AGENDA

ORDINARY MEETING OF COUNCIL

Tuesday, 15 July 2014

To be held
Swan Hill Town Hall
Council Chambers
McCallum Street, Swan Hill
Commencing at 5:00 PM

COUNCIL:
Cr LT McPhee – Mayor

Cr JN Katis
Cr GW Norton
Cr GI Cruickshank
Cr JA Kiley
Cr CM Adamson
Cr JB Crowe

45 Splatt Street SWAN HILL VIC 3585
PO Box 488 SWAN HILL VIC 3585
Telephone: 03 5036 2333 Fax: 03 5036 2340
Email: council@swanhill.vic.gov.au
Website: www.swanhill.vic.gov.au

SECTION A – PROCEDURAL MATTERS

- **Open**
- **Acknowledgement to Country**
- **Prayer**
- **Apologies**
- **Confirmation of Minutes**

  1) Ordinary Meeting held on 10 June 2014

- **Declarations of Conflict of Interest**
- **Receptions and Reading of Petitions, Memorials, Joint Letters and Deputations**
- **Public Question Time**

SECTION B – REPORTS

B.14.36 RECEIVE AND HEAR SUBMISSIONS TO THE DRAFT 2014/15 ANNUAL BUDGET

Responsible Officer: Director Corporate Services
File Number: 42-09-71
Attachments: Nil

Declarations of Interest: Officer
David Lenton - as the responsible officer, I declare that I have no disclosable interests in this matter.

Summary

The purpose of this item is to enable Council to formally receive and hear submissions to the Draft 2014/15 Budget.

Discussion

Council advertised for submissions to its Draft 2014/15 Budget in the Swan Hill Guardian on Friday 13 June 2014 and the Robinvale Sentinel on Thursday 19 June 2014.

The Statutory period for making submissions has now passed. As required under the Local Government Act, Council is now in a position to formally receive any submissions and allow submitters to speak to any issues they have raised.

Consideration of any submissions will be dealt with at a Special Council Meeting to be held in 22 July 2014.

Consultation

The submission process is part of the consultation process for the Budget.

Financial Implications

Nil

Social Implications

Nil

Economic Implications

Nil

Environmental Implications

Nil

Risk Management Implications

Nil

Council Plan Strategy Addressed

Responsible management of resources - We will continually improve the management of our finances, assets, systems and technology to achieve and maintain Best Value in our operations.

Options

Nil

Recommendations

That Council:

1. **Receive any submissions to the Draft 2014/15 Budget.**

2. **Enable any submitters to speak to their submission.**

B.14.37 SWAN HILL ECONOMIC DEVELOPMENT STRATEGY IMPLEMENTATION

Responsible Officer: Director Development and Planning
File Number: 26-33-00
Attachments: 1 Economic Development Strategy Implementation Report

Declarations of Interest: Officer
Brett Luxford - as the responsible officer, I declare that I have no disclosable interests in this matter.

Summary

This report seeks to update Council and the community on the actions taken to implement the Swan Hill Rural City Council Economic Development Strategy 2011-2016. The report is accompanied by an attachment that demonstrates the large number of initiatives undertaken to develop a sustainable and diverse local economy.

Discussion

The Swan Hill Rural City Council Economic Development Strategy 2011-2016 was adopted by Council at its Ordinary Meeting in October 2011. The strategy is a key document that links to the Council Plan and helps guide Council's role in economic development and identifies economic development activities across the five year lifespan of the strategy.

Within the strategy there are also some actions that extend beyond the 5 year horizon. This is in recognition of the long term strategic nature of some of the activities and that many of the projects or initiatives are a long time in the planning.

Throughout the development of the strategy the focus was on understanding what Council was able to achieve or able to influence. This resulted in a series of actions across five strategic themes. The themes are:

1. Attracting New Business Investment
2. Supporting Existing Businesses to Grow
3. Marketing the Region
4. Addressing Infrastructure Needs
5. Educations and Skills Development

It should be noted that the Economic Development Strategy is implemented by many different departments across Council. Many of the actions that Council undertakes on a daily basis either supports or generates local economic development and local businesses.

The attached report breaks down each of the key themes into its actions and outlines some of the activities that Council has been undertaking since the adoption of the strategy. The report highlights that significant progress has been made in achieving many of the actions identified.

The report also highlights that Council alone cannot develop a sustainable economy. Council is supported by, and in turn supports, many private and government entities in the quest for economic growth. Funding support from both the Australian and Victorian Governments has allowed many of the actions to be achieved.

The strategy is a living document and is continually being reviewed. A new strategy will be developed during 2016. Until that time Council will continue to implement the actions identified in the 2011-2016 strategy and harness new opportunities as they arise.

Consultation

Significant consultation was undertaken in the development of the strategy and initiatives or projects undertaken in implementing the strategy are often undertaken in partnership with other organisations or require consultation themselves.

Financial Implications

Not applicable.

Social Implications

There are strong links between economic development outcomes and social outcomes. Measurable community benefits come from creating a sustainable economy including employment and improvements to community infrastructure.

Economic Implications

The development of a sustainable local economy through the five strategic themes identified in the economic development strategy has significant local economic implications. The strategy was developed to seek to leverage the strengths in the local economy and address the gaps that were identified.

Environmental Implications

The economic development strategy identified actions to improve environmental sustainability and at the same time generate local economic growth.

Risk Management Implications

Not applicable.

Council Plan Strategy Addressed

Attracting new business - We will encourage new business development and will provide support to attract new business investment and expansion in the community.

Options

Council can accept the recommendations as outlined in the report or not accept the recommendations.

Recommendation

That Council note the report.

Theme One: ATTRACTING NEW BUSINESS INVESTMENT

Initiative	Horizon Years 1-5	Horizon Years >5		
SHRCC will encourage new business developments and provide support to attract new business.				

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders		Key Activities
1. Continue to provide hard public infrastructure ensuring that the region is an attractive place to live, work and invest.	✓		Economic Development Unit, Planning Department, Murray River Group of Councils, Infrastructure Department, RDV.	✓	**Riverfront Masterplans Swan Hill (Oct 2013) and Robinvale** Completed and endorsed by Council
				✓	**Bromley Road Masterplan** Completed and endorsed by Council (Dec 2013)
				✓	**Natural Gas Feasibility Study** Completed by Consultant Victorian Government have tendered for supply of natural gas to various areas including Swan Hill Rural City. Awaiting results of tender
				✓	**Swan Hill CBD Redevelopment** Completed (April 2014)
				✓	**Swan Hill Aerodrome Business Case** Completed and endorsed by Council (Dec 2014)
				✓	**Gateway Signage Project** Completed (Jan 2014)
				✓	**George Lay Park Redevelopment** Completed (Aug 2013)
				✓	**Barry Steggal Park Development** Completed (2013)
				✓	**Municipal Road Infrastructure Upgrades** - **North South Road (2013)** - **Karinie Street (Swan Hill)** - **Perrin Street (2011)** - **Shaggyridge Road (2013)** - **Crete Road (2014)** - **Beveridge Street (Aug/Sep 2013)**
				✓	**Beveridge & McCallum Streets Drainage Upgrade** Completed (2012)
				In progress	**Aerodrome Runway Upgrade** Works likely to occur this calendar year (2014)

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities		
2. Attract new investment in identified key industries including tourism, agriculture and manufacturing through the development of targeted investment prospectuses.	✓		Economic Development Unit, DPI, Murray Regional Tourism Board, Community Groups.	✓		**Swan Hill Region Overview Marketing Materials** Fact sheets (agriculture, tourism, manufacturing, retail and municipal overview) completed and printed Investment prospectus in final draft format
				In progress		**Investment Attraction Policy Review** Final draft currently being completed
				In progress		**Robinvale Investment Prospectus** Final draft currently being completed
				In progress		**Riverfront Masterplan – Lodges redevelopment** Expression of Interest document currently under development
3. Secure new business investment through targeted and proactive engagement with potential investors in the renewable energy sector.	✓		Economic Development Unit, Environment Department, Planning Department, Community Groups.	✓		**SHRCC Solar Prospectus** Completed and endorsed by Council (2013) Distributed to solar developers (2013)
				In progress		**Wemen Substation investigation** Ongoing site analysis and discussions with potential solar investors and land owners
				On going		**Large – Medium Scale Solar Development** Liaising with potential solar investment companies
				In progress		**Blackwire Reserve Solar Development** Rezoning Completed (Nov 2012) Preferred developer selected (Dec 2012) Due diligence of site completed (2012/2013) Land under contract (June 2014)
4. Ensure well-located industrial, business and residential land are available for businesses and individuals to become established within the region.		✓	Economic Development Unit, Planning Department, Victorian State Government	✓		**Rezoning of North Park Reserve** Completed
				✓		**Karinie Street Industrial Land (Development Plan)** Completed
				✓		**Highway Business Strategy** Completed
				In progress		**South West Development Precinct** Under development
				In progress		**Tower Hill Land Release** Various stages have been completed
				✓		**Residential Development Strategy (Review)** Completed and adopted by Council

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
				✓	**Old Tech School rezoning** Completed
5. Actively pursue a 10-year Aboriginal Tourism Plan through the States Government's Tourism Victoria and Aboriginal Victoria Project with the aim of establishing an Aboriginal Interpretive Centre within the Swan Hill region.		✓	Economic Development Unit, Tourism Victoria, Wakool Shire, DPCD, Parks Victoria, Aboriginal Elders, Murray Valley Aboriginal Cooperative (MVACOP)	✓ On going	**Inclusion in Lake Boga Economic Development, Tourism and Marketing Strategy** **New Tourism Strategy currently under development (June 2014)**
				✓	**Swan Hill Riverfront Masterplan** Seeking funding to undertake a feasibility study into the development of a Interpretive Centre
6. Capitalise on opportunities presented by the rollout of a National Broadband Network, particularly in the health and education fields.	✓		Economic Development Unit, LLEN, SuniTAFE, RTOs, SHDH, RDHS, Schools, Community Groups	✓ On going	**NBN 4 Loddon Mallee** NBN Champion identified committee formed (2012)
7. Facilitate the sale and development of unoccupied green development zones (Crown Land) in the municipality on behalf of the State Government.	✓		Economic Development Unit, Planning Department, State Government, Private Developers	✓	**Old Tech School rezoning** Completed (Land sold)
				✓	**Rezoning of North Park Reserve** Completed (Land sold)
8. Improve the social infrastructure, in particular the welcoming of new residents, by developing programs with community groups, industry bodies and service providers.	✓		Economic Development Unit, Media & Events Unit, Community Facilitation Unit, Pacific Islander Guest Workers Scheme, Industry, Community Groups.	✓	**Update Guide for New Residents** Completed and printed (2013/2014)
				✓ On going	**Regional Certifying Body** Providing certification of skilled migrants for businesses
				✓ On going	**Swan Hill Region Introduction Weekend** Held as a result of the Regional Victoria Living Expo (July 2013) Planned to be held again in 2014
				✓	**Swan Hill Region App** Completed and available for download
				✓ On going	**Regular Updates of Official Visitor Guides for – Robinvale and the Swan Hill region** Completed and distributed nationally
				✓ On going	**Regional Victoria Living Expo** Annual event
9. Develop an Investment Attraction Program to streamline processes for	✓		Economic Development Unit, Planning Department.	In progress	**Investment Attraction Policy Review** Final draft currently being completed

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
large scale business investment.				✓ On going	**Industry Forums Breakfast and Luncheons** Business Breakfasts held quarterly Businesses from selected industries meet to discuss issues
10. Develop and improve upon relationships with private developers by facilitating timely investment and offering pre-lodgement meetings.	✓		Economic Development Unit, Planning Department, Developers, Real Estate Agents, RDV.	✓ On going	**Regular Pre-lodgement Meetings Occurring**
11. Actively attract private investment for the establishment of tourism-related businesses that enhance access or awareness of the regions' natural attractions.	✓		Economic Development Unit, Environment Department, Murray Regional Tourism Board, Tourism Victoria, Community Groups.	In progress	**Blackwire Reserve Solar Development (see above)**
				✓	**Riverfront Masterplans Swan Hill (2013) and Robinvale** Completed and endorsed by Council
				✓ On going	**Regional Victoria Living Expo** Annual event
				In progress	**Pioneer Settlement Redevelopment including Heartbeat of the Murray**
				✓	**Loddon Mallee Region 2014 Investment Prospectus** Features SHRCC tourism investment opportunities
				✓	**Murray Regional Tourism Board Investment Prospectus** Features SHRCC tourism investment opportunities
12. SHRCC will support improvements in access to quality early childcare and education to encourage a quality workforce.	✓		Family, Youth and Children's Services, Economic Development Unit, Community Facilitation, Swan Hill District Health, Mallee Family Care.	✓	**Swan Hill Region Workforce Development Strategy 2013 – 2017** Completed and endorsed by Council (Oct 2013) Implementation now underway

Theme Two: SUPPORTING EXISTING BUSINESSES TO GROW

Initiative	Horizon Years 1-5 <5	Stakeholders	
SHRCC will support existing businesses and encourage expansion through building business capacity and Council's own procurement policies.			

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
1. Create stronger links with business communities through more planning (info sharing) active engagement and revised communication frameworks.	✓		Economic Development Unit, Industry, Media & Events Unit, Community Groups.	✓	**Business Expansion and Retention Business Visits** 50 visits completed (May/June 2013) and report endorsed by Council (Oct 2013). To be conducted again in 2014
				✓ On going	**Economic Development Unit Newsletter** Published and distributed monthly
				✓ On Going	**Host Small Business Victoria Workshops and Seminars** Events hosted between March and August as part of Victoria's Small Business Festival, and as available.
				✓ On Going	**Swan Hill Incorporated Events and Functions** Attendance at events and functions
				✓	**Murray River Tourism Excellence Program** Completed 2012
				✓ On going	**Industry Forums Breakfast and Luncheons** Business Breakfasts held quarterly Businesses from selected industries meet to discuss issues
2. Establish a business database to assist in disseminating information and engaging the business community e.g. advertising of Council tenders, training and funding opportunities.	✓		Economic Development Unit, Media & Events Unit, Community Groups.	In progress	**Australian Business Register** A major audit of businesses in SHRCC is being conducted utilising ABN data, rates information and existing databases
				✓ On Going	**Swan Hill Incorporated Events and Functions** Attendance at events and functions

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
				In progress	**Complete Municipal Business Database** Currently being updated and revamped to include home based businesses (June 2014)
				✓ On going	**Solar Industry database** Updated as required
3. Council's Economic Development Unit will strengthen ties and increase accessibility through a number of tactics including regular site visits throughout the business community.	✓		Economic Development Unit, Industry, Community Groups.	✓	**Business Expansion and Retention Business Visits** 50 visits completed (May/June 2013) and report endorsed by Council (Oct 2013). To be conducted again in 2014
				✓ On going	**Host Small Business Victoria Workshops and Seminars** Events hosted between March and August as part of Victoria's Small Business Festival, and as available.
				✓ On Going	**Swan Hill Incorporated Events and Functions** Attendance at events and functions
				✓ On going	**Industry Forums Breakfast and Luncheons** Business Breakfasts held quarterly Businesses from selected industries meet to discuss issues
4. Facilitate programs designed by government and industry bodies to provide business development, professional development training and assistance to meet challenges identified in SHRCC.	✓		Economic Development Unit, SBV, Industry bodies, DPI, RTOs, Employment agencies, LLEN, Community Groups.	On going	**Economic Development Unit Newsletter** Published and distributed monthly
				✓ On going	**Industry Forums Breakfast and Luncheons** Business Breakfasts held quarterly Businesses from selected industries meet to discuss issues
				✓	**Swan Hill Region Workforce Development Strategy 2013 – 2017** Complete and endorsed by Council (Oct 2013) Implementation now underway
				In progress	**Advancing Country Town Project – Robinvale** Led by Robinvale District Health Services, the ACT Employment Program is improving outcomes for job seekers and industry by delivering more efficient joined up employment services, training that addresses local and regional skills gaps, and improving employability of local people.

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
				✓ On going	**Host Small Business Victoria Workshops and Seminars** Events hosted between March and August as part of Victoria's Small Business Festival, and as available.
				✓	**Murray River Tourism Excellence Program** Complete 2012
				In progress	**Strengthening Swan Hill Region's Retail Industry** Strategy development and implementation of actions to increase retail business viability. Funding received and project underway.
5. Drive a more integrated community response to events including better communication surrounding extended trading hours.	✓		Economic Development Unit, Media & Events Unit, Robinvale Resource Centre, Community Facilitation, Community Groups.	✓ On going	**Economic Development Unit Newsletter** Published and distributed monthly
				✓ On going	**Partnering with Swan Hill Incorporated on communication**
				✓ On going	**Events and Special Events Calender** Special events calendars produced during Easter and Christmas and long weekends
				✓ On going	**Council Website Update 2013** Major upgrade has been completed. The EDU will continue to update content as required.
				✓	**Swan Hill Region App** Completed and available for download
				✓ On going	**Events Pack** Compiled by EDU staff promoting attractions and important local information distributed by event organisers
6. Council will play a more active role in developing business market opportunities on a regional, national and international level. Particular emphasis will be on utilising existing links such as sister city relationships with Yamagata and Villas Bretenoux, France.	✓		Economic Development Unit, Industry, Export Development Bodies, RDV, Yamagata, Villers Bretenoux, France, AusTrade, Export Vic.	✓ On going	**Regional Victoria Living Expo** Annual event
				✓	**Sunraysia Agribusiness Summit 2014** Agricultural forum held in Robinvale in May 2014 partnered with the Robinvale District Health Service to deliver
7. Assist local businesses and industry to adapt to changes in water policies and opportunities for alternative sustainable land uses and management systems.		✓	Economic Development Unit, DPI, Industry, Environment Unit, Lower Murray Water.	✓	**Implementation of Strengthening Murray Darling Basin Communities funding program.** Strategy development for reduced irrigation water and economic impact, economic development strategy for Robinvale (2012) and Bromley Road Masterplan (2013)

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
8. Undertake skills and training projects in partnership with local businesses with seasonal labour demands to establish year round employment outcomes for seasonal workers.	✓		Economic Development Unit, LLEN, Industry, RTOs.	✓	**Swan Hill Region Workforce Development Strategy 2013 – 2017** Completed and endorsed by Council (Oct 2013) Implementation now underway
				In progress	**Advancing Country Town Project – Robinvale** Led by Robinvale District Health Services, the ACT Employment Program is improving outcomes for job seekers and industry by delivering more efficient joined up employment services, training that addresses local and regional skills gaps, and improving employability of local people.
				✓ On going	**Regional Certifying Body** Providing certification of skilled migrants for businesses
				✓ On going	**Host Small Business Victoria Workshops and Seminars** Events hosted between March and August as part of Victoria's Small Business festival, and as available.
9. SHRCC will employ an Economic Development and Tourism Projects Officer for the Robinvale area to improve business outcomes specifically for Robinvale, subject to available funding.	✓		Economic Development Unit, RDV, Industry.	✓	**Economic Development Officer Robinvale** This position was funded by Regional Development Victoria until March 2013. Ongoing support has been has been provided from existing resources.
10. Council will support the improvement of the range and early childhood education and care, flexibility in order to retain the trained workforce.	✓		Family, Youth and Children's Services, Early Childhood Education Providers, Economic Development Unit.	✓	**Swan Hill Region Workforce Development Strategy 2013 – 2017** Completed and endorsed by Council (Oct 2013) Implementation now underway
				✓	**Family, Youth and Children Services** Information packs developed & distributed
11. SHRCC through its Economic Development and Tourism Projects Officer will develop an Economic Development Strategy for Robinvale.	✓		EDU, Business Community, Federal Government, Community Groups.	✓	**Robinvale Economic Development Strategy 2012 -2017** Completed and endorsed by Council (2012)

Theme Three: MARKETING THE REGION

Initiative	Horizon Years 1-5	>5	Stakeholders	
SHRCC will work with the community to ensure the municipality is continually promoted as a family friendly place to invest, live, work, visit and shop.				

Actions	Horizon Years 1-5	>5	Stakeholders	Key Activities	
1. Increase the value of the tourism industry to the region through more targeted marketing programs in partnership with regional tourism bodies.	✓		Economic Development Unit, Murray Regional Tourism Board, Parks Victoria, Events & Media Department, Community groups, Murray Mallee Racing, Pioneer Settlement, Local tourism operators, Community Groups.	In progress	**Swan Hill Region Farmers Market Feasibility Study** Funding secured from RDV to complete a feasibility study into the establishment of market in the municipality
				✓ On going	**Murray Regional Tourism Board** SHRCC continues to be a key member of this regional marketing committee.
				✓ On going	**Swan Hill Incorporated Marketing** The EDU works in close partnership with Swan Hill Inc to implement projects such billboard advertising in Melbourne, and print and media campaigns.
				✓ On going	**Pioneer Settlement Marketing Program** Ongoing marketing of the Pioneer Settlement
2. Continue to support the partnership with Swan Hill Incorporated on the co-operative "Swan Hill - Heart of the Murray" marketing campaigns.	✓		Economic Development Unit, Community Groups.	✓ On going	**Swan Hill Incorporated Marketing** The EDU works in close partnership with Swan Hill Inc to implement projects such billboard advertising in Melbourne, and print and media campaigns.
3. Review existing marketing efforts to ensure expected economic outcomes are being achieved and encourage a more targeted approach to identified markets including empty nesters and young families.	✓		Economic Development Unit, Swan Hill and Robinvale Information Centres (RDHS), Tourism operators, Murray Regional Tourism Board, Community Groups.	In progress	**Tourism Investment Prospectuses** Promoting tourism opportunities for the LGA, Lake Boga and Robinvale, currently under development
				In progress	**SHRCC Tourism Strategy 2010 – 2013** Currently being updated and previous strategy reported on
				✓ On going	**Swan Hill Incorporated Annual Marketing Plan** The EDU works closely with Swan Hill Incorporated to ensure KPI's are achieved.
				✓ On going	**Regular Updates of Official Visitor Guides for – Robinvale and the Swan Hill region** Completed and distributed nationally

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
				✓	**Swan Hill Region Overview Marketing Materials** Fact sheets (agriculture, tourism, manufacturing, retail and municipal overview) completed and printed Investment prospectus in final draft format
				In progress	**Investment Attraction Policy review** Final draft currently being completed
				In progress	**Robinvale Investment Prospectus** Final draft currently being completed
				✓ On going	**Murray Regional Tourism Board Research** Quarterly ABS visitation reports provided
				✓	**Swan Hill Region App** Complete and available for download
				✓	**Update Guide for New Residents** Completed and printed (2013/2014)
4. Continue to update, refine and make available marketing materials and the www.swanhillonline.com website, with special emphasis on investor packs, visitor guides, new residents' kits, and informational DVDs.	✓		Economic Development Unit, Community Facilitation Unit, Media & Events Unit, Community Groups.	In progress	**Update and Redevelopment of Swan Hill Online** The upgrade will be conducted in 2014 as part of a joint marketing project with the Murray Regional Tourism Board and Swan Hill Incorporated
				✓ On going	**Regular Updates of Official Visitor Guides for – Robinvale and the Swan Hill region** Completed and distributed nationally
				✓ On going	**Council Website Update** Major upgrade was completed in 2013. The EDU will continue to update content as required.
				✓	**Swan Hill Region App** Completed and available for download
				In progress	**Update DVD** Tourism focussed DVD completed with Swan Hill Incorporated in 2013 Investment DVD in progress, industry specific grabs will be developed for online distribution
5. Maintain a detailed and up-to-date statistical profile and analysis of the Swan Hill Rural City and its various industries and economic attributes.	✓		Economic Development Unit, RDV, Industry bodies, Community Groups.	✓	**Census Data** Census data is utilised by the EDU to update marketing materials such as industry fact sheets, new resident's guides and websites.
				✓	**Profile ID and REMPLAN** Profile ID is online profile of the LGA using graphs and analysis to present statistic information on the region.

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders		Key Activities	
						REMPLAN is an online modelling program that can measure the economic impact of scenarios.
6. Seek to improve the overall tourism offering by attracting private investment into tourism-related businesses that leverage off our natural assets i.e.: Murray River.	✓		Economic Development Unit, Developers, Planning Department, Parks Victoria.		In progress	**Investment Attraction Policy Review** Final draft currently being completed
					✓	**Riverfront Masterplans Swan Hill (2013) and Robinvale** Completed and endorsed by Council
					In progress	**Swan Hill Region Farmers Market Feasibility Study** Funding secured from RDV to complete a feasibility study into the establishment of market in the municipality
					In progress	**Swan Hill to Lake Boga Trail Feasibility Study** Funding secured from RDV to investigate establishing a trail between Lake Boga and Swan Hill
					✓ On going	**Major Events Support Scheme** Support of the regions hallmark events along with new and emerging events
					✓	**Murray Regional Tourism Board Investment Prospectus** Features SHRCC tourism investment opportunities
					✓	**Loddon Mallee Region 2014 Investment Prospectus** Features SHRCC tourism investment opportunities
					In progress	**Pioneer Settlement Redevelopment including Heartbeat of the Murray**
					✓	**Lake Boga Economic Development and Tourism Marketing Strategy** Completed and endorsed by Council (2012)
					✓	**RV Friendly Infrastructure** The installation of RV friendly infrastructure throughout the municipality to attract RVs
					In progress	**Riverfront Masterplan – Lodges redevelopment** Expression of Interest document currently under development
7. Continue to be involved in and support state and regional marketing programs through Regional Development Victoria and the Murray Regional Tourism Board.	✓		Economic Development Unit, Murray Regional Tourism Board, RDV, Community Groups.		✓ On going	**Regional Victoria Living Expo** Annual event
					✓ On going	**Murray Regional Tourism Board Membership** Membership 2011 – 2014 New agreement endorsed December 2013 for the period 2014 – 2017

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
8. Continue to run a quality accredited Visitor Information Service and Booking Office in Swan Hill and support the Robinvale Euston Information Centre.	✓		Economic Development Unit, Town Hall, Robinvale District Health Service, Cultural Services, Pioneer Settlement, Community Groups.	✓ On going	**Swan Hill Region Information Centre** Accreditation renewal annually. 2014 has been approved
				In progress	**Review of Visitor Services in Robinvale** A review is currently underway in regards to visitor servicing in Robinvale
9. Continue to use and enhance the effectiveness of the Major Events Support Scheme. Increase the targeted marketing to identify groups that could hold events during quieter visitor periods.	✓		Economic Development Unit, Community Facilitation Unit, Events & Media Unit, Industry bodies, Community Groups, Tourism operators	✓ On going	**Major Events Support Scheme** Support of the regions hallmark events along with new and emerging events
10. Develop a Economic Development, Marketing and Tourism Strategy for Lake Boga, complete with investment prospectuses that suit the areas competitive advantages.	✓		Economic Development Unit, RDV, Industry, Community Facilitation Unit, Community Groups.	✓	**Lake Boga Economic Development and Tourism Marketing Strategy** Completed and endorsed by Council (2012)
				In progress	**Investment Prospectuses for Lake Boga** Currently under development as part of the overall municipal investment prospectus
11. Promote services and activities for young people, to reflect the youth and family friendliness of SHRCC.	✓		Family, Youth and Children's Services, Youth Service Providers, Youth Connections, Youth Inc., SHDH, RDHS, Community groups, Community Facilitation Unit, Community Groups.	✓	**Swan Hill Region Overview Marketing Materials** Fact sheets (agriculture, tourism, manufacturing, retail and municipal overview) completed and printed Investment prospectus in final draft format
				✓ On going	**Regional Victoria Living Expo** Annual event
				✓	**Family, Youth and Children Services** Information packs developed & distributed
12. Undertake and develop specific marketing materials that promote the Swan Hill Region as a place to invest, work and live.	✓		Economic Development Unit, Community Groups.	✓	**Swan Hill Region Overview Marketing Materials** Fact sheets (agriculture, tourism, manufacturing, retail and municipal overview) completed and printed Investment prospectus in final draft format
				✓	**Swan Hill Region App** Complete and available for download
				✓	**Update Guide for New Residents** Completed and printed (2013/2014)
				✓	**SHRCC Solar Prospectus** Completed and endorsed by Council (2013) Distributed to solar developers (2013)

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
				✓	**Murray Regional Tourism Board Investment Prospectus** Features SHRCC tourism investment opportunities
				In progress	**Update and Redevelopment of Swan Hill Online** The upgrade will be conducted in 2014 as part of a joint marketing project with Murray Regional Tourism Board and Swan Hill Incorporated
13. Identify and attend marketing events that promote the region as a place to invest, work, live, visit and shop.	✓		Economic Development Unit.	✓ On going	**Regional Victoria Living Expo** Annual event
				✓ On going	**National Caravan and Camping Shows** Annual events
				✓	**CMCA Rally – Robinvale 2014** Robinvale hosted the 2014 CMCA rally which attracted approximately 1500 for over 7 days

Theme Four: ADDRESSING INFRASTRUCTURE NEEDS

Initiative	Horizon Years 1-5	Horizon Years >5	Stakeholders		
SHRCC seeks to ensure that appropriate infrastructure is provided to continue our economic growth.					

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
1. Facilitate the building of the new Murray River Bridge for Swan Hill, in partnership with the Wakool Shire Council (NSW) and the appropriate Victorian and New South Wales State Governments in a timely fashion.		✓	Economic Development Unit, VicRoads, RTA, Wakool Shire Council, Community Facilitation Unit.	In progress	**Location Under Review** Bridge location identified and adopted by the Victorian Government. SHRCC seeking a review of the decision and adoption of alternative location.
2. Ensure that rural settlements remain viable and desirable places to live, work and do business by maintaining a high standard of Council functions and protecting the unique attributes of the towns.	✓		Economic Development Unit, Community Planning, SHRCC, Community Groups.	✓	**Riverfront Masterplans Swan Hill (Oct 2013) and Robinvale** Completed and endorsed by Council
				✓	**Gateway Signage Project** Completed (Jan 2014)
				On going	**Community Plans** Continue to implement community plans
				✓	**Discovery Drive CD** Discover drive throughout the entire municipality
				✓	**RV Friendly Infrastructure** The installation of RV friendly infrastructure throughout the municipality to attract RVs
				In progress	**Swan Hill Region Farmers Market Feasibility Study** Funding secured from RDV to complete a feasibility study into the establishment of market in the municipality
				In progress	**Swan Hill to Lake Boga Trail Feasibility Study** Funding secured from RDV to investigate establishing a trail between Lake Boga and Swan Hill
3. Lobby State and Federal Governments for the delivery of major hard infrastructure into the region including		✓	Economic Development Unit, State Government, MRGC, Community Facilitation Unit, RDV, VicRoads, VLine.	✓	**Natural Gas Feasibility Study** Completed by Consultant

reticulated natural gas and soft infrastructure including increased transport connections throughout the municipality and Loddon Mallee region.				In progress	**Central Murray Transport Strategy 2012** Regional approach to transport, implementation now underway
				In progress	**Central Murray Intermodal Transport Strategy 2014** Currently being finalised
4. Develop a business case for the extension of reticulated natural gas for the Loddon Mallee, specifically the Swan Hill region, in partnership with the Murray River Group of Councils (subject to funding from the State Government).	✓		Economic Development Unit, State Government, MRGC, Environment Industry bodies.	✓	**Regional Business Case Developed 2011** SHRCC in conjunction with the Murray River Group of Councils developed a business case for the region which led to the State Government pledging $1m to undertake a Feasibility Study.
5. Lobby for the establishment of an inland transport hub including intermodal connections between road and rail freight.		✓	Economic Development Unit, Infrastructure, State Government, VicRoads, VLine, Planning Department, MRGC.	In progress	**Central Murray Transport Strategy 2012** Regional approach to transport, implementation now underway
				In progress	**Central Murray Intermodal Transport Strategy 2014** Currently being finalised
6. Support the redevelopment of the Chisholm Reserve Motorsport Complex so that it is capable of hosting major regional, national and international motorsport events in partnership with local motorsport clubs and national motorsport bodies.	✓		Economic Development Unit, Planning Department, Infrastructure, State Government, Motorsport Industry Bodies, Community Groups, Media & Events Unit.		**Community Facilitation** Regular meetings with user groups occurring State Government funding application lodged.
7. Complete required upgrades to the Swan Hill Aerodrome site and develop a business study into future use.	✓		Economic Development Unit, Infrastructure, RDV, Industry bodies, Planning Department, State Government.	✓	**Swan Hill Aerodrome Business Case** Completed and endorsed by Council (Dec 2014)
8. Support the Mildura Rail Link Feasibility Study recommendations five and nine to capture additional services from Swan Hill to Bendigo or Melbourne and increased bus links with the Loddon Mallee region.	✓		Economic Development Unit, Mildura RCC, RDV, VLine, State Government.	In progress	**Central Murray Transport Strategy 2012** Regional approach to transport, implementation now underway
9. Develop the Robinvale and Swan Hill riverfronts in partnership with State and Federal Governments, key stakeholders and private investors with the aim of improving tourism within the municipality.		✓	Economic Development Unit, Planning, Infrastructure Department, RDV, State & Federal Government, Community Groups, Community Facilitation Unit.	✓	**Riverfront Masterplans Swan Hill (Oct 2013) and Robinvale** Completed and endorsed by Council
10. Advocate for the relocation of Council information services in Robinvale and/or provide a physical upgrade to	✓		Economic Development Unit, Infrastructure, Centrelink, RDHS, Planning Department, RDV,	In progress	**Review of current visitor services in Robinvale**

the existing site in partnership with other key stakeholders.			Community Groups, Community Facilitation Unit.	✓	**Bromley Road Masterplan** Completed and endorsed by Council (Dec 2013)
11. Upgrade the region's road network through partnerships with VicRoads and major transport users to support projected increases of heavy transport usage, especially in the west of the municipality.		✓	Economic Development Unit, Planning Department, Infrastructure, Transport Industry, VicRoads, Industry bodies.	In progress	**Central Murray Transport Strategy 2012** Regional approach to transport, implementation now underway
				In progress	**Central Murray Intermodal Transport Strategy 2014** Currently being finalised
12. Complete the installation of the Gateway Signage Program by 2013 including the installation of over 55 signs throughout the municipality.	✓		Economic Development Unit, Communities, Community Facilitation Unit, Engineering Department, Planning Department.	✓	**Gateway Signage Project** Completed (Jan 2014)
13. Address cross border differences in planning, regulation, service provision and opportunities more efficiently through the establishment of a new collaborative forum involving Local, State and Federal Government regionally-based representatives from Victoria and New South Wales. The forum will identify and develop processes to resolve cross-border differences to be endorsed by the NSW & VGBAC.		✓	Economic Development Unit, State Government, Federal Government, Wakool Shire Council, Balranald Shire Council, Gannawarra Shire Council, Service providers, SHRCC, MRG of Councils, Industry bodies.	On going	**Central Murray Transport Forum** **Victorian State Logistics Plan**
14. Advocate for and support the implementation of the Swan Hill District Hospital Master Development Plan.	✓		SHDH, SHRCC, State Government.	Ongoing	**Involvement and Support provided from Council as required**

Theme Five: EDUCATION AND SKILLS DEVELOPMENT

Initiative	Horizon Years 1-5	Horizon Years >5	Stakeholders
SHRCC will encourage and support local employment opportunities with the aim to improve employment outcomes for local residents.			
SHRCC will seek to advocate for increased local post-secondary education options and explore other opportunities to encourage an appropriate level of skills in the community.			

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
1. Design and implement Workforce Development Strategies with the private sector and public sector, including the region's Registered Training Organisations (RTOs), to address the region's skills shortages.	✓		Economic Development Unit, LLEN, Industry, State Government, RTOs, Business Communities, Pacific Islander Guest Workers Scheme, Community Groups.	✓	**Swan Hill Region Workforce Development Strategy 2013 – 2017** Completed and endorsed by Council (Oct 2013) Implementation now underway
2. Facilitate the development of a Municipal Learning Strategy, inclusive of all development stages from early childhood to adult learning opportunities.	✓		Economic Development Unit, LLEN, RTOs, SuniTAFE, Loddon Mallee Department of Education, Education Providers, Family Youth & Children's Services.	Yet to commence	Priority has been on the development of the Workforce Development Strategy
3. Support local Registered Training Organisations in the expansion of education offerings that address regional skills shortages, particularly in the agricultural, manufacturing, construction industries and health and community services.	✓		Economic Development Unit, LLEN, RTOs, Industry, Health & Community Organisations, State Government, Education Providers.	✓	**Swan Hill Region Workforce Development Strategy 2013 – 2017** Completed and endorsed by Council (Oct 2013) Implementation now underway
				In progress	**Advancing Country Town Project – Robinvale** Led by Robinvale District Health Services, the ACT Employment Program is improving outcomes for job seekers and industry by delivering more efficient joined up employment services, training that addresses local and regional skills gaps, and improving employability of local people.
				✓ On going	**Regional Victoria Living Expo** Annual event

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
4. Support improved access to tertiary education via a regional university campus shop front and/or access to appropriate university links, through collaborative partnerships between SuniTAFE and Universities such as the "Deakin at your Doorstep" program.		✓	Economic Development Unit, LLEN, SuniTAFE, National Universities, Loddon Mallee Department of Education, Education Providers.		**Working in partnership with SuniTAFE** To promote courses and the region via the Workforce Development Strategy. Deakin at your Doorstep program occurring
5. Attract private investment for the development of affordable accommodation options for travelling students and foreign backpackers.	✓		Economic Development Unit, SuniTAFE, Private Developers, Planning Department, RTOs.	In progress	**Investment Attraction Policy Review** Final draft currently being completed
				✓	**Swan Hill Region Workforce Development Strategy 2013 – 2017** Completed and endorsed by Council (Oct 2013) Implementation now underway
				In progress	**Advancing Country Town Project – Robinvale** Led by Robinvale District Health Services, the ACT Employment Program is improving outcomes for job seekers and industry by delivering more efficient joined up employment services, training that addresses local and regional skills gaps, and improving employability of local people.
				On going	**Working with Large Employers** Meetings occurring with large employers in the region including the Swan Hill Abattoirs.
6. Offer and encourage work experience programs throughout the business community including the Victorian Government's Young Professionals Provincial Cadetship Program for tertiary students and structured workplace learning opportunities.	✓		Economic Development Unit, LLEN, Industry, Community Groups, Community Facilitation Unit, Education Industry, RDV, AES.	On going	**Swan Hill Incorporated Accounting Work Experience Program** Participating
7. Link to the Victorian Aboriginal Economic Development Agenda and Yareeta Yirramboi (the Victorian Aboriginal Public Sector Employment and Career Development Plan 2010-2015) to ensure a co-ordinated approach to regional Indigenous employment, with the aim of increasing public and private sector employment for Indigenous people.		✓	Economic Development Unit, Kinaway-Aboriginal Chamber of Commerce (Vic), MVACOP, DPCD, Aboriginal Elders, AES.	Yet to commence	No progress

Actions	Horizon Years 1-5	Horizon Years >5	Stakeholders	Key Activities	
8. Assist and support the Aboriginal Employment Strategy (AES) in the establishment of an AES Service Centre with the Swan Hill Rural City, in the aim of improving regional employment outcomes for local Indigenous communities.	✓		Economic Development Unit, Aboriginal Employment Strategy, Federal Government, LLEN, SHRCC, RTOs, MVACOP, Industry.	In progress	A number of events (2011) held with interested parties, however no outcome as yet.
9. Continue to deliver the Pacific Islander Guest Workers Program as part of the Department of Immigration and Citizenships Diverse Australia Program.	✓		Economic Development Unit, Federal Government, DICDA, Local Employers, Community facilitation.	Ceased	**Funding from Federal Government Ceased June 2013**
10. Support flexible and effective early childhood education options, to allow adult enrolment in formal and informal education.	✓		Family, Youth and Children's Services, Education Providers, SHDH, Welfare providers, MMLLEN, RTOs.	In progress	**Community and Cultural Services Program** Supporting the development of an Early Years Centre in Robinvale – offering long day and occasional care as well as actively encouraging links between existing and potential occasional care providers in Swan Hill

B.14.38 ROOMING HOUSE AND PRESCRIBED ACCOMMODATION UPDATE

Responsible Officer: Director Development and Planning
File Number: 48-12-01
Attachments: Nil

Declarations of Interest: Officer
Brett Luxford - as the responsible officer, I declare that I have no disclosable interests in this matter.

Summary

This report provides an update on the actions Council takes following reports of alleged rooming houses operating in various locations throughout the municipality. This report also highlights the challenges faced relating to the investigation, compliance and follow-up of alleged rooming houses and requests that Council advocate for a coordinated approach to rooming houses and temporary worker accommodation across the region.

Discussion

The issue relating to alleged unregistered rooming houses and the challenges faced during investigation and enforcement are widespread throughout Victoria. There has also been media attention in recent months regarding rooming houses and follow-up of alleged rooming houses.

Council actively follows up on any reports it receives in relation to rooming houses and has a coordinated internal approach involving four separate departments. Upon receipt of advice regarding an alleged rooming house operating within the municipality, Council employees implement the Cross Functional Rooming House Investigation Procedure which involves Public Health, Building, Planning and Local Laws.

An inspection of the alleged property is conducted by a cross functional team of Authorised Council Officers. Where breaches and non-compliance of respective legislation are identified (eg) Public Health, Building, Planning and Local Laws, the necessary enforcement processes are implemented in accordance with the relevant Acts and Regulatory provisions.

As a result of legislative changes in 2008 and 2009, Council has had a key role to play in enforcement and registration of rooming houses. Since this time Council employees have conducted a number of investigations of alleged rooming houses in Robinvale, Nyah West, Lake Boga and Woorinen.

The following example of an investigation highlights the challenges Council faces in enforcing legislation relating to rooming houses. In 2009 Council received information about 20 alleged rooming houses operating in the Robinvale area. A large investigation resulted in only one of the premises requiring registration with Council as a rooming house. Four other building owners were issued with Building Notices and Orders with respect to illegal building works, lack of smoke detectors, etc.

The above example highlights that while it may be easy for local residents to identify what appears to be an "alleged" rooming house, the ability to gather sufficient evidence to prove a premises is operating in that manner is difficult to obtain. The protracted investigation and subsequent legal processes and costs incurred are also a major frustration.

As an example, matters relating to an alleged rooming house investigated in 2009 were not heard in the Magistrates Court until 2011. Legal costs were in the order of $5,000 and Council employee time involved in this matter was significant. The Magistrate only awarded $1,500 in costs to Council.

As a result when Council receives complaints about an alleged rooming house, Council Officers will seek to work with the owner of the premises to either stop the activity or put into place the necessary requirements and register the premises. To assist, Council's Public Health and Building departments have developed information kits and links are also available on Council's website that is specific to rooming house requirements.

Council's Planning, Building and Public Health departments have also worked together to develop an 'On-Farm Workers Accommodation Guideline' to assist farmers who are looking to develop workers' accommodation on-farm.

The challenges faced by the Council are reflected across the region and across the state and while Council actively enforces the legislation more may be achieved through a coordinated approach by other tiers of Government and industry. A coordinated approach will help ensure that safe accommodation is available for a workforce that is vital to the region.

Consultation

Nil

Financial Implications

There are significant officer resources required to investigate rooming house complaints and the financial impacts to follow up non-compliance is also substantial.

Social Implications

The report will contribute to improving the health and wellbeing of communities.

Economic Implications

Nil

Environmental Implications

Nil

Risk Management Implications

Nil

Council Plan Strategy Addressed

Housing - We will support appropriate accommodation options for our growing economy.

Options

1. Adopt all of the recommendations as outlined below.
2. Adopt some of the recommendations.
3. Choose not to accept the report.

Recommendations

That Council:

1. Note the report.

2. Advocate to other tiers of government and relevant agencies for a coordinated approach to rooming houses and temporary worker accommodation across the region.

B.14.39 PLANNING SCHEME AMENDMENT REQUEST - C58 LAND - SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT

Responsible Officer: Director Development and Planning
File Number: 73-02-125
Attachments:
1 Swan Hill C58 001znMaps36_39_40 Exhibition
2 Swan Hill C58 003dpoMaps36_39 Exhibition
3 Swan Hill C58 002dpoMaps39_40 Exhibition
4 Schedue 6 for DPO Draft
5 Version 4.5 SWDP
6 Infastructure Cost Sharing Calculations
7 SWDP Planning Report 23 June 2014
8 SWDP Drainage Strategy 23 June 2014
9 SWDP Traffic Strategy 2 July 2014
10 TIA Final 20 June 2014
11 TIA Appendices Report

Declarations of Interest: Officer
Brett Luxford - as the responsible officer, I declare that I have no disclosable interests in this matter.

Summary

The purpose of this report is to request Council resolve to seek authorisation from the Minister for Planning (**Minister**) to undertake amendment C58 to the Swan Hill Planning Scheme.

Council adopted the "*Review of the Swan Hill Residential Development Strategy 2006-2030"* at its meeting in March 2013. When adopting the Strategy, Council directed that officers review the previously prepared Outline Development Plan (**ODP**) for the Swan Hill South West Development Precinct and undertake necessary amendments to the Planning Scheme.

Accordingly, the previously prepared ODP and the associated documents have been reviewed. A revised draft Swan Hill South West Development Plan (**SWDP**) has been prepared, which together with the background documents, inform this amendment.

The majority of the land within the SWDP is zoned Farming and Low Density Residential. As such this amendment is required to rezone these parcels of land to General Residential Zone (**GRZ**) to facilitate the supply of residential zoned land as identified in the draft SWDP. The amendment also proposes to apply necessary planning controls to land within the SWDP to ensure fair, orderly and sustainable development outcomes within the SWDP.

Discussion

Land affected by the amendment

The SWDP includes 33 parcels of land; however the amendment applies to only 27 parcels of land within the Precinct.

The following map shows the land within the SWDP.

Swan Hill South West Development Precinct and Current Zoning **N**

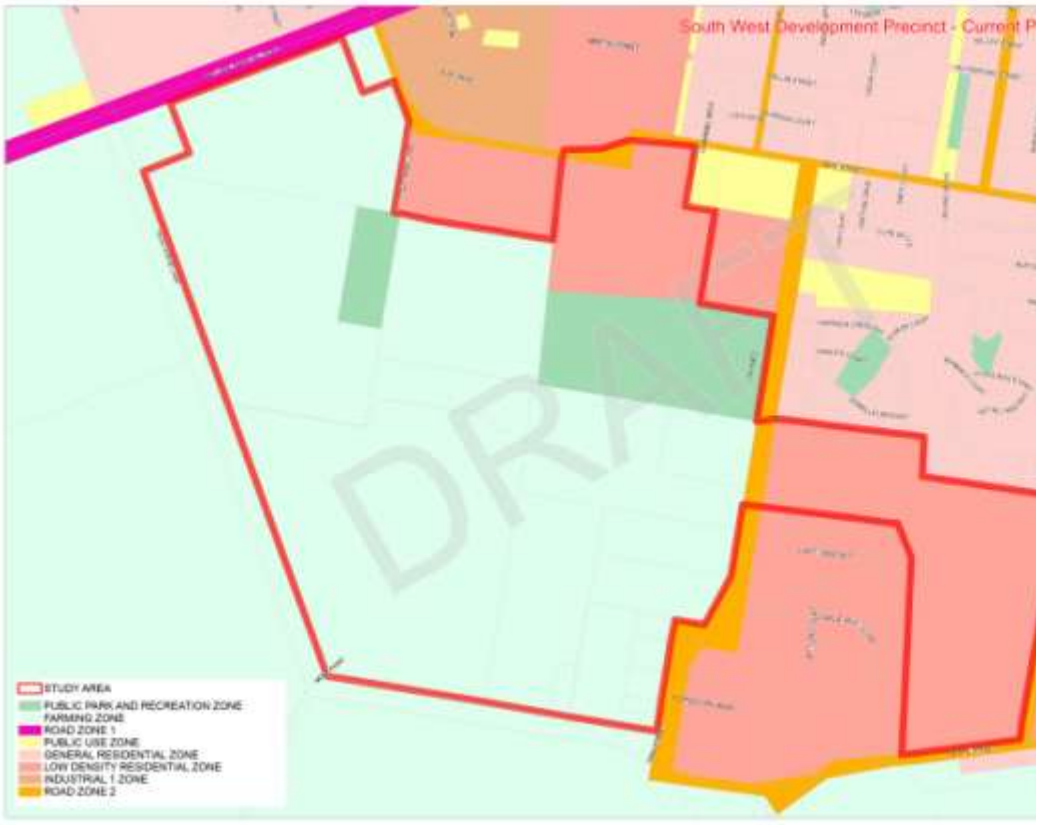


Table below lists the land within the SWDP that is to be rezoned by this amendment.

Land affected by amendment C58

Address	Lot No	TP/PS/LP	Approximate Size/ha
Dead Horse Lane, Swan Hill	Lot 2	PS 131446	28.3ha
Sea Lake-Swan Hill Road, Swan Hill (part of)	Lot 2	PS 405842S	19.8ha
Feldtmann Lane, Swan Hill	Lot 1	LP 131446	3.8ha

Address	Lot No	TP/PS/LP	Approximate Size/ha
Dead Horse Lane, Swan Hill (part of)	Lot 1	TP 821121W	17.3ha
Dead Horse Lane, Swan Hill	Lot 1	TP 821120Y	51.8ha
183-187 Gray Street, Swan Hill (part of)	Lot 1	TP 519005	5.0ha
177 Gray Street, Swan Hill	Lot 1	TP 814807A	0.4ha
175 Gray Street, Swan Hill	Lot 1	TP 519770S	0.5ha
173 Gray Street, Swan Hill	Lot 1	PS 424914L	0.9ha
179 Gray Street, Swan Hill	Lot 1	TP 539204Q	7.1ha
70 Yana Street, Swan Hill	Lot 1	PS 76581	4.4ha
98 Yana Street, Swan Hill	Lot 1	TP 179253F	13.9ha
110 Yana Street, Swan Hill	Lot 1	PS 99806	4.8ha
116 Yana Street, Swan Hill	Lot 1	TP 205402A	4.8ha
235 Dead Horse Lane, Swan Hill	Lot 2	PS 124722	13ha
233 Dead Horse Lane, Swan Hill	Lot 1	PS 124722	0.8ha
249 Dead Horse Lane, Swan Hill	Lot 2	PS 637281M	4.8ha
134 Yana Street, Swan Hill	Lot 3	PS 99806	0.6ha
142 Yana Street, Swan Hill	Lot 1	PS 75694	0.9ha
148 Yana Street, Swan Hill	Lot 2	PS 75694	0.8ha
154 Yana Street, Swan Hill	Lot 1	PS 637281M	0.5ha
75 Yana Street, Swan Hill	Lot 1	LP 117284	3.3ha
75 Yana Street, Swan Hill	Lot 2	LP 117284	6.7ha
Coronation Avenue, Swan Hill	Lot 18	LP14827	6ha
112 Coronation Avenue, Swan Hill	Lot 19	LP14827	6.1ha
112 Coronation Avenue, Swan Hill	Lot 2	LP 205853S	11.4ha
152 Coronation Avenue, Swan Hill	Lot 1	LP205853S	0.8ha
	TOTAL Approximately		**218.5ha**

Although located within the SWDP the following parcels of land listed below will not be rezoned as part of amendment C58 and will be retained in their current zone:

- Properties excluded from being rezoned due to required setback from industrial activities in Gray Street as per requirements of Clause 52.10 of the Swan Hill Planning Scheme, include:
    - Entire land at Nos. 69 and 71 Sea Lake – Swan Hill Road, Swan Hill;
    - No. 219 Gray Street, Swan Hill;
    - No. 183-187 Gray Street (Lot No. 1 TP 614559H);
    - Part of No. 183-187 Gray Street, Swan Hill (Lot No. 1 TP 519005); and
    - A 70 metre wide and 140 metre long strip of land along Gray Street of Lot No. 2 PS 405842 Sea Lake- Swan Hill Road.
- Property at No. 7 Dead Horse Lane will be retained as Farming Zone pending Environmental Audit justifying the suitability of the land for residential uses.

- The Council owned and managed Ken Harrison Reserve will be retained as Public Park and Recreation Zone.

The SWDP also includes land currently used by the Goulburn Murray Water channel; this land will also be rezoned. The authority is in the process of decommissioning the channel infrastructure and aims to reinstate the land used for the channel. However, future developments on land that are reclaimed as a result of decommissioning of the channel requires further investigation to demonstrate the suitability of the land to use and develop for residential and other purposes.

Overlays affecting the SWDP

There are three overlays affecting the land within the SWDP:

- Development Plan Overlay – Schedule 2 (DPO2) affects the land zoned LDRZ. This DPO 2 will be removed and will be replaced with a new Scheduled DPO6 that will be applied to all land to be rezoned for residential purpose within SWDP.
- The southern boundary along Werril Street of the SWDP is affected by Airport Environs Overlay (AEO) and a Design and Development Overlay (DDO). These overlays will be retained.

Overlays currently affecting the SWDP **N**

What the amendment does

Amendment C58 proposes to rezone land within the Swan Hill South West Development Precinct to facilitate the supply of future residential zoned land. It also proposes Schedule 6 to the Development Plan Overlay to implement the final Swan Hill South West Development Plan and removes Schedule 2 to the Development Plan Overlay from land within the SWDP.

In particular the amendment proposes the following:

- Rezones Farming Zone land to General Residential Zone,
- Rezones Low Density Residential Zone land to General Residential Zone,
- Rezones Public Park and Recreation Zone land to General Residential Zone,
- Rezones Farming Zone land to Commercial 1 Zone (to provide a retail activity area),
- Rezones Farming Zone land to Public Park and Recreation Zone (to provide a small public open space),
- Introduces new Schedule to Development Plan Overlay (DPO6) to Clause 43.04 and amends maps 39 DPO and 40 DPO; and
- Removes Development Plan Overlay Schedule 2 (DPO2) in map 39 DPO and 40 DPO from land within the Swan Hill South West Development Precinct.

Compliance with planning and Council policies

Compliance with the State Planning Policy Framework (**SPPF**)

The proposed amendment directly supports an implementation of the State Planning Policy Framework through the following:

Clause 11 Settlement of SPPF

A rezoning of land within the SWDP is a proactive response by Council to the needs of existing and future communities. The proposal provides appropriately zoned and serviced land for housing; it will generate direct and indirect employment opportunities; and facilitate the provision of recreation and open spaces, commercial and community facilities and necessary infrastructure for future communities.

Clause 15 Built Environment and Heritage of SPPF

The proposed Schedule 6 to Clause 43.04 – Development Plan Overlay ensures orderly outcomes as per the requirements of the proposed General Residential Zone. The SWDP is not affected by heritage overlay.

Clause 16 Housing of SPPF

The proposed rezoning will facilitate the provision of diverse and affordable housing choices to local communities and will ensure the efficient provision and use of supporting infrastructure.

The proposed Schedule 6 to Clause 44.04 (Development Plan Overlay) ensures that new housing within the SWDP will have access to services, and will facilitate long term sustainability by facilitating walking to activity areas, open space and recreational facilities, and public transport service.

Clause 17 Economic Development of SPPF

The amendment will have a positive impact on the local economy. There will be direct and indirect job opportunities created during the construction of future developments. In addition, the proposed retail activity area, medical centre, aged care facility and child care centre will bring permanent employment opportunities to Swan Hill.

Clause 18 Transport of SPPF

The proposed draft Development Plan identifies the need and allocates land for the provision of six bus stops (on three key locations) along the main collector road that runs through the precinct. The proposed Schedule 6 to the Development Plan Overlay encourages increased densities along the collector roads and closer to the activity areas to maximise the use of public transport service when it becomes available. In addition, the draft Development Plan proposes shared paths that can encourage and support alternative and sustainable transports models like walking and cycling.

Clause 19 Infrastructure of SPPF

The draft Development Plan proposes and facilitates the provision of necessary infrastructure and the efficient use of existing infrastructure that is already servicing the surrounding areas of Swan Hill township. It encourages necessary social and physical infrastructure including medical and childcare centres, aged care facilities and retail activity area within the SWDP.

Local Planning Policy Framework (LPPF)

The proposed amendment supports and implements the Local Planning Policy Framework, including the Municipal Strategic Statement (**MSS**) as follows:

Clause 21.02 Key Influences and Issues of the MSS

The rezoning supports key issues for the municipality including facilitating residential and economic development and maximising the use of existing infrastructure.

Clause 21.04 Settlement and Housing of the MSS

The rezoning supports the municipality's objectives for settlement by helping to facilitate residential use and developments which are encouraged in the major regional centre of Swan Hill.

Clause 21.04-4 Orderly growth of towns and settlements of the MSS

Clause 21.04-4 highlights the need to prepare an Outline Development Plan for the Swan Hill South West Development Precinct to facilitate future residential development. This amendment fulfils this requirement.

Clause 21.08 Economic Development of the MSS

The rezoning supports Council's economic development objectives in allowing for appropriate non-residential activities within the SWDP.

Clause 21.10-1 Swan Hill of the MSS

The rezoning will support the enhancement of Swan Hill as a strong regional centre.

Infrastructure provision

The attached draft Swan Hill South West Development Plan identifies the necessary development and community infrastructure within the Precinct. Concept infrastructure requirements for traffic and drainage servicing the SWDP have been prepared by Council to assist developers and Council in the planning for this planning scheme amendment and determining the viability of this rezoning. These concept infrastructure requirements are listed in the following documentation:

- Swan Hill South West Development Precinct Drainage Strategy
- Swan Hill South West Development Precinct Traffic Impact Assessment
- Swan Hill South West Development Precinct Traffic Strategy
- Swan Hill South West Development Precinct Infrastructure Cost Sharing Calculations

Further detailed design and studies as listed within the proposed Schedule 6 to the Development Plan Overlay will be required before development can commence.

The Planning and Environment Act 1987 (**Act**) specifies that infrastructure provision can be funded by either or a combination of:

- Development Contributions Plans (**DCP**)
- Under Section 173 Agreements of the Act

In considering the length of time for the completion of the development (in excess of 40 years) within the SWDP and the associated difficulties in determining standards and costs over that timeframe it was determined to enter into a series of s173 Agreements to facilitate development.

One advantage in the use of s173 agreements was that together with subdividing the SWDP into 6 sub-precincts, development could commence in each of these sub-

precincts independently of other sub-precincts. All landowners participated during consultations agreed in principle to enter into s173 Agreements.

However, it is vital that these agreements are signed prior to seeking authorisation to prepare the amendment to the Minister. In particular, the *Ministerial Direction No. 15 – The Planning Scheme Amendment Process* sets clear timelines for completing each step of the amendment process.
Upon receipt of the authorisation, Council has to commence the amendment process and publically exhibit the documents within 40 business days. As such any delay in getting the s173 agreements signed could obstruct the amendment process.

Consultation

Consultation undertaken prior to the commencement of the amendment

During the preparation of the revised draft Development Plan, consultation has been undertaken with the landowners within the SWDP. Where possible and appropriate, landowners' requirements have been incorporated into the revised Development Plan.

Further, landowners were consulted as individual groups at sub-precinct level to discuss the cost sharing options. They were presented with information on all the infrastructure projects required in future developments, cost of these projects, and the following four options available for sharing the cost for the infrastructure projects.

1. Option 1 – Development Contribution Plan
2. Option 2 – Two or more Development Contribution Plans to match the rate of proposed development in Swan Hill.
3. Section 173 Agreements for sub-precincts.
4. A combination of DCP and section 173 Agreements

Landowners were requested to choose an option from the above four. Landowners who attended the consultation meetings chose the Section 173 option for the provision of infrastructure.

Accordingly required section 173 agreements were prepared by legal professionals and the draft were sent to the landowners for comments prior to them being finalised for signing.

Where needed, State agencies were consulted with and without landowners to promote and facilitate landowners' interests without compromising agency's requirements.

In addition to the formal meetings, Council Officers met with landowners and their representatives when needed and or at landowners' request.

Further, landowners were kept informed via written correspondence of the progress of the project.

In addition to the consultation with the landowners, series of consultations were undertaken with the following State agencies:

- Lower Murray Water Authority – No objection and supports the amendment in principle.
- Goulburn Murray Water Authority – No objection and supports the amendment in principle.
- Country Fire Authority – No objection and supports the amendment in principle.
- VicRoads – The authority does not have any objection to the proposed development Plan, except for providing direct access to Sea Lake – Swan Hill Road.

  However the traffic impact assessment undertaken for the Development Plan specifies the upgrades requirements for the provision of safe and convenient direct access to Sea Lake – Swan Hill Road.

  Recommended upgrades have been incorporated as part of the infrastructure provision and necessary arrangements have been put in place to ensure that the upgrades are completed at the right time to the quality and standards required.
  During the exhibition period, VicRoads will be able to provide formal comments on the proposed direct access indicated on the draft Development Plan.

- Department of Environment and Primary Industries – No objection and supports the amendment in principle. The authority is also supportive of the environmental impact assessment and soil testing requirements to be included in the Schedule 6 to DPO. Especially, given the 40 years residential supply/development time of the Precinct, there could be changes in land use practices which will impact on the environment and flora and fauna. As such it is agreed that it will be appropriate to undertake such assessments at the time of development.
- Department of Transport – The Department recommends increased densities especially along the proposed public transport route. The proposed Schedule 6 encourages increased densities along the collector roads and around the activity areas.
- Aboriginal Affairs Victoria – The authority is supportive of the amendment and informed that there is no known cultural heritage significance within the SWDP. The authority provided notes to be included in planning permits in relation to cultural heritage significance. These notes are included in the proposed Schedule 6 to the Development Plan Overlay.

- Department of Transport, Planning and Local Infrastructure – Throughout the development of the revised Development Plan the Department had been consulted and kept informed of its progress. The Department also reviewed the amendment documents prior to send for authorisation. The Department is generally supportive of the amendment.

All of the relevant agencies will be formally notified during the exhibition process.

Relevant internal Council departments were consulted during the development of the draft Development Plan and background documents. In particular, inputs were sought from the Asset Management Department, Engineering Department, Environment Sustainability Unit, Council Valuer, Economic Development, and Community Facilitation Unit.

Proposed consultation during public exhibition

Upon receipt of the authorisation, public exhibition will be held for a period of four weeks. During the public exhibition period, the owners and occupiers of affected land and the adjoining properties will be notified. Further, a public notice will be published at the local news paper the *Guardian* every Wednesday during the public exhibition period. Two drop-in sessions will also be held for the public and agencies to drop in and discuss the amendment and clarify any issues with Council officers. A Notice of Amendment will also be published in the Government Gazette.

Further, amendment documents will be made available at Council's website, and Council Office.

In addition, notices will be sent to the prescribed Ministers, relevant State agencies and any other agencies required by the Minister for Planning during authorisation.

Financial Implications

Council will be paying the Planning Scheme Amendment fees. In addition, depending on the number of submissions received during the public exhibition there will be costs associated with Panel Hearing.

Social Implications

The amendment will facilitate the supply of residential land to meet the increasing housing needs of Swan Hill communities. Provision of appropriately zoned land is critical in addressing the affordable housing issues. In addition, future developments within the SWDP will offer a variety of residential lots that will meet the diverse housing needs of the future population.

The draft Development Plan encourages the provision of community facilities such as aged care facilities, medical centre, child care centre, retail activity areas and public places. Further, the proposed Schedule 6 to DPO encourages that future

developments within the SWDP incorporate Sustainable Design and Healthy by Design principles. The development infrastructure within SWDP is to be constructed to the standards specified in the Local Government Infrastructure Design Association's Infrastructure Design Manual (adopted by Council in April 2013).

The above requirements are designed to ensure that future development within the SWDP meets community needs and enhances the liveability of the area and the wellbeing of Swan Hill communities.

Economic Implications

The proposed amendment will not have any negative impact on the economy. In contrast, facilitating the provision of appropriately zoned residential land will have positive impact on the local economy.

The proposed retail activity area, medical centre, aged care facility and child care centre will bring employment opportunities. In addition, during the construction of future developments there will be direct and indirect job opportunities created for locals, particularly in the areas of real-estate and building and construction.

Further, more housing means more people, and more demand for goods and services, which will boost local businesses and the local economy.

Environmental Implications

The SWDP land currently located in the Farming Zone and the Low Density Residential Zone are already cleared and have been used for dry land and irrigated agriculture activities, and for rural residential purposes. As such there are no significant flora and fauna to be affected by the proposed amendment.

As part of the pre-amendment consultations, the draft Development Plan was consulted with the Department of Environment and Primary Industries in April 2014. The Department did not have any objection to the draft Development Plan and agreed that removal of native vegetation to facilitate future developments within the SWDP will have to be assessed as per the requirements of Clause 52.17 of the Swan Hill Planning Scheme.

Further, the proposed Schedule 6 to the Development Plan Overlay requires additional studies/analysis to be undertaken prior to any development approval in order to minimise negative impacts on the environment from future developments. The detailed studies required include:

- Environmental Management Plan to address the following but not limited to:
    - Sub-precinct development plans to identify the location of any significant environmental, cultural, heritage and/or ecological (faunal and/or floral) features including fauna and remnant native vegetation,
    - An environmental assessment of the land, involving a flora and fauna survey, which among other things, identifies the health and habitat value of all native vegetation; and

  - A preliminary soil assessment demonstrating the extent of any contaminated soils that may exist on the subject land. If detected, a more detailed assessment outlining the location of the contaminated soil, the type of contaminants detected, and the strategies required to be undertaken to decontaminate the affected areas in accordance with the Ministerial Direction No. 1 - Potentially Contaminated Land.

- Drainage Management Plan for all sub-precincts including computations and stormwater modelling.
- Approval from all relevant service authorities for works on waterways (where necessary).
- A Landscaping Plan including landscaping and street trees proposed to further enhance visual amenity of the area.

These studies will assist in the assessment of future residential subdivisions and will ensure the efficient use of land within the SWDP and minimal negative impact on the environment.

In addition, the SWDP is not located within the Designated Bushfire Prone Area, nor affected by Bushfire Management Overlay / Wildfire Management Overlay. However, any bushfire risk would be addressed at the building permit stage with construction standards enforced through the Building Code of Australia.

Risk Management Implications

There are no known risks in undertaking this amendment.

Council Plan Strategy Addressed

Housing - We will support appropriate accommodation options for our growing economy.

The Council Plan 2013 – 2017 emphasises the need to support appropriate accommodation options for the growing economy, and aims to complete respective amendments to the Swan Hill Planning Scheme to support the supply of future housing.

Options

Nil

Recommendations

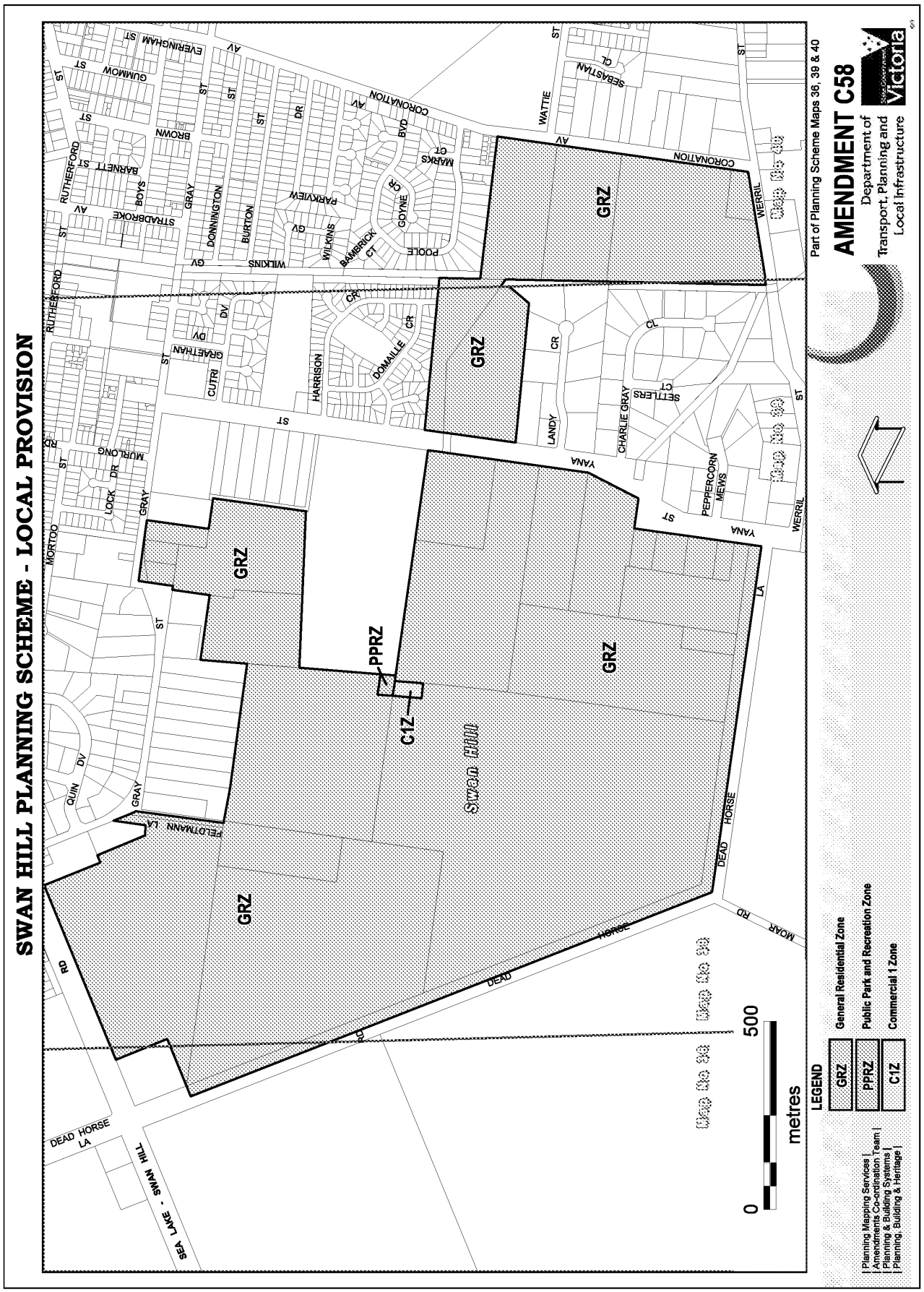
That Council:

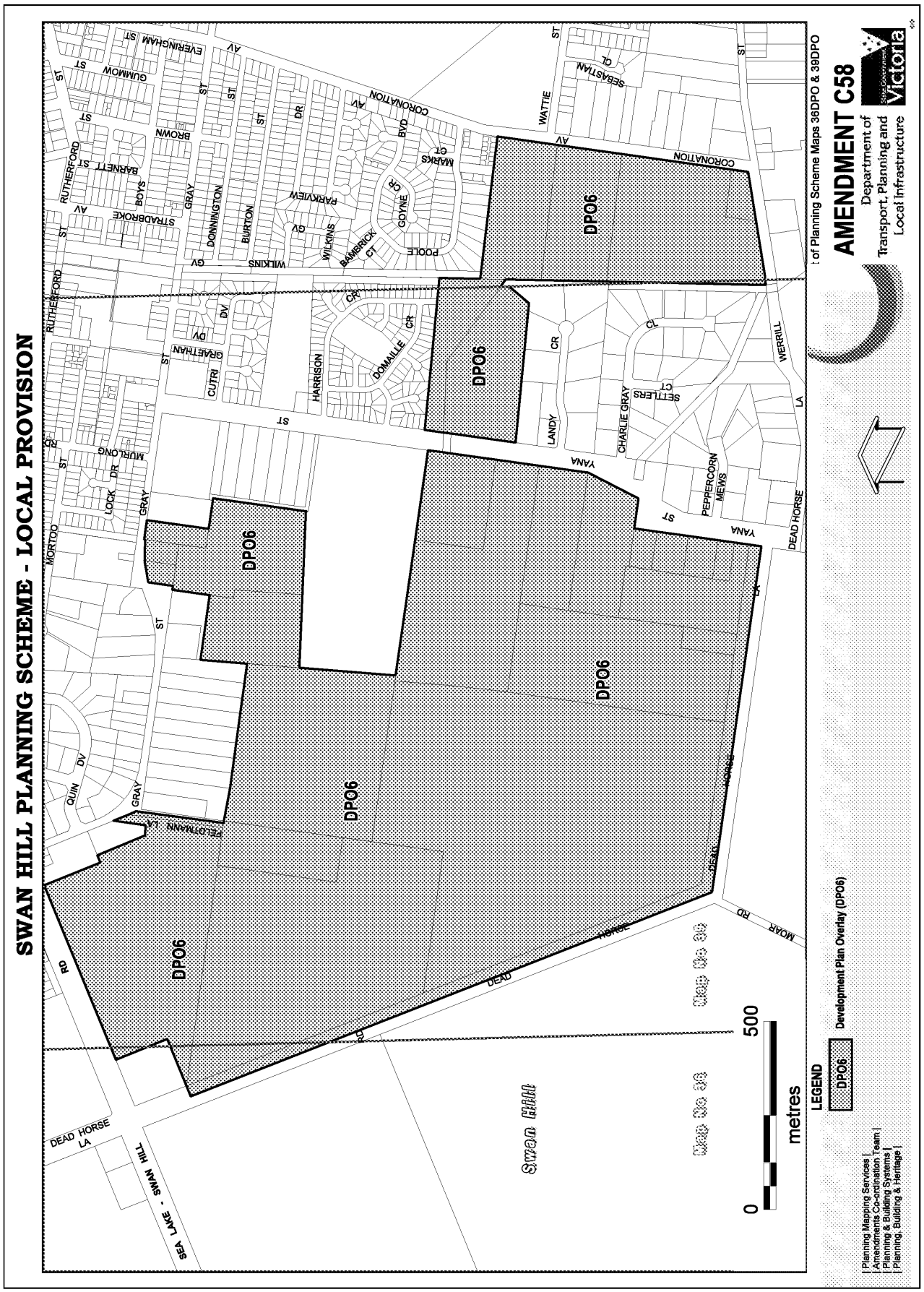
1. **Organise the necessary Section 173 Agreements as discussed in this report by end of November 2014.**

2. **If such agreements are not signed for any sub-precincts by the 30 November 2014, prepare alternative cost-sharing arrangements (such as Development Contributions Plan with no cost to Council) for those sub-precincts that did not sign, or the entire South West Development Precinct if necessary, to enable this planning scheme amendment to proceed.**

3. **Upon signing the required agreements and/or making alternative cost sharing arrangements, seek authorisation from the Minister for Planning to prepare amendment C58; and**

4. **Following the receipt of authorisation, publically exhibit the amendment and the draft Swan Hill South West Development Plan for a minimum period of 30 days.**


SWAN HILL PLANNING SCHEME - LOCAL PROVISION
Part of Planning Scheme Maps 36, 39 & 40
AMENDMENT C58
Department of Transport, Planning and Local Infrastructure
Victoria
GRZ
PPRZ
C1Z
Swan Hill
LEGEND
General Residential Zone
Public Park and Recreation Zone
Commercial 1 Zone
0
500
metres
DEAD HORSE LA
SEA LAKE - SWAN HILL RD
MOAMA RD
YANA ST
WERRIL CR
CORONATION AV
WATTIE ST
RUTHERFORD ST
MORTOO ST
GRAY ST
QUIN DV
FELDTMANN LA
MURLONG DR
LOCK DR
CUTRI DV
GRAETHAN DV
HARRISON ST
DOMAILLE CR
LANDY CR
CHARLIE GRAY CT
SETTLERS CT
PEPPERCORN MEWS CL
WILKINS GV
BAMBRICK CT
POOLE CT
GOYNE CR
MARKS CT
PARKVIEW GV
BURTON ST
DONNINGTON ST
GRAY ST
BOYS ST
BARNETT ST
STRADBROKE AV
BROWN ST
GUMMOW ST
EVERINGHAM ST
SEBASTIAN CL
Planning Mapping Services | Amendments Co-ordination Team | Planning & Building Systems | Planning, Building & Heritage |


SWAN HILL PLANNING SCHEME - LOCAL PROVISION
of Planning Scheme Maps 36DPO & 39DPO
AMENDMENT C58
Department of Transport, Planning and Local Infrastructure
Victoria
DPO6
LEGEND
DPO6
Development Plan Overlay (DPO6)
0
500
metres
Swan Hill
Map No 36
Map No 39
DEAD HORSE LA
SEA LAKE - SWAN HILL RD
MOAMA RD
YANA ST
CORONATION AV
RUTHERFORD ST
MORTOO ST
GRAY ST
QUIN DV
FELDTMANN LA
MURLONG DR
LOCK DR
CUTRI DV
GRAETHAN DV
HARRISON CR
DOMAILLE CR
WILKINS GV
BAMBRICK CT
POOLE CT
GOYNE CR
MARKS CT
PARKVIEW GV
BURTON ST
DONNINGTON ST
GRAY ST
BROWN ST
BARNETT ST
BOYS ST
STRADBROKE AV
GUMMOW ST
EVERINGHAM ST
WATTIE ST
SEBASTIAN CL
LANDY CR
CHARLIE GRAY CT
SETTLERS CT
WERRILL LA
PEPPERCORN MEWS
DEAD HORSE LA
DPO6
DPO6
DPO6
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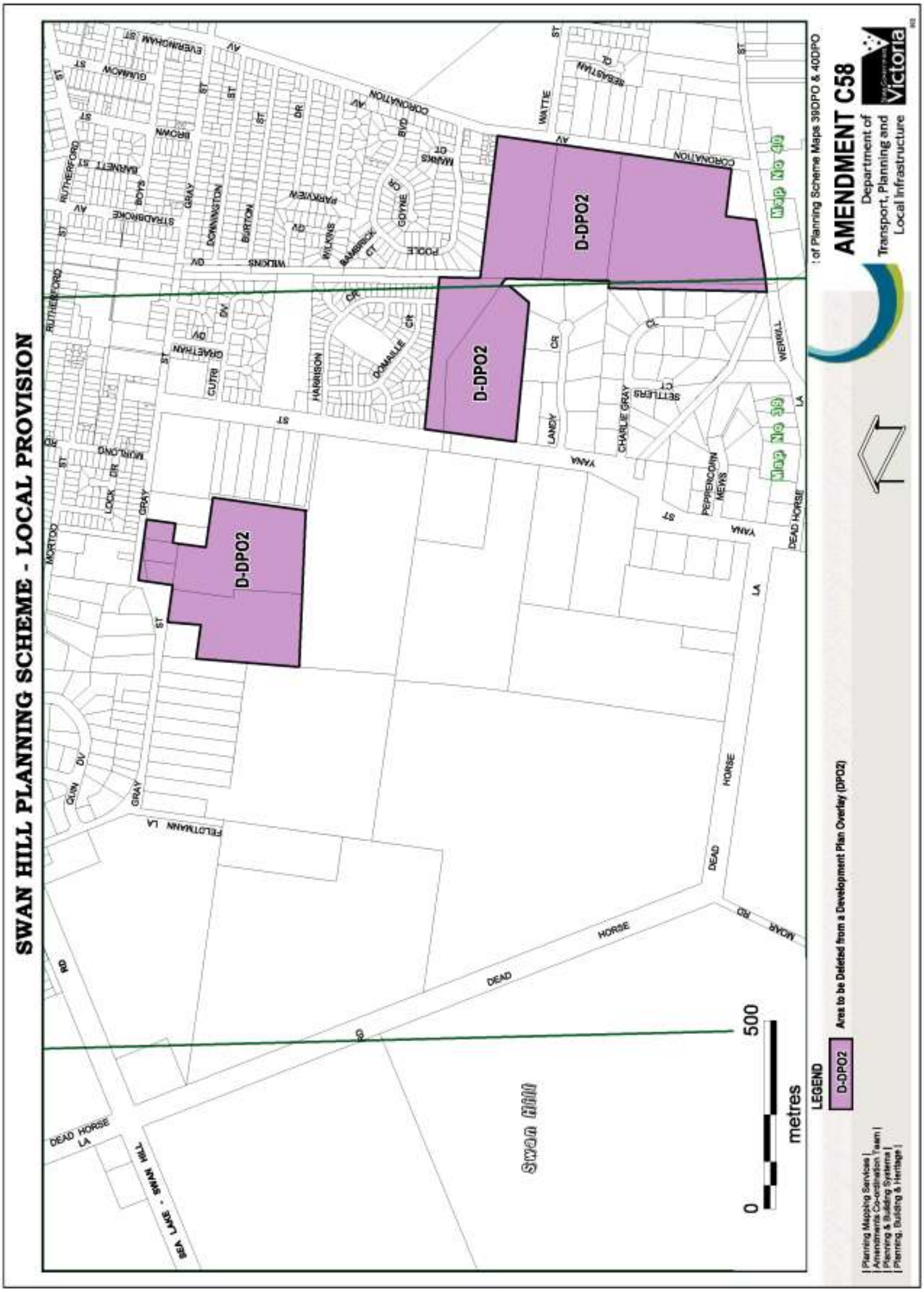
DPO6


SWAN HILL PLANNING SCHEME - LOCAL PROVISION
D-DPO2
D-DPO2
D-DPO2
AMENDMENT C58
Department of Transport, Planning and Local Infrastructure
Victoria
LEGEND
D-DPO2
Area to be Deleted from a Development Plan Overlay (DPO2)
0
500
metres
Map No 39
Map No 40
Swan Hill

SWAN HILL PLANNING SCHEME

SCHEDULE 6 TO THE DEVELOPMENT PLAN OVERLAY

--/--/20--
C58

Shown on the planning scheme map as **DDO6**

--/--/20--
C58

SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT

1.0 Requirement before a permit is granted

A permit must not be granted to use or subdivide land, construct a building or construct or carry out works within a sub-precinct until the following is prepared to the satisfaction of the Responsible Authority:

1.1 Detailed Sub-precinct Plan

- A detailed sub-precinct level development plan must be prepared as per the requirements outlined in this schedule for the sub-precinct and approved by the Responsible Authority.

  Note: The approved sub-precinct level development plan may be amended to the satisfaction of the Responsible Authority, and

1.2 Section 173 Agreement – Provision of infrastructure

- A signed and registered agreement pursuant to section 173 of the Planning and Environment Act 1987 between Swan Hill Rural City Council and the landowners within the sub-precinct for the provision of infrastructure to serve the land within the South West Development Precinct.

  This agreement will specify the infrastructure that is to be provided by the landowners within the sub-precinct as their fair and equitable contribution to the provision of infrastructure serving the whole of the South West Development Precinct. As a result they will not be expected to make contributions to the provision of infrastructure in other sub-precincts other than the common infrastructure covered by any s173 Agreement listed in Clause 1.3 of this schedule

The provision of infrastructure is to be in accordance with the requirements of the report titled "South West Development Precinct Infrastructure Cost Sharing Calculations" dated xxx (or as reviewed thereafter), and

1.3 Section 173 Agreement for infrastructure jointly provided by more than one sub-precinct

- A signed and registered agreement pursuant to section 173 of the Planning and Environment Act 1987 between Swan Hill Rural City Council and the landowners within all the sub-precincts that are to jointly provide infrastructure,

This agreement will specify the infrastructure that is to be jointly provided by the landowners of more than one sub-precinct as their fair and equitable contribution to the provision of infrastructure serving the whole of the South West Development Precinct.

This clause relates to the provision of Project 18: Catchment 4 Retardation Basin, pump station, rising main and outfall drains to service all of sub-precinct 3 and parts of sub-precincts 1 and 6

The provision of infrastructure is to be in accordance with the requirements of the report titled "South West Development Precinct Infrastructure Cost Sharing Calculations" dated xxx (or as reviewed thereafter), and referenced in this schedule, and

1.4 Section 173 Agreement for cost sharing within sub-precincts

A signed and registered agreement pursuant to section 173 of the Planning and Environment Act 1987 between Swan Hill Rural City Council and the landowner/s of the sub-precinct and any landowner on whose land the infrastructure to be provided by the sub-precinct, is located upon.

This agreement is to specify:

- That the landowners party to this agreement will pay 100% of the cost of providing the infrastructure that has been allocated to be provided by the by the landowners within the sub-precinct.
- Details of the cost sharing of the infrastructure allocated to be provided by the landowners within the sub-precinct in the report titled "South West Development Precinct Infrastructure Cost Sharing Calculations " dated xxx (or as reviewed thereafter)to the satisfaction of the Responsible Authority.

The agreement must provide that the signatories to this agreement must meet all of the obligations of the Owner listed in the section 173 agreements listed in Clause 2.2 and 2.3 of this schedule.

All the above agreements must be prepared in consultation with, to the satisfaction of, and at no cost to Swan Hill Rural City Council.

Exemptions

Permits may be granted before the detailed sub-precinct level plan is approved for the following, subject to the Responsible Authority being satisfied that the issuing of a planning permit will not prejudice the preparation and / or the implementation of the Swan Hill South West Development Plan:

- A single dwelling on an existing allotment
- For buildings or works and extensions and modifications associated with an existing use in accordance with the provisions of Clause 63 of this Planning Scheme.
- For the excision of an existing dwelling. The excision should be limited to the dwelling and any outbuildings and works associated with the dwelling to the satisfaction of the Responsible Authority.
- An outdoor advertising sign/structure.
- A minor utility installation and access to.
- Boundary realignment to the satisfaction of the Responsible Authority and will not prejudice the preparation and / or the implementation of the Swan Hill South West Development Plan.

2.0 Conditions and requirements for permits

Special conditions and notes that are to be included on subdivision permits other than those that are exempted in this schedule.

2.1 Infrastructure works

Conditions as appropriate must be included on any planning permit issued to subdivide or develop land with regard to infrastructure works being completed in accordance with any approved Infrastructure Plan approved under this Schedule.

2.1.1 Where development fronts to an existing collector street and arterial roads (such as Sea Lake - Swan Hill Road, Yana Street, Coronation Avenue, Gray Street and Werril Street) developer will be required to provide the following infrastructure:

- A 2.5 metre wide shared path
- Kerb and channel
- Pavement widening to the satisfaction of the Responsible Authority.

2.2 Cultural Heritage related requirements

Notes to be included in permits:

All Aboriginal Cultural Heritage, that is Aboriginal Places, Aboriginal Objects and Aboriginal Human remains are protected under the State Aboriginal Heritage Act 2006. It is an offence to do an act that will harm Aboriginal cultural heritage or is likely to harm Aboriginal cultural heritage.

