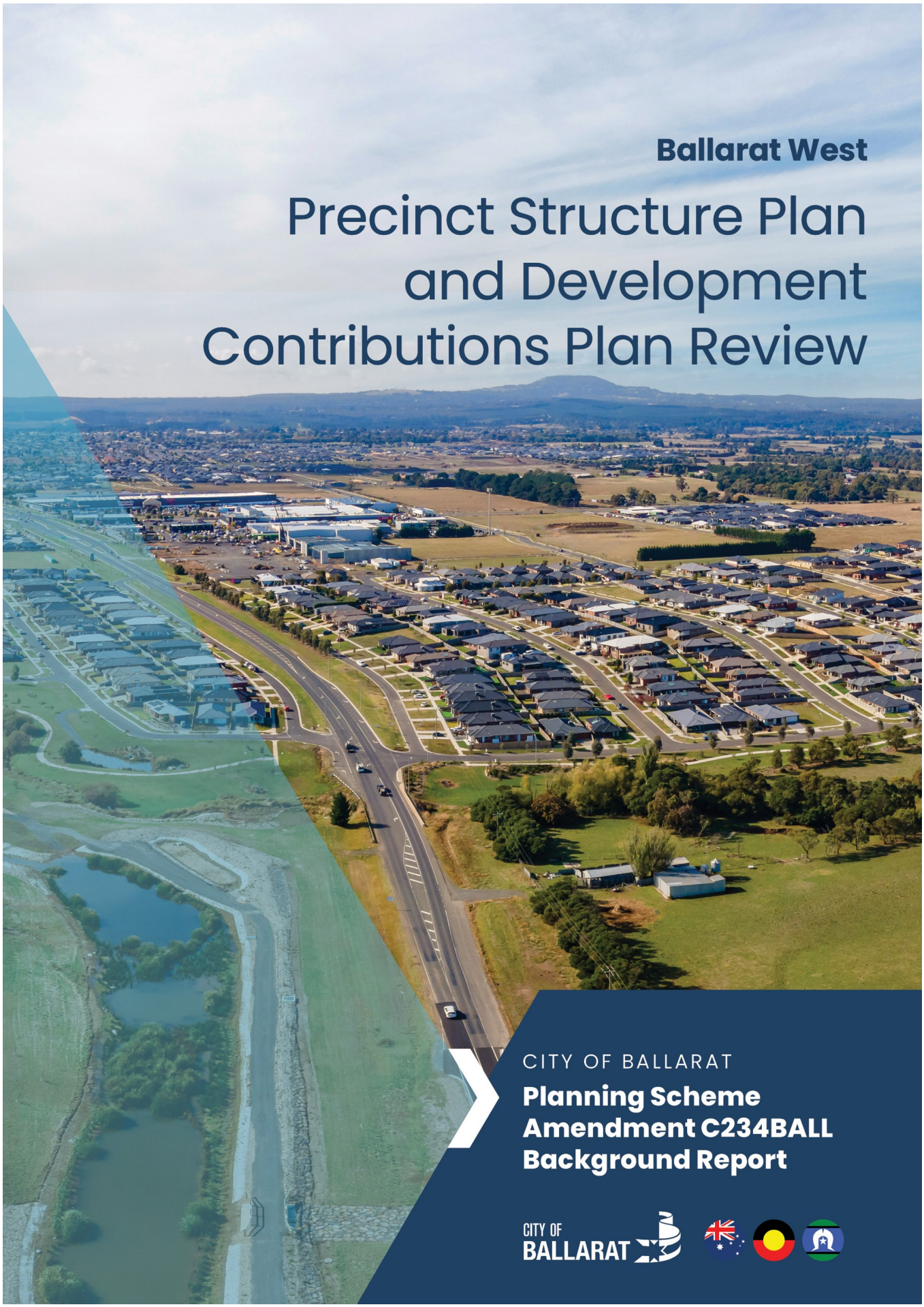
Ballarat West
Precinct Structure Plan and Development Contributions Plan Review
CITY OF BALLARAT
Planning Scheme Amendment C234BALL Background Report
CITY OF BALLARAT

Ballarat West PSP and DCP Review Background Report

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Ballarat West PSP and DCP Review Background Report

DOCUMENT PURPOSE

1. This report has been written with the purpose of explaining the background to the review of the Ballarat West Precinct Structure Plan (BWPSP) and Development Contribution Plan (BWDCP) and outlines in detail the proposed changes to both documents and associated planning scheme provisions.

2. The report should be read in conjunction with the revised BWPSP and BWDCP and associated documents.

BALLARAT WEST PSP AND DCP HISTORY

3. Ballarat West is the municipality's key growth front and the planning for Ballarat West has a long planning history which is summarised below.

BALLARAT STRATEGY 1998

4. The Ballarat Strategy identified land to the west of Wiltshire land in Smythes Creek as Ballarat's primary growth front. The strategy was incorporated into the planning scheme with a framework plan that included the western growth front.

BALLARAT WEST GROWTH AREA PLAN 2009

5. The Growth Area Plan provided a framework to guide growth in Ballarat West up to and beyond 2030. It was proposed that growth would be implemented in four precincts and was referenced in the planning scheme through amendment C117 on 3 September 2009.

ALFREDTON WEST PSP

6. Alfredton West was the first of the 4 precincts in the Ballarat West growth area to be prepared as a single PSP. The Alfredton West PSP was proponent-led and following exhibition of the PSP through amendment C122, submissions were received, most of which were resolved.

7. In order to speed up the process Council requested C122 be expedited to get land to market more quickly and C122 was subsequently abandoned, superseded by C150 and incorporated into the planning scheme through a ministerial intervention on 2 June 2011.

BALLARAT WEST PSP AND DCP

8. Amendment C158 sought to incorporate the BWPSP and BWDCP into the planning scheme and covered land that comprised the 3 remaining sub-precincts in Ballarat West.

9. The BWPSP was incorporated into the planning scheme through a ministerial intervention on 1 November 2012. However the Minister for Planning did not approve the DCP and directed further work and engagement to be undertaken on the DCP to respond to 27 opposing submissions. The

submissions had a focus on levies being excessively high and unaffordable, to such a degree that development of the growth area would be severely affected.

