           256.4   109.9
Total              256.4   109.9
---------------------------------
 Exit: NORTH
Lane:  1           557.8   239.1
Lane:  2             0.0     0.0
Total              557.8   239.1
---------------------------------
 Exit: WEST
Lane:  1            53.1    22.7
Total               53.1    22.7
---------------------------------
  *  Movement not allocated to the lane


DOWNSTREAM LANE FLOW RATES FOR EXIT ROADS

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           256.4   109.9
Total              256.4   109.9
---------------------------------
 Exit: NORTH
Lane:  1           557.8   239.1
Total              557.8   239.1
---------------------------------
 Exit: WEST
Lane:  1            53.1    22.7
Total               53.1    22.7
---------------------------------
  *  Movement not allocated to the lane

Unit Time for Volumes =  60 minutes
Peak Flow Period =  30 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings Summary
Site:PM Newell/Saleyards

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

* Basic Parameters:
  Intersection Type: Unsignalised - Give Way
  Driving on the left-hand side of the road
  Input data specified in Metric units
  Model Defaults: New South Wales
  Peak Flow Period (for performance): 30 minutes
  Unit time (for volumes): 60 minutes.
  SIDRA Standard Delay model used
  SIDRA Standard Queue model used
  Level of Service based on: Delay (RTA NSW)
  Queue percentile: 95%
```

Go to Table Links (Top)

Diagnostics

Site:PM Newell/Saleyards

Go to Table Links (Top)

Project: O:\Projects\Transfer\113076_Orange\Out\Reports\TIA\SIDRA\113076_Sidra_02.sip6
8000782, GEOLYSE PTY LTD, PLUS / 1PC

DETAILED OUTPUT

Site: AM Newell/New

New Site
Giveway / Yield (Two-Way)

OUTPUT TABLE LINKS

Movements

Intersection Negotiation Data
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

INTERSECTION NEGOTIATION DATA

From Approach	To Exit	Turn	Negn Radius m	Negn Speed km/h	Negn Dist. m	Appr. Dist. m	Downstream m	Distance User Spec?
South: Newell Highway								
	West	L2	10.0	20.2	15.7	500	231	No
	North	T1	S	110.0	13.2	500	6286	No
North: Newell Highway								
	South	T1	S	110.0	13.2	500	3634	No
	West	R2	9.9	20.1	15.6	500	231	No
West: New Road								
	North	L2	15.0	23.5	23.6	500	234	No
	South	R2	8.4	18.9	13.2	500	230	No

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

MOVEMENT SPEEDS AND GEOMETRIC DELAY

Mov ID	Turn	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Newell Highway										
1	L2	50.0	20.2	20.2	50.0			43.2	43.2	11.8
2	T1	110.0	110.0	110.0	110.0			109.8	109.8	0.0
North: Newell Highway										
8	T1	110.0	110.0	110.0	110.0			110.0	110.0	0.0
9	R2	50.0	20.1	20.1	50.0	16.8		37.3	31.6	11.8
West: New Road										

```
 10  L2      50.0  23.5   23.5  50.0    19.7            41.8    41.1    10.7
 12  R2      50.0  18.9   18.9  50.0    17.5            41.2    38.3    12.2
--------------------------------------------------------------------------------
  "Running Speed" is the average speed excluding stopped periods.
```

Go to Table Links (Top)

Gap Acceptance Parameters
Site:AM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

--------------------------------------------------------------------------------
                        Critical Gap                        Intra
                  Opng  ------------   Foll-up   Entry    Bunch   Propn
  Opd     Dest    Flow  Hdwy    Dist   Headway    HV      Hdwy    Bnchd
  Lane            pcu/h  sec     m       sec     Equiv     sec
--------------------------------------------------------------------------------
 South: Newell Highway

  No opposed movements on this approach.
--------------------------------------------------------------------------------
 North: Newell Highway
      2      W     426+    8.05     0.0     4.60     1.15   1.30    0.052
--------------------------------------------------------------------------------
 West: New Road
      1      N     376+    5.75     0.0     3.45     1.15   1.55    0.037
      2      S     376+    8.05     0.0     4.60     1.15   1.55    0.037
--------------------------------------------------------------------------------

  Values in this table are adjusted for heavy vehicles in the entry stream.
  Use the Pedestrians and Priorities input dialogs to specify opposing pedestrian movements.
  +  Percentage of exiting flow included in opposing vehicle flow
```

Go to Table Links (Top)

Movement Capacity and Performance Parameters
Site:AM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


MOVEMENT CAPACITY PARAMETERS

----------------------------------------------------------------
 Mov Turn Mov         Opng Movement  Total  Prac.  Prac.  Deg.
 ID       Cl.  Arv           Adjust.  Cap.  Deg.   Spare  Satn
               Flow  Flow    Flow           Satn   Cap.
               veh/h veh/h   pcu/h   veh/h   xp      %      x
----------------------------------------------------------------
South: Newell Highway
  1  L2   #      26      0      0    1530   0.98   5598  0.017
  2  T1   #     314      0      0    1632   0.98    410  0.192
----------------------------------------------------------------
North: Newell Highway
  8  T1   #     347      0      0    1632   0.80    276  0.213
  9  R2   #     238      0      0     353   0.80     19  0.673*
----------------------------------------------------------------
West: New Road
 10  L2   #      60      0      0     638   0.80    751  0.094
 12  R2   #       6      0      0     384   0.80   4762  0.016
----------------------------------------------------------------
  *  Maximum degree of saturation
  # Combined Movement Capacity parameters are shown for all Movement Classes.


MOVEMENT PERFORMANCE

--------------------------------------------------------------------------------
 Mov Turn Total    Total   Aver.  Eff.  Total  Perf. Tot.Trav. Tot.Trav. Aver.
 ID       Delay    Delay   Delay  Stop  Stops  Index Distance    Time    Speed
        (veh-h/h)(pers-h/h)(sec)  Rate                (veh-km/h)(veh-h/h) (km/h)
--------------------------------------------------------------------------------
South: Newell Highway
  1  L2    0.03    0.03    11.8   0.69    18.2  0.49     15.4     0.4     43.2
  2  T1    0.00    0.00     0.1   0.00     0.0  4.29    470.9     4.3    109.8
--------------------------------------------------------------------------------
North: Newell Highway
  8  T1    0.00    0.00     0.1   0.00     0.0  4.76    523.1     4.8    110.0
  9  R2    0.59    0.70    29.6   1.24   295.7 10.71    138.8     4.4     31.6
--------------------------------------------------------------------------------
West: New Road
 10  L2    0.07    0.08    13.7   0.73    43.9  1.45     35.3     0.9     41.1
 12  R2    0.01    0.01    18.3   0.75     4.7  0.18      3.7     0.1     38.3
--------------------------------------------------------------------------------
```

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

FUEL CONSUMPTION, EMISSIONS AND COST (TOTAL)

Mov ID	Turn	Cost Total $/h	Fuel Total L/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Newell Highway							
1	L2	15.68	2.7	6.5	0.01	0.001	0.034
2	T1	668.73	221.1	538.5	0.61	0.034	3.095
		684.41	223.8	545.0	0.63	0.036	3.129
North: Newell Highway							
8	T1	743.97	246.2	599.5	0.68	0.038	3.447
9	R2	176.72	26.5	64.6	0.14	0.015	0.330
		920.69	272.7	664.1	0.82	0.053	3.777
West: New Road							
10	L2	36.98	6.2	15.0	0.03	0.003	0.078
12	R2	4.08	0.7	1.6	0.00	0.000	0.008
		41.06	6.8	16.7	0.03	0.003	0.086
INTERSECTION:		1646.15	503.4	1225.7	1.48	0.092	6.992

FUEL CONSUMPTION, EMISSIONS AND COST (RATE)

Mov ID	Turn	Cost Rate $/km	Fuel Rate L/100km	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Newell Highway							
1	L2	1.02	17.5	425.0	0.82	0.083	2.202
2	T1	1.42	47.0	1143.4	1.30	0.073	6.573
		1.41	46.0	1120.7	1.29	0.073	6.435
North: Newell Highway							
8	T1	1.42	47.1	1146.1	1.31	0.073	6.589
9	R2	1.27	19.1	465.4	0.98	0.108	2.378
		1.39	41.2	1003.4	1.24	0.080	5.706
West: New Road							
10	L2	1.05	17.5	426.3	0.84	0.086	2.200
12	R2	1.11	18.0	439.2	0.88	0.092	2.266
		1.05	17.6	427.5	0.84	0.086	2.206
INTERSECTION:		1.16	35.3	860.5	1.04	0.065	4.908

Go to Table Links (Top)

Lanes

Lane Performance and Capacity Information
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE PERFORMANCE

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back m	Lane Length m
South: Newell Highway								
1	26	1530	0.017	11.8	0.69			500.0
2	314	1632	0.192	0.1	0.00			500.0

Lane No.	Total Arv Flow (veh/h)	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
North: Newell Highway					
1	347	1632	0.213	0.1	0.00	0.0	0.0	500.0
2	238	353	0.673	29.6	1.24	5.4	47.4	80.0T
West: New Road								
1	60	638	0.094	13.7	0.73	0.3	3.0	120.0
2	6	384	0.016	18.3	0.75	0.1	0.5	500.0

T Short lane due to specification of Turn Bay

LANE FLOW AND CAPACITY INFORMATION

Lane No.	Total Arv Flow (veh/h)	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Newell Highway					
1	26	26	1530	0.017	100
2	314	314	1632	0.192	100
North: Newell Highway					
1	347	347	1632	0.213	100
2	238	60	353	0.673	100
West: New Road					
1	60	60	638	0.094	100
2	6	6	384	0.016	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

Go to Table Links (Top)

Lane Delays
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE DELAYS

Lane No.	Deg. Satn x	Prog. Factor	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
South: Newell Highway											
1	0.017		0.0						11.8	11.8	
2	0.192		0.1						0.0	0.1	
North: Newell Highway											
1	0.213	1.000	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
2	0.673	1.000	11.1	6.7	17.8	3.2	14.6	4.5	10.0	11.8	29.6
West: New Road											
1	0.094	1.000	3.0	0.0	3.0	2.2	0.9	0.0	0.9	10.7	13.7
2	0.016	1.000	6.0	0.0	6.0	2.1	4.0	0.0	4.0	12.2	18.3

SIDRA Standard Delay Model is used. Control Delay is the sum of Stop-line Delay and Geometric Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Control delay

LANE DELAY PERCENTILES

Lane No.	Deg. Satn x	Percentile Delay 50%	70%	85%	90%	95%	98%	100%
South: Newell Highway								
1	NA - Continuous Movement							
2	NA - Continuous Movement							
North: Newell Highway								
1	0.213	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
 2     0.673   29.6   32.9   38.1   40.8   44.0   46.4   48.1
-------------------------------------------------------------
 West: New Road
 1     0.094   13.7   14.3   15.2   15.6   16.2   16.6   16.9
 2     0.016   18.3   19.4   21.2   22.1   23.2   24.0   24.6
-------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queues
Site:AM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUES (VEHICLES)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (veh)      Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   -------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc      95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.213  1.000    0.0     0.0    0.0    0.0    0.0   0.00    0.0  100.0    0.0     0.0
 2     0.673  1.000    0.6     1.3    0.8    2.2    5.4   0.24    0.0  100.0    1.2     2.1
-------------------------------------------------------------------------------------------------
 West: New Road
 1     0.094  1.000    0.0     0.1    0.0    0.1    0.3   0.01    0.0  100.0    0.1     0.1
 2     0.016  1.000    0.0     0.0    0.0    0.0    0.1   0.00    0.0  100.0    0.0     0.0
-------------------------------------------------------------------------------------------------



LANE QUEUES (DISTANCE)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (m)        Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   -------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc      95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.213  1.000    0.0     0.0    0.0    0.0    0.0   0.00    0.0  100.0    0.0     0.0
 2     0.673  1.000    5.0    11.7    7.3   19.1   47.4   0.24    0.0  100.0   10.3    18.7
-------------------------------------------------------------------------------------------------
 West: New Road
 1     0.094  1.000    0.0     1.2    0.0    1.2    3.0   0.01    0.0  100.0    0.4     0.8
 2     0.016  1.000    0.0     0.2    0.0    0.2    0.5   0.00    0.0  100.0    0.1     0.2
-------------------------------------------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queue Percentiles
Site:AM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUE PERCENTILES (VEHICLES)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (veh)
 Lane   Satn  ----------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------
 North: Newell Highway
 1     0.213    0.0    0.0    0.0    0.0    0.0    0.0    0.0
 2     0.673    2.2    2.8    4.0    4.6    5.4    6.0    6.4
-------------------------------------------------------------
 West: New Road
 1     0.094    0.1    0.2    0.2    0.3    0.3    0.4    0.4
 2     0.016    0.0    0.0    0.0    0.0    0.1    0.1    0.1
-------------------------------------------------------------



LANE QUEUE PERCENTILES (DISTANCE)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (metres)
 Lane   Satn  ----------------------------------------------
```

No.	x	50%	70%	85%	90%	95%	98%	100%
South: Newell Highway								
North: Newell Highway								
1	0.213	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.673	19.1	24.7	34.8	40.3	47.4	52.6	56.6
West: New Road								
1	0.094	1.2	1.5	2.2	2.5	3.0	3.3	3.5
2	0.016	0.2	0.3	0.4	0.4	0.5	0.6	0.6

Go to Table Links (Top)

Lane Stops
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

Lane No.	Deg. Satn x	Prog. Factor	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Queue Total Stops H	Move-up Rate hqm	Queue Move-ups Hqm	Prop. Queued pq
South: Newell Highway										
1	0.017	1.000			0.69	0.69	18.2			
2	0.192	1.000			0.00	0.00	0.0			
North: Newell Highway										
1	0.213	1.000	0.00	0.00	0.00	0.00	0.0	0.00	0.0	0.00
2	0.673	1.000	0.79	0.31	0.15	1.24	295.7	0.79	187.2	0.79
West: New Road										
1	0.094	1.000	0.40	0.00	0.33	0.73	43.9	0.00	0.0	0.47
2	0.016	1.000	0.42	0.00	0.33	0.75	4.7	0.00	0.0	0.54

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

Go to Table Links (Top)

Flow Rates

Origin-Destination Flow Rates (Total)
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

TOTAL FLOW RATES (ALL MOVEMENT CLASSES)

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate	26.3	313.7	340.0
%HV (all designations)	30.0	30.0	30.0
From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate	347.4	237.9	585.3
%HV (all designations)	30.0	30.0	30.0
From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate	60.0	6.3	66.3
%HV (all designations)	30.0	30.0	30.0

Go to Table Links (Top)

Origin-Destination Flow Rates by Movement Class
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

FLOW RATES FOR Light Vehicles

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate - Veh	18.4	219.6	238.0
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	243.2	166.5	409.7
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	42.0	4.4	46.4
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

FLOW RATES FOR Heavy Vehicles

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate - Veh	7.9	94.1	102.0
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	104.2	71.4	175.6
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	18.0	1.9	19.9
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

Go to Table Links (Top)

Lane Flow Rates
Site:AM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE FLOW RATES AT STOP LINE

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Lane 1			
LV	18.4	*	18.4
HV	7.9	*	7.9
Total	26.3	*	26.3
Lane 2			
LV	*	219.6	219.6
HV	*	94.1	94.1
Total	*	313.7	313.7
Approach	26.3	313.7	340.0

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Lane 1			
LV	243.2	*	243.2

```
   HV              104.2       *   104.2
   Total           347.4       *   347.4
 Lane  2
   LV                  *   166.5   166.5
   HV                  *    71.4    71.4
   Total               *   237.9   237.9
----------------------------------------
 Approach          347.4   237.9   585.3
----------------------------------------
 From WEST To:        N       S
 Turn:               L2      R2     TOT
----------------------------------------
 Lane  1
   LV               42.0       *    42.0
   HV               18.0       *    18.0
   Total            60.0       *    60.0
 Lane  2
   LV                  *     4.4     4.4
   HV                  *     1.9     1.9
   Total               *     6.3     6.3
----------------------------------------
 Approach           60.0     6.3    66.3
----------------------------------------
  *  Movement not allocated to the lane


EXIT LANE FLOW RATES

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           247.6   106.1
Total              247.6   106.1
---------------------------------
 Exit: NORTH
Lane:  1           261.6   112.1
Lane:  2             0.0     0.0
Total              261.6   112.1
---------------------------------
 Exit: WEST
Lane:  1           184.9    79.3
Total              184.9    79.3
---------------------------------
  *  Movement not allocated to the lane


DOWNSTREAM LANE FLOW RATES FOR EXIT ROADS

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           247.6   106.1
Total              247.6   106.1
---------------------------------
 Exit: NORTH
Lane:  1           261.6   112.1
Total              261.6   112.1
---------------------------------
 Exit: WEST
Lane:  1           184.9    79.3
Total              184.9    79.3
---------------------------------
  *  Movement not allocated to the lane

Unit Time for Volumes =  60 minutes
Peak Flow Period =  30 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings Summary
Site:AM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

* Basic Parameters:
  Intersection Type: Unsignalised - Give Way
  Driving on the left-hand side of the road
  Input data specified in Metric units
  Model Defaults: New South Wales
  Peak Flow Period (for performance): 30 minutes
  Unit time (for volumes): 60 minutes.
```

```
SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (RTA NSW)
Queue percentile: 95%
```