- Works must cease immediately up the discovery of any Aboriginal cultural material, and Aboriginal Affairs Victoria must be notified immediately of any such discovery at GPO Box 2392, Melbourne 3001 or on telephone 1300551380 or (03) 9208 3277 or via email to vahr@dpc.vic.gov.au (Contact details must be checked at the time of contact).

- If any suspected human remains are found, work in the area must cease and the Victorian Police and the State Coroner's Office must be informed of the discovery immediately.
- If there are reasonable grounds to suspect that the remains are Aboriginal, the discovery should be reported to Aboriginal Affairs Victoria as specified above.

2.3 Construction Management Plan

A site construction management plan that accords with the sediment control principles outlined in Construction techniques for Sediment Pollution Control (Environment Protection Authority, 1991) to manage site run off, dust, erosion, litter and construction waste must be submitted to and approved by the Responsible Authority prior to the commencement works.

3.0 Requirements for Development Plan

The Swan Hill South West Development Plan was prepared and approved by the Swan Hill Rural City Council in July 2014.

This Development Plan requires detailed sub-precinct plans to be prepared for individual sub-precincts prior to any development (other than that are exempted) can be approved. The South West Development Precinct has been divided into six sub-precincts to enable development to proceed in an orderly manner.

Sub-precinct development plans must:

- Ensure future use and development within the South West Development Precinct is generally in accordance with the approved Swan Hill South West Development Plan prepared and approved by Swan Hill Rural City Council July 2014 (or as reviewed thereafter).
- Ensure the orderly development of the Swan Hill South West Development Precinct creates a liveable place for the current and future communities of Swan Hill.
- Ensure the development provides appropriate traffic, drainage, transport, recreational, community and necessary social infrastructure to service the community.

The location of six sub-precincts is shown below on map titled Swan Hill South West Development Sub-Precincts Plan.

SWAN HILL PLANNING SCHEME

Swan Hill South West Development Sub-Precincts Plan

3.1 Requirements for Sub-precinct Development Plans

3.1.1 Site analysis and subdivision layout

The sub-precinct development plans must be drawn to scale and must be generally in accordance with the approved Swan Hill South West Development Plan and include the following but not limited to:

- A detailed site analysis plan showing existing conditions on the subject land and adjoining and opposite properties, contours at 0.1 meters and existing infrastructure, vegetation, buildings and any other structures.
- A subdivision layout that:
    - Creates a safe, convenient and legible street layout design that ensures development fronts streets and public open space.
    - The subdivision layout is sympathetic and appropriately responds to the proposed infrastructure as identified in the approved Swan Hill South West Development Plan, and developments that are already established within the adjoining sub-precincts.
    - Provides for a mix of lot sizes that can offer diverse residential development choices and affordable housing options.
    - Increased densities are encouraged along the proposed collector streets and near activity areas.
    - Is consistent with the requirements of sustainable design principles including solar efficiency where and as appropriate.
    - Has a minimum lot size of 2000m^2 abutting Dead Horse Lane and Werril Street as specified in the approved Swan Hill South West Development Plan. This requirement is valid until end of 2030.
    - Has a minimum lot size of 1000m^2 abutting to existing Low Density Residential Zone as specified in the approved Swan Hill South West Development Plan to minimize the negative impacts on the adjoining land.
    - Incorporates where appropriate *Healthy by Design* principles to encourage walking, cycling and active living by design.
    - Identify vegetation that are to be retained and/or to be removed
    - Identify existing and proposed infrastructure
    - Identify existing buildings, works and structures that are to be removed or to be relocated.

3.1.2 Drainage

A Drainage Management Plan for the sub-precinct addressing the management of the quantity of stormwater which is generally consistent with the drainage strategy titled "South West Development Precinct Drainage Strategy dated xxx (or as reviewed thereafter) and referenced in this schedule must be prepared to the satisfaction of the Responsible Authority. The Plan then has to be approved by the Responsible Authority.

The Drainage Management Plan must address the following but not limited to:

- Provision for stormwater arriving from upstream, passing through, and moving downstream from the site
- An assessment of the existing surface and subsurface drainage conditions on the site by a suitably qualified professional and the potential impacts on the proposed development, including any measures required to mitigate the impacts of groundwater coming to the ground surface on the development and the impact of the development on drainage.
- Detailed geotechnical and hydrological analysis and design of any retardation basins and their proximity to any groundwater table and in particular how groundwater infiltration will be addressed and how accessions to the water table will be addressed to the satisfaction of the Responsible Authority.
- Detailed computations and stormwater modelling showing that there are no adverse impacts to the operation of the Swan Hill Main Drain in a 100 year ARI rainfall event by any discharge from the drainage system serving the precinct to the Swan Hill Main Drain.
- Subdivision layout and road alignment must consider and give effect to the natural direction of overland flow paths for stormwater as shown in the "South West Development Precinct Drainage Strategy dated xxx (or as reviewed thereafter). Overland flows should be along roads reserves. Overland flows in drainage reserves should be avoided wherever possible.
- The provision, staging and timing of drainage infrastructure serving particular sub-precinct.
- An agreement from the landowners on whose land the drainage infrastructure is to be located upon (as detailed in Clause 2.4 of this schedule).
- A detailed landscape plans for the retardation basin within the sub-precinct showing the proposed landscape treatments, tree planting, footpaths around the basins and access to and around the basins for maintenance.
- A minimum of 40% of the perimeter of the retardation basin must have a frontage to a road/s to allow overland flows to enter the basin unless otherwise agreed in writing by the Swan Hill Rural City Council
- Must show the approved drainage connection points to Council's existing drainage infrastructure identified in the "South West Development Precinct Drainage Strategy" unless otherwise approved by the Swan Hill Rural City Council.
- Designation of fence design provisions in relation to the interface with retardation basin areas to maximise passive surveillance.
- Approval from all relevant service authorities whose assets or land may be affected by surface or pipe flow discharge. In particular it should be noted that a separate permit (Works on Waterway) from the relevant Catchment Management Authority may be required if:
    - There is a direct connection to a waterway.
    - There is a bridge or culvert over a waterway.
    - Construction of a retardation basin, and
    - When required by the relevant Catchment Authority.

3.1.3 Traffic

A sub-precinct level Traffic Management Plan that is generally in consistent with the report titled "Swan Hill South West Development Precinct Traffic Impact Assessment" dated xx) (or as reviewed thereafter), and the Swan Hill South West Development Precinct Traffic Strategy dated xxx (or as reviewed thereafter) and referenced in this schedule must be prepared to the satisfaction of the Responsible Authority.

The Traffic Management Plan must address the following but not limited to:

- Appropriate access and circulation of vehicles on the existing and future road network.
- Appropriate integration with the existing or proposed subdivision of adjoining properties and sub-precincts including through alignment and configuration of the street network and landscape character.
- The identification of existing and proposed public transport routes, bus stops (as shown on the approved Swan Hill South West Development Plan) and associated infrastructure.
- The identification of existing and proposed pedestrian and cycling networks and shared paths
- Including provision for safe and convenient access to public transport infrastructure.
- The works necessary to accommodate traffic generated by the development and to mitigate the impact of that traffic on the development.
- Ensure that the road and intersection design must create efficient clearance of traffic, activity areas including around public facilities. The proposed road network should not overload or detrimentally affect existing or proposed residential streets and intersections.
- Adequate sight distance should be provided, especially where road alignment deflections occur at acute angles.
- Road layouts should provide natural traffic speed control, appropriate to the street category. The introduction of specific speed control devices should be considered only as a secondary option. Roundabouts may be implemented at intersections. However, care must be taken to provide adequate sized roundabouts and therefore road reservation boundaries must be designed to accommodate the radius required and sightlines.
- Road layouts should be designed for all road users appropriate to the street type, including service vehicles, emergency vehicles, waste collection vehicles and street-sweepers. Bus routes need to be considered when developing road networks and be based on the Department of Transport, Planning and Local Infrastructure publication titled *'Public Transport Guidelines for Land Use Development'* (or a replacement document by the Department).
- Road reserve widths must be adequate for the intended road type, and should comply with requirements of the Infrastructure Design Manual.
- Should include a typical cross-section of differing road types, detailing the intended function of the road, e.g. bike lanes, drainage, landscaping.

- Addresses all off-site traffic infrastructure requirements associated with the sub-precinct and is to be accompanied by a Road Safety Audit, prepared by an appropriately qualified person. The Plan must address any safety issues raised by the Audit.

3.1.4 Environmental Assessment

A sub-precinct level Environmental Management Plan to be prepared to the satisfaction of the Responsible Authority. The Plan then must be approved by the Responsible Authority.

The Environmental Management Plan must address the following but not limited to:

- The location of any significant environmental, cultural, heritage and/or ecological (faunal and/or floral) features including fauna and remnant native vegetation.
- An environmental assessment of the land, involving a flora and fauna survey, which among other things, identifies the health and habitat value of all native vegetation.
- A preliminary soil assessment demonstrating the extent of any contaminated soils that may exist on the subject land, and if detected, a more detailed assessment outlining the location of the contaminated soil, the type of contaminants detected, and the strategies required to be undertaken to decontaminate the affected areas in accordance with the *Ministerial Direction No. 1 - Potentially Contaminated Land.*
- Developments on land that are reclaimed as a result of decommissioning of the Goulburn Murray Water Channel infrastructure requires further investigation undertaken by suitably qualified persons to demonstrate the suitability of the land to use and develop for residential and other purposes to the satisfaction of the Responsible Authority.

3.1.5 Infrastructure Plan

A sub-precinct level infrastructure plan approved by the Responsible Authority which identifies the anticipated staging and timing of the provision of infrastructure (on and off the subject land or sub-precinct), in accordance with the "South West Development Precinct Infrastructure Cost Sharing Calculations". The Infrastructure plan should address the following as appropriate:

- The provision, staging and timing of stormwater drainage works both internal and external to the precinct.
- The provision, staging and timing of road works (including bus stops, associated works, and shared paths as identified in the approved Swan Hill South West Development Plan) both internal and external to the precinct in accordance with the approved sub-precinct level traffic management plan.
- The widening of Feldtmann Lane road reserve to 24 metres (Only for sub-precinct 1).
- The provision, staging and timing of project numbers 22 and 23 as listed in Table 3 titled 'List of Infrastructure Projects to be Provided' in the Swan Hill South West Infrastructure Provision.

- That all infrastructure must be constructed generally in accordance with the provisions of the Infrastructure Design Manual as referred in this Schedule.
- The standard of construction for Dead Horse Lane, Werril Street and Yana Street is kerb and channel only on one the side of the development, with a 2.5 metre shared path, and 6 metre seal width and 1.5 metre gravel shoulder.
- Properties wishing to open access to Dead Horse Lane and Werril Street must construct the relevant road to which to wish to access at no cost to Council or to any other landowners (unless otherwise voluntarily agreed) to the standards specified above up to the nearest sealed urban road.
- Any other infrastructure or related matter reasonably requested by the Responsible Authority associated with the development of the land.

3.2 Urban Design requirements

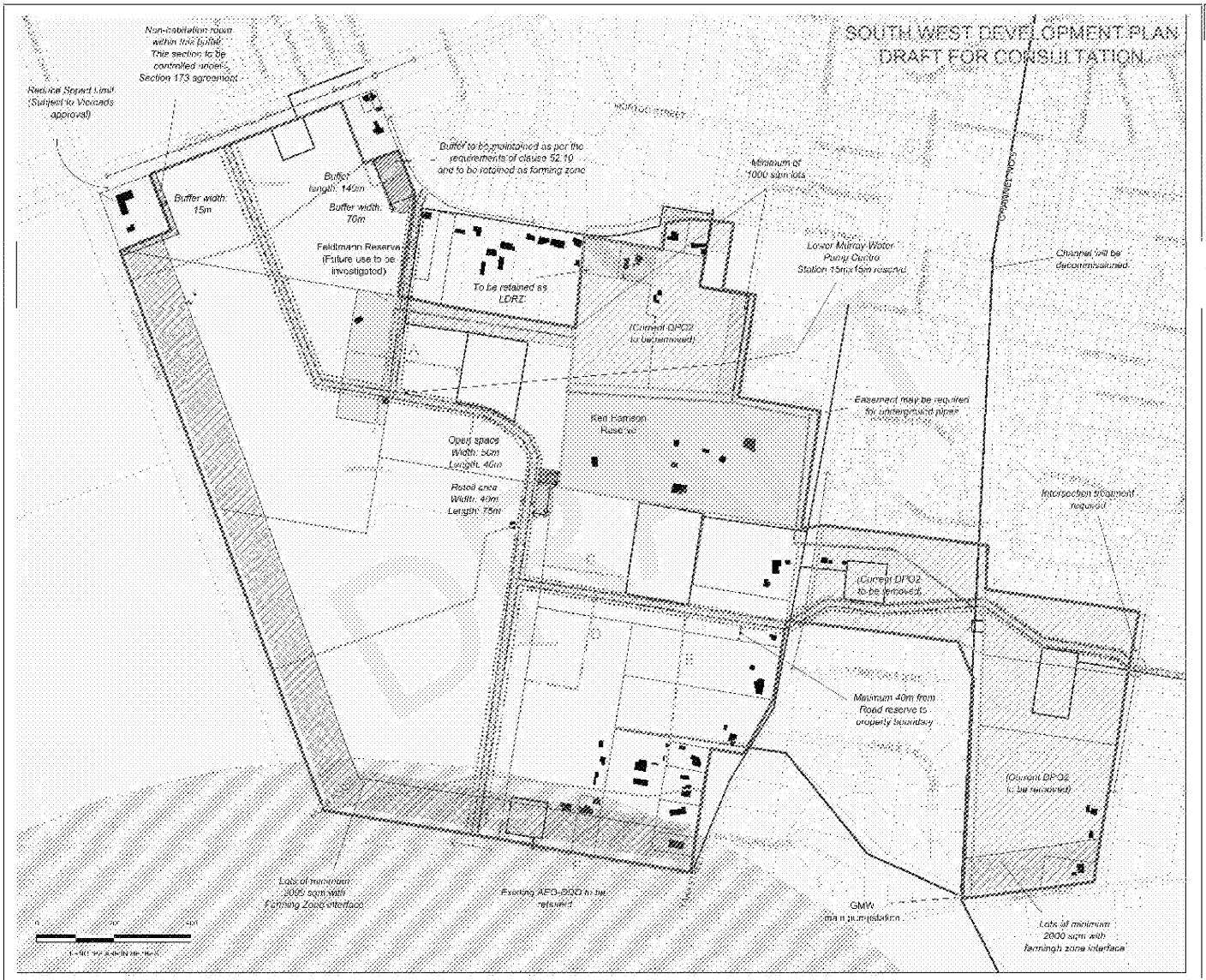
Future development fronting Sea Lake- Swan Hill Road and Dead Horse Lane should be designed to achieve attractive visual presentation to the roads in terms of built form, landscaping and streetscape to the satisfaction of the Responsible Authority.

3.3 Fencing

Fencing on or within 10 meters of the boundary along the SeaLake- Swan Hill Road and Dead Horse Lane should be at least 50% transparent to the satisfaction of the Responsible Authority unless otherwise agreed in writing by the Responsible Authority.

3.4 General Requirements

- The required buffer as per the requirements of Clause 52.10 of the Swan Hill Planning Scheme must be maintained between the industrial activities on Gray Street and sensitive use and developments within the Swan Hill South West Development Precinct.
- The following documents should be considered in the preparation of the reports, studies and documents required in this schedule.
  - Swan Hill South West Development Plan (approved and or revised thereafter)
  - Infrastructure Design Manual (as updated)
  - South West Development Precinct Infrastructure Cost Sharing Calculations " dated xxx (or as reviewed thereafter),
  - South West Development Precinct Drainage Strategy dated xxx (or as reviewed thereafter)
  - Swan Hill South West Development Precinct Traffic Impact Assessment dated xxx (or as reviewed thereafter), and the Swan Hill South West Development Precinct Traffic Strategy dated xxx (or as reviewed thereafter)
  - Swan Hill Review of the Residential Strategy dated March 2013 (or as reviewed thereafter).
- Proposed street names must conform to the Guidelines for Geographic Names Victoria.



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DATE: 26/06/2014

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NORTH

SWAN HILL Rural City Council

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TITLE

SOUTH WEST
DEVELOPMENT PRECINCT
DRAFT FOR CONSULTATION

NOTES:

Medical Centre, Childcare Centre and Aged Care are encouraged in appropriate locations within the precinct.

SWAN HILL
Rural City Council

SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT INFRASTRUCTURE COST SHARING CALCULATIONS

Version 1.5

Swan Hill Rural City

24 June 2014.

Table of Contents

1. INTRODUCTION

1.1 Purpose

The Infrastructure Cost Sharing Calculations (ICSC) has been prepared:

- To list the infrastructure projects that will be provided by the landowners/developers within the precinct
- To determine a fair and equitable method of infrastructure delivery which will allow, as far as possible, for development within an sub-precinct (Analysis Area) to proceed independently of other sub-precincts (Analysis Areas)
- To document the basis of calculating the determination of which sub-precinct/s (Analysis Area/s) is responsible for delivery of a particular infrastructure project
- To provide landowners within an sub-precinct (Analysis Area) the necessary information to determine the fair and equitable cost sharing of the provision of infrastructure allocated to a sub-precinct (Analysis Area) to provide.

The area covered by this report is the land covered by the South West Development Precinct (SWDP) as shown in Map 1.

Map 1 South West Development Precinct Area

The existing and proposed land uses contained within and adjacent to the boundaries of the SWDP are shown in Map 2.

Map 2 Existing and Proposed Land Uses

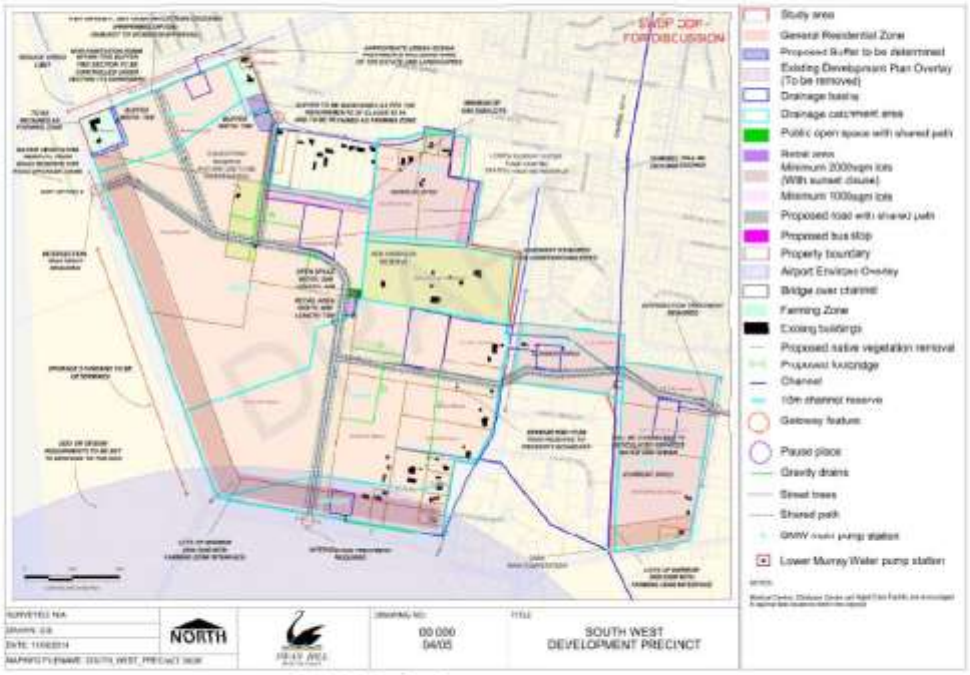


Table 1 shows the area of each of the proposed uses within the SWDP.

Table 1 Proposed Land Uses within the SWDP

Zoning or land description	Area of Land in square metres
Residential Land	2,079,865
Farming Zone	48,686
Drainage Reserves	93,800
Ken Harrison Reserve	173,000
Lower Murray Water Reserve	225
GMW channel reserves	4,777
Commercial	3,000
POS	2,000
Total	**2,405,353**

The amount of land available for residential development within the bounds of the SWDP is 207.99 ha. The average density of development has been nominated to be 10.5 dwellings per ha. This will accommodate those landowners/developers wishing to provide for the demand of larger allotments and those wishing to provide smaller sized residential allotments to maximize the return on investment on infrastructure.

The estimated lot yield based on density of 10.5 dwellings per ha is 2,184 allotments.

2. PROVISION OF INFRASTRUCTURE

The Planning and Environment Act specifies that infrastructure provision can be funded by either or a combination of:

- Development Contributions Plans (DCP)
- s173 Agreements

Council and landowners have agreed to fund the provision of infrastructure works using a series of s173 agreements.

The disadvantages associated with DCP's as follows:

- The expected period to fully develop the SWDP is in excess of 40 years and the standards of infrastructure today will not be the standard of the infrastructure in the future. Whilst it is reasonable for the today's standards to apply for the next 10 years it is not reasonable to insist that the standards of today will still be relevant in 40 years time.
- The 40 year period of development and the large number of landowners involved make the nomination of timeframes for the supply of infrastructure impossible.
- Council is not in a position to act as banker for the provision of infrastructure and therefore landowners wishing to develop will carry out "works in kind" and may carry costs for considerable periods of time until there are sufficient funds collected from DCP contributions to be able to reimburse them. This also creates an issue for Council in determining the order in which landowners should be reimbursed for infrastructure provided.
- The administration of DCP's are exacting and time consuming.
- Some landowners will be dependent upon other landowners to provide infrastructure before they can develop.
- Development could be adhoc and not provided in an orderly manner.

The advantages of using a series of s173 agreements, together with dividing the SWDP into 6 sub-precincts are:

- Development could commence in each of these sub-precincts independently of other sub-precincts upon the signing and registering of the necessary s173 agreements
- The timing and delivery of the projects is governed by the landowners within a sub-precinct.

- The cost sharing arrangements within a sub-precinct are determined by those landowners within the sub-precinct wishing to develop
- Gives the opportunity to allocated projects to be delivered by a particular sub-precinct instead of a cash contribution therefore removing the need to index estimated project costs with time.
- S173 agreements can deal with changing standards of infrastructure over time.
- Avoids the need for Council to administer a DCP

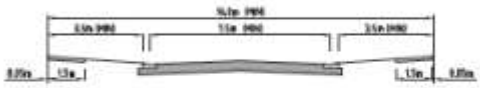
The methodology used to use a series of s173 agreements to deliver the infrastructure within the SWDP is as follows:

1. Determine the cost sharing to all landowners as if a DCP was to be implemented.
2. Allocate the costs to Sub-precincts (Analysis Areas) as per in a DCP.
3. Allocate each sub-precinct to carry out "works in kind" to the approximate value of their contribution determined under step 2.
4. Get the landowners to agree to allocation of "works in kind" to each sub-precinct before the planning scheme amendment is approved. (s173 Agreement for the provision of infrastructure.) This agreement to be signed and registered at the Titles Office before the Council will amend the Swan Hill Planning Scheme to give effect to the SWDP.
5. Identify any infrastructure that is servicing more than one sub-precinct and determine the costs sharing and other arrangements for the provision of this infrastructure and obtain agreement from all the landowners with the benefitting sub-precincts before the planning scheme amendment is approved (s173 Agreement for joint provision of infrastructure). This agreement to be signed and registered at the Titles Office before the Council will amend the Swan Hill Planning Scheme to give effect to the SWDP.
6. Determine the cost sharing between landowners within a sub-precinct for the works in kind allocated to that sub-precinct. This agreement is required to be signed and registered at the Titles Office before development can commence within a sub-precinct. (s173 Agreement for cost sharing of infrastructure within a sub-precinct). This agreement will be signed by those landowners within the sub-precinct who are prepared to fund 100% of the infrastructure allocated to that sub-precinct.

3. STANDARDS OF INFRASTRUCTURE AND ASSUMPTIONS MADE

Each landowner/developer will be required to build infrastructure to service the development in accordance with the standards set by the relevant service authorities. In the case of infrastructure to be gifted to the Rural City of Swan Hill the infrastructure standards are specified in the Local Government Infrastructure Design Association's Infrastructure Design Manual and the specifications of Council to the satisfaction of Council unless otherwise agreed in writing by Council.

The IDM cross sections for Access Streets and Collector Streets are shown below:



ACCESS STREET

COLLECTOR STREET – LEVEL 1

The determination of costs in relation to collector streets relates to paying for the difference between to the two cross sections i.e. a landowner/developer would have had to pay for the construction of an access street and therefore the additional width of road reserve, road pavement and footpaths for the collector street cross section is used in cost sharing calculations.

The construction standard for Deadhorse Lane (Option 2) is half the collector street – level one shown above plus 1m of seal and 1.5m of shoulder. When development occurs in the future on the west side of Deadhorse Lane they will be required construct the other half of Deadhorse Lane.

The construction of half a collector street for Deadhorse Lane will give a seal width of 6.2m which is considered adequate for the current traffic using Deadhorse Lane.

The calculations used in this ICSC are based Option 1 of the Swan Hill South West Development Precinct Traffic Impact Assessment as this is the Council's and the landowners preferred option.

4. INFRASTRUCTURE PROJECTS TO BE PROVIDED BY THE LANDOWNERS WITHIN THE SWDP.

The infrastructure projects provided by the landowners within the SWDP will be owned by Council when they are completed and are listed in Table 3. Their location is shown in Map 3.

The Infrastructure to be provided has been identified in This ICAC gives effect to the delivery of those infrastructure projects identified the Swan Hill SWDP Drainage Strategy dated 24 June 2014 and the Swan Hill SWDP Traffic Impact Assessment dated 21 June 2014 and this report as being required to serve the land within the SWDP.

Table 3 List of Infrastructure Projects to be Provided

Project Number	Project Description	Type	Description	Strategic Justification	Responsibility for Provision

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project Number	Project Description	Type	Description	Strategic Justification	Responsibility for Provision
1	Project 1 Link Road No 1	Road	Construction of the additional width between Collector Street and Access Street including the cost of the additional road reserve width	South West Development Precinct Development Plan	Analysis Area 5
2	Project 2 Link Road No 2	Road	Construction of the additional width between Collector Street and Access Street including the cost of the additional road reserve width	South West Development Precinct Development Plan	Analysis Area 4
3	Project 3 Link Road No 3	Road	Construction of the additional width between Collector Street and Access Street including the cost of the additional road reserve width	South West Development Precinct Development Plan	Analysis Area 3
4	Project 4 Link Road No 4	Road	Construction of the additional width between Collector Street and Access Street including the cost of the additional road reserve width	South West Development Precinct Development Plan	Analysis Area 1
5	Project 5 Link Road No 5	Road	Construction of the additional width between Collector Street and Access Street including the cost of the additional road reserve width	South West Development Precinct Development Plan	Analysis Area 1
6	Project 6 Link 6 Feldtmann Lane Construction	Road	Construction of the additional width between Collector Street and Access Street including the cost of the additional road reserve width and construction of Feldtman Lane incldng widening of	South West Development Precinct Development Plan	Analysis Area 1

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project Number	Project Description	Type	Description	Strategic Justification	Responsibility for Provision
			road reserve		
7	Project 7 Link Road 7(1)	Road	Construction of the full width of Collector Street including the cost of the additional road reserve width from existing width to collector street width.	South West Development Precinct Development Plan	Analysis Area 1
8	Project 8 Roundabout Coronation Street and Link Road Intersection 3	Road	Single lane roundabout	South West Development Precinct Development Plan	Analysis Area 5
9	Project 9 Roundabout Yana Street and Link Roads 3 and 4 Intersection 4	Road	single lane roundabout	South West Development Precinct Development Plan	Analysis Area 3
10	Project 10 Internal Road Analysis Area 2 to Gray Street Intersection 8	Road	Construction of left and right turn lanes on both internal road and Gray Street	South West Development Precinct Development Plan	Analysis Area 2
11	Project 11 Intersection of Gray Street and Feldtman Lane Intersection 7	Road	Construct right turn lane in Gray Street and right and left turn lanes in Feldtmann Lane	South West Development Precinct Development Plan	Analysis Area 1
12	Project 12 New Access Point to Swan Hill Sea Lake Road Intersection 10	Road	Construct new intersection between Link Road 7 and Swan Hill Sea Lake Road including right and left turn lanes in both	South West Development Precinct Development Plan	Analysis Area 1

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project Number	Project Description	Type	Description	Strategic Justification	Responsibility for Provision
			roads		
13	Project 13 Roundabout Link Road and Link Road Intersection 12	Road	Single lane roundabout	South West Development Precinct Development Plan	Analysis Area 1
14	Project 14 Roundabout Link Roads 6, 7 and 5 Intersection 13	Road	T intersection with right and left turn lanes on Link Road 6	South West Development Precinct Development Plan	Analysis Area 1
15	Project 15 Catchment 1 Retardation Basin to serve north part of Analysis Area 1	Drainage	Construction of 4,000 m^3 retardation basin which discharges by gravity through 260m of 300mm RCP to the main drain. Area of land 6980m2	South West Development Precinct Development Plan	Analysis Area 1
16	Project 16 Catchment 2 Retardation Basin, pump station, rising main and outfall drains to service development south part of Analysis Area 1	Drainage	Construction of 42,500 m^3 retardation basin, 4m deep pump station with a pumping capacity of 214 lit/sec and 1210m of 300mm dia rising main. Area of land 26,900 m^2 Outfall drains consisting of 160m of 600mm RCP, 267m of 750mm RCP, 235m of 900mm RCP and 190m of 1200mm RCP	South West Development Precinct Development Plan	Analysis Area 1
17	Project 17 Catchment 3 Gravity Outfall drains to service	Drainage	Outfall drain 220m of 750mm RCP	South West Development Precinct Development Plan	Analysis Area 2

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project Number	Project Description	Type	Description	Strategic Justification	Responsibility for Provision
	development Analysis Area 2				
18	Project 18 Catchment 4 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Areas 3 and part of 1 and 6	Drainage	Construction of 35,600 m^3 retardation basin, 4m deep pump station with a pumping capacity of 214 lit/sec and 560m of 300mm dia rising main. Area of land 30,300 m^2 Outfall drains consisting of 70m of 300mm RCP, 447m of 375m RCP, 130m of 525mm RCP, 67m of 600mm RCP, 130m of 900mm RCP, and 310m of 1050mm RCP	South West Development Precinct Development Plan	Analysis Areas 1, 3 and 6
19	Project 19 Catchment 5 Retardation Basin, pump station, rising main and outfall drains to service part development Analysis Areas 1 and 6	Drainage	Construction of 6,300 m^3 retardation basin, 3.4m deep pump station with a pumping capacity of 34 lit/sec and 1,320m of 150mm dia rising main. Area of land 8,000 m^2 Outfall drains consisting of 21m of 375mm RCP, 108m of 450mm RCP, 413m of 525mm RCP and 413 m of open earth drain.	South West Development Precinct Development Plan	Analysis Areas 1 and 6

Project Number	Project Description	Type	Description	Strategic Justification	Responsibility for Provision
20	Project 20 Catchment 6 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 4	Drainage	Construction of 5,300 m^3 retardation basin, 2.5m deep pump station with a pumping capacity of 34 lit/sec and 195m of 150mm dia rising main. Area of land 9,200 m^2	South West Development Precinct Development Plan	Analysis Area 4
21	Project 21 Catchment 7 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 5	Drainage	Construction of 10,700 m^3 retardation basin, 3m deep pump station with a pumping capacity of 131 lit/sec and 580m of 250mm dia rising main. Area of land 12,500 m^2	South West Development Precinct Development Plan	Analysis Area 5
22	Project 22 Development of Ken Harrison Reserve and purchase and development of POS	Contribution	Funds used to upgrade Ken Harrison Reserve as per Master Plan and purchase and development of 2000 m^2 of POS	Planning Scheme	Analysis Areas 1, 2 and 6
23	Project 23 Cost of preparing infrastructure cost sharing report, traffic impact assessment and drainage strategy	Contribution	Costs to cover engagement of consultants for Traffic reports and assistance in preparing DCP	Planning Scheme	Analysis Area 1

Note: See Section 5.5 to see the basis of determining which Analysis Area delivers which infrastructure project listed above.

Payment of Contribution to Project Number No 22 Development of Ken Harrison Reserve and purchase and development of POS.

The total POS payable for the whole of the Swan Hill South West Development Precinct is $1,109,478 based on Council charging 2.5% POS contribution. As part of the agreed delivery of projects between Analysis Areas (See Section 5.5) it has been agreed that this contribution will be used for the development and upgrade of the Ken Harrison Reserve and the purchase and development of POS shown on the SWDP:

This contribution will be levied as a contribution on land within these analysis areas as follows:

Analysis Area	Contribution to Project 22 - Development of Ken Harrison Reserve and purchase and development of POS	Current Value of Residential Land	Contribution as a % of Current Land Value
1	$818,919	$22,858,219	3.58%
2	$40,559	$3,076,535	1.32%
6	$250,000	$6,031,908	4.14%

The landowners/developers of land within each of the analysis areas listed in the above table will be required to make their contribution to Project 22 based on the value of the residential land developed multiplied by the % contribution listed in Column headed "Contribution as a % of Residential Land Value" in the above table.

Map 3 Location of Infrastructure Projects to be Provided

5. METHOD OF DETERMINING ALLOCATION OF THE DELIVERY OF INFRASTRUCTURE PROJECTS.

The determination of a fair and equitable allocation of the delivery of infrastructure projects is based on the following methodology:

1. Determination of analysis areas
2. Determination of the area of residential development
3. Determination of catchment areas for each infrastructure project and the external usage.
4. Calculation of infrastructure cost sharing
5. Determination delivery of projects.
6. Determination of the cost sharing within sub–precincts (Analysis Areas)

5.1 Determination of Analysis Areas

Six analysis areas were identified based on the ability of each of those areas to be developed independently of each other having regard for land parcel boundaries, access to the existing road network and potential access to a drainage basin or outlet.

Map 4 shows the boundaries of the adopted analysis areas.

Map 4 Analysis Areas

5.2 Determination of Area of Residential Development

The adopted average lot density for the SWDP is 10.5 dwellings per hectare. Table 4 shows the estimated lot yield for each analysis area.

Table 4 Analysis Areas Lot Yield

Analysis Area	Area in hectares	Area for drainage and other purposes	Residential Area	Estimated Lot Yield
1	1230.40	8.75	114.29	1200
2	153.83	0.00	16.24	171
3	183.26	3.03	15.30	161
4	99.75	0.92	9.05	95
5	250.75	1.25	22.96	241
6	309.60	0.80	30.16	317
Total	**2227.58**	**14.75**	**208.01**	**2184**

5.3 Determination of catchment areas for each infrastructure project and external usage.

The catchment boundaries for each infrastructure project have been determined by the traffic impact assessment and the drainage strategy.

This information is summarised in Table 5 Catchment Boundaries and External Benefitting Landowners.

Table 5 Catchment Boundaries and External Benefitting Landowners

Project Number	Description of Project	External landowners that benefit	Reasons relating to external benefit
1 -5	Collector Streets –Link Roads No 1, 2, 3, 4 and 5	Nil	
6	Feldtmann Lane Construction and the remainder of Link Road 6	Nil	The landowner to the east of Feldtmann Lane has direct access to Gray Street and the volume of traffic attributable to this single property is negligible compared to the traffic being generated from within the SWDP.
7	Collector Street – Link 7	Nil	No external benefit is applicable as this link is wholly contained within the bounds of the SWDP.
8	Roundabout Coronation Avenue and Collector Street Intersection 3	Nil	The roundabout is triggered by the development and would not be needed without the development and therefore no external benefit is applicable
9	Roundabout Yana Street and Collector Street Intersection 4	Nil	The roundabout is triggered by the development and would not be needed without the development and therefore no external benefit is applicable.
10	Internal Road Analysis Area 2 to Gray Street Intersection 6	Nil	Works created by the development within Analysis Area 2
11	Intersection of Gray Street and Feldtmann Lane Intersection 7	Nil	Works created by the development within the bounds of the SWDP.
12	New Access Point to Swan Hill Sea Lake	Nil	Works created by the development within the bounds of

Project Number	Description of Project	External landowners that benefit	Reasons relating to external benefit
	Road Intersection 10		the SWDP.
13 -14	Internal roundabouts	Nil	Works created by the development within the bounds of the SWDP
15 -21	Drainage related projects	Nil	There are no catchments external to the SWDP which contribute runoff to the drainage infrastructure to be provided as per the detail in the drainage strategy
22	Development of Ken Harrison Reserve and purchase and development of POS	Nil	There is no external contribution required for this project. To be funded from landowners within the SWDP
23	Cost of preparing the scheme	Nil	To be funded from landowners within the SWDP

5.4 Calculation of Infrastructure Cost Sharing

The number and type of infrastructure projects to be provided are quite varied and therefore the method of determining which analysis area delivers that infrastructure will need to vary depending on the type of infrastructure to be provided.

Table 6 lists the different type of infrastructure to be provided and the method used to determine the cost apportionment to benefitting landowners which then is used to determine which Analysis Area will be required to provide the various items of infrastructure.

Table 6 Basis of Cost Apportionment

Type of Infrastructure	Basis of Cost Apportionment

Construction of the difference between Access Streets and Collector Streets and the additional land required for the Collector Streets to be built on	The traffic engineer who was engaged by Council to carry out the Traffic Impact Assessment for the development plan determined the amount of traffic generated by each land parcel within the development and assigned the amount of traffic using each portion of the Collector Street based on the following assumptions:
	• Residential density: Approximately 10.5 households per ha (2184 lots in total)
	• Residential traffic generation
	  • Daily: 10 vtc/household/day
	  • Peak hour: 1 vte/household/hr
	  AM peak hour: "In": 20% "Out": 80%
	  PM peak hour: "In": 60% "Out": 40%
	• Trip purpose:
	  • Internal: 6%
	  • External:
	  • Work: 25.6%
	  • School: 11.4%
	  • Shopping: 34.2%
	  • Other: 23.8%
	From these assumptions a general trip distribution was able to be established and modelled which was then used to predict the daily traffic volumes using the Collector Streets and thereby give a basis for apportioning the cost for these projects against each analysis area.

Drainage Infrastructure	The cost apportionment for all retardation basins, pump stations, rising mains, and outfall works and structures is based on the equivalent area (Co-efficient of run-off multiplied by area contributing) for each catchment area. The cost is then apportioned to each analysis area within the drainage catchment in proportion to the equivalent area they contribute.
POS contribution	Is a straight levy of 2.5% of the value of the residential land parcel.
Cost of preparing ICSC	Is based on the proportion of area of land parcel compared to the total area of land within the ICSC.

Using the methods for cost apportionment listed in Table 4 the total contribution payable for each analysis area is able to be determined. This will be used to determine which Analysis Area will be allocated the delivery of each item of infrastructure.

The apportionment of costs for each infrastructure project to each land parcel within the SWDP is summarised in Table 7.

Table 7 Apportionment of Costs

Project Number	Description of Project	Analysis Area 1	Analysis Area 2	Analysis Area 3	Analysis Area 4	Analysis Area 5	Analysis Area 6	Total
1	Project 1 Link Road No 1	$84,773	$0	$47,711	$41,290	$44,187	$43,039	$261,000
2	Project 2 Link Road No 2	$134,471	$0	$76,388	$1,212	$2,881	$76,038	$291,000
3	Project 3 Link Road No 3	$277,894	$0	$96,663	$1,285	$2,437	$64,722	$443,000
4	Project 4 Link Road No 4	$384,762	$0	$0	$0	$0	$35,238	$420,000
5	Project 5 Link Road No 5	$410,610	$0	$1,970	$938	$2,111	$53,372	$469,000
6	Project 6 Link 6 Feldtmann Lane Construction	$622,117	$0	$214	$137	$343	$62,130	$685,000
7	Project 7 Link Road 7(1)	$511,094	$0	$5,380	$2,452	$5,756	$8,368	$533,000
8	Project 8 Roundabout Coronation Street and Link Road Intersection 3	$65,590	$0	$36,714	$31,797	$130,822	$33,078	$298,000
9	Project 9 Roundabout Yana Street and Link Roads 3 and 4 Intersection 4	$96,343	$0	$70,477	$626	$1,132	$129,421	$298,000
10	Project 10 Internal Road Analysis Area 2 to Gray Street Intersection 6	$49,554	$177,174	$272	$0	$0	$0	$227,000
11	Project 11 Intersection of Gray Street and Feldtmann Lane Intersection 7	$208,101	$746	$113	$0	$0	$17,040	$226,000
12	Project 12 New Access Point to Swan Hill Sea Lake Road Intersection 10	$270,368	$1,904	$2,128	$1,008	$1,680	$2,912	$280,000

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project Number	Description of Project	Analysis Area 1	Analysis Area 2	Analysis Area 3	Analysis Area 4	Analysis Area 5	Analysis Area 6	Total
13	Project 13 Roundabout Link Road and Link Road Intersection 12	$272,014	$0	$805	$507	$685	$23,989	$298,000
14	Project 14 Roundabout Link Roads 6, 7 and 5 Intersection 13	$267,485	$0	$1,073	$387	$1,404	$27,654	$298,000
15	Project 15 Catchment 1 Retardation Basin to serve north part of Analysis Area 1	$350,000	$0	$0	$0	$0	$0	$350,000
16	Project 16 Catchment 2 Retardation Basin, pump station, rising main and outfall drains to service development south part of Analysis Area 1	$2,826,000	$0	$0	$0	$0	$0	$2,826,000
17	Project 17 Catchment 3 Gravity Outfall drains to service development Analysis Area 2	$0	$201,000	$0	$0	$0	$0	$201,000
18	Project 18 Catchment 4 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Areas 3 and part of 1 and 6	$1,159,596	$0	$813,386	$0	$0	$1,020,018	$2,986,000

South West Development Precinct
Infastructure Cost Sharing Calculations

Project Number	Description of Project	Analysis Area 1	Analysis Area 2	Analysis Area 3	Analysis Area 4	Analysis Area 5	Analysis Area 6	Total
19	Project 19 Catchment 5 Retardation Basin, pump station, rising main and outfall drains to service part development Analysis Areas 1 and 6	$406,087	$0	$0	$0	$0	$866,913	$1,273,000
20	Project 20 Catchment 6 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 4	$0	$0	$0	$528,000	$0	$0	$528,000
21	Project 21 Catchment 7 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 5	$0	$0	$0	$0	$950,000	$0	$950,000
22	Project 22 Development of Ken Harrison Reserve and purchase and development of POS	$612,142	$82,390	$81,928	$48,496	$122,988	$161,534	$1,109,478
23	Project 23 Cost of preparing infrastructure cost sharing report, traffic impact assessment and [illegible] strategy	$59,735	$5,347	$5,317	$3,147	$7,981	$10,483	$72,000
TOTAL		$9,041,726	$468,559	$1,240,547	$661,292	$1,274,404	$2,635,950	$15,322,478

5.5 Determination of the Delivery of Infrastructure Projects

The purpose of these calculations is to determine a fair and equitable method of allocating the responsibilities of delivering the infrastructure projects listed in these ICSC. This is done by comparing the cost sharing that would have been attributable under a Development Contributions Plan and the costs of delivering the projects listed in this ICSC. Table 8 shows how the allocation of infrastructure projects has been carried out to achieve this aim.

Table 8 Determination of Delivery of Projects

Project Number	Project Description	Delivery of Projects					
		Analysis Area 1	Analysis Area 2	Analysis Area 3	Analysis Area 4	Analysis Area 5	Analysis Area 6
1	Project 1 Link Road No 1					$261,000	
2	Project 2 Link Road No 2				$291,000		
3	Project 3 Link Road No 3			$443,000			
4	Project 4 Link Road No 4	$420,000					
5	Project 5 Link Road No 5	$469,000					
6	Project 6 Link 6 Feldtmann Lane Construction	$685,000					
7	Project 7 Link Road 7(1)	$533,000					
8	Project 8 Roundabout Coronation Street and Link Road Intersection 3					$298,000	
9	Project 9 Roundabout Yana Street and Link Roads 3 and 4 Intersection 4			$298,000			
10	Project 10 Internal Road Analysis Area 2 to Gray Street Intersection 6		$277,000				
11	Project 11 Intersection of Gray Street and Feldtmann Lane Intersection 7	$226,000					
12	Project 12 New Access Point to Swan Hill Sea Lake Road Intersection 10	$280,000					
13	Project 13 Roundabout Link Road and Link Road Intersection 12	$298,000					
14	Project 14 Roundabout Link Roads 6, 7 and 5 Intersection 13	$298,000					
15	Project 15 Catchment 1 Retardation Basin to serve north part of Analysis Area 1	$350,000					
16	Project 16 Catchment 2 Retardation	$2,826,000					

South West Development Precinct
Infastructure Cost Sharing Calculations

Project Number	Project Description	Delivery of Projects					
		Analysis Area 1	Analysis Area 2	Analysis Area 3	Analysis Area 4	Analysis Area 5	Analysis Area 6
	Basin, pump station, rising main and outfall drains to service development south part of Analysis Area 1						
17	Project 17 Catchment 3 Gravity Outfall drains to service development Analysis Area 2		$201,000				
18	Project 18 Catchment 4 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Areas 3 and part of 1 and 6	$967,416		$499,546			$1,519,038
19	Project 19 Catchment 5 Retardation Basin, pump station, rising main and outfall drains to service part development Analysis Areas 1 and 6	$406,687					$866,913.0
20	Project 20 Catchment 6 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 4				$528,000		
21	Project 21 Catchment 7 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 5					$950,000	
22	Project 22 Development of Kent Harrison Reserve and purchase and development of Pt 5	$818,919	$40,559				$250,000
23	Project 23 Cost of preparing infrastructure cost sharing report,	$72,000					

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project Number	Project Description	Delivery of Projects					
		Analysis Area 1	Analysis Area 2	Analysis Area 3	Analysis Area 4	Analysis Area 5	Analysis Area 6
	traffic impact assessment and drainage strategy						
Total Option 1		$8,649,422	$468,559	$1,240,546	$819,[illegible]	$1,509,000	$2,635,951
Total DCP		$9,041,726	$468,559	$1,240,547	$661,[illegible]92	$1,274,404	$2,635,950
Difference		**$392,303**	**$0**	**$0**	**-$157,708**	**-$234,596**	**$0**

Table 8 shows that it has not been possible to exactly the match the costs using the S173 Agreements as compared to the cost apportioned under a DCP without there being a cash contribution to compensate for differences.

Analysis Area 1 will be required to make a cash contribution to Council as their development proceeds and Council will pay this money over to the landowners in Analysis Areas 4 and 5 as it receives the contributions. This obligation will be included in the s173 agreements that are prepares under clause 7.3 of this report.

5.6 Determination of Land Given Up and Cost Sharing Within Analysis Areas

Table 9 shows the credits for land given up in excess of the proportion of cost attributable to the project which is located on the land. Map 5 shows the location and number of each parcel of land within the boundaries of the SWDP. This allows the landowners who are giving up land to have infrastructure located on it to be reimbursed by having the amount they are liable for in the provision of infrastructure within their analysis area reduced by the value of land they have given up.

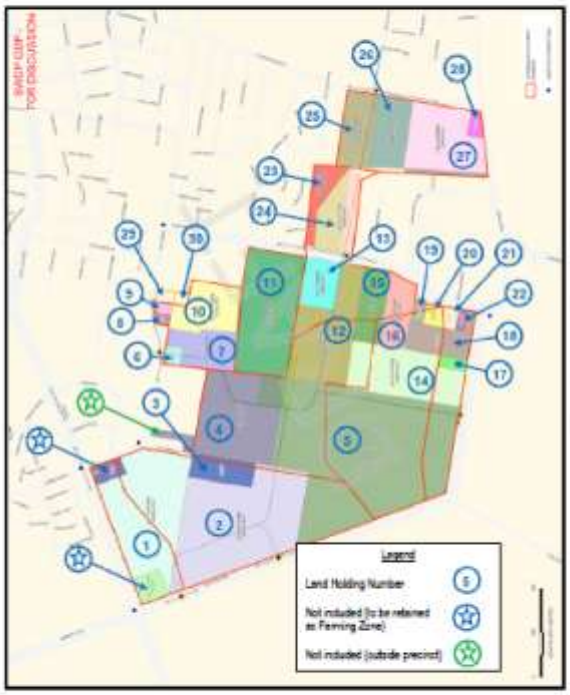
Table 9 Determination of Credit for Land Given Up.

Analysis Area (Sub-precinct Number)	Land Parcel Number	Area of Residential Land	Contribution	Credit for Land	Net Contribution	% of Net Contribution
1	1	152,667.60	$1,209,795	$176,240	$1,033,555	12.99%
1	2	282,896.11	$1,588,479	$88,000	$1,500,479	18.85%
1	3	38,222.81	$215,124	$58,080	$157,044	1.97%
1	4	150,888.95	$1,114,463	$582,800	$531,663	6.68%
1	5	518,235.50	$4,913,865	$177,120	$4,736,745	59.51%
		1,142,910.97	**$9,041,726**	**$1,082,240**	**$7,959,486**	**100.00%**
2	6	8,059.09	$25,637	$0	$25,637	5.47%
2	7	57,363.40	$180,646	$0	$180,646	38.55%
2	8	4,180.35	$13,084	$0	$13,084	2.79%
2	9	4,849.73	$15,344	$0	$15,344	3.27%
2	10	70,725.17	$218,197	$0	$218,197	46.57%
2	29	4832	$8,600	$0	$8,600	1.84%
2	30	3787	$7,051	$0	$7,051	1.50%
		153,826.74	**$468,559**	**$0**	**$468,559**	**100.00%**
Ken Harrison Reserve	11	0.00	$0		$0	
3	12	109,123.34	$988,972	$705,040	$283,932	53.02%
3	13	43,840.91	$251,574	$0	$251,574	46.98%
		152,964.25	**$1,240,547**	**$705,040**	**$535,507**	**100.00%**

South West Development Precinct
Infrastructure Cost Sharing Calculations

Analysis Area (Sub-precinct Number)	Land Parcel Number	Area of Residential Land	Contribution	Credit for Land	Net Contribution	% of Net Contribution
6	14	121,705.63	$1,212,347	$160,000	$1,052,347	42.50%
6	15	48,323.10	$243,238	$0	$243,238	9.82%
6	16	48,100.72	$298,584	$0	$298,584	12.06%
6	17	8,098.32	$108,568	$0	$108,568	4.38%
6	18	47,598.42	$447,596	$0	$447,596	18.08%
6	19	6,157.93	$94,886	$0	$94,886	3.83%
6	20	8,748.36	$69,642	$0	$69,642	2.81%
6	21	8,220.32	$104,199	$0	$104,199	4.21%
6	22	4,642.59	$56,891	$0	$56,891	2.30%
		301,595.39	**$2,635,950**	**$160,000**	**$2,475,950**	**100.00%**
4	23	32,516.48	$244,944	$0	$244,944	60.20%
4	24	58,029.69	$416,348	$254,400	$161,948	39.80%
		90,546.17	**$661,292**	**$254,400**	**$406,892**	**100.00%**
5	25	56,358.50	$345,239	$129,200	$216,039	22.48%
5	26	51,632.70	$303,545	$184,000	$119,545	12.44%
5	27	113,622.23	$586,383	$0	$586,383	61.00%
5	28	8,014.04	$39,237	$0	$39,237	4.08%
		229,627.47	**$1,274,404**	**$313,200**	**$961,204**	**100.00%**
Total		**2,071,470.99**	**$15,382,478**	**$2,514,880**	**$12,807,598**	

Map 5 Location of Parcels of land within the boundaries of the SWDP.



6. TIMEFRAME FOR THE PROVISION OF INFRASTRUCTURE PROJECTS

The timeframe for the provision of infrastructure projects contained in this ICSC is based upon the priorities for development within each Analysis Area. These priorities are as follows:

1. Install pump station, pumps, electrical and rising mains and stage 1 of retardation basin together with the necessary outfall drain to service the first stage the development within an Analysis Area unless temporary drainage infrastructure is permitted to be installed by the Council as per the requirements stated in the Drainage Strategy for the SWDP.
2. Install stage 1 of the Collector Street and relevant intersections to service the development.

All intersections listed in the infrastructure to be provided shall be constructed at the time the collector street feeding the intersection is constructed.

In the case of Link Road 1 and Intersection 3 these shall be provided upon:

- The completion of Link Road 2, or
- The completion of 50% of the residential land in Analysis Area 5

whichever occurs first.

In the case of Projects 22 and 23 and the cash contribution required to be paid by Analysis Area 1 landowners these will be provided progressively in accordance with the proportion of land developed within the respective Analysis Areas which have been allocated these projects to deliver.

In the case of the cash contributions made by the landowners of Analysis Area 1 (only those signing the s173 agreement under clause 7.3.3 of this report), these will be paid to Council who will pay that contribution to landowners of Analysis Area 4 and Analysis Area 5 who sign the s173 agreement under Clause 7.3.3 of this report for the cost sharing of infrastructure in accordance with the following percentages.

Analysis Area 4 amount to be reimbursed:	$157,708 (40.2%)
Analysis Area 5 amount to be reimbursed:	$234,596 (59.80%)
Total (Amount to be contributed by Analysis Area 1 landowners)	**$392,303**

7. PROCEDURAL MATTERS

7.1 Rise and Fall

Project 23 the cost of the preparing this ICSC is as at 30 June 2014. This cost will be adjusted annually on 1 July each year to adjust for the rise and fall in prices using the Melbourne All Groups Consumer Price Index ("CPI").

The rise and fall clause will also apply to the cash contribution that Analysis Area 1 is required to make under clause 5.5 of this report.

7.2 Terminology

The term Analysis Area whilst useful for determining the cost sharing of infrastructure provision is not suitable for use in the Schedule to the DP06 Development Plan Overlay to the Swan Hill Planning Scheme and therefore the S173 Agreements which are called up in that schedule use the term sub-precinct which has been used in these documents to replace Analysis Area.

7.3 Section 173 Agreements

The delivery of infrastructure projects allocated to particular sub- precincts (Analysis Areas) will be governed by a number of s173 Agreements entered between Council and Landowners to cover the delivery, standard, cost sharing and pre-requisites for development within any sub-precinct (Analysis Area).

All agreements must be prepared in consultation with, to the satisfaction of, and at no cost to Swan Hill Rural City Council.

The details of the various s173 agreements is shown below

7.3.1 Section 173 Agreements for the Delivery of Infrastructure Projects

A signed and registered agreement pursuant to section 173 of the Planning and Environment Act 1987 between Swan Hill Rural City Council and the landowners within the sub-precinct for the provision of infrastructure to serve the land within the South West Development Precinct.

This agreement will specify the infrastructure that is to be provided by the landowners within the sub-precinct as their fair and equitable contribution to the provision of infrastructure serving the whole of the South West Development Precinct. As a result of this agreement landowners within the sub-precinct will not be required to make contributions to the provision of infrastructure in other sub-precincts other than the common infrastructure covered by any s173 Agreement listed in Clause 7.3.2

There will be 6 separate section 173 agreements (i.e. one for each sub-precinct).

Each agreement will be required to be signed by the all the landowners within that sub-precinct.

This agreement must be signed and registered at the Titles Office before the Council will amend the Swan Hill Planning Scheme to give effect to the SWDP.

7.3.2 Section 173 Agreement for Infrastructure jointly provided by more than one sub-precinct

A signed and registered agreement pursuant to section 173 of the Planning and Environment Act 1987 between Swan Hill Rural City Council and the landowners within all the sub-precincts that are to jointly provide infrastructure.

This agreement will specify the infrastructure that is to be jointly provided by the landowners of more than one sub-precinct as their fair and equitable contribution to the provision of infrastructure serving the whole of the South West Development Precinct.

This clause relates to the provision of Project 18: Catchment 4 Retardation Basin, pump station, rising main and outfall drains to service all of sub-precinct 3 and parts of sub-precincts 1 and 6.

This agreement must be signed and registered at the Titles Office before the Council will amend the Swan Hill Planning Scheme to give effect to the SWDP.

7.3.3 Section 173 Agreement for the cost sharing of landowners within a sub-precinct.

A signed and registered agreement pursuant to section 173 of the Planning and Environment Act 1987 between Swan Hill Rural City Council and the landowner/s of the sub-precinct and any landowner on whose land the infrastructure to be provided by the sub-precinct, is located upon.

This agreement is to specify that the landowners party to this agreement will pay 100% of the cost of providing the infrastructure that has been allocated to be provided by the by the landowners within the sub-precinct.

The agreement must provide that the signatories to this agreement must meet all of the obligations of the Owner listed in the section 173 agreements listed in Clause 7.3.1 and 7.3.3.

This agreement must be signed and registered at the Titles Office before develop can commence in a sub-precinct.

Appendix A Engineers Estimates for Infrastructure Projects.

Project No 1-6 Link Road
Construction.

Determine cost for typical length and use this to determine unit rate for all the link road projects.

Item	Description	Quantity	Unit	Rate	Amount
1	Set out and project administration	1000	m	2	$2,000
2	Topsoil removal and stockpiling	3700	m^2	0.75	$2,775
3	Earthworks	2072	m^3	6	$12,432
4	Pavement				
4a	Supply and delivery of base wetmix of Class 2 crushed rock	1221	Tonnes	30.25	$36,935
4b	Supply and delivery of subbase wetmix of Class 3 crushed rock	1221	Tonnes	26.54	$32,405
4c	Placement and compaction of crushed rock	3700	m^2	1.6	$5,920
4d	Preparation for sealing	3700	m^2	3.5	$12,950
5	Supply and placement of Asphalt	3700	m^2	36.82	$136,234
6	Construction of additional footpath width to make shared path	2000	m^2	85	$170,000
6	Linemarking	1000	m	1	$1,000
7	Land acquisition	8000	m^2	20	$160,000
	Subtotal				**$572,652**
	15% Contingency				$85,898
	Total				**$658,549**
	SAY				**$659,000**

Assumptions

1. No site establishment as this would be done as part of Access St component
2. Estimate based on a unit length of 1000m
3. Shared path required on both sides of Collector Streets

Calculation of quantities

Length of road	1000	m
Additional width of pavement	3.7	m
Depth of pavement	0.3	m
Volume of pavement material (solid)	1110	
Quantity of crushed rock	2442	tonnes

Quantity of Class 2 base	1221	tonnes
Quantity of Class 3 Sub base	1221	tonnes
Area of asphalt	3700	m^2
Supply of Class 2 wetmix ex bin	23.8	$/tonne
Supply of Class 3 wetmix ex bin	20.09	$/tonne
Cartage from Lake Boga Quarries to Swan Hill	6.45	$/tonne
Depth of excavation for pavement	0.4	m
Volume of excavation (solid)	1480	m^3
Volume of excavation (loose)	2072	m^3
Width of additional road reserve	8	m
Area of additional land	8000	m^2
Length of shared path	2000	m
Additional width of path	1	m

	Link Roads	**Length as at 15 April**	**Estimated Cost**
Project 1	Link Road 1 Coronation Avenue to GMW Channel	395	$261,000
Project 2	Link Road 2 GMW Channel to Yana Street	441	$291,000
Project 3	Link Road 3 Yana Street to internal Roundabout	672	$443,000
Project 4	Link Road 4 Internal Roundabout to Deadhorse Lane	636	$420,000
Project 5	Internal Roundabout to internal T intersection	711	$469,000
Project 6a	Link Road 6 Feldtmann Lane Construction (Internal	249.6	$165,000
Project 6b	Link Road 6 Feldtmann Lane (See Project 7)	267.4	$520,000
Project 7(1)	From Internal T intersection to Swan Hill Sea Lake Road	808	$533,000

	Check	**1000**	**$659,000**
Project 7 (2)		697	$460,000

Project No 7 Feldtmann Lane
Construction.

Item	Description	Quantity	Unit	Rate	Amount
1	Set out and project administration			Item	$4,000
2	Topsoil removal and stockpiling	2980.96	m²	0.875	$2,608
3	Traffic control	267.4	m	10	$2,674
4	Earthworks	1669.3376	m³	7	$11,685
5	Pavement				
5a	Supply and delivery of base wetmix of Class 2 crushed rock	1076.5524	Tonnes	30.85	$32,566
5b	Supply and delivery of subbase wetmix of Class 3 crushed rock	1076.5524	Tonnes	26.54	$28,572
5c	Placement and compaction of crushed rock	2980.96	m²	1.6	$4,770
5d	Preparation for sealing	2980.96	m²	4	$11,924
6	Kerb and channel supply and lay	534.8	m	90	$48,132
7	Supply and lay 375mm dia underground drainage	220	m	115	$25,300
8	SEP	6	No	2000	$12,000
9	Supply and placement of Asphalt	2980.96	m²	36.82	$109,759
10	Construction of shared path	1337	m²	85	$113,645
11	Linemarking and road furniture	267.4	m	5	$1,337
12	Land acquisition	2139.2	m²	20	$42,784
	Subtotal				$451,755
	15% Contingency				$67,763
	Total				$519,519
	SAY				$520,000

Assumptions
No site establishment as this would be done as part of Access
1 St component
Shared path required on both sides of
2 Street

Calculation of quantities

Length of road	267.4	m
Area of seal	2980.96	
Width of pavement	12.2	m
Depth of pavement	0.3	m
Volume of pavement material (solid)	978.684	
Quantity of crushed rock	2153.1048	tonnes
Quantity of Class 2 base	1076.5524	tonnes
Quantity of Class 3 Sub base	1076.5524	tonnes

Area of asphalt	2980.96	m^2
Supply of Class 2 wetmix ex bin	23.8	$/tonne
Supply of Class 3 wetmix ex bin	20.09	$/tonne
Cartage from Lake Boga Quarries to Swan Hill	6.45	$/tonne
Depth of excavation for pavement	0.4	m
Volume of excavation (solid)	1192.384	m^3
Volume of excavation (loose)	1669.3376	m^3
Length of kerb and channel	534.8	m
Width of additional road reserve	8	m
Area of additional land	2139.2	m^2
Length of shared path	534.8	m
Width of path	2.5	

Project No 8, 9, 13 and 14 Typical Roundabout Construction.

Item	Description	Quantity	Unit	Rate	Amount
1	Set out and project administration			Item	$4,000
2	Topsoil removal and stockpiling	1700	m²	1.875	$3,188
3	Traffic control			Item	$5,000
4	Earthworks	1028.16	m³	15	$15,422
5	Pavement				
5a	Supply and delivery of base wetmix of Class 2 crushed rock	561	Tonnes	30.00	$16,970
5b	Supply and delivery of subbase wetmix of Class 3 crushed rock	561	Tonnes	26.54	$14,889
5c	Placement and compaction of crushed rock	1700	m²	10	$17,000
5d	Preparation for sealing	1700	m²	8	$13,600
6	Kerb and channel and traffic islands supply and lay	262	m	150	$39,300
7	Supply and lay 375mm dia underground drainage	50	m	115	$5,750
8	SEP	6	No	2000	$12,000
9	Supply and placement of Asphalt	1700	m²	36.82	$62,594
10	Construction of kerb ramps	60	m²	150	$9,000
11	Construction of central concrete slab	30	m²	85	$2,550
11	Street lighting			Item	$15,000
12	Linemarking and road furniture			Item	$4,000
13	Landscaping and reinstatement			Item	$3,000
14	Allowance for Service Alteration			Item	$15,000
	Subtotal				$258,263
	15% Contingency				$38,739
	Total				$297,003
	SAY				$298,000

Assumptions

1 No site establishment as this would be done as part of Access St component

2 Shared path would be part of Collector street costs

3 Based on McCrae Street/ High Street roundabout costs

Calculation of quantities

Length of road		m
Area of seal	1700	m²
Width of pavement		m
Depth of pavement	0.3	m
Volume of pavement material (solid)	510	
Quantity of crushed rock	1122	tonnes
Quantity of Class 2 base	561	tonnes
Quantity of Class 3 Sub base	561	tonnes
Area of asphalt	1700	m²
Supply of Class 2 wetmix ex bin	23.8	$/tonne
Supply of Class 3 wetmix ex bin	20.09	$/tonne
Cartage from Lake Boga Quarries to Swan Hill	6.45	$/tonne
Depth of excavation for pavement	0.4	m
Volume of excavation (solid)	734.4	m³
Volume of excavation (loose)	1028.16	m³
Length of kerb and channel	261	m
Width of additional road reserve	8	m
Area of additional land	0	m²
Length of shared path	0	m
Width of path	2.5	m
Diameter of central median	15.6	m

Cost Estimate of Standard Roundabout in SW Development

Costing date: 09/04/2014

Item No.	Description of Work	Unit	Quantity	Rate	Amount
	LUMP SUM ITEMS				
1	**EARTH WORKS/SITE CLEARANCE**				
1.1	Excavation and subgrade profile	m2	1572.00	$5.00	$7,860.00
2	**REMOVAL DISPOSAL ACESS**				
2.1	~~Removal of kerb and channel~~				

2.2	~~Removal of footpath and kerb crossings~~				
2.3	~~Removal of sign posts~~				
2.4	Survey and setout works	item	1.00	$3,000.00	$3,000.00
3	**ROAD PAVEMENT**				
3.3	Compaction of subgrade	m2	1572.00	$10.00	$15,720.00
3.4	Supply lay compact class 3 crushed rock	m2	1437.00	$17.00	$24,429.00
3.5	Supply lay compact class 2 crushed rock	m2	1437.00	$23.00	$33,051.00
4	**ASPHALT WORKS**				
4.1	Supply lay and compact 10mm Type V asphalt (inc primer)	m2	1376.00	$40.00	$55,040.00
5	**CONCRETE WORKS**				
5.1	Kerb and Channel SM1	Lnm	198.00	$110.00	$21,780.00
5.2	Kerb and Channel SM2	Lnm	120.00	$120.00	$14,400.00
6	**FOOTPATH**				
6.1	Footpath	m2	168.00	$90.00	$15,120.00
6.2	Kerb Ramps	item	4.00	$1,500.00	$6,000.00
6.3	Supply install TGSI	item	8.00	$1,500.00	$12,000.00
7	**MEDIAN ISLANDS**				
7.1	Construct pedestrian refuge	item	4.00	$1,500.00	$6,000.00
8	**CENTRAL RING**				
8.1	Construct concrete infill panels	m2	45.00	$120.00	$5,400.00
9	**DRAINAGE**				
9.2	Supply and lay 300 mm diameter RCP	Lnm	160.00	$300.00	$48,000.00
9.3	SEP	item	4.00	$2,500.00	$10,000.00
9.4	Junction Pit	item	4.00	$3,500.00	$14,000.00
10	**PROVISION OF LIGHTING**				
10.1	Excavation, supply and laying of conduits & protection slabs	item	1.00	$3,500.00	$3,500.00
10.2	Install underground power cable, pits and install and connect light pole	item	1.00	$12,000.00	$12,000.00
11	**TREATMENT OF CENTRAL RING**				
11.1	Supply and fill central ring 250mm	m2	136.00	$20.00	$2,720.00
11.2	Supply and fill quarry dust 50mm	m2	136.00	$10.00	$1,360.00
12	**SIGNAGE**				
12.1	Supply and install signs	item	1.00	$5,000.00	$5,000.00
13	**TRAFFIC MANAGEMENT**				

13.1	Safety measure and Provide traffic management	item	1.00	$1,000.00	$2,000.00
14	**GENERAL ITEMS**				
14.1	~~Saw cut existing footpath concrete and road pavement~~				
14.2	As constructed drawings	item	1.00	$500.00	$500.00
14.3	General site reinstatement	item	1.00	$2,000.00	$2,000.00
14.4	Contingencies	item	1.00	$15,000.00	**$15,000.00**
				Total(GST Excl)=	**$335,880.00**

Costing References from Projects:
High-McCrae Roundabout
Pritchard St Drainage
Beveridge St Drainage
Beveridge St Reconstruction
CBD Projects
TGSIs works

Project No 10 Intersection of Analysis Area 2 with Gray Street.
Intersection 6
Construction of left and right turn lanes in internal road plus left turn lane in Gray Street

Item	Description	Quantity	Unit	Rate	Amount
1	Set out and project administration			Item	$4,000
2	Cutting and removing of kerb and channel and relocation of services and drainage pipes	20	m	200	$4,000
3	Traffic control			Item	$5,000
4	Earthworks	686	m^3	15	$10,288
5	Pavement				
5a	Supply and delivery of base wetmix of Class 2 crushed rock	374	Tonnes	30.25	$11,320
5b	Supply and delivery of subbase wetmix of Class 3 crushed rock	374	Tonnes	26.55	$9,932
5c	Placement and compaction of crushed rock	1134	m^2	10	$11,340
5d	Preparation for sealing	1134	m^2	20	$22,680
6	Kerb and channel supply and lay	30	m	150	$4,500
7	Supply and lay 375mm dia underground drainage	50	m	115	$5,750
8	SEP	1	No	2000	$2,000
9	Supply and placement of Asphalt	1134	m^2	36.82	$41,754
10	Street lighting			Item	$15,000
11	Purchase of additional land for road widening at intersection	966	m^2	20	$19,320
12	Linemarking and road furniture			Item	$4,000
13	Landscaping and reinstatement			Item	$3,000
14	Allowance for Service Alteration			Item	$15,000
	Subtotal				$188,883
	20% Contingency				$37,777
	Total				$226,660
	SAY				$227,000

Assumptions

1	No site establishment as this would be done as part of Access St component	
2	Width of pavement at intersection is	
	2 parking Lanes	4.2
	3 through lanes	11.1
	Total	15.3
	Road Reserve Width	16
	Nature strip width at intersections	0.35
	Width of widening	8.4

2	Since it is a T intersection allow for the construction of a left turn lane in Gray St	
	Assume length of widening in Access Street	115
	Assume length of left lane is	20
	Width of lane	8.4

Calculation of quantities

Length of road		m
Area of seal	1134	m^2
Width of pavement		m
Depth of pavement	0.3	m
Volume of pavement material (solid)	340.2	
Quantity of crushed rock	748.44	tonnes
Quantity of Class 2 base	374.22	tonnes
Quantity of Class 3 Sub base	374.22	tonnes
Area of asphalt	113	m^2
Supply of Class 2 wetmix ex bin	23.8	$/tonne
Supply of Class 3 wetmix ex bin	20.09	$/tonne
Cartage from Lake Boga Quarries to Swan Hill	9.45	$/tonne
Depth of excavation for pavement	0.4	m
Volume of excavation (solid)	499.888	m^3
Volume of excavation (loose)	685.8432	m^3
Length of kerb and channel	261	m
Width of additional road reserve	0	m
Area of additional land	0	m^2
Length of shared path	0	m
Width of path	0	m
Diameter of central median		m

Project 11 Intersection of Gray Street and Feldtmann Lane
Intersection 7
Left and right turn lanes in Feldtmann Street and Right Turn Lane in Gray Street

Item	Description	Quantity	Unit	Rate	Amount
1	Set out and project administration			Item	$4,000
2	Cutting and removing of kerb and channel and relocation of services and drainage pipes and reinstatement	130	m	150	$19,500
3	Traffic control			Item	$5,000
4	Earthworks	617	m^3	15	$9,253
5	Pavement				
5a	Supply and delivery of base wetmix of Class 2 crushed rock	306	Tonnes	30.25	$9,257
5b	Supply and delivery of subbase wetmix of Class 3 crushed rock	673.2	Tonnes	26.54	$17,867
5c	Placement and compaction of crushed rock	336.6	m^2	10	$3,366
5d	Preparation for sealing	336.6	m^2	20	$6,732
6	Kerb and channel supply and lay	130	m	150	$19,500
7	Supply and lay 375mm dia underground drainage	130	m	115	$14,950
8	SEP	2	No	2000	$4,000
9	Supply and placement of Asphalt	1020	m^2	36.82	$37,556
10	Street lighting			Item	$15,000
11	Linemarking and road furniture			Item	$4,000
12	Landscaping and reinstatement			Item	$3,000
13	Allowance for Service Alteration			Item	$15,000
	Subtotal				$187,981
	20% Contingency				$37,596
	Total				$225,577
	SAY				$226,000

Project 12 New Access Point to Swan Hill Sea Lake Road
Intersection 10
Left and right turn lanes on both roads

Item	Description	Quantity	Unit	Rate	Amount
1	Set out and project administration			Item	$4,000
2	Cutting and removing of kerb and channel and relocation of services and drainage pipes and reinstatement	0	m	150	$0
3	Traffic control			Item	$5,000
4	Earthworks	1003	m³	15	$15,050
5	Pavement				
5a	Supply and delivery of base wetmix of Class 2 crushed rock	497.7	Tonnes	30.25	$15,055
5b	Supply and delivery of subbase wetmix of Class 3 crushed rock	1094.94	Tonnes	26.54	$29,060
5c	Placement and compaction of crushed rock	547.47	m²	10	$5,475
5d	Preparation for sealing	547.47	m²	20	$10,949
6	Kerb and channel supply and lay	210	m	150	$31,500
7	Supply and lay 375mm dia underground drainage	130	m	115	$14,950
8	SEP	2	No	2000	$4,000
9	Supply and placement of Asphalt	1659	m²	36.82	$61,084
10	Street lighting			Item	$15,000
11	Linemarking and road furniture			Item	$4,000
12	Landscaping and reinstatement			Item	$3,000
13	Allowance for Service Alteration			Item	$15,000
	Subtotal				$233,124
	20% Contingency				$46,625
	Total				$279,749
	SAY				$280,000

Assumptions
1 No site establishment as this would be done as part of Access St component
2 Since it is a T intersection allow for the construction of a left turn lane in Gray St

Assume length of left lane in Swan Hill Sea Lake Road	50
Width of lane	3.7
Assume length of right lane in Swan Hill Sea Lake Road	160
Assume length of widening in Link road for left hand lane	50
Assume length of right turn lane in link road	130

Total length of widening is	390
Width of widening in new Link Road	
2 parking Lanes	4.2
3 through lanes	11.1
Total	15.3
Road Reserve Width	24
Nature strip width at intersections	4.35
Width of widening of link road	4.9
Width of widening Swan Hill Sea Lake Road	3.7

Calculation of quantities

Length of road		m
Area of seal	1659	m²
Width of pavement		m
Depth of pavement	0.3	
Volume of pavement material (solid)	497.7	
Quantity of crushed rock	1094.94	tonnes
Quantity of Class 2 base	547.47	tonnes
Quantity of Class 3 Sub base	547.47	tonnes
Area of asphalt	1659	m²
Supply of Class 2 wetmix ex bin	23.8	$/tonne
Supply of Class 3 wetmix ex bin	20.09	$/tonne
Cartage from Lake Boga Quarries to Swan Hill	6.45	$/tonne
Depth of excavation for pavement	0.4	m
Volume of excavation (solid)	716.688	m³
Volume of excavation (loose)	1003.3632	m³
Length of kerb and channel	261	m
Width of additional road reserve	8	m
Area of additional land	0	m²
Length of shared path	0	m
Width of path	2.5	m
Diameter of central median	15.6	m

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project 15 Catchment 1	Construction of 4,000 m^3 retardation basin which discharges by gravity through 260m of 300mm RCP to the main drain. Area of land 6900m^2

Item	Description	Quantity	Unit	Rate	Amount
1	Set up and project administration	Item			$3,000
2	Stripping and stockpiling of topsoil	5,329	m^2	0.75	$3,997
3	Excavation of material and carting and placing on allotments and grading, compacting to line and level	7,840	m^3	5.7	$44,688
4	Excavate clay liner 500mm deep	0	m^3	5.7	$0
5	Place and compact clay liner 500mm deep	0	m^2	20	$0
6	Place topsoil and sow down	0	m	3	$0
7	Landscaping	6889	m^2	5	$34,445
8	Access track	100	m	20	$2,000
9	Pumpwell, pump station and electrics as per quote from Aquatach				$0
10	300mm dia rising main	260	m	300	$78,000
11	Gravity mains				
11a	600mm RCP		m	550	$0
11b	750mm RCP		m	700	$0
11c	900mm RCP		m	850	$0
11d	1200mm RCP		m	1000	$0
12	Pits				
12a	600mm pipeline		No	4000	$0
12b	750mm pipeline		No	4500	$0
12c	900mm pipeline		No	5000	$0
12d	1200mm pipeline		No	7000	$0
13	Headwall		No	1500	$0
14	Area of land required for basin	6,889	m^2	20	$137,780
	Subtotal				**$303,910**
	15% Contingency				$45,586
	Total				**$349,496**
	SAY				**$350,000**

Assumptions
Basin is square

Quantities

Basin storage volume required	3,918	m^3
Excavation volume (solid) excluding clay layer	5,600	m^3
Excavation volume (loose)	7,840	m^3
Area of liner	0	m^2
Excavation of clay liner 500mm deep (solid)	0	m^3
Excavation of clay liner loose	0	m^3
Top width of basin	73	m
Area of topsoil to be stripped	5,329	m^2
Area of land	6,889	m^2

Project 16 Catchment 2	**Construction of 42,500 m3 retardation basin, 4m deep pump station with a pumping capacity of 214 lit/sec and 1210m of 300mm dia rising main. Area of land 26,900 m2 Outfall drains consisting of 160m of 600mm RCP, 267m of 750mm RCP, 235m of 900mm RCP and 190m of 1200mm RCP**

Item	Description	Quantity	Unit	Rate	Amount
1	Set up and project administration	Item			$5,000
2	Stripping and stockpiling of topsoil	23,716	m^2	0.75	$17,787
3	Excavation of material and carting and placing on allotments and grading, compacting to line and level	70,980	m^3	5.7	$404,586
4	Excavate clay liner 500mm deep	12,000	m^3	5.7	$0
5	Place and compact clay liner 500mm deep including Geo-membrane	24,000	m^2	29	$0
6	Place topsoil and sow down	24,000	m^2	3	$72,000
7	Landscaping	26,986	m^2	4	$107,944
8	Access track	200	m	20	$4,000
9	Pumpwell, pump station and electrics as per quote from Aquatach	Item			$183,550
10	300mm dia rising main	1210	m	300	$363,000
11	Gravity mains				
11a	600mm RCP	160	m	550	$88,000
11b	750mm RCP	267	m	700	$186,900
11c	900mm RCP	235	m	850	$199,750
11d	1200mm RCP	190	m	1000	$190,000
12	Pits				
12a	600mm pipeline	3	No	4000	$12,000
12b	750mm pipeline	7	No	4500	$31,500
12c	900mm pipeline	4	No	5000	$20,000
12d	1200mm pipeline	4	No	7000	$28,000
13	Headwall	2	No	1500	$3,000
14	Area of Land required for basin	26,986	m^2	20	$539,720
	Subtotal				**$2,456,737**
	15% Contingency				$368,511
	Total				**$2,825,248**
	SAY				**$2,826,000**

Assumptions
Basin is square

Quantities

Basin storage volume required	42,481	m^3
Excavation volume (solid) excluding clay layer	50,700	m^3
Excavation volume (loose)	70,980	m^3
Area of liner	24,000	m^2
Excavation of clay liner 500mm deep (solid)	12,000	m^3
Excavation of clay liner loose	16,800	m^3
Top width of basin	154	m
Area of topsoil to be stripped	23,715	m^2
Area of land	26,986	m

Project 17 Catchment 3	Outfall drain 220m of 750mm RCP

Item	Description	Quantity	Unit	Rate	Amount
1	Set up and project administration	Item			$1,000
2	Stripping and stockpiling of topsoil	0	m^2	0.75	$0
3	Excavation of material and carting and placing on allotments and grading, compacting to line and level	0	m^3	[illegible]	$0
4	Excavate clay liner 500mm deep	0	m^3	5.7	$0
5	Place and compact clay liner 500mm deep	0	m^3	30	$0
6	Place topsoil and sow down	0	m^2	3	$0
7	Landscaping	0	m^2	2	$0
8	Access track	0	m	20	$0
9	Pumpwell, pump station and electrics as per quote from Aquatach				$0
10	300mm dia rising main	0	m	300	$0
11	Gravity mains				
11a	600mm RCP	0	m	550	$0
11b	750mm RCP	220	m	700	$154,000
11c	900mm RCP	0	m	850	$0
11d	1200mm RCP	0	m	1000	$0
12	Pits				
12a	600mm pipeline	0	No	4000	$0
12b	750mm pipeline	4	No	4500	$18,000
12c	900mm pipeline	0	No	5000	$0
12d	1200mm pipeline	0	No	7000	$0
13	Headwall	1	No	1500	$1,500
14	Area of land required for basin	0	m^2	20	$0
	Subtotal				**$174,500**
	15% Contingency				$26,175
	Total				**$200,675**
	SAY				**$201,000**

Assumptions
Basin is square
Basin is constructed below water table
Basin requires lining

Quantities

Basin storage volume required	0	m^3
Excavation volume (solid) excluding clay layer	0	m^3
Excavation volume (loose)	0	m^3
Area of liner	0	m^2
Excavation of clay liner 500mm deep (solid)	0	m^3
Excavation of clay liner loose	0	m^3
Top width of basin	0	m
Area of topsoil to be stripped	0	m^2
Area of land	0	m^2

Project 18 Catchment 4	**Construction of 35,600 m^3 retardation basin, 4m deep pump station with a pumping capacity of 214 lit/sec and 560m of 300mm dia rising main. Area of land 30,300 m^2 Outfall drains consisting of 70m of 300mm RCP, 347m of 375m RCP, 130m of 525mm RCP, 67m of 600mm RCP, 130m of 900mm RCP, and 310m of 1050mm RCP**

Item	Description	Quantity	Unit	Rate	Amount
1	Set up and project administration	Item			$5,000
2	Stripping and stockpiling of topsoil	26,896	m^2	0.75	$20,172
3	Excavation of material and carting and placing on allotments and grading, compacting to line and level	61,600	m^3	5.5	$351,120
4	Excavate clay liner 500mm deep	13,500	m^3	5	$0
5	Place and compact clay liner 500mm deep including placement of Geo-membrane	27,000	m^2	29	$0
6	Place topsoil and sow down	27,000	m^2	3	$81,000
7	Landscaping	30,276	m^2	4	$121,104
8	Access track	200	m	20	$4,000
9	Pumpwell, pump station and electrics as per quote from Aquatech	Item			$174,900
10	375mm dia rising main	827	m	375	$310,125
11	Gravity mains				
11a	300mm dia RCP	70		300	$21,000
11b	375mm dia RCP	347		350	$121,450
11c	525mm dia RCP	130		450	$58,500
11d	600mm RCP	67	m	550	$36,850
11e	750mm RCP	0	m	700	$0
11f	900mm RCP	130	m	850	$110,500
11g	1050mm RCP	310	m	900	$279,000
11h	1200mm RCP	190	m	1000	$190,000
12	Pit				
	300mm pipeline	2	No	2500	$5,000
	375mm pipeline	7	No	3000	$21,000
	525 pipeline	3	No	3800	$11,400
12a	600mm pipeline	2	No	4000	$8,000
12b	750mm pipeline	0	No	4500	$0
12c	900mm pipeline	3	No	5000	$15,000
12d	1050mm pipeline	7	No	6000	$42,000
12e	1200mm pipeline	0	No	7000	$0
13	Headwall	3	No	1100	$3,300

14	Area of Land required for basin	30,276	m^2	20	$605,520
	Subtotal				**$2,595,941**
	15% Contingency				$389,391
	Total				**$2,985,332**
	SAY				**$2,986,000**

Assumptions
Basin is square

Quantities

Basin storage volume required	35,591	m^3
Excavation volume (solid) excluding clay layer	44,000	m^3
Excavation volume (loose)	61,600	m^3
Area of liner	27,000	m^2
Excavation of clay liner 500mm deep (solid)	13,500	m^3
Excavation of clay liner loose	18,900	m^3
Top width of basin	164	m
Area of topsoil to be stripped	26,896	m^2
Area of land	30,276	m^2

South West Development Precinct
Infrastructure Cost Sharing Calculations

Project 19 Catchment 5	**Construction of 6,300 m^3 retardation basin, 3.4m deep pump station with a pumping capacity of 34 lit/sec and 1,320m of 150mm dia rising main. Area of land 8,000 m^2 Outfall drains consisting of 21m of 375mm RCP, 108m of 450mm RCP, 413m of 525mm RCP and 413m of open earth drain.**

Item	Description	Quantity	Unit	Rate	Amount
1	Set up and project administration	Item			$3,000
2	Stripping and stockpiling of topsoil	6,241	m^2	0.75	$4,681
3	Excavation of material and carting and placing on allotments and grading, compacting to line and level	12,180	m^3	5.7	$69,426
4	Excavate clay liner 500mm deep	3,200	m^3	5.7	$0
5	Place and compact clay liner 500mm deep including placement of Geo-membrane	6,400	m^2	29	$0
6	Place topsoil and sow down	6,400	m^2	3	$19,200
7	Landscaping	7,992	m^2	5	$39,960
8	Access track	100	m	20	$2,000
9	Pumpwell, pump station and electrics as per quote from Aquatech	Item			$126,700
10	150mm dia rising main	1320	m	300	$396,000
11	Gravity mains				
11a	450mm RCP	108	m	450	$48,600
11b	525mm RCP	413	m	450	$185,850
11c	375mm RCP	21	m	350	$7,350
11d	750mm RCP	0	m	700	$0
11e	900mm RCP	0	m	850	$0
11f	1200mm RCP	0	m	1000	$0
12	Pits				
12a	450mm pipeline	4	No	3500	$14,000
12b	525mm pipeline	5	No	3800	$19,000
12c	375mm pipeline	2	No	3000	$6,000
12d	750mm pipeline	0	No	4500	$0
	900mm pipeline	0	No	5000	$0
	1200mm pipeline	0	No	7000	$0
13	Headwall	1	No	900	$900
14	Construction of open earth drain overland flow path	413	m	10	$4,130
15	Area of Land required for basin	7,992	m^2	20	$159,840
	Subtotal				**$1,106,637**
	15% Contingency				$165,996

	Total				**$1,272,632**
	SAY				**$1,273,000**

Assumptions
Basin is square

Quantities

Basin storage volume required	6,232	m^3
Excavation volume (solid) excluding clay layer	8,700	m^3
Excavation volume (loose)	12,180	m^3
Area of liner	8,400	m^2
Excavation of clay liner 500mm deep (solid)	3,200	m^3
Excavation of clay liner loose	4,480	m^3
Top width of basin	79	m
Area of topsoil to be stripped	6,241	m^2
Area of land	7,992	m^2

Project 20 Catchment 6	**Construction of 5,300 m^3 retardation basin, 2.5m deep pump station with a pumping capacity of 34 lit/sec and 195m of 150mm dia rising main. Area of land 9,200 m^2**

Item	Description	Quantity	Unit	Rate	Amount
1	Set up and project administration	Item			$5,000
2	Stripping and stockpiling of topsoil	7,396	m^2	0.75	$5,547
3	Excavation of material and carting and placing on allotments and grading, compacting to line and level	10,640	m^3	5.7	$60,648
4	Excavate clay liner 500mm deep	3,700	m^3	5.7	$0
5	Place and compact clay liner 500mm deep including placement of Geo-membrane	7,400	m^2	29	$0
6	Place topsoil and sow down	7,400	m^2	3	$22,200
7	Landscaping	9,139	m^2	5	$45,695
8	Access track	200	m	20	$4,000
9	Pumpwell, pump station and electrics as per quote from Aquatech	Item			$103,500
10	150mm dia rising main	195	m	150	$29,250
11	Gravity mains				
11a	600mm RCP	0	m	550	$0
11b	750mm RCP	0	m	700	$0
11c	900mm RCP	0	m	850	$0
11d	1200mm RCP	0	m	1000	$0
12	Pits				
12a	600mm pipeline	0	No	4000	$0
12b	750mm pipeline	0	No	4500	$0
12c	900mm pipeline	0	No	5000	$0
12d	1200mm pipeline	0	No	7000	$0
13	Headwall	0	No	1500	$0
14	Area of Land required for basin	9,139	m^2	20	$182,780
	Subtotal				**$458,620**
	15% Contingency				$68,793
	Total				**$527,413**
	SAY				**$528,000**

Assumptions
Basin is square

Quantities

Basin storage volume required	5,430	m^3
Excavation volume (solid) excluding clay layer	7,600	m^3
Excavation volume (loose)	10,640	m^3
Area of liner	7,400	m^2
Excavation of clay liner 500mm deep (solid)	3,700	m^3
Excavation of clay liner loose	5,180	m^3
Top width of basin	86	m
Area of topsoil to be stripped	7,39[illegible]	m^2
Area of land	9,139	m^2

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Project 21 Catchment 7	**Construction of 10,700 m^3 retardation basin, 3m deep pump station with a pumping capacity of 131 lit/sec and 580m of 250mm dia rising main. Area of land 12,500 m^2**

Item	Description	Quantity	Unit	Rate	Amount
1	Set up and project administration	Item			$5,000
2	Stripping and stockpiling of topsoil	10,404	m^2	0.75	$7,803
3	Excavation of material and carting and placing on allotments and grading, compacting to line and level	19,600	m^3	5.7	$111,720
4	Excavate clay liner 500mm deep	5,200	m^3	5.7	$0
5	Place and compact clay liner 500mm deep including placement of Geo-membrane	10,400	m	29	$0
6	Place topsoil and sow down	10,400	m^2	3	$31,200
7	Landscaping	12,455	m^2	5	$62,275
8	Access track	200	m	20	$4,000
9	Pumpwell, pump station and electrics as per quote from Aquatech	Item			$163,250
10	250mm dia rising main	580	m	250	$145,000
	Contruction of Rising Main in sealed pavement	580	m		$46,039
11	Gravity mains				
11a	600mm RCP	0	m	550	$0
11b	750mm RCP	0	m	700	$0
11c	900mm RCP	0	m	850	$0
11d	1200mm RCP	0	m	1000	$0
12	Pits				
12a	600mm pipeline	0	No	4000	$0
12b	750mm pipeline	0	No	4500	$0
12c	900mm pipeline	0	No	5000	$0
12d	1200mm pipeline	0	No	7000	$0
13	Headwall	0	No	1500	$0
14	Area of Land required for basin	12,455	m^2	20	$249,100
	Subtotal				**$825,387**
	15% Contingency				$123,808
	Total				**$949,195**
	SAY				**$950,000**

Assumptions

Basin is square

Rising main located in road pavement

Quantities

Basin storage volume required	10,669	m^3
Excavation volume (solid) excluding clay layer	14,000	m^3
Excavation volume (loose)	19,600	m^3
Area of liner	10,400	m^2
Excavation of clay liner 500mm deep (solid)	5,200	m^3
Excavation of clay liner loose	7,280	m^3
Top width of basin	102	m
Area of topsoil to be stripped	10,404	m^2
Area of land	12,455	m^2

Calculation of quantities

Length of trench	580	m
Additional width of pavement	0.6	m
Depth of pavement	1	m
Volume of pavement material (solid)	348	
Quantity of crushed rock	765.6	tonnes
Quantity of Class 2 base	382.8	tonnes
Qunatity of Class 3 Sub base	382.8	tonnes
Area of asphalt	348	m^2
Supply of Class 2 wetmix ex bin	23.8	$/tonne
Supply of Class 3 wetmix ex bin	20.09	$/tonne
Cartage from Lake Boga Quarries to Swan Hill	6.45	$/tonne
Depth of excavation for pavement	0.4	m
Volume of excavation (solid)	139.2	m^3
Volume of excavation (loose)	194.88	m^3
Width of additional road reserve	8	m
Area of additional land	4640	m^2
Length of shared path	1160	m
Additional width of path	1	m

Cost of supply of crushed rock	$20,319
Cost of asphalt	$13,920

Cost of cutting pavement	$5,800
Reinstatement	$2,000
Traffic Control	$4,000
Total	**$46,039**

Project 23 Cost of preparing infrastructure cost sharing report, traffic impact assessment and drainage strategy

Item	Description	Amount
1	Traffic Impact Assessment	$30,000
2	Drainage Strategy	$2,000
3	Consultants assistance in preparing and reviewing cost sharing, finalising drainage strategy and preparing and traffic strategy	$40,000
	Total	**$72,000**

Appendix B Calculations to Determine Cost Sharing.