10. In April 2013, the Minister appointed an Advisory Committee to facilitate the process of considering the submissions on the DCP. This process resulted in the Advisory Committee recommending some key modifications in the DCP including a reduction in the levies.

11. The reduction of the levies was negotiated between Council and submitters and was achieved by the deletion of a number of projects and the adjustment to the cost apportionment of certain projects. The decision to reduce the levy in 2013 has created a financial legacy issue for the funding of the DCP and this is discussed further at paragraph 230.

12. Following the Advisory Committee process, the BWDCP was incorporated into the planning scheme under C167 on 30 October 2014.

13. On August 10 2017, an amended BWPSP was incorporated into the planning scheme (ref: C203). The amended PSP was a result of a partial review which considered changes to requirements around land contamination and noise buffers to sensitive land uses.

14. In November 2017, the BWDCP was amended under GC75 to make changes to the Community Infrastructure Levy across 13 planning schemes in Victoria.

15. On January 15 2024, the BWDCP was amended under VC249 to exclude small second dwellings from development contributions.

PURPOSE OF THE REVIEW

16. The primary purpose of the review is to ensure the development of land affected by the BWPSP and BWDCP will continue to deliver acceptable planning outcomes and an equitable and timely rollout of infrastructure in Ballarat West whilst maintaining the vision and integrity of the PSP.

KEY OBJECTIVES

17. To provide an updated PSP and DCP that delivers acceptable planning outcomes which will assist Council in meeting Goal 3 of the Council Plan: A city that fosters sustainable growth.

18. The implementation of a planning scheme amendment which is in accordance with legislative requirements and planning policy that delivers appropriate and affordable infrastructure in a fiscally responsible manner.

LEGISLATIVE JUSTIFICATION FOR REVIEW

19. Aside from the planning and infrastructure reasons for undertaking the review which are discussed in this report, legislation is also informative in undertaking the review.

20. Although there have been amendments to the PSP and DCP listed above, a full review has not been undertaken to date.

21. Under section 1.5, Monitoring and Review of the BWPSP it is stated that the effectiveness of the PSP will be evaluated regularly, at least every five years and that it may be revised and updated following review.

22. Under 4.6, Administrative Procedures of the BWDCP it is stated that the City of Ballarat will undertake a full review at least every five years during the lifespan of the DCP.

23. The Development Contribution Guidelines 16 June 2003 – as amended March 2007 identify that Councils have a responsibility to monitor the DCP on an annual basis and to review the DCP every 3 years as part of the review of the planning scheme.

24. Section 12 (1) (c) of the Planning and Environment Act also requires Councils to review regularly the provisions of a planning scheme for which it a planning authority. This PSP and DCP review is being undertaken independently from a review of the Ballarat planning scheme.

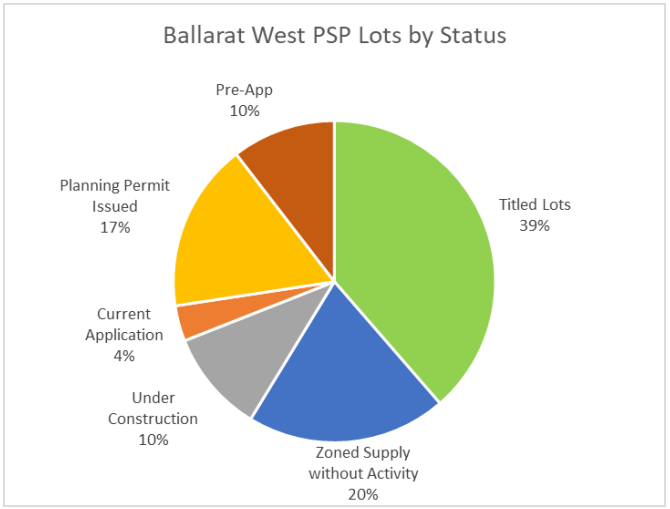
BALLARAT WEST PSP AND DCP STATUS AND IMPLEMENTATION

25. The BWPSP comprises 3 sub-precincts. As discussed above Alfredton West had originally been intended to be a 4th sub-precinct but development was brought forward and a separate PSP was prepared by the developer.

26. The BWPSP area comprises 1290 hectares of land with a net developable area (NDA) of 950 hectares which was projected to accommodate 14,442 dwellings and 31 hectares of non-residential commercial development. The BWPSP area was not expected to be fully developed until 2035-2040.

27. Key community infrastructure identified to be delivered in the BWPSP included 5 state schools, a private school, 4 community facilities hubs and 6 active open space reserves.

28. Since development commenced in 2014 around 40% of land has been titled, 13% of land is under construction and 47% undeveloped. (*see* Figure 1).



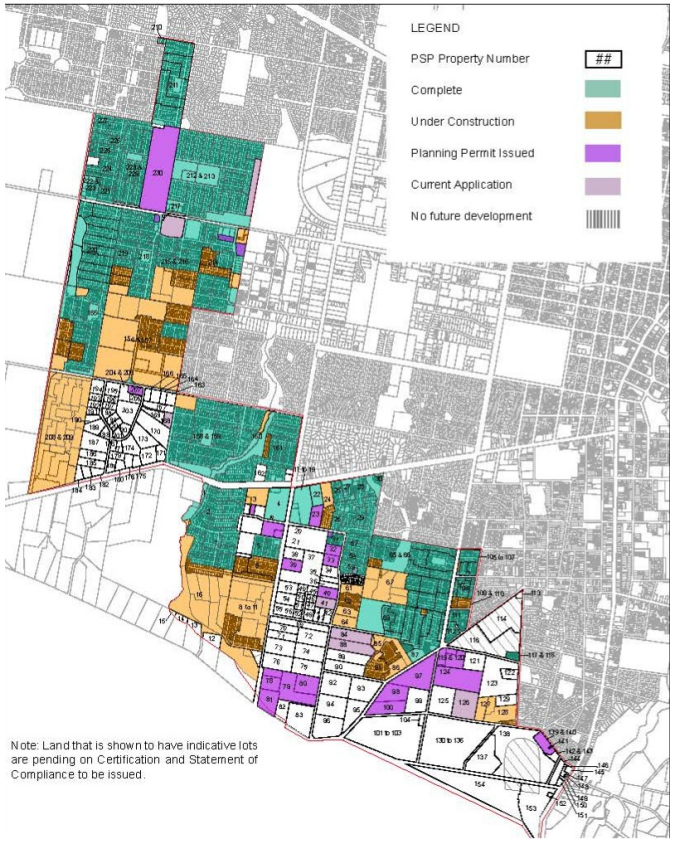


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Figure 1 Lot status pie chart and permit plan showing PSP properties development status, January 2025