Go to Table Links (Top)

Diagnostics
Site:AM Newell/New

Go to Table Links (Top)

Project: O:\Projects\Transfer\113076_Orange\Out\Reports\TIA\SIDRA\113076_Sidra_02.sip6
8000782, GEOLYSE PTY LTD, PLUS / 1PC

DETAILED OUTPUT

Site: PM Newell/New

New Site
Giveway / Yield (Two-Way)

OUTPUT TABLE LINKS

Movements

Intersection Negotiation Data
Site:PM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

INTERSECTION NEGOTIATION DATA

From Approach	To Exit	Turn	Negn Radius m	Negn Speed km/h	Negn Dist. m	Appr. Dist. m	Downstream m	Distance User Spec?
South: Newell Highway								
	West	L2	10.0	20.2	15.7	500	231	No
	North	T1	S	110.0	13.2	500	6289	No
North: Newell Highway								
	South	T1	S	110.0	13.2	500	3634	No
	West	R2	9.9	20.1	15.6	500	231	No
West: New Road								
	North	L2	10.0	20.2	15.7	500	231	No
	South	R2	8.4	18.9	13.2	500	230	No

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

MOVEMENT SPEEDS AND GEOMETRIC DELAY

Mov ID	Turn	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Newell Highway										
1	L2	50.0	20.2	20.2	50.0			43.2	43.2	11.8
2	T1	110.0	110.0	110.0	110.0			109.9	109.9	0.0
North: Newell Highway										
8	T1	110.0	110.0	110.0	110.0			110.0	110.0	0.0
9	R2	50.0	20.1	20.1	50.0	15.7		40.8	35.5	11.8
West: New Road										

```
 10  L2      50.0  20.2   20.2  50.0                    43.2    43.2    11.8
 12  R2      50.0  18.9   18.9  50.0    13.9            40.5    31.8    12.2
-------------------------------------------------------------------------------
  "Running Speed" is the average speed excluding stopped periods.
```

Go to Table Links (Top)

Gap Acceptance Parameters
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

-------------------------------------------------------------------------------
                        Critical Gap                        Intra
                  Opng  ------------   Foll-up   Entry    Bunch   Propn
  Opd     Dest    Flow   Hdwy    Dist  Headway    HV      Hdwy    Bnchd
  Lane            pcu/h   sec     m       sec    Equiv     sec
-------------------------------------------------------------------------------
 South: Newell Highway

  No opposed movements on this approach.
-------------------------------------------------------------------------------
 North: Newell Highway
      2      W     513+    8.05     0.0     4.60     1.15   1.07    0.051
-------------------------------------------------------------------------------
 West: New Road
      1      N       0+    0.00     0.0     0.00     0.00   0.00    0.000
      2      S     707+    8.05     0.0     4.60     1.15   0.91    0.061
-------------------------------------------------------------------------------

  Values in this table are adjusted for heavy vehicles in the entry stream.
  Use the Pedestrians and Priorities input dialogs to specify opposing pedestrian movements.
  +  Percentage of exiting flow included in opposing vehicle flow
```

Go to Table Links (Top)

Movement Capacity and Performance Parameters
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


MOVEMENT CAPACITY PARAMETERS

----------------------------------------------------------------
 Mov Turn Mov         Opng Movement  Total  Prac.  Prac.  Deg.
 ID       Cl.  Arv           Adjust.  Cap.  Deg.   Spare  Satn
               Flow   Flow   Flow           Satn   Cap.
               veh/h  veh/h  pcu/h   veh/h   xp      %      x
----------------------------------------------------------------
South: Newell Highway
  1  L2   #       6      0      0    1530   0.98   ****  0.004
  2  T1   #     295      0      0    1632   0.98    443  0.181
----------------------------------------------------------------
North: Newell Highway
  8  T1   #     317      0      0    1632   0.80    312  0.194
  9  R2   #      60      0      0     298   0.80    297  0.202*
----------------------------------------------------------------
West: New Road
 10  L2   #     238      0      0    9999   0.98   4019  0.024
 12  R2   #      26      0      0     196   0.80    496  0.134
----------------------------------------------------------------
  *  Maximum degree of saturation
  # Combined Movement Capacity parameters are shown for all Movement Classes.


MOVEMENT PERFORMANCE

-------------------------------------------------------------------------------
 Mov Turn Total    Total   Aver.  Eff.  Total  Perf. Tot.Trav. Tot.Trav. Aver.
 ID       Delay    Delay   Delay  Stop  Stops  Index Distance    Time    Speed
        (veh-h/h)(pers-h/h)(sec)  Rate                (veh-km/h)(veh-h/h) (km/h)
-------------------------------------------------------------------------------
South: Newell Highway
  1  L2    0.01    0.01    11.8   0.69     4.4  0.12      3.7     0.1     43.2
  2  T1    0.00    0.00     0.1   0.00     0.0  4.03    442.6     4.0    109.9
-------------------------------------------------------------------------------
North: Newell Highway
  8  T1    0.00    0.00     0.1   0.00     0.0  4.34    477.1     4.3    110.0
  9  R2    0.11    0.13    22.4   0.90    54.1  1.98     35.0     1.0     35.5
-------------------------------------------------------------------------------
West: New Road
 10  L2    0.23    0.28    11.8   0.69   164.7  4.47    138.8     3.2     43.2
 12  R2    0.06    0.08    29.5   0.94    24.6  1.02     15.3     0.5     31.8
-------------------------------------------------------------------------------
```

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost
Site:PM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

FUEL CONSUMPTION, EMISSIONS AND COST (TOTAL)

Mov ID	Turn	Cost Total $/h	Fuel Total L/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Newell Highway							
1	L2	3.76	0.6	1.6	0.00	0.000	0.008
2	T1	628.55	207.9	506.1	0.58	0.032	2.910
		632.32	208.5	507.7	0.58	0.033	2.918
North: Newell Highway							
8	T1	678.59	224.6	546.8	0.62	0.035	3.144
9	R2	40.66	6.4	15.6	0.03	0.003	0.080
		719.25	231.0	562.4	0.65	0.038	3.224
West: New Road							
10	L2	141.72	24.2	59.0	0.11	0.012	0.306
12	R2	19.16	2.9	7.0	0.01	0.002	0.036
		160.88	27.1	66.0	0.13	0.013	0.342
INTERSECTION:		1512.44	466.6	1136.2	1.36	0.084	6.483

FUEL CONSUMPTION, EMISSIONS AND COST (RATE)

Mov ID	Turn	Cost Rate $/km	Fuel Rate L/100km	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Newell Highway							
1	L2	1.02	17.5	425.0	0.82	0.083	2.203
2	T1	1.42	47.0	1143.6	1.30	0.073	6.574
		1.42	46.7	1137.7	1.30	0.073	6.538
North: Newell Highway							
8	T1	1.42	47.1	1146.1	1.31	0.073	6.589
9	R2	1.16	18.3	446.0	0.91	0.097	2.288
		1.40	45.1	1098.3	1.28	0.075	6.295
West: New Road							
10	L2	1.02	17.5	425.0	0.82	0.083	2.203
12	R2	1.25	18.9	459.8	0.96	0.106	2.343
		1.04	17.6	428.4	0.84	0.085	2.217
INTERSECTION:		1.13	35.0	851.1	1.02	0.063	4.856

Go to Table Links (Top)

Lanes

Lane Performance and Capacity Information
Site:PM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE PERFORMANCE

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back m	Lane Length m
South: Newell Highway								
1	6	1530	0.004	11.8	0.69			500.0
2	295	1632	0.181	0.1	0.00			500.0

```
------------------------------------------------------------
 North: Newell Highway
 1         317  1632 0.194    0.1  0.00    0.0    0.0    500.0
 2          60   298 0.202   22.4  0.90    0.8    6.6     80.0T
------------------------------------------------------------
 West: New Road
 1         238  9999 0.024   11.8  0.69                   120.0
 2          26   196 0.134   29.5  0.94    0.5    4.0    500.0
------------------------------------------------------------
  T  Short lane due to specification of Turn Bay


LANE FLOW AND CAPACITY INFORMATION

----------------------------------------
 Lane   Total     Min   Tot   Deg.  Lane
 No.    Arv Flow  Cap   Cap   Satn  Util
        (veh/h)  veh/h veh/h    x     %
----------------------------------------
 South: Newell Highway
 1          6       6  1530  0.004  100
 2        295     295  1632  0.181  100
----------------------------------------
 North: Newell Highway
 1        317     317  1632  0.194  100
 2         60      60   298  0.202  100
----------------------------------------
 West: New Road
 1        238      60  9999  0.024  100
 2         26      26   196  0.134  100
----------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Go to Table Links (Top)

Lane Delays
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE DELAYS

------------------------------------------------------------------------------
                       ----------------  Delay (seconds/veh)  ----------------
        Deg.  Prog.    Stop-line Delay  Acc.   Queuing   Stopd
 Lane    Satn  Factor   1st   2nd Total  Dec.  Total MvUp (Idle) Geom Control
 No.       x            d1    d2   dSL   dn    dq   dqm    di    dig   dic
------------------------------------------------------------------------------
 South: Newell Highway
 1      0.004              0.0                          11.8   11.8
 2      0.181              0.1                           0.0    0.1
------------------------------------------------------------------------------
 North: Newell Highway
 1      0.194  1.000    0.1   0.0   0.1   0.0   0.0   0.0   0.0   0.0    0.1
 2      0.202  1.000   10.5   0.1  10.6   2.7   7.8   0.0   7.8  11.8   22.4
------------------------------------------------------------------------------
 West: New Road
 1      0.024              0.0                          11.8   11.8
 2      0.134  1.000   17.3   0.0  17.3   3.0  14.3   0.0  14.3  12.2   29.5
------------------------------------------------------------------------------
  SIDRA Standard Delay Model is used.  Control Delay is the sum of Stop-line Delay
  and Geometric Delay.
  dSL: Stop-line delay (=d1+d2)
  dn: Average stop-start delay for all vehicles queued and unqueued
  dq: Queuing delay (the part of the stop-line delay that includes
      stopped delay and queue move-up delay)
  dqm: Queue move-up delay
  di: Stopped delay (stopped (idling) time at near-zero speed)
  dig: Geometric delay
  dic: Control delay


LANE DELAY PERCENTILES

------------------------------------------------------------
        Deg.                  Percentile Delay
 Lane   Satn  ------------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
------------------------------------------------------------
 South: Newell Highway
 1      NA - Continuous Movement
 2      NA - Continuous Movement
------------------------------------------------------------
 North: Newell Highway
 1     0.194    0.0    0.0    0.0    0.0    0.0    0.0    0.0
```

```
 2     0.202   22.4   24.4   27.5   29.1   31.0   32.4   33.4
-------------------------------------------------------------
 West: New Road
 1      NA - Continuous Movement
 2     0.134   29.5   32.7   37.8   40.4   43.5   45.8   47.5
-------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queues
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUES (VEHICLES)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (veh)      Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   ------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc     95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.194  1.000    0.0     0.0    0.0    0.0    0.0   0.00    0.0  100.0    0.0     0.0
 2     0.202  1.000    0.0     0.3    0.0    0.3    0.8   0.03    0.0  100.0    0.2     0.3
-------------------------------------------------------------------------------------------------
 West: New Road
 2     0.134  1.000    0.0     0.2    0.0    0.2    0.5   0.00    0.0  100.0    0.1     0.2
-------------------------------------------------------------------------------------------------



LANE QUEUES (DISTANCE)

-------------------------------------------------------------------------------------------------
        Deg.  Prog.   Ovrfl.     Back of Queue (m)        Queue  Prob.  P'ile   Cyc-Av. Queue
 Lane   Satn  Factor  Queue   ------------------------  Stor.  Block  Block   -------------
 No.      x            No      Nb1    Nb2    Nb     95%  Ratio     %      %      Nc     95%
-------------------------------------------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------------------------------------------
 North: Newell Highway
 1     0.194  1.000    0.0     0.0    0.0    0.0    0.0   0.00    0.0  100.0    0.0     0.0
 2     0.202  1.000    0.0     2.6    0.0    2.7    6.6   0.03    0.0  100.0    1.6     2.8
-------------------------------------------------------------------------------------------------
 West: New Road
 2     0.134  1.000    0.0     1.6    0.0    1.6    4.0   0.00    0.0  100.0    1.1     2.0
-------------------------------------------------------------------------------------------------
```

Go to Table Links (Top)

Lane Queue Percentiles
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


LANE QUEUE PERCENTILES (VEHICLES)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (veh)
 Lane   Satn  ------------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
-------------------------------------------------------------
 North: Newell Highway
 1     0.194    0.0    0.0    0.0    0.0    0.0    0.0    0.0
 2     0.202    0.3    0.4    0.6    0.6    0.8    0.8    0.9
-------------------------------------------------------------
 West: New Road
 2     0.134    0.2    0.2    0.3    0.4    0.5    0.5    0.5
-------------------------------------------------------------



LANE QUEUE PERCENTILES (DISTANCE)

-------------------------------------------------------------
        Deg.           Percentile Back of Queue (metres)
 Lane   Satn  ------------------------------------------------
 No.      x     50%    70%    85%    90%    95%    98%   100%
-------------------------------------------------------------
 South: Newell Highway
```

```
-------------------------------------------------------------
 North: Newell Highway
 1     0.194    0.0    0.0    0.0    0.0    0.0    0.0    0.0
 2     0.202    2.7    3.4    4.9    5.6    6.6    7.3    7.9
-------------------------------------------------------------
 West: New Road
 2     0.134    1.6    2.1    2.9    3.4    4.0    4.4    4.8
-------------------------------------------------------------
```

Go to Table Links (Top)

Lane Stops
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

-------------------------------------------------------------------------------
                                                 Queue   Total
        Deg.  Prog.   -- Effective Stop Rate --  Total  Move-up  Queue   Prop.
 Lane   Satn  Factor              Geom. Overall  Stops   Rate  Move-ups Queued
 No.      x           he1   he2    hig     h       H      hqm     Hqm     pq
-------------------------------------------------------------------------------
 South: Newell Highway
 1     0.004  1.000               0.69   0.69      4.4
 2     0.181  1.000               0.00   0.00      0.0
-------------------------------------------------------------------------------
 North: Newell Highway
 1     0.194  1.000   0.00  0.00  0.00   0.00      0.0    0.00     0.0   0.00
 2     0.202  1.000   0.67  0.00  0.23   0.90     54.1    0.01     0.4   0.67
-------------------------------------------------------------------------------
 West: New Road
 1     0.024  1.000               0.69   0.69    164.7
 2     0.134  1.000   0.78  0.00  0.16   0.94     24.6    0.00     0.0   0.78
-------------------------------------------------------------------------------
  hig is the average value for all movements in a shared lane
  hqm is average queue move-up rate for all vehicles queued and unqueued
```

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Flow Rates

Origin-Destination Flow Rates (Total)
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


TOTAL FLOW RATES (ALL MOVEMENT CLASSES)

-------------------------------------------------
 From SOUTH To:                 W       N
 Turn:                          L2      T1     TOT
 Flow Rate                     6.3   294.7   301.1
 %HV (all designations)       30.0    30.0    30.0
-------------------------------------------------
 From NORTH To:                 S       W
 Turn:                          T1      R2     TOT
 Flow Rate                  316.8    60.0   376.8
 %HV (all designations)       30.0    30.0    30.0
-------------------------------------------------
 From WEST To:                  N       S
 Turn:                          L2      R2     TOT
 Flow Rate                  237.9    26.3   264.2
 %HV (all designations)       30.0    30.0    30.0
-------------------------------------------------
```

Go to Table Links (Top)

Origin-Destination Flow Rates by Movement Class
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection


FLOW RATES FOR Light Vehicles

-----------------------------------------
 From SOUTH To:          W       N
 Turn:                   L2      T1     TOT
-----------------------------------------
 Flow Rate - Veh       4.4   206.3   210.7
```

Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	221.8	42.0	263.8
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	166.5	18.4	184.9
Mov Class %	70.0	70.0	70.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

FLOW RATES FOR Heavy Vehicles

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Flow Rate - Veh	1.9	88.4	90.3
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Flow Rate - Veh	95.1	18.0	113.1
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

From WEST To:	N	S	
Turn:	L2	R2	TOT
Flow Rate - Veh	71.4	7.9	79.3
Mov Class %	30.0	30.0	30.0
Flow Scale - Fixed	1.00	1.00	
Flow Scale - Var	1.00	1.00	
Peak Flow Factor	0.95	0.95	

Go to Table Links (Top)