Analysis Area (Sub-precinct) Number	Project 1 Link Road No 1	
	% of traffic	Proportion of Cost
1	32.48%	$84,773
2	0.00%	$0
3	18.28%	$47,711
4	15.82%	$41,290
5	16.93%	$44,187
6	16.49%	$43,039
Total	**100.00%**	**$261,000**

Analysis Area (Sub-precinct) Number	Project 2 Link Road No 2	
	% of traffic	Proportion of Cost
1	46.21%	$134,471
2	0.00%	$0
3	26.25%	$76,388
4	0.42%	$1,222
5	0.99%	$2,881
6	26.13%	$76,038
Total	**100.00%**	**$291,000**

Analysis Area (Sub-precinct) Number	Project 3 Link Road No 3	
	% of traffic	Proportion of Cost
1	62.73%	$277,894
2	0.00%	$0
3	21.82%	$96,663
4	0.29%	$1,285
5	0.55%	$2,437
6	14.61%	$64,722
Total	**100.00%**	**$443,000**

Analysis Area (Sub-precinct) Number	Project 4 Link Road No 4	
	% of traffic	Proportion of Cost
1	91.61%	$384,762
2	0.00%	$0
3	0.00%	$0
4	0.00%	$0
5	0.00%	$0
6	8.39%	$35,238
Total	**100.00%**	**$420,000**

Analysis Area (Sub-precinct) Number	Project 5 Link Road No 5	
	% of traffic	Proportion of Cost
1	87.55%	$410,610
2	0.00%	$0
3	0.42%	$1,970
4	0.20%	$938
5	0.45%	$2,111
6	11.38%	$53,372
Total	**100.00%**	**$469,000**

Analysis Area (Sub-precinct) Number	Project 6 Link 6 Feldtmann Lane Construction	
	% of traffic	Proportion of Cost
1	90.82%	$622,117
2	0.00%	$0
3	0.04%	$274
4	0.02%	$137
5	0.05%	$343
6	9.07%	$62,130
Total	**100.00%**	**$685,000**

Analysis Area (Sub-precinct) Number	Project 7 Link Road 7(1)	
	% of traffic	Proportion of Cost
1	95.89%	$511,094
2	0.00%	$0
3	1.00%	$5,330
4	0.46%	$2,452
5	1.08%	$5,756
6	1.57%	$8,368
Total	**100.00%**	**$533,000**

Analysis Area (Sub-precinct) Number	Project 8 Roundabout Coronation Street and Link Road Intersection 3	
	% of traffic	Proportion of Cost
1	22.01%	$65,590
2	0.00%	$0
3	12.32%	$36,714
4	10.67%	$31,797
5	43.90%	$130,822
6	11.10%	$33,078
Total	**100.00%**	**$298,000**

Analysis Area (Sub-precinct) Number	Project 9 Roundabout Yana Street and Link Roads 3 and 4 Intersection 4	
	% of traffic	Proportion of Cost
1	32.33%	$96,343
2	0.00%	$0
3	23.65%	$70,477
4	0.21%	$626
5	0.38%	$1,132
6	43.43%	$129,421
Total	**100.00%**	**$298,000**

Analysis Area (Sub-precinct) Number	Project 10 Internal Road Analysis Area 2 to Gray Street Intersection 6	
	% of traffic	Proportion of Cost
1	21.83%	$49,554
2	78.05%	$177,174
3	0.12%	$272
4	0.00%	$0
5	0.00%	$0
6	0.00%	$0
Total	**100.00%**	**$227,000**

Analysis Area (Sub-precinct) Number	Project 11 Intersection of Gray Street and Feldtmann Lane Intersection 7	
	% of traffic	Proportion of Cost
1	92.08%	$208,101
2	0.33%	$746
3	0.05%	$113
4	0.00%	$0
5	0.00%	$0
6	7.54%	$17,040
Total	**100.00%**	**$226,000**

Analysis Area (Sub-precinct) Number	Project 12 New Access Point to Swan Hill Sea Lake Road Intersection 10	
	% of traffic	Proportion of Cost
1	96.56%	$270,368
2	0.68%	$1,904
3	0.76%	$2,128
4	0.36%	$1,008
5	0.60%	$1,680
6	1.04%	$2,912
Total	**100.00%**	**$280,000**

Analysis Area (Sub-precinct) Number	Project 13 Roundabout Link Road and Link Road Intersection 12	
	% of traffic	Proportion of Cost
1	91.28%	$272,014
2	0.00%	$0
3	0.27%	$805
4	0.17%	$507
5	0.23%	$685
6	8.05%	$23,989
Total	**100.00%**	**$298,000**

Analysis Area (Sub-precinct) Number	Project 14 Roundabout Link Roads 6, 7 and 5 Intersection 13	
	% of traffic	Proportion of Cost
1	89.76%	$267,485
2	0.00%	$0
3	0.36%	$1,073
4	0.13%	$387
5	0.47%	$1,401
6	9.28%	$27,654
Total	**100.00%**	**$298,000**

Analysis Area (Sub-precinct) Number	Project 15 Catchment 1 Retardation Basin to serve north part of Analysis Area 1	
	%AE	Proportion of Cost
1	100.00%	$350,000
2	0.00%	$0
3	0.00%	$0
4	0.00%	$0
5	0.00%	$0
6	0.00%	$0
Total	**100.00%**	**$350,000**

Analysis Area (Sub-precinct) Number	Project 16 Catchment 2 Retardation Basin, pump station, rising main and outfall drains to service development south part of Analysis Area 1	
	%AE	Proportion of Cost
1	100.00%	$2,826,000
2	0.00%	$0
3	0.00%	$0
4	0.00%	$0
5	0.00%	$0
6	0.00%	$0
Total	**100.00%**	**$2,826,000**

Analysis Area (Sub-precinct) Number	Project 17 Catchment 3 Gravity Outfall drains to service development Analysis Area 2	
	%AE	Proportion of Cost
1	0.00%	$0
2	100.00%	$201,000
3	0.00%	$0
4	0.00%	$0
5	0.00%	$0
6	0.00%	$0
Total	**100.00%**	**$201,000**

Analysis Area (Sub-precinct) Number	Project 18 Catchment 4 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Areas 3 and part of 1 and 6	
	%AE	Proportion of Cost
1	38.60%	$1,152,596
2	0.00%	$0
3	27.24%	$813,386
4	0.00%	$0
5	0.00%	$0
6	34.16%	$1,020,018
Total	**100.00%**	**$2,986,000**

Analysis Area (Sub-precinct) Number	Project 18 Catchment 5 Retardation Basin, pump station, rising main and outfall drains to service part development Analysis Areas 1 and 6	
	%AE	Proportion of Cost
1	31.90%	$406,087
2	0.00%	$0
3	0.00%	$0
4	0.00%	$0
5	0.00%	$0
6	68.10%	$866,913
Total	**100.00%**	**$1,273,000**

Analysis Area (Sub-precinct) Number	Project 20 Catchment 6 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 4	
	%AE	Proportion of Cost
1	0.00%	$0
2	0.00%	$0
3	0.00%	$0
4	100.00%	$528,000
5	0.00%	$0
6	0.00%	$0
Total	**100.00%**	**$528,000**

Analysis Area (Sub-precinct) Number	Project 21 Catchment 7 Retardation Basin, pump station, rising main and outfall drains to service development Analysis Area 5	
	%AE	Proportion of Cost
1	0%	$0
2	0%	$0
3	0%	$0
4	0%	$0
5	100%	$950,000
6	0%	$0
Total	**100%**	**$950,000**

Analysis Area (Sub-precinct) Number	Project 22 Development of Ken Harrison Reserve and purchase and development of POS	
	% of residential area	Proportion of Cost
1	55.17%	$612,142
2	7.43%	$82,390
3	7.38%	$81,928
4	4.37%	$48,496
5	11.09%	$122,988
6	14.56%	$161,534
Total	**100.00%**	**$1,109,478**

Analysis Area (Sub-precinct) Number	Project 23 Cost of preparing infrastructure cost sharing report, traffic impact assessment and drainage strategy	
	Area	Cost
1	1142910.97	$39,725
2	153826.74	$5,347
3	152964.25	$5,317
4	90546.17	$3,147
5	229627.47	$7,981
6	301595.39	$10,483
Total	**2071470.99**	**$72,000**

SWAN HILL
Rural City Council

Swan Hill South West Development Precinct
Planning Scheme Amendment C58
Planning Report

Swan Hill Rural City Council

June 2014

Swan Hill South West Development Precinct
Planning Scheme Amendment C58

Introduction

The purpose of this report is to provide background information for Amendment C58 (**C58**) to Swan Hill Planning Scheme. Amendment C58 proposes rezoning of land within the Swan Hill South West Development Precinct (**SWDP**) to facilitate the supply of residential zoned land to meet the housing needs of future communities. C58 also proposes Schedule 6 to Development Plan Overlay that will implement the orderly development outcome of future residential developments within the SWDP.

Background

The Swan Hill Residential Development Strategy 2006 identified the SWDP as the suitable area for future residential development for the Township of Swan Hill. Accordingly Swan Hill Rural City Council (**SHRCC**) in consultation with landowners developed a draft Development Plan, Drainage Plan and associated background documents[1] towards an amendment process. However due to various reasons including estimated cost associated with stormwater management within the precinct the project has not been proceeded with.

In 2009, Council has commenced the Review of the Swan Hill Residential Development Strategy. This Strategy while reviewed the previous residential strategy, it also investigated further opportunities for residential land supply. The revised Strategy was adopted by Council at its meeting in March 2013. The Strategy provides directions for future residential development in the municipality and recommends that the previously prepared draft Outline Development Plan for the SWDP to be reviewed.

The current SWDP project includes the review of the previously prepared draft Outline Development Plan, review of the previously prepared drainage plan, stormwater management plan, and develops suitable cost sharing mechanism for the provision of future development infrastructure within the precinct via a series of section 173 agreements under the *Planning and Environment Act 1987*.

Land affected by the project

The table below shows the land within the SWDP. Total area of land within the Precinct is approximately 244.33ha, of which the Council owned and managed Ken Harrison Reserve and the Feldtmann Reserve both zoned Public Park and Recreation Zone (**PPRZ**) are approximately 17.3ha and 3.8ha respectively. Ken Harrison Reserved will be retained as PPRZ.

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[1] Draft Development Plan was prepared by David Locks and Associates
Drainage Plan was prepared by Oricon
Development Contributions Plan was prepared by SGS Economics

Address	Lot No	TP/PS/LP	Size ha	Comments
69 Sea Lake-Swan Hill Road, Swan Hill	Lot 1	PS 81008	0.1ha	Will be retained as Farming Zone due to proximity to IN1Z
71 Sea Lake-Swan Hill Rd, Swan Hill	Lot 1	TP 99093V	0.1ha	
219 Gray Street, Swan Hill	Lot 1	PS 405842S	1.3ha	
7 Dead Horse Lane, Swan Hill	Lot 1	TP 243546J	2ha	
183-187 Gray Street, Swan Hill	Lot 1	TP 614559H	0.8ha	Will be retained as LDRZ due to its proximity to IN1Z
66 Yana Street, Swan Hill	Lot 1	TP 187649H	17.3ha	Ken Harrison Reserve will be retained as PPRZ
Feldtmann Lane, Swan Hill	Lot 1	LP 131446	3.8ha	
Dead Horse Lane, Swan Hill	Lot 2	PS 131446	28.3ha	
Sea Lake-Swan Hill Rd Swan Hill	Lot 2	PS 405842S	20.8ha	Part of the land (about 9800sqm) will be retained FZ
Dead Horse Lane, Swan Hill	Lot 1	TP 821121W	18.3ha	Part of the land (about 1ha) is outside the SWDP in LDRZ.
Dead Horse Lane, Swan Hill	Lot 1	TP 821120Y	51.8ha	
183-187 Gray Street, Swan Hill	Lot 1	TP 519005	5.7ha	Part of the land (about 8000sqm) will be retained LDRZ
177 Gray Street, Swan Hill	Lot 1	TP 814807A	0.4ha	
175 Gray Street, Swan Hill	Lot 1	TP 519770S	0.5ha	
173 Gray Street, Swan Hill	Lot 1	PS 424914L	0.9ha	
179 Gray Street, Swan Hill	Lot 1	TP 539204Q	7.1ha	
70 Yana Street, Swan Hill	Lot 1	PS 76581	4.4ha	
98 Yana Street, Swan Hill	Lot 1	TP 179253F	13.9ha	
110 Yana Street, Swan Hill	Lot 1	PS 99806	4.8ha	
116 Yana Street, Swan Hill	Lot 1	TP 205402A	4.8ha	
235 Dead Horse Lane, Swan Hill	Lot 2	PS 124722	13ha	
233 Dead Horse Lane, Swan Hill	Lot 1	PS 124722	0.8ha	
249 Dead Horse Lane, Swan Hill	Lot 2	PS 637281M	4.8ha	
134 Yana Street, Swan Hill	Lot 3	PS 99806	0.6ha	
142 Yana Street, Swan Hill	Lot 1	PS 75694	0.9ha	
148 Yana Street, Swan Hill	Lot 2	PS 75694	0.8ha	
154 Yana Street, Swan Hill	Lot 1	PS 637281M	0.5ha	
75 Yana Street, Swan Hill	Lot 1	LP117284	3.3ha	
75 Yana Street, Swan Hill	Lot 2	LP 117284	6.7ha	
Coronation Avenue, Swan Hill	Lot 18	LP14827	6ha	
112 Coronation Avenue, Swan Hill	Lot 19	LP 14827	6.1ha	
112 Coronation Avenue, Swan Hill	Lot 2	LP 205853S	11.4ha	
152 Coronation Avenue, Swan Hill	Lot 1	LP 205853S	0.8ha	

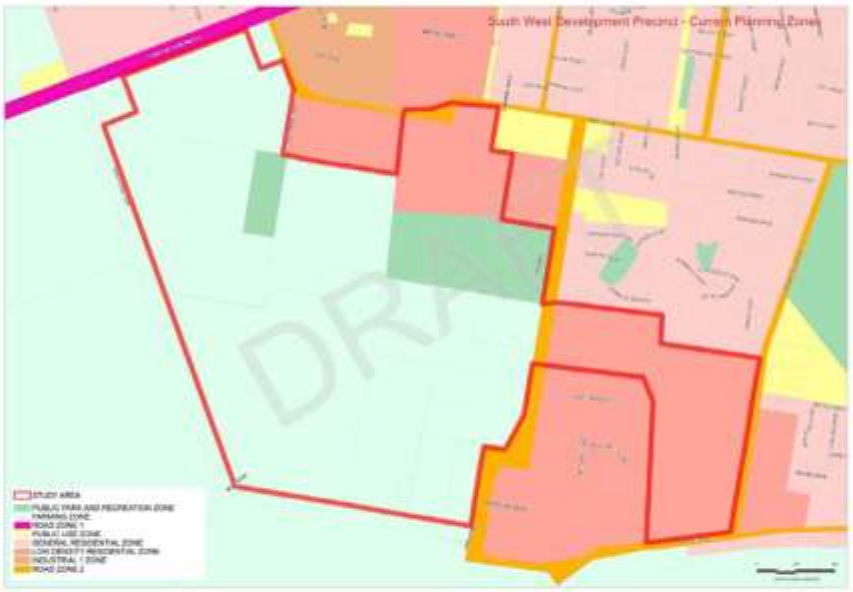
The SWDP also includes land currently used by the Goulbourn Murray Water channel. The authority is in the process of decommissioning the channel infrastructure and reinstates the land. However, future developments on land that are reclaimed as a result of decommissioning of the Goulburn Murray Water Channel infrastructure requires further investigation to demonstrate the suitability of the land for build on for habitable and other purposes.

Current zoning and land uses within SWDP

As shown in map below, majority of the land within SWDP is Farming Zone (**FZ**) with an exception to land along the south side of Gray Street, east of Yana Street and west of Coronation Avenue which are zoned Low Density Residential Zone (**LDRZ**).

Most of the land within the precinct are predominantly used for combination of dry land and irrigated farming. Small FZ parcels along west side of Yana Street are used for residential purpose. Smaller parcels of land zoned LDRZ along the southern side of Gray Street are too used for residential purposes while the lager parcels of along this section are used for farming activities.

Swan Hill South West Development Precinct and Current Zoning



Small parcels of FZ land that located on south west corner of Gray Street and Swan Hill – Sea Lake Road are too being used for residential purposes (69 Sea Lake-Swan Hill Road, 71 Sea Lake-Swan Hill Road and 219 Gray Street, Swan Hill). However, it is believed that these properties are located within the minimum setback requirements specified in Clause 52.10 of the Swan Hill Planning Scheme to the existing industrial activities on the east side of Gray Street. This 100 metre setback was measured from the polystyrene products operation at No. 2-4 McAllister Road, Swan Hill. As such these land cannot be rezoned for residential purposes and will be retained FZ. The landowners were advised of this matter and were invited to justify if they believe their land should be included in the residential zoning.

When applied the same setback requirements to Lot No. 2 PS 405842 Sea Lake- Swan Hill Road, it is found a 70metre setback was required inside the property to make up the 100metre setback from the above polystyrene products activity, this setback is 20 meters more than what the landowners proposed. This setback within Lot No. 2 PS 405842 Sea Lake- Swan Hill Road will also be retained Farming Zone as indicated in the draft Swan Hill South West Development Plan.

The land located at the south east corner of Dead Horse Lane and Swan Hill – Sea Lake Road (No. 7 Dead Horse Lane, Swan Hill) will also be retained FZ. Due to the history of its previous uses, an environmental audit of the site is required prior to the land can be considered for residential rezoning. Representatives of the owners of the land have been advised of this issue and were invited to submit an environmental audit to justify the suitability of the land for residential zoning. This land will also be retained as FZ until the above matter is addressed.

Further, a 15 metre buffer is proposed on the adjoining land to protect the future residential amenity from activities of this FZ land.

The LDRZ properties along the southern side of Gray Street that are within the SWDP were invited to justify their suitability and required minimum setbacks as per the requirements Clause 52.10 of the Swan Hill Planning Scheme. Information provided by landowners claims these properties are located outside the minimum setback. However, it is noted that as per the requirements of Clause 52.10 the concrete batching use at No. 9 Quin Drive, Swan Hill requires 300 metre setback from residential uses. As such the entire Lot No. 1 TP614559 and the northern section of Lot No.1 TP519005 both properties known as No. 183-187 Gray Street could not be rezoned from LDRZ to GRZ as they are located within the 300 metre setback. The remaining southern section of Lot No.1 TP519005 (outside the existing dwelling and associated outbuildings) will be rezoned to GRZ.

The Council owned Ken Harrison Reserve is zoned PPRZ and used for recreational activities and will be kept as PPRZ. The Development Plan for SWDP identifies this reserve as a public open space for future residential uses. The Reserve currently fronts to Yana Street. A small 50 X 40 metre public open space 'pose area' is proposed at the south west corner of the Reserve to provide pedestrian access to the Reserve from SWDP. In addition, the proposed collector roads and the shared paths are too designed to provide linear, efficient and safe access to Ken Harrison Reserve from the development.

Project No 22 - Development of Ken Harrison Reserve and purchase and development of public open space identified in the 'South West Development Precinct Infrastructure Cost Sharing Calculations' will be used to purchase land for and develop the small public open space 'pose area' and to upgrade the facilities at Ken Harrison Reserve as identified in the approved Master Plan for the Reserve.

The Council owned and managed Feldtmann Reserve located within the SWDP is currently used by a Pony Club. This reserve will be rezoned for residential uses and the Pony Club will be relocated to the exiting Equestrian Facility at E.F. Butler Reserve in Tyntynder South or another suitable location.

Overlays affecting the SWDP

There are three overlays affecting the land within the SWDP. Development Plan Overlay – Schedule 2 (DPO2) affects the land zoned LDRZ. This DPO 2 will be removed and will be replaced with a new Scheduled DPO6 that will be applied to all land to be rezoned for residential purpose within SWDP.

The southern boundary along Werril Street of the SWDP is affected by Airport Environs Overlay (AEO) and a Design and Development Overlay (DDO). These overlays will be retained.

Overlays currently affecting the SWDP

Surrounding land uses

Most of the surrounding uses along the north and western sides of the Precinct are residential, with an exception of the industrial uses on the north east corner of Gray Street, the Council owned reserve and the Swan Hill Primary School both located south of Gray Street. These lands are zoned Public Use Zone -PUZ 6 and PUZ2 respectively. Uses along the west of Dead Horse Lane and the south of Werril Street are predominantly farming with exception to residential activities towards the east end of Werril Street.

Sea Lake- Swan Hill Road borders a section of the northern boundary of the Precinct zoned Road Zone Category 1 (RD1Z). Majority of the eastern half of the northern boundary is bounded by Gray Street zoned both Industrial 1 Zone and LDRZ. Dead Horse Lane and Werril Street border the western and southern boundaries of the Precinct respectively, whereas Coronation Avenue, a section of Yana Street and various private properties border the eastern boundaries of the Precinct. A section of Yana Street also runs north-south through the Precinct and zoned Road Zone Category 2 (RD2Z).

Strategic policy background

State Planning Policy Framework (SPPF)

The proposed rezoning and future residential and associated developments within the SWDP are consistent with the SPPF. Clause 11 (Settlement) of the SPPF states that:

"*Planning is to anticipate and respond to the needs of existing and future communities through provision of zoned and serviced land for housing, employment, recreation and open space, commercial and community facilities and infrastructure. Planning is to recognise the need for, and as far as practicable contribute towards:*

- Health and safety.
- Diversity of choice.
- Adaptation in response to changing technology.
- Economic viability.
- A high standard of urban design and amenity.
- Energy efficiency.
- Prevention of pollution to land, water and air.
- Protection of environmentally sensitive areas and natural resources.
- Accessibility, and
- Land use and transport integration.

Above directions from the SPPF are acknowledged, recognised and incorporated in the preparation of the DP and associated provisions for the SWDP.

Clause 11.02 (Urban Growth) within the SPPF requires "*to ensure a sufficient supply of land is available for residential, commercial, retail, industrial, recreational, institutional and other community uses*". As identified by the Review of the Swan Hill Residential Strategy 2013, the main aim of the rezoning of land for residential uses within the SWDP is to ensure the supply of appropriately zoned residential land to meet the current and future communities of Swan Hill.

The clause also emphasises the importance of infrastructure to support sustainable urban development. The proposed DP for the SWDP ensures the provision of relevant development and community infrastructure are planed and provided in the Precinct. Infrastructure that is identified and planned for includes collector streets, internal streets, shared paths, bus stops, public open space, upgrades to existing intersections, retardation

basins, overland flow paths for managing stormwater, and a retail area for convenience stores.

Standards and quality of development infrastructure provided within the Precinct will be in accordance with the standards specified within the Local Government Infrastructure Design Manual (version as updated).

In addition, to the above, the DP recognises the need for and supports the provision of aged care facilities, child care centres and medical centres within the SWDP. Use and development of these facilities and any other relevant social, community and commercial uses can be supported within the Precinct as needed and as per the requirements of Swan Hill Planning Scheme.

Clause 16 (Housing) of the SPPF specifies that:

- Planning should provide for housing diversity, and ensure the efficient provision of supporting infrastructure.
- New housing should have access to services and be planned for long term sustainability, including walkability to activity centres, public transport, schools and open space.
- Planning for housing should include providing land for affordable housing.

The proposed DP for SWDP carefully considers the above directions including the provision of necessary development and social infrastructure, long-term sustainability, encourage walkability by the provision of shared path, provision of bus stops for future public transport, the and provision of and efficient access to open spaces within the Precinct. It also aims to, and supports the supply of affordable housing by encouraging small residential lots in suitable locations with appropriate orientations. These will not only ensure affordability during purchase, but will also be affordable live in these as houses as the right orientation will reduce the cost of heating and cooling in different seasons and allow natural light and ventilation into the houses.

Loddon Mallee North Regional Growth Plan (LMNRGP)

The LMNRGP was adopted by Council in November 2013 as it was by other four municipalities within the Loddon Mallee North Region. The Plan amongst other things recognises the need for appropriately zoned land to meet the increasing need of variates of residential uses in the region. It acknowledges the SWDP being identified for the provision of future residential land supply.

It also recognises continues increase in housing prices, affordable and sustainable housing needs, quality and standards of development infrastructure, the need to create places that encourage active and healthy living and integrated development that encourage use of public transport.

The proposed draft Development Plan for the SWDP and the Schedule 6 to DPO ensure the achievement of the above goals outlined in the LMNRGP and quality development outcome.

Council Plan 2013-2017 - Council's vision for housing

Council Plan 2013 – 2017 sets out Council's targets for service delivery and provides strategic directions to achieve them. It emphasises the need to support appropriate accommodation options for the growing economy, and aims to complete respective amendments to the Swan Hill Planning Scheme to support the supply of future housing.

The Council Plan also states that Council is seeking to grow the regional population to 40,000 by 2040 (also referred in Clause 21 of the Swan Hill Planning Scheme). The proposed residential rezoning will contribute to achieve this goal by facilitating the supply of residential land.

Local Planning Policy Framework (LPPF)

The LPPF of the Swan Hill Planning Scheme consists of two major clauses. Clause 21 being the Municipal Strategic Statement (MSS) and Clause 22 contains local (planning) policies.

Clause 21.02 (Settlement) recognises that:

- Moderate population growth is expected in Swan Hill and Robinvale.
- The size of households has declined over time and is consistent with general national trends.
- The population is ageing and will require a diversified housing stock.

The proposed rezoning of land within the SWDP will increase the supply of residential zoned land to meet the housing needs of the growing population. Decline in household size with increase in population means more demand for variety of housing types including one to two bedroom units and townhouses as generally small households prefer this type of accommodations. Equally the aging population also means increasing needs for low-maintenance small houses for downsizing, and increasing demand for variety of retirement villages and age care facilities, including lifestyle living, independent living units, semi-care facilities, high-care facilities and palliative care units. Residential rezoning within SWDP and the associated DP recognise the need for and facilitate future aged care facilities within the Precinct.

Clause 21.02-2 (Settlement and housing) recognises "*the provision of an alternative to Tower Hill in Swan Hill as a new residential development front*". The proposed development within the SWDP provides alternative residential fronts for the Township of Swan Hill.

Relevant adopted strategies

- The Review of Swan Hill Residential Development Strategy 2006-2013 identifies SWDP for future residential development. Although the Strategy suggests mixture of GRZ and LDRZ for the SWDP, Council chooses to use only GRZ for the following reasons.
    - Lower Murray Water the authority responsible for sewer and water is supportive of the amendment and confirmed that SWDP could be serviced with reticulated sewer and water.
    - To provide fair and equal opportunity to all landowners (big and small) within the precinct opportunity to develop. There are total of 23 private landowners within the precinct who have experienced many delays in attempts to rezone this land. The previous attempts were based on a mixture of LDRZ and Residential 1 Zone (former zone) which in Council's opinion will make it a difficult task to stage the development. As such, Council has decided to allow for all land that can be serviced to be rezoned GRZ and introduced a sub-precinct approach with Section 173 agreements where landowners within each sub-precinct can share the infrastructure cost and develop their land as they prefer.
    - However, as in any development the market will guide and determine the supply and release of the land.

- Public Health and Wellbeing Plan – recognises the need to incorporate Healthy by Design principles in future residential developments.
- Swan Hill Economic Development Strategy 2011-2016 (2011) highlights the importance of attracting new residents, and encouraging economic activities that can generate employment opportunities.
- Swan Hill Reserves Master Plan – lists the upgrades required for Ken Harrison Reserve.

Consultation

Consultation prior to the commencement of the amendment.

During the preparation of the revised Development Plan series of consultation have been undertaken with the landowners within the SWDP. Where possible and appropriate landowners' requirements have been incorporated into the revised Development Plan.

Further, landowners were consulted as individual groups at sub-precinct level to discuss the cost sharing options. They were presented with information on all the infrastructure projects required in future developments, cost of these projects, and the following four options available for sharing the cost for the infrastructure projects.

1. Option 1 – Development Contribution Plan
2. Option 2 – 2 or more Development Contribution Plans to match the rate of proposed development in Swan Hill.
3. Section 173 Agreements for sub-precincts.
4. A combination of DCP and section 173 Agreements

Landowners were requested to choose an option from the above four. Landowners attended the consultation meetings choose Section 173 option for the provision of infrastructure.

Accordingly the required section 173 agreements were prepared by legal professionals and the drafts were sent to the landowners for comments prior to them being finalised for signing.

Where needed State agencies were too consulted with and without landowners to promote and facilitate landowners' interest without compromising agencies requirements.

In addition to the formal meetings, Council Officers met with landowners and their representatives when needed and or at landowners' request.

Further, landowners were kept informed via written correspondence of the progress of the project.

In addition to the consultation with the landowners, series of consultation were undertaken with the following State agencies.

- Lower Murray Water Authority – No objection and supports the amendment in principle
- Goulbourn Murray Water Authority – No objections and supports the amendment in principle
- Country Fire Authority – No objections and supports the amendment in principle
- VicRoads – The authority does not have any objections to the proposed development Plan, except for providing direct access to Sea Lake – Swan Hill Road.

  The traffic impact assessment undertaken for the Development Plan specifies the upgrades requirements for the provision of safe and convenient direct access to Sea Lake – Swan Hill Road.

  Recommended upgrades have been incorporated as part of the infrastructure provision and necessary arrangements have been put in place to ensure the upgrades are completed at the right time to the quality and standards required.

  During the exhibition period, VicRoads will be able to provide formal comments on the proposed direct access indicated on the draft Development Plan.
- Department of Environment and Primary Industries – No objections and supports the amendment in principle. The authority also supportive for environmental impact assessment and soil testing requirements to be included in the Schedule 6 to the DPO. Especially, given the 40 years residential supply/development time of the Precinct, there could be changes in land use practices which will impact on the environment and flora and fauna. As such it is agreed that it will be appropriate to undertake such assessments at the time of development.
- Department of Transport – The Department recommends increased densities especially along the proposed public transport route. The proposed Schedule 6 to the DPO encourages increased densities along the collector roads and around the activity areas.

- Aboriginal Affairs Victoria – The authority is supportive of the amendment and informed there is no known cultural heritage significance within the SWDP. The authority provided notes to be included in planning permits in relation to cultural heritage significance. These notes are included in the proposed Schedule 6 to the Development Plan Overlay.
- Department of Transport, Planning and Local Infrastructure – Throughout the development of the revised Development Plan the Department had been consulted and kept informed of the progress of the Plan. The Department also reviewed the amendment documents prior to submitting for authorisation. The Department is generally supportive of the amendment.

All the relevant agencies will be formally notified during exhibition process.

Relevant internal departments were consulted during the development of the draft Development Plan and background documents. In particular, inputs were sought from Asset Management Department, Engineering Department, Environment Sustainability Unit, Council Valuer, Economic Development, and Community Facilitation Unit.

Proposed consultation during public exhibition

Upon receipt of the authorisation, public exhibition will be held for a period of four weeks. During the public exhibition period, the owners and occupiers of affected land and the adjoining properties will be notified. And a public notice will be published at the local news paper the *Guardian* each Friday. Two drop-in sessions will also be held for public and agencies to drop in and discuss the amendment and clarify any issues with Council Officers. A Notice of Amendment will also be published at the Government Gazette.

Further, amendment documents will be made available at Council website, and Council Office.

In addition, notices will be sent to the Prescribed Ministers, relevant State agencies and any other agencies as required by the Minister for Planning during authorisation.

Planning Scheme Amendment

The amendment proposes the following:

Rezoning:

- Rezones Farming Zone to General Residential Zone in map No. 39
- Rezones Low Density Residential Zone into General Residential Zone in maps Nos. 39 and 40
- Rezones Public Park and Recreation Zone into General Residential Zone (Feldtmann Reserve) in map No. 39

- Rezones Farming Zone to Commercial 1 Zone (proposed retail activity area within the SWDP) in map No. 39
- Rezones Farming Zone to Public Park and Recreation Zone (proposed small Public Open Space within the SWDP) in map No. 39.

Overlays:

- Amends maps Nos. 39 DPO and 40 DPO to introduce the new DPO6 and to delete DPO2 from land within the SWDP, and
- Introduces new Schedule (DPO6) to Clause 43.04.

INFRASTRUCTURE PROVISION

Existing infrastructure and buildings

The following street and other infrastructure are currently available within the SWDP.

- Goulburn Murray Water Channel No 9 and other small channels
- Ken Harrison Reserve - Swan Hill Rural City Council
- Equestrian Reserve – Swan Hill Rural City Council
- Dead Horse Lane – Rural road
- Werril Street – Road Zone Category 2
- Yana Street – Road Zone Category 2
- Coronation Avenue – Urban road
- Gray Street – Urban road
- Sea Lake – Swan Hill Road – VicRoads Road Zone Category 1
- Feldtmann Lane – unmade local street, and
- Existing dwellings and associated outbuildings – private

Proposed Infrastructure

The following infrastructure is proposed to service the SWDP as identified in the Swan Hill South West Development Precinct Traffic Impact Assessment Report and as indicated in the Swan Hill South West Development Plan (only for infrastructure within the SWDP).

- Collector streets
- Intersections and upgrades (Yana Street and new collector street intersection, Coronation Avenue and new collector street intersection, Gray St , Feldtmann Lane widening and intersection with Gray Street, Dead Horse Lane Sea Lake Road intersection.
- Collector road exit to Sea Lake - Swan Hill Road (Option 1) and via Dead Horse Lane (Option 2) are shown on the draft Development Plan. However, only one option is required to serve the development. Council's preferred option 1 has been discussed with VicRoads; however the authority is not supportive of the option as it will impact on the functionality of the arterial road. The traffic impact assessment undertaken for

the development discuss the minimal impact on the arterial road of Option 1, and the necessary upgrades required at this intersection to support direct exit to Sea Lake – Swan Hill Road. As such Council prefers to proceed with this option.

- Shared paths on both sides of collector streets
- Internal streets
- Drainage infrastructure including pipes, pits, retardation basins (including landscaping), rising mains and associated infrastructure
- Street trees and footpaths in local streets
- Street furniture – by Council in the future
- Upgrades to the existing Ken Harrison Reserve. Public Open Space contribution collected from SWDP will be used to upgrade the Ken Harrison Recreation Reserve in accordance with an approved Master Plan for the reserve and to purchase and develop a small parcel of land for POS.
- A small 50metrex40metre Public Open Space (PPRZ)
- 75metre X 40metre Commercial 1 Zone land to provide retail activities
- Intersection upgrades
- Entry features
- Street lights

Triggers for the Provision of Proposed Infrastructure

The triggers for provision of common infrastructure are listed in Clause 6 of the Swan Hill South West Development Precinct Infrastructure Cost Sharing Calculations.

In summary this document states all intersections to be provided and upgraded must be carried out at the time of the construction of streets leading into that intersection.

There is a specific trigger for the provision of the collector street between east of Yana Street and Coronation Avenue and construction of a roundabout at the intersection of Coronation Avenue and the collector street.

This requires the construction of this collector street upon

- The completion of the collector street identified as Link Road 2, or
- The completion of 50% of the residential land in sub-precinct 5 whichever occurs first.

Infrastructure Standards

Each developer will be required to build infrastructure to service the development in accordance with the standards set by the relevant service authorities. In the case of infrastructure to be gifted to the Rural City of Swan Hill the infrastructure standards are specified in the Local Government Infrastructure Design Association's Infrastructure Design Manual (IDM, version as updated) and the specifications of Council.

The developer will be responsible for the maintenance of infrastructure and landscaping, after the handover of assets to Council, for the periods specified in the IDM, unless otherwise agreed in writing by Council.

Infrastructure Requirements

Concept infrastructure requirements for traffic and drainage servicing the SWDP have been prepared by Council to assist developers and Council in the planning for this planning scheme amendment and determining the viability of this rezoning. These concept infrastructure requirements are listed in the following documentation:

- Swan Hill South West Development Precinct Drainage Strategy
- Swan Hill South West Development Precinct Traffic Impact Assessment
- Swan Hill South West Development Precinct Traffic Strategy
- Swan Hill South West Development Precinct Infrastructure Cost Sharing Calculations

Further detailed design and studies as listed within the proposed Schedule 6 to the Development Plan Overlay will be required before development can commence.

Provision of Infrastructure - Funding

The Planning and Environment Act 1987 specifies that infrastructure provision can be funded by either or a combination of:

- Development Contributions Plans (DCP)
- S173 Agreements

In considering the length of time to complete the development (in excess of 40 years) within the SWDP and the associated difficulties in determining standards and costs over that timeframe it was determined to enter into a series of s173 Agreements to facilitate development.

One advantage in the use of s173 agreements was that together with subdividing the SWDP into 6 sub-precincts development could commence in each of these sub-precincts independently of other sub-precincts.

The methodology used to achieve this aim is as follows:

1. Determine the cost sharing to all landowners as if a DCP was to be implemented.
2. Allocate the costs to Analysis Areas (sub-precincts) as per in a DCP.
3. Allocate each sub-precinct to carry out "works in kind" to the approximate value of their contribution determined under step 2.
4. Get the landowners to agree to allocation of "works in kind" to each sub-precinct before the planning scheme amendment is approved. (Level 1 s173 Agreement.)
5. Identify any infrastructure that is servicing more than one sub-precinct and determine the costs sharing and other arrangements for the provision of this infrastructure and obtain agreement from all the landowners with the benefitting sub-precincts before the planning scheme amendment is approved (Level 2 s173 Agreement)

6. Determine the cost sharing between landowners within a sub-precinct for the works in kind allocated to that sub-precinct. This agreement is required before development can commence within a sub-precinct. (Level 3 s173 Agreement). This agreement will not require all landowners within the sub-precinct to sign it but those that do sign it must be prepared to fund 100% of the works in kind allocated to that sub-precinct.

The analysis of applying the above principles to the provision of infrastructure is detailed in Swan Hill South West Development Precinct Infrastructure Cost Sharing Calculations.

Community infrastructure

South West Development encourages the provision of community services such as medical centre, childcare centre and aged care facilities within the precinct. It identifies the need for and designates a small 40 X 75 metre area for the retail activities that can provide neighbourhood activity type of activities for future residents. A small 50x40metre 'pose area' has been identified adjacent to the exiting Ken Harrison Reserve. This area will be rezoned to Public Park and Recreation Zone and will be developed as a focal point and a pose area for public to sit and relax. These public areas are located in the centre of the prescient and will be linked by internal roads and shared paths.

In addition to the above, appropriate non-residential and community uses can be considered in the future as per the requirements of the proposed General Residential Zone.

Department of Education will be consulted during public exhibition. The Department will be able to incorporate future development of this area in their strategic planning for the Township of Swan Hill.

Service Provision

The local water and sewer authority Lower Murray Water indicated its support for the rezoning. Upon satisfying the authority's requirements, future developments can be connected to reticulated water and sewer services through the subdivision process.

There several properties connected to rural water supply through irrigation channels from Goulburn Murray Water Authority. Provision of rural water is not within the control of SHRCC. As such, future residential properties wish to receive rural water will have approach GMW for such arrangements.

Electricity, telecommunication, internet broadband including the provision for NBN will be addressed through the subdivision process of individual properties. Swan Hill does not have reticulated natural gas, however, if natural gas becomes available in the future, properties within the South West Development area will be able to tap into the service like any other developed urban areas of Swan Hill Township.

The SWDP designate areas for future bus stops. These bus stops will be provided by Council or other statutory authority and will not be the responsibility of the developer.

Implementation

The approved Swan Hill South West Development Plan will be implemented through the amendment C58 to the Swan Hill Planning Scheme Amendment.
The amendment amongst other things introduces Schedule 6 to the Development Plan Overlay (DPO6). DPO 6 outlines the prerequisites, standards and cost sharing arrangements required to ensure the orderly development of Swan Hill South West Development Precinct.

There are number of agreements under section 173 of the Planning and Environment Act 1987 that have been proposed to ensure current and future landowners provide the agreed infrastructure.

Where necessary, the approved plan, and agreements may be modified by Council to accommodate future circumstances of landowners, Council and agencies.

REFERENCE DOCUMENTS

The following supporting documents are prepared by the Council to inform the South West Development Plan and the associated planning scheme amendment.

- Swan Hill South West Development Plan (approved and or revised thereafter)
- Infrastructure Design Manual (version as updated)
- South West Development Precinct Infrastructure Cost Sharing Calculations dated xxx (or as reviewed thereafter),
- South West Development Precinct Drainage Strategy dated xxx (or as reviewed thereafter)
- Swan Hill South West Development Precinct Traffic Impact Assessment dated xxx (or as reviewed thereafter). Swan Hill South West Development Precinct Traffic Strategy dated (or as reviewed thereafter)
- Review of the Swan Hill Residential Development Strategy 2006-2030 March 2013 (or as reviewed thereafter).
- Background report and environmental impact assessment (Flora fauna assessment from previous reports, if not use the discussions in this report)

SWAN HILL
Rural City Council

Swan Hill South West Development Precinct Drainage Strategy

Version 4.1

Swan Hill Rural City

21 June 2014.

1. Introduction

This strategy has been prepared to assist Council to implement the rezoning of land within the bounds of the South West Development Precinct.

This has been a long term desire of Council to provide for the future residential growth for Swan Hill. Over time the requirements for the type and density of development to be permitted within this precinct and as a result there is a need to update a previous drainage study which was prepared for this precinct.

This strategy is based upon the study completed by M Dang of Aurecon entitled Swan Hill South West Development Precinct – Stormwater Drainage Schematic Design Study (Version 3, 5/12/2011, Doc Id 225232 001/350).

Since that report was completed following changes that have occurred:

- The rezoning proposed for the precinct has changed from partly Res 1 and partly LDRZ to the majority of precinct being rezoned to General Residential Zone. There are some other minor zoning changes but these do not affect the outcomes of this strategy and therefore they have been ignored
- Council wishes to reduce future operational and maintenance costs of the drainage system by reducing the number of retarding basins, pump stations and rising mains proposed in the Aurecon Report
- Council adoption of the Infrastructure Design Manual (IDM) as the design standard for new developments has an impact on the design of the drainage infrastructure.

This updated drainage strategy will provide Council and developers with the necessary drainage information to enable the provision of drainage infrastructure to serve the land within the precinct so that development can proceed in a logical and orderly manner so that the objectives of this drainage strategy are met.

2. Objectives

The objectives of this drainage strategy are as follows:

1. To ensure that the drainage infrastructure provided to serve the South West Development Precinct is planned, effective and avoids the unnecessary provision of infrastructure that will increase Council's future maintenance and renewal costs.

2. To provide drainage infrastructure which will allow for a number of development fronts to open up within the precinct without compromising the other objectives of this strategy.

3. To ensure that the drainage being discharged from this precinct does not adversely impact the existing Council drainage infrastructure or the environment.

4. To identify the additional detailed drainage design requirements that are required for any area within the precinct to commence development.
5. To allow the review, assessment and approval of future detailed drainage designs required by Council before development can proceed against the requirements of this strategy.
6. To ensure that overland flow paths are identified and provided to the satisfaction of Council.

3. Methodology and Assumptions

Calculations have been done using the major and minor storm approach and the Rational Method as described in Australian Rainfall and Runoff. Some of the work previously done by Aurecon has been adopted for this report.

Rainfall Intensity Frequency Duration data for Swan Hill has been adopted from Table 3.1 of the Aurecon study as shown below.

	Rainfall Intensity mm/hr	
Duration (minutes)	**Average Storm Recurrence Interval 5 years**	**Average Storm Recurrence Interval 100 years**
10	66.01	126.25
20	47.21	89.43
30	37.7	71.03
40	31.72	59.57
50	27.56	51.63
60	24.46	45.76
90	18.56	34.64
120	15.15	28.24
150	12.91	24.03
180	11.3	21.04
210	10.1	18.79
240	9.16	17.03
270	8.4	15.62
300	7.77	14.45

Runoff coefficients have been adopted from Table 6.2 of the Aurecon study as shown below.

Land Use Zone	**Fraction Impervious f**	**Runoff Coefficient C5**	**Runoff Coefficient C100**
Farming Zone	0.1	0.21	0.266
Residential 1 Zone	**0.45**	**0.461**	**0.582**
Low Density Residential	0.2	0.282	0.356
Public Park & Recreation	0.1	0.21	0.266

The following design assumptions have been adopted for this strategy:

- The existing main drain and Yana Street drains have limited capacity to accept additional stormwater runoff without major upgrades, therefore only Catchment 3 has been allowed to discharge directly into the drain. Other catchments may be discharged to the main drain via retarding basins provided that discharge is delayed by 12 hours. This will allow the main drain to empty before receiving discharges from the catchments covered by this strategy.
- Discharge to the existing southern drain may only occur after a 6 hour delay.
- A stormwater treatment wetland exists at the main drain outfall and no further treatment is required within the South West Development Precinct.
- It has been assumed that no overland flow will cross Deadhorse Lane from the farming zones to the west and south. Discussion with Council and council staff have revealed that stormwater runoff to the west of Deadhorse Lane does soak into the sand layers until it reaches the clay layer whereupon it flows along the clay layer and discharges out of the soil some days later on land east of Feldtmann Lane and south of Gray Street. Due to the time lag for this discharge to reach the proposed drainage system it will have no impact upon the sizing of the retardation basin or underground pipes. The issue of the impacts of these discharges will need to be determined (by developers to the satisfaction of Council) prior to development commencing.
- Discharge to the existing open drain in Sea Lake Swan Hill Road to be restricted to gravity discharge from a single 300mm pipe.
- Depth of retarding basins no longer restricted to 1.5m to allow for fewer basins placed further apart from each other.

Ground Water Table Assumptions and Preliminary Testing

Information on the local ground water table levels has been obtained from the DEPI website http://data.water.vic.gov.au/monitoring.htm. Ground water table levels have been recorded at bore number 26808 located near the intersection of Butterworth Street and Woorinen Rd, Swan Hill for the period 1986 to 2012. These records show that 95% of recorded levels are at or below AHD 66.04m.

Natural surface levels at the retarding basin sites vary from 66.75m to 68.0m.

Due to the possibility that groundwater levels would impact the design of the basins and the need to provide geotextiles and clay liners test excavations were dug at each site of a proposed retardation basin to determine the presence of groundwater. Monitoring bores were not installed at this time and will be a requirement placed a developers before development proceeds.

The results of the test excavations as shown in the

Catchment No	Proposed depth of basin	Depth of Test Excavation	Results
1	1.5m	2.4m	Naturally high ground of sandy soil. Medium moisture in top layer of 0.5-0.8m then hard LS layer of 0.8m-1m then again sandy soil with very little moisture
2	3.0m	3.3m	Moist soil all the way down up to depth of 3.3m. No saturated soil or water found in the trench.
4	2.0m	2.9m	Moist soil all the way down up to depth of 2.9m. No saturated soil or water found in the trench.
5	2.4m	3.0m	Medium moist soil all the way down up to depth of 3.0m. No saturated soil or water sign visible the trench
6	1.35m	2.8m	Moist soil all the way down up to depth of 2.8m. No saturated soil or water found in the trench
7	1.85m	3.4m	Moist soil all the way down up to depth of 3.4m. No saturated soil or water found in the trench

Based on the testing carried out it has been assumed that the level of groundwater at each site that there is no impact on the design or construction of the retardation basins.

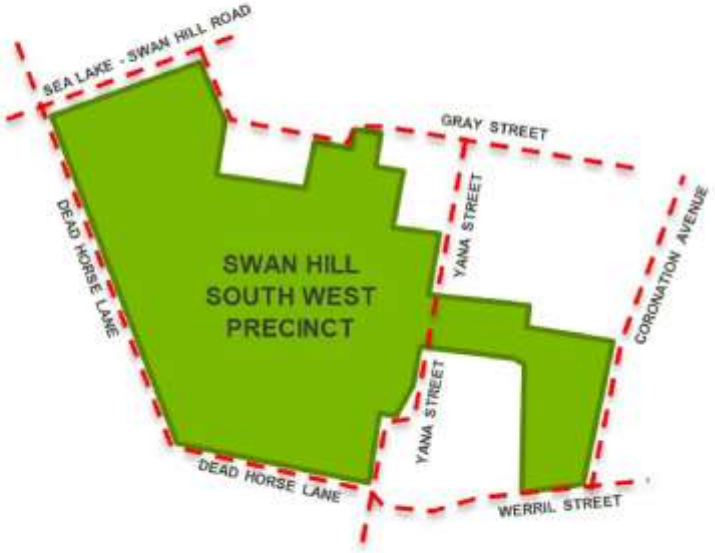
At least 6 months prior to development commencing in any of the above catchment areas developers will need to install a monitoring bore and monitor the level of any ground water table so that Council can be satisfied that the detailed design of retardation basins has adequately addressed the impacts of any groundwater table that may be present in the area of the proposed retardation basin.

4. Site Context

4.1 General

The Swan Hill South West Development Precinct is bounded by Sea Lake – Swan Hill Road, Dead Horse Lane, Coronation Avenue and Gray Street as shown in Map 1

Map 1 Swan Hill South West Development Precinct



The majority of the development precinct is currently Farming Zone (FZ) used for agricultural purposes. The precinct is bounded by residential development to the north and east as Residential 1 Zone (R1Z) and Low Density Residential Zone (LDRZ). Towards the south and west of the precinct the land use is currently FZ.

Minor open irrigation channels are located within the precinct serviced from the main irrigation channel (Channel No. 9) located between Yana Street and Coronation Avenue as shown in Map 2 on the next page.

Discussions with Goulburn Murray Water have indicated that the main irrigation channel is proposed to be piped underground and that the minor open irrigation channels within the precinct will be removed.

This drainage study assumes that existing open irrigation channels within the precinct are abandoned and removed.

Map 2 Key Existing Features

4.2 Existing Council Infrastructure

There are a number of existing drainage issues and constraints surrounding the development precinct. These are summarised below:

- An existing concrete lined open channel is located north of the precinct near Gray Street. Council's main drain is currently servicing Swan Hill and outfalls towards the Murray River at the north end of Swan Hill.
- The existing piped drainage system is unable to accommodate the whole of the development within the precinct. The existing concrete lined main drain is capable of accepting development flows subject to some discharge and timing constraints.
- The main drain is relatively flat with a grade of approximately 1 in 5000, however the cross sectional area does have the capacity for the development once the flows from existing drainage system have passed. The outfall for the main drain is approximately 4.5km north east of the development and is treated and ultimately pumped into the Murray River.
- The main drain acts as a retarding basin as the flows to the river are highly restricted due to the existing pump rates.

5. Catchments

5.1 Location and sizing

Catchment boundaries have been determined firstly by following ridge lines and secondly by following property boundaries. This resulted in 7 catchments as shown Map 3 Catchment Boundaries

Map 3 Catchment Areas

The areas and outfalls of the catchments are shown in the following table:

Catchment	Area (m^2)	Area (ha)	Location	Outfall
1	119,700	11.97	Sea Lake Rd	Gravity to Tower Hill
2	799,200	79.92	West	Pump to main drain
3	127,500	12.75	North	Gravity to main drain
4	672,300	67.23	Central	Pump to Yana St
5	117,600	11.76	South	Pump to Yana st
6	100,200	10.02	Yana Street	Pump to Yana St
7	241,900	24.19	Rosaia property	Pump to Cleeland Drive

5.2 Catchment Characteristics

The catchment boundaries have been determined using a 0.5m contour plan prepared by Price Merrett Consulting for the Council in 2007.

Catchment 1 – bound to the north by Sea Lake Swan Hill Rd, to the west by Dead Horse Lane, to the east by Gray Street and to the south by a ridge line. This catchment can discharge by gravity to the open channel constructed for the Tower Hill Estate along the north side of Sea Lake Swan Hill Rd. The capacity of this open channel will have to be determined by discussions with the Tower Hill Estate engineers Paroissian Grant Associates. For the purposes of this report it has been assumed that the channel can only accept the discharge from a single 300mm pipe operating under gravity. For this reason a retarding basin will be required in this catchment. This is an additional retarding basin not included in the Aurecon study

Catchment 2 – bound to the west by Deadhorse Lane, to the north and south by ridge lines and to the east by property boundaries. This catchment combines catchments B2 and B3 from the Aurecon study and requires a retarding basin, pump station and rising main discharging to the main drain in Gray St.

Catchment 3 – bound to the north by Gray St, to the south by Ken Harrison Reserve and to the east and west by property boundaries. This catchment has the same extents as Aurecon's Gray Street catchment and is assumed to discharge by gravity to the main drain in Gray Street. Since the main drain itself acts as a retardation basin and all other catchments discharging to the main drain at Gray Street have retarding basins it has been assumed that no further retardation will be required for catchment 3. This assumption should be verified by computation at detailed design stage.

Catchment 4 – bound by ridge lines to the north and south, Deadhorse Lane to the west, Yana St to the east and Ken Harrison Reserve to the north. This catchment includes Aurecon's catchment B4 and part of B1 and requires a retarding basin, pump station and rising main discharging to the gravity drain in Yana Street. The exact location of the discharge point in Yana Street is to be determined at detailed design stage.

Catchment 5 – bound to the south by Deadhorse Lane, to the north by a ridge line and to the east by Yana St. In the Aurecon study this catchment (Ext2) was entirely low density development and drainage was assumed to be retained on site, however with the new proposed zoning of General Residential, this will no longer be acceptable and a retarding basin, pump station and rising main discharging to the gravity drain in Yana Street will be required.

Catchment 6 – bound to the west by Yana Street, the east by the No. 9 channel and to the north and south by existing developments. This low lying catchment will require a retarding basin, pump station and rising main discharging to the gravity drain in Yana St.

Catchment 7 – bound by Coronation Avenue to the east, the No. 9 channel to the west, Werril Street to the south and existing development to the north. This catchment will require a retarding basin, pump station and rising main discharging to the gravity drain in Cleeland Drive.

6. Retarding Basin and Outfall Pipe Sizes

6.1 Retardation Basin and Outfall Pipe Sizes

Calculation of retarding basin, pump station and outfall pipe sizes is detailed in a spreadsheet titled SWDP Drainage Review April 2014 located at M:\Projects\SWDP. The locations of the basins shown in the map are indicative only and subject to detailed design and subdivision layout.

A summary of the basin capacity and outfall details are shown in the following table:

Catchment Number	Outfall type	Basin storage capacity (m^3)	Outfall flow rate and pump capacity (lit/sec)	Outfall diameter (mm)	Length of outfall pipe (m)
1	Gravity	3,918	63	300	260
2	Pump	42,481	214	300	710
3	Gravity	Nil	Nil	Nil	Nil
4	Pump	35,591	214	375	560
5	Pump	6,232	34	150	1210
6	Pump	5,304	34	150	504
7	Pump	10,669	131	250	580

With co-operation between the developers the above three rising mains in Yana Street i.e. rising mains serving Catchments 4,5 and 6 could be combined into a single larger diameter rising main for a reduced cost. This combined rising main would be required to discharge into the Yana Street underground drainage system at the pit with the asset ID 11356 opposite Cutri Drive Swan Hill.

The rising main to serve catchment 4 has been increased in size from 300mm diameter to 375mm diameter and this will reduce the velocity slightly but will allow for the flows from catchments 5 and 6 to enter into it.

In the event that the rising main from Catchment 4 is not constructed at the time either development within catchment 5 or 6 is ready to develop they could choose to construct their own 150mm dia rising main to discharge into the existing Yana Street drainage system at Asset ID xxx which is locate approximately 454m from where the rising main from where Catchment 6 enters Yana Street.

6.2 Earthwork Volumes

Earthworks volume and minimum land area required have been calculated assuming that the retarding basin and land are square in shape, batters are sloped at 1 in 8, there is 300mm freeboard above top water level during a 1 in 100 year event, basin floor level matches the invert of incoming

pipes and a 5m wide access/landscaping area on all sides of the basin. The resulting earthworks volumes and land areas are shown in the following table:

Catchment Number	Basin storage capacity (m^3)	Excavation Depth (m)	Floor width (m)	Excavation Volume (m^3)	Land width (m)	Land area (m^2)
1	3,918	1.5	49	5,365	83	6,889
2	42,481	3	106	48,972	164	26,896
3	Nil					
4	35,591	2	132	43,296	174	30,276
5	6,232	2.4	41	7,813	89	7,992
6	5,304	1.4	64	7,396	95	9,139
7	10,669	1.9	72	13,533	111	12,454

Due to the amount of earthworks being excavated from the retardation basins the developers will be required to provide an earthworks master plan to the satisfaction of Council prior to development commencing.

6.3 Gravity Drains

Where stormwater flows from one property across a different property to reach its retarding basin the size and depth of pipe required has been calculated to allow for apportionment of costs between property owners. The calculations are detailed in a spreadsheet titled SWDP Drainage Review April 2014 located at M:\Projects\SWDP.

The Rational Method was used to calculate flows resulting from a 1 in 5 year storm and pipes were sized and graded to ensure that a minimum velocity of 1m/sec was achieved. A maximum length between pits of 80m was assumed and a minimum cover of 600mm over the pipes. The resultant pipe diameters, depths and lengths are summarised in the table below and shown in Map1 above.

Line	Catchment	Length (m)	Diameter (mm)	Average Depth to invert (m)
A	2	100	750	1.4
A	2	167	750	1.5
A	2	160	600	1.3
A	2	190	1200	2.1
B	2	235	900	1.5
C	4	212	375	1.2
D	4	130	900	1.5
D	4	180	1050	1.7
D	4	130	1050	1.7
E	4	70	300	1.0
E	4	143	375	1.2
E	4	130	525	2.0
E	4	67	600	2.1

Line	Catchment	Length (m)	Diameter (mm)	Average Depth to invert (m)
F	5	108	450	1.3
F	5	413	525	1.6
H	5	21	375	1.6
G	3	220	750	1.7

The routes of the various pipes are approximate only and cannot be accurately determined until the layout of the subdivisions is known. Developers will be required to provide detailed drainage designs to the satisfaction of Council generally complying with this strategy prior to development proceeding.

As the pipes are designed for minor 1 in 5 year storms only, overland flow paths along approximately the same routes will also be required for major 1 in 100 year storms. These must be allowed for in the detailed drainage design.

7. Overland Flow Paths

Gravity drainage pipes are designed for minor 1 in 5 year storms only and therefore overland flow paths will also be required to convey the stormwater for storms exceeding the pipe capacity for major 1 in 100 year storms.

These overland flow paths are required to be designed for all catchments throughout the development area in accordance with the requirements of the Infrastructure Design Manual (IDM).

Overland flow paths must be located on public land either in road reserves or landscaped drainage reserves to the satisfaction of Council.

Where overland flow paths cross property boundaries there is potential for cost sharing between developers. These instances coincide with the gravity drains described in the previous section and follow the same alignments as the gravity drains shown in green Map 1 and labelled A to G.

It is essential that overland flow paths crossing property boundaries are provided for by each developer and taken through to the appropriate retardation basin to the satisfaction of Council.

The siting of retardation basins along the frontage of collector streets is important to ensure that overlands flows are able to enter into the retardation basins. To achieve this, the retardation basins must have a frontage of at least 40% of the perimeter of the basin to a street/s frontage to the satisfaction of Council unless otherwise agreed in writing.

8. Temporary Drainage Infrastructure

To assist in the orderly and timely development of the precinct Council **MAY** allow the installation of temporary drainage infrastructure to service the land to be developed where the Council is satisfied that:

- The proposed works will not result in any adverse effects on adjoining landowners
- The temporary works are designed to the satisfaction of Council
- The temporary works are constructed, maintained and owned by the developer. Council will have no responsibility or liability in relation to the operation, maintenance or renewal of such a temporary drainage system. This will remain the case until the drainage system is connected to Council's drainage infrastructure as per the details of this strategy or otherwise as approved by Council.
- Until a S173 Agreement is entered into with Council specifying that the landowner is responsible for all aspects of the temporary drainage works.
- The discharge from temporary drainage system must be contained on land belonging to the developer/landowner unless otherwise agreed in writing by the Council.

9. Standards of Construction

The infrastructure to be constructed for the SWDP must be constructed to the standards specified in the Local Government Infrastructure Design Association Infrastructure Design Manual (IDM) to the satisfaction of Council unless otherwise agreed in writing by Council.

10. Landscaping of the Drainage Reserves Containing Retardation Basins

All drainage reserves to be constructed within the bounds of the SWDP must be landscaped to the satisfaction of Council.

11. Estimated Costs

Costs of all of the above works have been estimated are detailed in the Swan Hill South West Development Precinct Infrastructure Cost Sharing Calculations.

Appendix – Drainage Computations

Sizing of Basins for 100 Yr ARI

Gravity outfall

Catchment No	1		Diameter	300	mm
Size m^2	119,700		Grade	0.3	%
C*A m^2	69,665		Flow Rate	0.063	m^3/sec
			Velocity	0.89	m/sec

Duration hrs	Intensity mm/hr	Volume in m^3	Volume out m^3	Storage m^3	Maximum Storage m^3
0.2	126.25	1,759	45	1,714	
0.3	89.43	1,869	68	1,801	
0.5	71.03	2,474	113	2,361	
0.7	59.57	2,905	159	2,746	
0.8	51.63	2,877	181	2,696	
1	45.76	3,188	227	2,961	
1.2	41.23	3,447	272	3,175	
1.3	37.6	3,405	295	3,110	
1.5	34.64	3,620	340	3,280	
1.7	32.16	3,809	386	3,423	
2	28.24	3,935	454	3,481	
2.5	24.03	4,185	567	3,618	
3	21.04	4,397	680	3,717	
4	17.03	4,746	907	3,839	
5	14.45	5,033	1134	3,899	
6	12.63	5,279	1361	3,918	3,918
7	11.28	5,501	1588	3,913	
8	10.22	5,696	1814	3,882	
9	9.37	5,875	2041	3,834	
10	8.67	6,040	2268	3,772	
11	8.08	6,192	2495	3,697	
12	7.58	6,337	2722	3,615	
13	7.14	6,466	2948	3,518	
14	6.76	6,593	3175	3,418	
15	6.42	6,709	3402	3,307	
16	6.12	6,822	3629	3,193	
17	5.85	6,928	3856	3,072	
18	5.61	7,035	4082	2,953	
19	5.39	7,134	4309	2,825	

20	5.18	7,217	4536	2,681	
21	5	7,315	4763	2,552	
22	4.82	7,387	4990	2,397	
23	4.66	7,467	5216	2,251	
24	4.52	7,557	5443	2,114	
25	4.38	7,628	5670	1,958	
26	4.25	7,698	5897	1,801	
27	4.13	7,768	6124	1,644	
28	4.01	7,822	6350	1,472	
29	3.9	7,879	6577	1,302	
30	3.8	7,942	6804	1,138	
31	3.71	8,012	7031	981	
32	3.62	8,070	7258	812	
33	3.53	8,115	7484	631	
34	3.45	8,172	7711	461	
35	3.37	8,217	7938	279	
36	3.29	8,251	8165	86	

Pumped outfall

Catchment No	2		Diameter	300	mm
Size m^2	799,200		Grade	3.5	%
C*A m^2	465,134		Flow Rate	0.214	m^3/sec
			Velocity	3.03	m/sec

Duration hrs	Intensity mm/hr	Volume in m^3	Volume out m^3	Storage m^3	Maximum Storage m^3
0.2	126.25	11,745		11,745	
0.3	89.43	12,479		12,479	
0.5	71.03	16,519		16,519	
0.7	59.57	19,396		19,396	
0.8	51.63	19,212		19,212	
1	45.76	21,285		21,285	
1.2	41.23	23,013		23,013	
1.3	37.6	22,736		22,736	
1.5	34.64	24,168		24,168	
1.7	32.16	25,430		25,430	
2	28.24	26,271		26,271	
2.5	24.03	27,943		27,943	
3	21.04	29,359		29,359	
4	17.03	31,685		31,685	
5	14.45	33,606		33,606	
6	12.63	35,248		35,248	
7	11.28	36,727		36,727	
8	10.22	38,029		38,029	
9	9.37	39,225		39,225	
10	8.67	40,327		40,327	
11	8.08	41,341		41,341	
12	7.58	42,309	0	42,309	
13	7.14	43,174	770	42,404	
14	6.76	44,020	1541	42,479	
15	6.42	44,792	2311	42,481	42,481
16	6.12	45,546	3082	42,464	
17	5.85	46,258	3852	42,406	
18	5.61	46,969	4622	42,347	
19	5.39	47,634	5393	42,241	
20	5.18	48,188	6163	42,025	
21	5	48,839	6934	41,905	
22	4.82	49,323	7704	41,619	
23	4.66	49,853	8474	41,379	

24	4.52	50,458	9245	41,213	
25	4.38	50,932	10015	40,917	
26	4.25	51,397	10786	40,611	
27	4.13	51,867	11556	40,311	
28	4.01	52,225	12326	39,899	
29	3.9	52,607	13097	39,510	
30	3.8	53,025	13867	39,158	
31	3.71	53,495	14638	38,857	
32	3.62	53,881	15408	38,473	
33	3.53	54,184	16178	38,006	
34	3.45	54,560	16949	37,611	
35	3.37	54,863	17719	37,144	
36	3.29	55,091	18490	36,601	
37	3.22	55,416	19260	36,156	
38	3.15	55,677	20030	35,647	
39	3.09	56,053	20801	35,252	
40	3.03	56,374	21571	34,803	
41	2.96	56,449	22342	34,107	
42	2.91	56,849	23112	33,737	
43	2.85	57,002	23882	33,120	
44	2.8	57,305	24653	32,652	
45	2.75	57,560	25423	32,137	
46	2.7	57,770	26194	31,576	
47	2.65	57,932	26964	30,968	
48	2.6	58,049	27734	30,315	

Pumped outfall

Catchment No	4		Diameter	300	mm
Size m^2	672,300		Grade	3.5	%
C*A m^2	391,279		Flow Rate	0.214	m^3/sec
			Velocity	3.03	m/sec

Duration hrs	Intensity mm/hr	Volume in m^3	Volume out m^3	Storage m^3	Maximum Storage m^3
0.2	126.25	9,880		9,880	
0.3	89.43	10,498		10,498	
0.5	71.03	13,896		13,896	
0.7	59.57	16,316		16,316	
0.8	51.63	16,161		16,161	
1	45.76	17,905		17,905	
1.2	41.23	19,359		19,359	
1.3	37.6	19,126		19,126	
1.5	34.64	20,331		20,331	
1.7	32.16	21,392		21,392	
2	28.24	22,099		22,099	
2.5	24.03	23,506		23,506	
3	21.04	24,698		24,698	
4	17.03	26,654		26,654	
5	14.45	28,270		28,270	
6	12.63	29,651		29,651	
7	11.28	30,895		30,895	
8	10.22	31,991		31,991	
9	9.37	32,997		32,997	
10	8.67	33,924		33,924	
11	8.08	34,777		34,777	
12	7.58	35,591	0	35,591	35,591
13	7.14	36,318	770	35,548	
14	6.76	37,031	1541	35,490	
15	6.42	37,680	2311	35,369	
16	6.12	38,314	3082	35,232	
17	5.85	38,913	3852	35,061	
18	5.61	39,511	4622	34,889	
19	5.39	40,071	5393	34,678	
20	5.18	40,536	6163	34,373	
21	5	41,084	6934	34,150	
22	4.82	41,491	7704	33,787	
23	4.66	41,937	8474	33,463	

24	4.52	42,446	9245	33,201	
25	4.38	42,845	10015	32,830	
26	4.25	43,236	10786	32,450	
27	4.13	43,631	11556	32,075	
28	4.01	43,933	12326	31,607	
29	3.9	44,254	13097	31,157	
30	3.8	44,606	13867	30,739	
31	3.71	45,001	14638	30,363	
32	3.62	45,326	15408	29,918	
33	3.53	45,580	16178	29,402	
34	3.45	45,897	16949	28,948	
35	3.37	46,151	17719	28,432	
36	3.29	46,343	18490	27,853	
37	3.22	46,617	19260	27,357	
38	3.15	46,836	20030	26,806	
39	3.09	47,153	20801	26,352	
40	3.03	47,423	21571	25,852	
41	2.96	47,486	22342	25,144	
42	2.91	47,822	23112	24,710	
43	2.85	47,951	23882	24,069	
44	2.8	48,206	24653	23,553	
45	2.75	48,421	25423	22,998	
46	2.7	48,597	26194	22,403	
47	2.65	48,734	26964	21,770	
48	2.6	48,832	27734	21,098	

Pumped outfall

Catchment No	**5**		Diameter	150	mm
Size m^2	117,600		Grade	3.5	%
C*A m^2	68,443		Flow Rate	0.034	m^3/sec
			Velocity	1.92	m/sec

Duration hrs	**Intensity mm/hr**	**Volume in m^3**	**Volume out m^3**	**Storage m^3**	**Maximum Storage m^3**
0.2	126.25	1,728		1,728	
0.3	89.43	1,836		1,836	
0.5	71.03	2,431		2,431	
0.7	59.57	2,854		2,854	
0.8	51.63	2,827		2,827	
1	45.76	3,132		3,132	
1.2	41.23	3,386		3,386	
1.3	37.6	3,346		3,346	
1.5	34.64	3,556		3,556	
1.7	32.16	3,742		3,742	
2	28.24	3,866		3,866	
2.5	24.03	4,112		4,112	
3	21.04	4,320		4,320	
4	17.03	4,662		4,662	
5	14.45	4,945		4,945	
6	12.63	5,187		5,187	
7	11.28	5,404		5,404	
8	10.22	5,596		5,596	
9	9.37	5,772		5,772	
10	8.67	5,934		5,934	
11	8.08	6,083		6,083	
12	7.58	6,226	0	6,226	
13	7.14	6,353	122	6,231	6,231
14	6.76	6,477	245	6,232	
15	6.42	6,591	367	6,224	
16	6.12	6,702	490	6,212	
17	5.85	6,807	612	6,195	
18	5.61	6,911	734	6,177	
19	5.39	7,009	857	6,152	
20	5.18	7,091	979	6,112	
21	5	7,187	1102	6,085	
22	4.82	7,258	1224	6,034	
23	4.66	7,336	1346	5,990	

24	4.52	7,425	1469	5,956	
25	4.38	7,495	1591	5,904	
26	4.25	7,563	1714	5,849	
27	4.13	7,632	1836	5,796	
28	4.01	7,685	1958	5,727	
29	3.9	7,741	2081	5,660	
30	3.8	7,803	2203	5,600	
31	3.71	7,872	2326	5,546	
32	3.62	7,928	2448	5,480	
33	3.53	7,973	2570	5,403	
34	3.45	8,028	2693	5,335	
35	3.37	8,073	2815	5,258	
36	3.29	8,106	2938	5,168	
37	3.22	8,154	3060	5,094	
38	3.15	8,193	3182	5,011	
39	3.09	8,248	3305	4,943	
40	3.03	8,295	3427	4,868	
41	2.96	8,306	3550	4,756	
42	2.91	8,365	3672	4,693	
43	2.85	8,388	3794	4,594	
44	2.8	8,432	3917	4,515	
45	2.75	8,470	4039	4,431	
46	2.7	8,501	4162	4,339	
47	2.65	8,525	4284	4,241	
48	2.6	8,542	4406	4,136	

Pumped outfall

Catchment No	6		Diameter	150	mm
Size m^2	100,200		Grade	3.5	%
C*A m^2	58,316		Flow Rate	0.034	m^3/sec
			Velocity	1.92	m/sec

Duration hrs	Intensity mm/hr	Volume in m^3	Volume out m^3	Storage m^3	Maximum Storage m^3
0.2	126.25	1,472		1,472	
0.3	89.43	1,565		1,565	
0.5	71.03	2,071		2,071	
0.7	59.57	2,432		2,432	
0.8	51.63	2,409		2,409	
1	45.76	2,669		2,669	
1.2	41.23	2,885		2,885	
1.3	37.6	2,851		2,851	
1.5	34.64	3,030		3,030	
1.7	32.16	3,188		3,188	
2	28.24	3,294		3,294	
2.5	24.03	3,503		3,503	
3	21.04	3,681		3,681	
4	17.03	3,973		3,973	
5	14.45	4,213		4,213	
6	12.63	4,419		4,419	
7	11.28	4,605		4,605	
8	10.22	4,768		4,768	
9	9.37	4,918		4,918	
10	8.67	5,056		5,056	
11	8.08	5,183		5,183	
12	7.58	5,304	0	5,304	5,304
13	7.14	5,413	122	5,291	
14	6.76	5,519	245	5,274	
15	6.42	5,616	367	5,249	
16	6.12	5,710	490	5,220	
17	5.85	5,800	612	5,188	
18	5.61	5,889	734	5,155	
19	5.39	5,972	857	5,115	
20	5.18	6,042	979	5,063	
21	5	6,123	1102	5,021	
22	4.82	6,184	1224	4,960	
23	4.66	6,250	1346	4,904	

24	4.52	6,326	1469	4,857	
25	4.38	6,386	1591	4,795	
26	4.25	6,444	1714	4,730	
27	4.13	6,503	1836	4,667	
28	4.01	6,548	1958	4,590	
29	3.9	6,596	2081	4,515	
30	3.8	6,648	2203	4,445	
31	3.71	6,707	2326	4,381	
32	3.62	6,755	2448	4,307	
33	3.53	6,793	2570	4,223	
34	3.45	6,841	2693	4,148	
35	3.37	6,878	2815	4,063	
36	3.29	6,907	2938	3,969	
37	3.22	6,948	3060	3,888	
38	3.15	6,980	3182	3,798	
39	3.09	7,028	3305	3,723	
40	3.03	7,068	3427	3,641	
41	2.96	7,077	3550	3,527	
42	2.91	7,127	3672	3,455	
43	2.85	7,147	3794	3,353	
44	2.8	7,185	3917	3,268	
45	2.75	7,217	4039	3,178	
46	2.7	7,243	4162	3,081	
47	2.65	7,263	4284	2,979	
48	2.6	7,278	4406	2,872	

Pumped outfall

Catchment No	7		Diameter	250	mm
Size m^2	241,900		Grade	3.5	%
C*A m^2	140,786		Flow Rate	0.131	m^3/sec
			Velocity	2.67	m/sec

Duration hrs	Intensity mm/hr	Volume in m^3	Volume out m^3	Storage m^3	Maximum Storage m^3
0.2	126.25	3,555		3,555	
0.3	89.43	3,777		3,777	
0.5	71.03	5,000		5,000	
0.7	59.57	5,871		5,871	
0.8	51.63	5,815		5,815	
1	45.76	6,442		6,442	
1.2	41.23	6,966		6,966	
1.3	37.6	6,882		6,882	
1.5	34.64	7,315		7,315	
1.7	32.16	7,697		7,697	
2	28.24	7,952		7,952	
2.5	24.03	8,458		8,458	
3	21.04	8,886		8,886	
4	17.03	9,590		9,590	
5	14.45	10,172		10,172	
6	12.63	10,669	0	10,669	10,669
7	11.28	11,116	472	10,644	
8	10.22	11,511	943	10,568	
9	9.37	11,872	1415	10,457	
10	8.67	12,206	1886	10,320	
11	8.08	12,513	2358	10,155	
12	7.58	12,806	2830	9,976	
13	7.14	13,068	3301	9,767	
14	6.76	13,324	3773	9,551	
15	6.42	13,558	4244	9,314	
16	6.12	13,786	4716	9,070	
17	5.85	14,001	5188	8,813	
18	5.61	14,217	5659	8,558	
19	5.39	14,418	6131	8,287	
20	5.18	14,585	6602	7,983	
21	5	14,783	7074	7,709	
22	4.82	14,929	7546	7,383	
23	4.66	15,089	8017	7,072	

24	4.52	15,272	8489	6,783	
25	4.38	15,416	8960	6,456	
26	4.25	15,557	9432	6,125	
27	4.13	15,699	9904	5,795	
28	4.01	15,807	10375	5,432	
29	3.9	15,923	10847	5,076	
30	3.8	16,050	11318	4,732	
31	3.71	16,192	11790	4,402	
32	3.62	16,309	12262	4,047	
33	3.53	16,400	12733	3,667	
34	3.45	16,514	13205	3,309	
35	3.37	16,606	13676	2,930	
36	3.29	16,675	14148	2,527	
37	3.22	16,773	14620	2,153	
38	3.15	16,852	15091	1,761	
39	3.09	16,966	15563	1,403	
40	3.03	17,063	16034	1,029	
41	2.96	17,086	16506	580	
42	2.91	17,207	16978	229	
43	2.85	17,253	17449	-	
44	2.8	17,345	17921	-	
45	2.75	17,422	18392	-	
46	2.7	17,486	18864	-	
47	2.65	17,535	19336	-	
48	2.6	17,570	19807	-	

SWAN HILL
Rural City Council

Swan Hill South West Development Precinct

Traffic Strategy

Version 2.1

Swan Hill Rural City

3 July 2014.

1. Introduction

This strategy has been prepared to assist Council to implement the rezoning of land within the bounds of the South West Development Precinct (SWDP).

This has been a long term desire of Council to provide for the future residential growth for Swan Hill.

This strategy has been prepared to consider the traffic management requirements of the proposed development of the South West Development Precinct.

Council engaged the Traffix Group to undertake a traffic impact assessment (TIA) of the proposed development. A copy of the assessment titled Swan Hill South West Development Precinct Traffic Impact Assessment prepared by in June 2014 is attached as Appendix 1 to this strategy.

2. Objectives

The objectives of this traffic strategy are as follows:

1. To integrate the transport requirements of the SWDP with the existing transport infrastructure serving Swan Hill.
2. To consider the two options for the collector street connection to the Swan Hill Sea Lake Road as identified in the SWDP.
3. To identify additional traffic studies/assessments to be undertaken prior to the development within the sub-precincts of the SWDP.
4. To identify and incorporate any existing Council strategy, policy or program into this Traffic Strategy.

3. South West Development Precinct Site Context

3.1 General

The Swan Hill South West Development Precinct is bounded by Sea Lake – Swan Hill Road, Dead Horse Lane, Coronation Avenue and Gray Street as shown in Map 1.

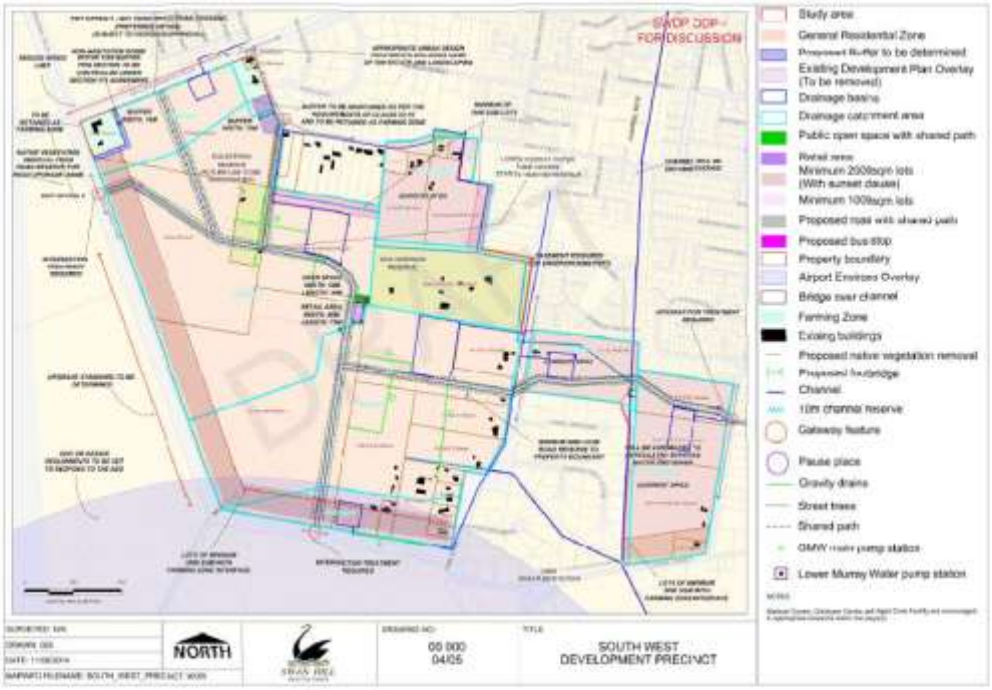
Map 1 Locality Plan of the Swan Hill South West Development Precinct

The majority of the development precinct is currently Farming Zone (FZ) used for agricultural purposes. The precinct is bounded by residential development to the north and east as Residential 1 Zone (R1Z) and Low Density Residential Zone (LDRZ). Towards the south and west of the precinct the land use is currently FZ.