29. Whilst the BWPSP established the strategic justification and locations for key infrastructure that would be required to service the future community. The BWDCP was prepared to provide the specifications, detailed costings, cost apportionment and triggers for each project that would be partly funded through development contributions.

30. The BWDCP set out the drainage infrastructure which is costed over 20 sub-catchments which have a total 30 drainage basins and associated pipework. There are also 39 road projects, 12 intersection projects and 6 community facility projects and 12 active open space projects.

31. A number of the road and drainage projects required to facilitate development sites have already been delivered across the three sub-precincts.

32. The only community and recreation infrastructure projects that have been delivered are kinder facilities in the Carngham Road and Bonshaw Creek sub-precincts. In terms of state community infrastructure, no state or private education facilities have been delivered. This is discussed further in the section on community infrastructure.

PSP AND DCP REVIEW SCOPE

33. The review of the BWPSP and BWDCP seeks to respond to on the ground development changes that have occurred since the documents were incorporated into the Ballarat planning scheme and where appropriate and reasonable, update objectives to reflect current state planning policy.

34. Matters in the scope of the project include:

- A review of outstanding PSP/DCP infrastructure projects
- Reviewing the specifications, costs and apportionment of the projects
- Inclusion of strategic planning costs as a DCP project
- Planning permit and Urban Design Framework review to ensure development changes are reflected in the updated documents
- Audit of net developable area and land use allocation including open space
- Updates to housing yield and a review of density targets considering market trends and state planning policy
- Addressing ambiguity in PSP drafting
- Reviewing the protection afforded to the Growling Grass Frog in the PSP and planning scheme ordinances
- Updating land valuations.

35. Advice from the Department of Transport and Planning in the early stages of the project was that new infrastructure projects were unlikely to be supported given the amount of development that had already occurred.

36. With this advice in mind although new projects were not formally considered out of scope, advice provided to consultants was that they should only be recommended in exceptional circumstances. Consequently no new major infrastructure projects were recommended.

37. The key changes proposed as a result of the review are summarised under the headings below.

LAND BUDGET CHANGES

38. When a PSP is developed, land budget tables are prepared to set out the estimated allocation of land uses on a parcel-by-parcel basis. The tables include housing yields, areas for non-residential uses and land required for infrastructure.

39. As PSPs allow for flexibility when considering planning application by requiring development to be "generally in accordance" with the PSP, this means that as land is developed, the actual figures allocated to the different parcels will inevitably change.

40. Officers have audited the land budget tables against all permits issued and current applications for permits to prepare an updated set of figures that more accurately represents what has and is expected to occur in the PSP area.

41. The total land area in the original PSP land budget was 1290 hectares. Following the audit, this has been adjusted in the land use budget to 1287 hectares. The audit of developed land and land use allocation has also resulted in an adjustment to the land available for development from 947 hectares to 972 hectares.

42. Table 1 summarises the key changes to infrastructure which will be reproduced in the PSP and DCP.

Land Use Category	Existing PSP (ha)	Revised PSP (ha)
Roads and Road Widening	87.51	84.91
Drainage Basins and Reserves	81.44	91.04
Environment and Heritage Conservation Areas	27.30	8.27
Community Facilities	31.60	28.6
Active Open Space	39.98	36.64
Passive Open Space	58.15	65.11
Regional Recreation Open Space	17.63	0

Table 1: Revised Land Use Budget Summary

43. Some of reasons for the key changes in land uses are discussed in the relevant section of this report. The land use allocation changes inform the amount of NDA that is available for subdivision and development.

44. The housing yield table shows the forecasted number of lots that will be delivered in the PSP with a range of housing densities encouraged to deliver a variety of lot sizes and housing types.

45. The distribution of housing densities across the three precincts was forecasted at 15.70 dwellings per developable hectare. This was to be provided through a combination of conventional residential at an average of 15 dwellings per hectare and medium density at 25 dwellings per hectare.

46. In the initial stages of the PSP, subdivision occurred below these density targets but in recent years the yield has steadily increased and across the precinct the density is now slightly under 16 dwellings per hectare.

47. There is now a development industry trend for smaller lot sizes and this has been demonstrated through subdivision applications that now typically seek a higher density in the range of 17 to 18 dwellings per hectare.

48. It is expected that this trend will continue, and the amended PSP seeks to facilitate this trend to encourage a more efficient use of existing urban land as well as planned infrastructure. Moreover, the revised density target responds to the State Government's updated PSP guidelines released in 2021 which encourage a minimum of 20 dwellings per hectare and 30 dwellings per hectare in high amenity areas.

49. Taking this trend and policy direction into account, it is expected that raising the average net density to 20 dwellings per hectare on the remaining undeveloped land would deliver around 15,524 dwellings compared with the 14,442 that was originally anticipated in Ballarat West. This would raise the overall average density from 15.69 dwellings per hectare to 17 dwellings per hectare. The PSP review has factored this increased yield in by ensuring that the capacity of future infrastructure will accommodate this extra growth.

50. In the Informal consultation on the project some developers expressed concerns about the increase in density and said that the yield should be maintained at 15 dwellings per hectare. However this would be overly restrictive and contrary to both market trends and planning policy.

51. Moreover restricting yield to below market trends would conflict with the State Government directions in the Housing Statement which seeks to prioritise housing that is close to services and jobs. Furthermore an additional 1082 lots would make a material contribution to the recently announced state government housing targets for the City of Ballarat.