Lane Flow Rates
Site:PM Newell/New

Intersection ID: 1
Give-Way Sign Controlled Intersection

LANE FLOW RATES AT STOP LINE

From SOUTH To:	W	N	
Turn:	L2	T1	TOT
Lane 1			
LV	4.4	*	4.4
HV	1.9	*	1.9
Total	6.3	*	6.3
Lane 2			
LV	*	206.3	206.3
HV	*	88.4	88.4
Total	*	294.7	294.7
Approach	6.3	294.7	301.1

From NORTH To:	S	W	
Turn:	T1	R2	TOT
Lane 1			
LV	221.8	*	221.8
HV	95.1	*	95.1
Total	316.8	*	316.8
Lane 2			
LV	*	42.0	42.0

```
   HV                  *    18.0    18.0
   Total               *    60.0    60.0
----------------------------------------
 Approach          316.8    60.0   376.8
----------------------------------------
 From WEST To:        N       S
 Turn:               L2      R2     TOT
----------------------------------------
 Lane  1
   LV              166.5       *   166.5
   HV               71.4       *    71.4
   Total           237.9       *   237.9
 Lane  2
   LV                  *    18.4    18.4
   HV                  *     7.9     7.9
   Total               *    26.3    26.3
----------------------------------------
 Approach          237.9    26.3   264.2
----------------------------------------
  *  Movement not allocated to the lane


EXIT LANE FLOW RATES

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           240.2   102.9
Total              240.2   102.9
---------------------------------
 Exit: NORTH
Lane:  1           372.8   159.8
Lane:  2             0.0     0.0
Total              372.8   159.8
---------------------------------
 Exit: WEST
Lane:  1            46.4    19.9
Total               46.4    19.9
---------------------------------
  *  Movement not allocated to the lane


DOWNSTREAM LANE FLOW RATES FOR EXIT ROADS

---------------------------------
Movement Class:       LV      HV
---------------------------------
 Exit: SOUTH
Lane:  1           240.2   102.9
Total              240.2   102.9
---------------------------------
 Exit: NORTH
Lane:  1           372.8   159.8
Total              372.8   159.8
---------------------------------
 Exit: WEST
Lane:  1            46.4    19.9
Total               46.4    19.9
---------------------------------
  *  Movement not allocated to the lane

Unit Time for Volumes =  60 minutes
Peak Flow Period =  30 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

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Other

Model Settings Summary
Site:PM Newell/New