Minor open irrigation channels are located within the precinct serviced from the main irrigation channel (Channel No. 9) located between Yana Street and Coronation Avenue as shown in Map 2 on the next page.

The existing and proposed land uses contained within and adjacent to the boundaries of the SWDP are shown in Map 2.

Map 2 Existing and Proposed Land Uses

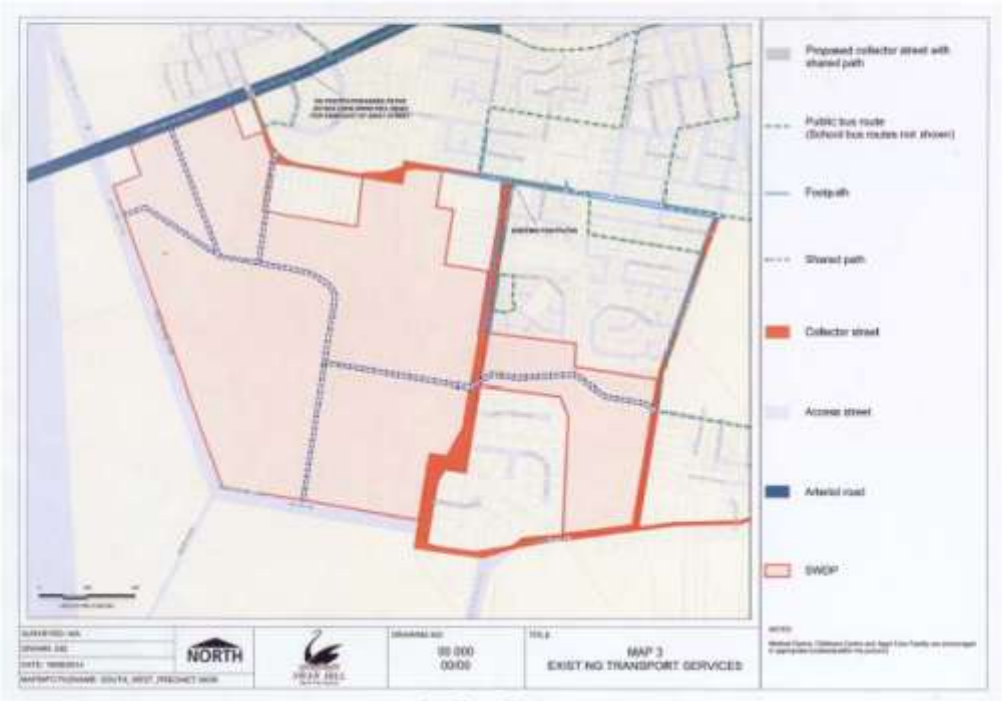


3.2 Existing Transport Network

3.2.1 Existing Transport Services

Map 3 Existing Transport Services details the location of existing transport services within the locality of the SWDP.

Map 3 Existing Transport Services



3.2.2 Road Network Connections

The SWDP primary connection points to the existing road network are listed in Table 1 Details of Existing Road Network Interfaces with the SWDP.

Table 1 Details of Existing Road Network Interfaces with the SWDP

Road Name	Status	Existing Construction Standard	Proposed Construction Standard	Comments
Sea Lake Swan Hill Road	VicRoads Arterial Road	7.9m seal width	No change	Intersection upgrades will be required as detailed in the Traffic Impact Assessment
Gray Street	Council Collector	9.4m seal at Feldtmann Lane and 6.9m where new	Where new development fronts Gray Street a 2.5m	Intersection upgrades will be required as detailed in the

Road Name	Status	Existing Construction Standard	Proposed Construction Standard	Comments
		access road from east of Feldtmann Lane intersects with Gray Street	shared path and kerb and channel will be required. Overall seal width must be at least 10.4m	Traffic Impact Assessment
Yana Street	Council Collector Street	6.9m seal	Where new development fronts Yana Street a 2.5m shared path and kerb and channel will be required. Overall seal width must be at least 10.4m	Intersection upgrades will be required as detailed in the Traffic Impact Assessment
Coronation Avenue	Council Collector Street	7.4m seal	Where new development fronts Coronation Avenue a 2.5m shared path and kerb and channel will be required. Overall seal width must be at least 10.4m	Intersection upgrades will be required as detailed in the Traffic Impact Assessment
Werril Street	Council Collector Street	6.9m seal	Where new development fronts Werril Street a 2.5m shared path and kerb and	

Road Name	Status	Existing Construction Standard	Proposed Construction Standard	Comments
			channel will be required. Overall seal width must be at least 10.4m	
Dead Horse Lane	Council Access	7.5m Gravel Road	6.2m seal, 1.5m shoulder , K&C and 2.5m shared path	
Feldtmann Lane	Council Access	6.0m Gravel Road	10.4m seal, K&C and 2.5m shared path on both sides	Intersection upgrade will be required as detailed in the Traffic Impact Assessment

The impact of the SWDP on the existing road network has been considered as part of the Traffic Impact Assessment (TIA) undertaken by the Traffic Group for Council.

A summary of their recommendations is shown in Table 2 Summary of TIA Intersection Treatment Recommendations for Option 1.

Table 2 Summary of TIA Intersection Treatment Recommendations.

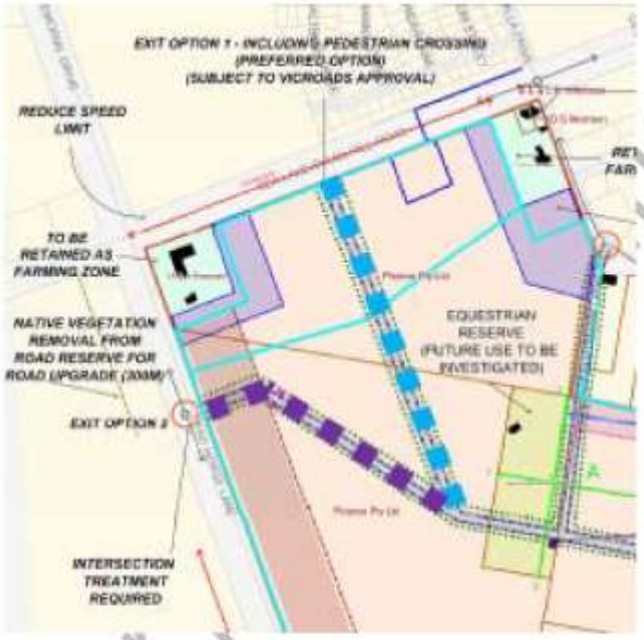
Intersection Number	Description of Intersection	Recommended Treatment
1	Dead Horse Lane/Link 4	Simple T-intersection
2	Yana Street/Werril Street/Dead Horse Lane	The existing simple T-intersection continues to be provided.
3	Coronation Avenue/Wattie Street/Link 1	A single lane roundabout be provided
4	Yana Street/Link 2/Link 3	A single lane roundabout be provided

Intersection Number	Description of Intersection	Recommended Treatment
5	Gray Street/Yana Street	The existing configuration of the Gray Street/Yana Street intersection continues to be provided.
6	Gray Street/Internal Road	A simple T-intersection be provided at the Gray Street/Internal Road intersection provided with priority to Gray Street and separate left and right turn lanes in the internal road. A left turn lane should be provided in Gray Street, due to the relatively large volume of left turning traffic.
7	Gray Street/Feldtmann Lane	A simple T-intersection continues to be provided at the Gray Street/Feldtmann Lane intersection. A separate right turn facility should be provided in Gray Street and separate left and right turn lanes in Feldtmann Lane. A left turn lane in Gray Street is not warranted on the basis of the predicted left turn volumes.
8	Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive	The intersection remains under roundabout control. No upgrades are required from a capacity perspective.
9	Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive	That the intersection remains in its current form.
10	Sea Lake-Swan Hill Road/Link 7(1)	That a BAR (basic right turn) and AUL (auxiliary left turn) treatments be provided on the west and east approaches respectively. Given the relatively high volume of right turning traffic compared to left turning traffic in Link 7, separate left and right turn lanes should be provided in Link 7 at this intersection.
12	Link 5/Link 3/Link 4	A single lane roundabout be provided
13	Link 7/Link 6/Link 5	A single lane roundabout be provided

Connection to the Sea Lake Swan Hill Road.

The SWDP considered two options for the connection of the collector roads servicing the SWDP to the Sea Lake Swan Hill Road. These options are shown in Map 4 Connection Options to Sea Lake Swan Hill Road.

Map 4 Connection Options to Sea Lake Swan Hill Road.



The Sea Lake Swan Hill is an arterial road under the control and management of VicRoads and it is noted that under Clause 56.06 4 and Standard C17 that Council is required to comply with the Roads Corporation's arterial road access management policies.

A search of the VicRoads website has not revealed any arterial road access management policies. (However, it is believed that the draft arterial road access management policy was prepared in 2006 but was never formally adopted. It has been assumed that the draft was used to prepare VicRoads internal arterial road access management guidelines.)

Option 1 is the preferred option for Council for the following reasons:

1. The urban design outcomes are superior for Option 1 because the interface of the development with the Sea Lake Swan Hill Road provides a more attractive visual presentation to the roads in terms of built form, landscaping and streetscape.

2. Will provide passive surveillance and promote a sense of safety for people as emphasised by the State Government's Safer Design Guidelines 2006. It is also noted that Clause 15.01-4 of

the Planning Scheme requires planning to consider the recommendations of the Safer Design Guidelines 2006.

3. Provides a better distribution of traffic from the SWDP into Feldtmann Lane and Gray Street. The Traffic Impact Assessment undertaken for the SWDP states *"provides a superior road network compared to Option 2 and will not detrimentally affect the operation or capacity of the Sea Lake Swan Hill Road."*

4. This will also provide an opportunity to create a gateway entrance at the western entrance to Swan Hill.

5. Is consistent with the option indicated in the previous Outline Development Plan for the SWDP which was supported by VicRoads.

However, VicRoads' letter dated 8 October 2013 stating "*In August 2007 VicRoads agreed to create a new access point on Sea Lake –Swan Hill Road (arterial road) between Gray Street and Dead Horse Lane. VicRoads has now reconsidered this in order to uphold the functionality of the arterial road and to follow the Guidelines in Access Management which has been developed in recent years.*"

VicRoads could not provide a copy of the document as it was only an internal draft policy and had not been through any public consultation.

While Council acknowledging the need to protect the existing and future functionality of arterial roads; Council believes that Option 1 does not detrimentally affect the functionality or operation or capacity of the Sea Lake - Swan Hill Road for the following reasons:

- The intersection spacing proposed Option 1 is not inconsistent with the spacing of existing intersections along the Sea Lake Swan Hill Road.

- There **are no known traffic management issues** with the existing spacing of intersections and therefore the addition of one more intersection will not detrimentally affect the functionality, operation and capacity of the Sea Lake Swan Hill Road.

Council is concerned that VicRoad's decision to reject Option 1 is based upon the following:

- An internal VicRoads Guideline which has not been subject public consultation and input and

- That the Guideline **does not distinguish** between urban arterials having different traffic volumes such that the access requirements for the Sea Lake Swan Hill Road with a current traffic count of 1095 vpd is the same as for an urban arterial having a traffic count of 6,000 to 10,000 vpd. There is a significant difference between the impacts of an additional intersection in both these situations and therefore Council believes that VicRoads should take this into account when assessing the preferred option of Council.

3.2.3 Pedestrian and Bicycle Network Connections

Map 3 showing the existing transport services shows that on the Sea Lake Swan Hill Road that the nearest shared path is some 430m east of the intersection of Gray Street and the Sea Lake Swan Hill Road. Developers will not be required to link the existing shared path network.

There is no master plan for pedestrian connections and it is recommended that Council should address this shortfall so that linkages to the Tower Hill residential development and the SWDP development can be identified as priorities and their provision planned future capital works programs.

Map 3 also there is a need to connect to the existing footpath networks in Yana Street, Coronation Avenue and Gray Street. This will be a requirement for individual developers as development takes place.

The new collector streets to be constructed are required to be constructed with a shared 2.5m path on both sides of the street.

This will meet the needs of parents and children riding to school but will not be used by cyclists cycling to and from work and other activities.

Some Council's recognising the differing requirements of parents and children riding to school and other serious cyclists have opted to replace one shared path with on road cycle lanes. The other 2.5m shared path is reclassified as a 2.5m wide footpath so that the shared path signage is not required.

It is recommended that Council gives serious consideration to this option.

3.2.4 Public Transport Connections

Map 3 shows the existing public bus routes going along some of the boundary streets to the SWDP.

The collector streets have been sized that are able to be used by buses and therefore as the SWDP develops both school bus routes and the public bus routes could be changed to service this development, subject to there being sufficient patronage to warrant such changes.

4. Information to be Provided Before Development Commences

To facilitate development within the SWDP the precinct has been subdivide into 6 sub-precincts. Map 5 Swan Hill South West Development Sub-precinct Plan shows the boundaries of the sub-precincts.

Map 5 Swan Hill South West Development Sub-precinct Plan

The following requirements must be met before development can take place within a sub-precinct.

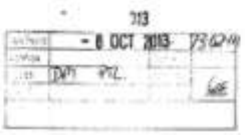
A sub-precinct level Traffic Management Plan that is generally in consistent with the report titled "Swan Hill South West Development Precinct Traffic Impact Assessment" dated 20 June 2014) and this strategy

The Traffic Management Plan must address the following but not limited to:

- Appropriate access and circulation of vehicles on the existing and future road network.
- Appropriate integration with the existing or proposed subdivision of adjoining properties and sub-precincts including through alignment and configuration of the street network and landscape character.
- The identification of existing and proposed public transport routes, bus stops (as shown on the approved Swan Hill South West Development Plan) and associated infrastructure.
- The identification of existing and proposed pedestrian and cycling networks and shared paths
- Including provision for safe and convenient access to public transport infrastructure.
- The works necessary to accommodate traffic generated by the development and to mitigate the impact of that traffic on the development.
- Ensure that the road and intersection design must create efficient clearance of traffic, activity areas including around public facilities. The proposed road network should not overload or detrimentally affect existing or proposed residential streets and intersections.
- Adequate sight distance should be provided, especially where road alignment deflections occur at acute angles.
- Road layouts should provide natural traffic speed control, appropriate to the street category. The introduction of specific speed control devices should be considered only as a secondary option. Roundabouts may be implemented at intersections. However, care must be taken to provide adequate sized roundabouts and therefore road reservation boundaries must be designed to accommodate the radius required and sightlines.
- Road layouts should be designed for all road users appropriate to the street type, including service vehicles, emergency vehicles, waste collection vehicles and street-sweepers. Bus routes need to be considered when developing road networks and be based on the Department of Transport, Planning and Local Infrastructure publication titled *'Public Transport Guidelines for Land Use Development'* (or a replacement document by the Department).
- Road reserve widths must be adequate for the intended road type, and should comply with requirements of the Local Government Infrastructure Design Association's Infrastructure Design Manual.
- Should include a typical cross-section of differing road types, detailing the intended function of the road, e.g. bike lanes, drainage, landscaping.

- Addresses all off-site traffic infrastructure requirements associated with the sub-precinct and is to be accompanied by a Road Safety Audit, prepared by an appropriately qualified person. The Plan must address any safety issues raised by the Audit.

Appendix 1 VicRoads Response to Option 1 Sea Lake Swan Hill Road Intersection.



vicroads

Mr. Vige Sutkumarajah
Planning Team Leader
Swan Hill Rural City Council
PO Box 488
SWAN HILL VIC 3585

3 October 2013

Dear Vige,

SWAN HILL DRAFT DEVELOPMENT PLAN – SOUTH WEST SWAN HILL

I refer to your meeting with VicRoads' officers and Department of Transport officers in Bendigo on 26 September 2013 in relation to the draft development plan for South West Swan Hill.

In August 2007 VicRoads agreed to create a new access point on Sea Lake-Swan Hill Road (arterial road) between Grey Street and Dead Horse Lane. VicRoads has now reconsidered this in order to uphold the functionality of the arterial road and to follow the Guidelines on Access Management which was developed in recent years.

VicRoads' position supports in principle what is shown in your draft plan (No:00 000 02/02 dated 09/09/2013) not to have an additional intersection point on Sea Lake-Swan Hill Road between Gray Street and Dead Horse Lane to minimise congestion and compromised future traffic lane configurations.

VicRoads also supports council's initiation of channelling traffic to the west via a single access point on Dead Horse Lane. This access should be relocated well away from Sea Lake-Swan Hill Road/Dead Horse Lane intersection, preferably in the order of more than 300 metres to support future operational efficiency of both Dead Horse Lane and its intersection with the Swan Hill-Sea Lake Road.

VicRoads has no objection to the draft plan submitted by the council provided the above is considered and a detailed Transport Impact Assessment Report (TIAR) is prepared to VicRoads satisfaction taking into consideration the following;

- Predicted traffic generation by this development together with current and proposed future developments in the vicinity of Sea Lake-Swan Hill Road/Dead Horse Lane intersection to represent the traffic volume projected to 10 years after the development is fully completed.
- Mitigating works identified along Sea Lake-Swan Hill Road (eg: intersection treatments, any capacity improvements along the arterial road etc.) and must demonstrate how these

Victoria

improvements assist the operation of the arterial road traffic flow and pedestrian movements along and across this section.

- Provision of pedestrian, bicycle and public bus facilities must be considered
- Staging of the development must identify trigger points for all identified improvement measures on and along the arterial road network, and identify a mechanism for the delivery of the mitigating works.

If you have any queries please contact Ravi Mylvaganam on 5434 5058.

Yours sincerely

DAVA GOVENDER
MANAGER PLANNING.

TraffixGroup
Traffic Engineers and Transport Planners

Traffix Group Pty Ltd
ABN 32 100 481 570

Address
Suite 8, 431 Burke Road
Glen Iris Victoria 3146

Contact
Telephone 03 9822 2888
Facsimile 03 9822 7444
admin@traffixgroup.com.au
www.traffixgroup.com.au

SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT

TRAFFIC IMPACT ASSESSMENT

PREPARED FOR

SWAN HILL RURAL CITY COUNCIL

20 JUNE, 2014

GRP16371R9263B

TRAFFIC IMPACT ASSESSMENT

SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT

Our Reference: GRP16371R9263B

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EXECUTIVE SUMMARY

Traffix Group was engaged by Swan Hill Rural City Council to undertake a traffic impact assessment of the proposed Swan Hill South West Development Precinct. Initially, the scope of the study comprised an assessment of the external traffic impacts, the forms of intersection treatments required and, on Sea Lake-Swan Hill Road, the trigger point for their provision. The scope of the study was extended to include an assessment of the relative traffic volumes from each land holding that travels through nominated intersections and along nominated roads. Initially, a yield of approximately 10.5 lots per hectare was investigated. The study was extended to "test" the impacts of a yield of approximately 14 lots per hectare.

Two layout options were considered: Option 1 - Sea Lake-Swan Hill Road Link, and Option 2 - Dead Horse Lane Link.

The outcomes of the study are summarised as follows:

1. Traffic Model

A traffic generation and distribution model was prepared for the Swan Hill South West Development Precinct, with the following key assumptions adopted:

- A residential density of approximately 10.5 lots per ha was adopted, resulting in 2,241 lots within the precinct.
- Daily traffic generation: 10 vte/household/day
- Peak hour traffic generation: 1 vte/household/hr
- Direction of travel:

AM peak hour:	"In":	20%	"Out":	80%
PM peak hour:	"In":	60%	"Out":	40%

- 5% of trips generated remain internal to the precinct.
- A design year of 2033 and a traffic growth of 1% per annum along Sea Lake-Swan Hill Road, as required by VicRoads.

2. Option 1 - Sea Lake-Swan Hill Road Link

2.1 Intersection Requirements

Dead Horse Lane/Link 4 (Intersection #1)

- It is recommended that a simple T-intersection be provided at the Yana Street/Werril Street/Dead Horse Lane intersection.

Yana Street/Werril Street/Dead Horse Lane (Intersection #2)

- It is recommended that the existing simple T-intersection continue to be provided at the Yana Street/Werril Street/Dead Horse Lane intersection.

Coronation Avenue/Wattie Street/Link 1 (Intersection #3)

- It is recommended that a single lane roundabout be provided at the Coronation/Wattie Street/Link 1 intersection.

Yana Street/Link 2/Link 3 (Intersection #4)

- It is recommended that a single lane roundabout be provided at the Yana Street/Link 2/Link 3 intersection.
- This should be provided when an intersection is first created (either as a T-intersection or as a cross road).

Gray Street/Yana Street (Intersection #5)

- It is recommended that the existing configuration of the Gray Street/Yana Street intersection continue to be provided.

Gray Street/Internal Road (Intersection #6)

- It is recommended that a simple T-intersection be provided at the Gray Street/Internal Road intersection provided with priority to Gray Street and separate left and right turn lanes in the internal road. A left turn lane should be provided in Gray Street, due to the relatively large volume of left turning traffic.

Gray Street/Feldtmann Lane (Intersection #7)

- It is recommended that a simple T-intersection continue to be provided at the Gray Street/Feldtmann Lane intersection. A separate right turn facility should be provided in Gray Street and separate left and right turn lanes in Feldtmann Lane. A left turn lane in Gray Street is not warranted on the basis of the predicted left turn volumes.

Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8)

- It is recommended that the intersection remain under roundabout control. No upgrades are required from a capacity perspective.
- As no upgrades are required from a capacity perspective, there is no "trigger point".

Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9)

- It is recommended that the intersection remain in its current form.
- As no upgrades are required from a capacity perspective, there is no "trigger point".

Sea Lake-Swan Hill Road/Link 7(1) (Intersection #10)

- It is recommended that BAR (basic right turn) and AUL (auxiliary left turn) treatments be provided on the west and east approaches respectively. Given the relatively high volume of right turning traffic compared to left turning traffic in Link 7, separate left and right turn lanes should be provided in Link 7 at this intersection.
- The need for the AUL treatment in Sea Lake-Swan Hill Road is linked to the volume of left turning traffic. Initially, a BAL (basic left turn) treatment may only be necessary, with an upgrade to an AUL treatment when traffic volumes warrant it. In terms of a "trigger point" for its provision, guidance is provided by Austroads Figure 4.9(b). A PM peak hour volume of 60 vph turning left would be appropriate, equivalent to approximately 130 residential lots each using this intersection in that period.
- It may be that it is more convenient to initially construct this intersection with the AUL treatment.

Link 5/Link 3/Link 4 (Intersection #12)

- It is recommended that a single lane roundabout be provided at the Link 5/Link3/Link 4 intersection.

Link 7/Link 6/Link 5 (Intersection #13)

- It is recommended that a single lane roundabout be provided at the Link 5/Link6/Link 5 intersection.

2.2 Apportionment of Traffic Generation to Land Holders

Intersections

Table A: Apportionment of Traffic - Intersections (Option 1 - Sea Lake-Swan Hill Road Link)

Landowner Number	*Proportion of Traffic Through Intersection Attributable to Landowner*						
	Int #3	*Int #4*	*Int #6*	*Int #7*	*Int #10*	*Int #12*	*Int #13*
1	0.41%	0.33%	2.11%	4.47%	65.60%	0.00%	0.44%
2	0.00%	0.00%	9.65%	10.22%	27.32%	0.00%	14.73%
3	0.06%	0.05%	2.73%	5.41%	1.19%	0.00%	0.69%
4	4.40%	4.35%	7.34%	21.63%	0.56%	5.10%	12.84%
5	17.13%	27.61%	0.00%	50.36%	1.89%	86.19%	61.04%
6	0.00%	0.00%	4.24%	0.02%	0.04%	0.00%	0.00%
7	0.00%	0.00%	29.69%	0.12%	0.26%	0.00%	0.00%
8	0.00%	0.00%	2.12%	0.01%	0.02%	0.00%	0.00%

9	0.00%	0.00%	2.54%	0.01%	0.02%	0.00%	0.00%
10	0.00%	0.00%	34.78%	0.15%	0.30%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	10.45%	22.10%	0.00%	0.00%	0.56%	0.22%	0.31%
13	1.87%	1.56%	0.12%	0.05%	0.20%	0.05%	0.05%
14	4.81%	13.97%	0.00%	7.23%	0.52%	7.59%	8.64%
15	0.04%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%
16	2.08%	8.67%	0.00%	0.00%	0.22%	0.11%	0.12%
17	0.21%	0.60%	0.00%	0.31%	0.02%	0.33%	0.37%
18	1.29%	7.30%	0.00%	0.00%	0.00%	0.00%	0.00%
19	1.94%	9.37%	0.00%	0.00%	0.21%	0.00%	0.12%
20	0.23%	1.02%	0.00%	0.00%	0.03%	0.00%	0.01%
21	0.37%	1.60%	0.00%	0.00%	0.04%	0.02%	0.02%
22	0.13%	0.75%	0.00%	0.00%	0.00%	0.00%	0.00%
23	7.36%	0.06%	0.00%	0.00%	0.15%	0.07%	0.08%
24	3.31%	0.15%	0.00%	0.00%	0.21%	0.10%	0.05%
25	10.95%	0.09%	0.00%	0.00%	0.26%	0.00%	0.09%
26	10.16%	0.09%	0.00%	0.00%	0.21%	0.00%	0.12%
27	21.95%	0.19%	0.00%	0.00%	0.12%	0.22%	0.25%
28	0.83%	0.01%	0.00%	0.00%	0.01%	0.01%	0.01%
29	0.00%	0.00%	2.54%	0.01%	0.02%	0.00%	0.00%
30	0.00%	0.00%	2.12%	0.01%	0.02%	0.00%	0.00%

Links

Table B: Apportionment of Traffic - Road Links (Option 1 - Sea Lake-Swan Hill Road Link)

Landowner Number	*Proportion of Traffic Along Link Attributable to Landowner*							
	Link 1	*Link 2*	*Link 3*	*Link 4*	*Link 5*	*Link 6*	*Link 7(1)*	*Link 8*
1	0.61%	0.88%	0.33%	0.00%	0.27%	0.14%	49.98%	0.00%
2	0.00%	0.00%	0.00%	0.00%	0.00%	6.50%	40.72%	0.00%
3	0.09%	0.12%	0.05%	0.00%	0.04%	3.34%	1.76%	0.00%
4	6.53%	9.38%	8.49%	0.00%	11.51%	19.51%	0.59%	0.00%

5	25.26%	35.83%	53.87%	91.60%	75.74%	61.33%	2.84%	0.00%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
9	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	15.51%	22.26%	21.74%	0.00%	0.35%	0.03%	0.85%	0.00%
13	2.78%	3.99%	0.08%	0.00%	0.07%	0.01%	0.15%	0.00%
14	7.14%	10.25%	13.71%	8.05%	10.66%	8.68%	0.78%	0.00%
15	0.05%	0.08%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
16	3.09%	4.44%	0.18%	0.00%	0.15%	0.01%	0.33%	0.00%
17	0.31%	0.44%	0.59%	0.34%	0.46%	0.37%	0.03%	0.00%
18	1.92%	2.75%	0.00%	0.00%	0.00%	0.00%	0.00%	90.63%
19	2.88%	6.61%	0.09%	0.00%	0.07%	0.01%	0.32%	0.00%
20	0.35%	0.50%	0.01%	0.00%	0.01%	0.00%	0.04%	0.00%
21	0.55%	0.78%	0.03%	0.00%	0.03%	0.00%	0.06%	0.00%
22	0.20%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	9.38%
23	10.92%	0.17%	0.12%	0.00%	0.10%	0.01%	0.23%	0.00%
24	4.90%	0.25%	0.17%	0.00%	0.10%	0.01%	0.23%	0.00%
25	16.25%	0.25%	0.09%	0.00%	0.06%	0.01%	0.32%	0.00%
26	0.16%	0.23%	0.08%	0.00%	0.07%	0.01%	0.31%	0.00%
27	0.34%	0.49%	0.37%	0.00%	0.31%	0.03%	0.43%	0.00%
28	0.18%	0.02%	0.01%	0.00%	0.01%	0.00%	0.02%	0.00%
29	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

3. Option 2 - Dead Horse Lane Link

There is very little difference in the predicted traffic volumes for the majority of intersections and link roads as a result of replacing a connection to Sea Lake-Swan Hill Road (Option 1) by a connection to Dead Horse Land (Option 2). Intersections 7, 8, 9 and 11 and links 6 and 7 are most affected by this change and therefore these intersections have been assessed. The remainder of the intersections have the treatments recommended for Option 1.

3.1 Intersection Requirements

Gray Street/Feldtmann Lane (Intersection #7)

- It is recommended that a simple T-intersection continue to be provided at the Gray Street/Feldtmann Lane intersection be provided with priority to Gray Street, a right turn facility in Gray Street (due to the large volume of right turning traffic) and separate left and right turn lanes in Feldtmann Lane.

Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8)

- It is recommended that the intersection remain under roundabout control. No upgrades are required from a capacity perspective.
- As no upgrades are required from a capacity perspective, there is no "trigger point".

Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9)

- It is recommended that BAR (basic right turn) and BAL (basic left turn) treatments be provided on the west and east approaches respectively. No particular treatment is required for the left and right turn lanes in Dead Horse Lane at this intersection.
- The existing volumes warrant the provision of BAR and BAL turn treatments, as do the post development volumes. There is therefore no "trigger point" for an upgrade of the right turn treatment as a result of the Swan Hill South West Development Precinct.

Dead Horse Lane/Link 7(2) (Intersection #11)

- It is recommended that a simple T-intersection be provided at the Dead Horse Lane/Link 7(2) intersection, with priority to Dead Horse Lane.

3.2 Apportionment of Traffic Generation to Land Holders

Intersections

Table C: Apportionment of Traffic - Intersections (Option 2 - Dead Horse Lane Link)

Landowner Number	Proportion of Traffic Through Intersection Attributable to Landowner						
	Int #3	Int #4	Int #6	Int #7	Int #11	Int #12	Int #13
1	0.37%	0.30%	12.09%	19.77%	4.03%	0.35%	0.28%
2	0.52%	0.42%	16.85%	27.26%	31.67%	0.49%	39.15%
3	0.08%	0.06%	2.51%	4.07%	1.07%	0.02%	1.42%
4	4.38%	4.33%	5.89%	13.24%	4.50%	5.06%	9.02%
5	17.05%	27.49%	0.00%	30.82%	21.94%	85.45%	42.89%
6	0.00%	0.00%	3.40%	0.01%	0.00%	0.00%	0.00%
7	0.00%	0.00%	23.80%	0.08%	0.00%	0.00%	0.00%
8	0.00%	0.00%	1.70%	0.01%	0.00%	0.00%	0.00%
9	0.00%	0.00%	2.04%	0.01%	0.00%	0.00%	0.00%

10	0.00%	0.00%	27.88%	0.09%	0.00%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	10.40%	22.01%	0.00%	0.01%	6.25%	0.22%	0.22%
13	1.86%	1.55%	0.09%	0.03%	1.14%	0.05%	0.04%
14	4.79%	13.91%	0.00%	4.42%	6.00%	7.53%	6.07%
15	0.04%	0.15%	0.00%	0.00%	0.04%	0.00%	0.00%
16	2.07%	8.63%	0.00%	0.00%	2.53%	0.11%	0.09%
17	0.21%	0.60%	0.00%	0.19%	0.26%	0.32%	0.26%
18	1.29%	7.27%	0.00%	0.00%	2.49%	0.00%	0.00%
19	1.93%	9.34%	0.00%	0.00%	2.49%	0.00%	0.08%
20	0.23%	1.01%	0.00%	0.00%	0.30%	0.00%	0.01%
21	0.37%	1.59%	0.00%	0.00%	0.47%	0.02%	0.02%
22	0.13%	0.75%	0.00%	0.00%	0.26%	0.00%	0.00%
23	7.33%	0.06%	0.00%	0.00%	1.76%	0.07%	0.06%
24	3.29%	0.15%	0.00%	0.00%	2.44%	0.10%	0.04%
25	10.90%	0.09%	0.00%	0.00%	2.61%	0.00%	0.09%
26	10.11%	0.09%	0.00%	0.00%	2.40%	0.00%	0.08%
27	21.84%	0.19%	0.00%	0.00%	5.19%	0.22%	0.17%
28	0.83%	0.01%	0.00%	0.00%	0.17%	0.01%	0.01%
29	0.00%	0.00%	2.04%	0.01%	0.00%	0.00%	0.00%
30	0.00%	0.00%	1.70%	0.01%	0.00%	0.00%	0.00%

Links

Table D: Apportionment of Traffic - Road Links (Option 2 - Dead Horse Lane Link)

Landowner Number	*Proportion of Traffic Along Link Attributable to Landowner*							
	Link 1	*Link 2*	*Link 3*	*Link 4*	*Link 5*	*Link 6*	*Link 7(2)*	*Link 8*
1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3	0.11%	0.16%	0.07%	0.00%	0.06%	2.82%	3.25%	1.09%
4	6.48%	9.28%	8.39%	0.00%	11.39%	12.98%	0.36%	4.57%
5	25.07%	35.45%	53.27%	91.60%	75.01%	40.81%	1.71%	22.28%

6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
9	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	15.39%	22.03%	21.50%	0.00%	0.34%	0.02%	0.52%	5.94%
13	2.76%	3.95%	0.08%	0.00%	0.07%	0.00%	0.09%	1.15%
14	7.09%	10.15%	13.56%	8.05%	10.55%	5.78%	0.48%	6.09%
15	0.05%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%
16	3.07%	4.39%	0.18%	0.00%	0.15%	0.01%	0.20%	2.57%
17	0.30%	0.43%	0.58%	0.34%	0.45%	0.25%	0.02%	0.26%
18	1.90%	2.72%	0.00%	0.00%	0.00%	0.00%	0.00%	1.51%
19	2.85%	6.54%	0.09%	0.00%	0.07%	0.01%	0.20%	2.52%
20	0.34%	0.49%	0.01%	0.00%	0.01%	0.00%	0.02%	0.30%
21	0.54%	0.77%	0.03%	0.00%	0.03%	0.00%	0.04%	0.48%
22	0.20%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%
23	10.84%	0.17%	0.12%	0.00%	0.10%	0.01%	0.14%	1.78%
24	4.87%	0.24%	0.16%	0.00%	0.10%	0.01%	0.09%	2.48%
25	16.13%	0.25%	0.09%	0.00%	0.08%	0.01%	0.21%	2.65%
26	0.16%	0.23%	0.08%	0.00%	0.07%	0.01%	0.19%	2.44%
27	0.34%	0.49%	0.36%	0.00%	0.30%	0.02%	0.41%	5.26%
28	0.18%	0.02%	0.01%	0.00%	0.01%	0.00%	0.01%	0.17%
29	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

4. Option 1 v Option 2

Option 1 (a connection to Sea Lake-Swan Hill Road) provides a superior road network compared to Option 2 (a connection to Dead Horse Lane) and will not detrimentally affect the operation or capacity of Sea Lake-Swan Hill Road. Option 1 is the preferred solution.

5. *Increased Residential Density*

The single lane roundabouts recommended at intersections 3 (Coronation Avenue/Wattie Street/Link 1), 4 Yana Street/Link 2/Link 3), 12 (Link 3/Link 4/Link 5) and 13 ((Link 5/Link 6/Link 7) will have the capacity to accommodate the extra traffic generated by a higher residential density.

The higher density will increase traffic at intersections 5 (Grey Street/Yana Street), 7 (Gray Street/Feldtmann Lane (Link 6)) and 8 Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive). Additional capacity analysis was undertaken to determine the impact the higher density will have on the operation and form of these intersections.

These analyses showed that the recommended treatments remain appropriate, albeit that the intersections will operate at lower levels of service. It is noted that the east approach in Gray Street is sufficiently wide to enable through vehicles to pass left turning vehicles, and on the west approach there is scope to ban kerbside parking to allow through traffic to pass stationary right turning traffic. This action should be considered by Council separate to this study.

6. *Comments on Specific Items*

Distance from Sea Lake-Swan Hill Road of First Intersection on Dead Horse Lane

VicRoads' requirement to offset a local road intersection on Dead Horse Lane more than 800m from Sea Lake Swan Hill Road is excessive. There will be low volumes of traffic through this intersection in the design year (2033) and queues on the Dead Horse Lane approach will be one vehicle long. The first intersection to the south will carry low volumes of traffic, and a simple T-intersection is all that is required.

The property on the southeast corner of this intersection has a frontage to Dead Horse Lane of some 135m and is to be retained. The first intersection to the south of Sea Lake-Swan Hill Road will therefore be greater than this distance from the main road, which is more than sufficient to ensure that both intersections can operate efficiently in the future.

Access to Sea Lake-Swan Hill Road

The intersections of Gray Street and Dead Horse Lane with Sea Lake-Swan Hill Road are separated by approximately 750m. There is therefore more than sufficient road length in which to create an intersection if so desired. A connection to Sea Lake-Swan Hill Road provides a superior road network whilst not detrimentally affecting the operation or capacity of Sea Lake-Swan Hill Road.

Recommended Speed Zones

The setting of speed zones on the declared road network is the responsibility of VicRoads and takes into account many factors. The assessment of the intersection requirements at Dead Horse Lane has been undertaken on the basis that, as the urban edge of Swan Hill would have moved to this location, a speed limit of 80 km/h is appropriate.

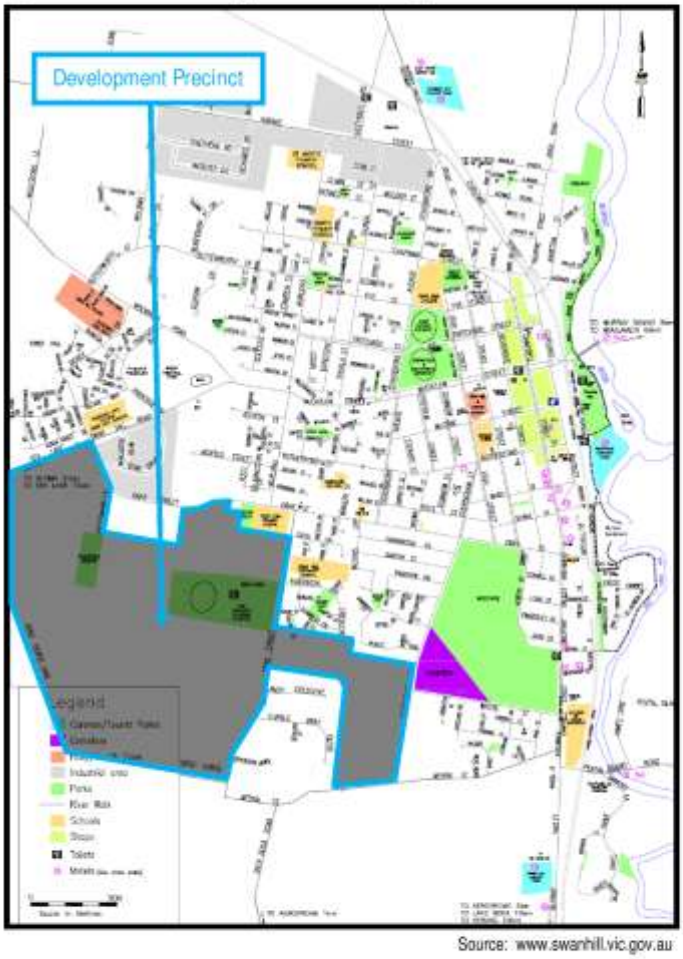
1. INTRODUCTION

Traffix Group was engaged by Swan Hill Rural City Council to undertake a traffic impact assessment of the proposed Swan Hill South West Development Precinct. Initially, the scope of the study comprised an assessment of the external traffic impacts, the forms of intersection treatments required and, on Sea Lake-Swan Hill Road, the trigger point for their provision. The scope of the study was extended to include an assessment of the relative traffic volumes from each land holding that travels through nominated intersections and along nominated roads. Initially, a yield of approximately 10.5 lots per hectare was investigated. The study was extended to "test" the impacts of a yield of approximately 14 lots per hectare.

2. SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT

2.1. LOCATION

The development area is bounded by Sea Lake-Swan Hill Road, Gray Street, Yana Street and Dead Horse Lane. It is located at the southwest edge of the urban development of the Swan Hill township. The development area covers approximately 241 hectares. A locality plan is shown in Figure 1.



Source: www.swanhill.vic.gov.au

Figure 1: Swan Hill South West Development Precinct Locality Plan

2.2. ZONING

The development area comprises a number of zones, principally Farming Zone, but including Low Density Residential Zone and Public Park & Recreation Zone, as shown in the zoning map at Figure 2.

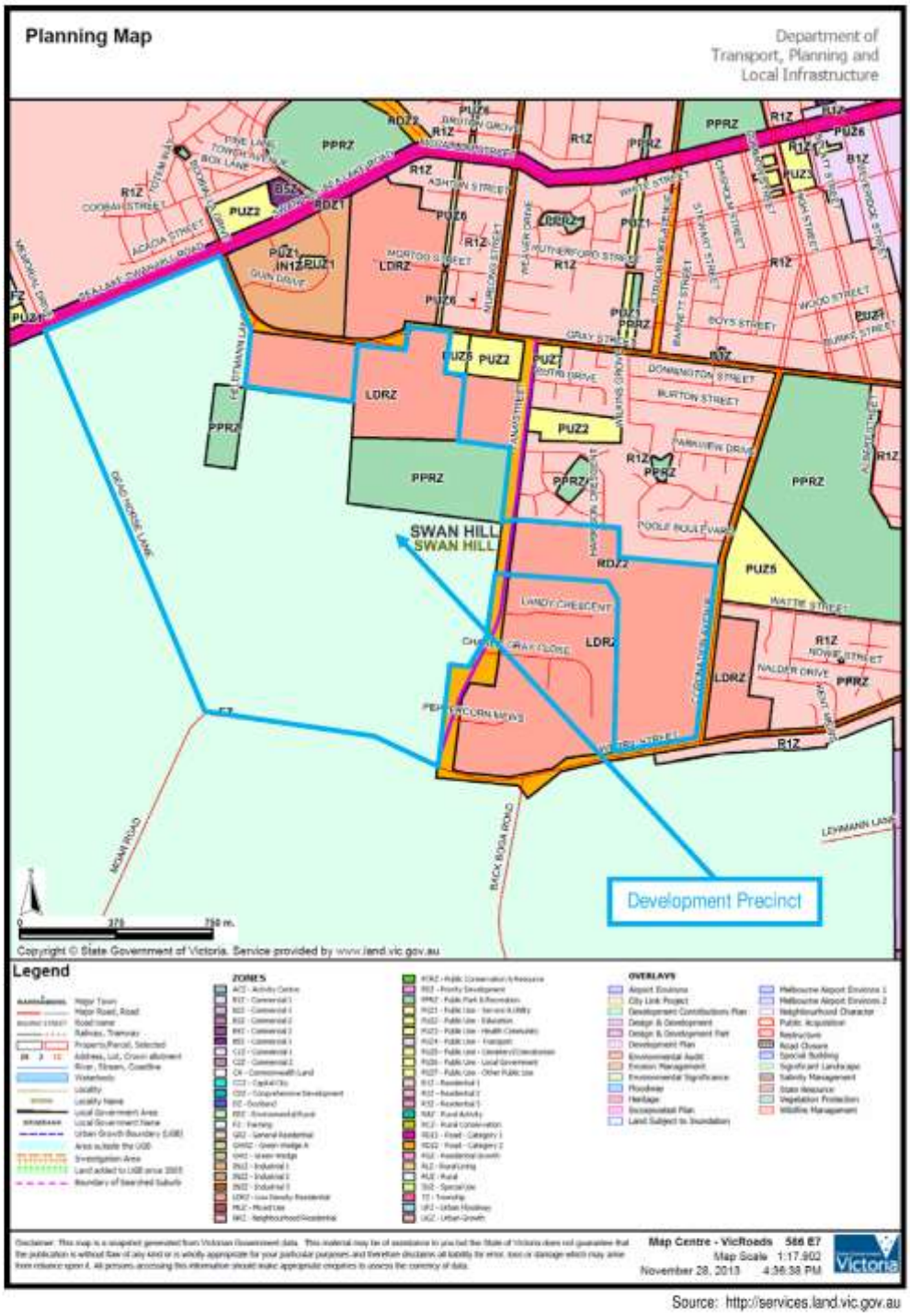


Figure 2: Zoning Map

2.3. DEVELOPMENT PLAN

The Swan Hill South West Development Precinct plan is shown in Figure 3.

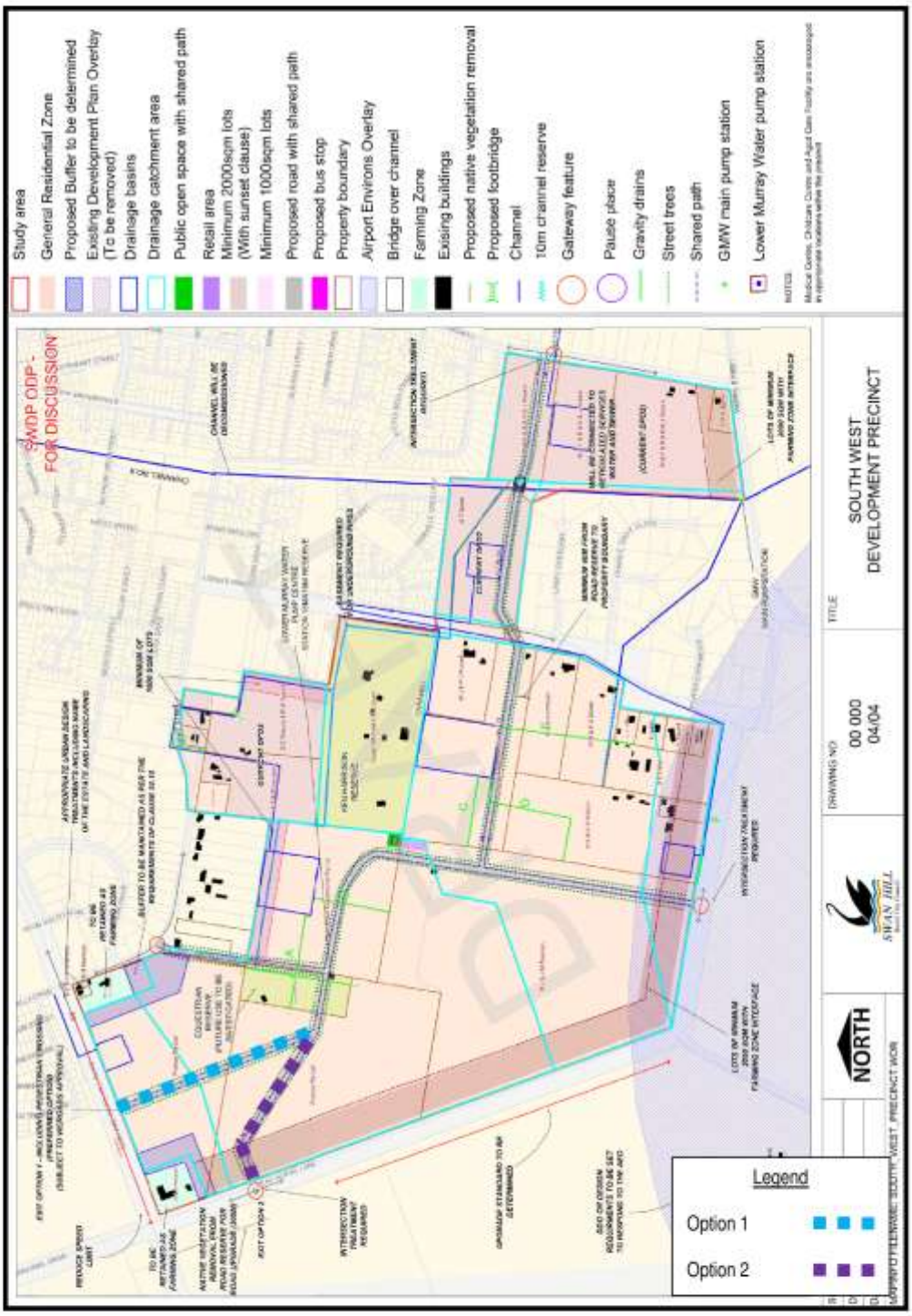


Figure 3: Swan Hill South West Development Precinct Plan

The Swan Hill South West Development Precinct Plan shows two access options in the northwest corner of the precinct:

- Option 1: Connection to Sea Lake-Swan Hill Road; and
- Option 2: Connection to Dead Horse Lane.

The remainder of the Development Precinct Plan is the same for both options.

2.4. EXISTING TRAFFIC VOLUMES

Swan Hill Rural City Council undertook a number of traffic surveys within the precinct area in November, 2013. These comprised turning movement counts and automatic tube counts. The results are shown in Figures 4 to 7 and Table 1.

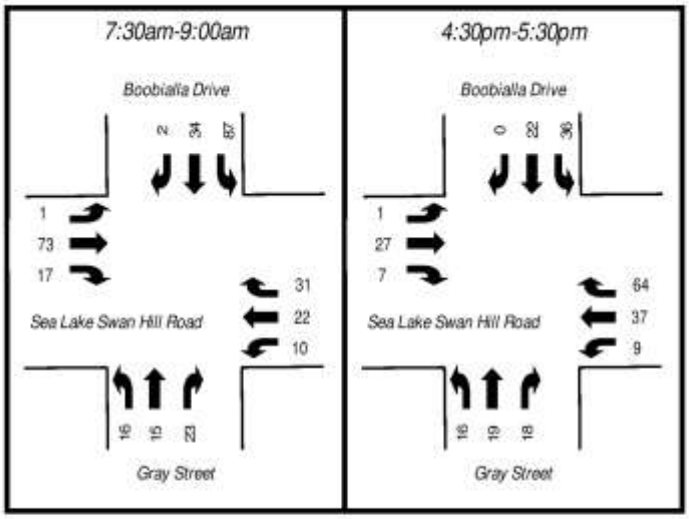


Figure 4: Existing Traffic Volumes - Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive

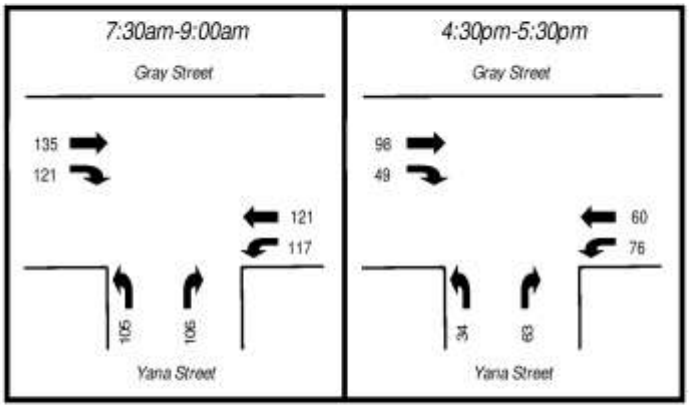


Figure 5: Existing Traffic Volumes - Gray Street/Yana Street

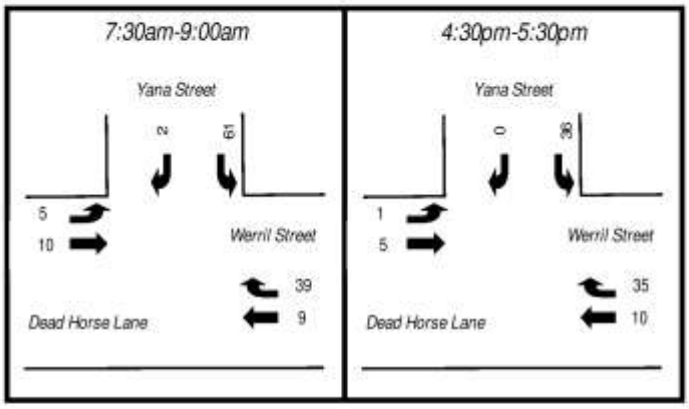


Figure 6: Existing Traffic Volumes - Yana Street/Werril Street/Dead Horse Lane

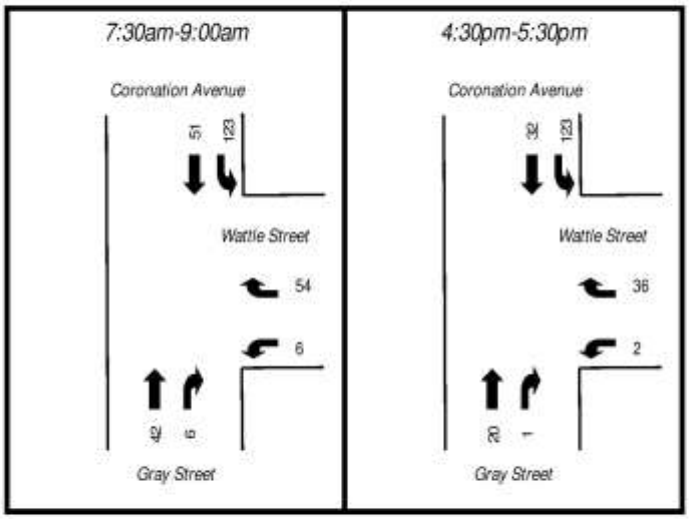


Figure 7: Existing Traffic Volumes - Coronation Avenue/Wattie Street

Table 1: Existing Traffic Volumes

Period	Tues 29/10/13	Wed 30/10/13	Thurs 31/10/13	Fri 1/11/13	Mon 4/11/13	Average
Dead Horse Lane, South of Sea Lake Road						
8:00am-9:00am	4	2	5	3	2	3
5:00pm-6:00pm	3	5	3	2	3	3
Daily	33	43	46	34	35	38
Dead Horse Lane, West of Yana Street						
8:00am-9:00am	14	7	15	10	3	10
5:00pm-6:00pm	15	21	9	12	8	13
Daily	139	149	150	124	111	141
Gray Street, Between Murlong Street and Sea Lake Road						
8:00am-9:00am	77	101	81	76	66	80
5:00pm-6:00pm	68	100	77	70	62	75
Daily	800	900	648	931	754	807
Sea Lake Road, Between Gray Street and Dead Horse Lane						
8:00am-9:00am	92	105	92	78	69	87
5:00pm-6:00pm	72	79	73	68	65	71
Daily	932	1,039	1,021	1,087	971	1,010
Werril Street, Between Yana Street and Back Boga Road						
8:00am-9:00am	83	91	99	85	79	87
5:00pm-6:00pm	92	81	93	97	77	88
Daily	842	916	918	917	768	872
Period	*Thurs 7/11/13*	*Fri 8/11/13*	*Mon 11/11/13*	*Tues 12/11/13*	*Wed 13/11/13*	*Average*
Coronation Avenue, North of Wattie Street						
8:00am-9:00am	176	149	159	157	166	161
5:00pm-6:00pm	174	170	181	175	185	177
Daily	1,557	1,702	1,649	1,665	1,700	1,655

Period	Thurs 7/11/13	Fri 8/11/13	Mon 11/11/13	Tues 12/11/13	Wed 13/11/13	Average
Coronation Avenue, South of Wattie Street						
8:00am-9:00am	176	149	159	157	166	161
5:00pm-6:00pm	174	170	181	175	185	177
Daily	1,557	1,702	1,649	1,665	1,700	1,655
Coronation Avenue, North of Wattie Street						
8:00am-9:00am	104	85	91	91	88	92
5:00pm-6:00pm	93	91	81	78	75	84
Daily	773	830	791	825	805	805
Yana Street, South of Ken Harrison Reserve Entrance						
8:00am-9:00am	116	117	121	119	125	120
5:00pm-6:00pm	117	113	125	114	154	125
Daily	1,125	1,284	1,135	1,225	1,269	1,208
Yana Street, North of Werril Street/Dead Horse Lane						
8:00am-9:00am	22	15	9	13	10	14
5:00pm-6:00pm	10	8	15	6	14	11
Daily	140	148	119	119	130	131
Werril Street, East of Back Boga Road						
8:00am-9:00am	99	91	96	95	87	94
5:00pm-6:00pm	90	79	85	86	84	85
Daily	762	886	761	844	837	818
Period	Fri 15/11/13	Mon 18/11/13	Tues 19/11/13	Wed 20/11/13	Thurs 21/11/13	Average
Sea Lake Road, West of Dead Horse Lane						
8:00am-9:00am	81	94	91	76	-	86
5:00pm-6:00pm	65	58	74	73	-	68
Daily	1,065	842	935	898	-	935

3. SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT TRAFFIC GENERATION MODEL

A spreadsheet traffic generation and distribution model was prepared for the Swan Hill South West Development Precinct, whereby the precinct was divided into a number of discrete areas and the traffic generated by each area was assigned to the road network.

The following assumptions were adopted:

- Residential density:
  - "Standard" lot sizes: Approximately 10.5 households per ha
  - Low density lot sizes: 1,000m² and 2,000m²
- Residential traffic generation
  - Daily: 10 vte/household/day
  - Peak hour: 1 vte/household/hr
    - AM peak hour: "In": 20% "Out": 80%
    - PM peak hour: "In": 60% "Out": 40%
- Trip purpose:
  - Internal: 5%
  - External:
    - Work: 25.6%
    - School: 11.4%
    - Shopping: 34.2%
    - Other: 23.8%
- General trip distribution:

Purpose	*To/From North*	*To/From South*	*To/From East*	*To/From West*
Internal	0%	0%	0%	0%
Work	50%	0%	50%	0%
School	100%	0%	0%	0%
Shopping	50%	0%	50%	0%
Other	45%	5%	45%	5%

The model assumed that the traffic generated by the childcare centre, retail area and "village green" located within the middle of the precinct was all internal traffic.

- Applying this general trip distribution to the individual trip purpose produced the following adopted average external trip distributions:
  - To/from north: 58%
  - To/from south: 1%
  - To/from east: 35%
  - To/from west: 1%
  - Internal: 5%

VicRoads required traffic along Sea Lake-Swan Hill Road to be grown at a rate of 1% per annum to a design year of 2033 (being 10 years until full development of the precinct plus a further 10 years). Whilst full development of the precinct may take longer than 10 years, this design year is considered to be appropriate in light of the adopted growth rate for Sea Lake-Swan Hill Road traffic, which is likely to be high given the lack of future traffic generators to the west of the precinct.

4. OPTION 1 - SEA LAKE-SWAN HILL ROAD LINK

4.1. DESIGN TRAFFIC VOLUMES (OPTION 1 - SEA LAKE-SWAN HILL ROAD LINK)

Figure 8 identifies the intersection and road numbers used in this report for Option 1.

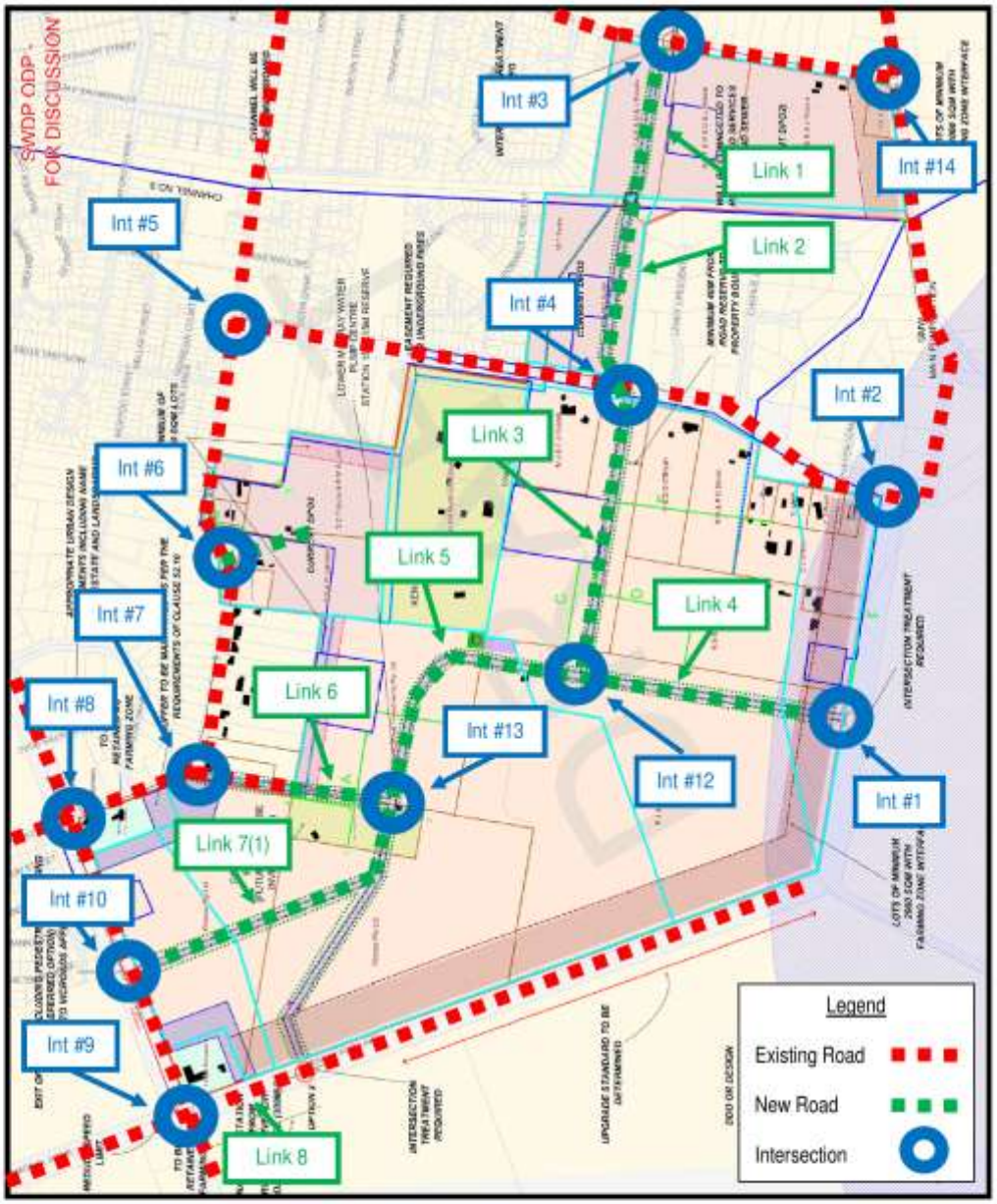


Figure 8: Intersection and Road Identification (Option 1 - Sea Lake-Swan Hill Road Link)

The predicted precinct daily traffic volumes arising from the traffic model for Option 1 - Sea Lake-Swan Hill Road Link are shown in Figure 9.

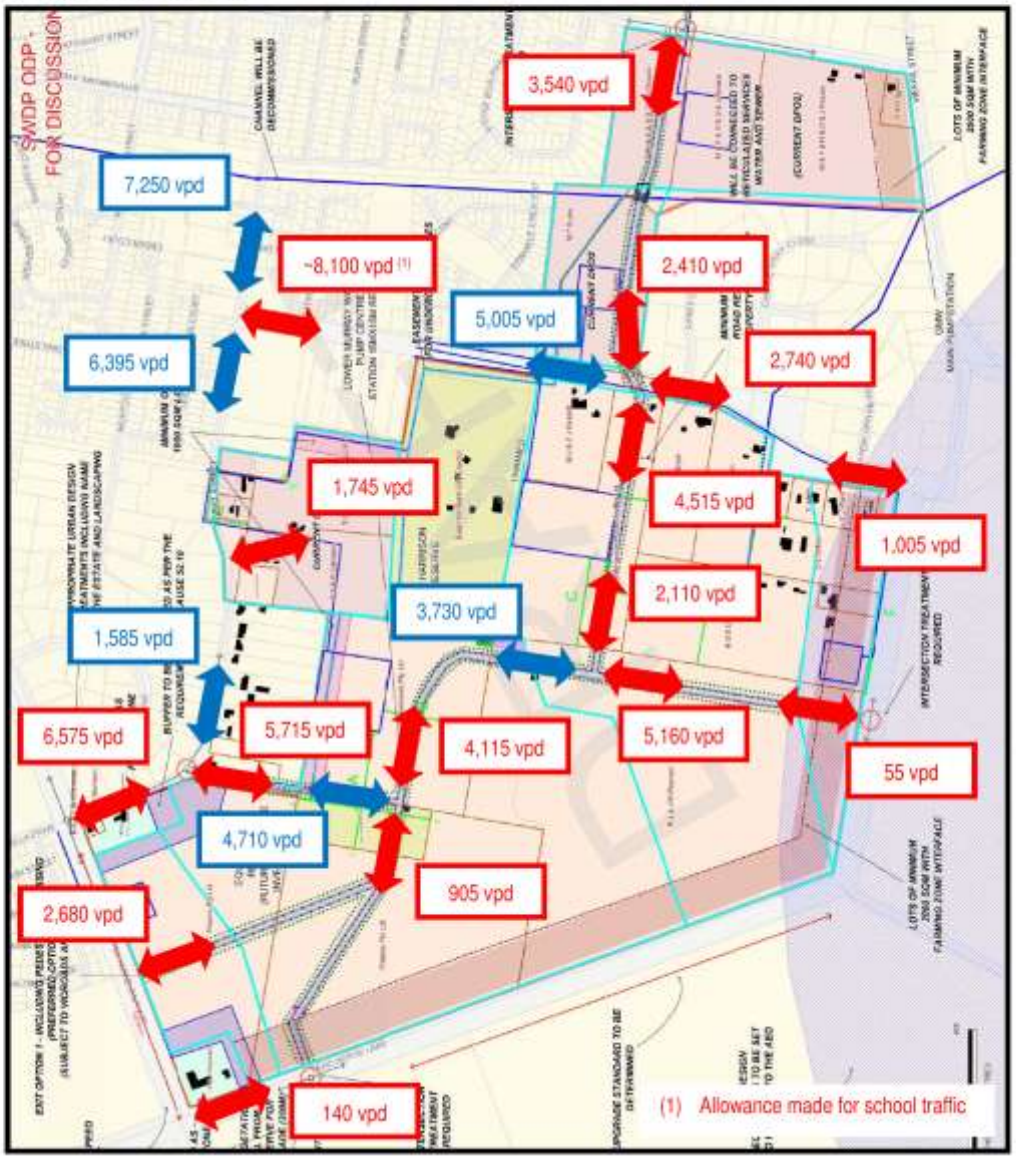
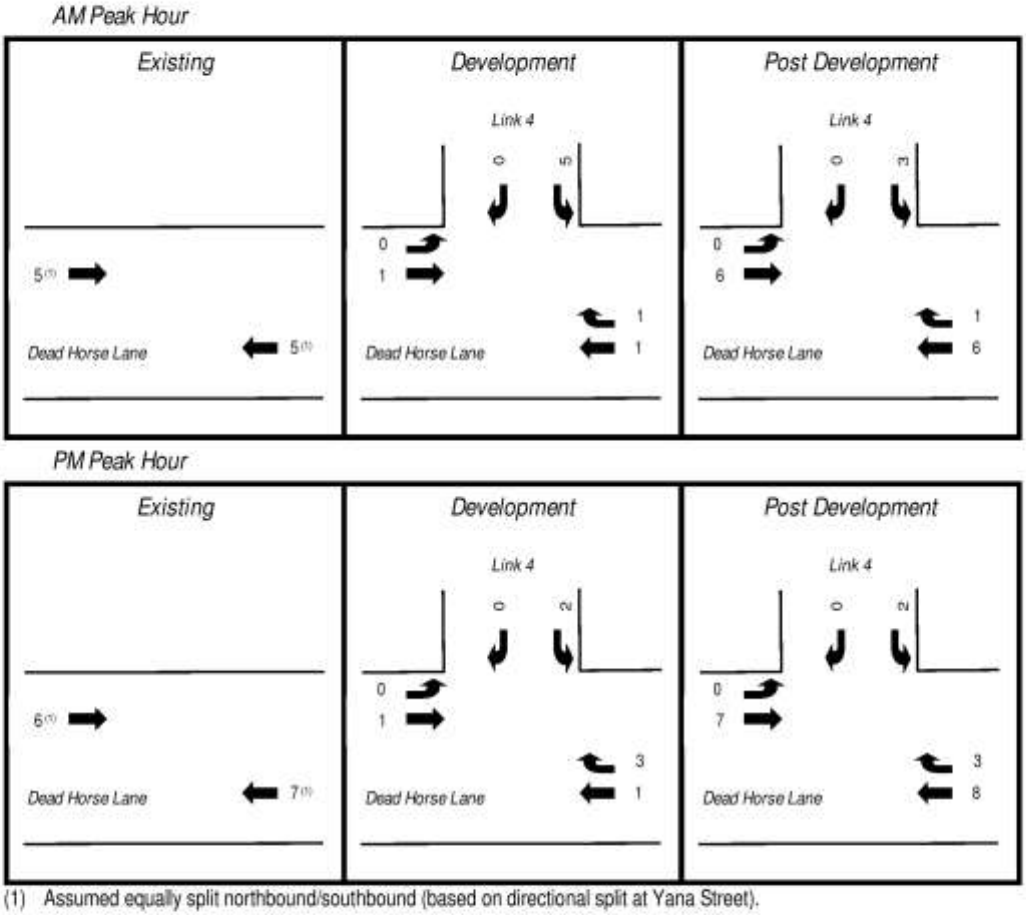


Figure 9: Predicted Precinct Daily Traffic Volumes (Option 1 - Sea Lake-Swan Hill Road Link)

The traffic model also allowed the peak hour turning volumes to be determined at critical locations. These are shown in Figures 10 to 21, which also show existing volumes and the total post-development volumes (including growth of traffic along Sea Lake-Swan Hill Road, as required by VicRoads).



(1) Assumed equally split northbound/southbound (based on directional split at Yana Street).

Figure 10: Traffic Volumes - Dead Horse Lane/Link 4 (Intersection #1) (Option 1 - Sea Lake-Swan Hill Road Link)

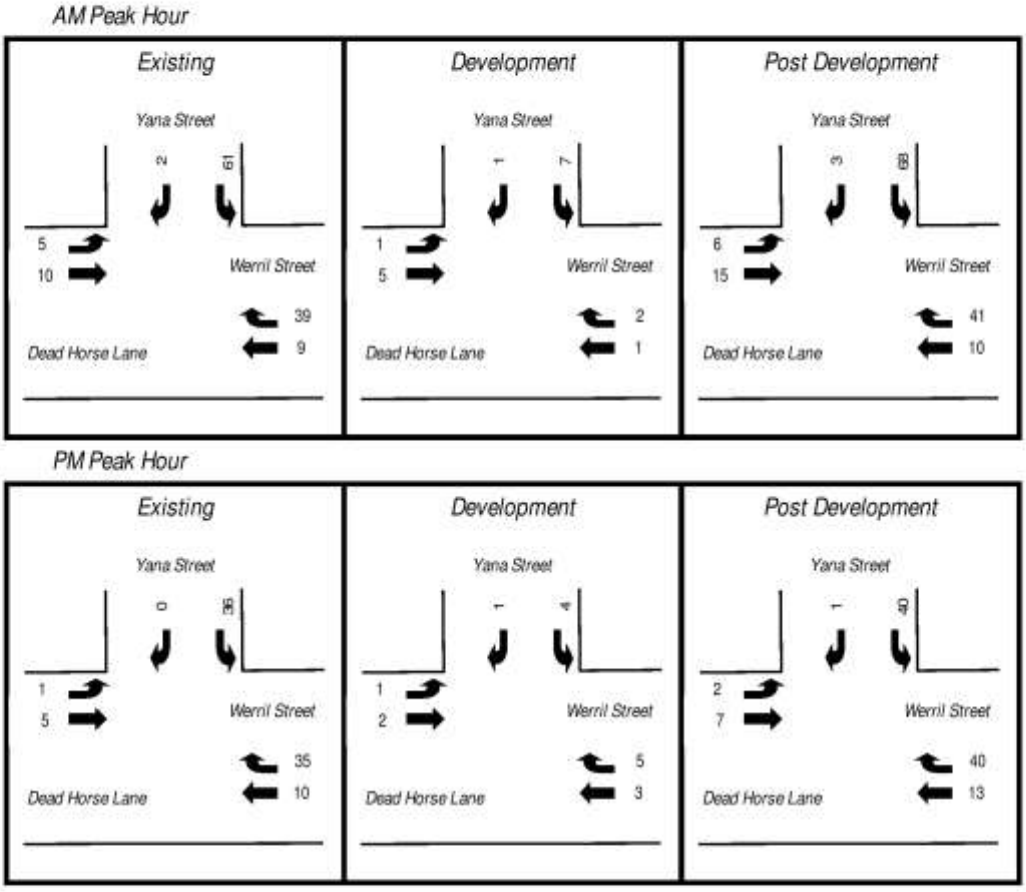


Figure 11: Traffic Volumes - Yana Street/ Werril Street/Dead Horse Lane (Intersection #2) (Option 1 - Sea Lake-Swan Hill Road Link)

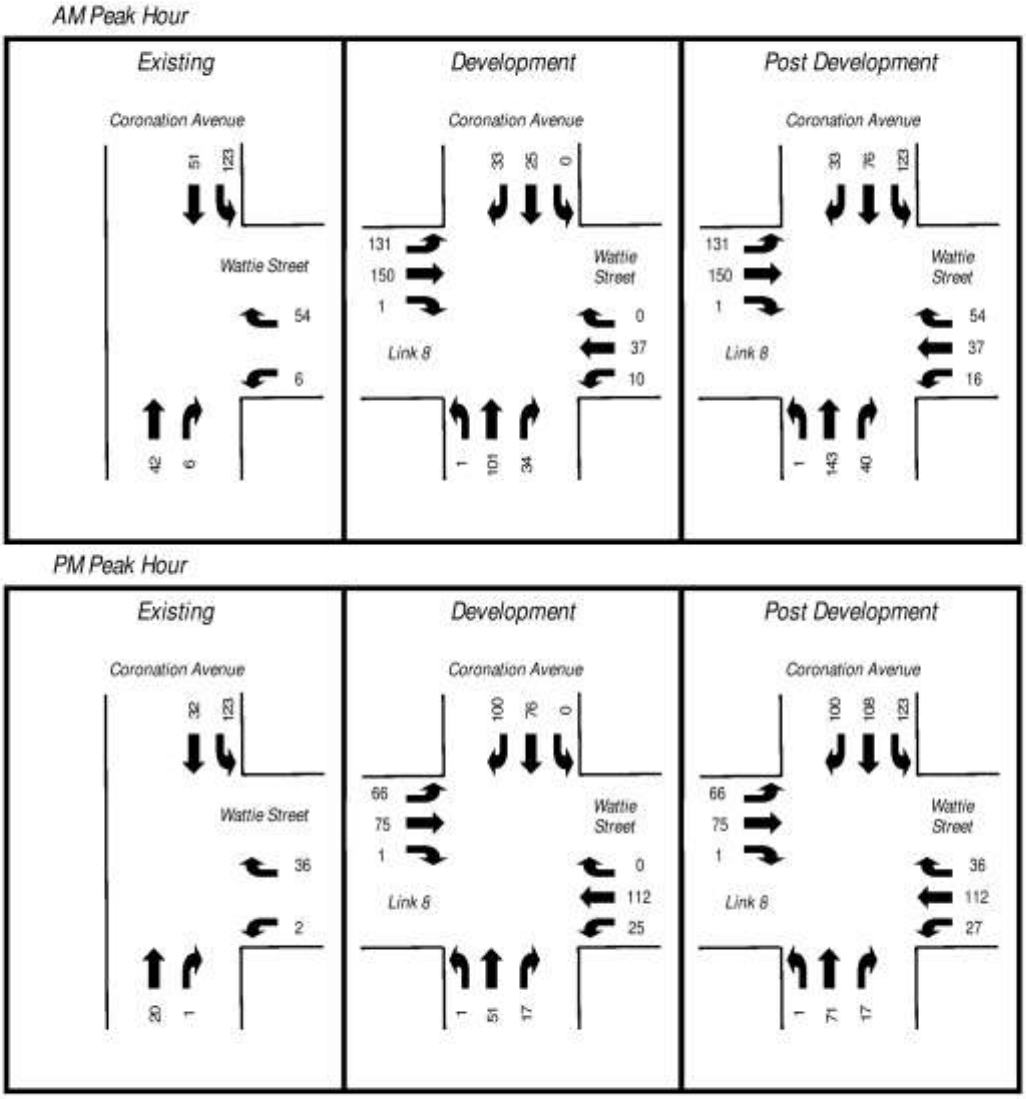
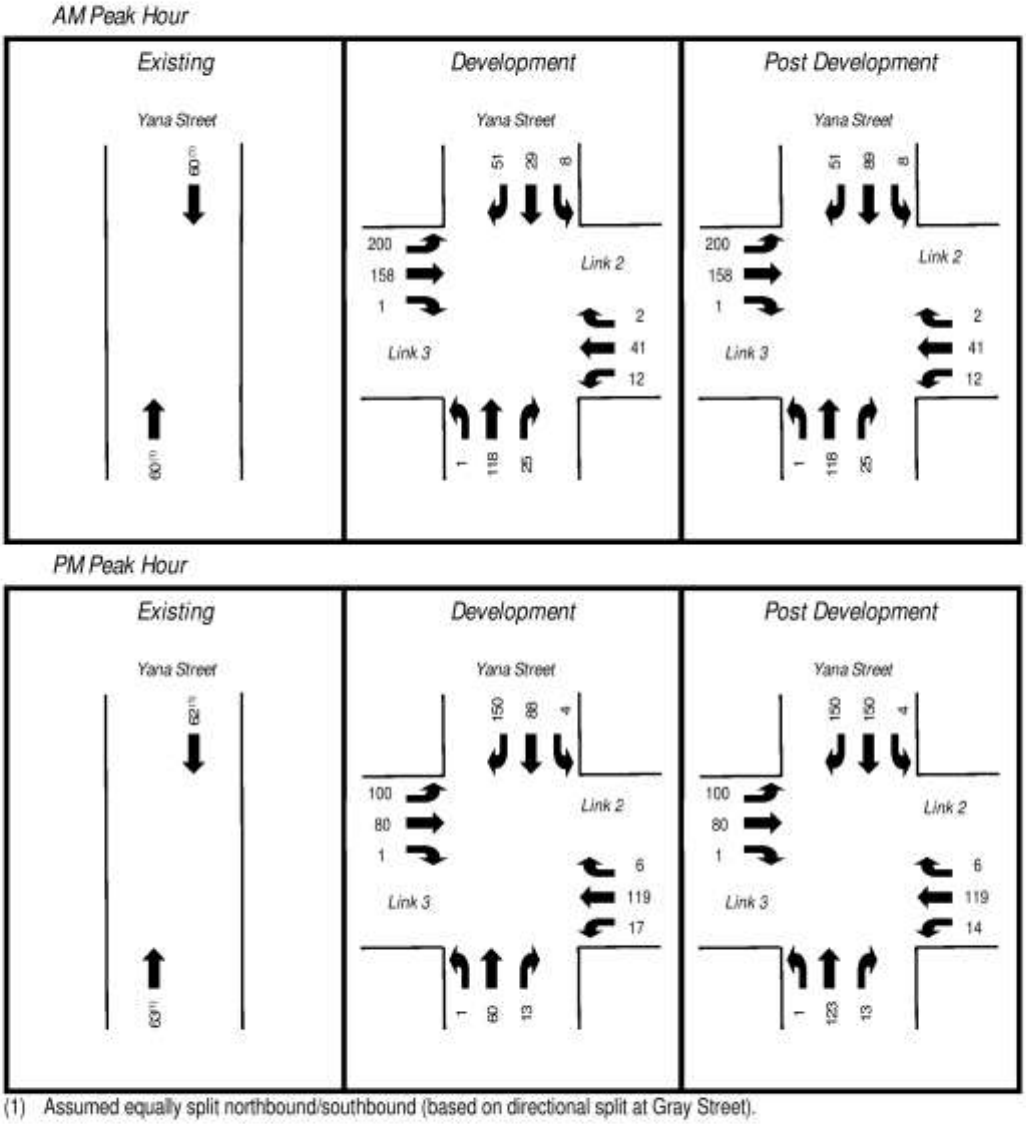


Figure 12: Traffic Volumes - Coronation Avenue/Wattie Street/Link 1 (Intersection #3) (Option 1 - Sea Lake-Swan Hill Road Link)



(1) Assumed equally split northbound/southbound (based on directional split at Gray Street).

Figure 13: Traffic Volumes - Yana Street/Link 2/Link 3 (Intersection #4) (Option 1 - Sea Lake-Swan Hill Road Link)

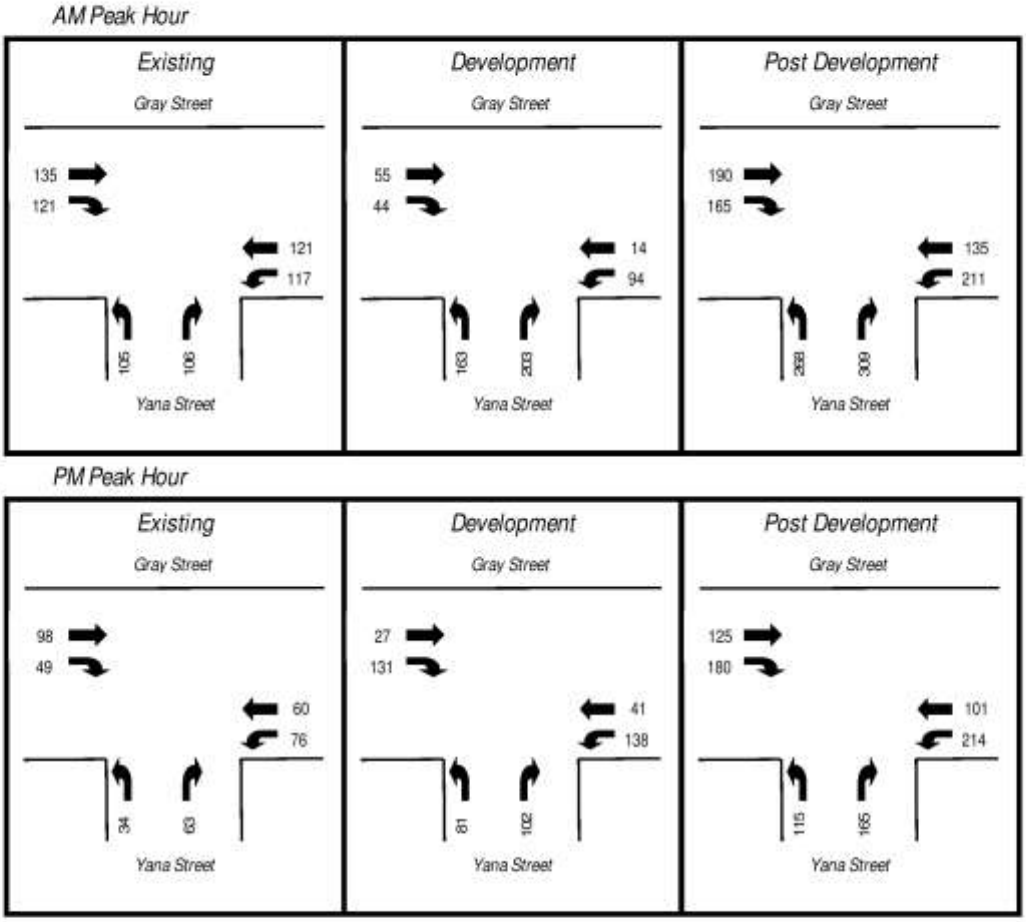
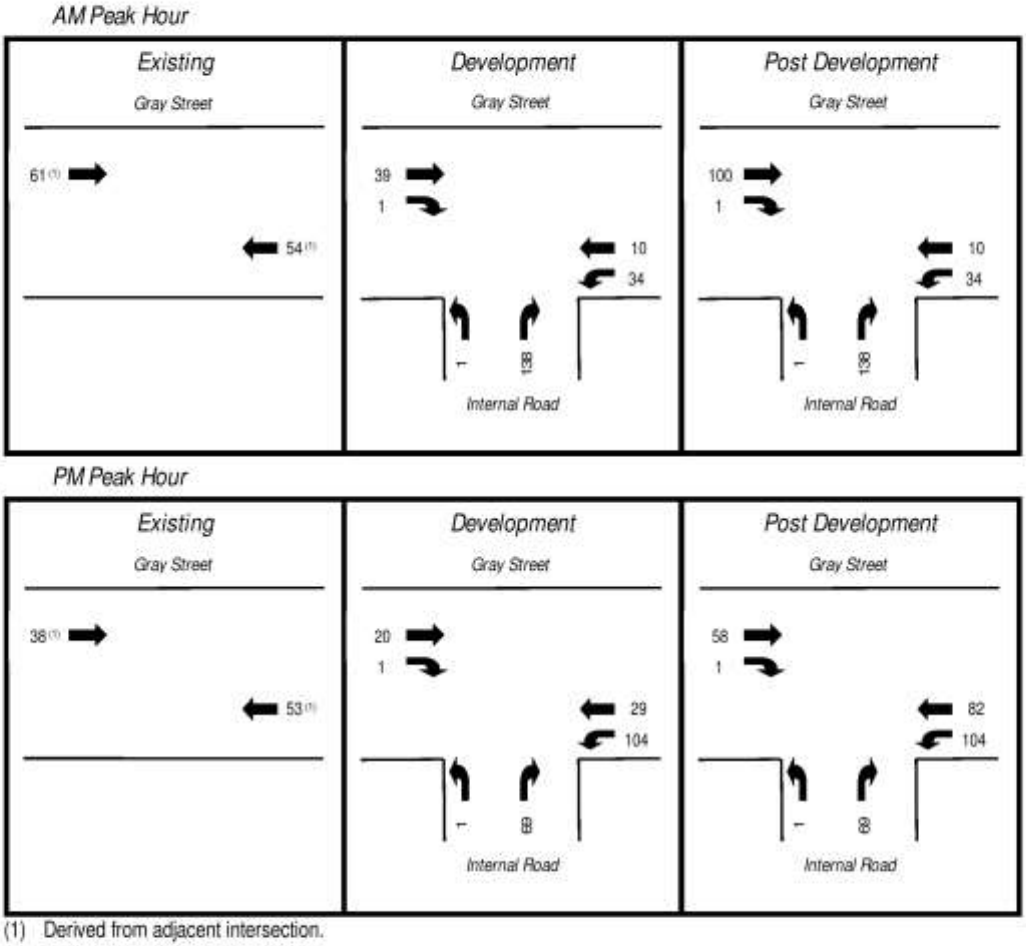
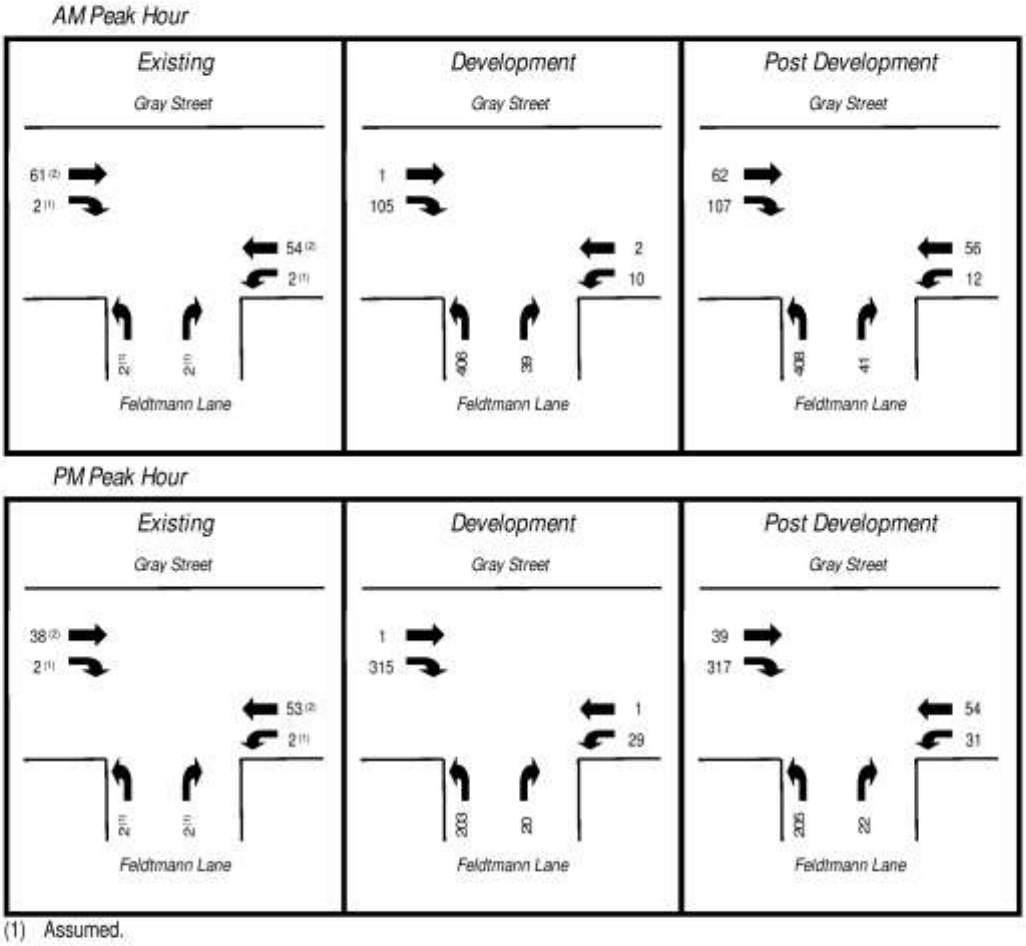


Figure 14: Traffic Volumes - Grey Street/Yana Street (Intersection #5) (Option 1 - Sea Lake-Swan Hill Road Link)



(1) Derived from adjacent intersection.