INFRASTRUCTURE

52. A critical component of the review is to ensure that all the required precinct wide infrastructure is planned for and can be delivered and funded in a timely and fiscally responsible manner.

53. The City engaged consultants to undertake a review of community and recreation, transport and drainage infrastructure projects. Each of the consultants have provided technical reports with recommended changes to projects which are discussed under the headings in the Infrastructure Projects Review section below.

54. The changes result in the need to update the scope and costings of projects which will be included in the final DCP and provided in tables in the appendices.

BIODIVERSITY

55. As part of the PSP review, an audit of biodiversity controls that are currently in place in Ballarat West has been undertaken.

56. The two key documents reviewed are the Ballarat West Native Vegetation Precinct Plan (BWNVPP) and Growling Grass Frog Conservation Management Plan (GGF CMP).

57. The BWNVPP that applies to the PSP area together with Environmental Offset Areas has been audited to understand what vegetation has been removed and retained in accordance with the NVPP.

58. Of the PSP parcels where vegetation was shown as being retained only one, 520 Glenelg Highway Smythes Creek, remains undeveloped. This site has two trees, one of which is dead. The remaining tree is to be retained in an approved subdivision layout.

59. The review of the GGF CMP is also discussed later in the report.

PSP DOCUMENT CHANGES

60. Most of the PSP plans in the document will need to be revised to reflect the land use and infrastructure changes. The land budget and housing yield tables will also be updated to reflect the numbers discussed above.

61. Attachment 3 - Small Lot Housing Code (SLHC) will be removed in the Ballarat West PSP as this version of the SLHC in the BWPSP has since been superseded.

62. In addition to the plan updates, it is proposed to introduce a series of new concept plans to provide guidance for some of the community and recreation where the preferred outcomes are known. The plans are for:

- MR Power Park Community Facilities
- Delacombe Major Activity Centre Community Facilities
- Ballarat Carngham Road Community Facilities
- Greenhalghs Road Community Facilities
- Two linear link open space reserves

63. A further plan included in the revised PSP is a concept plan (*see* figure 2) for the Masada Boulevard/Fay Drive precinct which prior to being included in the PSP and zoned Urban Growth Zone was zoned Low Density Residential. This plan is required to give guidance to landowners on

how the existing parcel configuration and road network may be incorporated into future subdivision layouts to ensure an orderly and rational integration of this fragmented land.

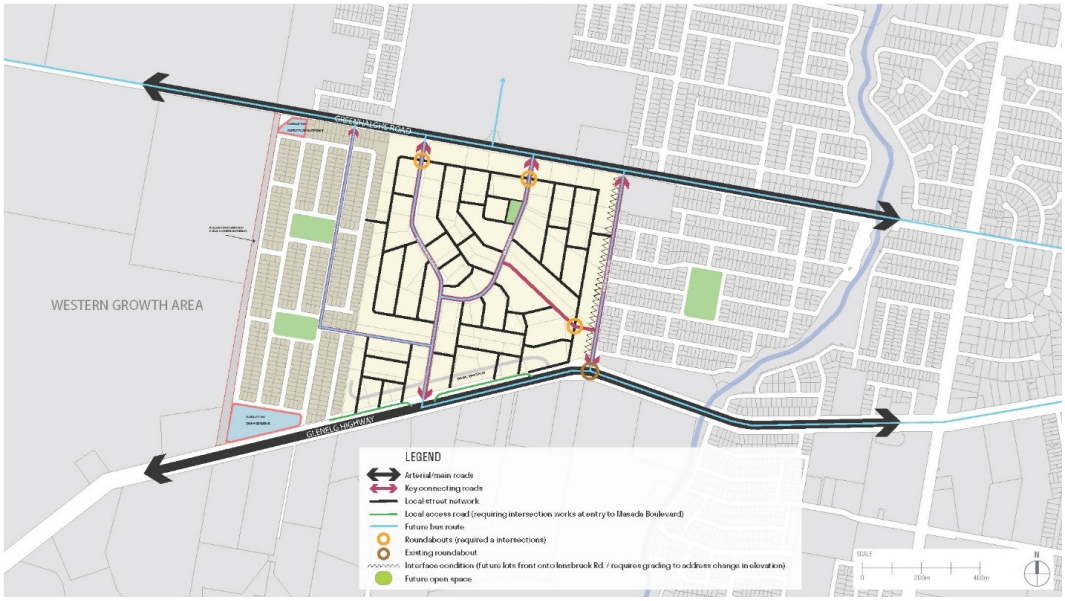


Figure 2: Masada Boulevard/Fay Drive Concept Plan

64. Aside from the changes discussed, the PSP will generally only be given a 'light touch', updating text only where it could have a material bearing on the outcome sought. The changes are reflected in track change and clean versions of the PSP document and a change summary document.

65. One discreet PSP drafting issue has come to light through a planning permit assessment of a childcare centre application. This issue is proposed to be addressed through the review.

66. In a preliminary assessment of the proposal, Officers had concerns as to whether a permit could be granted for the proposed use of the land.

67. The concerns were formed having had regard to Planning and Design Guidelines for Community Hubs in the Ballarat West PSP, in particular Guideline 5.4.3 of the PSP which states:

'Education and community services (public and private) and other activities (such as childcare centres) must:

-Be within and/or adjoining community hubs or activity centres.

68. The first matter considered was whether the Guideline should be interpreted as being a mandatory or discretionary requirement. Having had regard to the Victorian Civil and Administrative Tribunal case law and the language of the PSP and particularly the language in Chapter 5 it was concluded that the Guideline is intended to operate mandatorily.

69. Having been satisfied that the Guidelines are be interpreted as mandatory, Officers turned their mind to the location of the childcare centre at 491 Greenhalghs Road (the site) and whether the site is 'within or adjoining a community hub or activity centre'.

70. The site is located directly opposite a proposed community hub which forms part of the Winterfield North Estate within the Ballarat West PSP. As the site is separated from the community hub by Greenhalghs Road itself, it is evident that the site is not within a community hub.