```
Intersection ID: 1
Give-Way Sign Controlled Intersection

* Basic Parameters:
  Intersection Type: Unsignalised - Give Way
  Driving on the left-hand side of the road
  Input data specified in Metric units
  Model Defaults: New South Wales
  Peak Flow Period (for performance): 30 minutes
  Unit time (for volumes): 60 minutes.
  SIDRA Standard Delay model used
  SIDRA Standard Queue model used
  Level of Service based on: Delay (RTA NSW)
  Queue percentile: 95%
```

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Diagnostics
Site:PM Newell/New

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Project: O:\Projects\Transfer\113076_Orange\Out\Reports\TIA\SIDRA\113076_Sidra_02.sip6
8000782, GEOLYSE PTY LTD, PLUS / 1PC

Appendix E

ADW JOHNSON MASTERPLAN DEVELOPMENT STUDY

ADW JOHNSON PTY LIMITED
ABN 62 129 445 398

planning

working beyond expectations

Masterplan Development Study

Parkes Industrial Estate

Parkes Shire Council:

Date:
February 2013

adw johnson

project management • town planning • engineering • surveying
visualisation • economic analysis • social impact • urban planning

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Document Control

Issue No.	Date	Author	
		Name	Reviewed
A	Feb 2011	BH	KY
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Table of Contents

Executive Summary

The purpose of this report is to investigate, examine and evaluate Masterplan development and outcomes for industrial land within the Council owned Parkes Industrial Estate.

Parkes sits within a relatively unique context in the Central West Region of New South Wales at the junction of the Newell Highway and Orange Road (arterial extension to the Great Western Highway) and national rail line links. These connections link Brisbane and Melbourne and Sydney and Perth and are powerful influences in an economic context.

Strategies for Parkes seek to gain leverage from the proximity of this valuable transport infrastructure. The town already accommodates a large intermodal facility, a regional airport as well as the Parkes Industrial Estate. This allows Parkes to market and accommodate enquiry and activity across three broad levels:

- Local level in response to demand emanating from Parkes role as a regional service centre.
- Intermodal, transport and logistics oriented demand as a consequence of broader interregional, interstate and national activity.
- An airport with land capable of responding to airport related activity as well as opportunistic outcomes as a consequence of broader scale development at either the intermodal facility or Parkes Industrial Estate.

It is considered that Parkes has an adequate stock of appropriately located land designated for industrial purpose to meet the medium to long term demands.

The process to inform the masterplan for the future development of the remainder of the Parkes Industrial Estate needs to embrace the pulses from the tiers of economic activity as well as respond to potential change within the region. The population for Parkes is forecast to continue to grow through to 2031. Its regional focus will increase as small towns within the hinterland potentially decline based on official population forecast.

Parkes is also in the midst of significant triggers that will impact the economic wellbeing of the area including:

- Further development and investigations for the proposed inland rail.
- Extension of operations at the North Parkes mine, until beyond 2030.
- Growth captured as a consequence of involvement in the PORTS initiative (Promote Our Regional Towns).
- Growth across retail, residential and commercial sectors as a consequence of potential increase in population and associated activity.

This report and other studies have identified potential for the Parkes Industrial Estate to accommodate bulky goods, urban services, light industrial, general heavy industrial and railway related industrial development well into the future. Commercial and retail uses need not feature in future land use planning across the estate owing to the capacity and preference for these uses to be located in town.

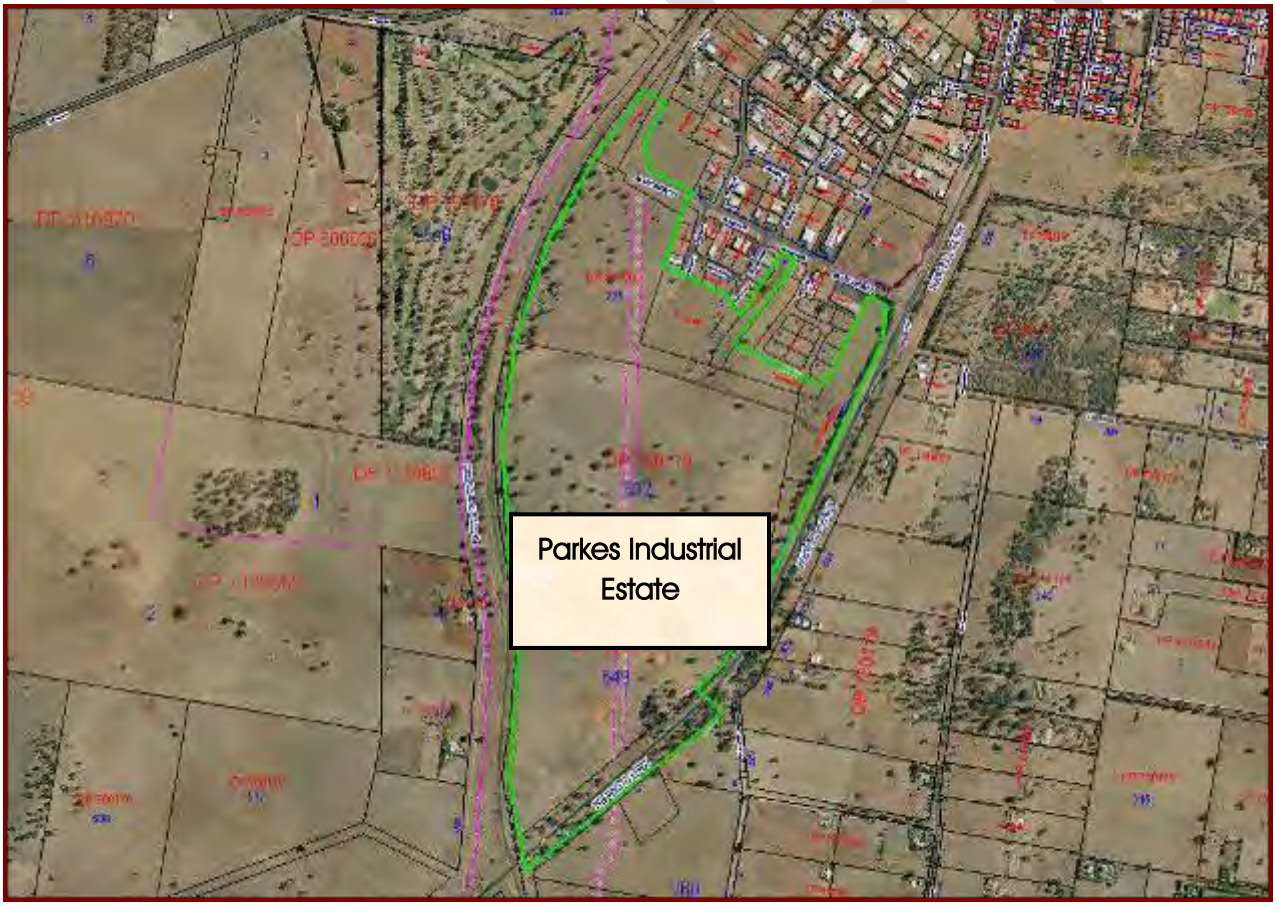
The masterplan approach provides a broad opportunity with a desire to instil flexibility and tiered land uses so as to optimise the opportunity to attract development and investment. Detailed staging and precinct planning can be reflective of contemporary market circumstances from time to time. The opportunity to "allocate" enquiry and development across Parkes Industrial Estate, the intermodal facility and potentially the airport will underwrite capacity for Parkes to be a focus for future development in the Central West Region.

1.0 Introduction

ADW Johnson have been instructed by Parkes Shire Council to investigate, examine and evaluate the provision for industrial land and the masterplan development of the Parkes Industrial Estate. The investigation has had regard for the long term strategic objectives and market and development imperatives that influence projects of this nature.

Parkes Industrial Estate is located on the southern side of Parkes town centre adjacent to the Newell Highway. The undeveloped portion of the estate is depicted in **Figure 1** and comprises approximately 110 hectares of land. The area is bounded by the existing industrial area and Saleyards Road in the north, the Newell Highway to the east and the Parkes Stockinbingal railway corridor in the west.

Figure 1- Parkes Industrial Estate



Source: Parkes Shire Council

1.1 STUDY METHODOLOGY

The methodology used to compile this study is built around an assessment of the site and the estimate of its potential and capacity to supply employment lands in response to local and sub-regional demands. The general scope of the report includes the following:

- Site and local area inspection;
- Review of existing information, studies and data in relation to the employment land status for the Parkes Local Government Area (LGA);
- Review and analysis of the industrial land market in Parkes including stakeholder discussions concerning the future of Parkes and the sub-region;
- Consideration of demographic and statistical information concerned with Parkes and sub-region; and
- A comparison of other industrial estates in order to extract lessons for masterplan development.

The investigation will consider a number of existing strategies and documents concerned with this form of analysis. In preparing the report the following primary reference sources have been used.

- Census information published by the Australian Bureau of Statistics (ABS);
- Parkes Shire Land Use Strategy- Local Profile 2009, Collie Consultants;
- Parkes Shire Land Use Strategy- Issues Paper 2008, Collie Consultants;
- Comprehensive Land Use Strategy and LEP Review Draft Local Profile, 2006, Ratio Consultants;
- Parkes Shire Council website; and
- Other reference documents concerned with matters likely to influence the industrial land outcome and profile for Parkes and the region.

In providing the assessment it is important to note the following assumptions apply:

- The economy and the specific economic circumstances remain stable through the forecast period;
- The characteristics and assumptions in relation to population growth and employment change are realised through the forecast period; and

- The project will proceed in a format in line with the assumptions made within the report and achieved forecast development timing.

Market information has been compiled from the outcome of investigations and discussions with various stakeholders and Council in late 2010. The statistical demographic and data input for the study is generated from various publications as well as consultant estimates.

2.0 Background

Much has been done in Parkes in recent times to facilitate and action industrial land supply. With three distinct nodes comprising the Parkes Industrial Hub (intermodal terminal), the Parkes Industrial Estate and the Parkes Airport, a considerable ambit of possible demand sources can be accommodated.

Parkes Council has had tremendous foresight in acquiring or identifying significant parcels of land able to accommodate the various forms of industrial and commercial development. The Parkes Industrial Estate features both highway and railway frontage whilst also being adjacent to existing town development.

Preliminary layouts across the full extent of the industrial land demonstrate there is scope and capacity to accommodate a wide range of development types and land use options. A task of this investigation is to formulate a masterplan across the entire Council land holding.

The assessment and development of masterplan options should have regard for functional benchmarks in establishing layouts driven by a premonition of the sectors from which demand for land will emerge. It is clear that the size of the Parkes Industrial Estate allows for considerable flexibility through staging provided the framework and basis have sufficient scope to accommodate change over time.

In considering the composition of the framework in which the masterplan will be assessed, the report is respectful of the three tiers within the industrial land use hierarchy (Intermodal Hub, Airport and Industrial Estate) and notes the process needs to step through the following:

- Review of the contextual setting across location, demographic, development and market facets;
- The lessons learnt from other regions and the implications on the future development of employment lands in Parkes; and
- The extrapolation of the timeline of future development focusing on the Parkes Industrial Estate.

The context of these issues in terms of this proposal will be considered in the following sections of the report.

The Council brief for this current Masterplan Study sought a long term view on the consideration of influences on the development of the Parkes Industrial Estate. Therefore, the study does not deal with the detail concerned with the Parkes Intermodal Hub and Parkes Airport, both of which have a capacity to independently drive and accommodate economic development and commercial and industrial land uses. However, the Intermodal Hub and the Airport are

important from a contextual viewpoint. The industrial property market in Parkes will be analysed in the context of three distinctive demand and market circumstances.

Firstly, economic pulses generated from the local area and sub-region more commonly associated with typical industrial and employment land development and the activity most relevant for the Parkes Industrial Estate;

Secondly, footloose opportunity responding to broader state, national and international influences particularly related to transport and logistics and capable of being accommodated at either the Intermodal Hub or the industrial estate.

Thirdly, opportunity that stems from growth and development of the airport noting its international status yet development infancy and capacity to accommodate both opportunistic and planned outcomes.

These tiers and development concepts will thread through the discussion within the report. It is important to distinguish these given the demand characteristics and development outcomes are quite distinctive.

2.1 DOCUMENT REVIEW

There has been an extensive range of studies and strategies completed in the context of economic development focusing not only the Parkes Shire but also the Central West region of New South Wales. The following discussion is not inclusive of all these studies but highlights aspects of relevance to the consideration of the plans for the industrial estate.

In 2002 Ratio Consultants prepared a Retail Commercial Strategy focusing on the Parkes Town Centre. Based on forecasts population and household growth the report predicted demand for retail and commercial floor space through to 2021. The report found Parkes serves a "regional population" in excess of 35,000 people and needs to maintain and consolidate this regional role to underwrite floor space demand.

In 2003 the Parkes Transport Hub Local Environmental Study was completed and established the basis for the rezoning for the intermodal hub from rural to industrial. The implementation of these findings have since facilitated a number of operations to set up within the Hub in line with the vision and strategy for the area.

In 2009 a Shire Land Use Strategy and Local Profile were prepared by Collie Pty Ltd. These documents informed the preparation of a comprehensive LEP for the Shire and scoped social, economic land use and environmental issues. The report predicted that the population in the Shire (and more particularly the Parkes township) would continue to grow providing a basis for further development in the area.

At a broader level, an extract from the New South Wales State Plan concerning the Central West Region completed by NSW Industry and Investment in August 2010, highlights opportunities and challenges for the Central West region. The document notes the high priorities for the region including the following:

- Water security;
- Transport, telecommunication and alternative energy sources;
- Manufacturing and value adding;
- Skill and workforce development; and
- Tourism development.

A number of these challenges are of significance for development in Parkes and will be considered through the report.

Results from the 2011 census are available. The times series for the Parkes LGA show slight population growth since 2006 and increasing personal, family and household incomes. Employment remained steady from 2006 to 2011.

The literature places Parkes in a positive and optimistic context in terms of its positioning and role as a regional service centre but also its capabilities as a consequence of the planned infrastructure which distinguish the town.

3.0 Industrial Development Context

3.1 INTRODUCTION

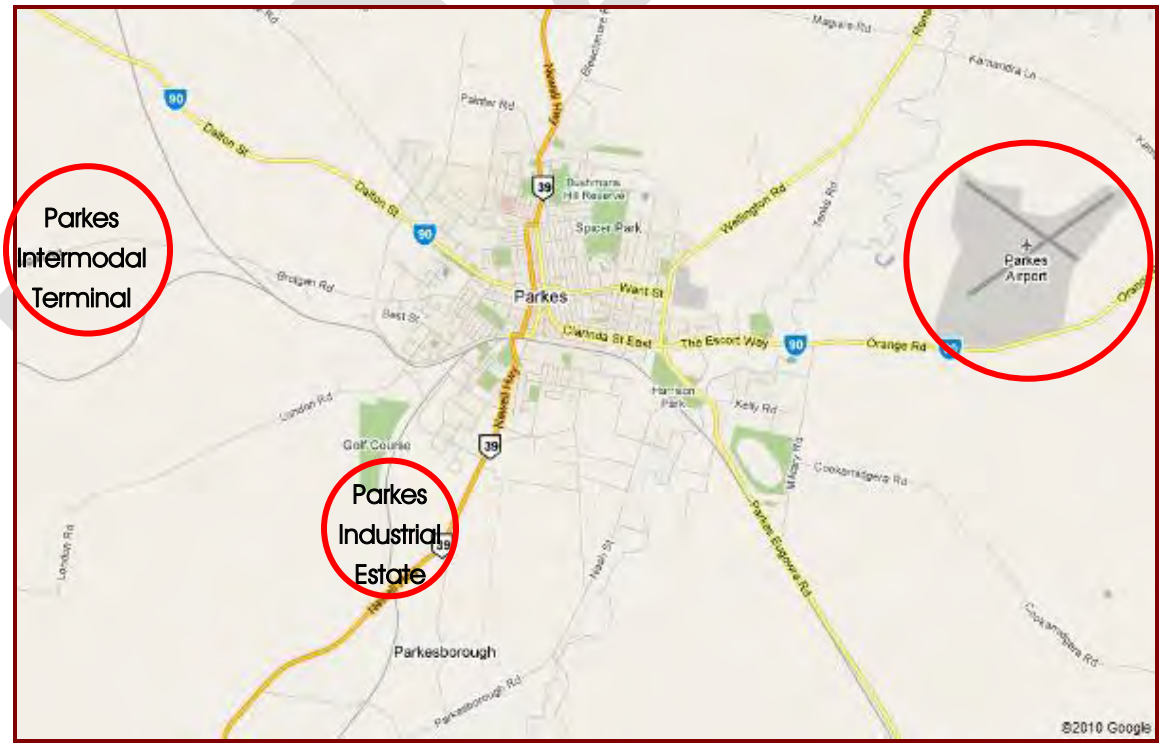
This section of the report will consider the contextual influences concerning the site, masterplan and development options. This includes location, demographic, economic and market contexts as well as an analysis of the supply and demand characteristics likely to influence the development of the site.

3.2 LOCATION CONTEXT

The site is located approximately 2km south of Parkes town centre. It has road frontage along the eastern boundary to the Newell Highway and adjoins Parkes Stockinbingal railway line to the west (**See Figure 2**).

The airport is located less than 5km to the east of Parkes on the road to Orange. The Parkes Intermodal Terminal on the western edge of the town is located about 4km from the industrial estate.

Figure 2 - Location and Context Plan



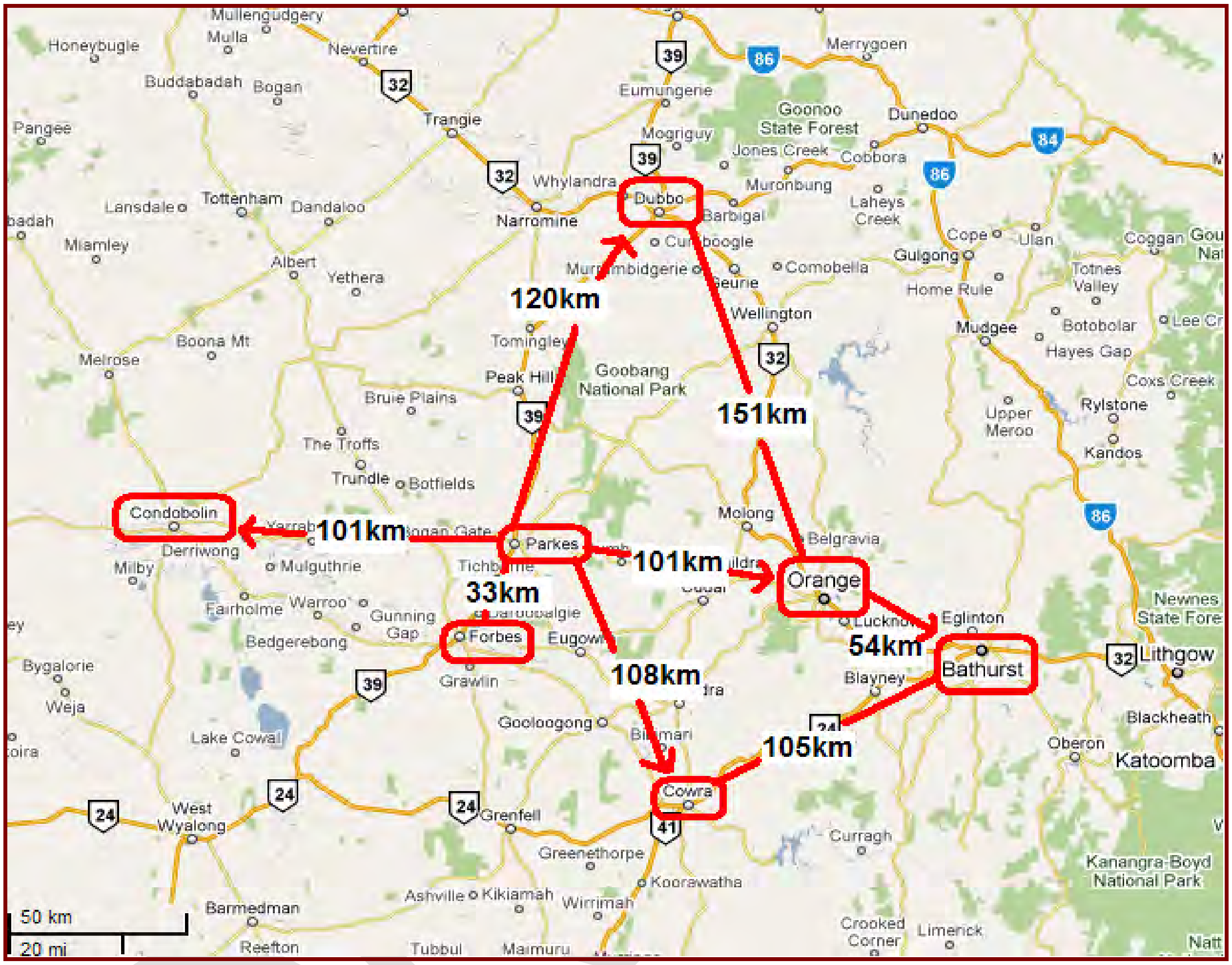
Source: Google maps, 2010

Parkes is within the Central West region of NSW and as such is geographically located amongst a number of interdependent yet competing regional centres including Orange, Forbes, Cowra, Lithgow and Bathurst (**refer to Figure 5 and Figure 6**).

Figure 5- Central West Region

Source: ABS

Figure 6- Regional Towns and Distances



Source: Google maps, 2010

By far the most significant location characteristic concerned with Parkes is its position at the junction point of important national road and railway infrastructure. It is the intersection of the Newell Highway and Orange Road (an arterial extension to the Great Western Highway) and the major Melbourne to Brisbane inland road link. It also connects directly to the national east/west rail corridor linking the east coast to the Perth. Indirect rail network connections link the east coast cities of Brisbane, Sydney and Melbourne. Parkes is also serviced by an airport which has approval for international service.

Parkes competes with other inland towns across the Central West and other regions that claim similar or favourable location in terms of transport nexus and capability. In each case the characteristics are subtly different yet provide a platform for each centre to etch out its own

vision or strategy to achieve growth and development. In June 2012 the Melbourne to Brisbane Inland Rail Symposium was held in Parkes. Attended by Commonwealth State and Local Council Officials and politicians the outcome of the symposium was a call for increased investment in rail to alleviate road freight problems.

Dubbo sits at the crossroads of Newell, Golden and Mitchell Highways. It also has indirect access to the east/west rail line corridor. Orange, Bathurst and Lithgow enjoy a similar alignment to Parkes using the east/west rail line and the Great Western Highway as the potential catalyst for transport related development.

Wagga, Albury and Goulburn have each developed transport oriented visions given their positioning on the north/south road and rail corridors. Newcastle with its access to a deep port also lobbies to increase its focus from a transport infrastructure viewpoint already boasting significant bulk cargo exports linked by rail through the northwest of the State.

The outcome from the strategic positioning of each of these centres does not result in one developing at the expense of all the others. Rather it divides the market having developed a number of similar but subtly distinct possibilities. From Parkes viewpoint, there is no doubt that the incidence of transport infrastructure allows it to punch above its weight in terms of industry development and potential and the presence of logistics businesses in the Hub precinct are testament to this.

The proposed inland rail would also increase the focus on Parkes but also other towns along the route. Albury, Narrabri and Moree would each benefit by consequently enjoying east/west as well as north/south rail links if the inland rail project is completed.

Parkes can and will continue to boast superior credentials to most other inland centres because of the transport nexus. There is no doubt the strategic vision and economic development strategies will continue to lever off this aspect and promote the Parkes location distinct advantages when it comes to transport infrastructure.

3.3 DEMOGRAPHIC CONTEXT

There is much discussion within the body of existing reports concerning the historical and future demographic projections for Parkes and the Central West region. At a broad level, regional and rural areas have been struggling over the last 20 years to maintain the growth rates they achieved over prior decades and in some cases to arrest population decline as the nature of rural economies change.

Across the raft of demographic characteristics, the focus tends to be drawn to population and household growth. In planning for future industrial land demand population growth is particularly relevant for driving some demand generated locally compared to the higher order and somewhat opportunistic transport orientated growth that may also occur.