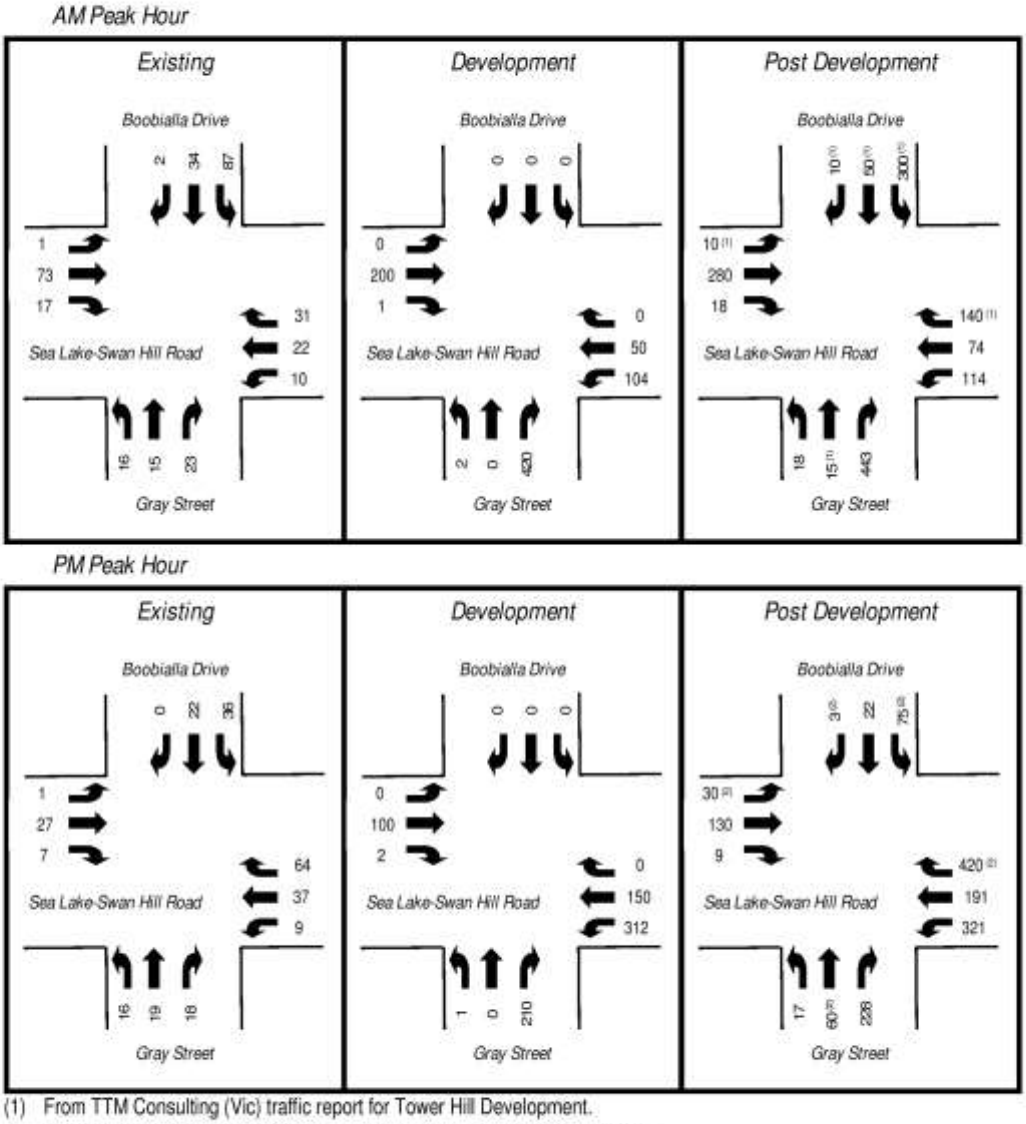
Figure 15: Traffic Volumes - Gray Street/Internal Road (Intersection #6) (Option 1 - Sea Lake-Swan Hill Road Link)



(1) Assumed.

(2) Derived from adjacent intersection.

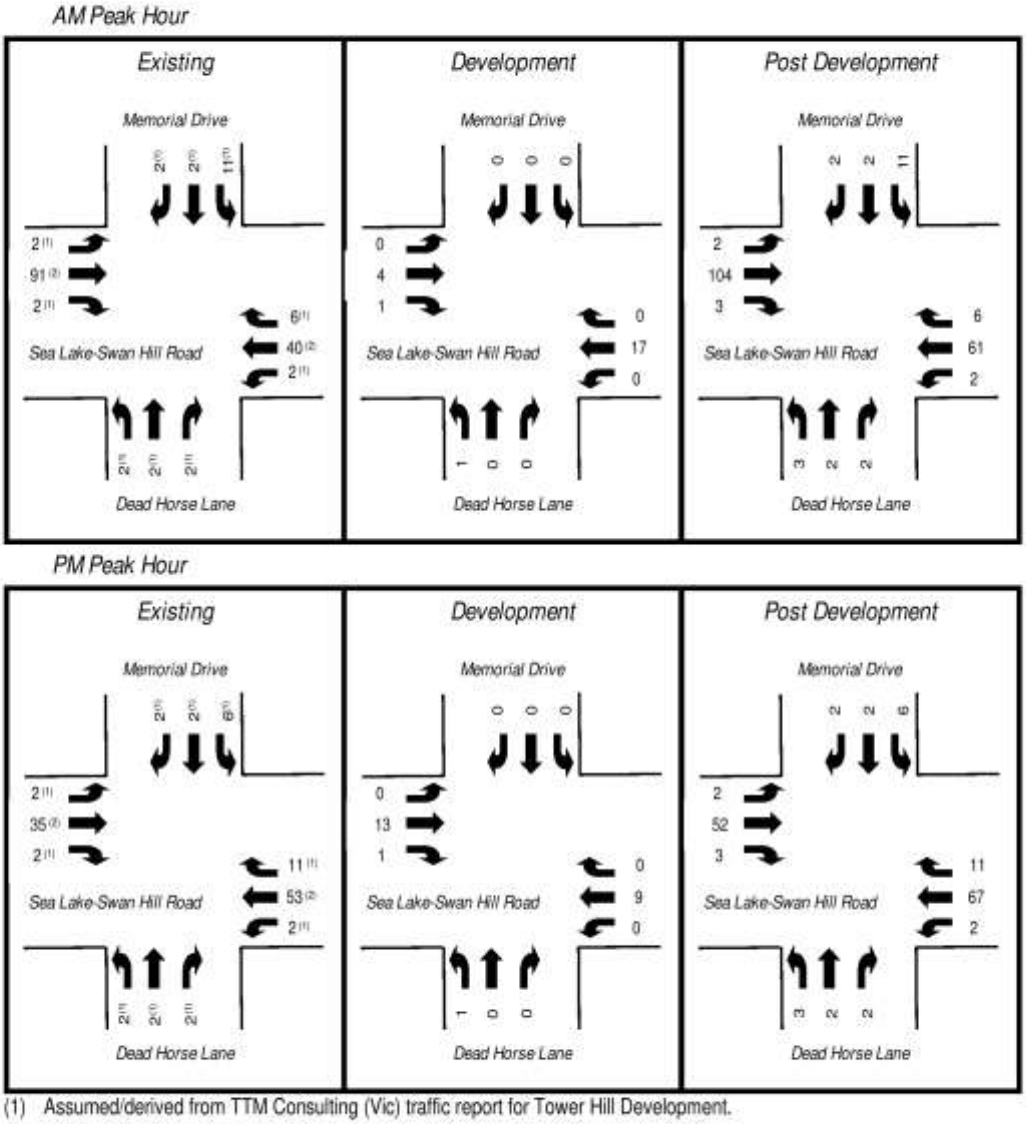
Figure 16: Traffic Volumes - Gray Street/Feldtmann Lane (Link 6) (Intersection #7) (Option 1 - Sea Lake-Swan Hill Road Link)



(1) From TTM Consulting (Vic) traffic report for Tower Hill Development.

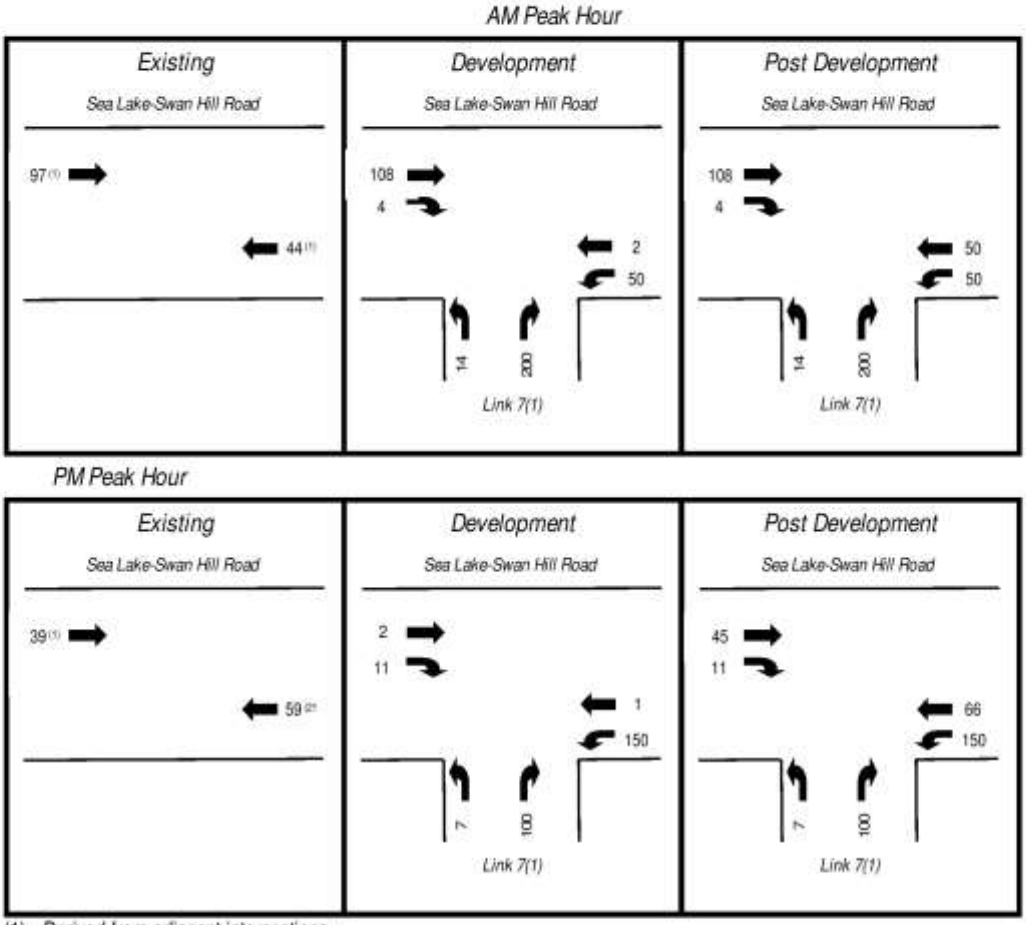
(2) Derived from TTM Consulting (Vic) traffic report for Tower Hill Development.

Figure 17: Traffic Volumes - Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8) (Option 1 - Sea Lake-Swan Hill Road Link)



(1) Assumed/derived from TTM Consulting (Vic) traffic report for Tower Hill Development.
(2) Derived from adjacent intersection.

Figure 18: Traffic Volumes - Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9) (Option 1 - Sea Lake-Swan Hill Road Link)



(1) Derived from adjacent intersections.

Figure 19: Traffic Volumes - Sea Lake-Swan Hill Road/Link 7(1) (Intersection #10) (Option 1 - Sea Lake-Swan Hill Road Link)

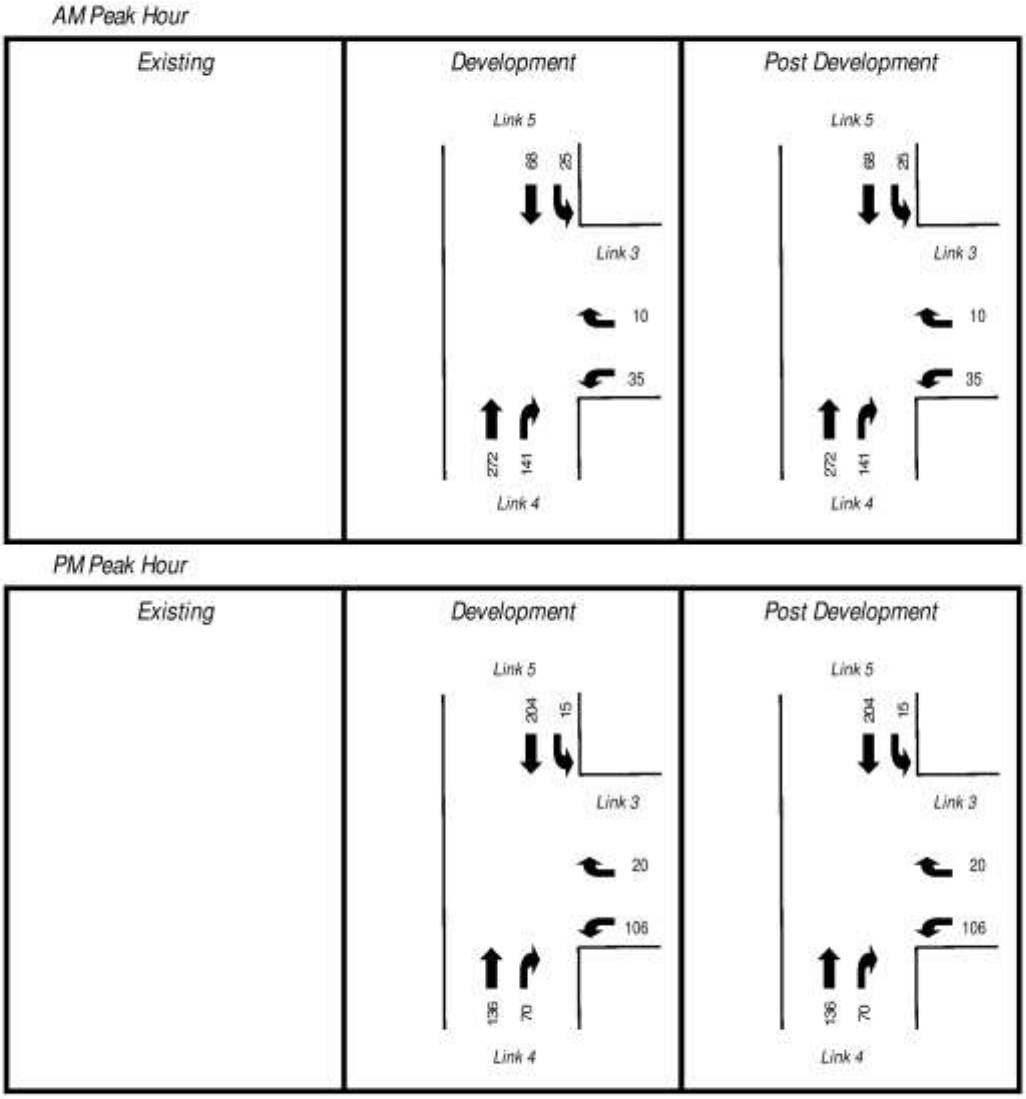


Figure 20: Traffic Volumes - Link 5/Link 3/Link 4 (Intersection #12) (Option 1 - Sea Lake-Swan Hill Road Link)

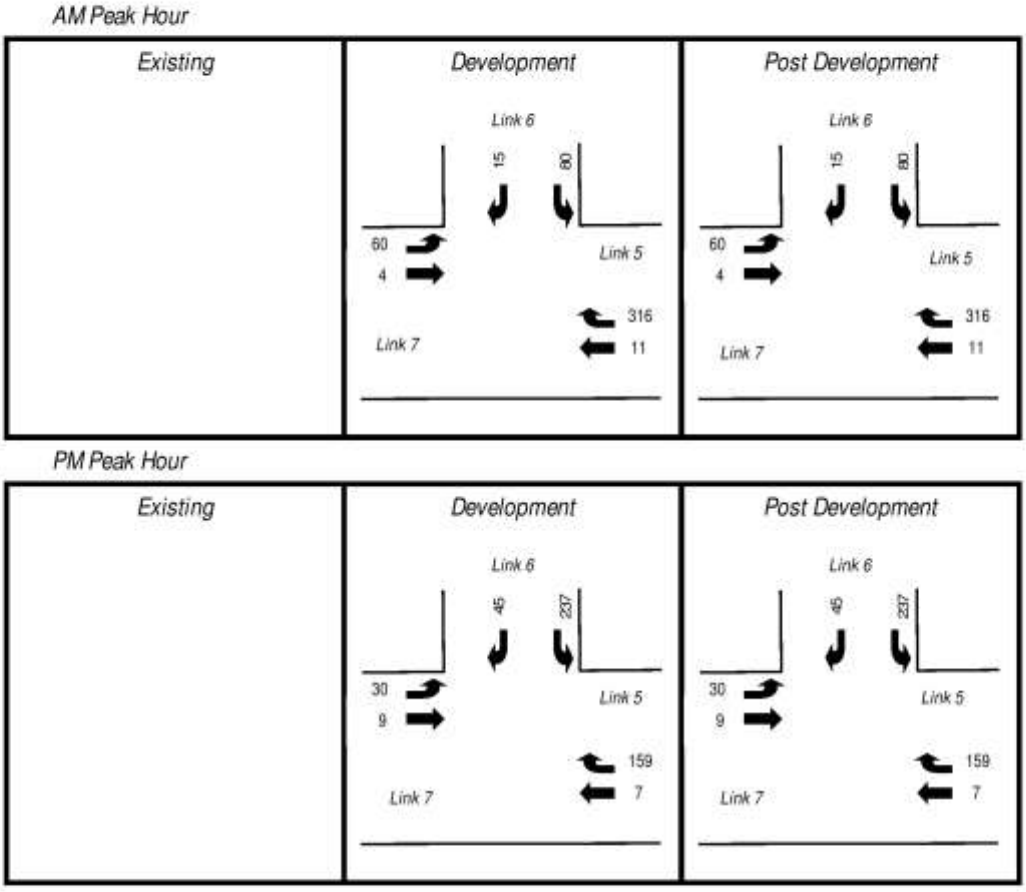


Figure 21: Traffic Volumes - Link 7/Link 6/Link 5 (Intersection #13) (Option 1 - Sea Lake-Swan Hill Road Link)

4.2. INTERSECTION REQUIREMENTS (OPTION 1 - SEA LAKE-SWAN HILL ROAD LINK)

To determine the appropriate requirements for the critical intersections, two assessments were completed - SIDRA capacity analysis and, on Sea Lake-Swan Hill Road, an assessment against the relevant requirements of "Guide to Road Design Part 4A: Unsignalised and Signalised Intersections" (Austroads, 2009). The outputs from the capacity analyses are contained in the separate Appendices report.

In undertaking these analyses, the following parameters were adopted:

- T-intersection:
  - Right turn from major road: t_a = 4 sec t_f = 2 sec
  - Right turn from minor road: t_a = 5 sec t_f = 3 sec
  - Left turn from minor road: t_a = 5 sec t_f = 3 sec
- Roundabout:
  - As calculated by SIDRA

4.2.1. Dead Horse Lane/Link 4 (Intersection #1)

Capacity Analysis

The existing simple T-intersection is an appropriate treatment for this intersection. Due to the low volumes of traffic through the intersection, no capacity analysis has been undertaken.

Recommended Intersection Treatment

It is recommended that a simple T-intersection be provided at the Yana Street/Werril Street/Dead Horse Lane intersection.

4.2.2. Yana Street/Werril Street/Dead Horse Lane (Intersection #2)

Capacity Analysis

The existing simple T-intersection is an appropriate treatment for this intersection. Due to the low volumes of traffic through the intersection, no capacity analysis has been undertaken.

Recommended Intersection Treatment

It is recommended that the existing simple T-intersection continue to be provided at the Yana Street/Werril Street/Dead Horse Lane intersection.

4.2.3. Coronation Avenue/Wattie Street/Link 1 (Intersection #3)

Capacity Analysis

This intersection will become a cross road, so a roundabout has been nominated as the most appropriate treatment. The results of the analysis for this configuration are summarised in Table 2.

Table 2: Capacity Analysis - Coronation Avenue/Wattie Street/Link 1 (Intersection #3) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	N/A	N/A	N/A	0.14	6.4	5.3
	East	N/A	N/A	N/A	0.08	8.4	3.1
	North	N/A	N/A	N/A	0.19	6.7	7.7
	West	N/A	N/A	N/A	0.24	6.0	9.8
	All Veh	N/A	N/A	N/A	0.24	6.6	9.8
	LoS	N/A			A		
PM	South	N/A	N/A	N/A	0.08	6.8	2.8
	East	N/A	N/A	N/A	0.15	6.9	5.6
	North	N/A	N/A	N/A	0.24	7.2	10.0
	West	N/A	N/A	N/A	0.11	5.4	4.1
	All Veh	N/A	N/A	N/A	0.24	6.7	10.0
	LoS	N/A			A		

The analysis shows that under post-development traffic volumes, the intersection operates at a Level of Service A, with a low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches.

Recommended Intersection Treatment

It is recommended that a single lane roundabout be provided at the Coronation/Wattie Street/Link 1 intersection.

4.2.4. Yana Street/Link 2/Link 3 (Intersection #4)

Capacity Analysis

This intersection will become a cross road, so a roundabout has been nominated as the most appropriate treatment.

The results of the analysis for this configuration are summarised in Table 3.

Table 3: Capacity Analysis - Yana Street/Link 2/Link 3 (Intersection #4) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	N/A	N/A	N/A	0.15	5.6	5.7
	East	N/A	N/A	N/A	0.04	5.4	1.6
	North	N/A	N/A	N/A	0.12	7.6	4.7
	West	N/A	N/A	N/A	0.29	6.0	12.7
	All Veh	N/A	N/A	N/A	0.29	6.1	12.7
	LoS	N/A			A		
PM	South	N/A	N/A	N/A	0.12	6.2	4.5
	East	N/A	N/A	N/A	0.13	6.1	4.9
	North	N/A	N/A	N/A	0.22	8.2	9.2
	West	N/A	N/A	N/A	0.14	5.5	5.7
	All Veh	N/A	N/A	N/A	0.22	6.8	9.2
	LoS	N/A			A		

The analysis shows that under post-development traffic volumes, the intersection operates at a Level of Service A, with a low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches.

Recommended Intersection Treatment

It is recommended that a single lane roundabout be provided at the Yana Street/Link 2/Link 3 intersection. This should be provided when an intersection is first created (either as a T-intersection or as a cross road).

4.2.5. Gray Street/Yana Street (Intersection #5)

Capacity Analysis

The existing configuration of this intersection comprises a simple T-intersection with priority to Gray Street and separate left and right turn lanes in Yana Street.

The results of the analysis for this configuration are summarised in Table 4.

Table 4: Capacity Analysis - Gray Street/Yana Street - Existing Configuration (Intersection #5) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.57	13.2	25.1
	East	0.13	4.0	0.0	0.19	5.0	0.0
	West	0.16	4.9	6.5	0.24	5.5	10.7
	All Veh	0.16	6.2	6.5	0.57	8.9	25.1
PM	South	0.07	9.3	1.8	0.27	11.0	7.7
	East	0.08	4.6	0.0	0.17	5.6	0.0
	West	0.09	3.2	3.2	0.21	6.3	8.6
	All Veh	0.09	5.3	3.2	0.27	7.5	8.6

The analysis shows that under post-development traffic volumes, Gray Street operates with a very low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on both approaches. Yana Street will experience a reduction in Level of Service in both peak periods.

It is noted that the model produced for this study does not allow for any redistribution of traffic that might occur due to congestion and/or delays at a particular intersection. Both these factors mean that the predicted traffic volumes turning from Yana Street (and into Yana Street) may be overestimated which, in turn, means that the traffic impact may be overstated.

To assess upgrade options, three upgrades have been assessed - left and right turn lanes in Gray Street, a roundabout and traffic signals. The results of the analyses for these configurations are shown in Tables 5, 6 and 7.

Table 5: Capacity Analysis - Gray Street/Yana Street (Intersection #5)
Turn Lanes in Gray Street
(Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.54	12.7	24.0
	East	0.13	4.0	0.0	0.12	5.0	0.0
	West	0.16	4.9	6.5	0.14	4.5	4.4
	All Veh	0.16	6.2	6.5	0.54	8.3	24.0
PM	South	0.07	9.3	1.8	0.26	10.8	7.5
	East	0.08	4.6	0.0	0.12	5.6	0.0
	West	0.09	3.2	3.2	0.14	5.6	4.7
	All Veh	0.09	5.3	3.2	0.26	7.2	7.5

Table 6: Capacity Analysis - Gray Street/Yana Street (Intersection #5)
Roundabout
(Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.20	9.0	10.0
	East	0.13	4.0	0.0	0.28	5.9	14.7
	West	0.16	4.9	6.5	0.33	9.6	16.8
	All Veh	0.16	6.2	6.5	0.33	8.3	16.8
PM	South	0.07	9.3	1.8	0.11	9.1	4.8
	East	0.08	4.6	0.0	0.26	6.1	12.7
	West	0.09	3.2	3.2	0.25	9.4	11.6
	All Veh	0.09	5.3	3.2	0.26	8.1	12.7

Table 7: Capacity Analysis - Gray Street/Yana Street (Intersection #5) Traffic Signals (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.44	17.4	41.5
	East	0.13	4.0	0.0	0.20	8.7	17.1
	West	0.16	4.9	6.5	0.43	16.4	24.9
	All Veh	0.16	6.2	6.5	0.44	14.8	41.5
PM	South	0.07	9.3	1.8	0.31	20.4	23.7
	East	0.08	4.6	0.0	0.16	7.1	10.5
	West	0.09	3.2	3.2	0.36	12.9	22.5
	All Veh	0.09	5.3	3.2	0.36	13.2	23.7

It is noted that the SIDRA analysis did not take into account the "peaking effect" of the adjacent school during the AM period. In practice, more of the existing traffic will occur closer to 9:00am than be evenly spread over the hour. Similarly, more of the development traffic may occur away from the school peak to avoid the delays that it creates. Thus, the proposed development will have less of an impact at this intersection during the AM peak.

These analyses show that, compared to the existing configuration of the intersection, for post-development traffic volumes:

- Turn lanes in Gray Street have limited impact on delays and queues to traffic leaving Yana Street, and on the operation of Gray Street;
- A roundabout reduces delays and queues in Yana Street at the expense of increased queues in both directions along Gray Street; and
- Traffic signals, whilst operating at Level of Service B in both the AM and PM peaks, increase delays and queues for all movements.

Traffic Engineering Manual Volume 1 Traffic Management (VicRoads) provides guidelines for new traffic signals installations. A key consideration is traffic volumes. The manual states "Traffic signals may be considered subject to detailed analysis; when the major road carries at least 600 vehicles per hour (two way) and the minor road concurrently carries at least 200 vehicles per hour (one way) on one approach over any 4 hours of an average day." The predicted traffic volumes do not reach these values.

Pedestrian movements across the intersection would be enhanced by its signalisation. The manual states the following for pedestrian operated signals "Where the crossing is primarily intended for the use of school children, the device may be appropriate where for at least one hour of an average school day:

- The number of children (P) crossing the road within 20m of the proposed site exceeds 50 per hour; and
- The number of vehicles which children have to cross during that hour exceeds 500; and
- The product P x V exceeds:
  - 25,000 for primary school children, or
  - 34,000 for secondary school children."

It is unlikely that the existing pedestrian activity in the area would justify pedestrian operated signals (or signalisation of the intersection). The Swan Hill South West Development Precinct is unlikely to increase the number of pedestrian movements at this location.

Intersection signals are a costly measure (depending on services and the like, the cost could be in the order of $1m to $1.5m). Should they be considered for implementation as part of the Swan Hill South West Development Precinct, funding could include a contribution from Council to account for the traffic that currently uses the intersection.

It is noted that the east approach in Gray Street is sufficiently wide to enable through vehicles to pass left turning vehicles, and on the west approach there is scope to ban kerbside parking to allow through traffic to pass stationary right turning traffic.

Recommended Intersection Treatment

It is recommended that the existing configuration of the Gray Street/Yana Street intersection continue to be provided.

4.2.6. Gray Street/Internal Road (Intersection #6)

Capacity Analysis

The intersection was analysed as a simple T-intersection with priority to Gray Street and separate left and right turn lanes in the internal road.

The results of the analysis are summarised in Table 8.

Table 8: Capacity Analysis - Gray Street/Internal Road (Intersection #6) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	N/A	N/A	N/A	0.15	9..5	4.0
	East	N/A	N/A	N/A	0.05	2.8	0.0
	West	N/A	N/A	N/A	0.06	0.4	2.1
	All Veh	N/A	N/A	N/A	0.15	4.8	4.0
PM	South	N/A	N/A	N/A	0.08	9.5	1.9
	East	N/A	N/A	N/A	0.10	4.6	0.0
	West	N/A	N/A	N/A	0.03	0.7	1.3
	All Veh	N/A	N/A	N/A	0.10	4.9	1.9

The analysis shows that under post-development traffic volumes, Gray Street operates with a very low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on both approaches. The south approach (internal road) will operate at a Level of Service A, in both the AM and PM peaks.

Recommended Intersection Treatment

It is recommended that a simple T-intersection be provided at the Gray Street/Internal Road intersection with priority to Gray Street and separate left and right turn lanes in the internal road. A left turn lane should be provided in Gray Street, due to the relatively large volume of left turning traffic.

4.2.7. Gray Street/Feldtmann Lane (Intersection #7)

Capacity Analysis

The predicted volume of right turning traffic from Gray Street is high. This intersection has therefore been modelled with a separate right turn lane in Grey Street and separate left and right turn lanes in Feldtmann Lane.

The results of the analysis are summarised in Table 9.

Table 9: Capacity Analysis - Gray Street/Feldtmann Lane (Intersection #7) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.00	8.7	0.0	0.38	8.7	13.7
	East	0.03	0.3	0.0	0.04	1.4	0.0
	West	0.03	0.3	0.0	0.07	5.4	2.2
	All Veh	0.03	0.6	0.0	0.38	5.2	13.7
PM	South	0.00	8.6	0.1	0.19	8.7	5.5
	East	0.03	0.3	0.0	0.05	3.0	0.0
	West	0.02	0.4	0.0	0.20	7.7	7.3
	All Veh	0.03	0.7	0.0	0.20	7.4	7.3

The analysis shows that under post-development traffic volumes, the intersection operates with a very low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches.

Recommended Intersection Treatment

It is recommended that a simple T-intersection continue to be provided at the Gray Street/Feldtmann Lane intersection. A separate right turn facility should be provided in Gray Street and separate left and right turn lanes in Feldtmann Lane. A left turn lane in Gray Street is not warranted on the basis of the predicted left turn volumes.

4.2.8. Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8)

Capacity Analysis

This existing cross road intersection is currently controlled by a single lane roundabout.

The results of the analysis for this configuration are summarised in Table 10.

Table 10: Capacity Analysis - Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.04	7.8	1.3	0.39	12.1	18.6
	East	0.05	8.1	1.6	0.24	8.0	10.7
	North	0.10	5.6	3.3	0.17	9.9	7.9
	West	0.07	5.9	2.3	0.35	8.5	17.2
	All Veh	0.10	6.5	3.3	0.39	9.9	18.6
	LoS	A			A		
PM	South	0.04	7.4	1.3	0.30	14.1	13.8
	East	0.08	8.5	2.6	0.59	8.0	43.3
	North	0.04	5.3	1.4	0.31	7.3	14.3
	West	0.03	6.1	0.9	0.20	8.8	9.0
	All Veh	0.08	7.2	2.6	0.59	8.9	43.3
	LoS	A			A		

The analysis shows that under existing and post-development traffic volumes, the intersection operates at a Level of Service A, with low degrees of saturation in both the AM and PM peak periods and minimal delays and minimal queues on all approaches.

Recommended Intersection Treatment

It is recommended that the intersection remain under roundabout control. No upgrades are required from a capacity perspective.

"Trigger Point" for Upgrade

As no upgrades are required from a capacity perspective, there is no "trigger point".

4.2.9. Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9)

Capacity Analysis

This cross road intersection carries relatively low volumes on the side roads, including very low volumes of crossing traffic. The intersection has therefore been analysed under yield conditions for the side road traffic, with no left or right turn lanes in Sea Lake-Swan Hill Road.

The results of the analysis are summarised in Table 11.

Table 11: Capacity Analysis - Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.01	8.4	0.1	0.07	8.5	0.2
	East	0.03	1.7	1.0	0.04	1.3	1.4
	North	0.02	8.5	0.4	0.02	8.6	0.4
	West	0.05	0.5	1.9	0.06	0.6	2.2
	All Veh	0.05	1.8	1.9	0.06	1.7	2.2
PM	South	0.01	8.2	0.1	0.01	8.4	0.2
	East	0.04	1.8	1.3	0.04	1.5	1.6
	North	0.01	8.3	0.2	0.01	8.4	0.2
	West	0.02	1.0	0.8	0.03	0.9	1.1
	All Veh	0.04	2.4	1.3	0.04	2.1	1.6

The analysis shows that under existing and post-development traffic volumes, the intersection operates with a very low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches. The impact of the additional traffic on the operation of the intersection is negligible.

Austroads

"Guide to Road Design Part 4A: Unsignalised and Signalised Intersections" (Austroads, 2009) provides guidance on the form of intersection treatment for various situations. Of relevance here is Figure 4.9(b), which provides numerical warrants for turn treatments on the major road with a design speed of less than 100km/h (for the purposes of this assessment, it is assumed that the speed limit on Sea Lake-Swan Hill Road is 80 km/h).

The predicted volumes of left and right turning traffic into Dead Horse Lane from Sea Lake-Swan Hill Road are 2 or 3 vph. These volumes are within the range whereby basic right turn (BAR) and basic left turn (BAL) treatments are required, ie the warrants for a higher standard of treatment (CHR(S) or AUL(S)) are not met.

Recommended Intersection Treatment

It is recommended that the intersection remain in its current form.

"Trigger Point" for Upgrade

As no upgrades are required from a capacity perspective, there is no "trigger point".

4.2.10. Sea Lake-Swan Hill Road/Link 7(1) (Intersection #10)

Capacity Analysis

On the basis of predicted traffic volumes, this new intersection was analysed as a T-intersection with a left turn lane in Sea Lake-Swan Hill Road and separate left and right turn lanes in Link 7 (the new intersecting road).

The results of the analysis are summarised in Table 12.

Table 12: Capacity Analysis - Sea Lake-Swan Hill Road/Link 7(1) (Intersection #10) (Option 1 - Sea Lake-Swan Hill Road Link)

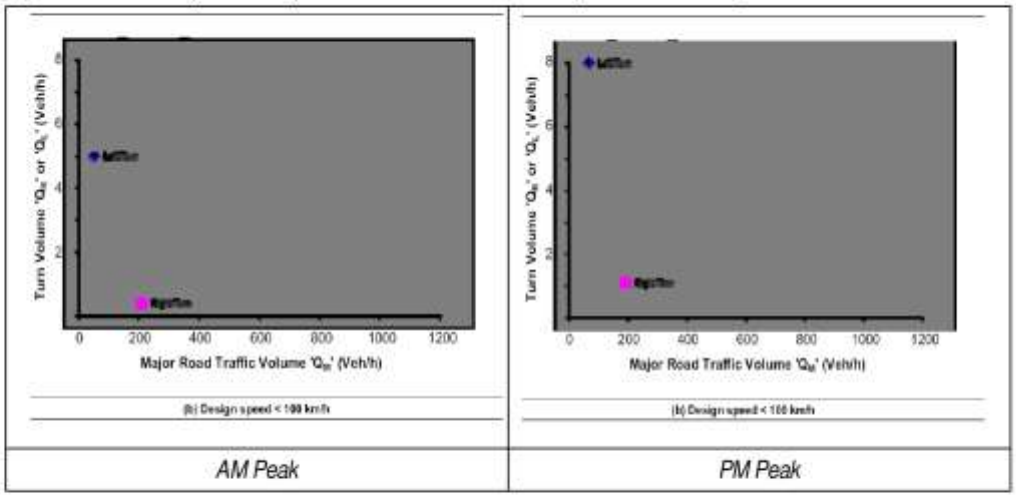
Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	N/A	N/A	N/A	0.22	9.5	6.8
	East	N/A	N/A	N/A	0.03	4.1	0.0
	West	N/A	N/A	N/A	0.06	0.6	2.3
	All Veh	N/A	N/A	N/A	0.22	5.9	6.8
PM	South	N/A	N/A	N/A	0.11	9.4	3.1
	East	N/A	N/A	N/A	0.09	5.7	0.0
	West	N/A	N/A	N/A	0.03	2.3	1.2
	All Veh	N/A	N/A	N/A	0.11	6.2	3.1

The analysis shows that under post-development traffic volumes, the intersection operates with a very low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches.

Austroads

"Guide to Road Design Part 4A: Unsignalised and Signalised Intersections" (Austroads, 2009) provides guidance on the form of intersection treatment for various situations. Of relevance here is Figure 4.9(b), which provides numerical warrants for turn treatments on the major road with a design speed of less than 100km/h (for the purposes of this assessment, it is assumed that the speed limit on Sea Lake-Swan Hill Road is 80 km/h).

Figure 22 shows the post development assessments for the AM peak and the PM peak.



AM Peak | PM Peak

Figure 22: Turn Lane Warrant Assessment - Sea Lake-Swan Hill Road/ Link 7(1) (Intersection #10) (Option 1 - Sea Lake-Swan Hill Road Link)

It is noted that the modelled left turn volume in the PM peak for the post development scenario is greater than 80 vph, the maximum value on the chart. The model developed for this study assumes that parcels of land ("zones") within the Development Precinct have one access point to the road network, ie there is no movement through zones to travel to and from the precinct. A consequence of this is that the volume of traffic moving between the east and south legs of this intersection may be overestimated.

The high volume of left turning traffic from Sea Lake-Swan Hill Road supports the provision of an AUL (auxiliary left turn) treatment on the east approach.

Recommended Intersection Treatment

On this basis, it is recommended that BAR (basic right turn) and AUL (auxiliary left turn) treatments be provided on the west and east approaches respectively. Given the relatively high volume of right turning traffic compared to left turning traffic in Link 7, separate left and right turn lanes should be provided in Link 7 at this intersection.

"Trigger Point" for Upgrade

The need for the AUL treatment in Sea Lake-Swan Hill Road is linked to the volume of left turning traffic. Initially, a BAL (basic left turn) treatment may only be necessary, with an upgrade to an AUL treatment when traffic volumes warrant it. In terms of a "trigger point" for its provision, guidance is provided by Austroads Figure 4.9(b). A PM peak hour volume of 60 vph turning left would be appropriate, equivalent to approximately 130 residential lots each using this intersection in that period.

It may be that it is more convenient to initially construct this intersection with the AUL treatment.

4.2.11. Link 5/Link 3/Link 4 (Intersection #12)

Capacity Analysis

This internal intersection has been analysed for two layouts - a simple T-intersection and a roundabout.

The results of the analysis for a T-intersection are summarised in Table 13.

Table 13: Capacity Analysis - Link 5/Link 3/Link 4 - T-Intersection (Intersection #12) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	N/A	N/A	N/A	0.26	3.3	11.7
	East	N/A	N/A	N/A	0.02	8.9	0.7
	North	N/A	N/A	N/A	0.05	2.2	0.0
	All Veh	N/A	N/A	N/A	0.26	3.6	11.7
PM	South	N/A	N/A	N/A	0.14	3.9	5.7
	East	N/A	N/A	N/A	0.08	9.1	2.3
	North	N/A	N/A	N/A	0.12	0.6	0.0
	All Veh	N/A	N/A	N/A	0.14	3.8	5.7

The results of the analysis for a roundabout are summarised in Table 14.

Table 14: Capacity Analysis - Link 5/Link 3/Link 4 - Roundabout (Intersection #12) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	N/A	N/A	N/A	0.25	6.7	12.4
	East	N/A	N/A	N/A	0.03	6.9	1.4
	North	N/A	N/A	N/A	0.07	5.3	2.9
	All Veh	N/A	N/A	N/A	0.25	3.6	12.4
PM	South	N/A	N/A	N/A	0.13	6.8	6.2
	East	N/A	N/A	N/A	0.11	7.3	4.4
	North	N/A	N/A	N/A	0.16	4.8	6.7
	All Veh	N/A	N/A	N/A	0.16	6.1	6.7

The analysis shows that for both layout options, the intersection operates with low degrees of saturation and minimal delays and queues. Link4-Link5 is a relatively long length of road. A roundabout is therefore preferred at this location from a speed management perspective.

Recommended Intersection Treatment

It is recommended that a single lane roundabout be provided at the Link 5/Link3/Link 4 intersection.

4.2.12. Link 5/Link 6/Link 7 (Intersection #13)

Capacity Analysis

This internal intersection has been analysed as a simple T-intersection with separate left and right turn lanes on the north (Link 6) approach). The results are summarised in Table 15.

Table 15: Capacity Analysis - Link 5/Link 6/Link 7 (Intersection #13) (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	East	N/A	N/A	N/A	0.20	8.3	7.5
	North	N/A	N/A	N/A	0.05	8.5	1.5
	West	N/A	N/A	N/A	0.04	7.7	0.0
	All Veh	N/A	N/A	N/A	0.20	8.2	7.5
PM	East	N/A	N/A	N/A	0.10	8.1	3.4
	North	N/A	N/A	N/A	0.15	8.4	4.9
	West	N/A	N/A	N/A	0.02	6.3	0.0
	All Veh	N/A	N/A	N/A	0.15	8.1	4.9

The analysis shows that that the intersection will operate at a low degree of saturation, with minimal queues and delays.

Whilst not analysed, a roundabout would also operate at a low degree of saturation, with minimal queues and delays. A roundabout provides better speed control than a T-intersection and is therefore recommended for this location.

Recommended Intersection Treatment

It is recommended that a single lane roundabout be provided at the Link 5/Link 6/Link 7 intersection.

4.3. Relative Traffic Volumes Contributions by Individual Land Holdings (Option 1 - Sea Lake-Swan Hill Road Link)

Traffix Group was requested by Council to identify the relative traffic volumes from each land holding that travels through nominated intersections and along nominated roads.

The various land holdings (as provided by Council) are shown in Figure 23.

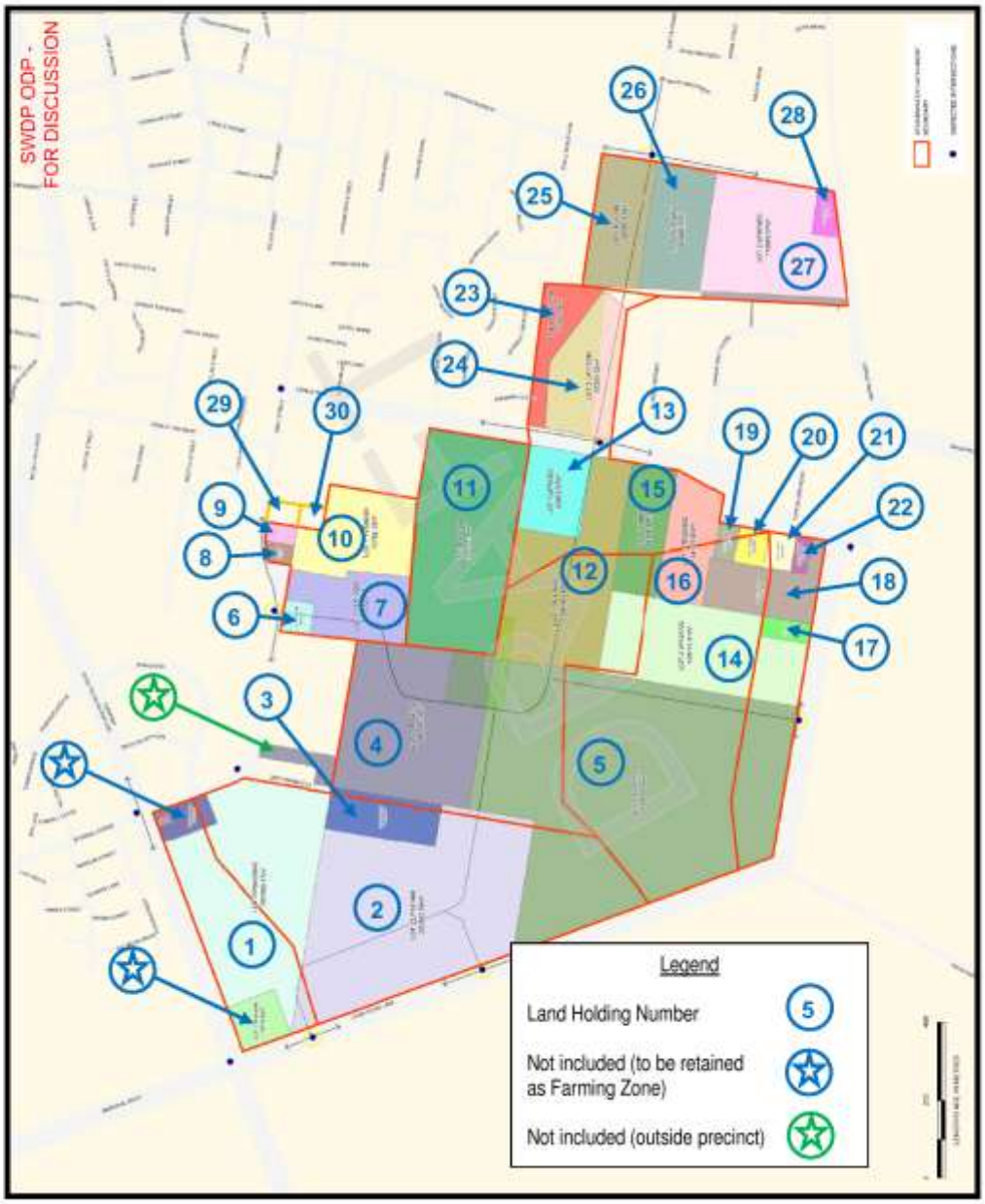


Figure 23: Precinct Land Holdings

4.3.1. Nominated Intersections (Option 1 - Sea Lake-Swan Hill Road Link)

The apportionment of traffic, calculated by determining the proportion of traffic generated by each zone in the traffic model that was attributable to each land holding, is shown in Table 16 for the nominated intersections.

Table 16: Apportionment of Traffic - Intersections (Option 1 - Sea Lake-Swan Hill Road Link)

Landowner Number	Proportion of Traffic Through Intersection Attributable to Landowner						
	Int #3	Int #4	Int #6	Int #7	Int #10	Int #12	Int #13
1	0.41%	0.33%	2.11%	4.47%	65.60%	0.00%	0.44%
2	0.00%	0.00%	9.65%	10.22%	27.32%	0.00%	14.73%
3	0.06%	0.05%	2.73%	5.41%	1.19%	0.00%	0.69%
4	4.40%	4.35%	7.34%	21.63%	0.56%	5.10%	12.84%
5	17.13%	27.61%	0.00%	50.36%	1.89%	86.19%	61.04%
6	0.00%	0.00%	4.24%	0.02%	0.04%	0.00%	0.00%
7	0.00%	0.00%	29.69%	0.12%	0.26%	0.00%	0.00%
8	0.00%	0.00%	2.12%	0.01%	0.02%	0.00%	0.00%
9	0.00%	0.00%	2.54%	0.01%	0.02%	0.00%	0.00%
10	0.00%	0.00%	34.78%	0.15%	0.30%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	10.45%	22.10%	0.00%	0.00%	0.56%	0.22%	0.31%
13	1.87%	1.56%	0.12%	0.05%	0.20%	0.05%	0.05%
14	4.81%	13.97%	0.00%	7.23%	0.52%	7.59%	8.64%
15	0.04%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%
16	2.08%	8.67%	0.00%	0.00%	0.22%	0.11%	0.12%
17	0.21%	0.60%	0.00%	0.31%	0.02%	0.33%	0.37%
18	1.29%	7.30%	0.00%	0.00%	0.00%	0.00%	0.00%
19	1.94%	9.37%	0.00%	0.00%	0.21%	0.00%	0.12%
20	0.23%	1.02%	0.00%	0.00%	0.03%	0.00%	0.01%
21	0.37%	1.60%	0.00%	0.00%	0.04%	0.02%	0.02%
22	0.13%	0.75%	0.00%	0.00%	0.00%	0.00%	0.00%
23	7.36%	0.06%	0.00%	0.00%	0.15%	0.07%	0.08%
24	3.31%	0.15%	0.00%	0.00%	0.21%	0.10%	0.05%
25	10.95%	0.09%	0.00%	0.00%	0.26%	0.00%	0.09%
26	10.16%	0.09%	0.00%	0.00%	0.21%	0.00%	0.12%
27	21.95%	0.19%	0.00%	0.00%	0.12%	0.22%	0.25%

28	0.83%	0.01%	0.00%	0.00%	0.01%	0.01%	0.01%
29	0.00%	0.00%	2.54%	0.01%	0.02%	0.00%	0.00%
30	0.00%	0.00%	2.12%	0.01%	0.02%	0.00%	0.00%

4.3.2. Nominated Internal Roads (Option 1 - Sea Lake-Swan Hill Road Link)

The roads nominated by Council for assessment are shown in Figure 24.

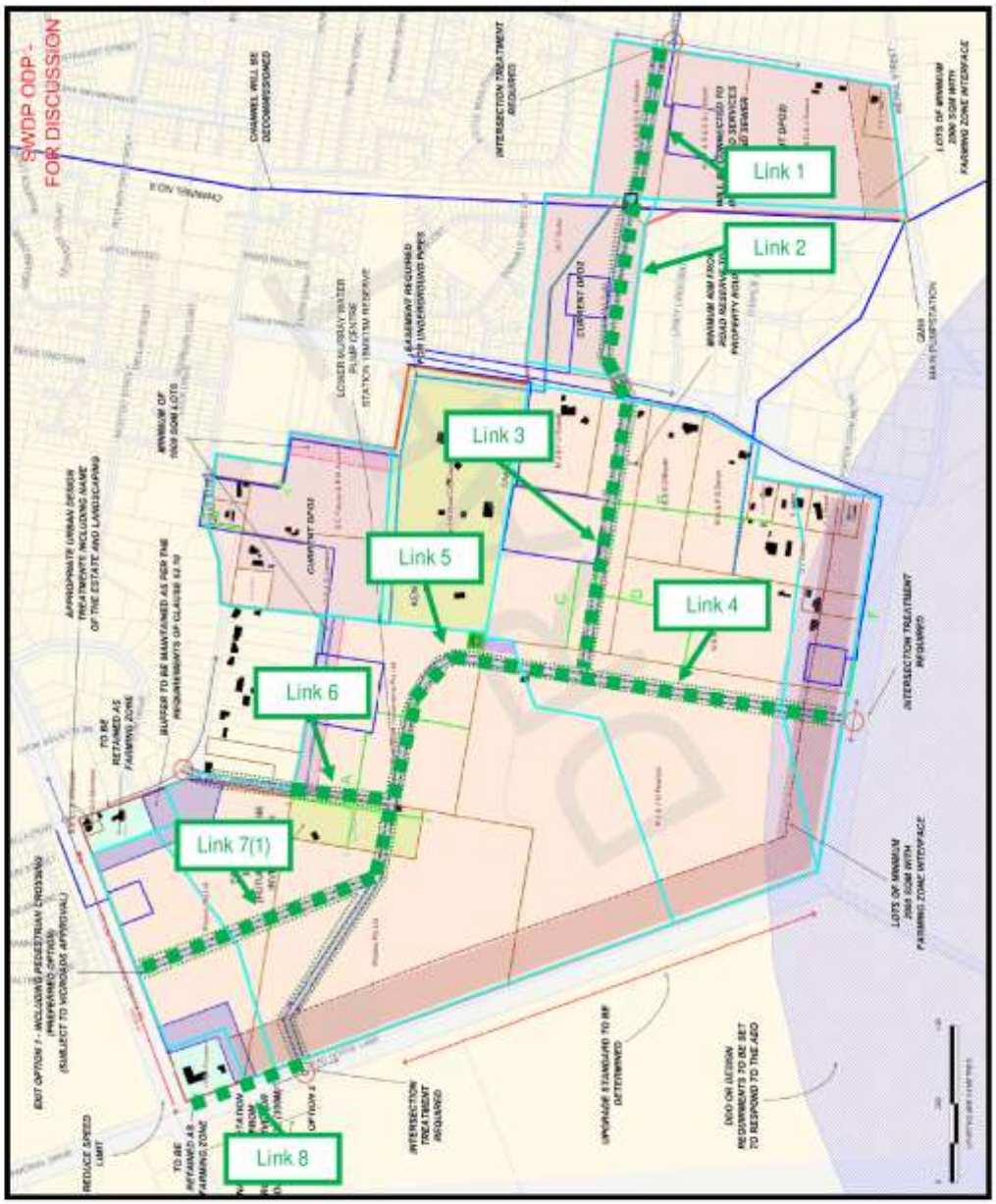


Figure 24: Nominated Internal Roads

The apportionment of traffic, calculated by determining the proportion of traffic generated by each zone in the traffic model that was attributable to each land holding, is shown in Table 17 for the nominated road links.

Table 17: Apportionment of Traffic - Road Links (Option 1 - Sea Lake-Swan Hill Road Link)

Landowner Number	Proportion of Traffic Along Link Attributable to Landowner							
	Link 1	Link 2	Link 3	Link 4	Link 5	Link 6	Link 7(1)	Link 8
1	0.61%	0.88%	0.33%	0.00%	0.27%	0.14%	49.98%	0.00%
2	0.00%	0.00%	0.00%	0.00%	0.00%	6.50%	40.72%	0.00%
3	0.09%	0.12%	0.05%	0.00%	0.04%	3.34%	1.76%	0.00%
4	6.53%	9.38%	8.49%	0.00%	11.51%	19.51%	0.59%	0.00%
5	25.26%	35.83%	53.87%	91.60%	75.74%	61.33%	2.84%	0.00%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
9	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	15.51%	22.26%	21.74%	0.00%	0.35%	0.03%	0.85%	0.00%
13	2.78%	3.99%	0.08%	0.00%	0.07%	0.01%	0.15%	0.00%
14	7.14%	10.25%	13.71%	8.05%	10.66%	8.68%	0.78%	0.00%
15	0.05%	0.08%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
16	3.09%	4.44%	0.18%	0.00%	0.15%	0.01%	0.33%	0.00%
17	0.31%	0.44%	0.59%	0.34%	0.46%	0.37%	0.03%	0.00%
18	1.92%	2.75%	0.00%	0.00%	0.00%	0.00%	0.00%	90.63%
19	2.88%	6.61%	0.09%	0.00%	0.07%	0.01%	0.32%	0.00%
20	0.35%	0.50%	0.01%	0.00%	0.01%	0.00%	0.04%	0.00%
21	0.55%	0.78%	0.03%	0.00%	0.03%	0.00%	0.06%	0.00%
22	0.20%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	9.38%
23	10.92%	0.17%	0.12%	0.00%	0.10%	0.01%	0.23%	0.00%
24	4.90%	0.25%	0.17%	0.00%	0.10%	0.01%	0.23%	0.00%
25	16.25%	0.25%	0.09%	0.00%	0.06%	0.01%	0.32%	0.00%

26	0.16%	0.23%	0.08%	0.00%	0.07%	0.01%	0.31%	0.00%
27	0.34%	0.49%	0.37%	0.00%	0.31%	0.03%	0.43%	0.00%
28	0.18%	0.02%	0.01%	0.00%	0.01%	0.00%	0.02%	0.00%
29	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

5. OPTION 2 - DEAD HORSE LANE LINK

5.1. DESIGN TRAFFIC VOLUMES (OPTION 2 - DEAD HORSE LANE LINK)

Figure 25 identifies the intersection and road numbers used in this report for Option 2.

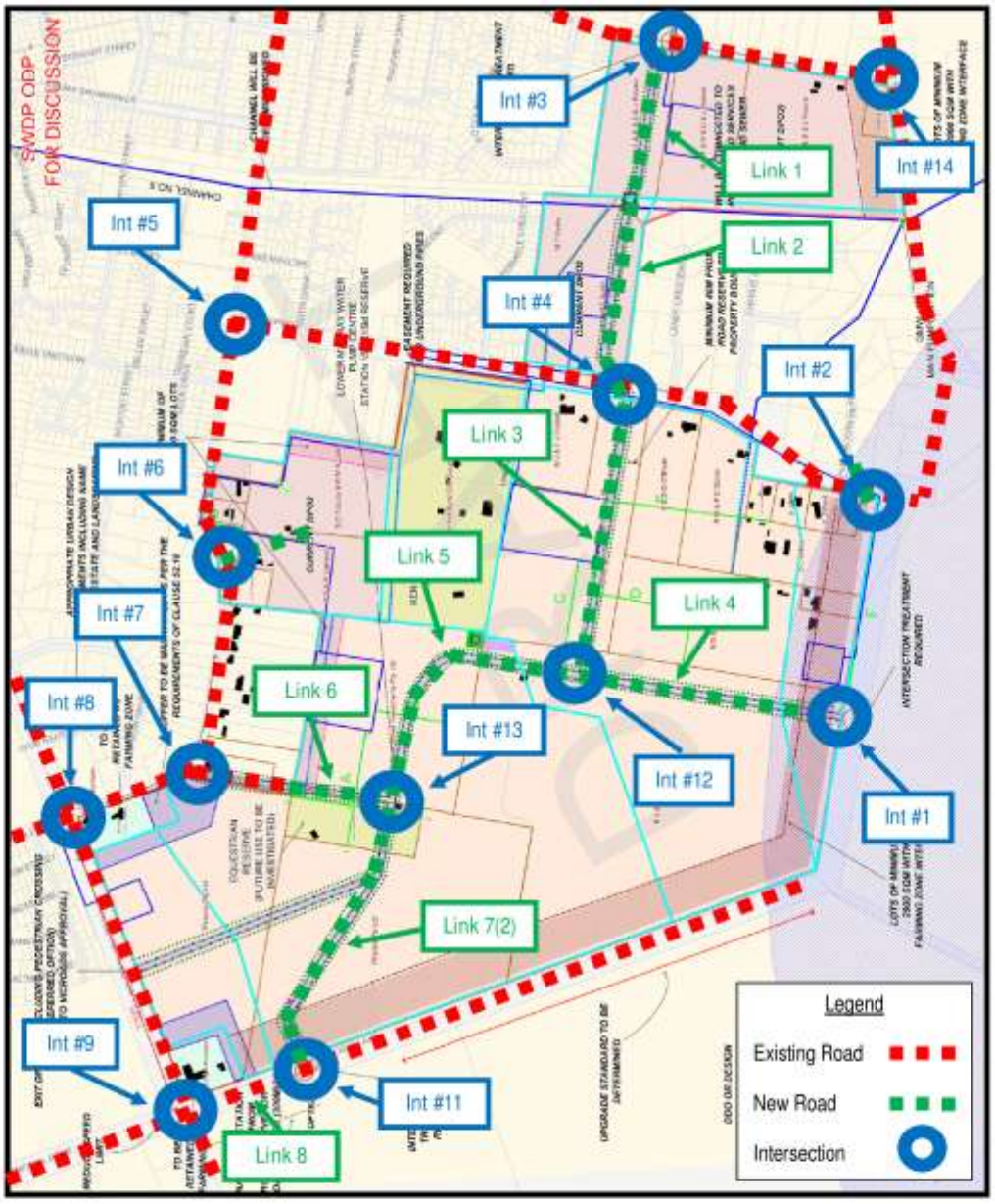


Figure 25: Intersection and Road Identification (Option 2 - Dead Horse Lane Link)

The predicted precinct daily traffic volumes arising from the traffic model for Option 2 - Dead Horse Lane Link are shown in Figure 26.

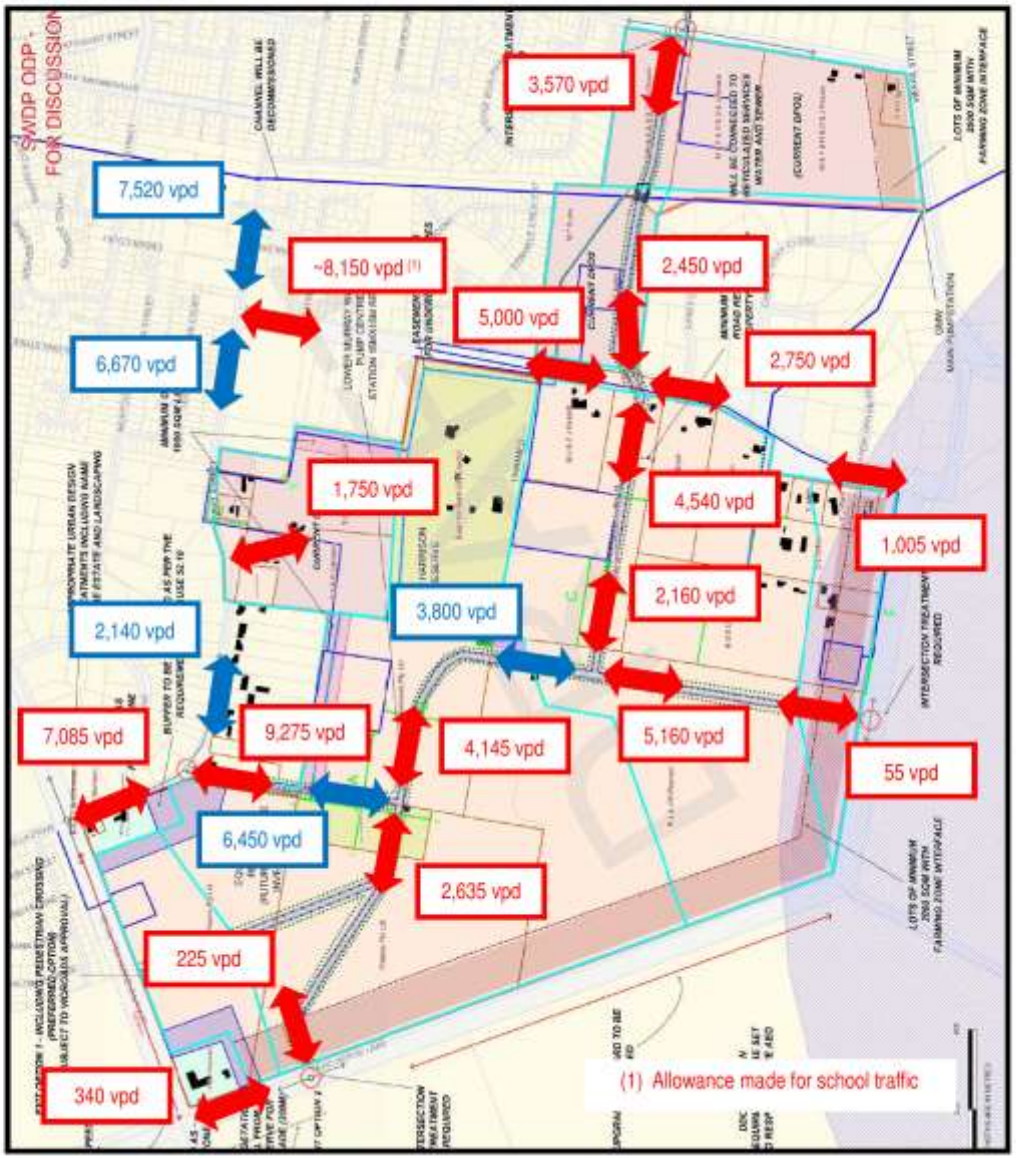
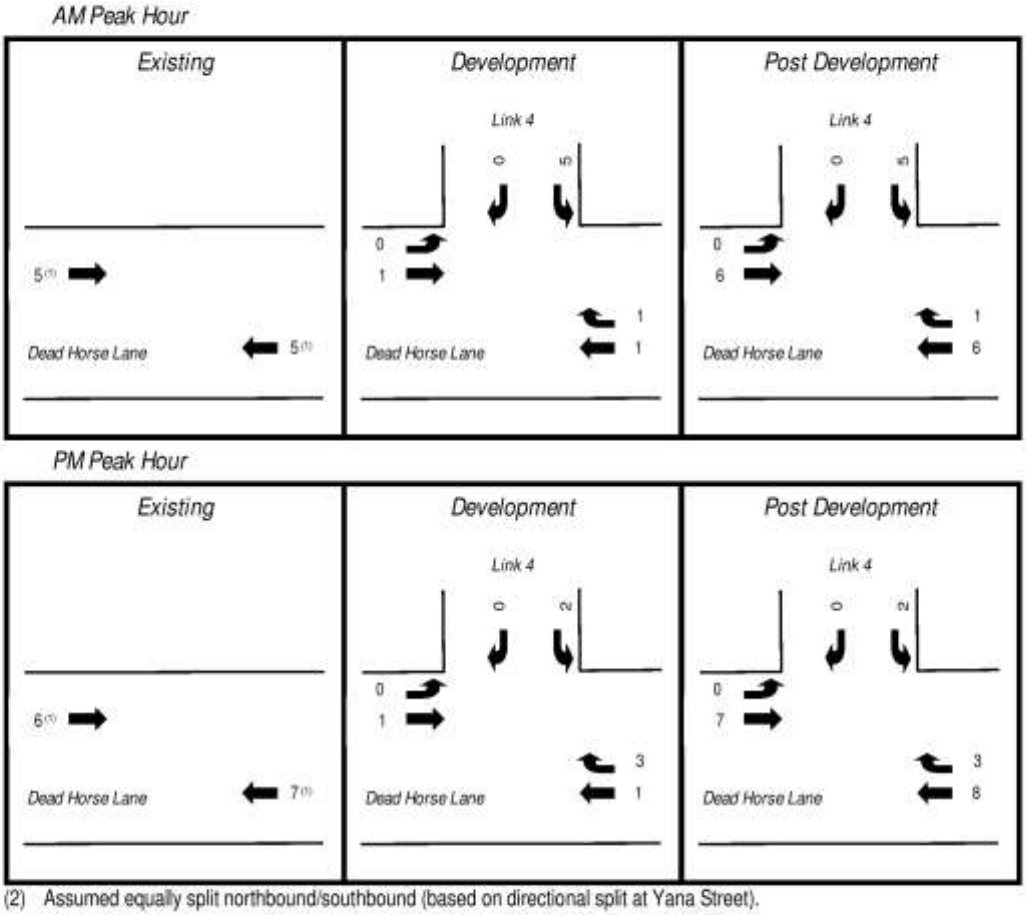


Figure 26: Predicted Precinct Daily Traffic Volumes (Option 2 - Dead Horse Lane Link)

Figures 27 to 38 show existing volumes and the total post-development volumes (including growth of traffic along Sea Lake-Swan Hill Road, as required by VicRoads) for Option 2 - Dead Horse Lane Link.



(2) Assumed equally split northbound/southbound (based on directional split at Yana Street).

Figure 27: Traffic Volumes - Dead Horse Lane/Link 4 (Intersection #1) (Option 2 - Dead Horse Lane Link)

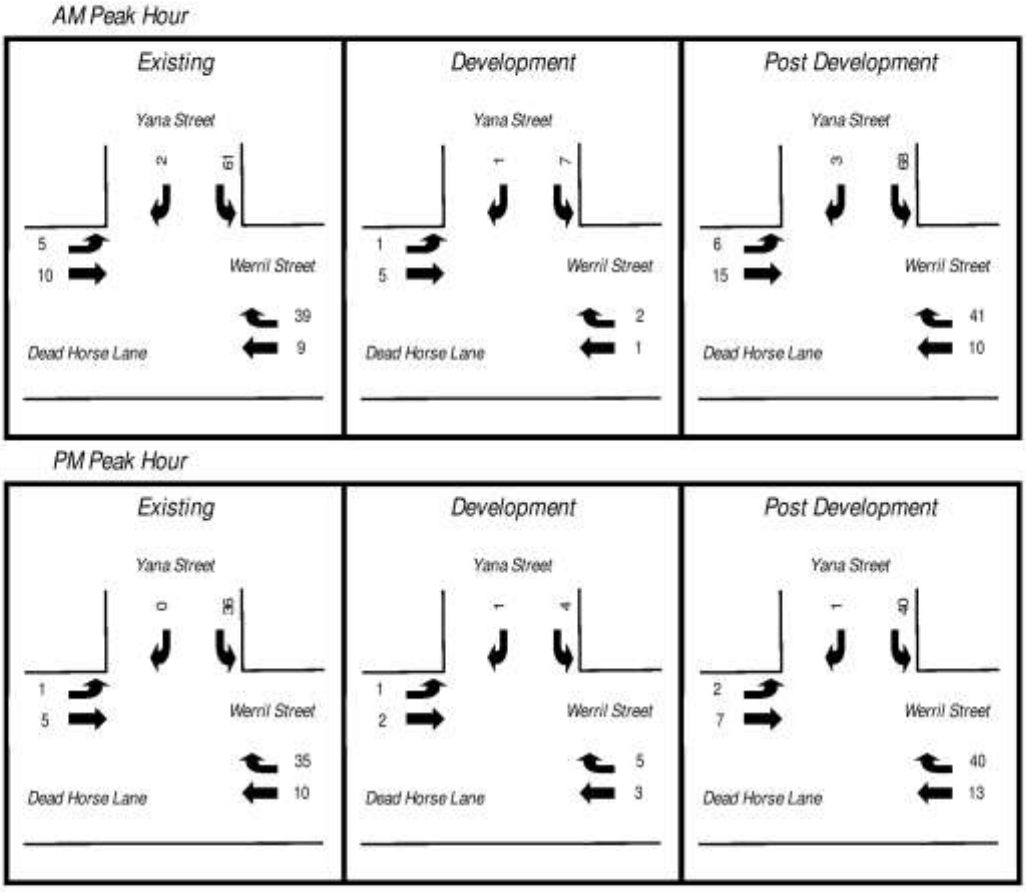


Figure 28: Traffic Volumes - Yana Street/ Werril Street/Dead Horse Lane (Intersection #2) (Option 2 - Dead Horse Lane Link)

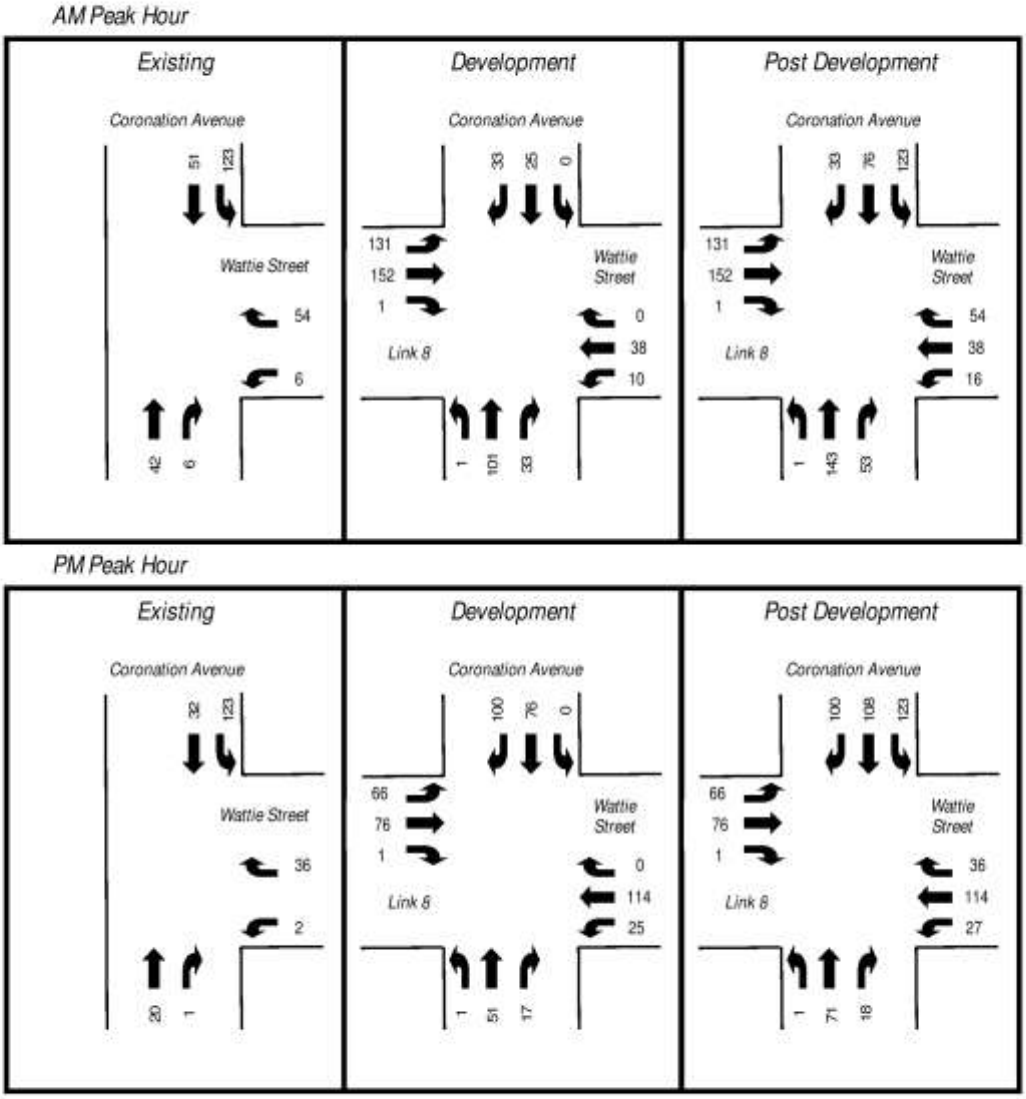
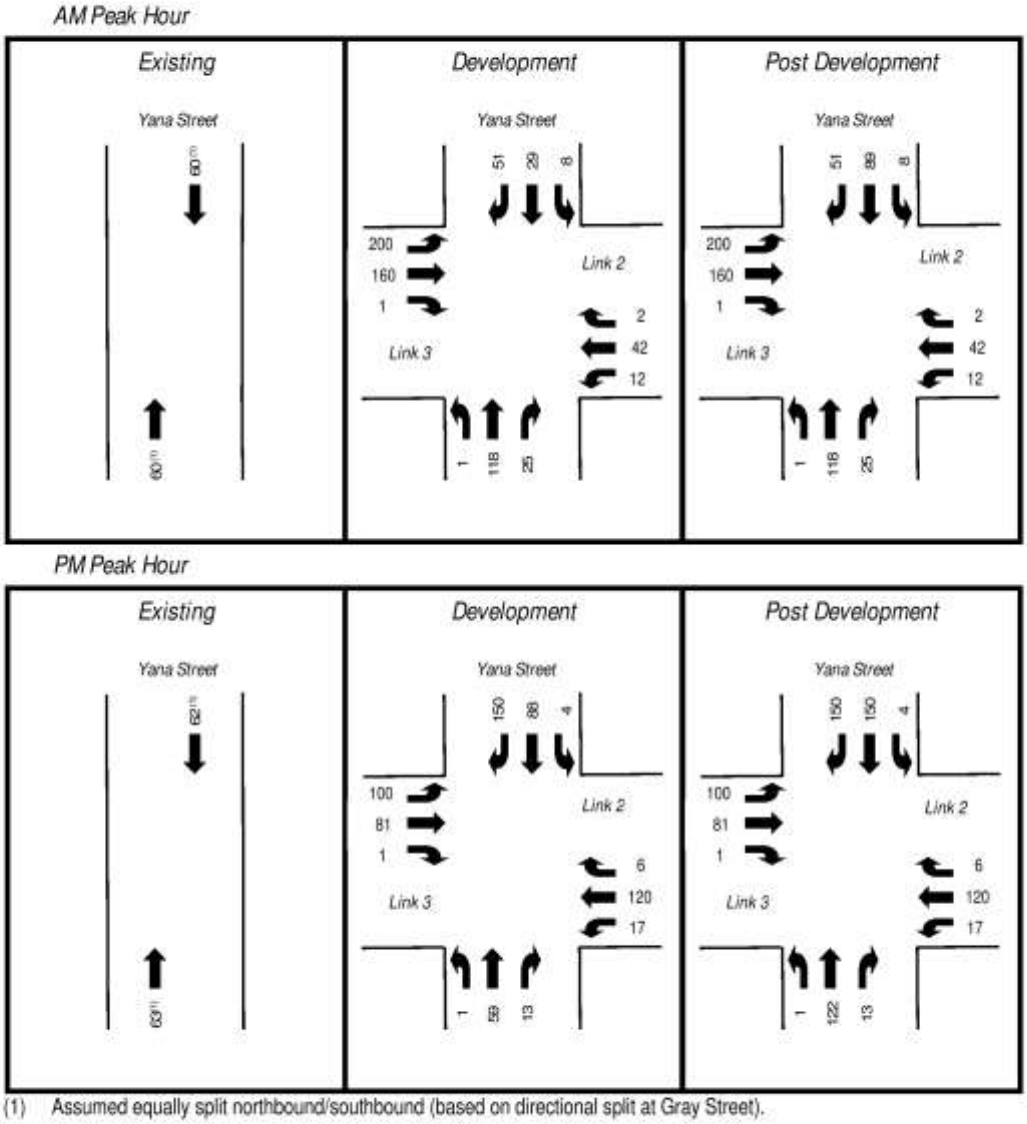


Figure 29: Traffic Volumes - Coronation Avenue/Wattie Street/Link 1 (Intersection #3) (Option 2 - Dead Horse Lane Link)



(1) Assumed equally split northbound/southbound (based on directional split at Gray Street).

Figure 30: Traffic Volumes - Yana Street/Link 2/Link 3 (Intersection #4) (Option 2 - Dead Horse Lane Link)

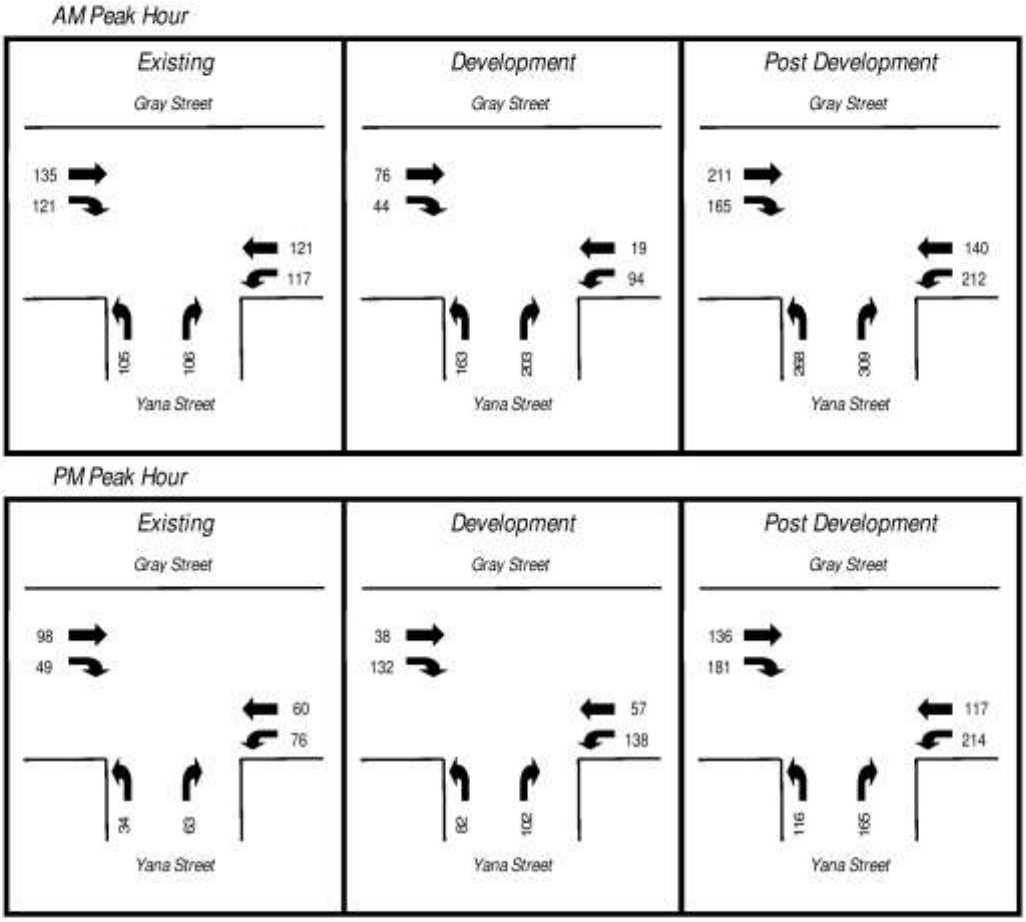
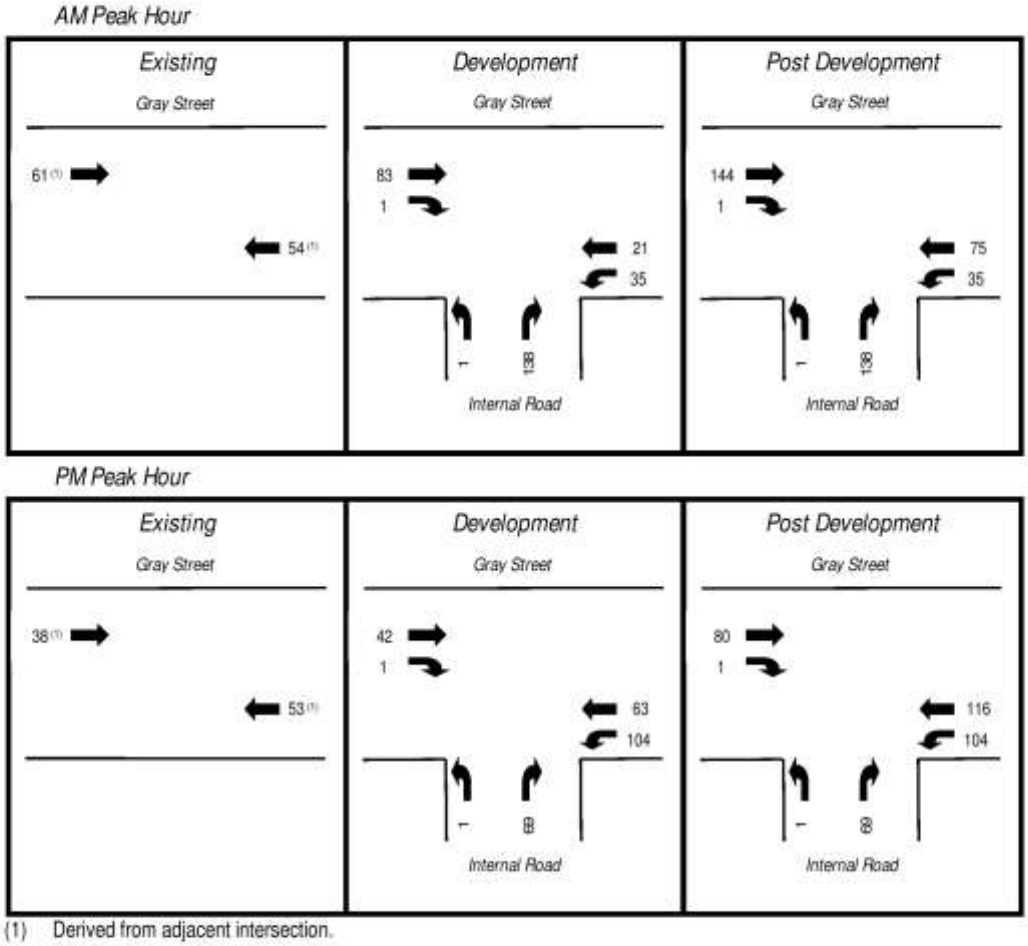
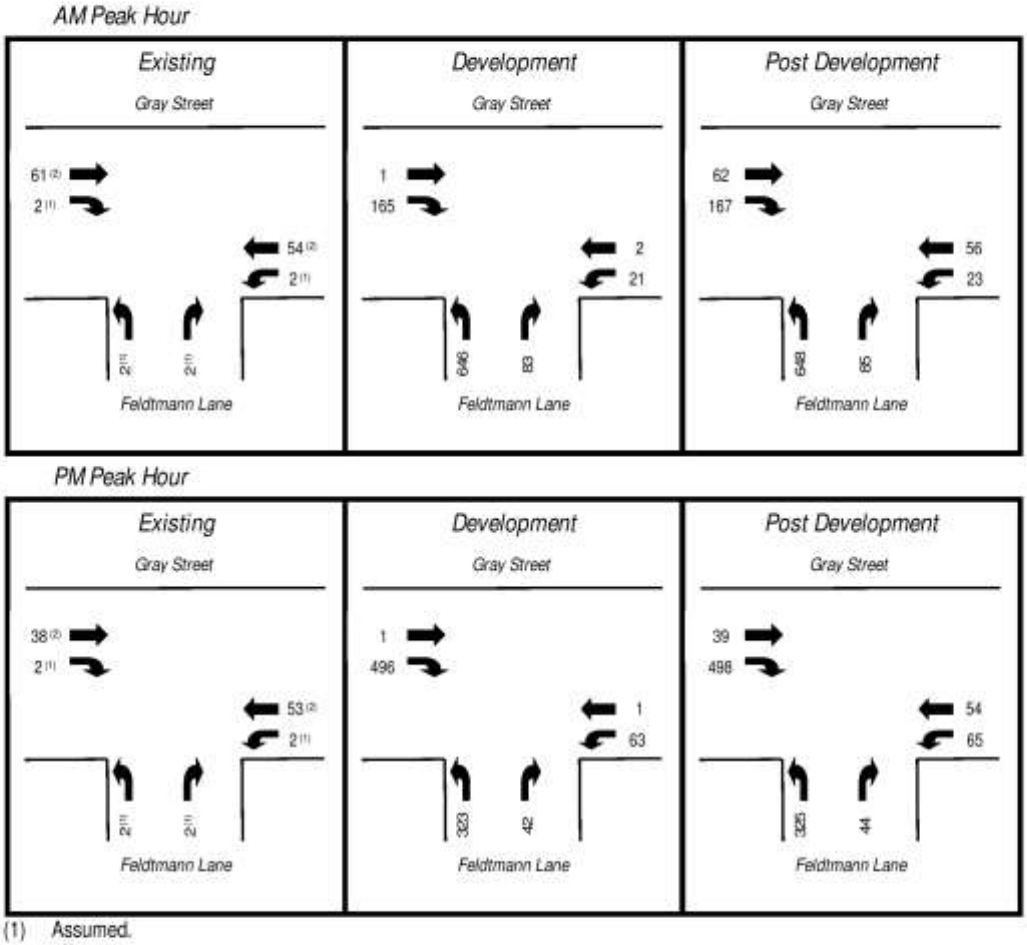


Figure 31: Traffic Volumes - Grey Street/Yana Street (Intersection #5) (Option 2 - Dead Horse Lane Link)



(1) Derived from adjacent intersection.