71. This led to a consideration of whether the site 'adjoins' an activity centre or community hub requiring specific consideration of the meaning of 'adjoining' in the context of Guideline 5.4.3.

72. The meaning of 'adjoining' is not defined in the PSP, the Planning and Environment Act 1987, or clause 73.01 (or indeed any provision) of the Victoria Planning Provisions. Therefore, in accordance with clause 73 Meaning of terms, where a term used in the planning scheme is not defined, the term has its ordinary meaning.

73. In forming the view in the preliminary assessment, officers had regard to *Stephen D' Andrea Pty Ltd v Brighton CC & St Finbar's Catholic Primary School & Ors* (1991) 6 AATR 259 which in summary held that 'adjoin' should be given its primary meaning, namely 'conterminous with'. That case has similarities to the matter under consideration as, in the context of the meaning of 'adjoining, the site was also separated by a road, albeit a zone was the relevant interface rather than a community hub.

74. Officers also considered common definitions of 'adjoin' from the Macquarie and Oxford dictionaries, which were considered to be broadly consistent with usage of 'adjoin' in the D'Andrea case. In the Macquarie, the definition includes terms such as *'to be in connection with' and 'to be next to'.* In Oxford the definition includes *'To be located next to or very near…'.* The Oxford definition is considered further below.

75. Having taken the above matters into account, Officers were comfortable that their preliminary view that a permit could not be granted for the proposed use could be interpreted as being correct. However, a more comprehensive assessment of the proposal against the PSP did cast a degree of doubt that this initial view may be too narrow or incorrect.

76. The meaning of 'adjoin' in the decision of *Stephen D' Andrea Pty Ltd v Brighton CC & St Finbar's Catholic Primary School & Ors* (1991) 6 AATR 259 was in a different statutory context. In that case, the decision maker was asked to determine the meaning of 'adjoin' in the context of notice requirements of permit applications.

77. Furthermore, a review of the Future Urban Structure Plans in the PSP at both the Community Hub in question and the Major Activity Centre reveals that at both of these locations there are education and community services proposed. What is of particular note is that in both locations some of the

community services do not physically adjoin all of the other components of the Community Hub or Activity Centre. They are in fact shown to be separated by a road.

78. This is significant as it suggests that the spatial planning embedded in the PSP may enable the adoption of a more liberal interpretation of the meaning of 'adjoining' to that adopted by the Tribunal in the context of interpreting s 52(1)(a). Having regard to the Oxford dictionary definition once more, which defines 'adjoin' as including the words 'To be located next to or very near…', it is the clear that the site is either located next to or very near to the Community Hub as it is directly opposite and disconnected only by a road.

79. Having regard to all the above matters, Officers determined that on balance, it is open to Council to form the view that the site does fall within the meaning of adjoining a community hub. It would also be a more orderly outcome to adopt a less restrictive definition of the meaning of 'adjoining' to allow a permit to be granted for the proposed use given its spatial location and relationship. In forming this position Officers also had regard to:

(a) the fact that several other childcare centres in the PSP have previously been issued permits where they do not adjoin a Community Hub or Activity Centre, and;

(b) a child care centre is a permissible use in the General Residential Zone (the applied zone in the UGZ).

80. To provide greater clarity and flexibility in this matter it is proposed to revise the guideline as below:

(a) Education and community services (public and private) and other activities (such as childcare centres) must:
(b) Be within ~~and/or adjoining~~ or nearby community hubs or activity centres.

DCP DOCUMENT CHANGES

81. The main consequential changes to the DCP will be updates to the descriptions, specification and costings sheets of the infrastructure projects that have been included in the review. Locational project changes will also be reflected in updated plans.

82. All other DCP projects that have been delivered or not updated have had their values fixed at the current DCP value and indexed to the current financial year.

83. Other document changes include:

- Updated introduction and strategic basis to reflect the scope of the review
- An update to the life of the DCP from 40 years to 30 years to reflect development occurring faster than originally anticipated
- Document structure changes to improve its ease of use
- Update to various tables, i.e NDA, demand units, summary of costs and contributions

- Updated date references to indexation
- New clause to allow collection of development contributions for a land use and/or construction of buildings where subdivision of a lot is not proposed
- Updated clause 3.4.2 City of Ballarat Funding Liability including table
- Updated clause 5.5 Drainage, including removal of the drainage rebate option which has not been implemented in Ballarat West.

INFRASTRUCTURE PROJECTS REVIEW

84. The City engaged three external consultants to undertake a technical review of the PSP and DCP infrastructure projects.
    - ASR Research undertook the community and recreation infrastructure review,
    - Engeny were engaged to review the drainage strategy and;
    - Milward Engineering reviewed the transport projects.

COMMUNITY AND RECREATION INFRASTRUCTURE

85. The scope of ASR's work included a review of the current and future demand for existing community and recreation infrastructure, including state infrastructure to understand what changes will need to be implemented in the revised PSP and DCP. ASR's methodology included revised dwelling and population assumptions.

86. The PSP community and recreation infrastructure projects included in the ASR review were kindergartens and associated facilities, community centres, a library, active open space reserves, sporting pavilions and indoor recreation centres.

87. A key finding of the ASR review was that the specifications and costings in the existing DCP do not mirror those adopted in contemporary growth areas and it was recommended that the revised PSP incorporate the Victorian Planning Authority (VPA) Benchmark Infrastructure Costs guide which is based on a report prepared by Cardno in 2019. As this is now accepted as standard practice in calculating infrastructure costings in growth areas it is proposed to adopted this recommendation and update the costings using the benchmarking methodology.

88. It is acknowledged that the adopting benchmark costings will increase cost of the facilities. This will result in an increase in development contributions with a cost to both developers and to Council. This is discussed under the levies section at paragraph 230.

89. The community and recreation facilities are located throughout the precinct area in four activity centres or hubs and one additional open space reserve. A summary of the key recommended changes in each hub are documented under the headings below. A section is also provided on proposed changes to the indoor recreation centres as this change has a major impact on the costing and funding mechanism proposed.