Collie noted (Land Use Strategy and Local Profile 2009) the Shire estimated resident population (ERP) is forecast to increase from 14,850 (2006) to 16,210 persons to 2031, an increase of 9.2%. It further noted that about 90% of the household growth would occur in the Parkes township with less growth occurring in the villages and rural balance. However, the estimates on which Collie based their forecasts have since been updated by the Department of Planning (DoP), whilst the current DoP forecasts are less than the Collie estimates, there is also a significant difference to the ABS data which no longer predicts growth for the LGA through to 2036.

Estimates for resident population growth for the future range from at worse slightly declining and at best slow continuing growth for the Parkes Statistical Local Area (SLA). The SLA corresponds to the LGA and forms the predominant catchment or region from which the Parkes township draws business and provides commercial services and community support.

However, current forecasts suggest that the population of the township of Parkes will continue to grow. This is not unusual or unique in regional and rural areas as population change in these circumstances can be highly sensitive to local factors. The forecasts of stable or slight growth for the Parkes township and decline in the surrounding district is consistent with the latest release figures from the Department of Planning Transport Data Centre (TDC).

Townships like Dubbo, Tamworth and Armidale within their SLA's are experiencing similar outcomes. In other words, small outlying towns in decline pull down the overall statistics for the SLA or LGA. However, the major service towns are either holding their own or growing even if only at very modest rates. The circumstance concerned with a number of these other nearby centres (Orange, Dubbo, Bathurst, Cowra and Forbes) are summarised in the following sections.

Orange

Orange is one of the major provincial centres in Central NSW. In 2006, the Orange SLA supported a resident population of approximately 35,000. The DoP population forecasts for Orange SLA predict growth to 42,000, an increase of 7,000 people by 2036.

Orange supports and services key industries including agriculture, mining, health services and aged care, hospitality and tourism, public sector administration, retailing and education, accounting and metal trades.

Orange has four main shopping centres, an extensive range of medical specialists and health services and a large public and education sector. Further, Cadia Hill, one of the largest open pit gold-copper mines in Australia is located is the Orange district. The mine received approval in January 2010 to extend the mine life until 2030.

Dubbo

Dubbo is one of the State's largest inland cities. It is a regional centre that is home to some 3,500 businesses of which 90% are small businesses[1].The 2006 population of Dubbo SLA was 35,900 which is comparable to Orange. Over the period to 2036, the local population is expected to increase to nearly 42,000 people.

Dubbo is a service city with six shopping centres and draws on an estimated regional population in excess of 120,000. It is situated at the junction of the Newell, Mitchell and Golden Highways and located on rail routes. It also has an active airport.

The main industries include retail, health, manufacturing, transport, tourism, education, construction, business services, agriculture, and government services.

Bathurst

Bathurst is the most easterly of the inland centres with direct access to Sydney via the Great Western Highway and rail line. Between 2001 and 2006 it had the fastest growing annual growth rate of any NSW regional city at 2.19%[2]. In 2006 Bathurst SLA had over 37,000 people and is predicted to increase to approximately 44,800 in 2036.

Bathurst is a demographically young city with the median age being 37. It is supported by a strong educational sector including Charles Sturt University, Western Institute of TAFE, public and private primary and secondary schools and boarding schools located within the City.

The key employment prospects include education, manufacturing, retail, trade and health sectors as well as mining support services, and distribution businesses.

Cowra

Cowra SLA's population has shown steady growth and was 12,475 people in the 2006 census. It is expected to increase to some 13,300 people by 2036.

Cowra is supported by tourism, the wine and food sector and manufacturing. The manufacturing sector represents over 12% of total employment in Cowra slightly above the state average of just over 10%. This facet is not common for towns in regional areas.

[1] Dubbo City Council website

[2] ABS, 2010

Cowra is not located on the main rail line buts sits off a supplementary line between the Sydney to Melbourne link and the east/west lines. It relies on linkages via highway connections to a number of other townships.

Forbes

Forbes is close to Parkes and has distinctive characteristics. The major industry for the area is based on agriculture. In 2006, Forbes LGA population was 9,700 persons however trends show a slow decline reducing to 7,900 by 2036.

Like Cowra, Forbes is not located on one of the main rail lines and relies on subsidiary line services. However, its location on the Newell Highway places it on a similar highway context to Parkes. From a historical perspective, Forbes and Parkes have an interesting relationship. Whilst Parkes moved down the road of industry diversification, Forbes maintained its relationship to the agriculture sector. The recent breaking of the 2000 to 2010 drought will potentially increase the fortunes for Forbes in the short term.

These summaries bear out the similar yet distinctive characteristics of these major centres each vying for attention and business within the rural and regional west area of NSW. It is beyond the scope of this report to evaluate the ability for each centre to attract new growth and investment over the next 20 to 30 years however, it is clear the competitive yet cooperative approach will result in some towns doing better than others.

What is important is that they each face similar challenges but on difference scales. The larger towns are each predicting a capacity to grow based on official forecasts. Smaller towns are less predictable and where growth is forecast, it is generally more modest. Parkes is in between with growth forecast for the town and slow decline in the outlying areas of the LGA. From the viewpoint of forecasting development and demand for industrial lands it is therefore useful to consider low and high scenarios.

In adopting a conservative viewpoint, the official forecast would form the "low" scenario whilst the "high" growth assumptions would be more in line with expectations that the Parkes SLA could grow to more than 17,000 persons by 2031. The respective scenarios are depicted within **Table 1**.

There is considerable difference between these forecasts. The increment of 3,000 people represents a factor of 21%. In our view, whether Parkes achieves the low or high growth scenario will be highly dependent on employment. The drift witnessed from regional and rural areas over the last 40 years has, at its core, sustainable employment buttressed by education, lifestyle and opportunistic motivation. The question as to how Parkes can respond to the employment outcomes will loom large in influencing the population result. The potential impetus provided by development of the logistics hub and on the industrial estate as well as commercial and retail growth in the town have the capacity to support this.

Table 1: Past and Projected Population of Parkes LGA, 2001 – 2036

Year	Total Population		Change			
	Low Growth	High Growth	Low Growth		High Growth	
			No.	%	No.	%
Actual						
2001	14,300	14,300				
2006	14,300	14,300				
2011	14,600	14,600				
Projected						
2016	14,700	14,900	+100	-0.12%	+300	20%
2021	14,600	15,400	-100	-0.14%	+500	3.3%
2026	14,500	15,800	-100	-0.19%	+400	2.4%
2031	14,300	16,100	-200	-0.26%	+300	1.9%
2036	14,000	16,400	-300	-0.32%	+300	1.9%

Source: Department of Planning; ABS Census 2001, 2006, 2011, ADW Johnson estimates

Along with the respective population forecasts, the household statistics will also change. Collie[3] noted that as the population ages, the household density will decrease. This is consistent with trends across NSW and around Australia. Consequently, although population can be increasing only slightly, the rate of growth in the number of households will be significantly different to the population change. Collie also noted the percentage of occupied households in growth areas will have propensity to increase. Collie expected that about 90% of all household growth will occur in the Parkes township and that the proportion of the population in the Shire living in Parkes will also continue to increase.

These underlying characteristics place a different inflection on the population projections for the LGA and further support arguments that notwithstanding the likelihood of a decrease or only a slight increase in the LGA population, the Parkes township is likely to grow over the forecast period.

The aging of the population will also have a significant impact on the local community. Collie foreshadowed that there would be an increase in the demand for community services and transport; a change in the demand for different household types; a contraction of the labour supply and; a change in the nature of demand for retail and commercial services. This change will create underlying economic activity. However the growing demands on

[3] Parkes Shire Land Use Strategy, October 2008

community services, health and specialised support can often result in aging populations moving to service centres that are considered better able to provide these services.

Parkes boasts a good range of health facilities. Even though it is well known anecdotally that people (particularly the aged) will travel or move to centres deemed "better equipped", Parkes is retaining and expanding on this community infrastructure as evidenced by potential seniors living and aged care projects mooted for the town.

Smaller towns do not reach the required benchmarks for particular social service agencies to invest in new facilities and consequently the gravity of expenditure tends to move to the larger townships. This is a national problem and something that will require addressing on a state and national level into the future. In the meantime, larger towns like Parkes will perform more strongly than towns with populations of 5 to 6,000 and less.

In terms of formulating land and development demand forecasts later in the report, these respective projections and circumstances will be used as the building blocks in estimates for take up and long term demand for certain types of industrial land.

Summary

There is no universal agreement about the future prospects for population growth and demographic change within the Parkes LGA. However, most forecasts predict the population within the town will increase to 2031 whilst the outlying areas of the LGA will slightly decline or at best remain static. In any event, the total population will age.

The prospect of Parkes LGA achieving a high growth scenario is supported by the potential for economic growth as a consequence of a number of catalyst projects that could materialise in the region. However, if this fails to occur it is highly likely that the lower growth or that aligned with current official forecast produced by the TDC will more likely be witnessed.

3.4 ECONOMIC CONTEXT

Parkes plays an important role as one of the major centres within the Central West of NSW. According to Industry and Investment NSW, the Central West region boasts the following characteristics:

- Extensive freight and commuter road and rail infrastructure;
- Active extraction and mining of natural resources including gold, copper and timber;
- It is capable of serving major markets of Sydney, Newcastle, Wollongong and Canberra;
- It has a diverse regional economy; and
- Includes strong education and service sectors within the larger towns.

Parkes is keyed into some of these characteristics but is not as fortunate with education and tertiary sector elements compared to other towns. It boasts links with agribusiness, mining and tourism each of which play a significant part in the economic fabric of the Central West region.

The towns within the Central West region are each well organised. They each boast well developed community profiles, visions and strategies espousing the advantages and prospects of growth in the respective areas.

Into the future, diversity within the local economies is going to be important as a factor to underwrite future growth but also provide resilience to economic and social change. Parkes has a balanced employment profile which is summarised and compared to the data for the Central West region in **Table 2.**

Table 2: Employment Comparison – Central West & Parkes

	Central West Time Series				Parkes Times Series		
	2001	2006	2011		2001	2006	2011
	Persons	Persons	Persons		Persons	Persons	Persons
Agriculture, forestry and fishing	11,093	9,641	8,434		888	807	658
Mining	2,166	2,966	5,238		323	302	426
Manufacturing	8,846	7,684	7,083		359	331	341
Electricity, gas, water and waste services	1,163	1,282	1,374		40	68	72
Construction	4,497	5,104	5,816		283	335	383
Wholesale trade	3,312	2,296	2,344		271	152	191
Retail trade	8,520	9,292	8,870		646	744	694
Accommodation and food services	5,165	5,433	5,782		411	428	435
Transport, postal and warehousing	3,358	3,514	3,715		390	360	387
Information media and telecommunications	918	914	773		53	48	33
Financial and insurance services	1,314	1,342	1,192		96	91	73
Rental, hiring and real estate services	825	902	912		51	56	55
Professional, scientific and technical services	2,632	2,721	3,157		148	150	208
Administrative and support services	1,752	1,596	2,067		138	106	124
Public administration and safety	4,160	5,422	5,574		344	396	435
Education and training	6,245	6,724	7,468		377	425	436
Health care and social assistance	7,328	8,602	10,156		540	617	668
Arts and recreation services	606	660	694		32	47	25
Other services	2,707	2,929	3,316		224	252	275
Inadequately described/Not stated	1,851	1,757	1,863		128	108	131
Total	**78,458**	**80,781**	**85,828**		**5,742**	**5,823**	**6,050**

Source: ABS Census 2011

Key to Table 2

declining
Steadying
increasing

Table 2 indicates that the relative representation across the main industry sectors has broad similarities with the Central West sector. The noticeable differences occur in manufacturing and professional services and education and training where Parkes has an under representation compared to the region whilst in retail trade, mining, transport, agriculture, forestry and fishing it is relatively strong. This is reflective of the current activity and base in the economy and the incidence of the tertiary sectors including commercial services, community services and government for example are far more prevalent in the larger towns.

Proposed Developments and Opportunity

There are a number of projects in the region that have the capacity to drive further growth and development within the Central West and Parkes region. Some have the prospect to further diversify the economic activity while others will build on existing industry and commercial activity. The ability for some or each of these to elevate Parkes beyond the forecast growth rates is highly dependent on the specific project or the pulse of economic activity being realised. A number of the more prominent projects and issues are discussed in the following sections.

Proposed Inland Rail

The inland rail linking Brisbane to Melbourne has a long history. The Stage 3 Feasibility Report that focused on the development of the proposed alignment of the railway and more detailed financial and economic analysis was released in mid 2010.

The Stage 3 report suggests the project would best be kept under review and revisited sometime around 2020. However, in the lead up and through the 2010 federal election campaign, both sides of politics committed funds to further investigate the project over the coming decade. The commitments will allow work to progress on the track alignment and extend the preliminary steps to undertake property acquisition in advance of further progress of the project.

Whilst this continuing activity is an encouraging sign it does not yet elevate the project to the status of "fully funded commencement". There are two levels to consider in the advancement of the project in this context.

Firstly, an ARTC based decision in terms of its budget and business model, revisiting and commitment to the project sometime prior to 2030.

Secondly, from a political level the possibility that government could commit the funds in conjunction with ARTC or some other delivery model and bring the project forward, notwithstanding the potential poor performance from a financial and economic viewpoint until consistent tonnages are achieved.

There is no doubt that should the project materialise, Parkes would benefit significantly. The pre-emptive investment made by Asciano, SCT Logistics and Linfox are testament to the favourable circumstances for Parkes once the project is operational. What is more difficult to estimate is the extent to which economic development and growth pulses would cascade and lead on to further growth with the Intermodal Hub, Parkes Airport and Parkes Industrial Estate. It is envisaged that rail sidings and access will be regarded as a premium and to this extent the Intermodal facility is likely to be the first recipient of major change and growth.

The airport could also play a role. It is our view that the airport land should be kept for uses that have a direct link to airport activity. The linking of a major air freight and logistics transport operation to rail and road freight in this context would be the main driver but there are currently no indications this is going to be achieved in the short term.

The Parkes Industrial Estate has a significant frontage to the rail line and could assist in resourcing related growth. It is unlikely that any significant market demand will materialise until the inland rail project timing is clear or the project is committed.

Mining

In recent times, as a consequence of the increase in world commodity prices, mining is playing an increasingly important part in the fabric of various economies around Australia. Parkes is not regarded as being within a coal production area although townships in the Central West such as Lithgow are benefiting from this activity. However, Parkes in the vicinity of minerals extraction and recent announcements made in relation to the North Parkes Mine to extend its life to beyond 2030 will benefit the area generally.

Mining is regarded as an industry capable of generating significant multipliers in local economies as a consequence of the activity and income earned by the respective workers. Many of the strategies in recent times concerned with Parkes have predicted a regrowth of jobs and activity relating to the mining sector.