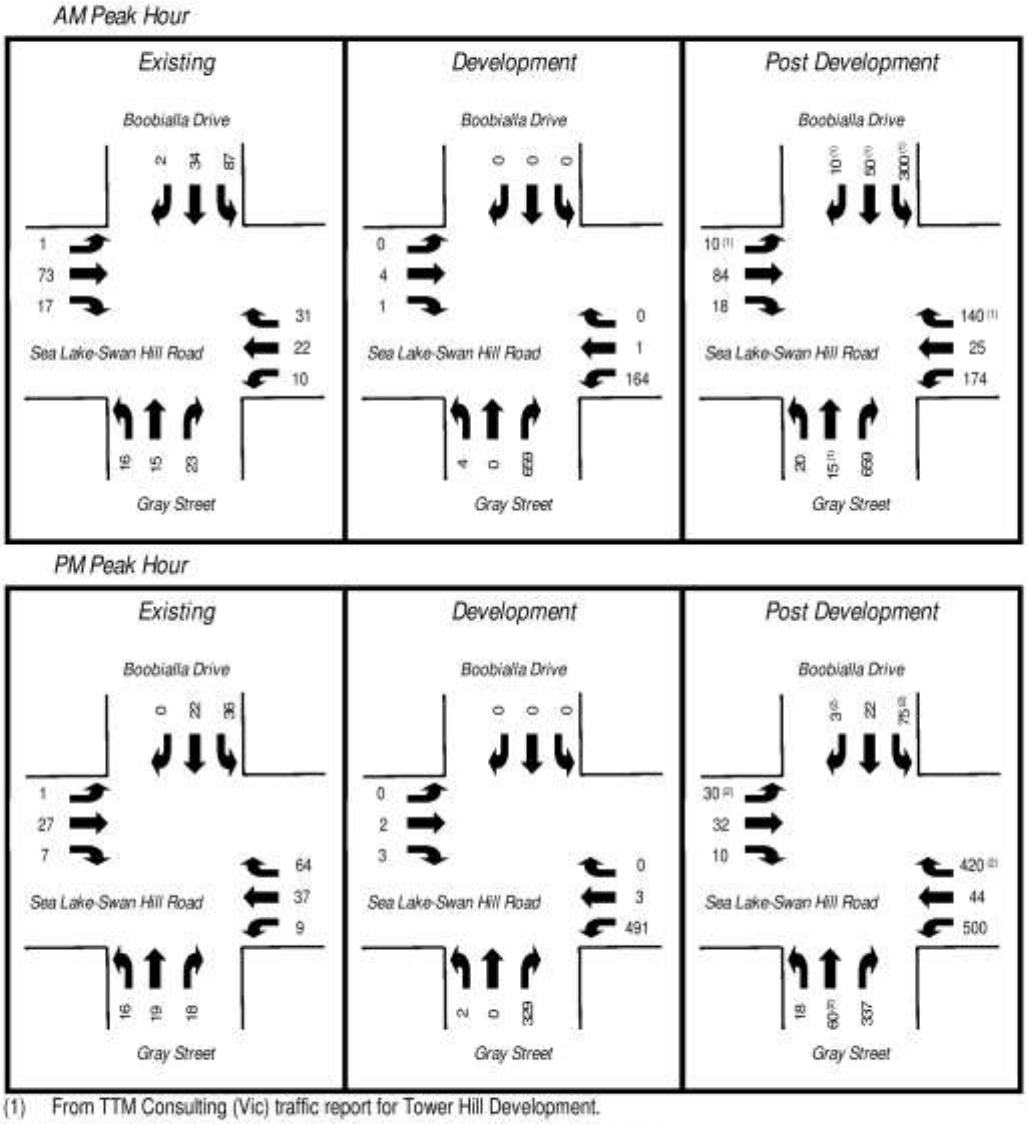
Figure 32: Traffic Volumes - Gray Street/Internal Road (Intersection #6) (Option 2 - Dead Horse Lane Link)



(1) Assumed.

(2) Derived from adjacent intersection.

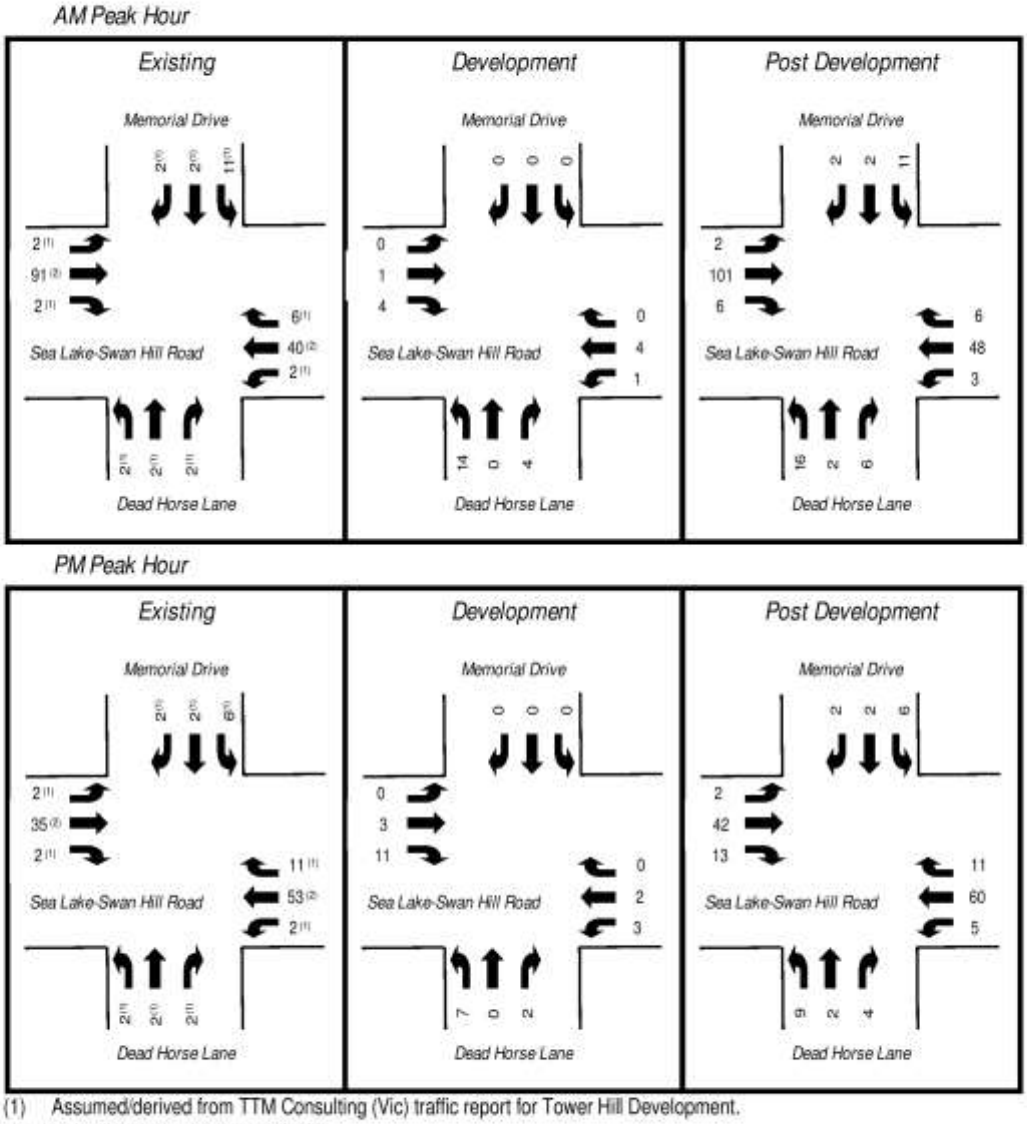
Figure 33: Traffic Volumes - Gray Street/Feldtmann Lane (Link 6) (Intersection #7) (Option 2 - Dead Horse Lane Link)



(1) From TTM Consulting (Vic) traffic report for Tower Hill Development.

(2) Derived from TTM Consulting (Vic) traffic report for Tower Hill Development.

Figure 34: Traffic Volumes - Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8) (Option 2 - Dead Horse Lane Link)



(1) Assumed/derived from TTM Consulting (Vic) traffic report for Tower Hill Development.
(2) Derived from adjacent intersection.

Figure 35: Traffic Volumes - Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9) (Option 2 - Dead Horse Lane Link)

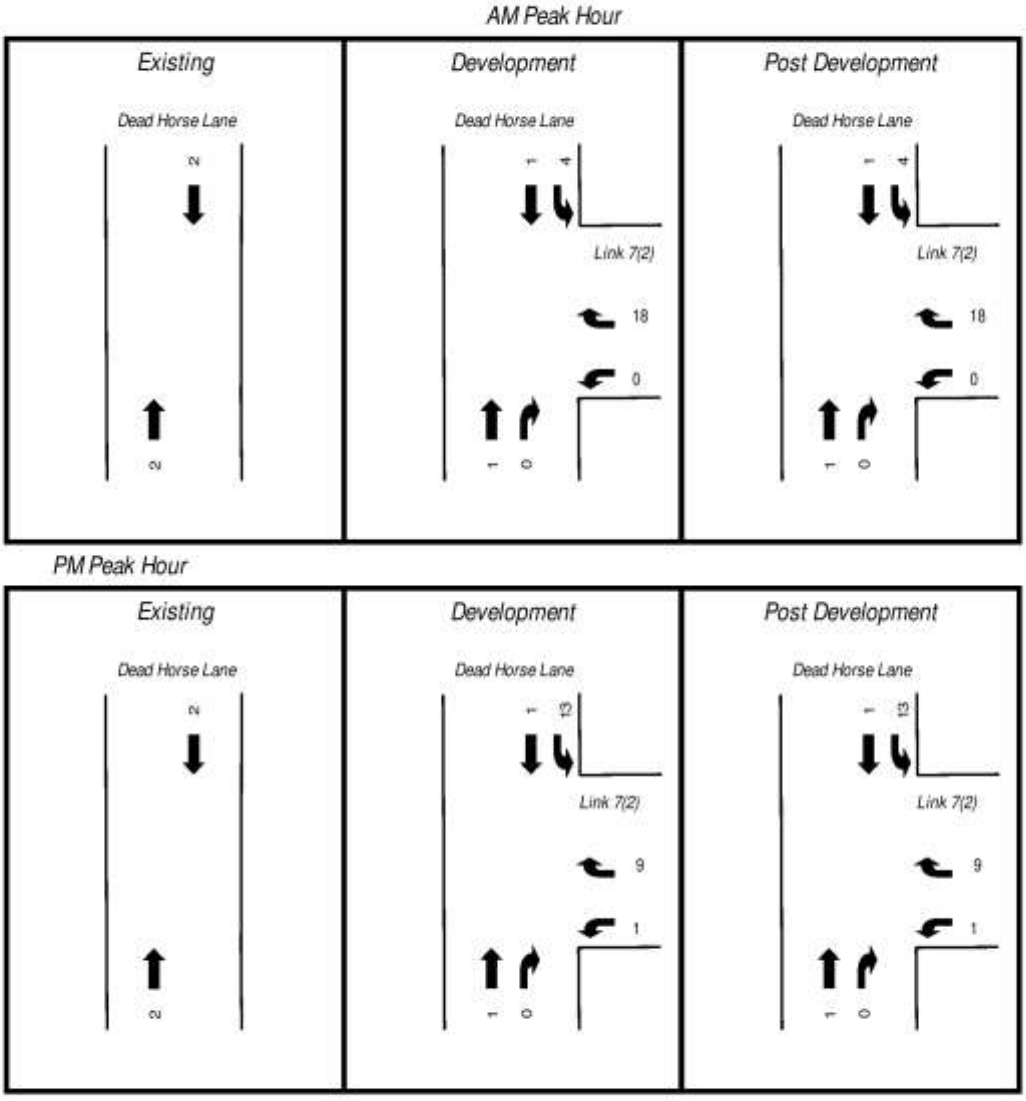


Figure 36: Traffic Volumes - Dead Horse Lane/Link 7(2) (Intersection #11) (Option 2 - Dead Horse Lane Link)

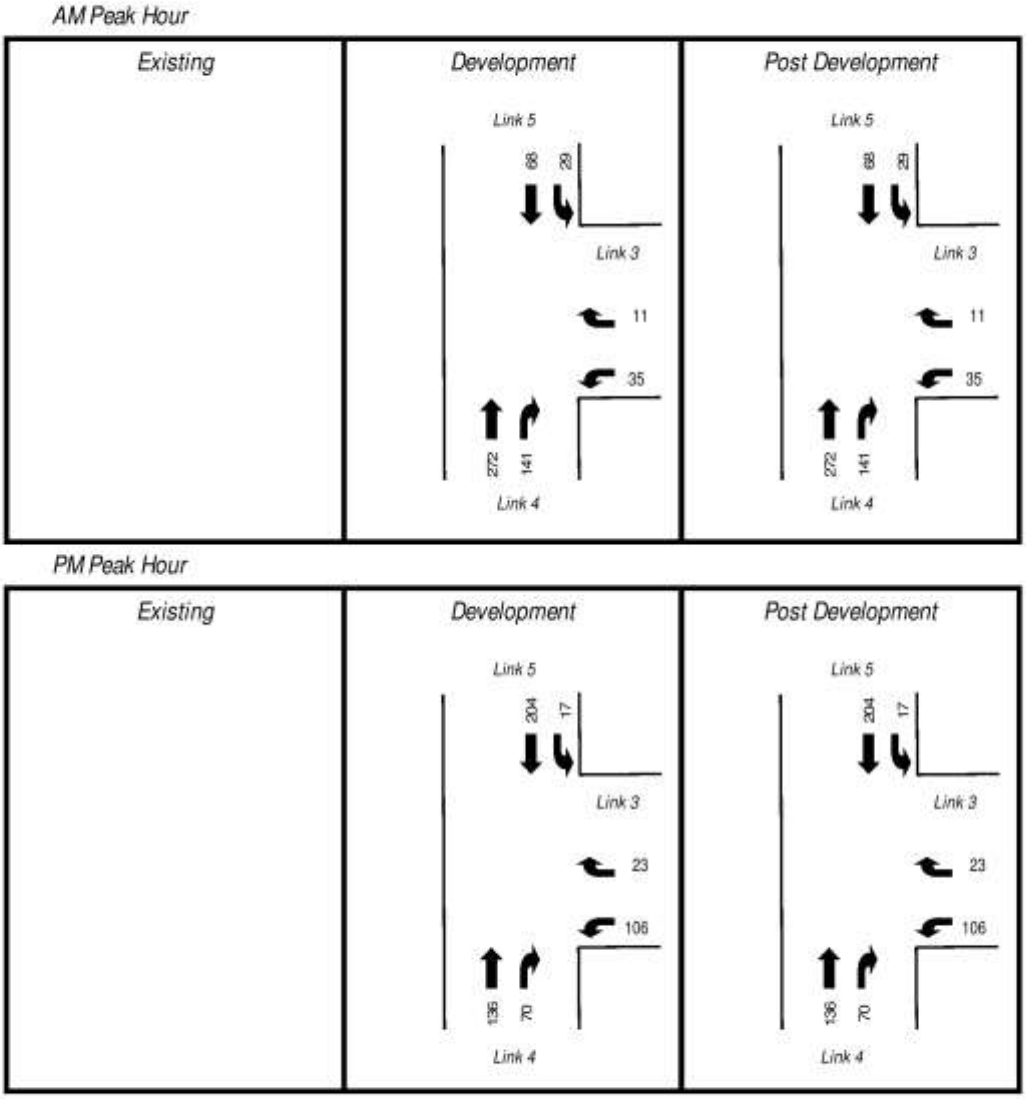


Figure 37: Traffic Volumes - Link 5/Link 3/Link 4 (Intersection #12) (Option 2 - Dead Horse Lane Link)

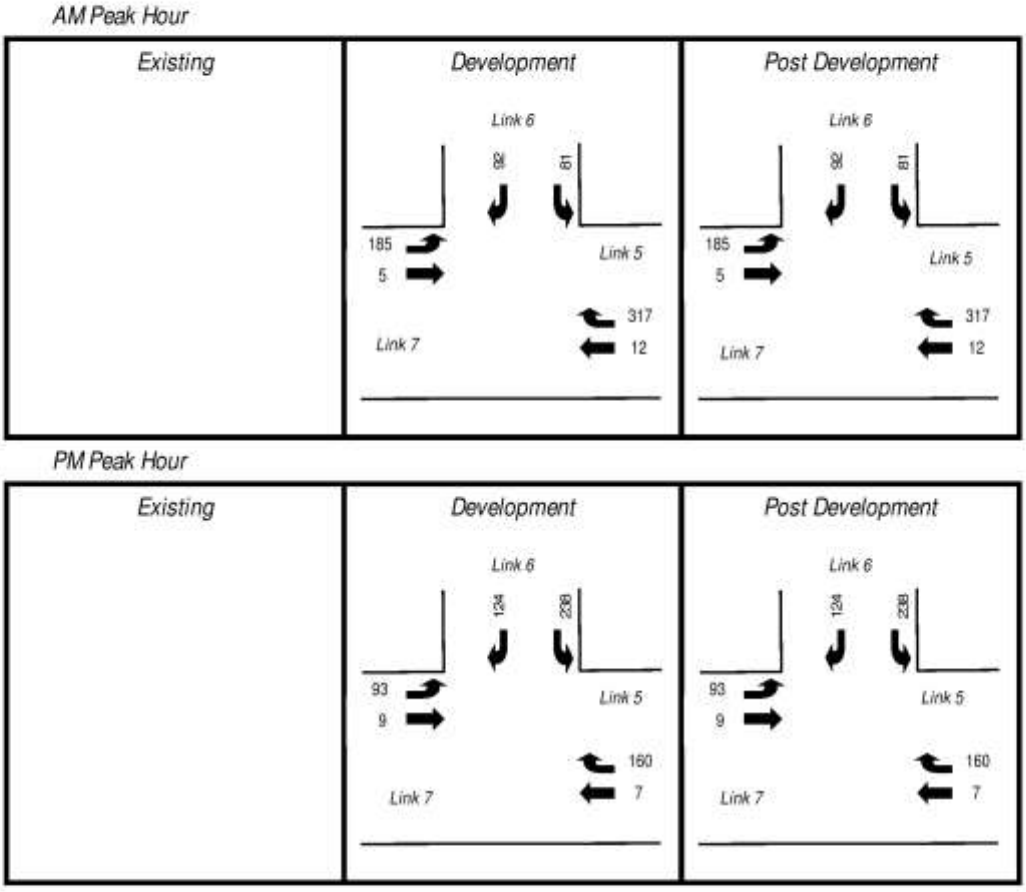


Figure 38: Traffic Volumes - Link 7/Link 6/Link 5 (Intersection #13) (Option 2 - Dead Horse Lane Link)

5.2. INTERSECTION REQUIREMENTS (OPTION 2 - DEAD HORSE LANE LINK)

A comparison of Figures 10 to 21 and Figures 26 to 37 shows that there is very little difference in the predicted traffic volumes for the majority of intersections and link roads. Intersections 7, 8, 9 and 11 and links 6 and 7 are affected by the replacement of a connection to Sea Lake-Swan Hill Road (Option 1) by a connection to Dead Horse Lane (Option 2). These intersections and links are therefore assessed as follows. The outputs of the capacity analyses are contained in the separate Appendices report.

5.2.1. Gray Street/Feldtmann Lane (Intersection #7)

Capacity Analysis

The volumes of traffic through this intersection are relatively low. The intersection was analysed as a simple T-intersection with priority to Gray Street and separate left and right turn lanes in Feldtmann Lane.

The results of the analysis are summarised in Table 18.

Table 18: Capacity Analysis - Grey Street/Feldtmann Lane (Intersection #7) (Option 2 - Dead Horse Lane Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.00	8.7	0.0	0.60	9.0	31.3
	East	0.03	0.3	0.0	0.04	2.4	0.0
	West	0.03	0.4	0.0	0.11	6.2	3.5
	All Veh	0.03	0.6	0.0	0.60	7.9	31.3
PM	South	0.00	8.6	0.0	0.30	9.1	9.9
	East	0.03	0.3	0.0	0.07	4.5	0.0
	West	0.02	0.6	0.0	0.33	8.2	13.3
	All Veh	0.03	0.7	0.0	0.33	8.1	13.3

The analysis shows that under existing and post-development traffic volumes, the intersection generally operates with low degrees of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches. The exception to this is Feldtmann Lane, where the degree of saturation is 0.60 and the 95th percentile queue is 31.3m in the AM peak. These compare to Option 1 values of 0.38 and 13.7m.

Removing the new access to Sea Lake-Swan Hill Road significantly increases the number of movements between the south and west legs. Whilst the intersection operates at an acceptable level, it nonetheless performs at a lower level than in Option 1.

Recommended Intersection Treatment

It is recommended that a simple T-intersection continue to be provided at the Gray Street/Feldtmann Lane intersection be provided with priority to Gray Street, a right turn facility in Gray Street (due to the large volume of right turning traffic) and separate left and right turn lanes in Feldtmann Lane.

5.2.2. Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8)

Capacity Analysis

This existing cross road intersection is currently controlled by a single lane roundabout.

The results of the analysis for this configuration are summarised in Table 19.

Table 19: Capacity Analysis - Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8) (Option 2 - Dead Horse Lane Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.04	7.8	1.3	0.52	12.2	29.5
	East	0.05	8.1	1.6	0.24	8.0	11.6
	North	0.10	5.6	3.3	0.49	12.4	30.2
	West	0.07	5.9	2.3	0.16	10.8	7.7
	All Veh	0.10	6.5	3.3	0.52	11.2	30.2
	LoS	A			A		
PM	South	0.04	7.4	1.3	0.42	12.9	20.3
	East	0.08	8.5	2.6	0.61	8.1	45.7
	North	0.04	5.3	1.4	0.10	7.0	4.0
	West	0.03	6.1	0.9	0.10	10.8	4.6
	All Veh	0.08	7.2	2.6	0.61	9.4	45.7
	LoS	A			A		

As with Option 1, the analysis shows that under existing and post-development traffic volumes, the intersection operates at a Level of Service A, with a low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches.

Removing the new access to Sea Lake-Swan Hill Road significantly increases the number of movements between the south and east legs. Whilst the intersection operates at an acceptable level, it nonetheless performs at a lower level than in Option 1.

Recommended Intersection Treatment

It is recommended that the intersection remain under roundabout control. No upgrades are required from a capacity perspective.

"Trigger Point" for Upgrade

As no upgrades are required from a capacity perspective, there is no "trigger point".

5.2.3. Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9)

Capacity Analysis

This cross road intersection carries relatively low volumes on the side roads, including very low volumes of crossing traffic. The intersection has therefore been analysed under yield conditions for the side road traffic, with no left or right turn lanes in Sea Lake-Swan Hill Road.

The results of the analysis are summarised in Table 20.

Table 20: Capacity Analysis - Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive (Intersection #9) (Option 2 - Dead Horse Lane Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.01	8.4	0.1	0.02	8.6	0.6
	East	0.03	1.7	1.0	0.03	1.6	1.2
	North	0.02	8.5	0.4	0.02	8.6	0.4
	West	0.05	0.5	1.9	0.06	0.8	2.2
	All Veh	0.05	1.8	1.9	0.06	2.5	2.2
PM	South	0.01	8.2	0.1	0.01	8.5	0.4
	East	0.04	1.8	1.3	0.04	1.9	1.5
	North	0.01	8.3	0.2	0.01	8.3	0.2
	West	0.02	1.0	0.8	0.03	2.4	1.1
	All Veh	0.04	2.4	1.3	0.04	3.1	1.5

As with Option 1, the analysis shows that under existing and post-development traffic volumes, the intersection operates with a very low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches. The impact of the additional traffic on the operation of the intersection is negligible.

Austroads

"Guide to Road Design Part 4A: Unsignalised and Signalised Intersections" (Austroads, 2009) provides guidance on the form of intersection treatment for various situations. Of relevance here is Figure 4.9(b), which provides numerical warrants for turn treatments on the major road with a design speed of less than 100km/h (for the purposes of this assessment, it is assumed that the speed limit on Sea Lake-Swan Hill Road has been reduced to 80 km/h).

Figure 39 compares the existing and post development assessment for the AM peak, and Figure 40 for the PM peak.

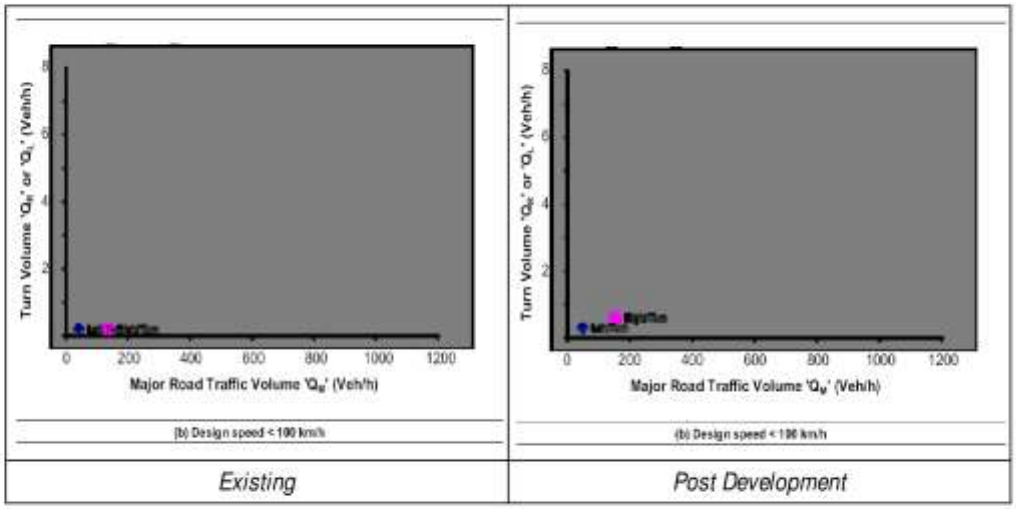


Figure 39: Turn Lane Warrant Assessment - Sea Lake-Swan Hill Road/ Dead Horse Lane/Memorial Drive (Intersection #9) - AM Peak (Option 2 - Dead Horse Lane Link)

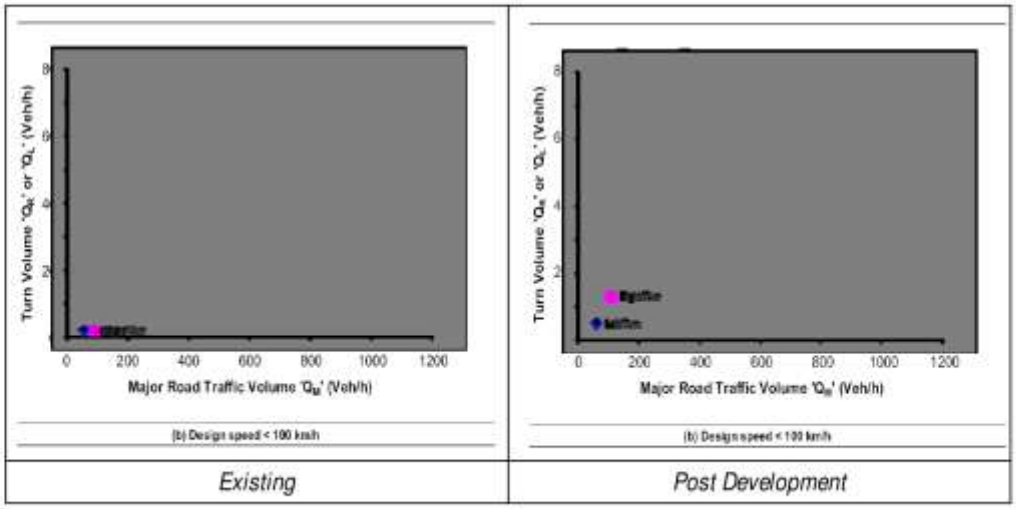


Figure 40: Turn Lane Warrant Assessment - Sea Lake-Swan Hill Road/ Dead Horse Lane/Memorial Drive (Intersection #9) - PM Peak (Option 2 - Dead Horse Lane Link)

Recommended Intersection Treatment

On this basis, it is recommended that BAR (basic right turn) and BAL (basic left turn) treatments be provided on the west and east approaches respectively. No particular treatment is required for the left and right turn lanes in Dead Horse Lane at this intersection.

"Trigger Point" for Upgrade

The existing volumes warrant the provision of BAR and BAL turn treatments, as do the post development volumes. There is therefore no "trigger point" for an upgrade of the right turn treatment as a result of the Swan Hill South West Development Precinct.

5.2.4. Dead Horse Lane/Link 7(2) (Intersection #11)

Capacity Analysis

Due to the low volumes of traffic through the intersection, a simple T-intersection is an appropriate treatment. No capacity analysis has been undertaken.

Recommended Intersection Treatment

It is recommended that a simple T-intersection be provided at the Dead Horse Lane/Link 7(2) intersection, with priority to Dead Horse Lane.

5.3. Relative Traffic Volumes Contributions by Individual Land Holdings (Option 2 - Dead Horse Lane Link)

5.3.1. Nominated Intersections (Option 2 - Dead Horse Lane Link)

The apportionment of traffic, calculated by determining the proportion of traffic generated by each zone in the traffic model that was attributable to each land holding, is shown in Table 21 for the nominated intersections.

Table 21: Apportionment of Traffic - Intersections (Option 2 - Dead Horse Lane Link)

Landowner Number	Proportion of Traffic Through Intersection Attributable to Landowner						
	Int #3	Int #4	Int #6	Int #7	Int #11	Int #12	Int #13
1	0.37%	0.30%	12.09%	19.77%	4.03%	0.35%	0.28%
2	0.52%	0.42%	16.85%	27.26%	31.67%	0.49%	39.15%
3	0.08%	0.06%	2.51%	4.07%	1.07%	0.02%	1.42%
4	4.38%	4.33%	5.89%	13.24%	4.50%	5.06%	9.02%
5	17.05%	27.49%	0.00%	30.82%	21.94%	85.45%	42.89%
6	0.00%	0.00%	3.40%	0.01%	0.00%	0.00%	0.00%
7	0.00%	0.00%	23.80%	0.08%	0.00%	0.00%	0.00%
8	0.00%	0.00%	1.70%	0.01%	0.00%	0.00%	0.00%
9	0.00%	0.00%	2.04%	0.01%	0.00%	0.00%	0.00%
10	0.00%	0.00%	27.88%	0.09%	0.00%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	10.40%	22.01%	0.00%	0.01%	6.25%	0.22%	0.22%
13	1.86%	1.55%	0.09%	0.03%	1.14%	0.05%	0.04%
14	4.79%	13.91%	0.00%	4.42%	6.00%	7.53%	6.07%
15	0.04%	0.15%	0.00%	0.00%	0.04%	0.00%	0.00%
16	2.07%	8.63%	0.00%	0.00%	2.53%	0.11%	0.09%

17	0.21%	0.60%	0.00%	0.19%	0.26%	0.32%	0.26%
18	1.29%	7.27%	0.00%	0.00%	2.49%	0.00%	0.00%
19	1.93%	9.34%	0.00%	0.00%	2.49%	0.00%	0.08%
20	0.23%	1.01%	0.00%	0.00%	0.30%	0.00%	0.01%
21	0.37%	1.59%	0.00%	0.00%	0.47%	0.02%	0.02%
22	0.13%	0.75%	0.00%	0.00%	0.26%	0.00%	0.00%
23	7.33%	0.06%	0.00%	0.00%	1.76%	0.07%	0.06%
24	3.29%	0.15%	0.00%	0.00%	2.44%	0.10%	0.04%
25	10.90%	0.09%	0.00%	0.00%	2.61%	0.00%	0.09%
26	10.11%	0.09%	0.00%	0.00%	2.40%	0.00%	0.08%
27	21.84%	0.19%	0.00%	0.00%	5.19%	0.22%	0.17%
28	0.83%	0.01%	0.00%	0.00%	0.17%	0.01%	0.01%
29	0.00%	0.00%	2.04%	0.01%	0.00%	0.00%	0.00%
30	0.00%	0.00%	1.70%	0.01%	0.00%	0.00%	0.00%

5.3.2. Nominated Internal Roads (Option 2 - Dead Horse Lane Link)

The apportionment of traffic, calculated by determining the proportion of traffic generated by each zone in the traffic model that was attributable to each land holding, is shown in Table 22 for the nominated road links.

Table 22: Apportionment of Traffic - Road Links (Option 2 - Dead Horse Lane Link)

Landowner Number	*Proportion of Traffic Along Link Attributable to Landowner*							
	Link 1	*Link 2*	*Link 3*	*Link 4*	*Link 5*	*Link 6*	*Link 7(2)*	*Link 8*
1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3	0.11%	0.16%	0.07%	0.00%	0.06%	2.82%	3.25%	1.09%
4	6.48%	9.28%	8.39%	0.00%	11.39%	12.98%	0.36%	4.57%
5	25.07%	35.45%	53.27%	91.60%	75.01%	40.81%	1.71%	22.28%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
9	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	15.39%	22.03%	21.50%	0.00%	0.34%	0.02%	0.52%	5.94%
13	2.76%	3.95%	0.08%	0.00%	0.07%	0.00%	0.09%	1.15%
14	7.09%	10.15%	13.56%	8.05%	10.55%	5.78%	0.48%	6.09%
15	0.05%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%
16	3.07%	4.39%	0.18%	0.00%	0.15%	0.01%	0.20%	2.57%
17	0.30%	0.43%	0.58%	0.34%	0.45%	0.25%	0.02%	0.26%
18	1.90%	2.72%	0.00%	0.00%	0.00%	0.00%	0.00%	1.51%
19	2.85%	6.54%	0.09%	0.00%	0.07%	0.01%	0.20%	2.52%
20	0.34%	0.49%	0.01%	0.00%	0.01%	0.00%	0.02%	0.30%
21	0.54%	0.77%	0.03%	0.00%	0.03%	0.00%	0.04%	0.48%
22	0.20%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%
23	10.84%	0.17%	0.12%	0.00%	0.10%	0.01%	0.14%	1.78%
24	4.87%	0.24%	0.16%	0.00%	0.10%	0.01%	0.09%	2.48%
25	16.13%	0.25%	0.09%	0.00%	0.08%	0.01%	0.21%	2.65%
26	0.16%	0.23%	0.08%	0.00%	0.07%	0.01%	0.19%	2.44%
27	0.34%	0.49%	0.36%	0.00%	0.30%	0.02%	0.41%	5.26%
28	0.18%	0.02%	0.01%	0.00%	0.01%	0.00%	0.01%	0.17%
29	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

5.4. OPTION 1 V OPTION 2

A key comparison task of the study was to compare the provision of a connection to Sea Lake-Swan Hill Road (Option 1) to the provision of a connection to Dead Horse Lane. A driver of this was VicRoads' preference to not provide a new intersection on Sea Lake-Swan Hill Road between the Gray Street/Boobialla Drive and Dead Horse Lane/Memorial Drive intersections to minimise congestion and to not compromise future traffic lane configurations.

To assist put this into perspective, the following are noted:

- The Gray Street/Boobialla Drive and Dead Horse Lane/Memorial Drive intersections are approximately 750m apart; and
- From Figure 4, the current daily two way traffic volume on Sea Lake-Swan Hill Road west of Gray Street/Boobialla Drive is 1,095 vpd. Based on the adopted growth rate of 1% pa for ten years, this will increase to around 1,215 vpd in 2023 (without Swan Hill South West Development Precinct traffic).

The intersections affected by the variation in connection to the external road network are intersections 7 (Gray Street/Feldtmann Lane), 8 Sea lake-Swan Hill Road/Gray Street/Boobialla Drive) and 9 (Sea Lake-Swan Hill Road/Dead Horse Lane/Memorial Drive). Removing the Sea Lake-Swan Hill Road connection (Option 1) significantly increases the number of movements between the south and west legs of the Gray Street/Feldtmann Lane intersection. It also significantly increases the number of movements between the south and east legs at the Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive roundabout. Whilst both these intersections will operate at an acceptable level under the increased traffic volumes resulting from the removal of the connection to Sea Lake-Swan Hill Road (ie Option 2), they will nonetheless perform at lower levels than in Option 1 (ie retaining the connection to Sea Lake-Swan Hill Road). This situation would be exacerbated should residential densities of 14 households per ha be adopted instead of 10.5 households per ha.

In simple terms, Option 2 results in more traffic using Gray Street and Feldtmann Lane than in Option 1. It also increases the volume of traffic through the internal intersection 13.

Physically, there are no reasons that prevent a new intersection to Sea Lake-Swan Hill Road in the location proposed. It is to be located approximately 400m west of the Gray Street/Boobialla Drive roundabout and approximately 350m east of the Dead Horse Lane/Memorial Drive intersection. The recommended treatment is a BAL (basic right turn) on the west approach and an AUL (auxiliary left turn) on the east approach. For an 80 km/h design speed, there is more than sufficient road length in which to generate the required lane lengths without affecting the adjacent intersections.

Option 1 will direct approximately 2,500 vpd onto Sea Lake-Swan Hill Road to/from the east. This will increase the total daily traffic volume on Sea Lake-Swan Hill Road west of Gray Street/Boobialla Drive to around 3,700 vpd in 2023 (the assumed completion date for development within the Swan Hill South West Development Precinct). This can be readily accommodated in a two lane-two way cross-section. Also, it is well within the environmental capacity of an arterial road (rural or urban) (10,000 vpd or more, depending on the road cross section).

Option 1 (a connection to Sea Lake-Swan Hill Road) provides a superior road network compared to Option 2 (a connection to Dead Horse Lane) and will not detrimentally affect the operation or capacity of Sea Lake-Swan Hill Road.

6. INCREASED DENSITY

Traffix Group was requested by Council to assess the impact of increasing the residential density from 10.5 lots per ha to 14 lots per ha.

6.1. DESIGN TRAFFIC VOLUMES

The predicted precinct daily traffic volumes arising from the traffic model for Option 1 - Sea Lake-Swan Hill Road Link are shown in Figure 41 and for Option 2 - Dead Horse Lane Link are shown in Figure 42.

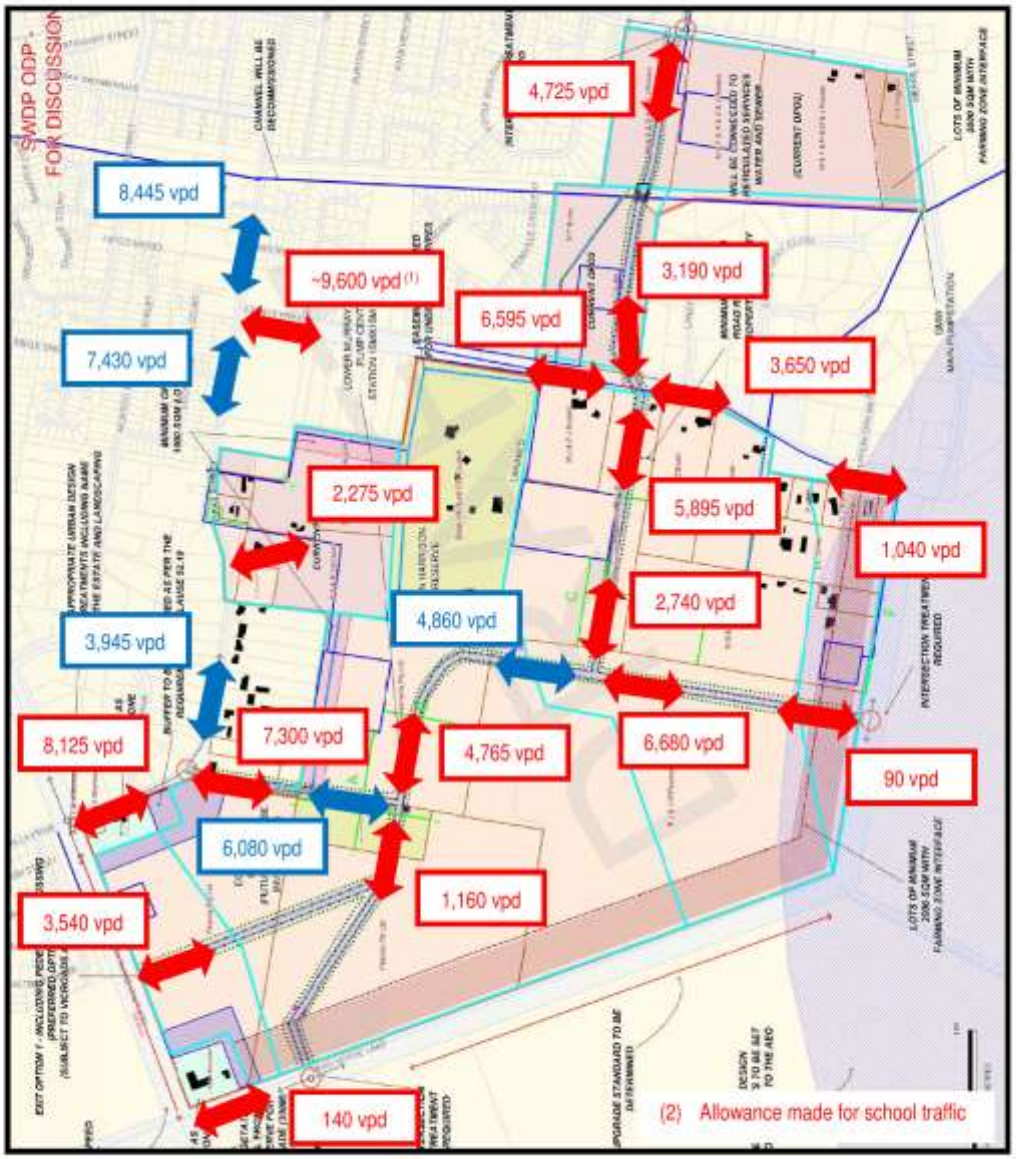


Figure 41: Predicted Precinct Daily Traffic Volumes - 14 Lots per ha (Option 1 - Sea Lake-Swan Hill Road Link)

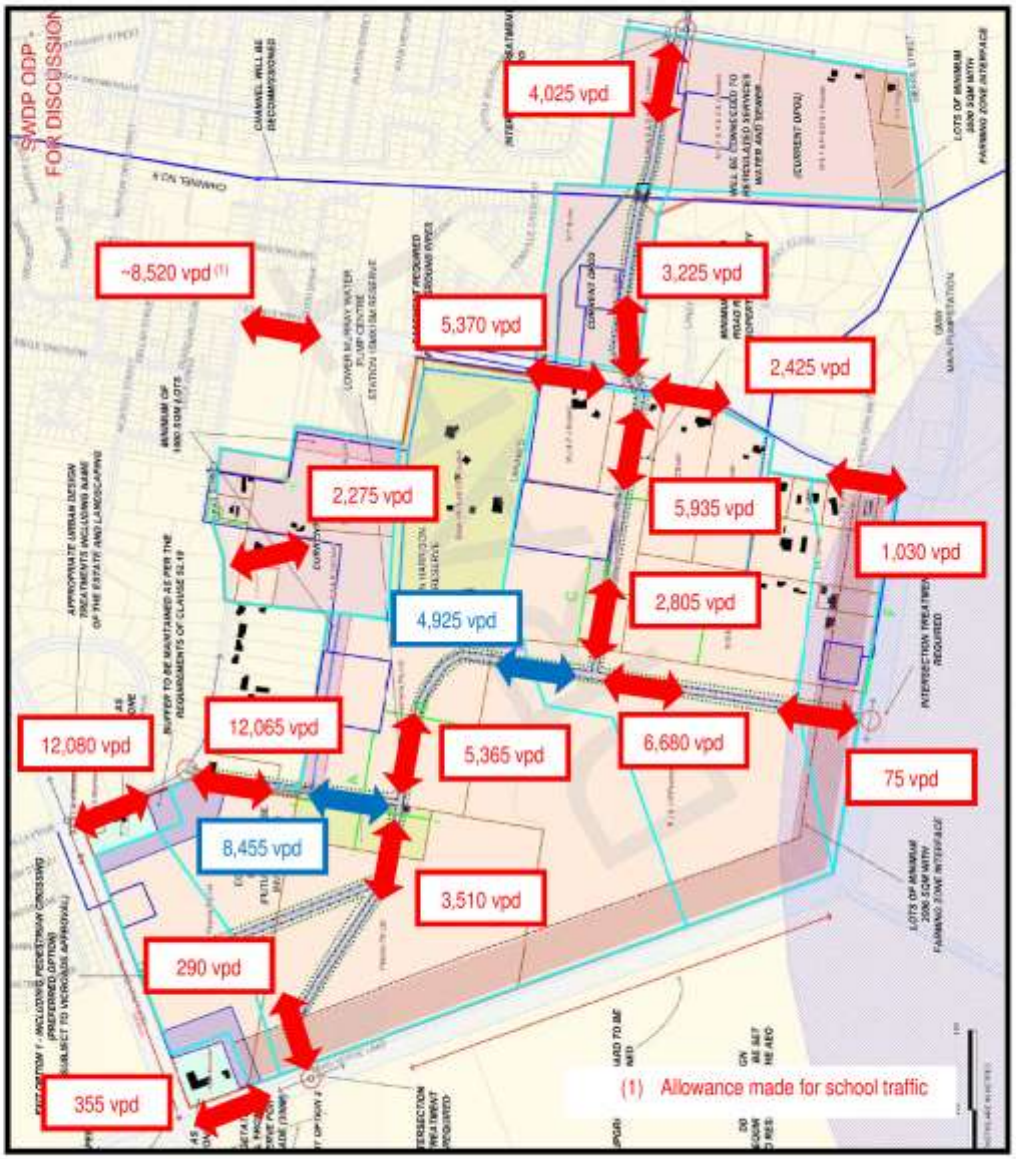


Figure 42: Predicted Precinct Daily Traffic Volumes - 14 Lots per ha (Option 2 - Dead Horse Lane Link)

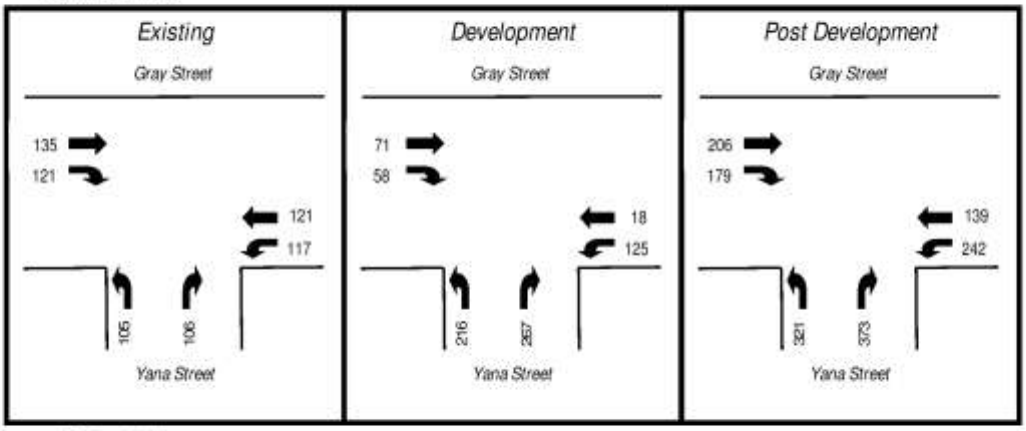
Clearly, the higher density results in greater traffic volumes being generated by the Swan Hill South West Development Precinct.

The single lane roundabouts recommended at intersections 3 (Coronation Avenue/Wattie Street/Link 1), 4 Yana Street/Link 2/Link 3), 12 (Link 3/Link 4/Link 5) and 13 ((Link 5/Link 6/Link 7) will have the capacity to accommodate the extra traffic generated by a higher residential density.

The higher density will increase traffic at intersections 5 (Grey Street/Yana Street), 7 (Gray Street/Feldtmann Lane (Link 6)) and 8 Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive) to the point where additional capacity analysis is warranted to determine the impact the higher density will have on the operation and form of these intersections.

Figures 43, 44 and 45 show the predicted traffic volumes with higher densities for Option 1 (Sea Lake-Swan Hill Road connection).

AM Peak Hour



PM Peak Hour

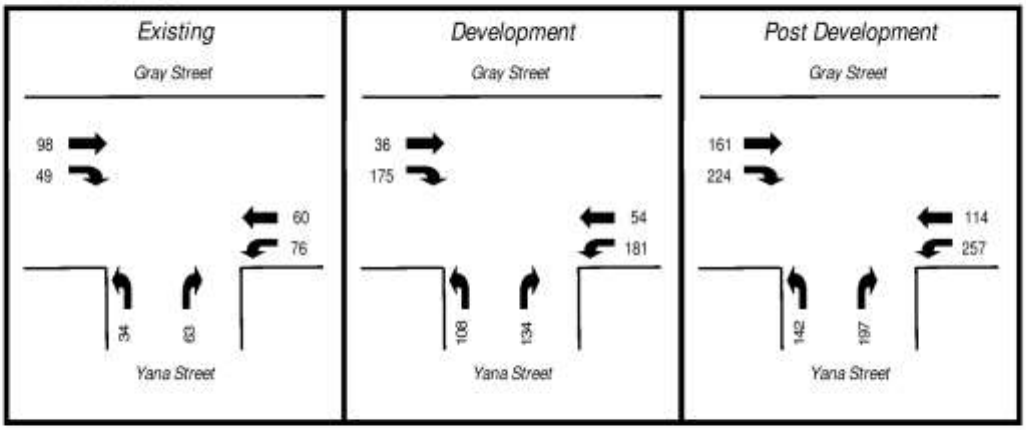
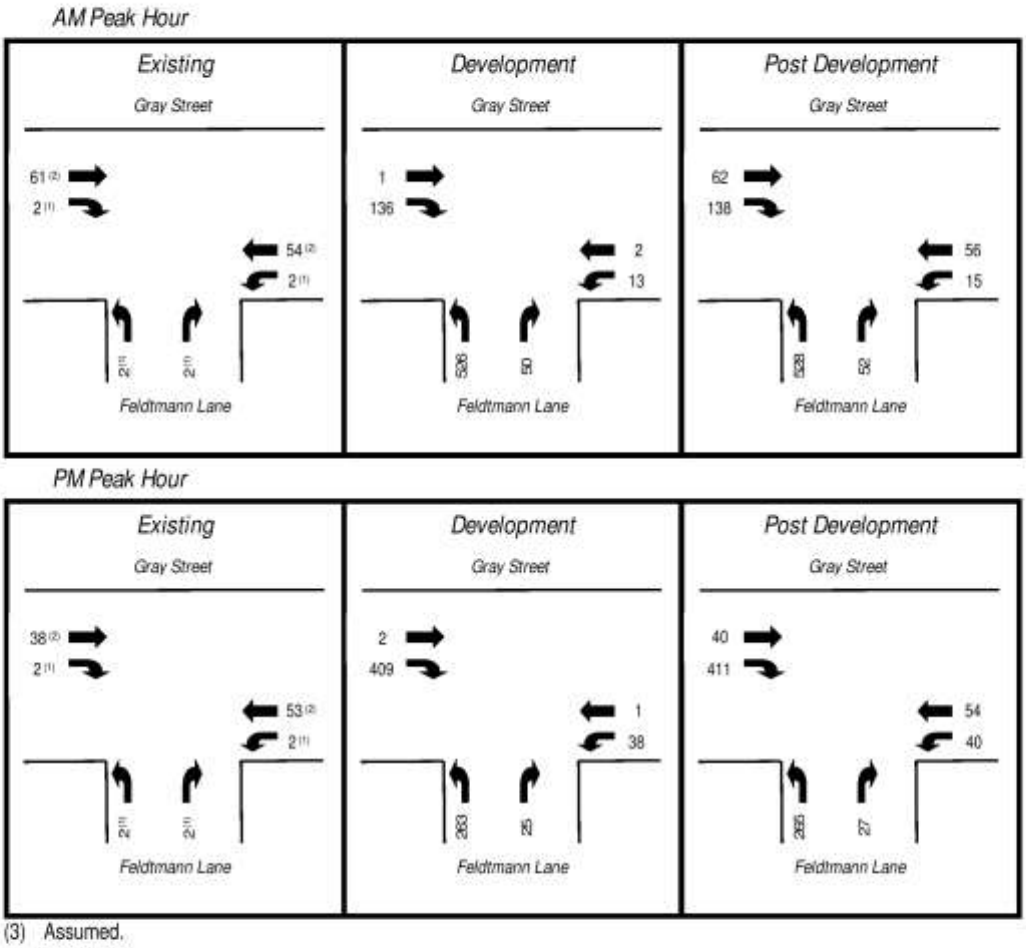


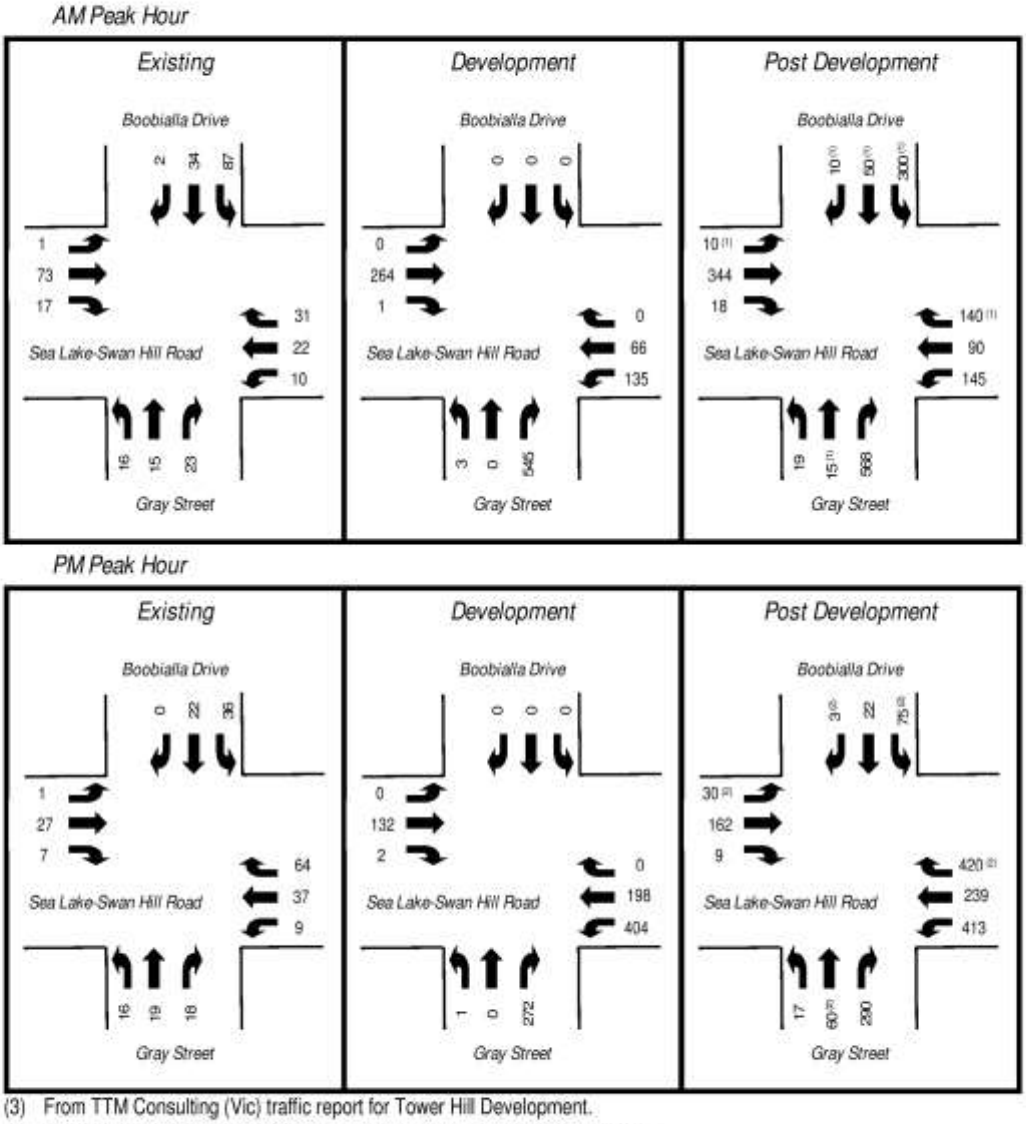
Figure 43: Traffic Volumes - Grey Street/Yana Street (Intersection #5) - 14 Lots per ha (Option 1 - Sea Lake-Swan Hill Road Link)



(3) Assumed.

(4) Derived from adjacent intersection.

Figure 44: Traffic Volumes - Gray Street/Feldtmann Lane (Link 6) (Intersection #7) - 14 Lots per ha (Option 1 - Sea Lake-Swan Hill Road Link)



(3) From TTM Consulting (Vic) traffic report for Tower Hill Development.

(4) Derived from TTM Consulting (Vic) traffic report for Tower Hill Development.

Figure 45: Traffic Volumes - Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8) - 14 Lots per ha (Option 1 - Sea Lake-Swan Hill Road Link)

6.2. INTERSECTION REQUIREMENTS

The outputs of the capacity analyses for these intersections are contained in the separate Appendices report.

6.2.1. Gray Street/Yana Street (Intersection #5)

Capacity Analysis

The existing configuration of this intersection comprises a simple T-intersection with priority to Gray Street and separate left and right turn lanes in Yana Street.

The results of the analysis for this configuration are summarised in Table 23.

Table 23: Capacity Analysis - Gray Street/Yana Street - Existing Configuration (Intersection #5) - 14 Lots per ha (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.74	12.9	42.8
	East	0.13	4.0	0.0	0.21	3.5	0.0
	West	0.16	4.9	6.5	0.27	4.5	12.3
	All Veh	0.16	6.2	6.5	0.74	8.2	42.8
PM	South	0.07	9.3	1.8	0.38	9.6	12.6
	East	0.08	4.6	0.0	0.21	3.9	0.0
	West	0.09	3.2	3.2	0.28	5.1	12.2
	All Veh	0.09	5.3	3.2	0.38	6.1	12.6

The analysis shows that under post-development traffic volumes, Gray Street operates with a low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on both approaches. Yana Street will experience a reduction in Level of Service in both peak periods, in particular the AM peak where the degree of saturation increases to 0.74.

It is noted that the model produced for this study does not allow for any redistribution of traffic that might occur due to congestion and/or delays at a particular intersection. Both these factors mean that the predicted traffic volumes turning from Yana Street (and into Yana Street) may be overestimated which, in turn, means that the traffic impact may be overstated.

To assess upgrade options, three upgrades have been assessed - left and right turn lanes in Gray Street, a roundabout and traffic signals. The results of the analyses for these configurations are shown in Tables 24, 25 and 26.

Table 24: Capacity Analysis - Gray Street/Yana Street (Intersection #5) - Lots per ha Turn Lanes in Gray Street (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.70	12.0	39.4
	East	0.13	4.0	0.0	0.14	3.5	0.0
	West	0.16	4.9	6.5	0.15	3.3	4.9
	All Veh	0.16	6.2	6.5	0.70	7.5	39.4
PM	South	0.07	9.3	1.8	0.36	9.3	12.0
	East	0.08	4.6	0.0	0.15	3.8	0.0
	West	0.09	3.2	3.2	0.19	4.1	6.3
	All Veh	0.09	5.3	3.2	0.36	5.6	12.0

Table 25: Capacity Analysis - Gray Street/Yana Street (Intersection #5) - 14 Lots per ha Roundabout (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.25	7.1	12.6
	East	0.13	4.0	0.0	0.32	4.6	17.1
	West	0.16	4.9	6.5	0.38	8.8	20.0
	All Veh	0.16	6.2	6.5	0.38	6.9	20.0
PM	South	0.07	9.3	1.8	0.13	7.2	6.0
	East	0.08	4.6	0.0	0.32	4.9	16.7
	West	0.09	3.2	3.2	0.32	8.1	16.1
	All Veh	0.09	5.3	3.2	0.32	6.7	16.7

Table 26: Capacity Analysis - Gray Street/Yana Street (Intersection #5) - 14 Lots per ha Traffic Signals (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.16	10.1	4.0	0.50	17.1	50.6
	East	0.13	4.0	0.0	0.22	8.8	18.3
	West	0.16	4.9	6.5	0.51	17.5	28.3
	All Veh	0.16	6.2	6.5	0.51	15.1	50.6
PM	South	0.07	9.3	1.8	0.37	20.7	28.9
	East	0.08	4.6	0.0	0.19	7.1	11.9
	West	0.09	3.2	3.2	0.46	13.3	29.6
	All Veh	0.09	5.3	3.2	0.46	13.5	29.6

It is noted that the SIDRA analysis did not take into account the "peaking effect" of the adjacent school during the AM period. In practice, more of the existing traffic will occur closer to 9:00am than be evenly spread over the hour. Similarly, more of the development traffic may occur away from the school peak to avoid the delays that it creates. Thus, the proposed development will have less of an impact at this intersection during the AM peak.

These analyses show that, compared to the existing configuration of the intersection, for post-development traffic volumes:

- Turn lanes in Gray Street have limited impact on delays and queues to traffic leaving Yana Street, and on the operation of Gray Street;
- A roundabout reduces delays and queues in Yana Street at the expense of increased queues in both directions along Gray Street; and
- Traffic signals, whilst operating at Level of Service B in both the AM and PM peaks, increase delays and queues for all movements.

It is noted that the east approach in Gray Street is sufficiently wide to enable through vehicles to pass left turning vehicles, and on the west approach there is scope to ban kerbside parking to allow through traffic to pass stationary right turning traffic.

Recommended Intersection Treatment

It is recommended that the existing configuration of the Gray Street/Yana Street intersection continue to be provided.

6.2.2. Gray Street/Feldtmann Lane (Intersection #7)

Capacity Analysis

The predicted volume of right turning traffic from Gray Street is high. This intersection has therefore been modelled with a separate right turn lane in Grey Street and separate left and right turn lanes in Feldtmann Lane.

The results of the analysis are summarised in Table 27.

Table 27: Capacity Analysis - Gray Street/Feldtmann Lane (Intersection #7) - 14 Lots per ha (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.00	8.7	0.0	0.49	6.1	20.9
	East	0.03	0.3	0.0	0.04	1.2	0.0
	West	0.03	0.3	0.0	0.09	4.0	2.9
	All Veh	0.03	0.6	0.0	0.49	5.2	20.9
PM	South	0.00	8.6	0.1	0.25	6.2	7.6
	East	0.03	0.3	0.0	0.05	2.4	0.0
	West	0.02	0.4	0.0	0.26	5.4	10.1
	All Veh	0.03	0.7	0.0	0.26	5.3	10.1

The analysis shows that under post-development traffic volumes, the intersection operates with a very low degree of saturation in both the AM and PM peak periods, with minimal delays and minimal queues on all approaches.

Recommended Intersection Treatment

It is recommended that a simple T-intersection continue to be provided at the Gray Street/Feldtmann Lane intersection. A separate right turn facility should be provided in Gray Street and separate left and right turn lanes in Feldtmann Lane. A left turn lane in Gray Street is not warranted on the basis of the predicted left turn volumes.

6.2.3. Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8)

Capacity Analysis

This existing cross road intersection is currently controlled by a single lane roundabout.

The results of the analysis for this configuration are summarised in Table 28.

Table 28: Capacity Analysis - Sea Lake-Swan Hill Road/Gray Street/Boobialla Drive (Intersection #8) - 14 Lots per ha (Option 1 - Sea Lake-Swan Hill Road Link)

Period	Approach	Existing			Post Development		
		Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)	Approach DoS	Approach Ave Delay (sec)	Approach 95th %ile Queue (m)
AM	South	0.04	7.8	1.3	0.50	10.5	26.7
	East	0.05	8.1	1.6	0.27	6.0	13.3
	North	0.10	5.6	3.3	0.58	16.6	42.3
	West	0.07	5.9	2.3	0.49	10.2	29.8
	All Veh	0.10	6.5	3.3	0.58	10.7	42.3
	LoS	A			B		
PM	South	0.04	7.4	1.3	0.44	12.8	22.9
	East	0.08	8.5	2.6	0.68	6.0	58.8
	North	0.04	5.3	1.4	0.10	5.8	4.3
	West	0.03	6.1	0.9	0.27	8.9	13.2
	All Veh	0.08	7.2	2.6	0.68	7.8	58.8
	LoS	A			A		

The analysis shows that under existing and post-development traffic volumes, the intersection operates at a Level of Service B in the AM peak and a Level of Service A in the PM peak.

Recommended Intersection Treatment

It is recommended that the intersection remain under roundabout control. No upgrades are required from a capacity perspective.

"Trigger Point" for Upgrade

As no upgrades are required from a capacity perspective, there is no "trigger point".

7. COMMENTS ON SPECIFIC ITEMS

Traffix Group was requested by Council to comment on a number of specific items as follows.

Distance from Sea Lake-Swan Hill Road of First Intersection on Dead Horse Lane

Council has sought a response to the requirement by VicRoads for the first intersection on Dead Horse Lane south of Sea Lake-Swan Hill Road to be "relocated well away from Sea Lake-Swan Hill Road/Dead Horse Lane intersection, preferably in the order of more than 800m to support future operational efficiency of both Dead Horse Lane and its intersection with the Swan Hill-Sea Lake Road".

The requirement to offset a local road intersection more than 800m from Sea Lake Swan Hill Road is excessive. The traffic projections and the capacity analysis indicate that there will be low volumes of traffic through this intersection in the design year (2033) and that queues on the Dead Horse Lane approach will be one vehicle long. Also, the first intersection to the south will carry low volumes of traffic, and a simple T-intersection is all that is required.

The property on the southeast corner of this intersection has a frontage to Dead Horse Lane of some 135m and is to be retained. The first intersection to the south of Sea Lake-Swan Hill Road will therefore be greater than this distance from the main road, which is more than sufficient to ensure that both intersections can operate efficiently in the future.

Access to Sea Lake-Swan Hill Road

It is understood that the Swan Hill South West Development Precinct plan has undergone a number of iterations. An earlier version of the Swan Hill South West Development Precinct plan did not show an access to Sea Lake-Swan Hill Road between Gray Street and Dead Horse Lane, which VicRoads supported "in principle … to minimise congestion and compromised future traffic lane configurations". The current plan shows such an access, and Council has sought a response to this.

Section 5.4 of this report compares the provision of a connection to Sea Lake-Swan Hill Road or a connection to Dead Horse Lane and concludes that a connection to Sea Lake-Swan Hill Road provides a superior road network whilst not detrimentally affecting the operation or capacity of Sea Lake-Swan Hill Road.

Recommended Speed Zones

The setting of speed zones on the declared road network is the responsibility of VicRoads and takes into account many factors. The assessment of the intersection requirements at Dead Horse Lane has been undertaken on the basis that, as the urban edge of Swan Hill would have moved to this location, a speed limit of 80 km/h is appropriate.

TraffixGroup
Traffic Engineers and Transport Planners

Traffix Group Pty Ltd
ABN 32 100 481 570

Address
Suite 8, 431 Burke Road
Glen Iris Victoria 3146

Contact
Telephone 03 9822 2888
Facsimile 03 9822 7444
admin@traffixgroup.com.au
www.traffixgroup.com.au

SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT

TRAFFIC IMPACT ASSESSMENT

APPENDICES REPORT

PREPARED FOR

SWAN HILL RURAL CITY COUNCIL

20 JUNE, 2014

GRP16371R9263B

TRAFFIC IMPACT ASSESSMENT

APPENDICES REPORT

SWAN HILL SOUTH WEST DEVELOPMENT PRECINCT

Our Reference: GRP16371R9263B Appendices Report

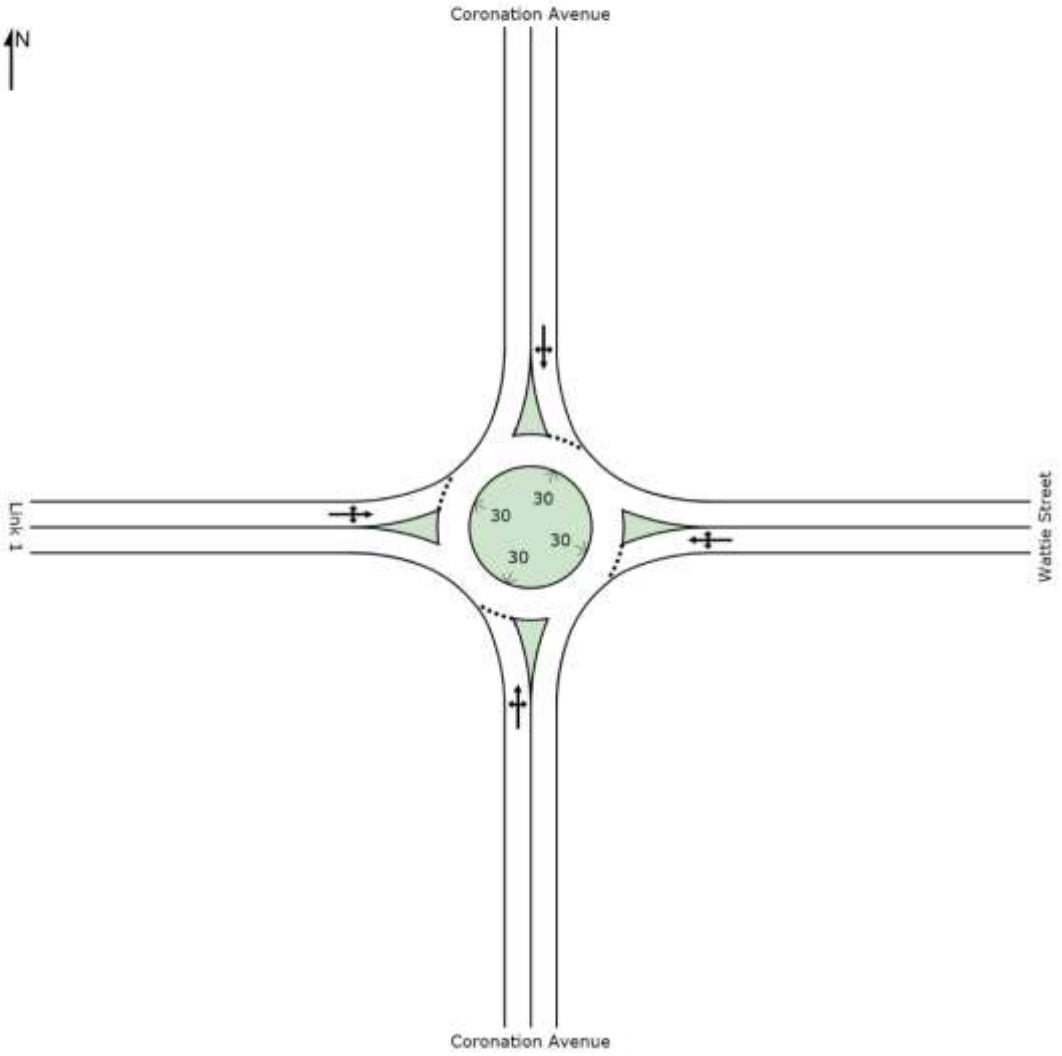
APPENDIX A

CAPACITY ANALYSIS RESULTS
OPTION 1 - SEA LAKE-SWAN HILL ROAD LINK

SITE LAYOUT

Site: INT 3 - Coronation Avenue/Link 1 - AM Post Development

Coronation Avenue/Link 1
Roundabout



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: INT 3 - Coronation Avenue/Link 1 - AM Post Development

Coronation Avenue/Link 1
Roundabout

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: Coronation Avenue											
1	L2	1	0.0	0.151	5.9	LOS A	0.8	5.7	0.30	1.03	49.6
2	T1	151	0.0	0.151	4.9	LOS A	0.8	5.7	0.30	1.03	49.6
3	R2	56	0.0	0.151	11.8	LOS B	0.8	5.7	0.30	1.03	49.6
Approach		207	0.0	0.151	6.8	LOS A	0.8	5.7	0.30	0.51	49.6
East: Wattle Street											
4	L2	17	0.0	0.084	5.8	LOS A	0.4	3.1	0.28	1.12	48.2
5	T1	40	0.0	0.084	4.8	LOS A	0.4	3.1	0.28	1.12	48.2
6	R2	57	0.0	0.084	11.7	LOS B	0.4	3.1	0.28	1.12	48.2
Approach		114	0.0	0.084	8.4	LOS A	0.4	3.1	0.28	0.56	48.2
North: Coronation Avenue											
7	L2	129	0.0	0.194	6.3	LOS A	1.1	7.8	0.41	1.09	49.1
8	T1	80	0.0	0.194	5.3	LOS A	1.1	7.8	0.41	1.09	49.1
9	R2	35	0.0	0.194	12.2	LOS B	1.1	7.8	0.41	1.09	49.1
Approach		244	0.0	0.194	6.8	LOS A	1.1	7.8	0.41	0.54	49.1
West: Link 1											
10	L2	138	0.0	0.243	6.6	LOS A	1.4	10.0	0.46	1.08	49.6
11	T1	160	0.0	0.243	5.6	LOS A	1.4	10.0	0.46	1.08	49.6
12	R2	1	0.0	0.243	12.5	LOS B	1.4	10.0	0.46	1.08	49.6
Approach		299	0.0	0.243	6.1	LOS A	1.4	10.0	0.46	0.54	49.6
All Vehicles		864	0.0	0.243	6.8	LOS A	1.4	10.0	0.38	0.54	49.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 3 - Coronation Avenue/Link 1 - PM Post Development

Coronation Avenue/Link 1
Roundabout

Movement Performance - Vehicles

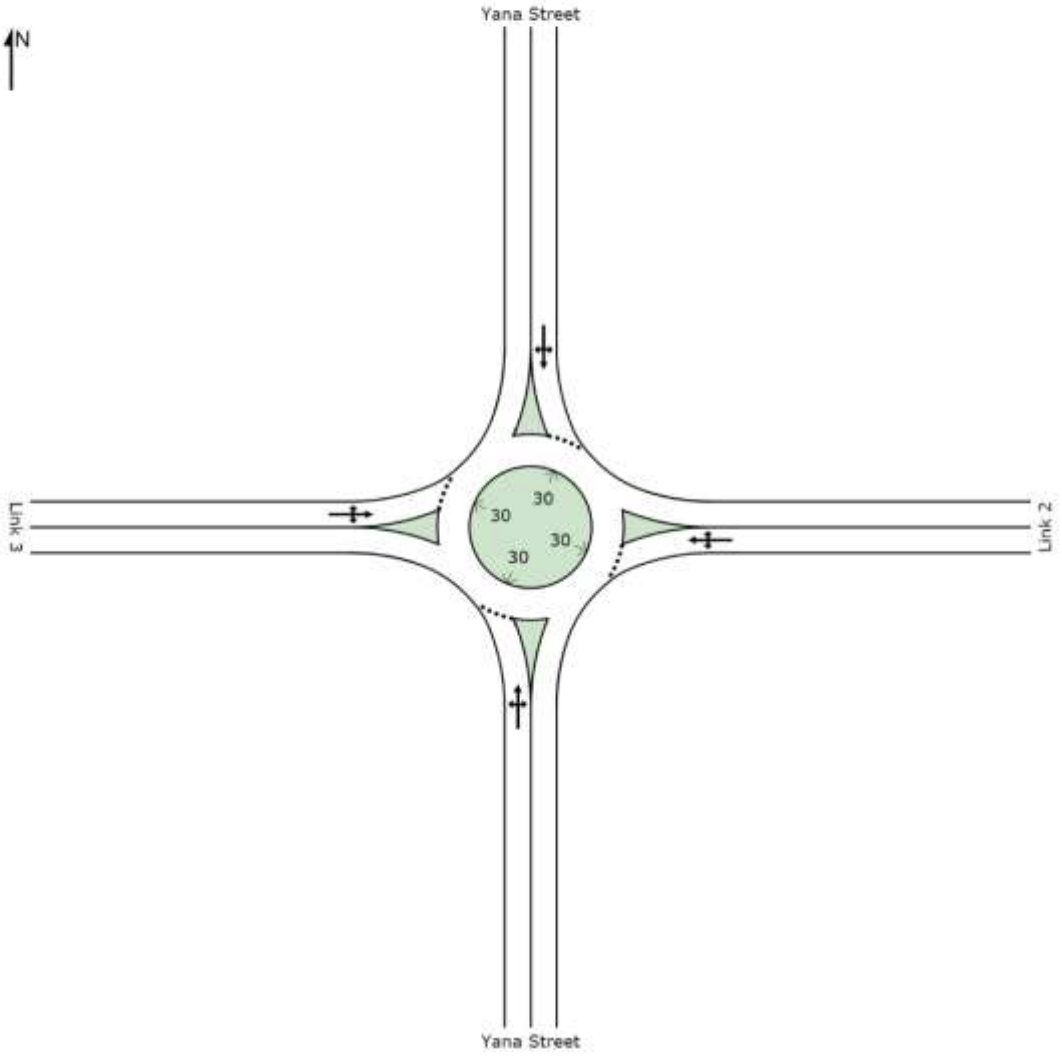
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coronation Avenue											
1	L2	1	0.0	0.077	6.4	LOS A	0.4	2.8	0.40	1.06	49.3
2	T1	75	0.0	0.077	5.4	LOS A	0.4	2.8	0.40	1.06	49.3
3	R2	19	0.0	0.077	12.3	LOS B	0.4	2.8	0.40	1.06	49.3
Approach		95	0.0	0.077	6.8	LOS A	0.4	2.8	0.40	0.53	49.3
East: Wattle Street											
4	L2	28	0.0	0.147	6.3	LOS A	0.8	5.5	0.38	1.08	49.3
5	T1	120	0.0	0.147	5.3	LOS A	0.8	5.5	0.38	1.08	49.3
6	R2	38	0.0	0.147	12.2	LOS B	0.8	5.5	0.38	1.08	49.3
Approach		186	0.0	0.147	6.8	LOS A	0.8	5.5	0.38	0.54	49.3
North: Coronation Avenue											
7	L2	129	0.0	0.223	5.5	LOS A	1.3	9.0	0.17	1.03	49.8
8	T1	114	0.0	0.223	4.5	LOS A	1.3	9.0	0.17	1.03	49.8
9	R2	105	0.0	0.223	11.4	LOS B	1.3	9.0	0.17	1.03	49.8
Approach		348	0.0	0.223	7.0	LOS A	1.3	9.0	0.17	0.51	49.8
West: Link 1											
10	L2	69	0.0	0.073	5.8	LOS A	0.4	2.6	0.28	0.92	50.5
11	T1	27	0.0	0.073	4.9	LOS A	0.4	2.6	0.28	0.92	50.5
12	R2	1	0.0	0.073	11.7	LOS B	0.4	2.6	0.28	0.92	50.5
Approach		98	0.0	0.073	5.6	LOS A	0.4	2.6	0.28	0.46	50.5
All Vehicles		727	0.0	0.223	6.7	LOS A	1.3	9.0	0.27	0.52	49.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 4 - Yana Street/Link 2/Link 3- AM Post Development

Yana Street/Link 2/Link 3
Roundabout



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: INT 4 - Yana Street/Link 2/Link 3- AM Post Development

Yana Street/Link 2/Link 3
Roundabout

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: Yana Street											
1	L2	1	0.0	0.151	5.7	LOS A	0.8	5.7	0.25	0.91	50.8
2	T1	187	0.0	0.151	4.8	LOS A	0.8	5.7	0.25	0.91	50.8
3	R2	26	0.0	0.151	11.6	LOS B	0.8	5.7	0.25	0.91	50.8
Approach		215	0.0	0.151	5.6	LOS A	0.8	5.7	0.25	0.46	50.8
East: Link 2											
4	L2	13	0.0	0.044	5.9	LOS A	0.2	1.6	0.30	0.88	50.7
5	T1	44	0.0	0.044	4.9	LOS A	0.2	1.6	0.30	0.88	50.7
6	R2	2	0.0	0.044	11.8	LOS B	0.2	1.6	0.30	0.88	50.7
Approach		59	0.0	0.044	5.4	LOS A	0.2	1.6	0.30	0.44	50.7
North: Yana Street											
7	L2	8	0.0	0.122	6.1	LOS A	0.7	4.7	0.37	1.11	48.7
8	T1	94	0.0	0.122	5.2	LOS A	0.7	4.7	0.37	1.11	48.7
9	R2	54	0.0	0.122	12.0	LOS B	0.7	4.7	0.37	1.11	48.7
Approach		156	0.0	0.122	7.6	LOS A	0.7	4.7	0.37	0.56	48.7
West: Link 3											
10	L2	211	0.0	0.295	6.4	LOS A	1.8	12.8	0.43	1.05	49.7
11	T1	168	0.0	0.295	5.4	LOS A	1.8	12.8	0.43	1.05	49.7
12	R2	1	0.0	0.295	12.3	LOS B	1.8	12.8	0.43	1.05	49.7
Approach		380	0.0	0.295	6.0	LOS A	1.8	12.8	0.43	0.52	49.7
All Vehicles		809	0.0	0.295	6.1	LOS A	1.8	12.8	0.36	0.51	49.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 4 - Yana Street/Link 2/Link 3- PM Post Development