DELACOMBE MAJOR ACTIVITY CENTRE (DMAC)

90. The DMAC is the Major Activity Centre for Ballarat West and it includes a community hub that comprises a state government primary school and 5 DCP projects that Council will need to deliver. The projects are a branch library co-located with a multi-purpose community centre, an early years hub, an active open space reserve and a sports pavilion.

91. Since the incorporation of the BWPSP into the planning scheme, a considerable amount of development has occurred at DMAC. The DMAC planning approvals including infrastructure documented in S173 Agreements have significantly reduced the land available to deliver the PSP community facilities. This shortfall of land could compromise the ability to meet some of the PSP's community facility objectives, including:

- *To provide community facilities in line with future population growth;*
- *To plan for a range of community facilities, cultural venues and services to meet the varying needs of local residents;*
- *To plan for community facilities of a high standard that have flexible designs which can accommodate a range of uses, meet the changing needs of the community and allow for both indoor and outdoor activities;*
- *To plan for physical connections that integrate future adjoining land uses for community uses;*
- *To provide sporting facilities and supporting infrastructure identified in the plan;*

92. This review seeks to address the shortfall of land where possible by making changes to a number of the land projects.

93. To fully understand how the impact of the decisions made on the land projects it is necessary look in detail at the approval history.

<u>DMAC Planning history/DCP land projects</u>

94. The changes of consequence to the community facilities projects have occurred to PSP property parcels 2, 3 and 4 to the immediate west of Cherry Flat Road and immediate south of Glenelg Highway and shown coloured yellow (primary school), orange (community facilities) and green (active open space) in the existing and proposed PSP in figure 3.

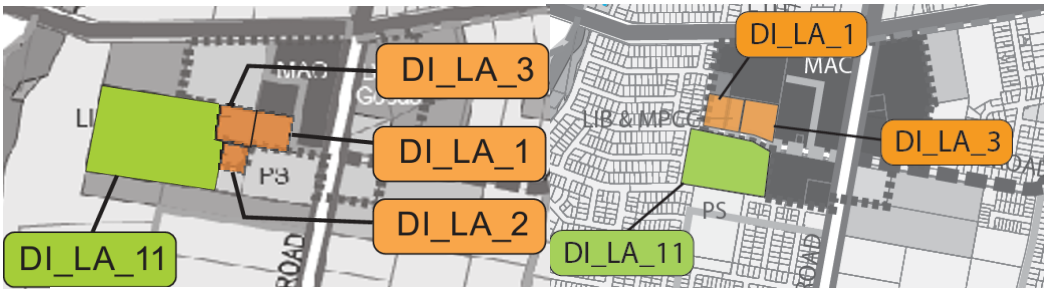


Figure 3 DMAC DCP Land Projects (existing left) and proposed (right)

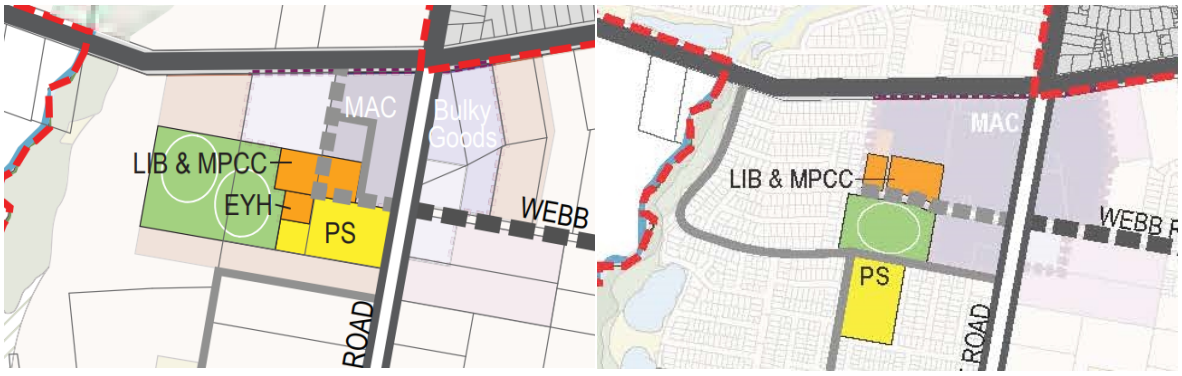


Figure 4 DMAC Existing PSP (left) and Proposed PSP (right)

95. The existing status and proposed changes to the 4 DCP land projects associated with the community facilities in DMAC are summarised in table 2. Table 3 goes into detail on the planning and permit history to provide more context to the changes.

Project Code	Facility	Original PSP Land Area	Land Area available under decisions made	Land Area with review changes
DI_LA_1	Library	1 hectare	0.06ha	0.9 hectares
DI_LA_2	Early Years Hub	0.5 hectares	NA	NA
DI_LA_3	Community Centre	1 hectare	1 hectare	1 hectare
DI_LA_11	Active Open Space	8 hectares	3.5 hectares	3.5 hectares
Total		**10.5 hectares**	**4.506 hectares**	**5.4 hectares**