Mining employment has recently increased after a period of decline. Based on the ABS census in 1996, 492 persons were employed in the mining sector in the Parkes LGA. By 2001 this had dropped to 323 and in 2006 a further fall to just 300 persons. In 2011, 426 persons were employed in mining.

It is logical to anticipate that the majority of any new employment will be based in Parkes and as a consequence have a significant opportunity to contribute to the further growth through both direct and indirect (multiplier) opportunities and outcomes within the town and the sub region.

Transport and Logistics

The earlier discussion on the inland rail has a significant bearing on the potential to expand transport and logistics industries. The current establishments within Parkes whilst anticipating the inland rail, are operating in the absence of its impact. Instead they rely on the transport and logistics networks currently in place as a consequence of existing road and rail transport.

There has been much change in this industry over the last ten years. Privatisation of rail systems and changes in the ownership of companies operating the rail stock particularly have meant a level of deregulation which has allowed operators to explore different business plan models. There is more to come. The floating of QR National is a precursor for that company to realise expansive development opportunities. The ARTC has realigned its interest and now focuses the main rail systems whereas small branch and feeder lines that are considered non-economic are struggling to maintain their relevance.

In the future, the nodes such as Parkes will have the opportunity to increase their profile as a consequence of the concentration of future investment by various stakeholders in these industries and on main network capabilities.

Like mining, these industries tend to have a capacity to produce more using the same or less people, however where they do they differ is they are land hungry in terms of the need to build facilities for their operation. Employment in the transport related sector in Parkes has fallen from 394 persons in 1996 to 360 in 2006 yet the facilities in the area are more expansive than they once were. By 2011 employment had increased to 387. The capacity for the new establishments to expand further within the Intermodal Hub is significant and therefore this should be considered in grounding future prospect for growth from this sector.

There is expansion capacity within the Intermodal Hub area. The question as to how much land will be required and when it is required is a direct function of the strength of future initiatives such as the inland rail and the opportunistic response they generate.

Sydney Growth Overflow

For many regions in NSW, the consideration and prospect of accommodating growth overflow from Sydney has long been a prospect and something to harness. The Greater Metropolitan Area (GMA) receives considerable government attention as it struggles to manage growth. In reality, the overflow has been limited and instead areas more than 100km from Sydney CBD have needed to foster their own growth and development plans. The genesis for change quite clearly comes from within. Most regions outside of the GMA (and some on the fringes within it) rely heavily on locally based development as opposed to successfully attracting and nurturing new development from outside their respective sub-regions.

Parkes is well beyond the "fuzzy line" for Sydney growth. Notwithstanding the linkage and logistics industries have with GMA, the circumstances for locating to Parkes are related directly

to their industry interest and only in part from growth pressures forcing them out from Sydney. In the future, land economics may increase a movement trend in some sectors and freight, transport and logistics handling is one such prospect. The Botany matrix across sea freight, road, rail and air transport is very strong but land is in short supply. Importantly, business decisions are not always made based on qualifying criteria but more conceived with the extent and location of existing interests and supply chain networks.

The Illawarra and the Hunter Region are lobbying hard to be considered as overflow for Port related activity flowing from Port Botany capacity issues. The road and rail transport flow on is also significant. Likewise other areas could capitalise on this change predicated to witness a shift towards 2020 as capacity at Botany is virtually reached.

Outside this prospect the concept of people living in regional and rural areas and commuting to Sydney will not be significant unless there are vast improvements made to the public transport system. These infrastructure projects come at a significant cost and thus far governments have not placed a high priority on this interregional connections as opposed to focusing on metropolitan networks within the larger cities around the country.

Parkes is also instrumental in advancing the recently announced 'PORTS' strategy (Promote Our Regional Towns). The strategy is in part a response to the recent Evocities initiative which limited their realm to seven of the larger regional centres in NSW.

The 'Evocities' targets seven centres in NSW being Albury, Armidale, Bathurst, Dubbo, Orange, Tamworth and Wagga Wagga. The campaign is supported by both the State and Federal government as well as corporate sponsorship and funding and resources from the cities themselves. The Evocities campaign encourages Sydney residents to make the move to an Evocity and invest in the opportunities the cities have to offer.

The PORTS campaign like the Evocities strategy focuses on demonstrating the lifestyle, work and investment opportunities of regional NSW.

Parkes is well placed to benefit from both campaigns. As a player in the PORTS, it is also close to three of the Evocities within the Central West/North West region. It is too early to tell whether either campaign will be a success but there is a strong likelihood should they prove as such there will be a direct impact on Parkes.

Regional and rural areas are also pressuring governments to improve local transport infrastructure. This is an understandable requirement given the importance of this facet on the way that economies operate. However, this prospect presents dual and opposing opportunities. Firstly, the improved transport connections bring the larger cities closer to the regional areas and therefore allows the regional areas to access the larger markets more quickly.

Secondly and conversely as the regional businesses expand the improved access and travel times can incentivize relocation on expansion within the larger centres to not only access the market but also the labour force.

In a broader sense, it is unlikely that Parkes industry will be absorbed into the Sydney basin, however, transport improvements could mean that the attraction of some of the lower order industry and commerce within Parkes being drawn to the larger centres such as Orange, Dubbo and Bathurst.

The location decision making matrix is not single dimensional about price or location and often the pragmatic considerations concerned with land costs, labour force, services is overridden by considerations about senior executive and board member lifestyle and retention, synergies with other suppliers and customers, vertical and horizontal integration based on supply chain networks. The issues concerning a number of these factors will be explored in the next section of the report.

Other Developments and Opportunities

The vision for the Central West includes the prospect of the region being attractive for new industry. This is a diverse prospect and could incorporate initiatives ranging from power generation (solar) to the next generation of data centres seeking to capitalise on broadband and IT networks.

The outcomes of programs within this context are difficult to predict. The energy industry offers enormous potential, however the take up of alternative energy generation nationally has been somewhat maverick and related directly to the particular circumstances of the location. For example the solar farms need to be located close to existing power grid to be effective. Gas fired power stations not only require the gas source but likewise need to be close to customers to be effective. This has limited the opportunity for wind, solar and other power generation schemes being dotted across the nation. Instead they have been careful about picking their mark to feed into the national grid and therefore maximizing their economic feasibility based on their contribution to either base or peak load capacity.

Other industries tend to be more reliant on labour force characteristics. Some regions have pursued the prospect of improving their environment in the hope that they will improve their appeal to knowledge based workers. It is fair to say that Australia has not yet witnessed a migration from the larger cities in this capacity and the gravity tends to stay towards larger employment areas where education, cultural and social facilities are abundant.

The political process can also drive these outcomes particularly where industry investment and incentives are concerned. The industries are cognisant of a generational continuity and there is consistently a fear that smaller regional areas are brittle in being able to constantly supply labour for decentralised interest.

Despite the difficulties in anticipating the level of demand that could emerge from these sources, Parkes is well placed accommodate these footloose prospects. Land use planning is sufficiently flexible to respond to these interests should they arise or wish to locate in Parkes in the future.

More directly there are some current proposals in Parkes that have the opportunity to provide a substantial lift to economic activity within their realm. These include consolidation and expansion of the retail area which has the potential to create additional employment and lead onto other services sector jobs in the commercial environment.

There is also a substantial retirement community proposed in the north western sector of the town known as Parkes Garden Estate. This seniors living complex could provide over 400 independent living units as well as 80 serviced apartments and a 180 bed aged care facility. The accommodation will be integrated to an amenities and lifestyle package not otherwise matched by other developments in Parkes or other nearby centres. This sort of project has the capacity to help stem any flow of population away from the town for fear of lack of facilities in this sector.

Examination of the history of development applications suggest significant diversity in the range and values of applications. There is a discerning upward trend which is reflective of the consolidation of development and investment within the region and the town.

3.5 THE MARKET

This section of the report will examine the principal supply and demand characteristics evident in Parkes and the prospects for these to change into the future. The analysis will scope supply and demand and the implications for the pattern of development of the industrial estate at Parkes.

Land Supply

The industrial land supply in Parkes has changed significantly in the last ten years. Prior to 2006 there was 78 hectares of industrial land based on the zoning maps existing at the time. Since then the intermodal facility, the industrial estate and the prospects for development of the airport have increased actual and notional land bank for industrial land use. The current supply (exclusive of lands within the CBD) is summarised in **Table 3**.

Table 3: Industrial Land Supply, Parkes

	Precinct	Area (ha)	Comment
	Industrial Estates		
1	Existing 4; Industrial	60	Land developed
2	Existing 2(v); Urban and Village	26	Areas closer to town
3	Parkes Industrial Estate	110	Subject area adjoining existing estate
4	*Sub Total*	*196*	
5	Intermodal Hub 4(a) Industrial	447	Parkes Hub document indicated 516ha with additional 100ha reserve.
	Parkes Airport		
6	Entire facility	233	
7	Orange Road Frontage	67	Exclusive of land immediately adjacent to runways and aprons.
	TOTAL	*710*	(sum of 4 + 5 + 7)

Source: Collie; Parkes Shire Council; ADW Johnson. Errors due to rounding.

The Parkes Shire Land Use Strategy of February 2009 (Collie Pty Ltd) estimated on the basis of the then supply of 78 hectares of industrial land that there would be a supply shortfall of 46.1 hectares through to 2031. Since then the allocation for the industrial estate of approximately 110 hectares along with the potential for supply at both the Intermodal Hub and the Airport will well and truly compensate the shortfall requirement.

It is acknowledged that in this context the Intermodal Hub and Airport land should not be considered supply in the general industrial sense. Rather they are intended to supply particular markets and demand factors. However, if in time the principle drivers do not materialise and other industrial lands become exhausted it will be possible to consider these areas more broadly in the terms of general industrial land supply.

Land Demand

There are a number of facets that can provide cues for the take up of industrial land. A significant proportion of these elements have been studied in the past in the context of the Parkes Shire Land Use Strategy as well as economic impact assessments relating to commercial and retail land use within the Parkes township.

In as much as these documents are contemporary sources, the Land Use Strategy identified an average industrial land demand for the period 2016 to 2031 of 30 hectares (2 hectares per annum). There are no current circumstances to suggest this figure should be varied significantly notwithstanding the differences in the prospective low and high growth population outcomes.

There are certain metrics that can provide guidance for land take up as determined by population and employment growth. These have constituted part of the rationale used by Collie within the Land Use Strategy. However, the outcomes are not always that predictable in that industry interest created by specific comparative advantage (such as intermodal facility) can cause demand shifts based on factors relating to that interest. The Land Use Strategy figure of 2 hectares per annum is exclusive of the intermodal requirement and therefore is a measure of the underlying demand based on the normal level of activity within the Parkes area.

Furthermore, it is not considered that the difference between the low and the high population scenarios warrants sufficient distinction to produce a demand shift or significantly different demand curve that would mean the uptake would be double or triple the Collie estimate.

Based on historical sales data for the period 2001 to 2010, the total industrial land sales are depicted in **Table 4**.

Table 4: Land Sales by Area, 2001 – 2010, Parkes.

Land Type	Number of Sales	Total Value	Total Area (ha)
General Industrial	19	$2,038,630	11.5
Intermodal	7	$7,465,700	417.6
Total	**26**	**$9,504,330**	**429.1**

Source: RP Data; ADW Johnson

The figures indicate just over 11 hectares of general industrial and over 417 hectares of land within the intermodal facility have been transacted. The general industrial figures are slightly below the estimates used by Collie however the sales data within **Table 4** may not be inclusive for the following reasons:

- These are land sales only and would not include sales or transactions where buildings have been retained and leased; and.
- Where land is unzoned but transacted for industrial purposes are not noted as such.

On a historical basis, this indicates a take up of just over 1.1 hectares per annum. Therefore the 2 hectares per annum moving forward is conservative on this basis.

The take up on the intermodal facility will be a little more unpredictable. The current transactions relate to the gross land parcels secured by the respective interests and do not reflect the actual development that has taken place. For example SCT Logistics currently occupy less than 5% of their site (occupying 12 hectares on a 283 hectares site).

Another component of use likely to drive demand on part of the Parkes Industrial Estate will be for bulky goods purposes. The existing Harvey Norman development occupies land for this purpose. Bulky goods uses tend to be more direct in the relationship to a metric that operates to calculate the floor space supply and therefore the land supply to accommodate the need and growth.

In 2009 Hill PDA undertook a review of the report completed by Hirst Consulting in relation to the Economic Impact Assessment for the homemaker centre lodged with Council in 2007. The review found that the market would grow to absorb the capacity of the homemakers development and that by 2016 the market catchment for Parkes could justify an additional 14,500sqm of floor space to satisfy bulky goods/homemakers demand.

For the purposes of this assessment, if this floor space requirement was conservatively re-estimated (i.e. over estimation of market demand) and increased to 20,000sqm of additional floor space by 2030, it would generate a land requirement of approximately 6 hectares. It is noted that the current Council plan estimates an additional requirement for 10 hectares which is considerably more than the estimates generated by the Hill PDA report or ADW Johnson factoring.

The additional 4 hectares could be left for urban service industries such as a petrol station and uses more in retail character that do not necessarily directly conflict or compromise the existing Parkes CBD.

The high growth population estimate is 21% higher that the low forecast. An increase of the same proportion for bulky goods space, factored by Hill PDA will amount to 17,000sqm total space. This would increase the land requirement to around 5.2 hectares. It is important to note this analysis is rudimentary and the real generative capacity for bulky goods is driven by households not just population. Notwithstanding this, the factoring does demonstrate there is sufficient scope within the allocation of 10 hectares to accommodate growth well beyond 2030.

Another facet of demand can be gauged from the number of development applications being processed by the Council. The information in **Table 5** depicts the volume and value of non-residential development applications in Parkes for the period 2005 to 2010.

Table 5: Non Residential Development Applications, Parkes 2005- 2010

Development type	Number	Value ($)
Additions to commercial	51	12,720,470
New commercial	55	134,957,299
Subtotal commercial	106	147,677,769
Additions to industrial	11	882,300
New industrial	19	12,944,100
Subtotal industrial	30	13,826,400
Total	**136**	**$161,504,169**

Source: Parkes Shire Council

Across all the categories over the period indicates activity of around 25 applications per annum. The industrial category is far more subdued than the commercial. The commercial category will include extensions and new development owing to retail and particularly the homemakers centre.