Yana Street/Link 2/Link 3
Roundabout

Movement Performance - Vehicles

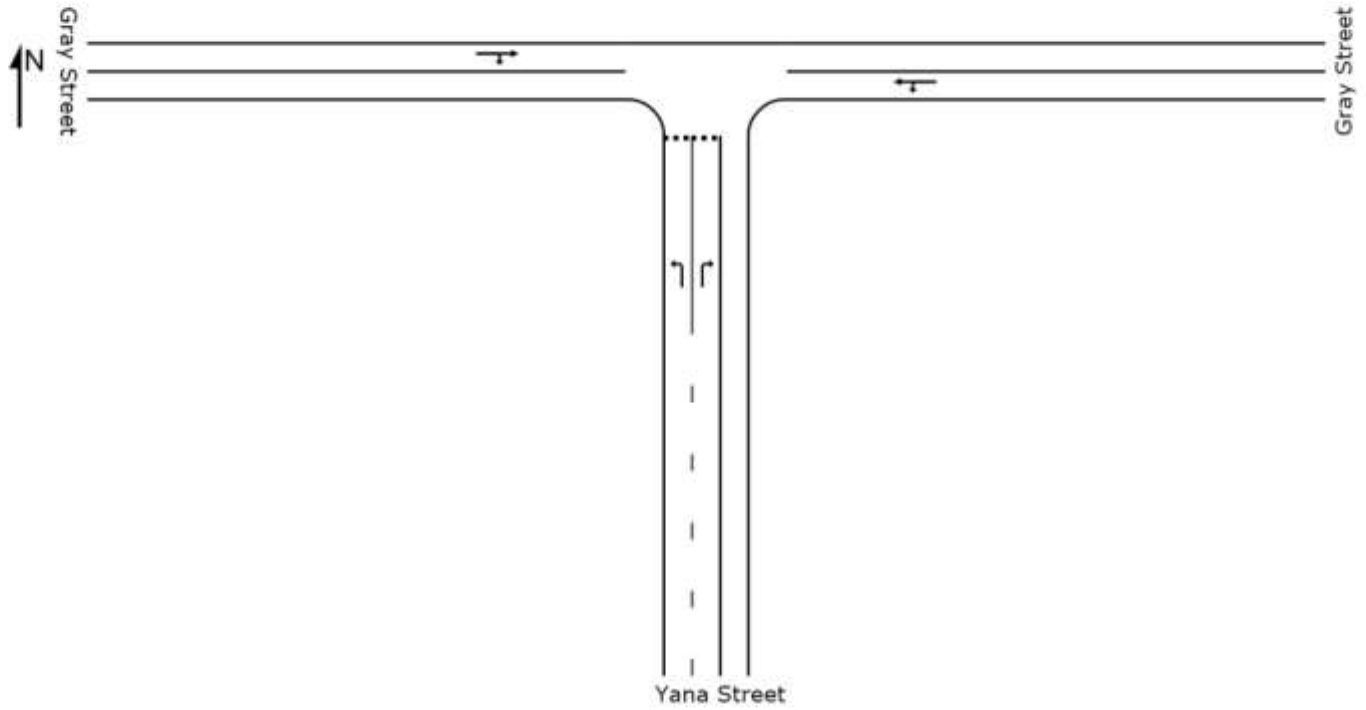
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Yana Street											
1	L2	1	0.0	0.119	6.5	LOS A	0.6	4.4	0.43	1.06	49.6
2	T1	128	0.0	0.119	5.6	LOS A	0.6	4.4	0.43	1.06	49.6
3	R2	14	0.0	0.119	12.4	LOS B	0.6	4.4	0.43	1.06	49.6
Approach		143	0.0	0.119	6.2	LOS A	0.6	4.4	0.43	0.53	49.6
East: Link 2											
4	L2	18	0.0	0.128	6.7	LOS A	0.7	4.9	0.46	1.07	49.6
5	T1	126	0.0	0.128	5.7	LOS A	0.7	4.9	0.46	1.07	49.6
6	R2	6	0.0	0.128	12.6	LOS B	0.7	4.9	0.46	1.07	49.6
Approach		151	0.0	0.128	6.1	LOS A	0.7	4.9	0.46	0.53	49.6
North: Yana Street											
7	L2	4	0.0	0.222	5.7	LOS A	1.3	9.2	0.28	1.12	48.4
8	T1	158	0.0	0.222	4.8	LOS A	1.3	9.2	0.28	1.12	48.4
9	R2	158	0.0	0.222	11.6	LOS B	1.3	9.2	0.28	1.12	48.4
Approach		320	0.0	0.222	8.2	LOS A	1.3	9.2	0.28	0.56	48.4
West: Link 3											
10	L2	105	0.0	0.144	5.9	LOS A	0.8	5.7	0.33	0.94	50.4
11	T1	85	0.0	0.144	5.0	LOS A	0.8	5.7	0.33	0.94	50.4
12	R2	1	0.0	0.144	11.8	LOS B	0.8	5.7	0.33	0.94	50.4
Approach		192	0.0	0.144	5.5	LOS A	0.8	5.7	0.33	0.47	50.4
All Vehicles		805	0.0	0.222	6.8	LOS A	1.3	9.2	0.35	0.53	49.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	111	0.0	0.105	8.8	LOS A	0.4	2.8	0.25	0.64	47.9
3	R2	112	0.0	0.155	11.4	LOS B	0.6	4.0	0.50	0.80	45.6
Approach		222	0.0	0.155	10.1	LOS B	0.6	4.0	0.37	0.72	46.7
East: Gray Street											
4	L2	123	0.0	0.132	8.2	LOS A	0.0	0.0	0.00	0.41	54.0
5	T1	127	0.0	0.132	0.0	LOS A	0.0	0.0	0.00	0.41	54.0
Approach		251	0.0	0.132	4.0	NA	0.0	0.0	0.00	0.41	54.0
West: Gray Street											
11	T1	142	0.0	0.164	0.9	LOS A	0.9	6.5	0.38	0.36	50.2
12	R2	127	0.0	0.164	9.2	LOS A	0.9	6.5	0.38	0.36	50.2
Approach		269	0.0	0.164	4.9	NA	0.9	6.5	0.38	0.36	50.2
All Vehicles		742	0.0	0.164	6.2	NA	0.9	6.5	0.25	0.48	50.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - AM Post Development

Gray Street/Yana Street
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: Yana Street											
1	L2	282	0.0	0.274	9.1	LOS A	1.2	8.4	0.31	0.65	47.6
3	R2	325	0.0	0.591	17.6	LOS C	3.8	26.6	0.74	1.09	40.3
Approach		607	0.0	0.591	13.7	LOS B	3.8	26.6	0.54	0.89	43.4
East: Gray Street											
4	L2	223	0.0	0.196	8.2	LOS A	0.0	0.0	0.00	0.47	52.8
5	T1	147	0.0	0.196	0.0	LOS A	0.0	0.0	0.00	0.47	52.8
Approach		371	0.0	0.196	4.9	NA	0.0	0.0	0.00	0.47	52.8
West: Gray Street											
11	T1	222	0.0	0.254	1.7	LOS A	1.6	11.5	0.52	0.36	49.1
12	R2	174	0.0	0.254	10.0	LOS B	1.6	11.5	0.52	0.36	49.1
Approach		396	0.0	0.254	5.4	NA	1.6	11.5	0.52	0.36	49.1
All Vehicles		1374	0.0	0.591	8.9	NA	3.8	26.6	0.39	0.62	47.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - PM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	36	0.0	0.032	8.5	LOS A	0.1	0.8	0.15	0.62	48.3
3	R2	66	0.0	0.072	9.8	LOS A	0.3	1.8	0.35	0.69	47.2
Approach		102	0.0	0.072	9.3	LOS A	0.3	1.8	0.28	0.67	47.6
East: Gray Street											
4	L2	80	0.0	0.075	8.2	LOS A	0.0	0.0	0.00	0.45	53.3
5	T1	63	0.0	0.075	0.0	LOS A	0.0	0.0	0.00	0.45	53.3
Approach		143	0.0	0.075	4.6	NA	0.0	0.0	0.00	0.45	53.3
West: Gray Street											
11	T1	103	0.0	0.086	0.5	LOS A	0.5	3.2	0.26	0.27	52.5
12	R2	52	0.0	0.086	8.8	LOS A	0.5	3.2	0.26	0.27	52.5
Approach		155	0.0	0.086	3.2	NA	0.5	3.2	0.26	0.27	52.5
All Vehicles		400	0.0	0.086	5.3	NA	0.5	3.2	0.17	0.43	51.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - PM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

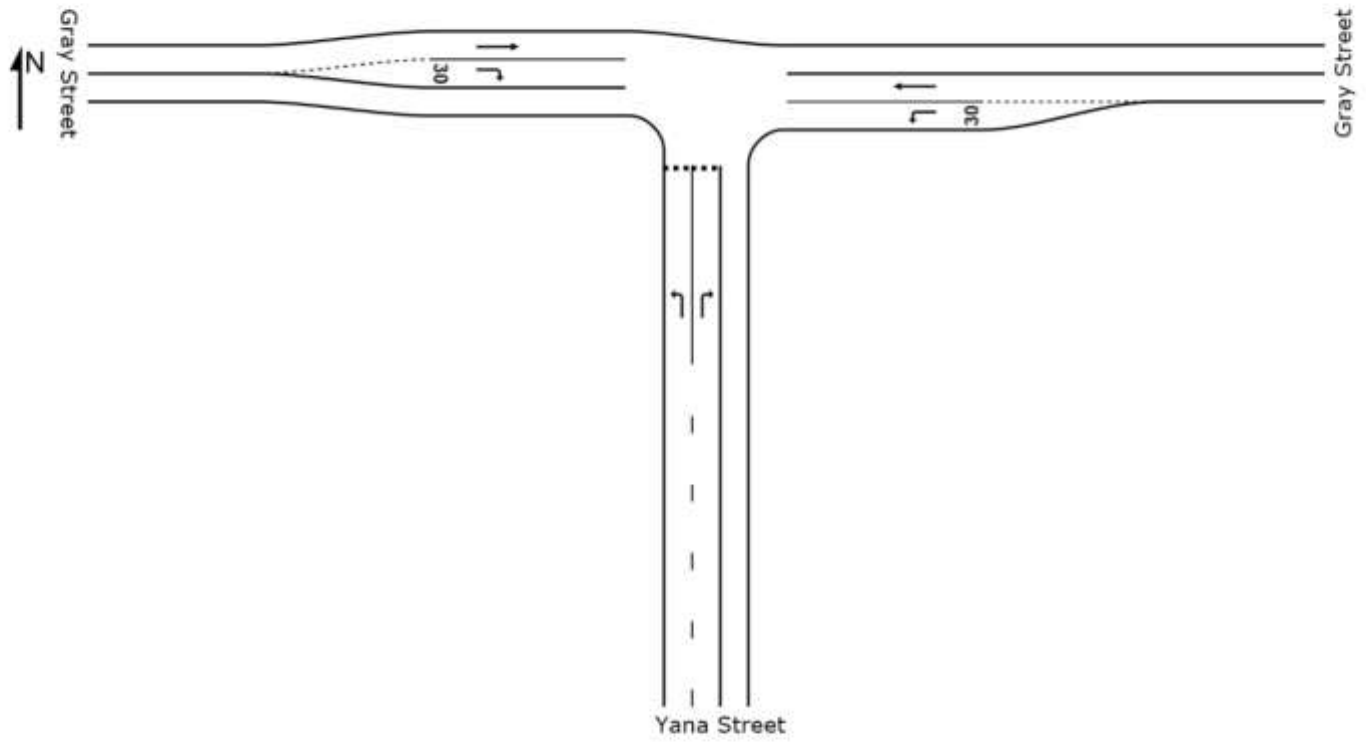
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Yana Street											
1	L2	122	0.0	0.115	8.8	LOS A	0.4	3.1	0.24	0.63	47.9
3	R2	174	0.0	0.279	13.0	LOS B	1.2	8.2	0.58	0.90	44.0
Approach		296	0.0	0.279	11.3	LOS B	1.2	8.2	0.44	0.79	45.6
East: Gray Street											
4	L2	225	0.0	0.184	8.2	LOS A	0.0	0.0	0.00	0.50	52.3
5	T1	123	0.0	0.184	0.0	LOS A	0.0	0.0	0.00	0.50	52.3
Approach		348	0.0	0.184	5.3	NA	0.0	0.0	0.00	0.50	52.3
West: Gray Street											
11	T1	143	0.0	0.223	1.5	LOS A	1.3	9.2	0.48	0.45	48.8
12	R2	191	0.0	0.223	9.8	LOS A	1.3	9.2	0.48	0.45	48.8
Approach		334	0.0	0.223	6.3	NA	1.3	9.2	0.48	0.45	48.8
All Vehicles		978	0.0	0.279	7.4	NA	1.3	9.2	0.30	0.57	48.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 5 (2) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	111	0.0	0.105	8.8	LOS A	0.4	2.8	0.25	0.64	47.9
3	R2	112	0.0	0.152	11.1	LOS B	0.6	4.0	0.49	0.78	45.9
Approach		222	0.0	0.152	10.0	LOS A	0.6	4.0	0.37	0.71	46.9
East: Gray Street											
4	L2	123	0.0	0.066	8.2	LOS A	0.0	0.0	0.00	0.67	48.9
5	T1	127	0.0	0.065	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		251	0.0	0.066	4.0	NA	0.0	0.0	0.00	0.33	54.0
West: Gray Street											
11	T1	142	0.0	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	127	0.0	0.088	9.1	LOS A	0.4	2.9	0.35	0.65	47.4
Approach		269	0.0	0.088	4.3	NA	0.4	2.9	0.17	0.31	53.3
All Vehicles		742	0.0	0.152	5.9	NA	0.6	4.0	0.17	0.43	51.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - AM Post Development

Gray Street/Yana Street
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: Yana Street											
1	L2	282	0.0	0.274	9.1	LOS A	1.2	8.4	0.31	0.65	47.6
3	R2	325	0.0	0.564	16.6	LOS C	3.6	25.2	0.71	1.06	41.1
Approach		607	0.0	0.564	13.1	LOS B	3.6	25.2	0.53	0.87	43.9
East: Gray Street											
4	L2	223	0.0	0.120	8.2	LOS A	0.0	0.0	0.00	0.67	48.9
5	T1	147	0.0	0.076	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		371	0.0	0.120	4.9	NA	0.0	0.0	0.00	0.40	52.8
West: Gray Street											
11	T1	222	0.0	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	174	0.0	0.136	9.7	LOS A	0.6	4.4	0.44	0.70	47.0
Approach		396	0.0	0.136	4.2	NA	0.6	4.4	0.20	0.31	53.5
All Vehicles		1374	0.0	0.564	8.4	NA	3.6	25.2	0.29	0.58	48.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - PM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	36	0.0	0.032	8.5	LOS A	0.1	0.8	0.15	0.62	48.3
3	R2	66	0.0	0.072	9.6	LOS A	0.3	1.8	0.35	0.68	47.4
Approach		102	0.0	0.072	9.2	LOS A	0.3	1.8	0.28	0.66	47.7
East: Gray Street											
4	L2	80	0.0	0.043	8.2	LOS A	0.0	0.0	0.00	0.67	48.9
5	T1	63	0.0	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		143	0.0	0.043	4.6	NA	0.0	0.0	0.00	0.37	53.3
West: Gray Street											
11	T1	103	0.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	52	0.0	0.032	8.7	LOS A	0.1	1.0	0.25	0.62	47.8
Approach		155	0.0	0.053	2.9	NA	0.1	1.0	0.08	0.21	55.3
All Vehicles		400	0.0	0.072	5.1	NA	0.3	1.8	0.10	0.38	52.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - PM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

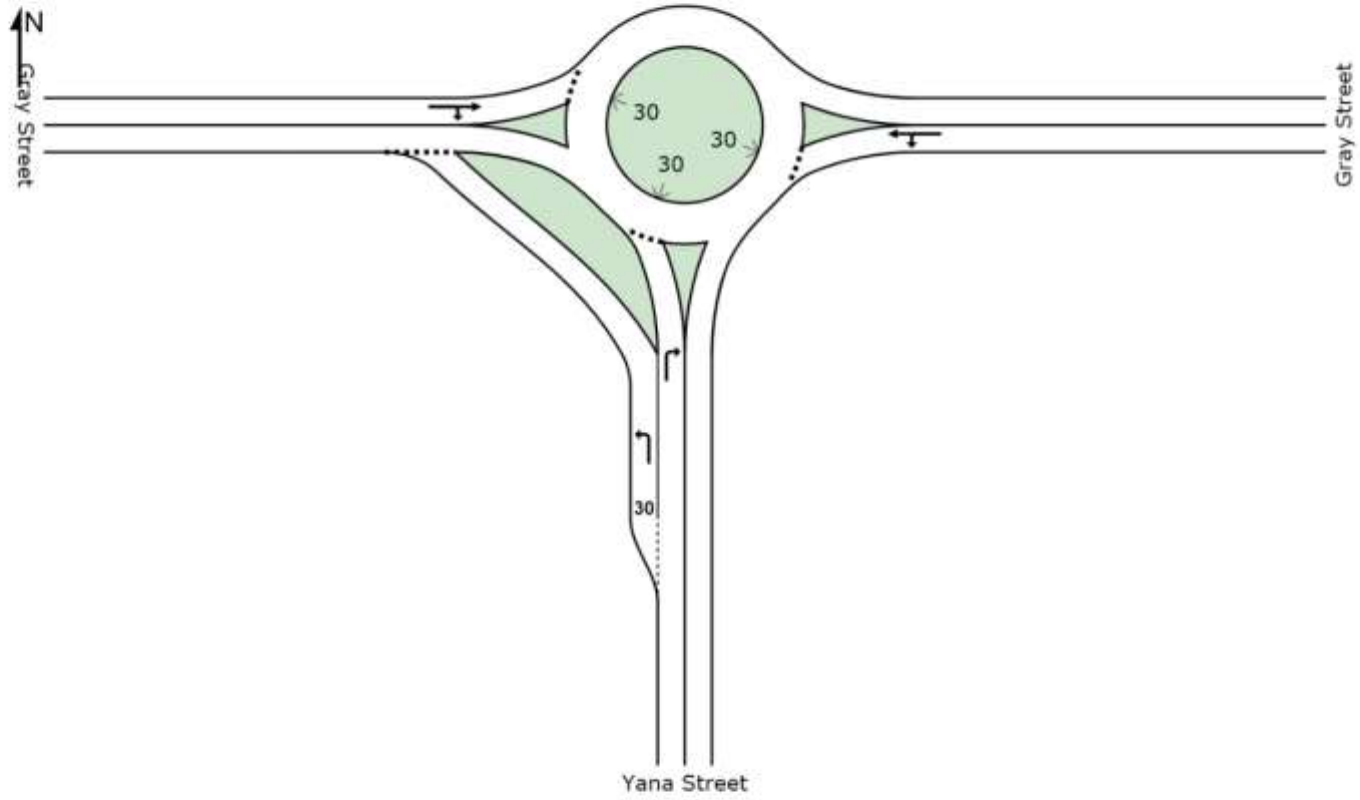
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Yana Street											
1	L2	122	0.0	0.115	8.8	LOS A	0.4	3.1	0.24	0.63	47.9
3	R2	174	0.0	0.271	12.6	LOS B	1.1	7.9	0.57	0.88	44.5
Approach		296	0.0	0.271	11.0	LOS B	1.1	7.9	0.44	0.78	45.8
East: Gray Street											
4	L2	225	0.0	0.121	8.2	LOS A	0.0	0.0	0.00	0.67	48.9
5	T1	123	0.0	0.063	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		348	0.0	0.121	5.3	NA	0.0	0.0	0.00	0.43	52.4
West: Gray Street											
11	T1	143	0.0	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	191	0.0	0.146	9.6	LOS A	0.7	4.8	0.43	0.69	47.0
Approach		334	0.0	0.146	5.5	NA	0.7	4.8	0.25	0.39	51.8
All Vehicles		978	0.0	0.271	7.1	NA	1.1	7.9	0.22	0.52	50.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 5 (3) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Roundabout



MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Roundabout

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: Yana Street											
1	L2	111	0.0	0.069	5.6	LOS A	0.4	2.9	0.30	0.90	50.4
3	R2	112	0.0	0.069	11.7	LOS B	0.4	2.9	0.30	1.23	45.4
Approach		222	0.0	0.069	8.6	LOS A	0.4	2.9	0.30	0.53	47.7
East: Gray Street											
4	L2	123	0.0	0.185	5.9	LOS A	1.2	8.4	0.35	0.92	50.4
5	T1	127	0.0	0.185	5.0	LOS A	1.2	8.4	0.35	0.92	50.4
Approach		251	0.0	0.185	5.5	LOS A	1.2	8.4	0.35	0.46	50.4
West: Gray Street											
11	T1	142	0.0	0.194	4.9	LOS A	1.3	8.8	0.32	1.11	48.3
12	R2	127	0.0	0.194	11.8	LOS B	1.3	8.8	0.32	1.11	48.3
Approach		269	0.0	0.194	8.2	LOS A	1.3	8.8	0.32	0.55	48.3
All Vehicles		742	0.0	0.194	7.4	LOS A	1.3	8.8	0.32	0.52	48.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - AM Post Development

Gray Street/Yana Street
Roundabout

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: Yana Street											
1	L2	282	0.0	0.178	5.7	LOS A	1.2	8.5	0.36	0.95	49.9
3	R2	325	0.0	0.205	11.8	LOS B	1.4	10.0	0.37	1.25	45.1
Approach		607	0.0	0.205	9.0	LOS A	1.4	10.0	0.36	0.56	47.2
East: Gray Street											
4	L2	223	0.0	0.288	6.3	LOS A	2.1	15.0	0.47	1.02	49.4
5	T1	147	0.0	0.288	5.4	LOS A	2.1	15.0	0.47	1.02	49.4
Approach		371	0.0	0.288	5.9	LOS A	2.1	15.0	0.47	0.51	49.4
West: Gray Street											
11	T1	222	0.0	0.354	6.5	LOS A	2.6	18.1	0.62	1.35	46.9
12	R2	174	0.0	0.354	13.4	LOS B	2.6	18.1	0.62	1.35	46.9
Approach		396	0.0	0.354	9.5	LOS A	2.6	18.1	0.62	0.68	46.9
All Vehicles		1374	0.0	0.354	8.3	LOS A	2.6	18.1	0.47	0.58	47.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - PM Existing

Gray Street/Yana Street
Roundabout

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: Yana Street											
1	L2	36	0.0	0.021	5.4	LOS A	0.1	0.8	0.19	0.86	51.2
3	R2	66	0.0	0.039	11.4	LOS B	0.2	1.5	0.19	1.25	45.9
Approach		102	0.0	0.039	9.3	LOS A	0.2	1.5	0.19	0.56	47.5
East: Gray Street											
4	L2	80	0.0	0.096	5.5	LOS A	0.6	4.0	0.19	0.84	51.5
5	T1	63	0.0	0.096	4.6	LOS A	0.6	4.0	0.19	0.84	51.5
Approach		143	0.0	0.096	5.1	LOS A	0.6	4.0	0.19	0.42	51.5
West: Gray Street											
11	T1	103	0.0	0.106	4.7	LOS A	0.6	4.4	0.22	1.01	49.7
12	R2	52	0.0	0.106	11.5	LOS B	0.6	4.4	0.22	1.01	49.7
Approach		155	0.0	0.106	7.0	LOS A	0.6	4.4	0.22	0.51	49.7
All Vehicles		400	0.0	0.106	6.9	LOS A	0.6	4.4	0.20	0.49	49.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - PM Post Development

Gray Street/Yana Street
Roundabout

Movement Performance - Vehicles

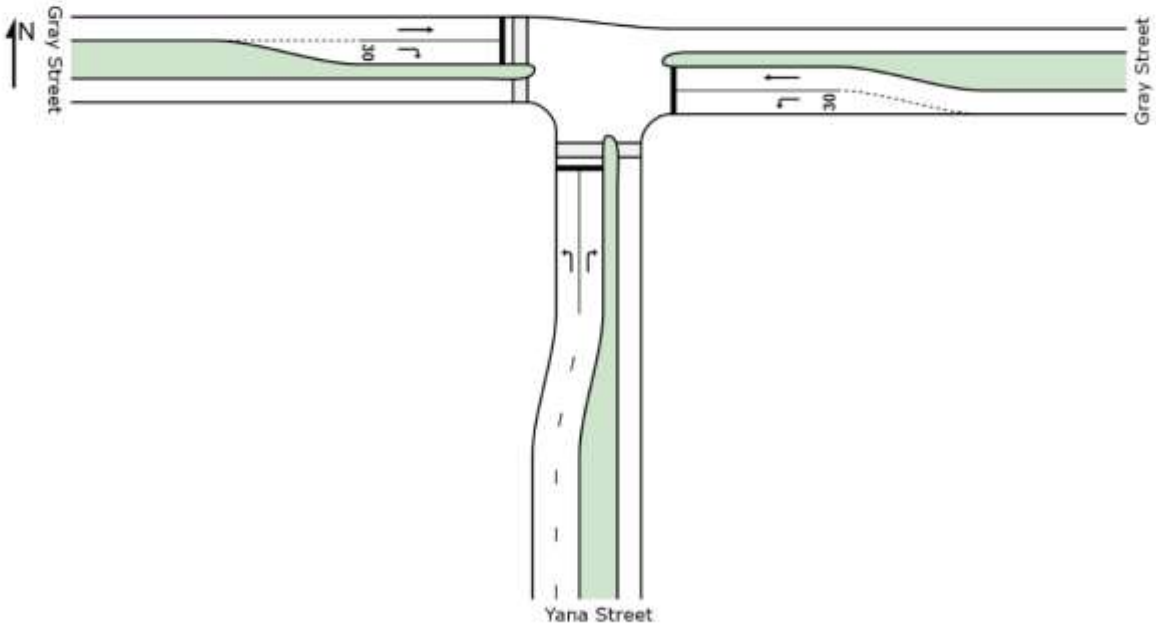
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Yana Street											
1	L2	122	0.0	0.076	5.6	LOS A	0.5	3.3	0.30	0.90	50.3
3	R2	174	0.0	0.108	11.7	LOS B	0.7	4.9	0.31	1.24	45.4
Approach		296	0.0	0.108	9.2	LOS A	0.7	4.9	0.31	0.55	47.2
East: Gray Street											
4	L2	225	0.0	0.274	6.4	LOS A	1.9	13.6	0.47	1.04	49.4
5	T1	123	0.0	0.274	5.5	LOS A	1.9	13.6	0.47	1.04	49.4
Approach		348	0.0	0.274	6.1	LOS A	1.9	13.6	0.47	0.52	49.4
West: Gray Street											
11	T1	143	0.0	0.256	5.4	LOS A	1.7	12.2	0.43	1.20	47.2
12	R2	191	0.0	0.256	12.2	LOS B	1.7	12.2	0.43	1.20	47.2
Approach		334	0.0	0.256	9.3	LOS A	1.7	12.2	0.43	0.60	47.2
All Vehicles		978	0.0	0.274	8.1	LOS A	1.9	13.6	0.41	0.56	48.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: Intersection 5 Option 1 - AM Exisitng

Gray Street/Yana Street
Signals - Fixed Time



MOVEMENT SUMMARY

Site: Intersection 5 Option 1 - AM Post

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

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: Yana Street											
1	L2	282	0.0	0.380	17.2	LOS B	5.0	34.9	0.75	0.78	45.8
3	R2	325	0.0	0.438	17.6	LOS B	5.9	41.5	0.77	0.79	45.4
Approach		607	0.0	0.438	17.4	LOS B	5.9	41.5	0.76	0.78	45.6
East: Gray Street											
4	L2	222	0.0	0.157	6.4	LOS A	0.8	5.3	0.29	0.65	52.7
5	T1	142	0.0	0.202	12.1	LOS B	2.4	17.1	0.73	0.58	50.0
Approach		364	0.0	0.202	8.7	LOS A	2.4	17.1	0.46	0.62	51.6
West: Gray Street											
11	T1	200	0.0	0.285	12.6	LOS B	3.6	24.9	0.75	0.62	49.7
12	R2	174	0.0	0.434	20.8	LOS C	3.5	24.8	0.83	0.79	43.6
Approach		374	0.0	0.434	16.4	LOS B	3.6	24.9	0.79	0.70	46.7
All Vehicles		1345	0.0	0.438	14.8	LOS B	5.9	41.5	0.69	0.72	47.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	16.8	LOS B	0.1	0.1	0.82	0.82
P4	West Full Crossing	53	15.2	LOS B	0.1	0.1	0.78	0.78
All Pedestrians		105	16.0	LOS B			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

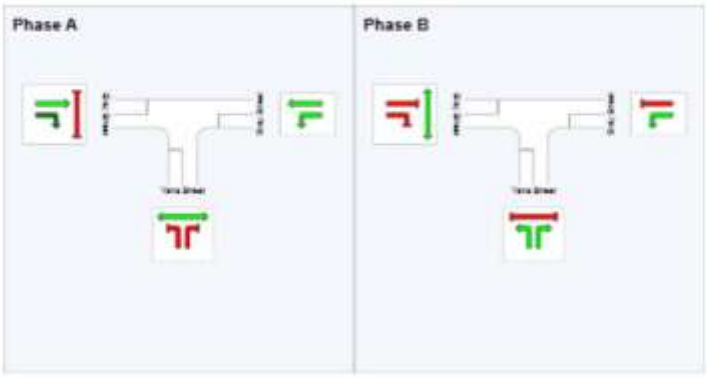
Site: Intersection 5 Option 1 - AM Post

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	24
Green Time (sec)	18	20
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	24	26
Phase Split	48 %	52 %



MOVEMENT SUMMARY

Site: Intersection 5 Option 1 - PM Post

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

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: Yana Street											
1	L2	121	0.0	0.217	20.1	LOS C	2.3	16.0	0.79	0.75	44.2
3	R2	174	0.0	0.312	20.6	LOS C	3.4	23.7	0.81	0.77	43.8
Approach		295	0.0	0.312	20.4	LOS C	3.4	23.7	0.80	0.76	43.9
East: Gray Street											
4	L2	225	0.0	0.160	6.4	LOS A	0.8	5.4	0.29	0.65	52.7
5	T1	106	0.0	0.119	8.4	LOS A	1.5	10.5	0.60	0.48	52.7
Approach		332	0.0	0.160	7.1	LOS A	1.5	10.5	0.39	0.59	52.7
West: Gray Street											
11	T1	132	0.0	0.147	8.5	LOS A	1.9	13.1	0.61	0.49	52.6
12	R2	189	0.0	0.359	16.0	LOS B	3.2	22.5	0.70	0.76	46.3
Approach		321	0.0	0.359	12.9	LOS B	3.2	22.5	0.67	0.65	48.7
All Vehicles		947	0.0	0.359	13.2	LOS B	3.4	23.7	0.61	0.67	48.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	13.0	LOS B	0.1	0.1	0.72	0.72
P4	West Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		105	16.2	LOS B			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

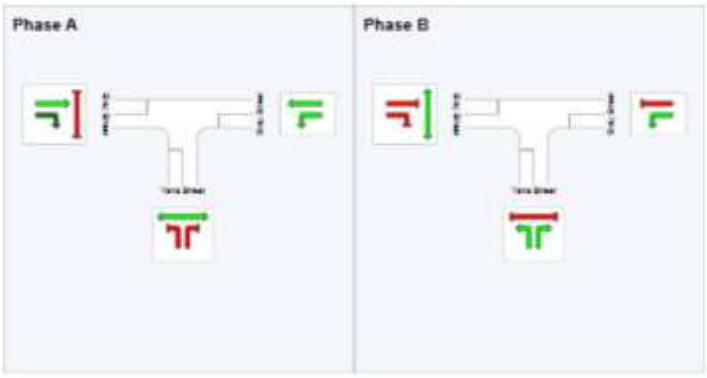
Site: Intersection 5 Option 1 - PM Post

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

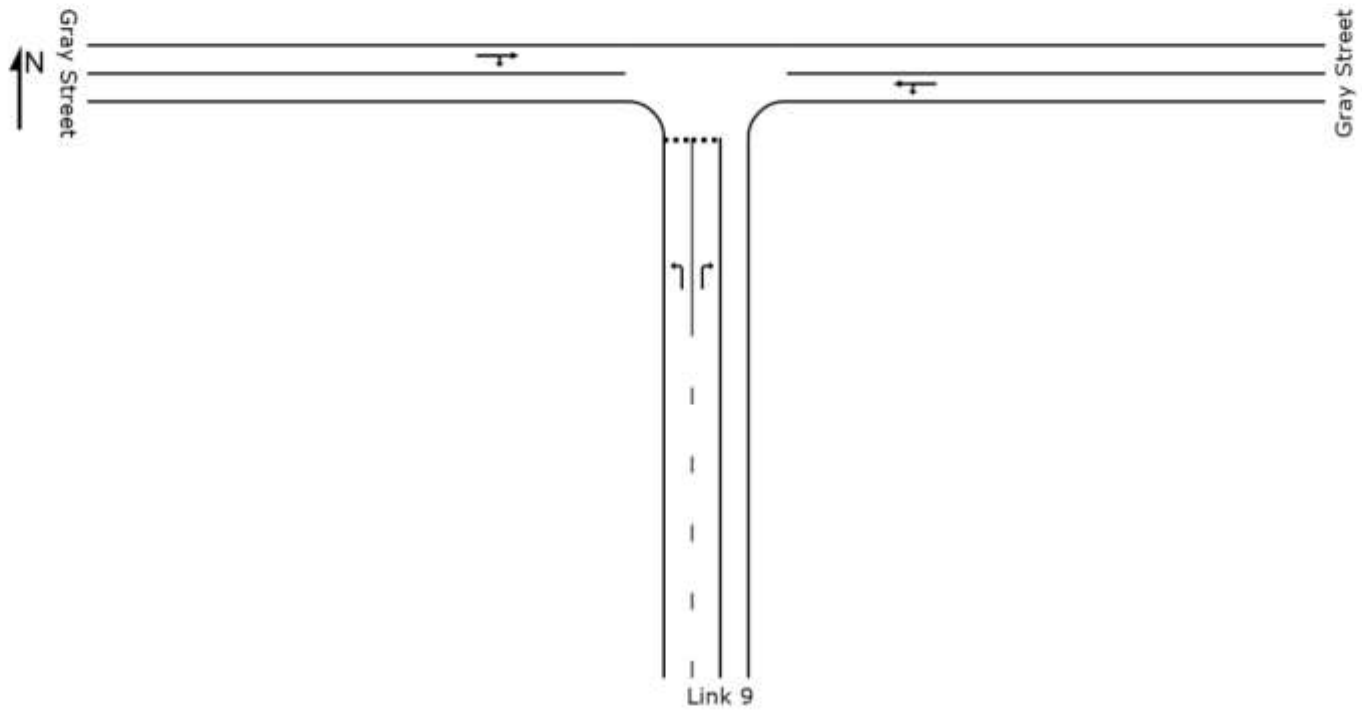
Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	29
Green Time (sec)	23	15
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	29	21
Phase Split	58 %	42 %



SITE LAYOUT

Site: INT 6 - Gray Street/Link 9- AM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 6 - Gray Street/Link 9 - AM Post Development

Gray Street/Yana Street
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: Link 9											
1	L2	1	0.0	0.001	8.5	LOS A	0.0	0.0	0.17	0.60	48.2
3	R2	145	0.0	0.157	9.9	LOS A	0.6	4.3	0.37	0.71	47.1
Approach		146	0.0	0.157	9.8	LOS A	0.6	4.3	0.37	0.71	47.1
East: Gray Street											
4	L2	37	0.0	0.060	8.2	LOS A	0.0	0.0	0.00	0.29	56.0
5	T1	79	0.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.29	56.0
Approach		116	0.0	0.060	2.6	NA	0.0	0.0	0.00	0.29	56.0
West: Gray Street											
11	T1	152	0.0	0.078	0.4	LOS A	0.4	3.1	0.23	0.01	55.7
12	R2	1	0.0	0.078	8.7	LOS A	0.4	3.1	0.23	0.01	55.7
Approach		153	0.0	0.078	0.4	NA	0.4	3.1	0.23	0.01	55.7
All Vehicles		415	0.0	0.157	4.4	NA	0.6	4.3	0.21	0.33	52.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 6 - Gray Street/Link 9 - PM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

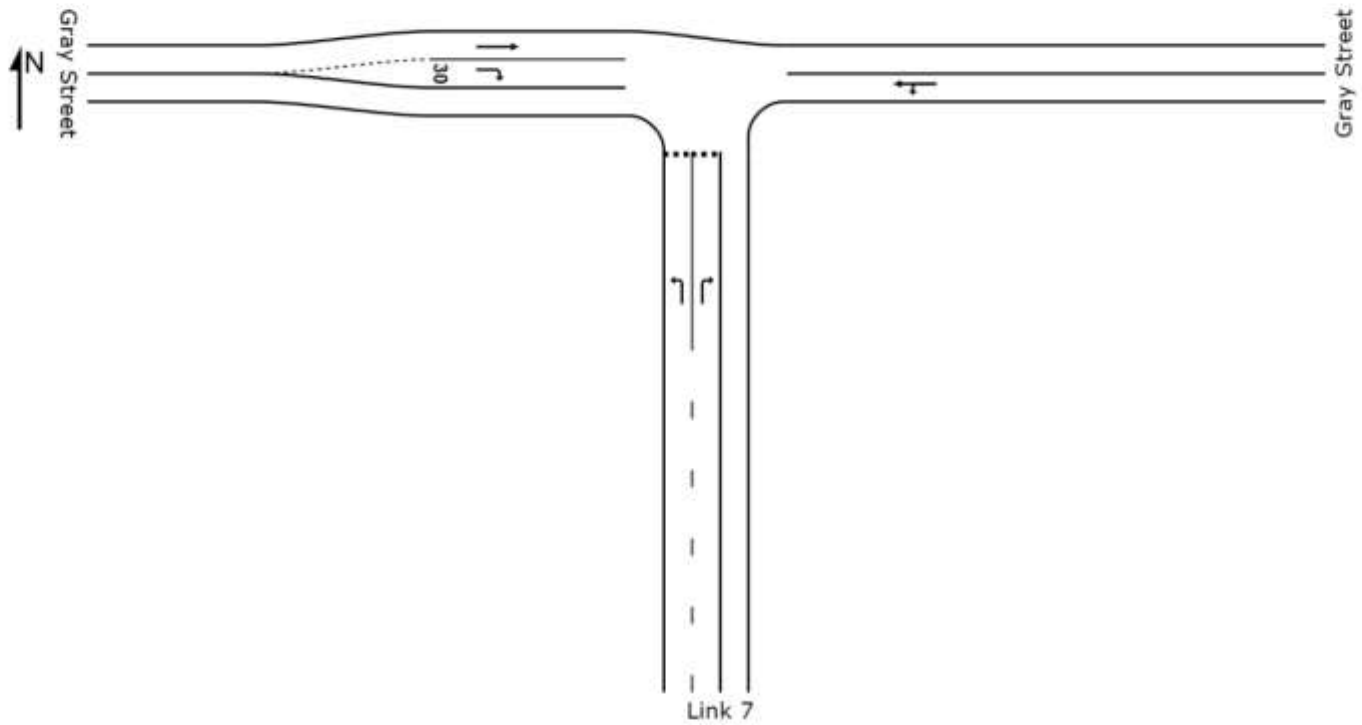
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Link 9											
1	L2	1	0.0	0.001	8.7	LOS A	0.0	0.0	0.22	0.59	48.0
3	R2	73	0.0	0.080	9.8	LOS A	0.3	2.0	0.36	0.70	47.2
Approach		74	0.0	0.080	9.8	LOS A	0.3	2.0	0.36	0.69	47.2
East: Gray Street											
4	L2	109	0.0	0.122	8.2	LOS A	0.0	0.0	0.00	0.39	54.2
5	T1	122	0.0	0.122	0.0	LOS A	0.0	0.0	0.00	0.39	54.2
Approach		232	0.0	0.122	3.9	NA	0.0	0.0	0.00	0.39	54.2
West: Gray Street											
11	T1	84	0.0	0.044	0.7	LOS A	0.3	1.8	0.33	0.01	53.9
12	R2	1	0.0	0.044	9.0	LOS A	0.3	1.8	0.33	0.01	53.9
Approach		85	0.0	0.044	0.8	NA	0.3	1.8	0.33	0.01	53.9
All Vehicles		391	0.0	0.122	4.3	NA	0.3	2.0	0.14	0.37	52.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 7 - Gray Street/Link 7 - AM Existing

Gray Street/Link 7
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - AM Existing

Gray Street/Link 7
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: Link 7											
1	L2	2	0.0	0.002	8.4	LOS A	0.0	0.0	0.14	0.61	48.3
3	R2	2	0.0	0.002	9.0	LOS A	0.0	0.0	0.22	0.62	47.8
Approach		4	0.0	0.002	8.7	LOS A	0.0	0.0	0.18	0.62	48.0
East: Gray Street											
4	L2	2	0.0	0.030	8.2	LOS A	0.0	0.0	0.00	0.04	59.5
5	T1	57	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.04	59.5
Approach		59	0.0	0.030	0.3	NA	0.0	0.0	0.00	0.04	59.5
West: Gray Street											
11	T1	64	0.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	2	0.0	0.001	8.4	LOS A	0.0	0.0	0.14	0.61	48.2
Approach		66	0.0	0.033	0.3	NA	0.0	0.0	0.00	0.02	59.5
All Vehicles		129	0.0	0.033	0.6	NA	0.0	0.0	0.01	0.05	59.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - AM Post Development

Gray Street/Link 7
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: Link 7											
1	L2	682	0.0	0.603	8.8	LOS A	4.5	31.3	0.30	0.61	47.6
3	R2	89	0.0	0.104	10.1	LOS B	0.4	2.7	0.40	0.72	46.8
Approach		772	0.0	0.603	9.0	LOS A	4.5	31.3	0.31	0.62	47.5
East: Gray Street											
4	L2	24	0.0	0.043	8.2	LOS A	0.0	0.0	0.00	0.27	56.3
5	T1	59	0.0	0.043	0.0	LOS A	0.0	0.0	0.00	0.27	56.3
Approach		83	0.0	0.043	2.4	NA	0.0	0.0	0.00	0.27	56.3
West: Gray Street											
11	T1	65	0.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	176	0.0	0.105	8.6	LOS A	0.5	3.5	0.19	0.63	48.0
Approach		241	0.0	0.105	6.2	NA	0.5	3.5	0.14	0.46	50.8
All Vehicles		1096	0.0	0.603	7.9	NA	4.5	31.3	0.25	0.56	48.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - PM Existing

Gray Street/Link 7
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: Link 7											
1	L2	2	0.0	0.002	8.4	LOS A	0.0	0.0	0.14	0.61	48.3
3	R2	2	0.0	0.002	8.8	LOS A	0.0	0.0	0.19	0.63	47.9
Approach		4	0.0	0.002	8.6	LOS A	0.0	0.0	0.17	0.62	48.1
East: Gray Street											
4	L2	2	0.0	0.030	8.2	LOS A	0.0	0.0	0.00	0.04	59.5
5	T1	56	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.04	59.5
Approach		58	0.0	0.030	0.3	NA	0.0	0.0	0.00	0.04	59.5
West: Gray Street											
11	T1	40	0.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	2	0.0	0.001	8.4	LOS A	0.0	0.0	0.14	0.62	48.2
Approach		42	0.0	0.021	0.4	NA	0.0	0.0	0.01	0.03	59.3
All Vehicles		104	0.0	0.030	0.7	NA	0.0	0.0	0.01	0.06	58.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - PM Post Development

Gray Street/Link 7
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

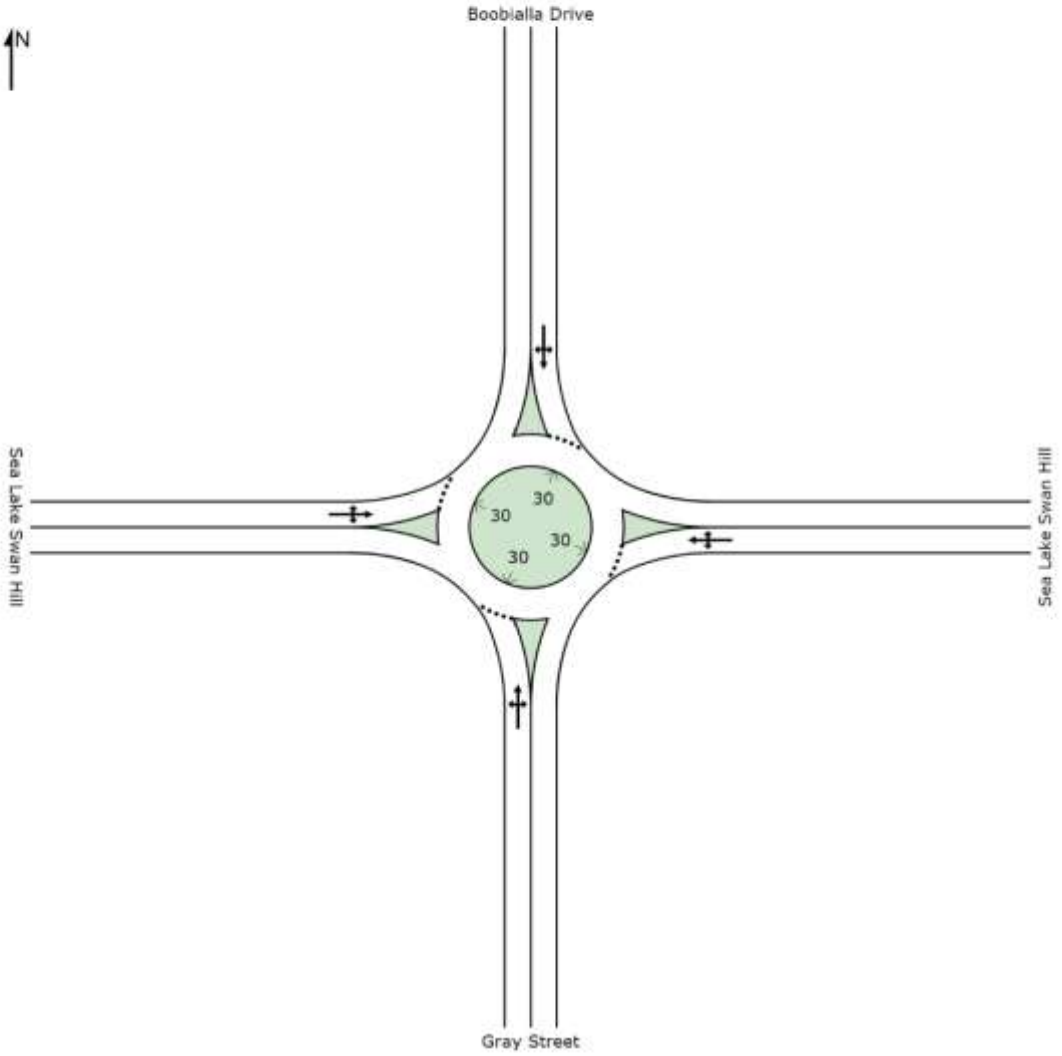
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Link 7											
1	L2	342	0.0	0.302	8.5	LOS A	1.4	9.9	0.19	0.62	48.1
3	R2	46	0.0	0.085	13.1	LOS B	0.3	2.0	0.57	0.85	44.0
Approach		388	0.0	0.302	9.1	LOS A	1.4	9.9	0.23	0.65	47.6
East: Gray Street											
4	L2	68	0.0	0.066	8.2	LOS A	0.0	0.0	0.00	0.44	53.4
5	T1	57	0.0	0.066	0.0	LOS A	0.0	0.0	0.00	0.44	53.4
Approach		125	0.0	0.066	4.5	NA	0.0	0.0	0.00	0.44	53.4
West: Gray Street											
11	T1	41	0.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	524	0.0	0.325	8.8	LOS A	1.9	13.3	0.30	0.63	47.6
Approach		565	0.0	0.325	8.2	NA	1.9	13.3	0.27	0.59	48.3
All Vehicles		1079	0.0	0.325	8.1	NA	1.9	13.3	0.23	0.59	48.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	17	0.0	0.040	5.5	LOS A	0.2	1.3	0.17	1.08	49.1
2	T1	16	0.0	0.040	4.6	LOS A	0.2	1.3	0.17	1.08	49.1
3	R2	24	0.0	0.040	11.4	LOS B	0.2	1.3	0.17	1.08	49.1
Approach		57	0.0	0.040	7.8	LOS A	0.2	1.3	0.17	0.54	49.1
East: Sea Lake Swan Hill											
4	L2	11	0.0	0.046	5.5	LOS A	0.2	1.6	0.17	1.11	48.8
5	T1	23	0.0	0.046	4.6	LOS A	0.2	1.6	0.17	1.11	48.8
6	R2	33	0.0	0.046	11.4	LOS B	0.2	1.6	0.17	1.11	48.8
Approach		66	0.0	0.046	8.1	LOS A	0.2	1.6	0.17	0.55	48.8
North: Boobialla Drive											
7	L2	92	0.0	0.095	5.8	LOS A	0.5	3.3	0.26	0.92	50.6
8	T1	36	0.0	0.095	4.8	LOS A	0.5	3.3	0.26	0.92	50.6
9	R2	2	0.0	0.095	11.7	LOS B	0.5	3.3	0.26	0.92	50.6
Approach		129	0.0	0.095	5.6	LOS A	0.5	3.3	0.26	0.46	50.6
West: Sea Lake Swan Hill											
10	L2	1	0.0	0.067	5.6	LOS A	0.3	2.3	0.19	0.93	50.8
11	T1	77	0.0	0.067	4.6	LOS A	0.3	2.3	0.19	0.93	50.8
12	R2	18	0.0	0.067	11.5	LOS B	0.3	2.3	0.19	0.93	50.8
Approach		96	0.0	0.067	5.9	LOS A	0.3	2.3	0.19	0.46	50.8
All Vehicles		348	0.0	0.095	6.5	LOS A	0.5	3.3	0.21	0.49	50.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Post Development

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	4	0.0	0.524	6.5	LOS A	4.2	29.5	0.51	1.32	44.7
2	T1	16	0.0	0.524	5.5	LOS A	4.2	29.5	0.51	1.32	44.7
3	R2	694	0.0	0.524	12.4	LOS B	4.2	29.5	0.51	1.32	44.7
Approach		714	0.0	0.524	12.2	LOS B	4.2	29.5	0.51	0.66	44.7
East: Sea Lake Swan Hill											
4	L2	183	0.0	0.243	5.7	LOS A	1.7	11.6	0.28	1.09	48.3
5	T1	26	0.0	0.243	4.7	LOS A	1.7	11.6	0.28	1.09	48.3
6	R2	147	0.0	0.243	11.6	LOS B	1.7	11.6	0.28	1.09	48.3
Approach		357	0.0	0.243	8.0	LOS A	1.7	11.6	0.28	0.55	48.3
North: Boobialla Drive											
7	L2	316	0.0	0.494	12.4	LOS B	4.3	30.2	0.90	1.90	44.8
8	T1	53	0.0	0.494	11.4	LOS B	4.3	30.2	0.90	1.90	44.8
9	R2	11	0.0	0.494	18.3	LOS B	4.3	30.2	0.90	1.90	44.8
Approach		379	0.0	0.494	12.4	LOS B	4.3	30.2	0.90	0.95	44.8
West: Sea Lake Swan Hill											
10	L2	11	0.0	0.162	10.5	LOS B	1.1	7.7	0.81	1.56	46.4
11	T1	88	0.0	0.162	9.6	LOS A	1.1	7.7	0.81	1.56	46.4
12	R2	19	0.0	0.162	16.4	LOS B	1.1	7.7	0.81	1.56	46.4
Approach		118	0.0	0.162	10.8	LOS B	1.1	7.7	0.81	0.78	46.4
All Vehicles		1567	0.0	0.524	11.2	LOS B	4.3	30.2	0.57	0.71	45.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - PM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	17	0.0	0.040	5.7	LOS A	0.2	1.3	0.24	1.05	49.2
2	T1	20	0.0	0.040	4.7	LOS A	0.2	1.3	0.24	1.05	49.2
3	R2	19	0.0	0.040	11.6	LOS B	0.2	1.3	0.24	1.05	49.2
Approach		56	0.0	0.040	7.4	LOS A	0.2	1.3	0.24	0.52	49.2
East: Sea Lake Swan Hill											
4	L2	9	0.0	0.075	5.4	LOS A	0.4	2.6	0.12	1.16	48.6
5	T1	39	0.0	0.075	4.5	LOS A	0.4	2.6	0.12	1.16	48.6
6	R2	67	0.0	0.075	11.3	LOS B	0.4	2.6	0.12	1.16	48.6
Approach		116	0.0	0.075	8.5	LOS A	0.4	2.6	0.12	0.58	48.6
North: Boobialla Drive											
7	L2	38	0.0	0.043	5.5	LOS A	0.2	1.4	0.17	0.86	51.5
8	T1	23	0.0	0.043	4.6	LOS A	0.2	1.4	0.17	0.86	51.5
9	R2	1	0.0	0.043	11.4	LOS B	0.2	1.4	0.17	0.86	51.5
Approach		62	0.0	0.043	5.3	LOS A	0.2	1.4	0.17	0.43	51.5
West: Sea Lake Swan Hill											
10	L2	1	0.0	0.027	5.7	LOS A	0.1	0.9	0.23	0.94	50.4
11	T1	28	0.0	0.027	4.7	LOS A	0.1	0.9	0.23	0.94	50.4
12	R2	7	0.0	0.027	11.6	LOS B	0.1	0.9	0.23	0.94	50.4
Approach		37	0.0	0.027	6.1	LOS A	0.1	0.9	0.23	0.47	50.4
All Vehicles		271	0.0	0.075	7.2	LOS A	0.4	2.6	0.17	0.52	49.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - PM Post Development

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

Movement Performance - Vehicles

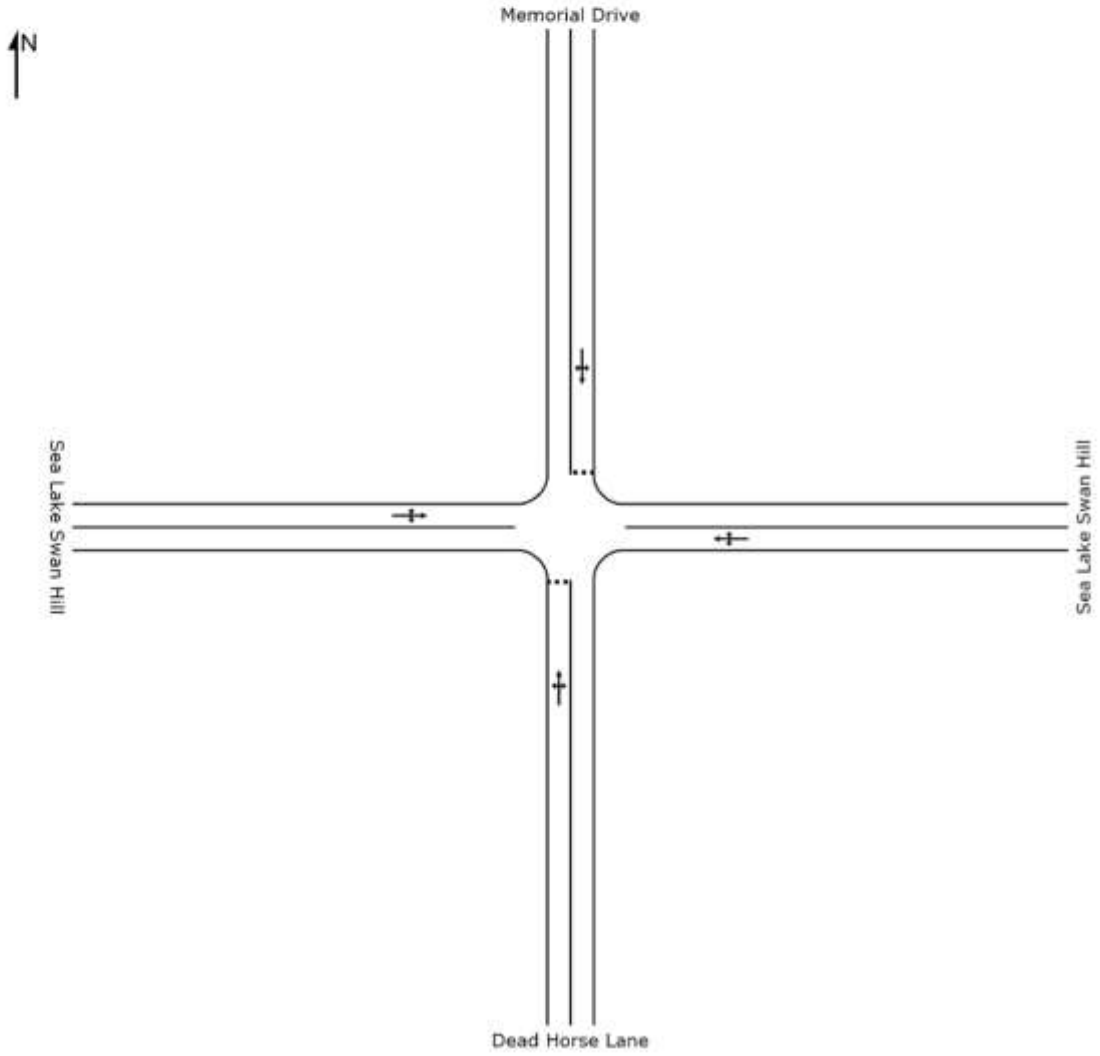
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gray Street											
1	L2	19	0.0	0.419	8.3	LOS A	2.9	20.3	0.69	1.56	44.8
2	T1	63	0.0	0.419	7.3	LOS A	2.9	20.3	0.69	1.56	44.8
3	R2	355	0.0	0.419	14.2	LOS B	2.9	20.3	0.69	1.56	44.8
Approach		437	0.0	0.419	12.9	LOS B	2.9	20.3	0.69	0.78	44.8
East: Sea Lake Swan Hill											
4	L2	526	0.0	0.611	5.6	LOS A	6.5	45.7	0.26	1.06	48.3
5	T1	46	0.0	0.611	4.6	LOS A	6.5	45.7	0.26	1.06	48.3
6	R2	442	0.0	0.611	11.5	LOS B	6.5	45.7	0.26	1.06	48.3
Approach		1015	0.0	0.611	8.1	LOS A	6.5	45.7	0.26	0.53	48.3
North: Boobialla Drive											
7	L2	79	0.0	0.098	7.0	LOS A	0.6	4.0	0.55	1.17	48.6
8	T1	23	0.0	0.098	6.1	LOS A	0.6	4.0	0.55	1.17	48.6
9	R2	3	0.0	0.098	12.9	LOS B	0.6	4.0	0.55	1.17	48.6
Approach		105	0.0	0.098	7.0	LOS A	0.6	4.0	0.55	0.59	48.6
West: Sea Lake Swan Hill											
10	L2	32	0.0	0.101	10.4	LOS B	0.7	4.6	0.78	1.48	46.4
11	T1	34	0.0	0.101	9.4	LOS A	0.7	4.6	0.78	1.48	46.4
12	R2	11	0.0	0.101	16.3	LOS B	0.7	4.6	0.78	1.48	46.4
Approach		76	0.0	0.101	10.8	LOS B	0.7	4.6	0.78	0.74	46.4
All Vehicles		1633	0.0	0.611	9.4	LOS A	6.5	45.7	0.42	0.61	47.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - AM Existing

Swan Hill Road/Dead Horse Lane/Memorial Drive
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - AM Existing

Swan Hill Road/Dead Horse Lane/Memorial Drive
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
1	L2	2	0.0	0.006	8.7	LOS A	0.0	0.1	0.16	0.61	48.6
2	T1	2	0.0	0.006	7.4	LOS A	0.0	0.1	0.16	0.61	48.6
3	R2	2	0.0	0.006	8.9	LOS A	0.0	0.1	0.16	0.61	48.6
Approach		6	0.0	0.006	8.4	LOS A	0.0	0.1	0.16	0.61	48.6
East: Sea Lake Swan Hill											
4	L2	2	0.0	0.027	8.5	LOS A	0.1	1.0	0.20	0.15	54.7
5	T1	42	0.0	0.027	0.3	LOS A	0.1	1.0	0.20	0.15	54.7
6	R2	6	0.0	0.027	8.7	LOS A	0.1	1.0	0.20	0.15	54.7
Approach		51	0.0	0.027	1.7	NA	0.1	1.0	0.20	0.15	54.7
North: Memorial Drive											
7	L2	12	0.0	0.015	8.7	LOS A	0.1	0.4	0.20	0.61	48.2
8	T1	2	0.0	0.015	7.4	LOS A	0.1	0.4	0.20	0.61	48.2
9	R2	2	0.0	0.015	8.9	LOS A	0.1	0.4	0.20	0.61	48.2
Approach		16	0.0	0.015	8.5	LOS A	0.1	0.4	0.20	0.61	48.2
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.052	8.3	LOS A	0.3	1.9	0.13	0.04	57.1
11	T1	96	0.0	0.052	0.1	LOS A	0.3	1.9	0.13	0.04	57.1
12	R2	2	0.0	0.052	8.6	LOS A	0.3	1.9	0.13	0.04	57.1
Approach		100	0.0	0.052	0.5	NA	0.3	1.9	0.13	0.04	57.1
All Vehicles		173	0.0	0.052	1.8	NA	0.3	1.9	0.16	0.15	55.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - AM Post Development

Swan Hill Road/Dead Horse Lane/Memorial Drive
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
1	L2	17	0.0	0.023	8.6	LOS A	0.1	0.6	0.14	0.63	48.4
2	T1	2	0.0	0.023	7.3	LOS A	0.1	0.6	0.14	0.63	48.4
3	R2	6	0.0	0.023	8.9	LOS A	0.1	0.6	0.14	0.63	48.4
Approach		25	0.0	0.023	8.6	LOS A	0.1	0.6	0.14	0.63	48.4
East: Sea Lake Swan Hill											
4	L2	3	0.0	0.032	8.5	LOS A	0.2	1.2	0.21	0.14	54.6
5	T1	51	0.0	0.032	0.3	LOS A	0.2	1.2	0.21	0.14	54.6
6	R2	6	0.0	0.032	8.8	LOS A	0.2	1.2	0.21	0.14	54.6
Approach		60	0.0	0.032	1.6	NA	0.2	1.2	0.21	0.14	54.6
North: Memorial Drive											
7	L2	12	0.0	0.015	8.7	LOS A	0.1	0.4	0.22	0.61	48.1
8	T1	2	0.0	0.015	7.5	LOS A	0.1	0.4	0.22	0.61	48.1
9	R2	2	0.0	0.015	9.0	LOS A	0.1	0.4	0.22	0.61	48.1
Approach		16	0.0	0.015	8.6	LOS A	0.1	0.4	0.22	0.61	48.1
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.059	8.3	LOS A	0.3	2.2	0.14	0.07	56.5
11	T1	106	0.0	0.059	0.2	LOS A	0.3	2.2	0.14	0.07	56.5
12	R2	6	0.0	0.059	8.6	LOS A	0.3	2.2	0.14	0.07	56.5
Approach		115	0.0	0.059	0.8	NA	0.3	2.2	0.14	0.07	56.5
All Vehicles		216	0.0	0.059	2.5	NA	0.3	2.2	0.17	0.20	54.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - PM Existing

Swan Hill Road/Dead Horse Lane/Memorial Drive
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: Dead Horse Lane											
1	L2	2	0.0	0.006	8.6	LOS A	0.0	0.1	0.17	0.60	48.5
2	T1	2	0.0	0.006	7.3	LOS A	0.0	0.1	0.17	0.60	48.5
3	R2	2	0.0	0.006	8.8	LOS A	0.0	0.1	0.17	0.60	48.5
Approach		6	0.0	0.006	8.2	LOS A	0.0	0.1	0.17	0.60	48.5
East: Sea Lake Swan Hill											
4	L2	2	0.0	0.037	8.3	LOS A	0.2	1.3	0.12	0.18	55.6
5	T1	56	0.0	0.037	0.1	LOS A	0.2	1.3	0.12	0.18	55.6
6	R2	12	0.0	0.037	8.6	LOS A	0.2	1.3	0.12	0.18	55.6
Approach		69	0.0	0.037	1.8	NA	0.2	1.3	0.12	0.18	55.6
North: Memorial Drive											
7	L2	6	0.0	0.009	8.5	LOS A	0.0	0.2	0.12	0.62	48.6
8	T1	2	0.0	0.009	7.2	LOS A	0.0	0.2	0.12	0.62	48.6
9	R2	2	0.0	0.009	8.7	LOS A	0.0	0.2	0.12	0.62	48.6
Approach		11	0.0	0.009	8.3	LOS A	0.0	0.2	0.12	0.62	48.6
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.021	8.3	LOS A	0.1	0.8	0.14	0.10	56.2
11	T1	37	0.0	0.021	0.2	LOS A	0.1	0.8	0.14	0.10	56.2
12	R2	2	0.0	0.021	8.6	LOS A	0.1	0.8	0.14	0.10	56.2
Approach		41	0.0	0.021	1.0	NA	0.1	0.8	0.14	0.10	56.2
All Vehicles		127	0.0	0.037	2.4	NA	0.2	1.3	0.13	0.21	54.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - PM Post Development

Swan Hill Road/Dead Horse Lane/Memorial Drive
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

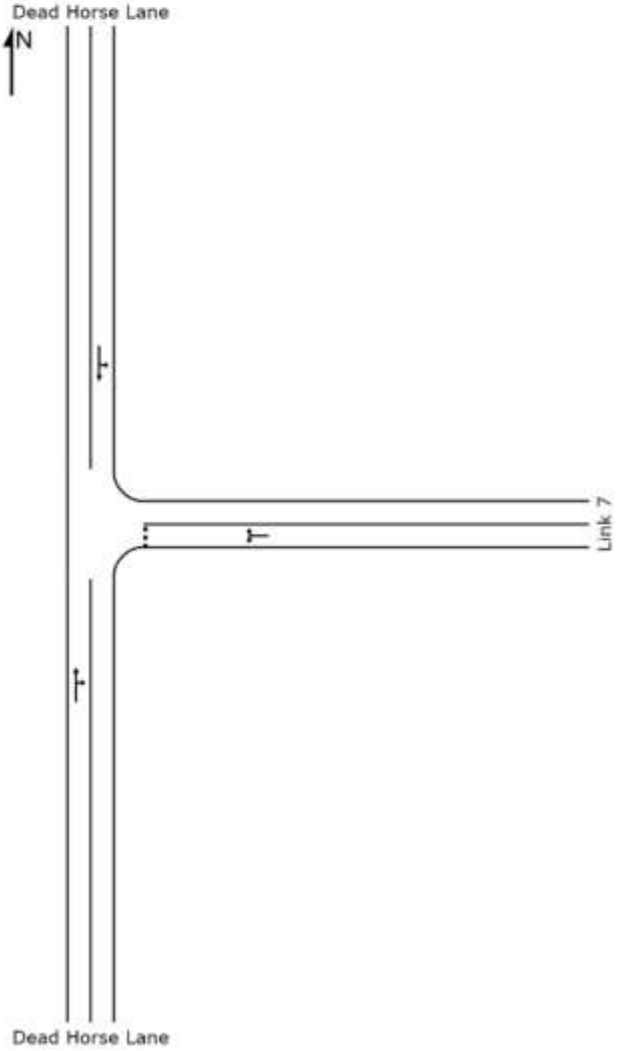
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
1	L2	9	0.0	0.014	8.6	LOS A	0.1	0.4	0.17	0.62	48.3
2	T1	2	0.0	0.014	7.3	LOS A	0.1	0.4	0.17	0.62	48.3
3	R2	4	0.0	0.014	8.9	LOS A	0.1	0.4	0.17	0.62	48.3
Approach		16	0.0	0.014	8.5	LOS A	0.1	0.4	0.17	0.62	48.3
East: Sea Lake Swan Hill											
4	L2	5	0.0	0.042	8.3	LOS A	0.2	1.5	0.13	0.19	55.3
5	T1	63	0.0	0.042	0.1	LOS A	0.2	1.5	0.13	0.19	55.3
6	R2	12	0.0	0.042	8.6	LOS A	0.2	1.5	0.13	0.19	55.3
Approach		80	0.0	0.042	1.9	NA	0.2	1.5	0.13	0.19	55.3
North: Memorial Drive											
7	L2	6	0.0	0.010	8.5	LOS A	0.0	0.2	0.13	0.62	48.6
8	T1	2	0.0	0.010	7.3	LOS A	0.0	0.2	0.13	0.62	48.6
9	R2	2	0.0	0.010	8.8	LOS A	0.0	0.2	0.13	0.62	48.6
Approach		11	0.0	0.010	8.3	LOS A	0.0	0.2	0.13	0.62	48.6
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.032	8.4	LOS A	0.2	1.1	0.16	0.23	54.3
11	T1	44	0.0	0.032	0.2	LOS A	0.2	1.1	0.16	0.23	54.3
12	R2	14	0.0	0.032	8.6	LOS A	0.2	1.1	0.16	0.23	54.3
Approach		60	0.0	0.032	2.4	NA	0.2	1.1	0.16	0.23	54.3
All Vehicles		166	0.0	0.042	3.1	NA	0.2	1.5	0.14	0.27	53.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: INT 11 - Dead Horse Lane/Link 7 - AM Post Development

Dead Horse Lane/Link 7
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 11 - Dead Horse Lane/Link 7 - AM Post Development

Dead Horse Lane/Link 7
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: Dead Horse Lane											
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.03	0.42	53.4
3	R2	1	0.0	0.001	8.5	LOS A	0.0	0.0	0.03	0.42	53.4
Approach		2	0.0	0.001	4.2	NA	0.0	0.0	0.03	0.42	53.4
East: Link 7											
4	L2	1	0.0	0.015	8.2	LOS A	0.0	0.3	0.02	0.69	48.5
6	R2	19	0.0	0.015	8.5	LOS A	0.0	0.3	0.02	0.69	48.5
Approach		20	0.0	0.015	8.4	LOS A	0.0	0.3	0.02	0.69	48.5
North: Dead Horse Lane											
7	L2	4	0.0	0.003	8.2	LOS A	0.0	0.0	0.00	0.58	50.8
8	T1	1	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.58	50.8
Approach		5	0.0	0.003	6.5	NA	0.0	0.0	0.00	0.58	50.8
All Vehicles		27	0.0	0.015	7.8	NA	0.0	0.3	0.02	0.64	49.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 11 - Dead Horse Lane/Link 7 - PM Post Development

Dead Horse Lane/Link 7
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

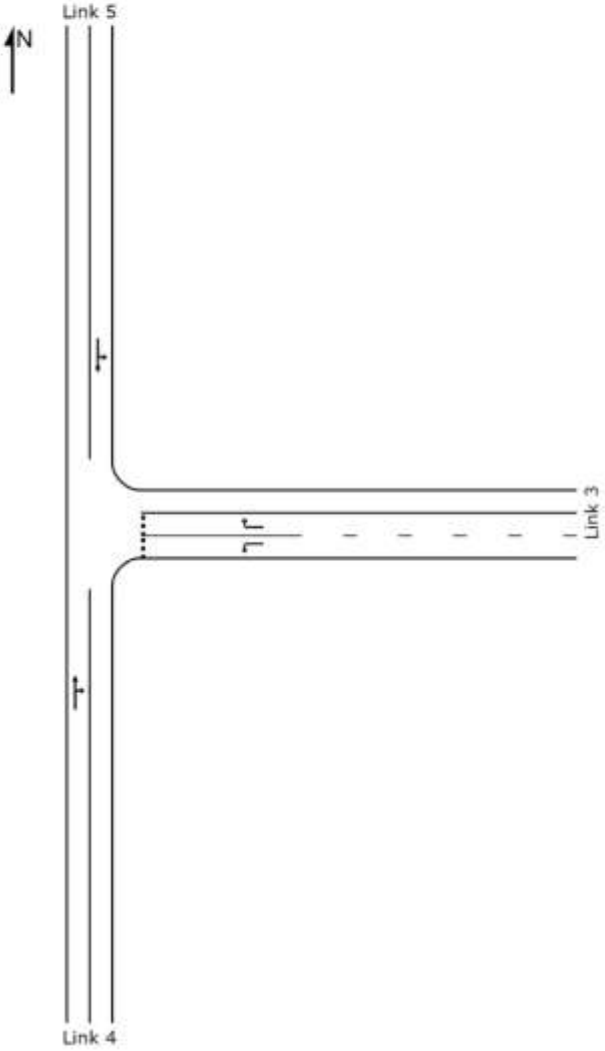
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.06	0.41	53.1
3	R2	1	0.0	0.001	8.5	LOS A	0.0	0.0	0.06	0.41	53.1
Approach		2	0.0	0.001	4.3	NA	0.0	0.0	0.06	0.41	53.1
East: Link 7											
4	L2	1	0.0	0.008	8.2	LOS A	0.0	0.2	0.02	0.68	48.5
6	R2	9	0.0	0.008	8.5	LOS A	0.0	0.2	0.02	0.68	48.5
Approach		11	0.0	0.008	8.4	LOS A	0.0	0.2	0.02	0.68	48.5
North: Dead Horse Lane											
7	L2	14	0.0	0.008	8.2	LOS A	0.0	0.0	0.00	0.64	49.6
8	T1	1	0.0	0.008	0.0	LOS A	0.0	0.0	0.00	0.64	49.6
Approach		15	0.0	0.008	7.6	NA	0.0	0.0	0.00	0.64	49.6
All Vehicles		27	0.0	0.008	7.7	NA	0.0	0.2	0.01	0.64	49.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: INT 12 (1) - Link3/Link 4//Link 5 - AM Post Development

Link3/Link 4//Link 5
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: INT 12 (1) - Link3/Link 4//Link 5 - AM Post Development

Link3/Link 4//Link 5
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: Link 4											
2	T1	286	0.0	0.263	0.5	LOS A	1.7	11.8	0.26	0.28	52.4
3	R2	148	0.0	0.263	8.8	LOS A	1.7	11.8	0.26	0.28	52.4
Approach		435	0.0	0.263	3.4	NA	1.7	11.8	0.26	0.28	52.4
East: Link 3											
4	L2	37	0.0	0.024	8.4	LOS A	0.1	0.7	0.15	0.61	48.3
6	R2	12	0.0	0.015	10.7	LOS B	0.0	0.3	0.44	0.72	46.3
Approach		48	0.0	0.024	8.9	LOS A	0.1	0.7	0.22	0.64	47.8
North: Link 5											
7	L2	31	0.0	0.053	8.2	LOS A	0.0	0.0	0.00	0.27	56.2
8	T1	72	0.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.27	56.2
Approach		102	0.0	0.053	2.5	NA	0.0	0.0	0.00	0.27	56.2
All Vehicles		585	0.0	0.263	3.7	NA	1.7	11.8	0.21	0.31	52.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 12 (1) - Link3/Link 4//Link 5 - PM Post Development

Link3/Link 4//Link 5
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

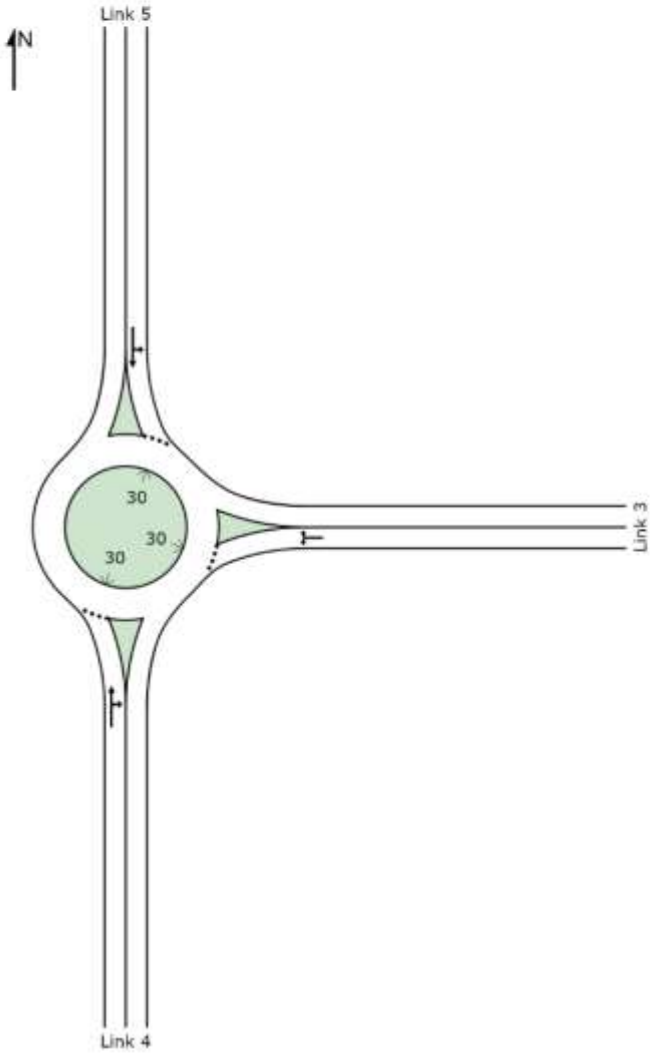
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Link 4											
2	T1	143	0.0	0.139	1.1	LOS A	0.8	5.7	0.36	0.28	51.2
3	R2	74	0.0	0.139	9.4	LOS A	0.8	5.7	0.36	0.28	51.2
Approach		217	0.0	0.139	3.9	NA	0.8	5.7	0.36	0.28	51.2
East: Link 3											
4	L2	112	0.0	0.082	8.9	LOS A	0.3	2.3	0.30	0.64	47.6
6	R2	24	0.0	0.028	10.2	LOS B	0.1	0.6	0.40	0.71	46.8
Approach		136	0.0	0.082	9.1	LOS A	0.3	2.3	0.32	0.65	47.5
North: Link 5											
7	L2	18	0.0	0.120	8.2	LOS A	0.0	0.0	0.00	0.08	59.0
8	T1	215	0.0	0.120	0.0	LOS A	0.0	0.0	0.00	0.08	59.0
Approach		233	0.0	0.120	0.6	NA	0.0	0.0	0.00	0.08	59.0
All Vehicles		585	0.0	0.139	3.8	NA	0.8	5.7	0.21	0.29	53.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 12 (2) - Link3/Link 4//Link 5 - AM Post Development

Link3/Link 4//Link 5
Roundabout



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: INT 12 (2) - Link3/Link 4//Link 5 - AM Post Development

Link3/Link 4//Link 5
Roundabout

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: Link 4											
2	T1	286	0.0	0.253	4.4	LOS A	1.8	12.5	0.09	1.03	50.4
3	R2	148	0.0	0.253	11.3	LOS B	1.8	12.5	0.09	1.03	50.4
Approach		435	0.0	0.253	6.7	LOS A	1.8	12.5	0.09	0.51	50.4
East: Link 3											
4	L2	37	0.0	0.035	5.6	LOS A	0.2	1.4	0.23	1.00	49.5
6	R2	12	0.0	0.035	11.5	LOS B	0.2	1.4	0.23	1.00	49.5
Approach		48	0.0	0.035	7.0	LOS A	0.2	1.4	0.23	0.50	49.5
North: Link 5											
7	L2	31	0.0	0.078	6.0	LOS A	0.4	3.0	0.33	0.89	50.7
8	T1	72	0.0	0.078	5.1	LOS A	0.4	3.0	0.33	0.89	50.7
Approach		102	0.0	0.078	5.3	LOS A	0.4	3.0	0.33	0.44	50.7
All Vehicles		585	0.0	0.253	6.5	LOS A	1.8	12.5	0.14	0.50	50.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 12 (2) - Link3/Link 4//Link 5 - PM Post Development

Link3/Link 4//Link 5
Roundabout

Movement Performance - Vehicles

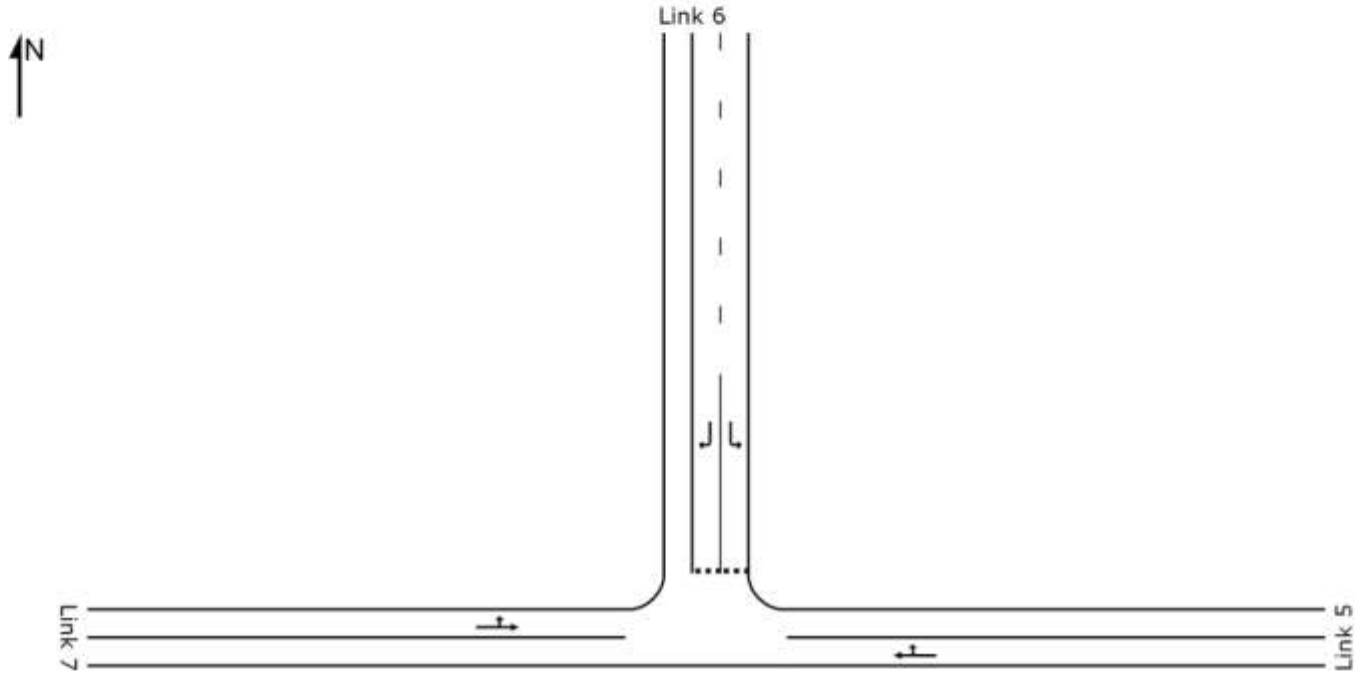
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Link 4											
2	T1	143	0.0	0.136	4.5	LOS A	0.9	6.2	0.13	1.01	50.1
3	R2	74	0.0	0.136	11.3	LOS B	0.9	6.2	0.13	1.01	50.1
Approach		217	0.0	0.136	6.8	LOS A	0.9	6.2	0.13	0.51	50.1
East: Link 3											
4	L2	112	0.0	0.110	6.4	LOS A	0.7	4.6	0.42	1.09	48.6
6	R2	24	0.0	0.110	12.3	LOS B	0.7	4.6	0.42	1.09	48.6
Approach		136	0.0	0.110	7.4	LOS A	0.7	4.6	0.42	0.55	48.6
North: Link 5											
7	L2	18	0.0	0.159	5.6	LOS A	1.0	6.8	0.24	0.81	51.6
8	T1	215	0.0	0.159	4.7	LOS A	1.0	6.8	0.24	0.81	51.6
Approach		233	0.0	0.159	4.8	LOS A	1.0	6.8	0.24	0.40	51.6
All Vehicles		585	0.0	0.159	6.1	LOS A	1.0	6.8	0.24	0.47	50.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 13 - Link 5/Link 6/ Link 7 - AM Post Development

Link 5/Link 6/ Link 7
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 13 - Link 5/Link 6/ Link 7 - AM Post Development

Link 5/Link 6/ Link 7
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
East: Link 5											
5	T1	13	0.0	0.229	0.8	LOS A	1.2	8.3	0.35	0.63	47.6
6	R2	334	0.0	0.229	9.1	LOS A	1.2	8.3	0.35	0.63	47.6
Approach		346	0.0	0.229	8.8	NA	1.2	8.3	0.35	0.63	47.6
North: Link 6											
7	L2	85	0.0	0.052	8.2	LOS A	0.2	1.5	0.03	0.65	48.8
9	R2	97	0.0	0.115	10.5	LOS B	0.4	2.7	0.43	0.77	46.5
Approach		182	0.0	0.115	9.4	LOS A	0.4	2.7	0.24	0.71	47.6
West: Link 7											
10	L2	195	0.0	0.108	8.2	LOS A	0.0	0.0	0.00	0.66	49.2
11	T1	5	0.0	0.108	0.0	LOS A	0.0	0.0	0.00	0.66	49.2
Approach		200	0.0	0.108	8.0	NA	0.0	0.0	0.00	0.66	49.2
All Vehicles		728	0.0	0.229	8.7	NA	1.2	8.3	0.23	0.66	48.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 13 - Link 5/Link 6/ Link 7 - PM Post Development

Link 5/Link 6/ Link 7
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
East: Link 5											
5	T1	7	0.0	0.107	0.3	LOS A	0.5	3.6	0.22	0.61	48.2
6	R2	168	0.0	0.107	8.6	LOS A	0.5	3.6	0.22	0.61	48.2
Approach		176	0.0	0.107	8.3	NA	0.5	3.6	0.22	0.61	48.2
North: Link 6											
7	L2	251	0.0	0.154	8.2	LOS A	0.7	4.9	0.05	0.64	48.7
9	R2	131	0.0	0.124	9.4	LOS A	0.4	3.0	0.30	0.69	47.4
Approach		381	0.0	0.154	8.6	LOS A	0.7	4.9	0.14	0.66	48.3
West: Link 7											
10	L2	98	0.0	0.058	8.2	LOS A	0.0	0.0	0.00	0.63	49.8
11	T1	9	0.0	0.058	0.0	LOS A	0.0	0.0	0.00	0.63	49.8
Approach		107	0.0	0.058	7.5	NA	0.0	0.0	0.00	0.63	49.8
All Vehicles		664	0.0	0.154	8.3	NA	0.7	4.9	0.14	0.64	48.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