Table 2: DMAC DCP Land Projects Summary

Delacombe Major Activity Centre/Hub Community Infrastructure Land Projects			
DCP and/or PSP Project Title	**Planning approvals**	**Status of land and commentary**	**Summary of proposed change**
DI_LA_1- Land for Branch library (1ha)	DI_LA_1 (pt) and DI_LA_2 (pt) are recorded in a S173 Agreement AS229209T 28 May 2019 as the Early Years Hub and library identified in the Urban Design Framework as a multi-purpose community facility/early years hub. Total land area of 1.08ha to be vested to Council. The S173 is tied to an approved UDF dated March 2017 with no associated planning permit. A separate planning permit PLP/2014/832 identifies land for a library, (discussed below).	A parcel of land was vested in Council under PS815355S on 23 October 2019 with an area of 1 ha. This land now has a street address of 26 Valiant Road, Smythes Creek. The vested land is essentially in the same location and the same size as DCP project DI_LA_3.	As the land acquired is not proposed for a library it is necessary to change the project code and description from: **DI_LA_1- Land for Branch library (1ha) to** **DI_LA_3- Land for community centre for a level 3 multi-purpose community centre co-located with MAC (1ha)** This project description change will make it spatially consistent with both the land that has been vested and the project in the DCP. There is no change to the location and size as this is suitable for delivery of the facilities.
DI_LA_2- Land for Early Years Hub comprising kindergarten, Maternal and Child Health and flexible community space (0.5ha)	See above.	Despite being recorded in Agreement AS229209T, it is not clear what land has been allocated to DI_LA_2 for as the land project areas are not split in the Agreement Schedule.	This land project can be deleted as and combined with DI_LA_3 to accommodate both the early years hub and community centre on the 1 ha site at 26 Valiant Road that has been vested in Council.
DI_LA_3- Land for community centre for a level 3 multi-purpose community centre co-located with MAC (1ha)	PLP/2017/A approved subdivision which created a lot which the officer report states is proposed for the library. The lot created is 639sqm. DI_LA_3 was subsequently recorded in a S173 Agreement AN529564S as Community centre co-located within MAC (Library site)	A parcel of land in the location shown on the endorsed plans was vested in Council under PS807055 on 29 November 2021 with an area of 639sqm. It is not clear why this parcel was identified for the library given that the library project code is DI_LA_1. It is also not clear why the land was accepted for a library given the area was only 6.4% of size of the land project in the DCP and clearly inadequate for an 1800sqm library.	To address the decision to accept undersized land for the library in S173 Agreement AN529564S, it is proposed to adjust this land project by: (a) Moving it to two new parcels of land at 34 and 44 Valiant Road, Smythes Creek and; (b) Expending the funds that Council has received towards DI_LA_3 on the provision of the additional land (with the consent of the Minister for Planning). The total land area for the library would 0.9ha.
DI_LA_11 Land for Active Open Space (8ha)	DI_LA_11 (pt) is documented in S173 AS229209T as the Glenelg Highway Active Open Space Reserve. Total land area of 2.977ha to be vested in Council.	A parcel of land was vested in Council under PS815355S on 14 July 2019 with an area of 2.977ha.	Project adjusted to reflect the new land size of 3.5ha.

	It is proposed to include a further 0.502ha of land for this project.	The total area of Active Open Space delivered under DI_LA_11 will be 3.5ha a shortfall of 4.5ha. The main reason for the shortfall was inappropriate topography for sporting recreation. The surplus land was added to the NDA in the PSP.	
Land for Primary School (3.5ha, non-DCP project)	PLP/2017/379 approved to extend the DMAC reference at 11 Valiant Road to the original school land. The UDF approved the relocation of the school to 54 Cherry Flat Road. A permit was also approved for the residential subdivision of land approval at 54 Cherry Flat Road Smythes Creek reference PLP/2018/217 which impacted the land available for the school. Due to the shortfall in land, officers have negotiated and allocated an additional 0.4ha from a subdivision of land at 88 Cherry Flat Road.	The land for the school remains in private ownership with the total area of land available for the school now 3.42ha, slightly under the required size.	Relocation of school site from 11 Valiant Road to 54 Cherry Flat Road and 88 Cherry Flat Road. Reduced land area allocation from 3.5ha to 3.42ha.

Table 3 DMAC Planning and permit history

96. Aside from the changes to DCP community infrastructure land projects there are changes to construction scope and costings in line with the ASR review and these are documented in attachment C. A concept plan (*see* figure 5) has been prepared to show how the facilities may be sited at DMAC.