The annual average for new industrial applications is around 3 or 4 applications per annum. Moving forward this has likely influenced Collie's estimate of land demand and there is little to suggest that this would be significantly different for the foreseeable future.

The prospects of incorporating land uses within the Parkes Industrial Estate that can accommodate commercial development has also been suggested. Our research indicates that there are not strong indications that this is necessary nor it would it be universally accepted. There is currently capacity within the existing CBD (both vacant land and underdevelopment or underutilisation of existing sites) that suggest the city centre can absorb significant capacity before out of town development would be warranted. It is also anticipated there would be significant resistance from existing stakeholders concerning the possibility of setting up a business park or commercial area within the industrial estate that would be seen to compete with the CBD.

Generally speaking, industrial business parks or commercial areas are warranted because of either a lack of capacity within the existing centre or pricing pressures that force out lower order economic uses that require large floor space areas but have a low capacity to pay an economic rent. It is considered these circumstances do not exist in Parkes either now or for the foreseeable future. However, given the amount of land available within the industrial estate it would be prudent to allow sufficient flexibility in future zoning or consideration of broadening the land uses should circumstances change within the city centre over the next 20 years.

4.0 Comparisons of Other Areas

4.1 INTRODUCTION

The purpose of this section of the report is to examine and highlight characteristics of other industrial developments and business parks in NSW that might provide some guidance for the development concept and outcomes of the Parkes Industrial Estate.

The comparison features the Tuggerah Business Park on the NSW Central Coast, Bomen Business Park at Wagga Wagga, the Thornton Industrial Estate near Maitland. Each of these locations has distinctive characteristics but are all within the context of areas of regional NSW. Summaries of the respective locations are contained within the following sections and tables.

4.2 LOCATIONS AND IMAGES

Tuggerah Business Park

Tuggerah Business Park is an integrated employment and activity centre. It is seen as a 'gateway' site to Wyong Shire and the Central Coast Region. The estate is accessed via two points on Wyong Road which is an important local transport corridor. It is adjacent to a major shopping centre and adjoins the railway on the western boundary (however the rail line does not have a spur access into the estate).

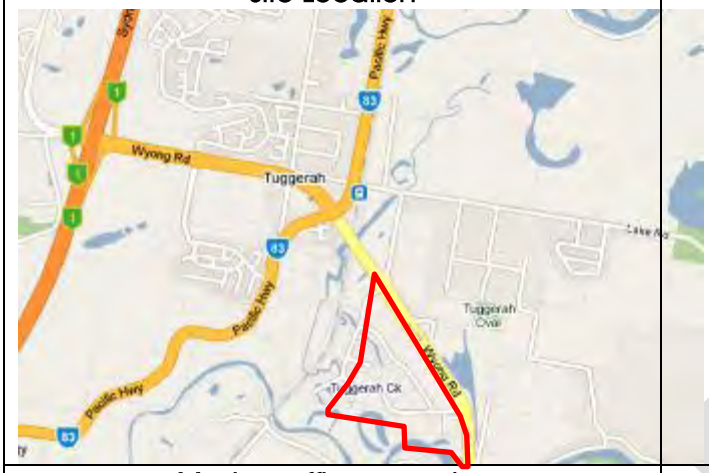
The size and setting of the estate provides scope for high quality development. Whilst industry and businesses form the core activities within the estate, recreation facilities, childcare centres and food outlets are permissible where they service the businesses within the estate.

This estate was very slow to develop. It was initially seen as relatively remote and removed from Gosford and Wyong CBD's. The development of nearby retail (Westfield Tuggerah) and a bulky goods centre lifted the area profile and take up in the estate accelerated.

It is arguable that the commercial elements have been allowed to develop at the detriment of Wyong and Gosford CBD's. The inexpensive land (initially) permitted buildings to compete successfully with development elsewhere. The estate is now somewhat self-generating and includes exclusive commercial developments.

Tuggerah Business Park

Site Location

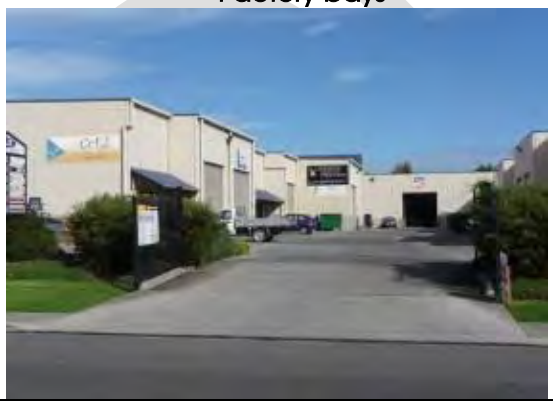


Estate Layout

Modern office complex

Large warehouse building

Factory bays



Entrance

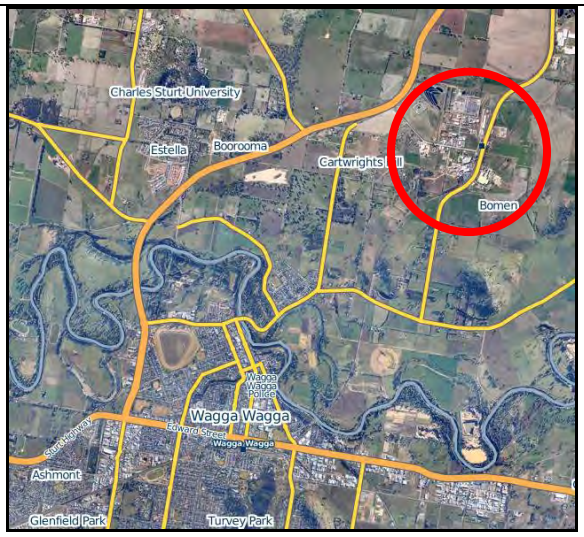
Bomen Business Park

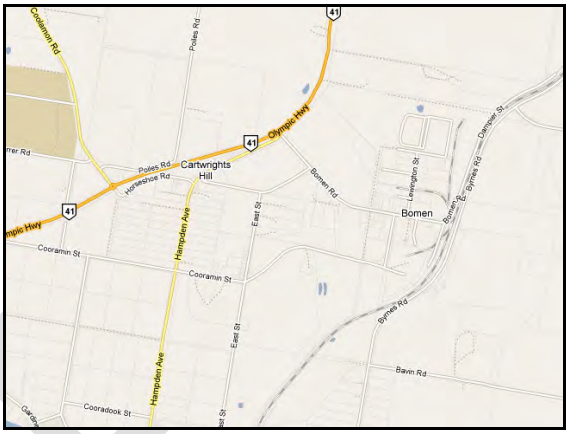
This Estate has been designed as a manufacturing and logistics hub. It contains over 2,000 ha of developable land and straddles the main railway between Melbourne and Sydney. It has good access to the Olympic and Sturt Highways and enjoys proximity to Wagga's airport.

The planning of the estate is encouraging the establishment of an intermodal and break bulk cargo facility. The geographical location between Melbourne, Sydney and Canberra with access to more distant parts has been the catalyst for this initiative. The Sydney- Melbourne rail line carries 70% of the national freight load.

The area has also attracted Government investment to assist with infrastructure provision. The estate has much in common with Parkes from the transport/logistics viewpoint. Wagga is also positioned on the alignment of the inland rail route but does not benefit from direct access to the rail line to Perth.

Images and maps of Bomen Business Park





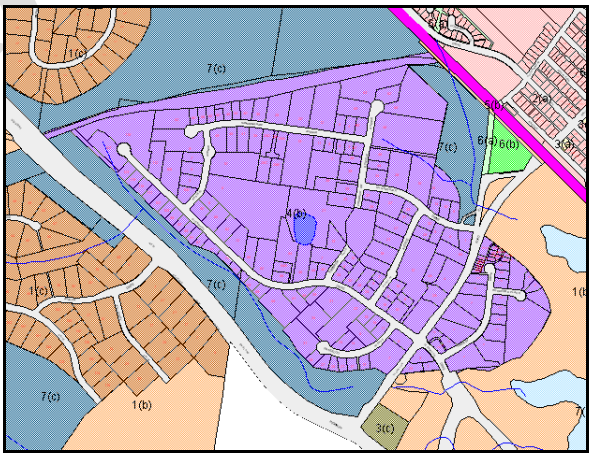
Thornton Industrial Estate

Commenced in 1995, Thornton Industrial Estate comprises 100 hectares of light industrial land and buildings. Development opportunities exist for land and construction packages within the estate. The site benefits from its proximity the New England and Pacific (F3) Highways.

Although regarded as an "industrial estate", Thornton presents a distinct mixed use character. It includes a range of manufacturing related businesses through to urban services and retail uses. It is set amongst a new residential area. Even though it is adjacent to the main Northern rail line, this has not been used or featured in the appeal or developed uses within the estate.

Thornton Industrial Estate set the tone for other similar nearby developments. In a sub-regional sense, these projects have outperformed the initial forecasts for land take up as a consequence of the "packaging" of projects and the recognition of the area (Thornton/Beresfield) as a core industrial precinct. The development form is inconsistent. This is not only as a consequence of the various uses but also the relatively broadly scoped DCP and building provisions. To some extent, "self-selection" of lower order industrial uses based on land price have grouped similar uses and the varieties in building design and appearance does not detract from the estate.

Photos and maps of Thornton Industrial Estate



4.3 PRINCIPAL CONTROLS AND FEATURES

Each of these locations, including the existing industrial subdivision in Parkes operate under respective land uses zones with stated objectives, lists of permitted and prohibited uses and various site and DCP and building controls. In combination, these have the capacity to influence the uses, building designs and form and gradually the image and characteristics of development in the respective estates. The information in **Table 6** presents this in comparison across the featured estates as well as the Parkes Industrial and Intermodal developments.

Table 6: Industrial Estate Characteristics.

Estate	Parkes Intermodal Hub	Parkes Industrial Estate	Tuggerah Business Park	Bomen Business Park	Thornton Industrial Estate
Location	West of Parkes Town Centre.	South of Parkes Town Centre.	Tuggerah, NSW Central Coast Close to F3; adjacent to main northern rail line but no access spur.	15 minutes north of Wagga Wagga CBD; fronts both main highway and rail line linking Sydney and Melbourne.	Thornton Close to New England and Pacific (F3) Highway; adjacent to main rail line but no access spur.
Local Gov't Area	Parkes	Parkes	Wyong	Wagga Wagga	Maitland
Zone	4(a) Transport Hub.	4 Industrial 2(v) Urban and Village.	4(c) (Business Park Zone) Wyong LEP 1991.	Wagga Wagga LEP 2010 IN1 General Industrial, IN2 Light Industrial, SP2 Infrastructure (sewer plant, public utility undertaking, gas station), RE1 Public Recreation. Note- some of the land within the estate is 'deferred matter' meaning the zoning under the previous LEP will apply (Wagga LEP 1985 and Wagga Rural LEP 1991).	4(b) Light Industrial.
Objectives	• to recognise the Parkes "Hub" as a special industrial enterprise area, specifically to nurture a multi-modal freight and transport interchange, and • to designate land for the accommodation of key industrial uses which are linked to the freight logistics industry, and • to encourage the	<u>4 Industrial zone</u> • to encourage development which will generate employment and contribute to the needs of the Shire, and • to provide opportunities for non-industrial commercial activities that may reasonably be located in an industrial zone. <u>2(v) Urban and Village</u>	• to provide for the integrated development of an industrial business park, and • to allow for large scale commercial development which is not in conflict with sustaining and developing commercial zones, and • to encourage	Objective of the business park: (extract from draft Masterplan). "The Bomen Business park will be a high quality and nationally renowned place for transport and logistics-based enterprises, well-designed and integrated with existing industry which meets the requirements of a targeted range of businesses	• To set aside certain land for the purpose of light industry within convenient distances of the urban centres of the City. • To allow commercial and retail development that does not undermine the commercial and retail functions of existing and future urban centres. • To ensure that industrial

Estate	Parkes Intermodal Hub	Parkes Industrial Estate	Tuggerah Business Park	Bomen Business Park	Thornton Industrial Estate
	growth of the freight logistics industry and capture consequent economic benefits for Parkes, and • to enable the continuation of agricultural land use within the zone.	<u>zone</u> • to provide a broad zone for the town of Parkes and to enable details to be provided by a development control plan, • to provide for the future expansion of the town of Parkes, and • to recognise existing villages and to enable future development appropriate to their function.	development appropriate to an industrial business park which generates multi-sector employment, and • to enable the Council to provide more detailed guidelines about industrial development in a development control plan.	and supporting activities to compliment and nurture a more sustainable City of Wagga Wagga and Riverina Region.	development creates areas which are pleasant to work in and safe and efficient in terms of transportation, land utilisation and services distribution.
Permitted uses	Any purpose that is not prohibited.	<u>4 Industrial zone</u> Any purpose which, by virtue of its nature, the services provided or the products produced, distributed or sold, is, in the opinion of the council, appropriately located in an industrial zone; industries; purposes associated with, ancillary to, dependent on, or which provide services to, industrial or other development permitted in this zone; utility installations. <u>2(v) Urban and Village zone</u>	Any purpose that is not prohibited.	<u>IN1 General Industrial</u> Home businesses; Home occupations; Roads, Animal boarding and training establishments; Depots; Freight transport facilities; Light industries; Neighbourhood shops; Take away food and drink premises; Warehouse or distribution centres; Any other development not prohibited. <u>IN2 Light Industrial</u> Depots; Light industries; Neighbourhood shops; Self-storage units; Take away food and drink premises; Warehouse or distribution centres; Any other development not prohibited.	Any development other than prohibited development (see below).

Estate	Parkes Intermodal Hub	Parkes Industrial Estate	Tuggerah Business Park	Bomen Business Park	Thornton Industrial Estate
		Any purpose other than prohibited uses.			
Prohibited	Boarding-houses; cemeteries; child care centres; churches; clubs; community centres; dwelling-houses; educational establishments; general stores; health care professionals; home industries; home occupations; hospitals; hotels; motels; motor showrooms; picnic grounds; places of public worship; reception establishments; recreation facilities; recreational establishments; retail plant nurseries; roadside stalls; shops; tourist facilities; units for aged persons; veterinary hospitals.	4 Industrial zone Any purpose other than permitted uses. 2(v) Urban and Village zone Feed lot establishments; institutions; junk yards; offensive and hazardous industries; pig keeping establishments; poultry farming establishments.	Abattoirs; aerodromes; agriculture; animal establishments; boarding houses; brothels; building products sales rooms or showrooms; bulky goods sales rooms or showrooms; caravan parks; commercial premises; detached dual occupancies; dual occupancy buildings; dwellings (other than those used in conjunction with a permitted industry and situated on the same land as the permitted industry); exhibition homes; generating works; group homes; hazardous industries; hazardous storage establishments; industries (other than light industries); intensive agriculture; large scale retail establishments; materials recycling depots; medical centres; motels; motor showrooms; offensive industries; offensive storage establishments; palliative day care centres; plant hire establishments;	IN1 General Industrial Agriculture; Airports; Amusement centres; Bulky goods premises; Business premises; Caravan parks; Cemeteries; Child care centres; Correctional centres; Educational establishments; Entertainment facilities; Extractive industries; Farm buildings; Forestry; Function centres; Health services facilities; Home occupations (sex services); Information and education facilities; Office premises; Places of public worship; Recreation facilities (major); Registered clubs; Residential accommodation; Retail premises; Tourist and visitor accommodation; Water recreation structures. IN2 Light Industrial Agriculture; Airports; Amusement centres; Biosolids treatment facilities; Bulky goods premises; Business premises; Caravan parks; Cemeteries; Child care centres; Correctional centres; Crematoria; Educational establishments;	Camp or Caravan Sites; Dual Occupancy; Dwelling used in conjunction with other prohibited development; Entertainment Facility; Exhibition Home; Exhibition Village; Hazardous Industry; Hazardous Storage; Hotel; Intensive Agriculture; Medium Density Housing; Motel; Offensive Industry; Residential Flat Building; Roadside Stall; Sawmill; Seniors Housing; Serviced Apartment; Shop; Stock and Saleyards; Tavern; Tourist Accommodation.

Estate	Parkes Intermodal Hub	Parkes Industrial Estate	Tuggerah Business Park	Bomen Business Park	Thornton Industrial Estate
			reception establishments; residential flat buildings; restaurants; roadside stalls; rural industries; sawmills; self-storage establishments; service stations; shops; stock and sale yards; tourist accommodation; toxic waste incinerators; transitional group homes; vehicle body repair workshops; vehicle repair stations.	Entertainment facilities; Farm buildings; Forestry; Function centres; Hazardous industries; Health services facilities; Heavy industries; Home-based child care; Home occupations (sex services); Information and education facilities; Livestock processing industries; Offensive industries; Office premises; Places of public worship; Recreation facilities (major); Registered clubs; Residential accommodation; Retail premises; Sawmill and log processing works; Stock and sale yards; Storage premises; Tourist and visitor accommodation; Veterinary hospitals; Water recreation structures.	
Lot size	From 1,500 sqm - 95 ha. Total area approx 447ha.	From 550sqm – 4.9 hectares. Total area approx 170ha.	From 2,700sqm to 2.5 ha. Total area approx 60ha.	From 1,500sqm to over 5ha. Total area approx 2,000ha.	From 1,500m^2 to over 4 ha. Total area approx 100 hectares.
Site specific DCP and building controls	Parkes Industrial Hub DCP 2006. • Max height 20m. • 15m building setback to Brolgan Road and Condobolin Road. • 10m setback to any other road. • 15m setbacks to adjoining rural land. • Site coverage not to	Parkes Industrial Estate DCP 1998. • Min subdivision lot size 2,000sqm. • 15m setback to Newell Hwy and Salesyards Road. • 7.5m setbacks to any other roads. • Landscaping required as part of any	Part of DCP No. 1; Chapter 80- Tuggerah Precinct. Maximum FSR 0.8:1. Site coverage (building only) 50%. No specific height maximum. Setbacks- range from 0-	Draft Bomen Strategic Masterplan, expected to be finalised Dec 2010. Wagga Wagga DCP Industrial Development 2010. • Setbacks ranging from 7.5m to 10m. • Front setbacks to be landscaped. • 3m landscape buffer	City Wide DCP- Industrial Development Code. Landscaping- 5m landscaped area at front of building. Parking- 1 per 75sqm of GFA.

Estate	Parkes Intermodal Hub	Parkes Industrial Estate	Tuggerah Business Park	Bomen Business Park	Thornton Industrial Estate
	exceed 60%. • Signage to be minimized . • 5m landscaping strip to Brolgan Road and Condobolin Road and rural land .	application. • Signage- contents must relate to use of land.	5m depending on landscape corridors, excluding boundaries to Wyong Road or rail line . Landscaping- emphasis on urban landscaping around buildings and Wyong Road frontage and native landscaping along perimeters. Signage- template given, all signage requires consent.	adjoining any residential land. • Solar access.	Setbacks- no specific setback requirement (apart from 5m landscaped set back) and assessed on bulk, layout, height etc.
Tenants and Occupants	SCT Logistics, Asciano, Linfox.	Central West Sheds.	NSW Police Call Centre, ING National Call Centre, Belkin International, Energy Australia, Allen & Unwin.	Austrak, Bidgeebong Wines, Bomen Agricultural Machinery, BOC Gases, Caltex, Cargill Foods Australia, Heinz-Watties, Nufarm, Patrick Portlink, Pivot Storage Warehouse, Polytank, Southern Oil Refineries, Trevor Garth Caravans, Vetafarm Pty Ltd, Vinidex Pty Ltd.	Justin Norris Swim Academy, Invitrogen, Advance Technology Solutions Australia, Aggreko, Bridgestone, Sigma Pharmaceuticals, NSW Dept Mineral Resources, Boral, CSR Humes, Humes Doors and Neumann Streel.

4.4 LESSONS FOR PARKES

The genesis for each of these industrial estates has been slightly different. Thornton was relatively simplistic in its approach and the master planning, vision and strategy were more or less encompassed within the LEP and Citywide Industrial Strategy and DCP provisions. In other words, it did not embark on a process to draw in particular forms of development as part of the marketing plan and vision. The estate was created at a time when industrial land take up in the region was relatively modest. The estate offered the market potential to take advantage of transport and access networks in close proximity to existing urban areas. Development on Thornton Industrial Estate is typified by small to medium enterprise and as not been built around large industry as is somewhat the case at Bomen and to a lesser extent Tuggerah.

Despite the absence of a carefully crafted masterplan vision and strategy the Thornton Industrial Estate has a development logic and relatively predictable outcome. It became the market leader owing to the flexibility in permitted uses, the attractive location and the relative costs and packaging opportunities that were offered to interested businesses.