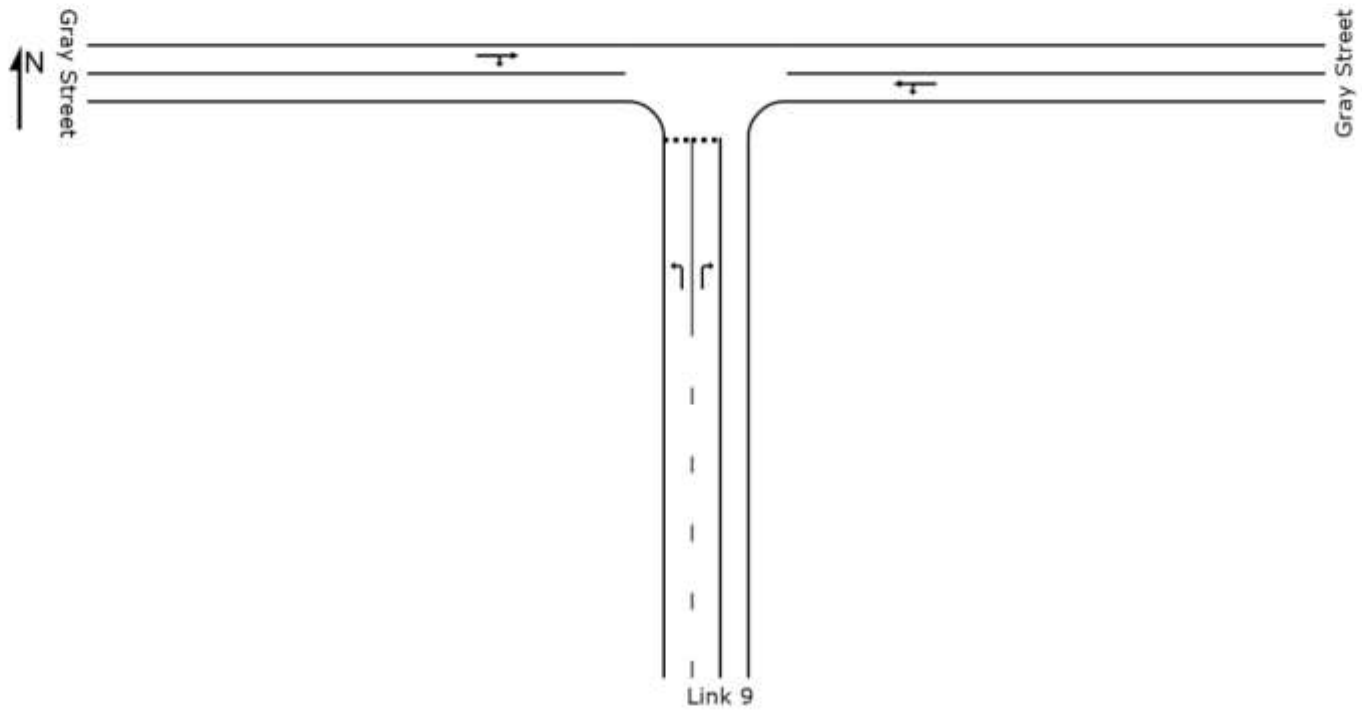
APPENDIX B

CAPACITY ANALYSIS RESULTS
OPTION 2 - DEAD HORSE LANE LINK

SITE LAYOUT

Site: INT 6 - Gray Street/Link 9- AM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 6 - Gray Street/Link 9- AM Post Development

Gray Street/Yana Street
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: Link 9											
1	L2	1	0.0	0.001	8.4	LOS A	0.0	0.0	0.15	0.60	48.3
3	R2	145	0.0	0.147	9.5	LOS A	0.6	4.0	0.32	0.68	47.4
Approach		146	0.0	0.147	9.5	LOS A	0.6	4.0	0.32	0.68	47.4
East: Gray Street											
4	L2	36	0.0	0.054	8.2	LOS A	0.0	0.0	0.00	0.31	55.6
5	T1	67	0.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.31	55.6
Approach		103	0.0	0.054	2.8	NA	0.0	0.0	0.00	0.31	55.6
West: Gray Street											
11	T1	105	0.0	0.055	0.3	LOS A	0.3	2.1	0.21	0.01	56.0
12	R2	1	0.0	0.055	8.6	LOS A	0.3	2.1	0.21	0.01	56.0
Approach		106	0.0	0.055	0.4	NA	0.3	2.1	0.21	0.01	56.0
All Vehicles		356	0.0	0.147	4.8	NA	0.6	4.0	0.19	0.37	52.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 6 - Gray Street/Link 9- PM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)

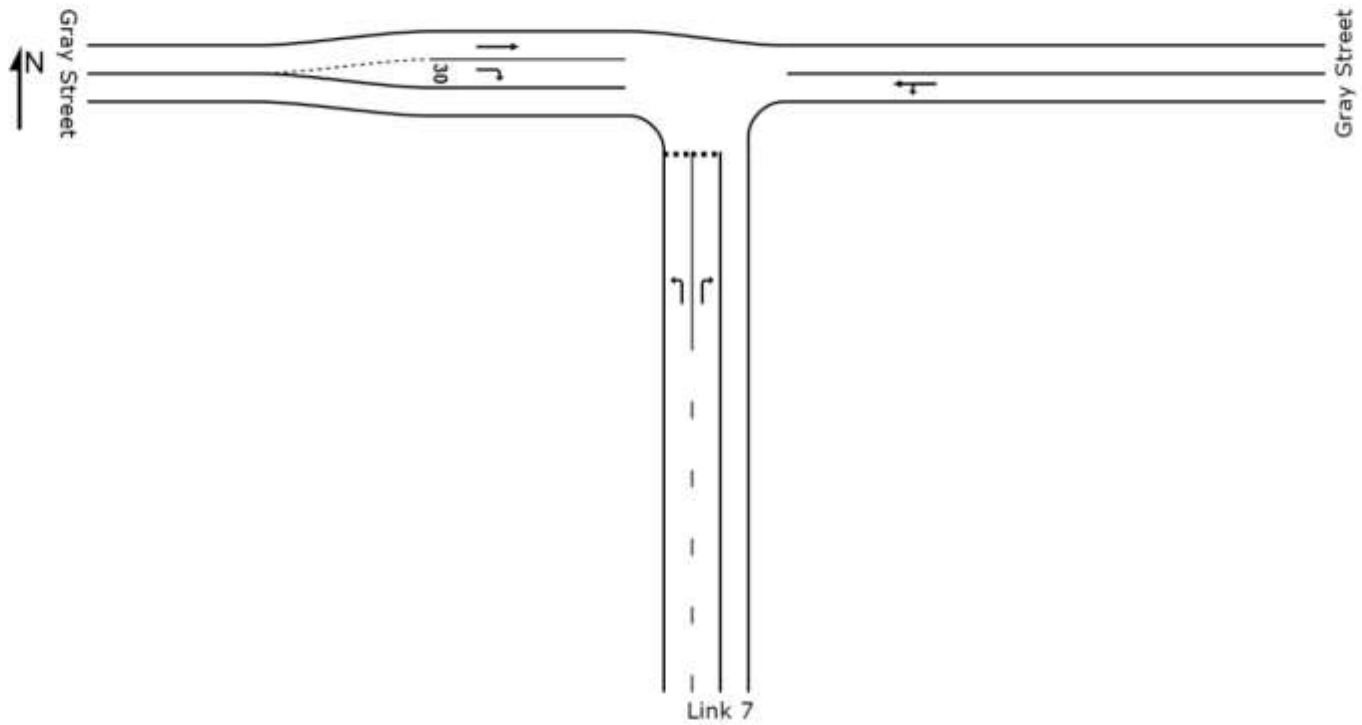
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Link 9											
1	L2	1	0.0	0.001	8.5	LOS A	0.0	0.0	0.18	0.60	48.2
3	R2	73	0.0	0.075	9.5	LOS A	0.3	1.9	0.31	0.68	47.4
Approach		74	0.0	0.075	9.5	LOS A	0.3	1.9	0.31	0.67	47.4
East: Gray Street											
4	L2	109	0.0	0.103	8.2	LOS A	0.0	0.0	0.00	0.45	53.3
5	T1	86	0.0	0.103	0.0	LOS A	0.0	0.0	0.00	0.45	53.3
Approach		196	0.0	0.103	4.6	NA	0.0	0.0	0.00	0.45	53.3
West: Gray Street											
11	T1	61	0.0	0.032	0.6	LOS A	0.2	1.3	0.30	0.02	54.4
12	R2	1	0.0	0.032	8.9	LOS A	0.2	1.3	0.30	0.02	54.4
Approach		62	0.0	0.032	0.7	NA	0.2	1.3	0.30	0.02	54.4
All Vehicles		332	0.0	0.103	4.9	NA	0.3	1.9	0.12	0.42	52.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 7 - Gray Street/Link 7 - AM Existing

Gray Street/Link 7
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - AM Existing

Gray Street/Link 7
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: Link 7											
1	L2	2	0.0	0.002	8.4	LOS A	0.0	0.0	0.14	0.61	48.3
3	R2	2	0.0	0.002	9.0	LOS A	0.0	0.0	0.22	0.62	47.8
Approach		4	0.0	0.002	8.7	LOS A	0.0	0.0	0.18	0.62	48.0
East: Gray Street											
4	L2	2	0.0	0.030	8.2	LOS A	0.0	0.0	0.00	0.04	59.5
5	T1	57	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.04	59.5
Approach		59	0.0	0.030	0.3	NA	0.0	0.0	0.00	0.04	59.5
West: Gray Street											
11	T1	64	0.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	2	0.0	0.001	8.4	LOS A	0.0	0.0	0.14	0.61	48.2
Approach		66	0.0	0.033	0.3	NA	0.0	0.0	0.00	0.02	59.5
All Vehicles		129	0.0	0.033	0.6	NA	0.0	0.0	0.01	0.05	59.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - AM Post Development

Gray Street/Link 7
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: Link 7											
1	L2	429	0.0	0.380	8.6	LOS A	2.0	13.7	0.21	0.62	48.0
3	R2	43	0.0	0.046	9.6	LOS A	0.2	1.2	0.33	0.68	47.3
Approach		473	0.0	0.380	8.7	LOS A	2.0	13.7	0.22	0.63	48.0
East: Gray Street											
4	L2	13	0.0	0.037	8.2	LOS A	0.0	0.0	0.00	0.17	57.7
5	T1	59	0.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.17	57.7
Approach		72	0.0	0.037	1.4	NA	0.0	0.0	0.00	0.17	57.7
West: Gray Street											
11	T1	65	0.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	113	0.0	0.067	8.5	LOS A	0.3	2.2	0.17	0.62	48.1
Approach		178	0.0	0.067	5.4	NA	0.3	2.2	0.11	0.40	51.9
All Vehicles		722	0.0	0.380	7.2	NA	2.0	13.7	0.17	0.52	49.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - PM Existing

Gray Street/Link 7
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: Link 7											
1	L2	2	0.0	0.002	8.4	LOS A	0.0	0.0	0.14	0.61	48.3
3	R2	2	0.0	0.002	8.8	LOS A	0.0	0.0	0.19	0.63	47.9
Approach		4	0.0	0.002	8.6	LOS A	0.0	0.0	0.17	0.62	48.1
East: Gray Street											
4	L2	2	0.0	0.030	8.2	LOS A	0.0	0.0	0.00	0.04	59.5
5	T1	56	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.04	59.5
Approach		58	0.0	0.030	0.3	NA	0.0	0.0	0.00	0.04	59.5
West: Gray Street											
11	T1	40	0.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	2	0.0	0.001	8.4	LOS A	0.0	0.0	0.14	0.62	48.2
Approach		42	0.0	0.021	0.4	NA	0.0	0.0	0.01	0.03	59.3
All Vehicles		104	0.0	0.030	0.7	NA	0.0	0.0	0.01	0.06	58.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 7 - PM Post Development

Gray Street/Link 7
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

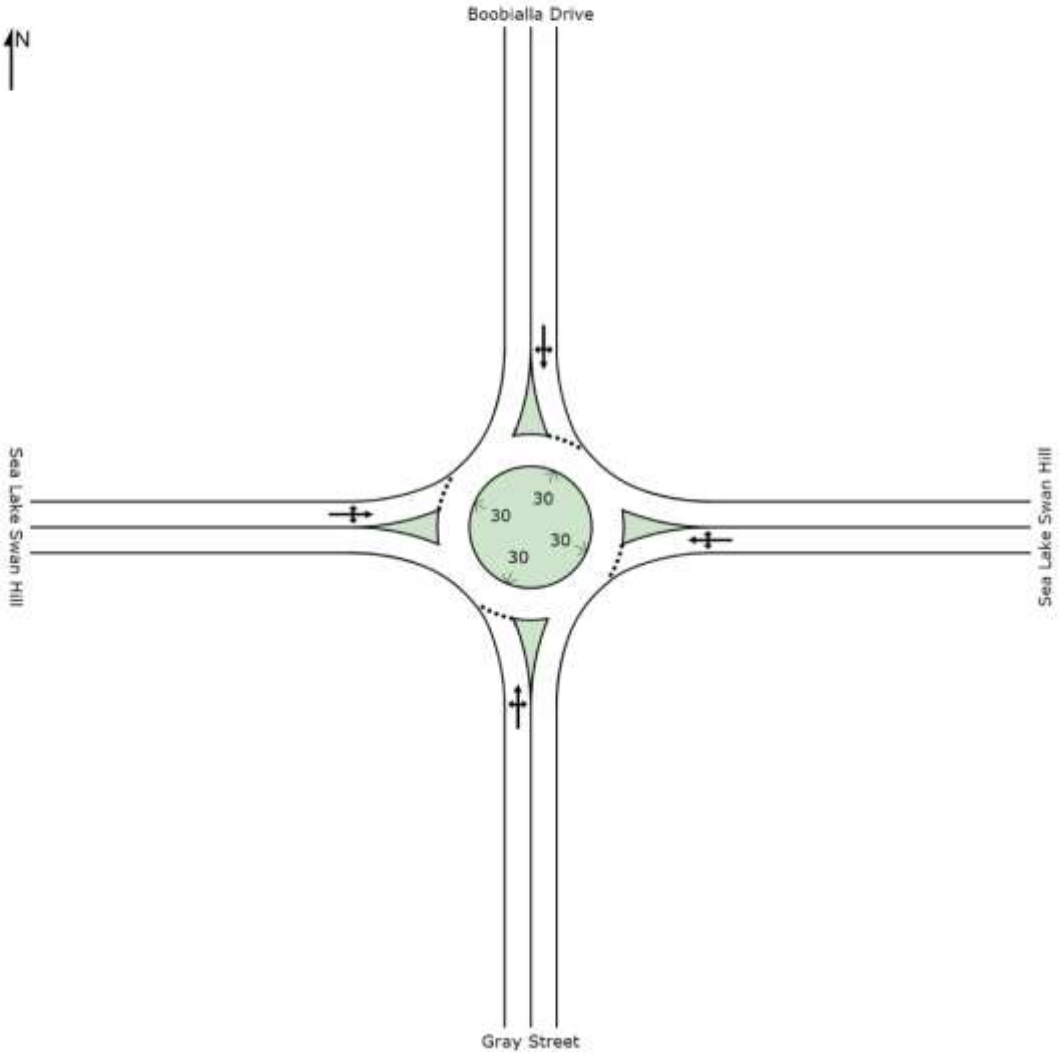
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Link 7											
1	L2	216	0.0	0.190	8.5	LOS A	0.8	5.5	0.17	0.62	48.2
3	R2	23	0.0	0.032	11.0	LOS B	0.1	0.8	0.46	0.73	46.0
Approach		239	0.0	0.190	8.7	LOS A	0.8	5.5	0.19	0.63	48.0
East: Gray Street											
4	L2	33	0.0	0.047	8.2	LOS A	0.0	0.0	0.00	0.32	55.4
5	T1	57	0.0	0.047	0.0	LOS A	0.0	0.0	0.00	0.32	55.4
Approach		89	0.0	0.047	3.0	NA	0.0	0.0	0.00	0.32	55.4
West: Gray Street											
11	T1	41	0.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	334	0.0	0.200	8.6	LOS A	1.0	7.3	0.22	0.63	47.9
Approach		375	0.0	0.200	7.7	NA	1.0	7.3	0.19	0.56	49.0
All Vehicles		703	0.0	0.200	7.4	NA	1.0	7.3	0.17	0.55	49.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	17	0.0	0.040	5.5	LOS A	0.2	1.3	0.17	1.08	49.1
2	T1	16	0.0	0.040	4.6	LOS A	0.2	1.3	0.17	1.08	49.1
3	R2	24	0.0	0.040	11.4	LOS B	0.2	1.3	0.17	1.08	49.1
Approach		57	0.0	0.040	7.8	LOS A	0.2	1.3	0.17	0.54	49.1
East: Sea Lake Swan Hill											
4	L2	11	0.0	0.046	5.5	LOS A	0.2	1.6	0.17	1.11	48.8
5	T1	23	0.0	0.046	4.6	LOS A	0.2	1.6	0.17	1.11	48.8
6	R2	33	0.0	0.046	11.4	LOS B	0.2	1.6	0.17	1.11	48.8
Approach		66	0.0	0.046	8.1	LOS A	0.2	1.6	0.17	0.55	48.8
North: Boobialla Drive											
7	L2	92	0.0	0.095	5.8	LOS A	0.5	3.3	0.26	0.92	50.6
8	T1	36	0.0	0.095	4.8	LOS A	0.5	3.3	0.26	0.92	50.6
9	R2	2	0.0	0.095	11.7	LOS B	0.5	3.3	0.26	0.92	50.6
Approach		129	0.0	0.095	5.6	LOS A	0.5	3.3	0.26	0.46	50.6
West: Sea Lake Swan Hill											
10	L2	1	0.0	0.067	5.6	LOS A	0.3	2.3	0.19	0.93	50.8
11	T1	77	0.0	0.067	4.6	LOS A	0.3	2.3	0.19	0.93	50.8
12	R2	18	0.0	0.067	11.5	LOS B	0.3	2.3	0.19	0.93	50.8
Approach		96	0.0	0.067	5.9	LOS A	0.3	2.3	0.19	0.46	50.8
All Vehicles		348	0.0	0.095	6.5	LOS A	0.5	3.3	0.21	0.49	50.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Post Development

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	19	0.0	0.391	6.6	LOS A	2.7	18.6	0.49	1.36	45.0
2	T1	16	0.0	0.391	5.7	LOS A	2.7	18.6	0.49	1.36	45.0
3	R2	466	0.0	0.391	12.5	LOS B	2.7	18.6	0.49	1.36	45.0
Approach		501	0.0	0.391	12.1	LOS B	2.7	18.6	0.49	0.68	45.0
East: Sea Lake Swan Hill											
4	L2	120	0.0	0.235	5.7	LOS A	1.5	10.7	0.27	1.09	48.5
5	T1	78	0.0	0.235	4.7	LOS A	1.5	10.7	0.27	1.09	48.5
6	R2	147	0.0	0.235	11.6	LOS B	1.5	10.7	0.27	1.09	48.5
Approach		345	0.0	0.235	8.0	LOS A	1.5	10.7	0.27	0.55	48.5
North: Boobialla Drive											
7	L2	79	0.0	0.174	9.8	LOS A	1.1	7.9	0.75	1.50	47.1
8	T1	53	0.0	0.174	8.8	LOS A	1.1	7.9	0.75	1.50	47.1
9	R2	11	0.0	0.174	15.7	LOS B	1.1	7.9	0.75	1.50	47.1
Approach		142	0.0	0.174	9.9	LOS A	1.1	7.9	0.75	0.75	47.1
West: Sea Lake Swan Hill											
10	L2	11	0.0	0.354	9.0	LOS A	2.5	17.2	0.75	1.50	47.5
11	T1	295	0.0	0.354	8.1	LOS A	2.5	17.2	0.75	1.50	47.5
12	R2	19	0.0	0.354	14.9	LOS B	2.5	17.2	0.75	1.50	47.5
Approach		324	0.0	0.354	8.5	LOS A	2.5	17.2	0.75	0.75	47.5
All Vehicles		1313	0.0	0.391	9.9	LOS A	2.7	18.6	0.53	0.67	46.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - PM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	17	0.0	0.040	5.7	LOS A	0.2	1.3	0.24	1.05	49.2
2	T1	20	0.0	0.040	4.7	LOS A	0.2	1.3	0.24	1.05	49.2
3	R2	19	0.0	0.040	11.6	LOS B	0.2	1.3	0.24	1.05	49.2
Approach		56	0.0	0.040	7.4	LOS A	0.2	1.3	0.24	0.52	49.2
East: Sea Lake Swan Hill											
4	L2	9	0.0	0.075	5.4	LOS A	0.4	2.6	0.12	1.16	48.6
5	T1	39	0.0	0.075	4.5	LOS A	0.4	2.6	0.12	1.16	48.6
6	R2	67	0.0	0.075	11.3	LOS B	0.4	2.6	0.12	1.16	48.6
Approach		116	0.0	0.075	8.5	LOS A	0.4	2.6	0.12	0.58	48.6
North: Boobialla Drive											
7	L2	38	0.0	0.043	5.5	LOS A	0.2	1.4	0.17	0.86	51.5
8	T1	23	0.0	0.043	4.6	LOS A	0.2	1.4	0.17	0.86	51.5
9	R2	1	0.0	0.043	11.4	LOS B	0.2	1.4	0.17	0.86	51.5
Approach		62	0.0	0.043	5.3	LOS A	0.2	1.4	0.17	0.43	51.5
West: Sea Lake Swan Hill											
10	L2	1	0.0	0.027	5.7	LOS A	0.1	0.9	0.23	0.94	50.4
11	T1	28	0.0	0.027	4.7	LOS A	0.1	0.9	0.23	0.94	50.4
12	R2	7	0.0	0.027	11.6	LOS B	0.1	0.9	0.23	0.94	50.4
Approach		37	0.0	0.027	6.1	LOS A	0.1	0.9	0.23	0.47	50.4
All Vehicles		271	0.0	0.075	7.2	LOS A	0.4	2.6	0.17	0.52	49.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - PM Post Development

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

Movement Performance - Vehicles

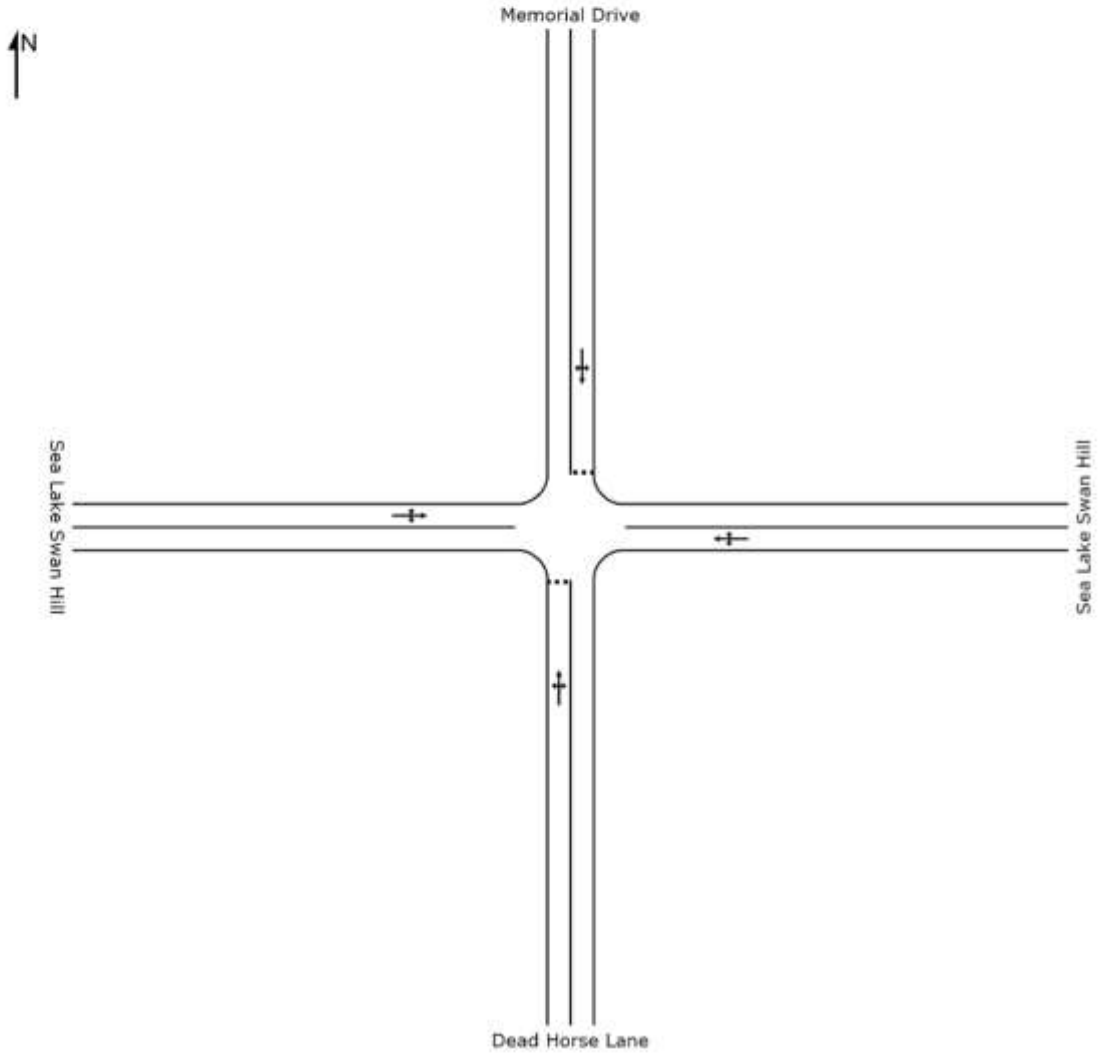
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gray Street											
1	L2	18	0.0	0.300	9.0	LOS A	2.0	13.8	0.72	1.61	44.0
2	T1	20	0.0	0.300	8.1	LOS A	2.0	13.8	0.72	1.61	44.0
3	R2	240	0.0	0.300	14.9	LOS B	2.0	13.8	0.72	1.61	44.0
Approach		278	0.0	0.300	14.1	LOS B	2.0	13.8	0.72	0.81	44.0
East: Sea Lake Swan Hill											
4	L2	338	0.0	0.591	5.6	LOS A	6.2	43.3	0.25	1.06	48.4
5	T1	201	0.0	0.591	4.6	LOS A	6.2	43.3	0.25	1.06	48.4
6	R2	442	0.0	0.591	11.5	LOS B	6.2	43.3	0.25	1.06	48.4
Approach		981	0.0	0.591	8.0	LOS A	6.2	43.3	0.25	0.53	48.4
North: Boobialla Drive											
7	L2	316	0.0	0.310	7.3	LOS A	2.0	14.3	0.60	1.28	48.2
8	T1	23	0.0	0.310	6.4	LOS A	2.0	14.3	0.60	1.28	48.2
9	R2	3	0.0	0.310	13.2	LOS B	2.0	14.3	0.60	1.28	48.2
Approach		342	0.0	0.310	7.3	LOS A	2.0	14.3	0.60	0.64	48.2
West: Sea Lake Swan Hill											
10	L2	32	0.0	0.202	9.2	LOS A	1.3	9.0	0.72	1.45	47.7
11	T1	137	0.0	0.202	8.2	LOS A	1.3	9.0	0.72	1.45	47.7
12	R2	9	0.0	0.202	15.1	LOS B	1.3	9.0	0.72	1.45	47.7
Approach		178	0.0	0.202	8.8	LOS A	1.3	9.0	0.72	0.72	47.7
All Vehicles		1779	0.0	0.591	8.9	LOS A	6.2	43.3	0.44	0.61	47.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - AM Existing

Swan Hill Road/Dead Horse Lane/Memorial Drive
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - AM Existing

Swan Hill Road/Dead Horse Lane/Memorial Drive
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
1	L2	2	0.0	0.006	8.7	LOS A	0.0	0.1	0.16	0.61	48.6
2	T1	2	0.0	0.006	7.4	LOS A	0.0	0.1	0.16	0.61	48.6
3	R2	2	0.0	0.006	8.9	LOS A	0.0	0.1	0.16	0.61	48.6
Approach		6	0.0	0.006	8.4	LOS A	0.0	0.1	0.16	0.61	48.6
East: Sea Lake Swan Hill											
4	L2	2	0.0	0.027	8.5	LOS A	0.1	1.0	0.20	0.15	54.7
5	T1	42	0.0	0.027	0.3	LOS A	0.1	1.0	0.20	0.15	54.7
6	R2	6	0.0	0.027	8.7	LOS A	0.1	1.0	0.20	0.15	54.7
Approach		51	0.0	0.027	1.7	NA	0.1	1.0	0.20	0.15	54.7
North: Memorial Drive											
7	L2	12	0.0	0.015	8.7	LOS A	0.1	0.4	0.20	0.61	48.2
8	T1	2	0.0	0.015	7.4	LOS A	0.1	0.4	0.20	0.61	48.2
9	R2	2	0.0	0.015	8.9	LOS A	0.1	0.4	0.20	0.61	48.2
Approach		16	0.0	0.015	8.5	LOS A	0.1	0.4	0.20	0.61	48.2
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.052	8.3	LOS A	0.3	1.9	0.13	0.04	57.1
11	T1	96	0.0	0.052	0.1	LOS A	0.3	1.9	0.13	0.04	57.1
12	R2	2	0.0	0.052	8.6	LOS A	0.3	1.9	0.13	0.04	57.1
Approach		100	0.0	0.052	0.5	NA	0.3	1.9	0.13	0.04	57.1
All Vehicles		173	0.0	0.052	1.8	NA	0.3	1.9	0.16	0.15	55.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - AM Post Development

Swan Hill Road/Dead Horse Lane/Memorial Drive
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
1	L2	3	0.0	0.007	8.8	LOS A	0.0	0.2	0.19	0.61	48.4
2	T1	2	0.0	0.007	7.5	LOS A	0.0	0.2	0.19	0.61	48.4
3	R2	2	0.0	0.007	9.0	LOS A	0.0	0.2	0.19	0.61	48.4
Approach		7	0.0	0.007	8.5	LOS A	0.0	0.2	0.19	0.61	48.4
East: Sea Lake Swan Hill											
4	L2	2	0.0	0.038	8.5	LOS A	0.2	1.4	0.22	0.11	54.9
5	T1	64	0.0	0.038	0.3	LOS A	0.2	1.4	0.22	0.11	54.9
6	R2	6	0.0	0.038	8.8	LOS A	0.2	1.4	0.22	0.11	54.9
Approach		73	0.0	0.038	1.3	NA	0.2	1.4	0.22	0.11	54.9
North: Memorial Drive											
7	L2	12	0.0	0.015	8.8	LOS A	0.1	0.4	0.22	0.61	48.1
8	T1	2	0.0	0.015	7.5	LOS A	0.1	0.4	0.22	0.61	48.1
9	R2	2	0.0	0.015	9.0	LOS A	0.1	0.4	0.22	0.61	48.1
Approach		16	0.0	0.015	8.6	LOS A	0.1	0.4	0.22	0.61	48.1
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.059	8.4	LOS A	0.3	2.2	0.16	0.04	56.5
11	T1	109	0.0	0.059	0.2	LOS A	0.3	2.2	0.16	0.04	56.5
12	R2	3	0.0	0.059	8.6	LOS A	0.3	2.2	0.16	0.04	56.5
Approach		115	0.0	0.059	0.6	NA	0.3	2.2	0.16	0.04	56.5
All Vehicles		211	0.0	0.059	1.7	NA	0.3	2.2	0.19	0.13	54.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - PM Existing

Swan Hill Road/Dead Horse Lane/Memorial Drive
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
1	L2	2	0.0	0.006	8.6	LOS A	0.0	0.1	0.17	0.60	48.5
2	T1	2	0.0	0.006	7.3	LOS A	0.0	0.1	0.17	0.60	48.5
3	R2	2	0.0	0.006	8.8	LOS A	0.0	0.1	0.17	0.60	48.5
Approach		6	0.0	0.006	8.2	LOS A	0.0	0.1	0.17	0.60	48.5
East: Sea Lake Swan Hill											
4	L2	2	0.0	0.037	8.3	LOS A	0.2	1.3	0.12	0.18	55.6
5	T1	56	0.0	0.037	0.1	LOS A	0.2	1.3	0.12	0.18	55.6
6	R2	12	0.0	0.037	8.6	LOS A	0.2	1.3	0.12	0.18	55.6
Approach		69	0.0	0.037	1.8	NA	0.2	1.3	0.12	0.18	55.6
North: Memorial Drive											
7	L2	6	0.0	0.009	8.5	LOS A	0.0	0.2	0.12	0.62	48.6
8	T1	2	0.0	0.009	7.2	LOS A	0.0	0.2	0.12	0.62	48.6
9	R2	2	0.0	0.009	8.7	LOS A	0.0	0.2	0.12	0.62	48.6
Approach		11	0.0	0.009	8.3	LOS A	0.0	0.2	0.12	0.62	48.6
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.021	8.3	LOS A	0.1	0.8	0.14	0.10	56.2
11	T1	37	0.0	0.021	0.2	LOS A	0.1	0.8	0.14	0.10	56.2
12	R2	2	0.0	0.021	8.6	LOS A	0.1	0.8	0.14	0.10	56.2
Approach		41	0.0	0.021	1.0	NA	0.1	0.8	0.14	0.10	56.2
All Vehicles		127	0.0	0.037	2.4	NA	0.2	1.3	0.13	0.21	54.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 9 - Swan Hill Road/Dead Horse Lane/Memorial Drive - PM Post Development

Swan Hill Road/Dead Horse Lane/Memorial Drive
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Dead Horse Lane											
1	L2	3	0.0	0.007	8.7	LOS A	0.0	0.2	0.19	0.61	48.4
2	T1	2	0.0	0.007	7.4	LOS A	0.0	0.2	0.19	0.61	48.4
3	R2	2	0.0	0.007	8.9	LOS A	0.0	0.2	0.19	0.61	48.4
Approach		7	0.0	0.007	8.4	LOS A	0.0	0.2	0.19	0.61	48.4
East: Sea Lake Swan Hill											
4	L2	2	0.0	0.044	8.3	LOS A	0.2	1.6	0.15	0.15	55.5
5	T1	71	0.0	0.044	0.2	LOS A	0.2	1.6	0.15	0.15	55.5
6	R2	12	0.0	0.044	8.6	LOS A	0.2	1.6	0.15	0.15	55.5
Approach		84	0.0	0.044	1.5	NA	0.2	1.6	0.15	0.15	55.5
North: Memorial Drive											
7	L2	6	0.0	0.010	8.6	LOS A	0.0	0.2	0.15	0.61	48.5
8	T1	2	0.0	0.010	7.3	LOS A	0.0	0.2	0.15	0.61	48.5
9	R2	2	0.0	0.010	8.8	LOS A	0.0	0.2	0.15	0.61	48.5
Approach		11	0.0	0.010	8.4	LOS A	0.0	0.2	0.15	0.61	48.5
West: Sea Lake Swan Hill											
10	L2	2	0.0	0.031	8.4	LOS A	0.2	1.1	0.17	0.08	55.9
11	T1	55	0.0	0.031	0.2	LOS A	0.2	1.1	0.17	0.08	55.9
12	R2	3	0.0	0.031	8.6	LOS A	0.2	1.1	0.17	0.08	55.9
Approach		60	0.0	0.031	0.9	NA	0.2	1.1	0.17	0.08	55.9
All Vehicles		162	0.0	0.044	2.1	NA	0.2	1.6	0.16	0.18	54.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

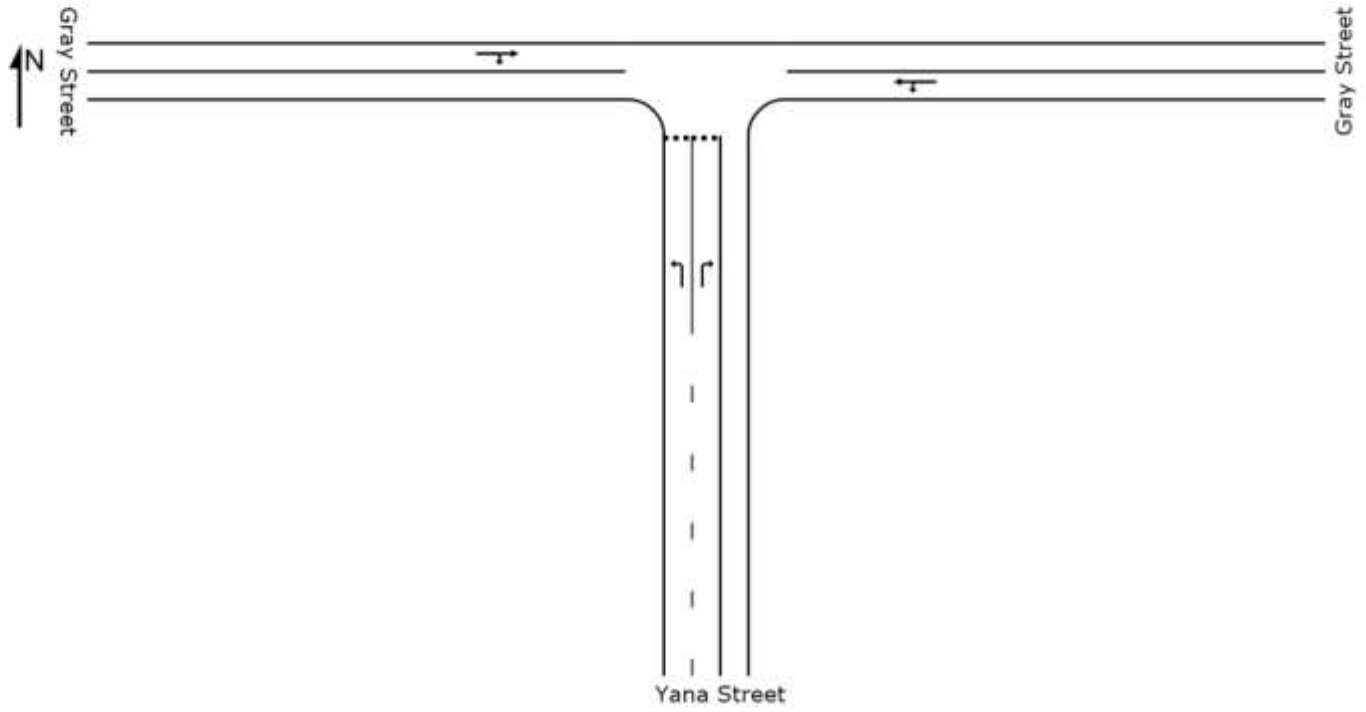
APPENDIX C

CAPACITY ANALYSIS RESULTS
OPTION 1 - SEA LAKE-SWAN HILL ROAD LINK
14 LOTS PER HA

SITE LAYOUT

Site: Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	111	0.0	0.105	8.8	LOS A	0.4	2.8	0.25	0.64	47.9
3	R2	112	0.0	0.155	11.4	LOS B	0.6	4.0	0.50	0.80	45.6
Approach		222	0.0	0.155	10.1	LOS B	0.6	4.0	0.37	0.72	46.7
East: Gray Street											
4	L2	123	0.0	0.132	8.2	LOS A	0.0	0.0	0.00	0.41	54.0
5	T1	127	0.0	0.132	0.0	LOS A	0.0	0.0	0.00	0.41	54.0
Approach		251	0.0	0.132	4.0	NA	0.0	0.0	0.00	0.41	54.0
West: Gray Street											
11	T1	142	0.0	0.164	0.9	LOS A	0.9	6.5	0.38	0.36	50.2
12	R2	127	0.0	0.164	9.2	LOS A	0.9	6.5	0.38	0.36	50.2
Approach		269	0.0	0.164	4.9	NA	0.9	6.5	0.38	0.36	50.2
All Vehicles		742	0.0	0.164	6.2	NA	0.9	6.5	0.25	0.48	50.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - AM Post Development

Gray Street/Yana Street
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: Yana Street											
1	L2	338	0.0	0.328	6.5	LOS A	1.5	10.6	0.33	0.60	52.6
3	R2	393	0.0	0.738	18.3	LOS C	6.1	42.8	0.83	1.25	44.7
Approach		731	0.0	0.738	12.9	LOS B	6.1	42.8	0.60	0.94	48.1
East: Gray Street											
4	L2	255	0.0	0.212	5.6	LOS A	0.0	0.0	0.00	0.37	55.2
5	T1	146	0.0	0.212	0.0	LOS A	0.0	0.0	0.00	0.37	56.7
Approach		401	0.0	0.212	3.5	NA	0.0	0.0	0.00	0.37	55.8
West: Gray Street											
11	T1	217	0.0	0.269	1.9	LOS A	1.8	12.3	0.55	0.33	55.6
12	R2	188	0.0	0.269	7.5	LOS A	1.8	12.3	0.55	0.33	53.9
Approach		405	0.0	0.269	4.5	NA	1.8	12.3	0.55	0.33	54.8
All Vehicles		1537	0.0	0.738	8.2	NA	6.1	42.8	0.43	0.63	51.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - PM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	36	0.0	0.032	8.5	LOS A	0.1	0.8	0.15	0.62	48.3
3	R2	66	0.0	0.072	9.8	LOS A	0.3	1.8	0.35	0.69	47.2
Approach		102	0.0	0.072	9.3	LOS A	0.3	1.8	0.28	0.67	47.6
East: Gray Street											
4	L2	80	0.0	0.075	8.2	LOS A	0.0	0.0	0.00	0.45	53.3
5	T1	63	0.0	0.075	0.0	LOS A	0.0	0.0	0.00	0.45	53.3
Approach		143	0.0	0.075	4.6	NA	0.0	0.0	0.00	0.45	53.3
West: Gray Street											
11	T1	103	0.0	0.086	0.5	LOS A	0.5	3.2	0.26	0.27	52.5
12	R2	52	0.0	0.086	8.8	LOS A	0.5	3.2	0.26	0.27	52.5
Approach		155	0.0	0.086	3.2	NA	0.5	3.2	0.26	0.27	52.5
All Vehicles		400	0.0	0.086	5.3	NA	0.5	3.2	0.17	0.43	51.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (1) - Gray Street/Yana Street - PM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

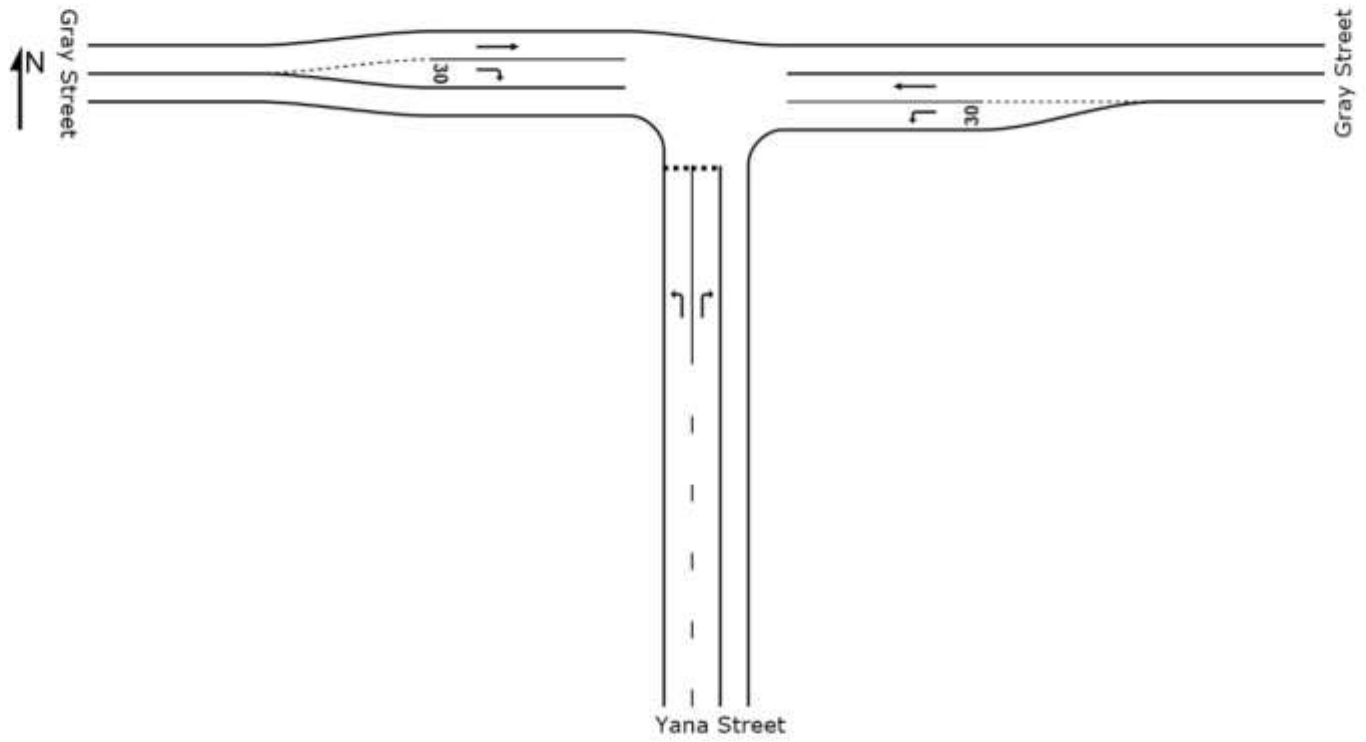
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Yana Street											
1	L2	149	0.0	0.141	6.2	LOS A	0.5	3.8	0.24	0.57	52.9
3	R2	207	0.0	0.381	12.2	LOS B	1.8	12.6	0.66	0.93	48.4
Approach		357	0.0	0.381	9.6	LOS A	1.8	12.6	0.49	0.78	50.2
East: Gray Street											
4	L2	271	0.0	0.207	5.6	LOS A	0.0	0.0	0.00	0.41	55.0
5	T1	120	0.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.41	56.4
Approach		391	0.0	0.207	3.9	NA	0.0	0.0	0.00	0.41	55.4
West: Gray Street											
11	T1	169	0.0	0.281	1.9	LOS A	1.7	12.2	0.54	0.41	55.1
12	R2	236	0.0	0.281	7.4	LOS A	1.7	12.2	0.54	0.41	53.5
Approach		405	0.0	0.281	5.1	NA	1.7	12.2	0.54	0.41	54.1
All Vehicles		1153	0.0	0.381	6.1	NA	1.8	12.6	0.34	0.52	53.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 5 (2) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Giveway / Yield (Two-Way)



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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	111	0.0	0.105	8.8	LOS A	0.4	2.8	0.25	0.64	47.9
3	R2	112	0.0	0.152	11.1	LOS B	0.6	4.0	0.49	0.78	45.9
Approach		222	0.0	0.152	10.0	LOS A	0.6	4.0	0.37	0.71	46.9
East: Gray Street											
4	L2	123	0.0	0.066	8.2	LOS A	0.0	0.0	0.00	0.67	48.9
5	T1	127	0.0	0.065	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		251	0.0	0.066	4.0	NA	0.0	0.0	0.00	0.33	54.0
West: Gray Street											
11	T1	142	0.0	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	127	0.0	0.088	9.1	LOS A	0.4	2.9	0.35	0.65	47.4
Approach		269	0.0	0.088	4.3	NA	0.4	2.9	0.17	0.31	53.3
All Vehicles		742	0.0	0.152	5.9	NA	0.6	4.0	0.17	0.43	51.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - AM Post Development

Gray Street/Yana Street
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: Yana Street											
1	L2	338	0.0	0.328	6.5	LOS A	1.5	10.6	0.33	0.60	52.6
3	R2	393	0.0	0.701	16.8	LOS C	5.6	39.4	0.79	1.18	45.9
Approach		731	0.0	0.701	12.0	LOS B	5.6	39.4	0.58	0.91	48.7
East: Gray Street											
4	L2	255	0.0	0.137	5.6	LOS A	0.0	0.0	0.00	0.58	53.6
5	T1	146	0.0	0.075	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		401	0.0	0.137	3.5	NA	0.0	0.0	0.00	0.37	55.8
West: Gray Street											
11	T1	217	0.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	188	0.0	0.152	7.0	LOS A	0.7	4.9	0.47	0.66	52.0
Approach		405	0.0	0.152	3.3	NA	0.7	4.9	0.22	0.31	56.0
All Vehicles		1537	0.0	0.701	7.5	NA	5.6	39.4	0.33	0.61	52.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - PM Existing

Gray Street/Yana Street
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: Yana Street											
1	L2	36	0.0	0.032	8.5	LOS A	0.1	0.8	0.15	0.62	48.3
3	R2	66	0.0	0.072	9.6	LOS A	0.3	1.8	0.35	0.68	47.4
Approach		102	0.0	0.072	9.2	LOS A	0.3	1.8	0.28	0.66	47.7
East: Gray Street											
4	L2	80	0.0	0.043	8.2	LOS A	0.0	0.0	0.00	0.67	48.9
5	T1	63	0.0	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		143	0.0	0.043	4.6	NA	0.0	0.0	0.00	0.37	53.3
West: Gray Street											
11	T1	103	0.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	52	0.0	0.032	8.7	LOS A	0.1	1.0	0.25	0.62	47.8
Approach		155	0.0	0.053	2.9	NA	0.1	1.0	0.08	0.21	55.3
All Vehicles		400	0.0	0.072	5.1	NA	0.3	1.8	0.10	0.38	52.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 5 (2) Gray Street/Yana Street - PM Post Development

Gray Street/Yana Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

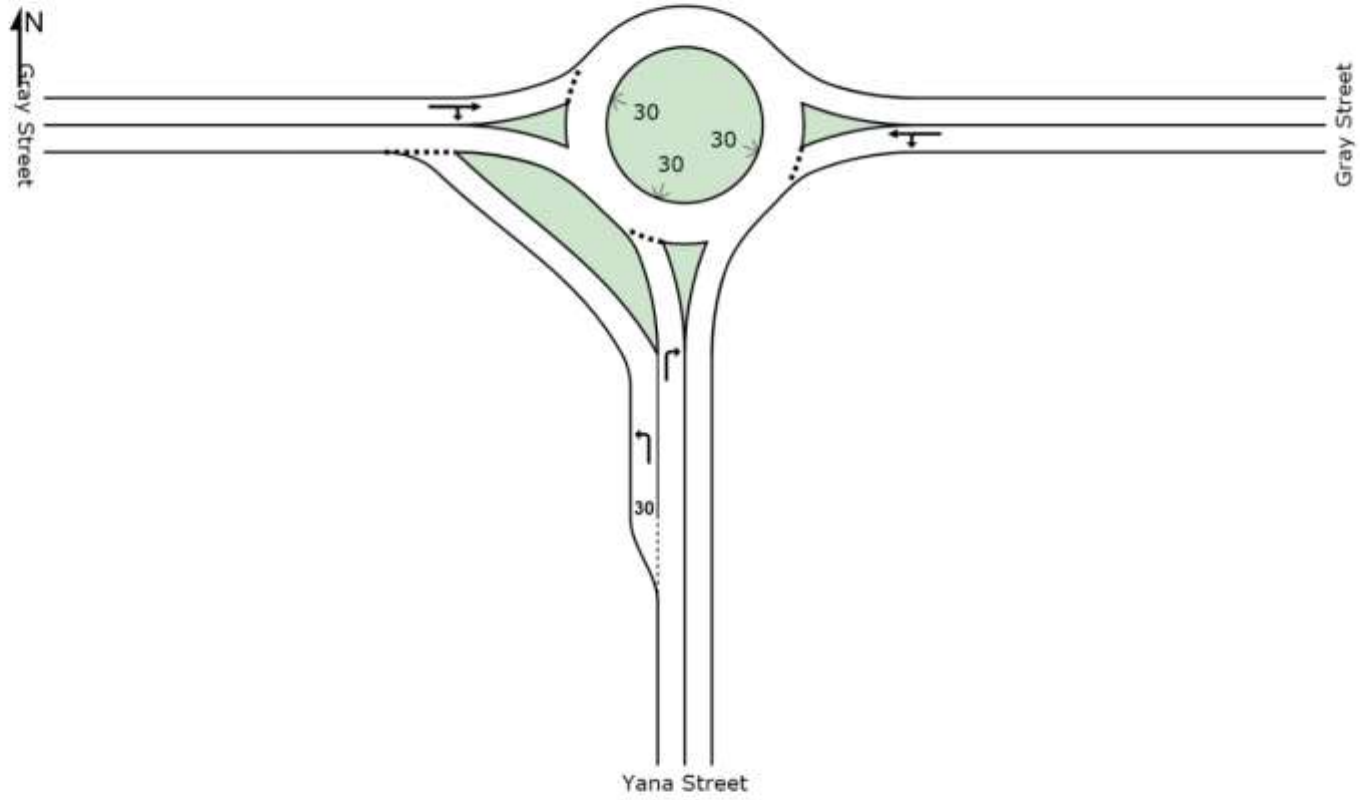
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Yana Street											
1	L2	149	0.0	0.141	6.2	LOS A	0.5	3.8	0.24	0.57	52.9
3	R2	207	0.0	0.363	11.6	LOS B	1.7	12.0	0.63	0.91	49.0
Approach		357	0.0	0.363	9.3	LOS A	1.7	12.0	0.47	0.76	50.5
East: Gray Street											
4	L2	271	0.0	0.146	5.6	LOS A	0.0	0.0	0.00	0.58	53.6
5	T1	120	0.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		391	0.0	0.146	3.8	NA	0.0	0.0	0.00	0.40	55.4
West: Gray Street											
11	T1	169	0.0	0.087	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	236	0.0	0.188	7.0	LOS A	0.9	6.3	0.47	0.67	52.0
Approach		405	0.0	0.188	4.1	NA	0.9	6.3	0.28	0.39	55.1
All Vehicles		1153	0.0	0.363	5.6	NA	1.7	12.0	0.24	0.51	53.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 5 (3) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Roundabout



MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - AM Existing

Gray Street/Yana Street
Roundabout

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: Yana Street											
1	L2	111	0.0	0.069	5.6	LOS A	0.4	2.9	0.30	0.90	50.4
3	R2	112	0.0	0.069	11.7	LOS B	0.4	2.9	0.30	1.23	45.4
Approach		222	0.0	0.069	8.6	LOS A	0.4	2.9	0.30	0.53	47.7
East: Gray Street											
4	L2	123	0.0	0.185	5.9	LOS A	1.2	8.4	0.35	0.92	50.4
5	T1	127	0.0	0.185	5.0	LOS A	1.2	8.4	0.35	0.92	50.4
Approach		251	0.0	0.185	5.5	LOS A	1.2	8.4	0.35	0.46	50.4
West: Gray Street											
11	T1	142	0.0	0.194	4.9	LOS A	1.3	8.8	0.32	1.11	48.3
12	R2	127	0.0	0.194	11.8	LOS B	1.3	8.8	0.32	1.11	48.3
Approach		269	0.0	0.194	8.2	LOS A	1.3	8.8	0.32	0.55	48.3
All Vehicles		742	0.0	0.194	7.4	LOS A	1.3	8.8	0.32	0.52	48.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - AM Post Development

Gray Street/Yana Street
Roundabout

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: Yana Street											
1	L2	338	0.0	0.213	3.9	LOS A	1.5	10.6	0.37	0.45	55.4
3	R2	393	0.0	0.247	9.8	LOS A	1.8	12.6	0.38	0.60	52.9
Approach		731	0.0	0.247	7.1	LOS A	1.8	12.6	0.38	0.53	54.0
East: Gray Street											
4	L2	255	0.0	0.317	4.5	LOS A	2.4	17.1	0.50	0.50	54.5
5	T1	146	0.0	0.317	4.7	LOS A	2.4	17.1	0.50	0.50	56.2
Approach		401	0.0	0.317	4.6	LOS A	2.4	17.1	0.50	0.50	55.1
West: Gray Street											
11	T1	217	0.0	0.384	6.2	LOS A	2.9	20.0	0.68	0.68	53.4
12	R2	188	0.0	0.384	11.9	LOS B	2.9	20.0	0.68	0.68	53.8
Approach		405	0.0	0.384	8.8	LOS A	2.9	20.0	0.68	0.68	53.6
All Vehicles		1537	0.0	0.384	6.9	LOS A	2.9	20.0	0.49	0.56	54.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - PM Existing

Gray Street/Yana Street
Roundabout

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: Yana Street											
1	L2	36	0.0	0.021	5.4	LOS A	0.1	0.8	0.19	0.86	51.2
3	R2	66	0.0	0.039	11.4	LOS B	0.2	1.5	0.19	1.25	45.9
Approach		102	0.0	0.039	9.3	LOS A	0.2	1.5	0.19	0.56	47.5
East: Gray Street											
4	L2	80	0.0	0.096	5.5	LOS A	0.6	4.0	0.19	0.84	51.5
5	T1	63	0.0	0.096	4.6	LOS A	0.6	4.0	0.19	0.84	51.5
Approach		143	0.0	0.096	5.1	LOS A	0.6	4.0	0.19	0.42	51.5
West: Gray Street											
11	T1	103	0.0	0.106	4.7	LOS A	0.6	4.4	0.22	1.01	49.7
12	R2	52	0.0	0.106	11.5	LOS B	0.6	4.4	0.22	1.01	49.7
Approach		155	0.0	0.106	7.0	LOS A	0.6	4.4	0.22	0.51	49.7
All Vehicles		400	0.0	0.106	6.9	LOS A	0.6	4.4	0.20	0.49	49.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 5 (3) Gray Street/Yana Street - PM Post Development

Gray Street/Yana Street
Roundabout

Movement Performance - Vehicles

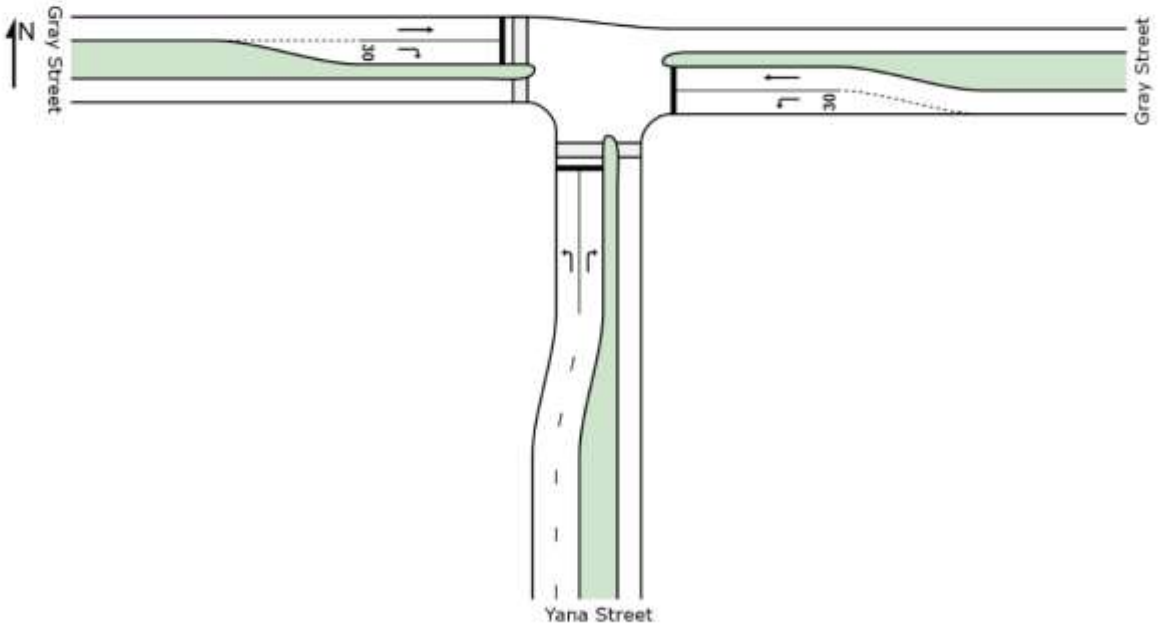
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Yana Street											
1	L2	149	0.0	0.093	3.7	LOS A	0.6	4.2	0.31	0.42	55.7
3	R2	207	0.0	0.129	9.6	LOS A	0.9	6.0	0.32	0.59	53.2
Approach		357	0.0	0.129	7.2	LOS A	0.9	6.0	0.31	0.52	54.2
East: Gray Street											
4	L2	271	0.0	0.322	4.9	LOS A	2.4	16.7	0.54	0.53	54.4
5	T1	120	0.0	0.322	5.0	LOS A	2.4	16.7	0.54	0.53	56.1
Approach		391	0.0	0.322	4.9	LOS A	2.4	16.7	0.54	0.53	54.9
West: Gray Street											
11	T1	169	0.0	0.321	4.8	LOS A	2.3	16.1	0.49	0.59	53.9
12	R2	236	0.0	0.321	10.5	LOS B	2.3	16.1	0.49	0.59	54.3
Approach		405	0.0	0.321	8.1	LOS A	2.3	16.1	0.49	0.59	54.1
All Vehicles		1153	0.0	0.322	6.7	LOS A	2.4	16.7	0.45	0.55	54.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: Intersection 5 Option 1 - AM Exisitng

Gray Street/Yana Street
Signals - Fixed Time



MOVEMENT SUMMARY

Site: Intersection 5 Option 1 - AM Post - 14 lots per Ha

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

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: Yana Street											
1	L2	338	0.0	0.433	16.9	LOS B	6.0	41.9	0.75	0.78	46.0
3	R2	393	0.0	0.503	17.3	LOS B	7.2	50.6	0.78	0.80	45.6
Approach		731	0.0	0.503	17.1	LOS B	7.2	50.6	0.77	0.79	45.8
East: Gray Street											
4	L2	255	0.0	0.180	6.5	LOS A	0.9	6.2	0.29	0.65	52.7
5	T1	146	0.0	0.221	13.0	LOS B	2.6	18.3	0.75	0.60	49.4
Approach		401	0.0	0.221	8.8	LOS A	2.6	18.3	0.46	0.64	51.5
West: Gray Street											
11	T1	217	0.0	0.327	13.5	LOS B	4.0	28.3	0.78	0.65	49.1
12	R2	188	0.0	0.512	22.1	LOS C	4.0	28.3	0.87	0.80	43.0
Approach		405	0.0	0.512	17.5	LOS B	4.0	28.3	0.83	0.72	46.0
All Vehicles		1537	0.0	0.512	15.1	LOS B	7.2	50.6	0.70	0.73	47.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	17.7	LOS B	0.1	0.1	0.84	0.84
P4	West Full Crossing	53	14.5	LOS B	0.1	0.1	0.76	0.76
All Pedestrians		105	16.1	LOS B			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

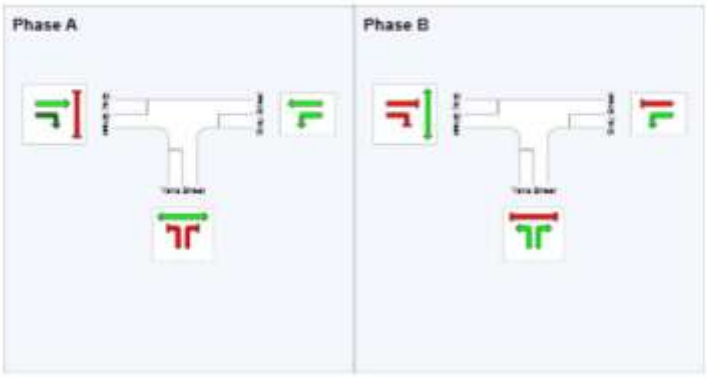
Site: Intersection 5 Option 1 - AM Post - 14 lots per Ha

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	23
Green Time (sec)	17	21
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	23	27
Phase Split	46 %	54 %



MOVEMENT SUMMARY

Site: Intersection 5 Option 1 - PM Post - 14 lots per Ha

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

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: Yana Street											
1	L2	149	0.0	0.268	20.4	LOS C	2.9	20.1	0.80	0.76	44.1
3	R2	207	0.0	0.372	20.9	LOS C	4.1	28.9	0.83	0.78	43.6
Approach		357	0.0	0.372	20.7	LOS C	4.1	28.9	0.82	0.77	43.8
East: Gray Street											
4	L2	271	0.0	0.192	6.5	LOS A	1.0	6.7	0.30	0.65	52.7
5	T1	120	0.0	0.134	8.4	LOS A	1.7	11.9	0.61	0.48	52.7
Approach		391	0.0	0.192	7.1	LOS A	1.7	11.9	0.39	0.60	52.7
West: Gray Street											
11	T1	169	0.0	0.189	8.7	LOS A	2.5	17.3	0.62	0.51	52.5
12	R2	236	0.0	0.459	16.6	LOS B	4.2	29.6	0.75	0.78	46.0
Approach		405	0.0	0.459	13.3	LOS B	4.2	29.6	0.69	0.67	48.5
All Vehicles		1153	0.0	0.459	13.5	LOS B	4.2	29.6	0.63	0.68	48.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	13.0	LOS B	0.1	0.1	0.72	0.72
P4	West Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		105	16.2	LOS B			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

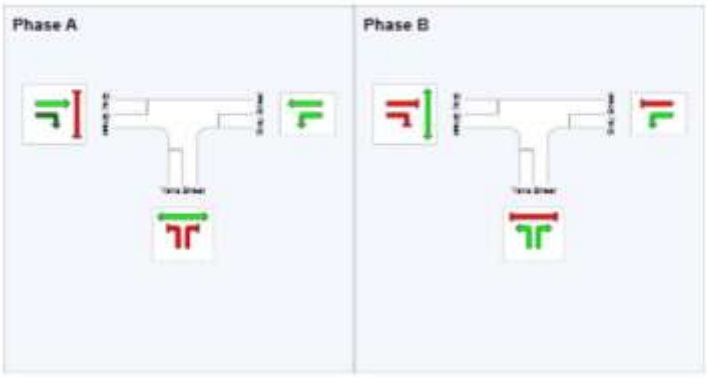
Site: Intersection 5 Option 1 - PM Post - 14 lots per Ha

Gray Street/Yana Street
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

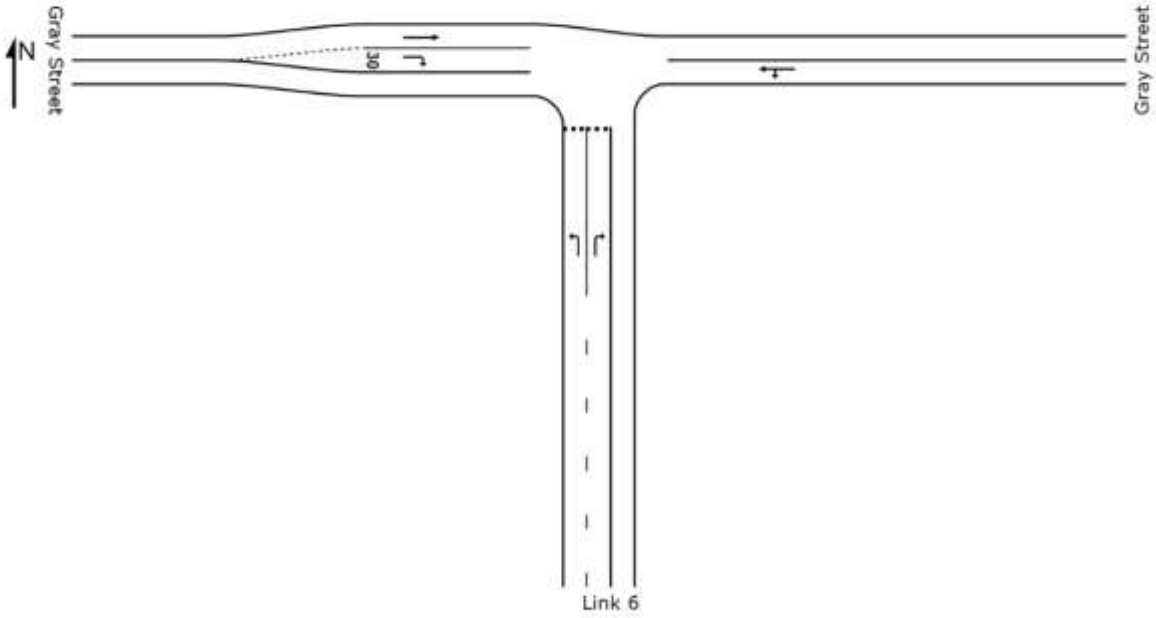
Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	29
Green Time (sec)	23	15
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	29	21
Phase Split	58 %	42 %



SITE LAYOUT

▽ Site: INT 7 - Gray Street/Link 6 - AM Existing

Gray Street/Link 6
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 6 - AM Existing

Gray Street/Link 6
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: Link 6											
1	L2	2	0.0	0.002	5.8	LOS A	0.0	0.0	0.14	0.53	53.2
3	R2	2	0.0	0.002	6.0	LOS A	0.0	0.0	0.22	0.55	52.5
Approach		4	0.0	0.002	5.9	LOS A	0.0	0.0	0.18	0.54	52.9
East: Gray Street											
4	L2	2	0.0	0.030	5.5	LOS A	0.0	0.0	0.00	0.02	58.2
5	T1	57	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		59	0.0	0.030	0.2	NA	0.0	0.0	0.00	0.02	59.7
West: Gray Street											
11	T1	64	0.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	2	0.0	0.001	5.7	LOS A	0.0	0.0	0.14	0.53	53.0
Approach		66	0.0	0.033	0.2	NA	0.0	0.0	0.00	0.02	59.7
All Vehicles		129	0.0	0.033	0.4	NA	0.0	0.0	0.01	0.04	59.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 6 - AM Post Development

Gray Street/Link 6
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: Link 6											
1	L2	556	0.0	0.491	6.0	LOS A	3.0	20.9	0.25	0.55	52.8
3	R2	55	0.0	0.061	6.9	LOS A	0.2	1.5	0.36	0.63	52.1
Approach		611	0.0	0.491	6.1	LOS A	3.0	20.9	0.26	0.55	52.8
East: Gray Street											
4	L2	16	0.0	0.039	5.5	LOS A	0.0	0.0	0.00	0.13	57.3
5	T1	59	0.0	0.039	0.0	LOS A	0.0	0.0	0.00	0.13	58.9
Approach		75	0.0	0.039	1.2	NA	0.0	0.0	0.00	0.13	58.5
West: Gray Street											
11	T1	65	0.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	145	0.0	0.086	5.7	LOS A	0.4	2.9	0.18	0.55	52.9
Approach		211	0.0	0.086	4.0	NA	0.4	2.9	0.12	0.38	54.9
All Vehicles		896	0.0	0.491	5.2	NA	3.0	20.9	0.20	0.48	53.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 6 - PM Existing

Gray Street/Link 6
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: Link 6											
1	L2	2	0.0	0.002	5.8	LOS A	0.0	0.0	0.14	0.53	53.2
3	R2	2	0.0	0.002	5.8	LOS A	0.0	0.0	0.19	0.55	52.6
Approach		4	0.0	0.002	5.8	LOS A	0.0	0.0	0.17	0.54	52.9
East: Gray Street											
4	L2	2	0.0	0.030	5.5	LOS A	0.0	0.0	0.00	0.02	58.2
5	T1	56	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		58	0.0	0.030	0.2	NA	0.0	0.0	0.00	0.02	59.7
West: Gray Street											
11	T1	40	0.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	2	0.0	0.001	5.6	LOS A	0.0	0.0	0.14	0.53	53.0
Approach		42	0.0	0.021	0.3	NA	0.0	0.0	0.01	0.03	59.6
All Vehicles		104	0.0	0.030	0.5	NA	0.0	0.0	0.01	0.04	59.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: INT 7 - Gray Street/Link 6 - PM Post Development

Gray Street/Link 6
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

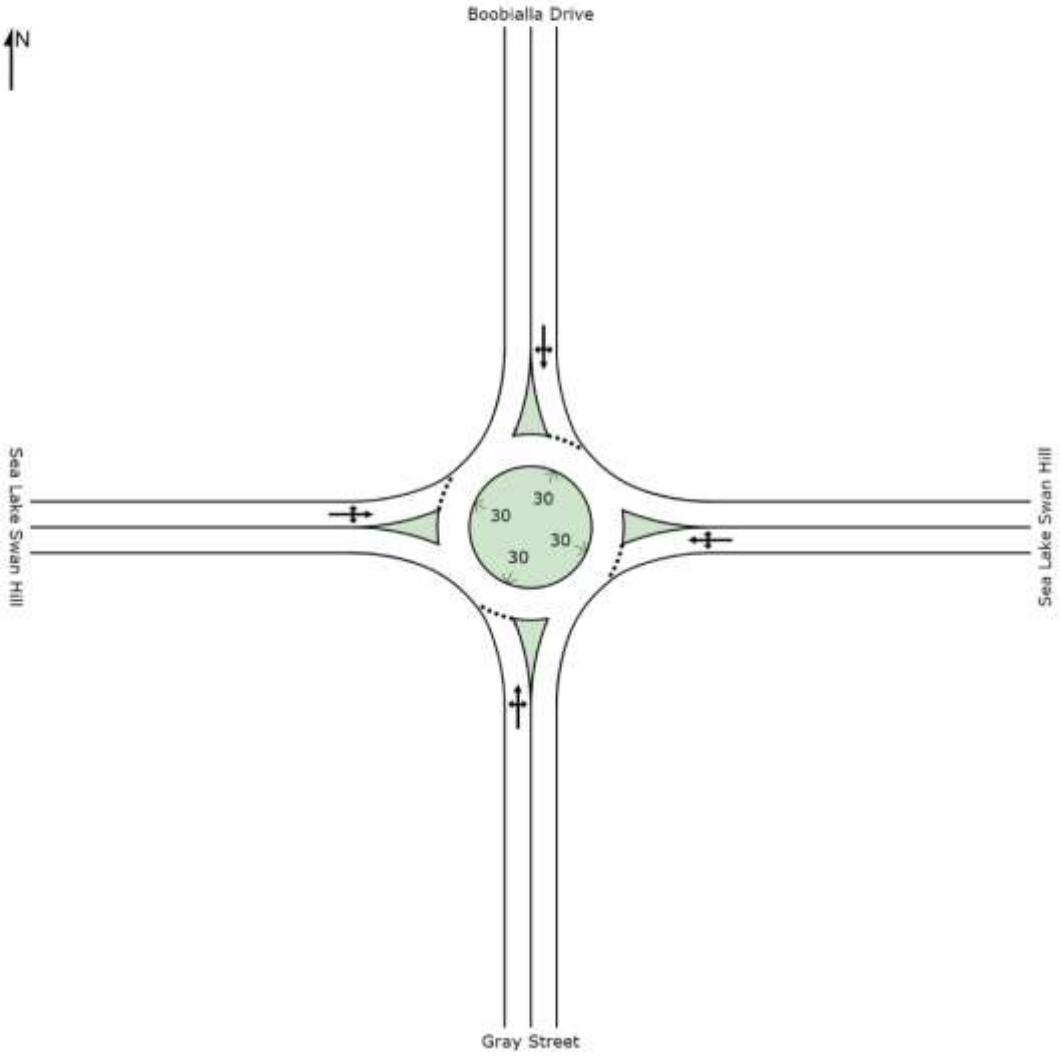
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Link 6											
1	L2	279	0.0	0.246	5.9	LOS A	1.1	7.6	0.18	0.55	53.1
3	R2	28	0.0	0.045	8.9	LOS A	0.2	1.1	0.51	0.73	50.6
Approach		307	0.0	0.246	6.2	LOS A	1.1	7.6	0.21	0.57	52.8
East: Gray Street											
4	L2	42	0.0	0.052	5.5	LOS A	0.0	0.0	0.00	0.25	56.2
5	T1	57	0.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.25	57.8
Approach		99	0.0	0.052	2.4	NA	0.0	0.0	0.00	0.25	57.1
West: Gray Street											
11	T1	42	0.0	0.022	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	433	0.0	0.262	5.9	LOS A	1.4	10.1	0.24	0.55	52.7
Approach		475	0.0	0.262	5.4	NA	1.4	10.1	0.22	0.51	53.3
All Vehicles		881	0.0	0.262	5.3	NA	1.4	10.1	0.19	0.50	53.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout



Created: Monday, 12 May 2014 5:04:35 PM
SIDRA INTERSECTION 6.0.17.4466
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SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	17	0.0	0.040	5.5	LOS A	0.2	1.3	0.17	1.08	49.1
2	T1	16	0.0	0.040	4.6	LOS A	0.2	1.3	0.17	1.08	49.1
3	R2	24	0.0	0.040	11.4	LOS B	0.2	1.3	0.17	1.08	49.1
Approach		57	0.0	0.040	7.8	LOS A	0.2	1.3	0.17	0.54	49.1
East: Sea Lake Swan Hill											
4	L2	11	0.0	0.046	5.5	LOS A	0.2	1.6	0.17	1.11	48.8
5	T1	23	0.0	0.046	4.6	LOS A	0.2	1.6	0.17	1.11	48.8
6	R2	33	0.0	0.046	11.4	LOS B	0.2	1.6	0.17	1.11	48.8
Approach		66	0.0	0.046	8.1	LOS A	0.2	1.6	0.17	0.55	48.8
North: Boobialla Drive											
7	L2	92	0.0	0.095	5.8	LOS A	0.5	3.3	0.26	0.92	50.6
8	T1	36	0.0	0.095	4.8	LOS A	0.5	3.3	0.26	0.92	50.6
9	R2	2	0.0	0.095	11.7	LOS B	0.5	3.3	0.26	0.92	50.6
Approach		129	0.0	0.095	5.6	LOS A	0.5	3.3	0.26	0.46	50.6
West: Sea Lake Swan Hill											
10	L2	1	0.0	0.067	5.6	LOS A	0.3	2.3	0.19	0.93	50.8
11	T1	77	0.0	0.067	4.6	LOS A	0.3	2.3	0.19	0.93	50.8
12	R2	18	0.0	0.067	11.5	LOS B	0.3	2.3	0.19	0.93	50.8
Approach		96	0.0	0.067	5.9	LOS A	0.3	2.3	0.19	0.46	50.8
All Vehicles		348	0.0	0.095	6.5	LOS A	0.5	3.3	0.21	0.49	50.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - AM Post Development

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	20	0.0	0.498	5.0	LOS A	3.8	26.7	0.57	0.67	50.8
2	T1	16	0.0	0.498	5.1	LOS A	3.8	26.7	0.57	0.67	52.2
3	R2	598	0.0	0.498	10.8	LOS B	3.8	26.7	0.57	0.67	52.6
Approach		634	0.0	0.498	10.5	LOS B	3.8	26.7	0.57	0.67	52.5
East: Sea Lake Swan Hill											
4	L2	153	0.0	0.268	3.8	LOS A	1.9	13.3	0.29	0.50	53.9
5	T1	95	0.0	0.268	3.9	LOS A	1.9	13.3	0.29	0.50	55.6
6	R2	147	0.0	0.268	9.6	LOS A	1.9	13.3	0.29	0.50	56.0
Approach		395	0.0	0.268	6.0	LOS A	1.9	13.3	0.29	0.50	55.1
North: Boobialla Drive											
7	L2	316	0.0	0.578	16.4	LOS B	6.0	42.3	0.99	1.12	47.2
8	T1	53	0.0	0.578	16.5	LOS B	6.0	42.3	0.99	1.12	48.5
9	R2	11	0.0	0.578	22.2	LOS C	6.0	42.3	0.99	1.12	48.8
Approach		379	0.0	0.578	16.6	LOS B	6.0	42.3	0.99	1.12	47.4
West: Sea Lake Swan Hill											
10	L2	11	0.0	0.492	9.8	LOS A	4.3	29.8	0.89	0.92	51.5
11	T1	362	0.0	0.492	10.0	LOS A	4.3	29.8	0.89	0.92	53.1
12	R2	19	0.0	0.492	15.6	LOS B	4.3	29.8	0.89	0.92	53.4
Approach		392	0.0	0.492	10.2	LOS B	4.3	29.8	0.89	0.92	53.0
All Vehicles		1799	0.0	0.578	10.7	LOS B	6.0	42.3	0.67	0.78	52.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - PM Existing

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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: Gray Street											
1	L2	17	0.0	0.040	5.7	LOS A	0.2	1.3	0.24	1.05	49.2
2	T1	20	0.0	0.040	4.7	LOS A	0.2	1.3	0.24	1.05	49.2
3	R2	19	0.0	0.040	11.6	LOS B	0.2	1.3	0.24	1.05	49.2
Approach		56	0.0	0.040	7.4	LOS A	0.2	1.3	0.24	0.52	49.2
East: Sea Lake Swan Hill											
4	L2	9	0.0	0.075	5.4	LOS A	0.4	2.6	0.12	1.16	48.6
5	T1	39	0.0	0.075	4.5	LOS A	0.4	2.6	0.12	1.16	48.6
6	R2	67	0.0	0.075	11.3	LOS B	0.4	2.6	0.12	1.16	48.6
Approach		116	0.0	0.075	8.5	LOS A	0.4	2.6	0.12	0.58	48.6
North: Boobialla Drive											
7	L2	38	0.0	0.043	5.5	LOS A	0.2	1.4	0.17	0.86	51.5
8	T1	23	0.0	0.043	4.6	LOS A	0.2	1.4	0.17	0.86	51.5
9	R2	1	0.0	0.043	11.4	LOS B	0.2	1.4	0.17	0.86	51.5
Approach		62	0.0	0.043	5.3	LOS A	0.2	1.4	0.17	0.43	51.5
West: Sea Lake Swan Hill											
10	L2	1	0.0	0.027	5.7	LOS A	0.1	0.9	0.23	0.94	50.4
11	T1	28	0.0	0.027	4.7	LOS A	0.1	0.9	0.23	0.94	50.4
12	R2	7	0.0	0.027	11.6	LOS B	0.1	0.9	0.23	0.94	50.4
Approach		37	0.0	0.027	6.1	LOS A	0.1	0.9	0.23	0.47	50.4
All Vehicles		271	0.0	0.075	7.2	LOS A	0.4	2.6	0.17	0.52	49.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: INT 8 - Sea Lake Swan Hill Road/Gray Street/Boobialla Drive - PM Post Development

Sea Lake Swan Hill Road/Gray Street/Boobialla Drive
Roundabout

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gray Street											
1	L2	18	0.0	0.438	8.2	LOS A	3.3	22.9	0.81	0.86	49.9
2	T1	63	0.0	0.438	8.3	LOS A	3.3	22.9	0.81	0.86	51.3
3	R2	305	0.0	0.438	14.0	LOS B	3.3	22.9	0.81	0.86	51.6
Approach		386	0.0	0.438	12.8	LOS B	3.3	22.9	0.81	0.86	51.5
East: Sea Lake Swan Hill											
4	L2	435	0.0	0.676	3.7	LOS A	8.4	58.8	0.30	0.47	53.9
5	T1	252	0.0	0.676	3.8	LOS A	8.4	58.8	0.30	0.47	55.5
6	R2	442	0.0	0.676	9.5	LOS A	8.4	58.8	0.30	0.47	55.9
Approach		1128	0.0	0.676	6.0	LOS A	8.4	58.8	0.30	0.47	55.0
North: Boobialla Drive											
7	L2	79	0.0	0.104	5.6	LOS A	0.6	4.3	0.59	0.60	54.1
8	T1	23	0.0	0.104	5.7	LOS A	0.6	4.3	0.59	0.60	55.8
9	R2	3	0.0	0.104	11.4	LOS B	0.6	4.3	0.59	0.60	56.2
Approach		105	0.0	0.104	5.8	LOS A	0.6	4.3	0.59	0.60	54.5
West: Sea Lake Swan Hill											
10	L2	32	0.0	0.272	8.5	LOS A	1.9	13.2	0.81	0.79	52.3
11	T1	171	0.0	0.272	8.6	LOS A	1.9	13.2	0.81	0.79	53.9
12	R2	9	0.0	0.272	14.3	LOS B	1.9	13.2	0.81	0.79	54.3
Approach		212	0.0	0.272	8.9	LOS A	1.9	13.2	0.81	0.79	53.7
All Vehicles		1832	0.0	0.676	7.8	LOS A	8.4	58.8	0.48	0.60	54.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SECTION C – DECISIONS WHICH NEED ACTION/RATIFICATION

C.14.11 COUNCILLOR ASSEMBLIES - RECORD OF ATTENDANCE AND AGENDA ITEMS

Responsible Officer: Chief Executive Officer
File Number: 22-13-12
Attachments: Nil

Declarations of Interest: Officer
Dean Miller - as the responsible officer, I declare that I have no disclosable interests in this matter.

Summary

The Local Government Act 1989 requires that the details of Councillor Assemblies be reported to Council meetings on a monthly basis.

Discussion

The State Government has amended the Local Government Act 1989 which requires Council to report on Councillor Assemblies.

Whilst Minutes do not have to be recorded, Agenda items and those in attendance must be, and a report presented to Council.

An assembly of Councillors is defined as a meeting that is planned or scheduled at which at least half of the Council and one Officer are in attendance, and where the matters being considered that are intended or likely to be the subject of a Council decision.

No formal decisions can be made at an assembly but rather direction can be given that is likely to lead to a formal decision of Council.

Details of the most recent assemblies of Council are attached.

Consultation

Nil

Financial Implications

Nil

Social Implications

Nil

Economic Implications

Nil

Environmental Implications

Nil

Risk Management Implications

Nil

Council Plan Strategy Addressed

Councillor and Staff accountability - We will represent the interests of our community and will conduct our affairs openly and with integrity, reflecting high levels of good governance.

Options

Council must comply with the requirements of the Local Government Act 1989.

Recommendations

That Council note the contents of the report.

SECTION D – NOTICES OF MOTION

SECTION E – URGENT ITEMS NOT INCLUDED IN AGENDA

SECTION F – TO CONSIDER & ORDER ON COUNCILLOR REPORTS

SECTION G – IN CAMERA ITEMS

Recommendation

That Council close the meeting to the public on the grounds that the following report(s) include concerns contractual matters

B.14.40 IN CAMERA CONSIDERATION OF CONFIDENTIAL REPORT