Bomen Business Park has been "re-launched" with the extension of the rezoned area to approximately 2,000 hectares. It has been able to take advantage of existing development enterprise within the area and attempts to harness the location of Wagga Wagga being virtually equally distant from Melbourne and Sydney markets.

The master planning at Bomen is on a large scale. The strategy and vision document have taken over two years to develop. The documents will double as marketing and lobbying resources in order to attract further industry and investment.

Like Parkes, the coincidental intersection of highway and rail service networks is the basis for the establishment of an intermodal facility at Bomen Business Park. There is a mix of government and private investment involved.

The Tuggerah Business Park is probably the least similar to the situation at Parkes. However, it does serve to demonstrate the outcome where there is a strong reliance on commercial, retail and bulky goods to support the concept.

Initially this estate was slow to take up and the LEP and DCP provisions were written in such a way to prevent any competition with the Wyong and Gosford CBD's. In time the development has occurred and now the estate is regarded as an attractive alternative to the respective CBD's. The availability of vast areas of relatively inexpensive and flat land has been an attractive by comparison to Wyong and Gosford.

Similar to Thornton the principal development drivers at Tuggerah have been sourced locally. It has some importation of new businesses which sought out regional opportunities for which Tuggerah was able to compete successfully.

Both Tuggerah and Bomen have a far more prescriptive approach than Thornton, however, the outcomes do not necessarily suggest that from an economic viewpoint the results are vastly different. In the case of Tuggerah the physical attractiveness and appearance of the development is distinctive and this perhaps has ramifications for the prestige and reputation of the business park as it reaches maturity. In some respects the DCP and building controls can be a

deterrent. In the case of Thornton the much lower level of formal criteria has resulted in far more diversity in the built forms and generally speaking is of lower quality compared to Tuggerah.

Bomen distinctiveness and diversity is created not only by the building forms but also by the industry and uses on site. It is far more difficult to control the building form when diversity across the use type eventuates. Concept planning on a precinct basis would help overcome this and nullify distinction site by site. This is not always possible but certainly more easily achieved in larger estates.

It is considered that Parkes needs to be careful about drawing in controls that would be considered a disincentive or in some way adding to the economic cost of development. In this respect, the Thornton model of basic approach is perhaps more relevant noting the opportunity to distinguish some controls between light industry and heavy industry on a precinct by precinct basis.

Precinct planning need not be limited by attempting to pre-empt use outcomes. Generally, lot size will be a more accurate benchmark. Smaller losts will not be as attractive to uses requiring extensive hardstand and these controls can be more extensive. In larger lots, landscaping provisions can be more extensive which in form creates a distinctive appearance and appeal. The detail of some of these aspects will be discussed in the next chapter.

Apart from the physical characteristics there are distinct marketing and presentation differences in comparing Parkes with these other developments. Packaged sales and leasing opportunity have been an important characteristic for the success of a number of these other developments. Generally speaking these stem from the land owner being in a position to offer either land sale or building packages for sale or lease to potential interest. Whilst this cannot create a market, it certainly facilities decision making whereby the gambit of acquiring property, securing development approval and sorting occupation and moving is simplified.

Presentation is also important. The environment around the Parkes Industrial Estate is of mixed character both in terms of the building forms but also the presentation of the streetscape. There is an immediate impression that land is market ready and available for sale and development. The attention to detail is an important facet of creating the right image and certainty or security about buying into the estate. These issues serve to reinforce intentions of both the land owner and the potential or prospective enquirer.

5.0 Masterplan Review and Analysis

5.1 INTRODUCTION

This section of the report is intended to scope the previous masterplan options developed for the Parkes Industrial Estate as detailed in **Figure 2** and **Figure 3** in Section 2 of this report. The analysis will go on to suggest the scope for review of these options with a view to identifying a preferred outcome based on the likely long term development scenario.

5.2 MASTERPLAN INFLUENCES AND OPTIONS

The significant factors that will influence the future masterplan options are as follows:

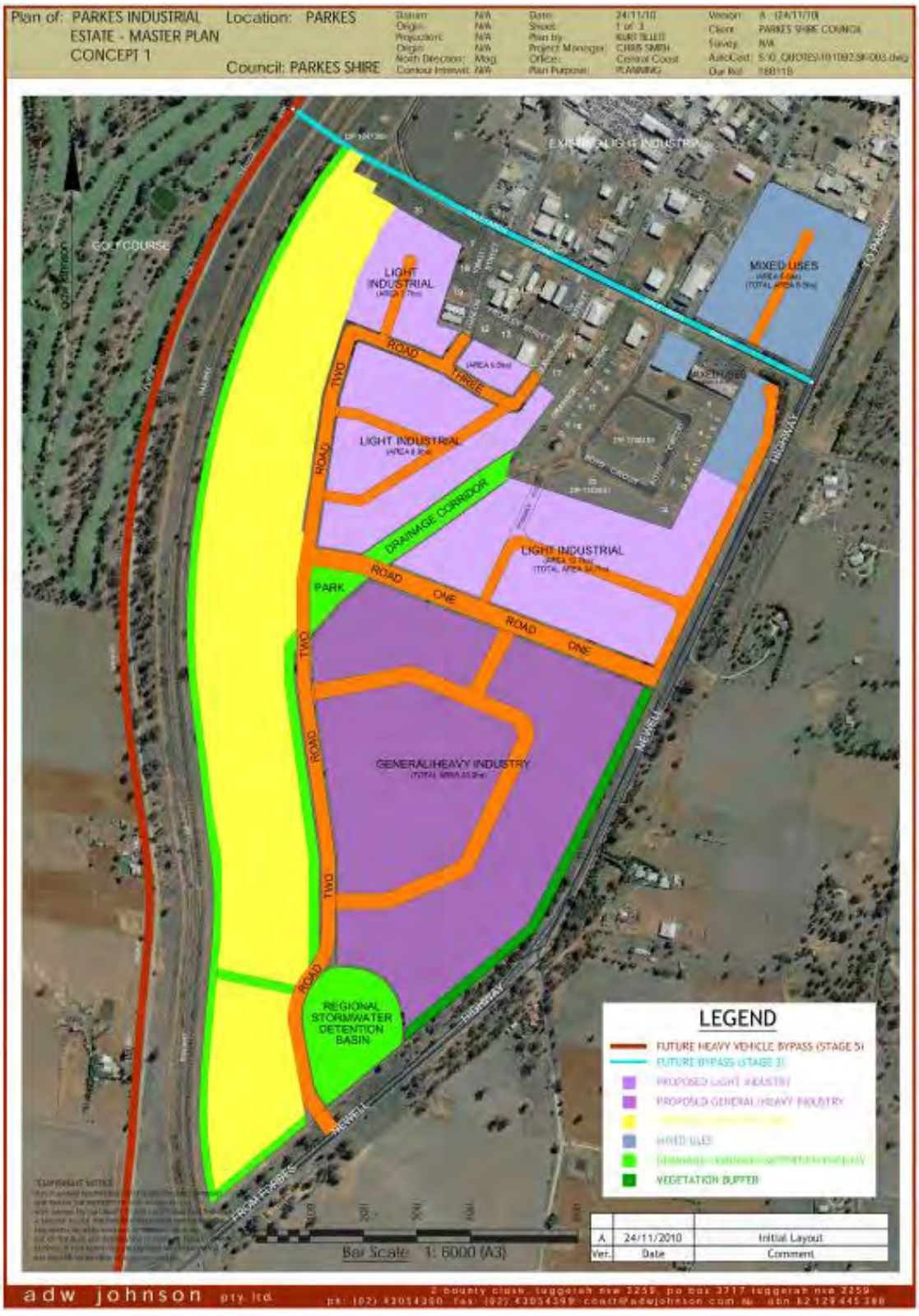
- The frontage to the rail line;
- The frontage to the Newell Highway; and
- The connectivity to the existing industrial estate.

The existing masterplan options have responded differently to these facets. The extent to which the reservation and future development form of the land fronting the rail line is difficult to detail. The rail line creates the opportunity for the Parkes Industrial Estate to be in some way competitive with the Intermodal facility and this might not be preferred as an initial outcome. Therefore the reservation of this land in the event that either the Intermodal facility becomes exhausted or the existing pattern of ownership constrains other future opportunity will lead to the formulation of a detailed strategy for the development of the land in the railway precinct.

Likewise the land fronting the Newell Highway could accommodate a range of bulky goods and urban services uses. However, as determined by previous commercial land use strategies there is not a huge need for this type of land as it would be primarily developed to service the population of Parkes and the immediate catchment. Therefore, it is deemed appropriate at this stage to confine these uses to a smaller area to prevent uneconomic use of the land and conflict with the CBD.

Forecast demand for light and heavy industrial land uses are likely to be related to interest that emanates from activity within the Parkes and immediate region. The forward planning for the next 25 to 30 years should reflect the demarcation between the uses noting a light industrial area of 40 to 50 hectares with flexibility to accommodate a variety of industry forms. In this respect, lot sizes in the light industrial area could range upwards from 1,500sqm. The opportunity for aggregation to satisfy larger requirements would permit planning for bigger lots within the general industrial area also. These uses would be located close to the existing industrial development with heavy industrial and rail uses pushed further to the south in the industrial area. A conceptual plan for the potential layout is detailed in **Figure 6**.

Figure 6 Masterplan Precinct Layout



5.3 MASTER PLAN DEVELOPMENT

Reviewing more specifically the features of the masterplan option, there are additional factors that will lead into the definition of the estate layout and details on staging.

At the broad level, the principal issues and factors are as follows:

- Mixed use/bulky goods area: this precinct is exposed to the Newell Highway and keys into the existing Harvey Norman development incorporating a land allocation of over 10 hectares. There is also an opportunity to create a new access road off Sales Yard Road that will service the potential bulky goods area. This road will also feature as the short term access to new light industrial areas adjacent to the bulky goods land allowing the new main road off the Newell Highway to be constructed in later stages.

- This existing subdivision to the north of the new area has not been built out. This area could buttress the mixed use/bulky goods area to keep these uses confined in this precinct without spillover into the backstreets potentially watering down the precinct focus.

- The light industrial areas will form the principal land use to the north of the proposed new main access road from the Newell Highway. The proximity to the adjacent existing subdivision will facilitate a range of staging options. The logical flow of development will move from either the existing areas to the south and west or via the new intersection.

- The heavy industrial area has less demand pulses than for light industrial use. It is also more unpredictable in terms of judging lot sizes and offsite impact stemming from business that may locate there. The deliberate placement away from the light industrial uses attempts to use roads as buffers and not reduce the flexibility for either land use area. The main access for this area will be via the new connection to the Newell Highway. It is also relevant to consider 'temporary' direct access arrangements for one or two industries that may wish to locate in the short to medium term.

- The rail related precinct seeks to take advantage of potential direct access to the rail line. Spur and branch lines are very expensive to construct. We are not advocating any 'speculative' inclusion of rail spur alignments or characteristics as these will be significantly influenced by the potential users of the site. The layout also contemplates an additional access to the Newell Highway allowing some further separation of rail and heavy industrial traffic from the light industry uses to the north. The inclusion of a main frontage road to the rail land will permit flexibility to staging and designation of lot size.

- The detention basin will service the needs of the entire estate.

The next level of issues will be more influential in the detailed design phase. There are two main categories to consider. Firstly, the site specific and DCP controls that relate to layouts and building form (as separate from design); and secondly, specific issues that relate to market and site conditions.

The controls that apply to the existing industrial estate date back to 1998. In principle, these are considered relevant and compare reasonably well to the other featured estates (**Table 6**).

However, the redefining of the estate precincts will trigger the need to revisit elements of the DCP in part distinguished by a new road hierarchy, distinct use precincts and eventual variation in the building forms.

The market and site conditions will have a bearing on issues like staging plans and lot sizes. Whilst service provisions has not been identified as a constraint, these issues come into play when considering a logical and efficient land development outcome and are also influenced by the actual uses that are attracted to the area. This is particularly relevant for power and to a lesser extent, sewer and water services.

The distillation of these elements will vary across the precinct types. Table 7 draws in the respective characteristics relevant for consideration in the detailed planning stages. It is also important to note the new LEP standard provisions will require Councils to stipulate certain controls relating to lot size, building height, floor space ratio (FSR), heritage, flood control and other elements within the LEP. This will influence the outcomes of the form on industrial lands and respective issues are noted in the table.

It is impossible to interpret the impact of the respective controls as it will vary according to actual use building layout and function and design elements. Generally speaking, industrial development will yield between 30% and 50% of building footprint on particular lots having allowed for car parking, access, hardstand and landscaping provisions. Some of the controls suggested will influence this outcome. For example, the stipulation of site coverage for the rail industry land is not only consistent with the Intermodal precinct provisions but will also prevent or reduce the likelihood of large monolithic sheds occupying virtually entire sites.

Conversely, the provision for the mixed use area will allow neighbouring buildings to virtually butt to one another, particularly attractive for outcomes seeking some commonality across lots in terms of building appearance, combined use of car parking and access arrangements. Stipulations within the BCA may limit the possibilities, however, planning controls should not attempt to pre-empt these but rather allow for flexibility in instances where these outcomes are preferred.

Table 7: Project Characteristics

Precinct	Mixed Use	Light Industrial	Heavy Industrial	Rail Industry
Lot Size **	From 1,500sqm and reflective of existing surrounding development	1,500sqm to 4ha. Most lots in the 3,500sqm to 5,000sqm range.	1,500sqm to 5ha. Most lots around 5,000sqm	3,500sqm to 5ha. Focus on larger lots with full depth (road and rail frontage).
Staging	Full precinct in one line.	Up to 20ha and subject to services.	Small stages subject to demand. Stage design and development concurrent with DA for the user	Subject to demand and rail spur layouts and access.
Building Controls				
FSR **	0.8:1	No	No	No
Height **	No	No	No	20m
Setbacks				
To Road	Min 7.5m	Min 7.5m	Min 10m	Min 10m
To Building	No	Min 10m	Min 15m	Min 15m
To Boundary	No	Min 5m	Min 7.5m	Min 7.5m
Landscaping	Subject to lot location and proximity to existing buffers but generally no less than 3m to front and rear boundaries.			
Site Coverage	No	No	60%	60%

***Items to be stipulated and subject to provisions of LEP standard template.*

These features will facilitate the drafting of an overall layout. The draft depicted in **Figure 7** includes a departure from **Figure 6** in that the layout is patterned on light and heavy industrial use only. This demonstrates the alternative outcome should the rail and not be pursued and much of the lot layout would be 'typical' for either scheme.

The plan in **Figure 8** shows the site contours to provide a clearer understanding for the need for the detention drainage system proposed in the respective layout plans.

The essence of the staging and actual lot layout will and should be subject to review on a 5 yearly basis. Market trends as well as lessons learnt from implementation will inform the review process to ensure the controls are contemporary yet not diminishing or unnecessarily restricting development outcomes.

Figure 7: Indicative Lot and Staging Layout

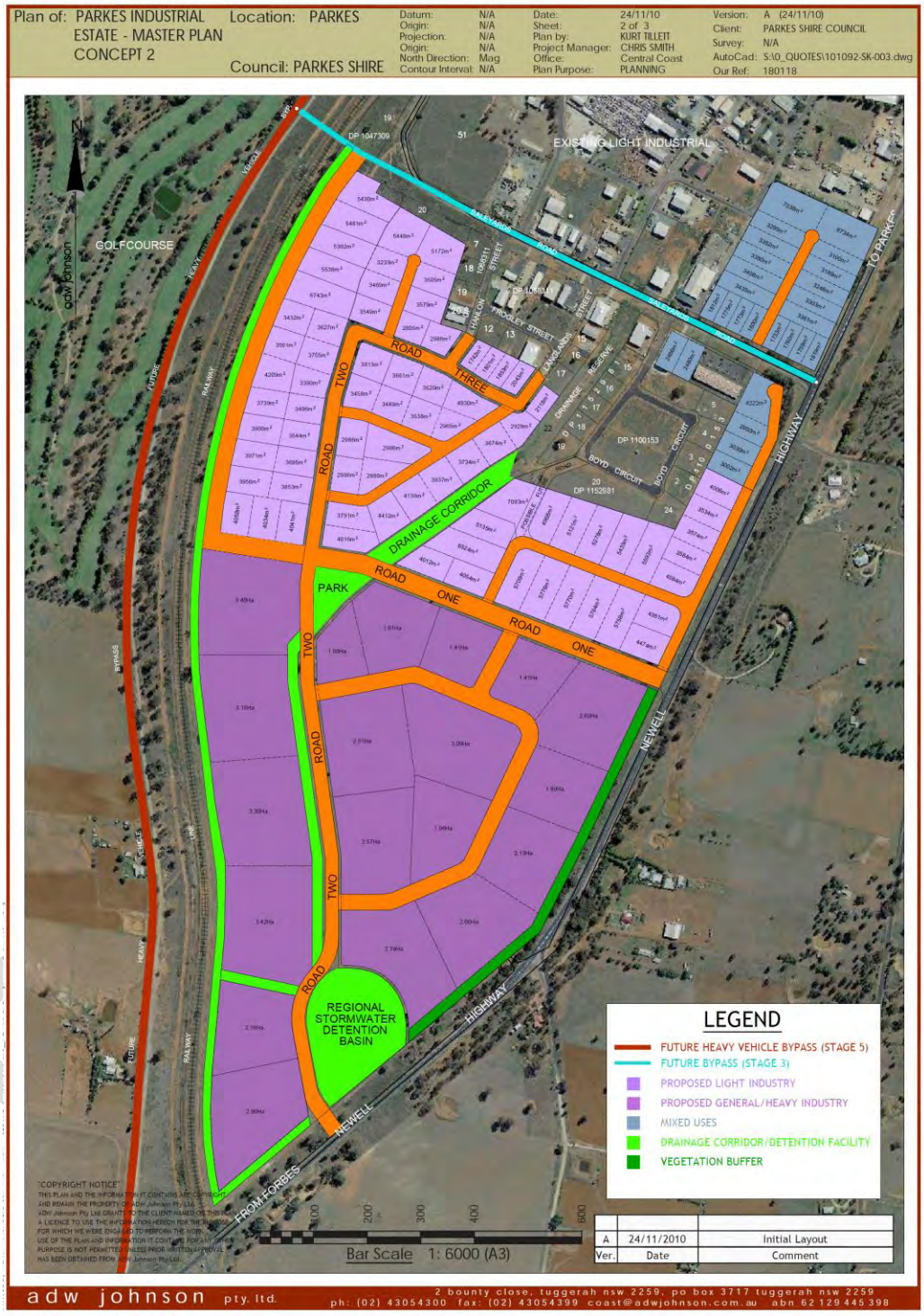
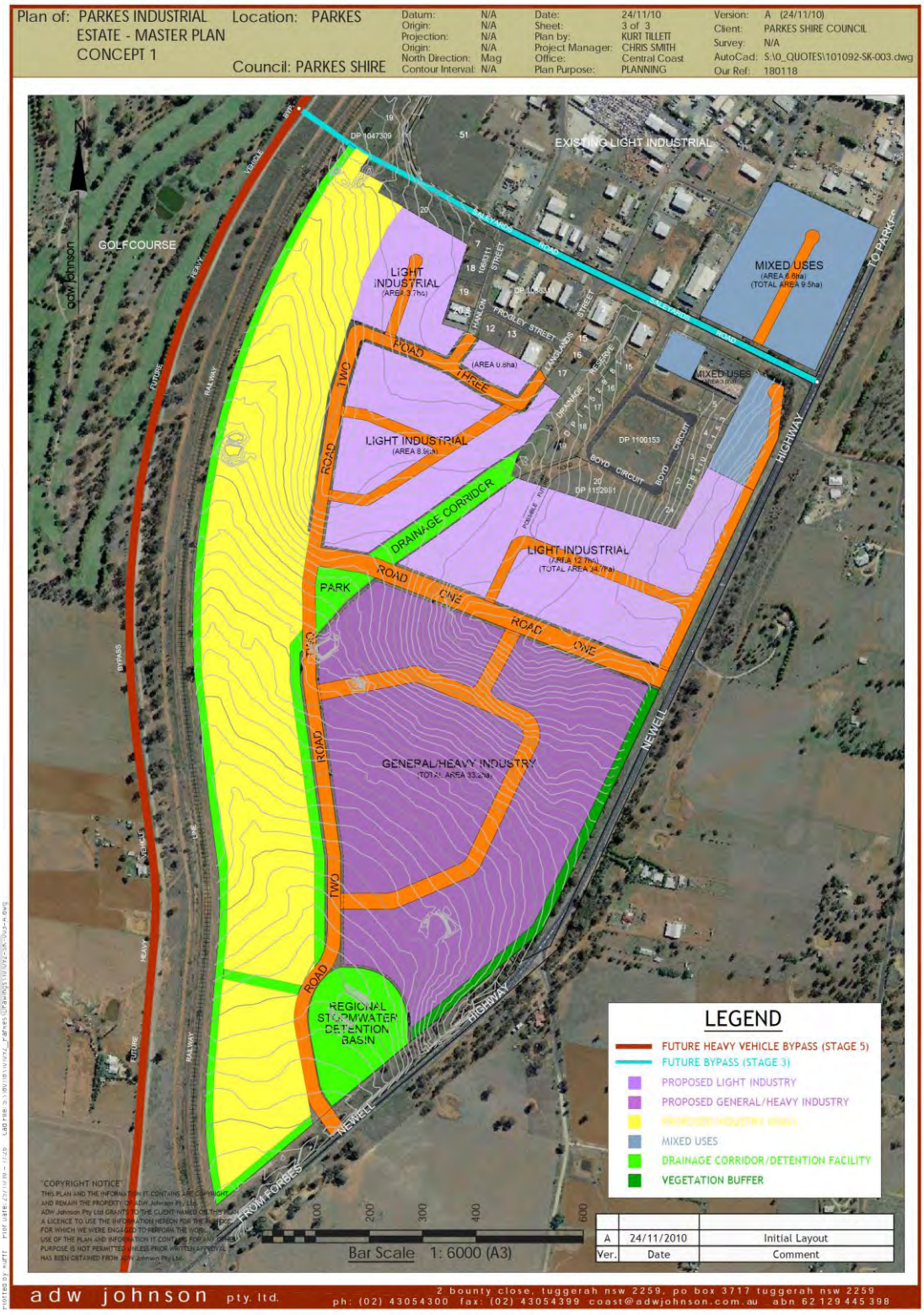


Figure 8: Site Contour Plan



6.0 Summary and Conclusions

Parkes has done an excellent job in ensuring its preparedness from a market viewpoint to attract and accommodate a wide range of industrial and employment land development opportunities.

The Intermodal facility and Parkes Airport have the capacity to extend the market reach of Parkes nationally and potentially internationally putting it on a stage with a number of other centres across Australia but distinguishing it from so many more.

However, the pulses and forces that will drive development of the Parkes Industrial Estate are considered to be more regionally and locally based. The historical pattern of take up and development has witnessed absorption of less than 1.5 hectares of land on average over the last ten years. The population within the Parkes township and catchment provide a basic metric to influence the future development of bulky goods and some urban services uses and also drive the base level demand for industrial purposes.

Growth scenarios suggest Parkes can anticipate a continuation of the past trends with capacity to increase over time. It is considered the current landholding is well equipped to be able to meet this demand capacity for the medium to long term.

In considering the future of and the master planning options of the Parkes Industrial Estate, an approach that provides base case opportunity with elemental controls to allow for some precinct planning will provide the best platform to attract development and investment. Parkes as a location is a natural attractor and the estate planning must do all it can to capitalise on these transport network assets.

It is not considered appropriate for Parkes to consider business or IT parks as the development drivers are not sufficiently strong or matured to warrant their inclusion. There is currently scope within the existing zoned areas of the township including the CBD to accommodate higher order commercial and retail development. These uses should be confined to these areas until development pressure materialises and there is clear evidence that the lack of opportunity within the CBD is retarding development and investment.

Future master planning must reserve and allow for future development off the railway line but not at the expense of the Intermodal facility. There may well be an opportunity in the future where build out of the Intermodal facility or the nature of the ownership prevents the uptake of land wishing to access the rail corridor and this would provide the opportunity for the Parkes Industrial Estate to respond. Otherwise bulky goods and urban services, light industrial and general/heavy industrial development staging should be planned across the respective precincts in a staging plan reflective of market circumstances from time to time.

Limitations Statement

This report has been prepared in accordance with the scope of services agreed between ADW Johnson Pty Ltd and the Client. The scope of services was defined by the requests of the client and correspondence in relation to the commissioning of the work.

All reasonable skill, diligence and care have been applied within the agreed scope of services with the client and the resources made available to it by agreement with the Client. Any responsibility to the Client and others in respect of matters outside the scope of the work is disclaimed.

Unless otherwise specified in this report, information and advice received from external parties during the course of this project was not independently verified. However, any such information was in our opinion deemed to be current and relevant prior to its use. Whilst the information is believed to be accurate, it is not warranted or guaranteed and no responsibility or liability for any information opinion or commentary contained herein or for any consequences of its use will be accepted by ADW Johnson or by any person involved in the preparation of this assessment and report.