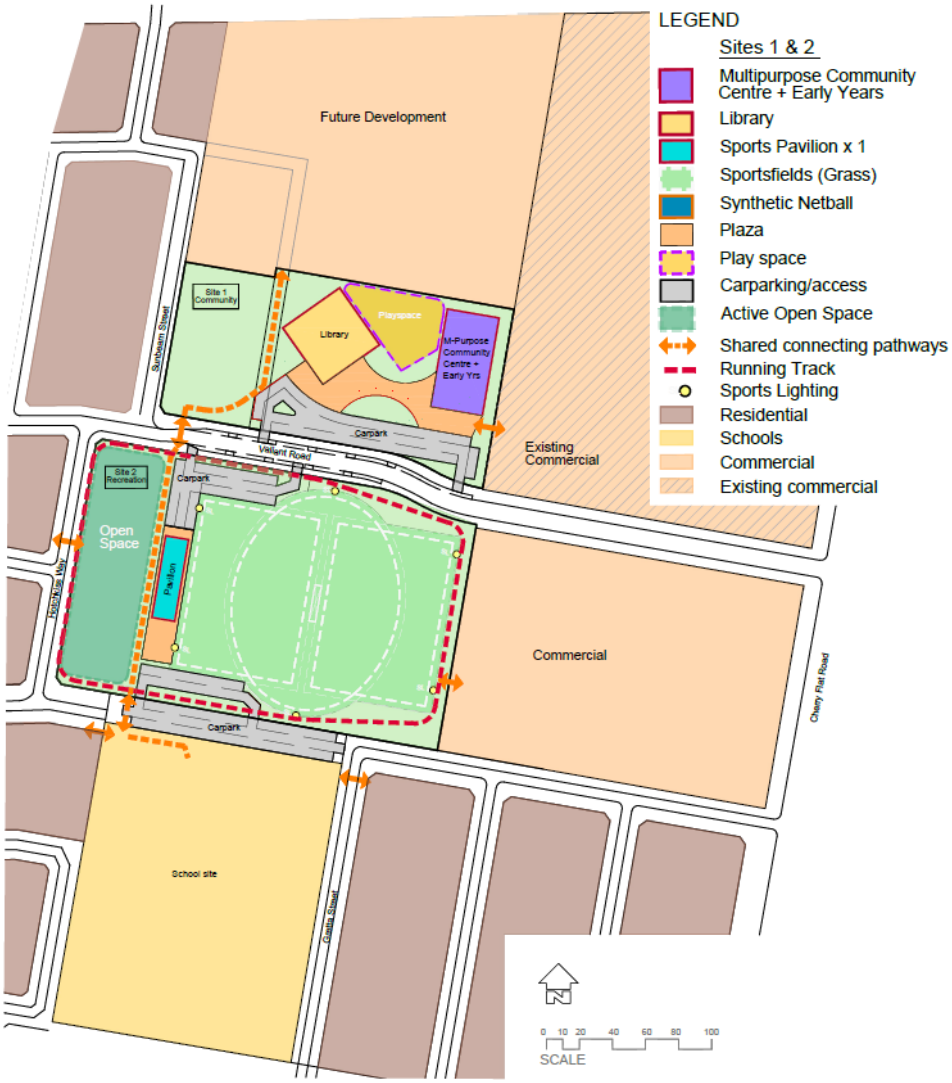


Figure 5: Concept plan for Delacombe Community Facilities

97. As discussed, there are some legacy decisions in DMAC which this review seeks to address and there is strong strategic justification to make these changes. If the projects are left unchanged, the community facilities in particular will be inadequate to meet the needs of the future community.

98. Of note regarding the early years hubs is that part of the reason for the changes to scope and costings is to address a requirement to accommodate additional floorspace to meet the state government's Three-Year-Old kinder reform program. The applies to all the early years hubs in Ballarat West yet to be delivered.

99. In regard to the changes to the primary school in DMAC, the City has consulted with the Department of Education (DoE) and they have advised that the location and size is not consistent with the department's site selection criteria. However DoE advised they would be agreeable and open to further consider the option of a proposed government school site on the proviso that additional land with an area of 0.47ha can be acquired via the subdivision of land to the south at 88 Cherry Flat Road, (PSP Property No.6).

100. Subsequent to DoE's response, the City commenced the negotiated land acquisition process with the land owner of 88 Cherry Flat Road. It is intended that in the short term this will become a Council reserve which would then be on-sold to DoE at a time they decide to develop the land as a school site.

GREENHALGHS ROAD LOCAL ACTIVITY CENTRE (LAC)

101. The Greenhalghs Road is the largest community hub in the PSP, (*see* Figure 6). The LAC includes state secondary and primary schools, a private primary school (yellow), a multi-purpose community centre including an early years hub (orange), an active open space reserve with an indoor recreation centre and a sports pavilion (green).

Figure 6 Greenhalghs Road LAC as shown in BWPSP Plan 13 Community Facilities (existing left, proposed right)

102. The planning history for the community hub land is less complex than DMAC as all the land is currently owned by the developer of the Winterfield North Estate. A permit has been issued for subdivision of the land and work commenced in 2023, (*see* Figure 7). It is expected that the community hub land will be vested in Council in the next 1-5 years. Note that the Community Facilities shown on the subdivision plan differ from the proposed location in the PSP.

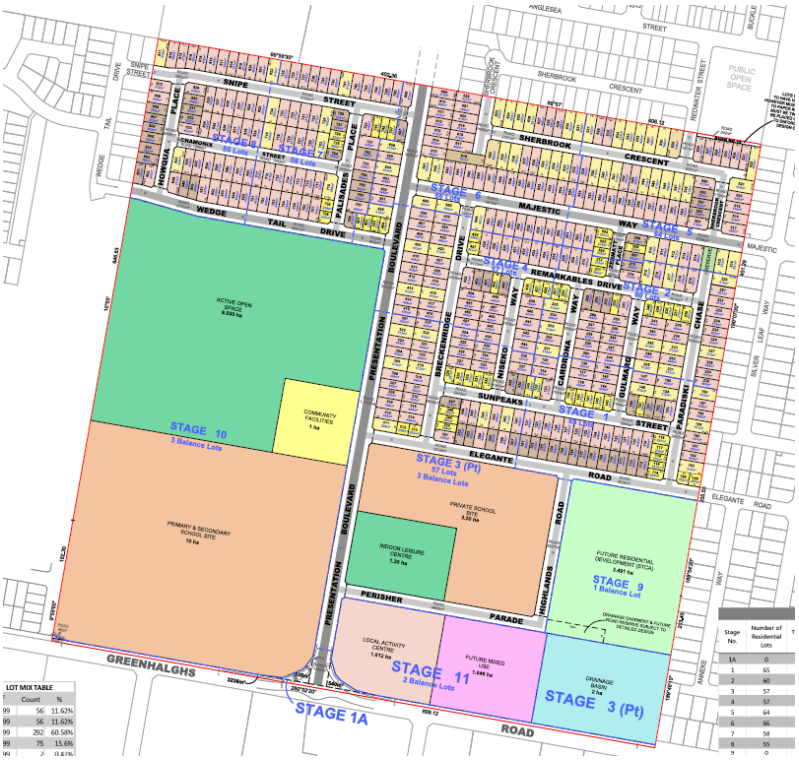


Figure 7 Winterfield North endorsed plan showing Greenhalghs Road LAC

103. In common with the DMAC there have been permitted changes in the area that were deemed to be generally in accordance with the BWPSP. Some of the key changes are:

- Reduction in the size of the land for active open space reserve from 11ha to 9.03ha. This change resulted from land not being acquired from the site to the west of Winterfield North. Note: the 11ha included 1ha land required for the indoor recreation centre.
- A change to the cost apportionment of the indoor recreation centres (considered under paragraph 114)
- The early years hub will be relocated to the eastern side of the link road.
- The location of the state secondary and primary schools have been relocated to the western side of the link road and the private primary school to the eastern side.

104. The City has consulted with DoE regarding the proposed changes to the schools and they have advised that the location and size in the current PSP is not consistent with the department's site selection criteria but they would be agreeable and open to further considering the option of a proposed government school site in this sub-precinct. This would be dependent on relocating the early years hub to enable the kinder facilities to be co-located with the school in line with state government policy. Relocating the indoor recreation to the opposite side of Presentation

Boulevard is impractical because the land available is only 1.3ha which is inadequate to accommodate the facility and associated car parking.

105. The changes to DCP community infrastructure land and construction project scope and costings from the Greenhalghs Road have been adjusted in line with the ASR review and these are documented in attachment C.

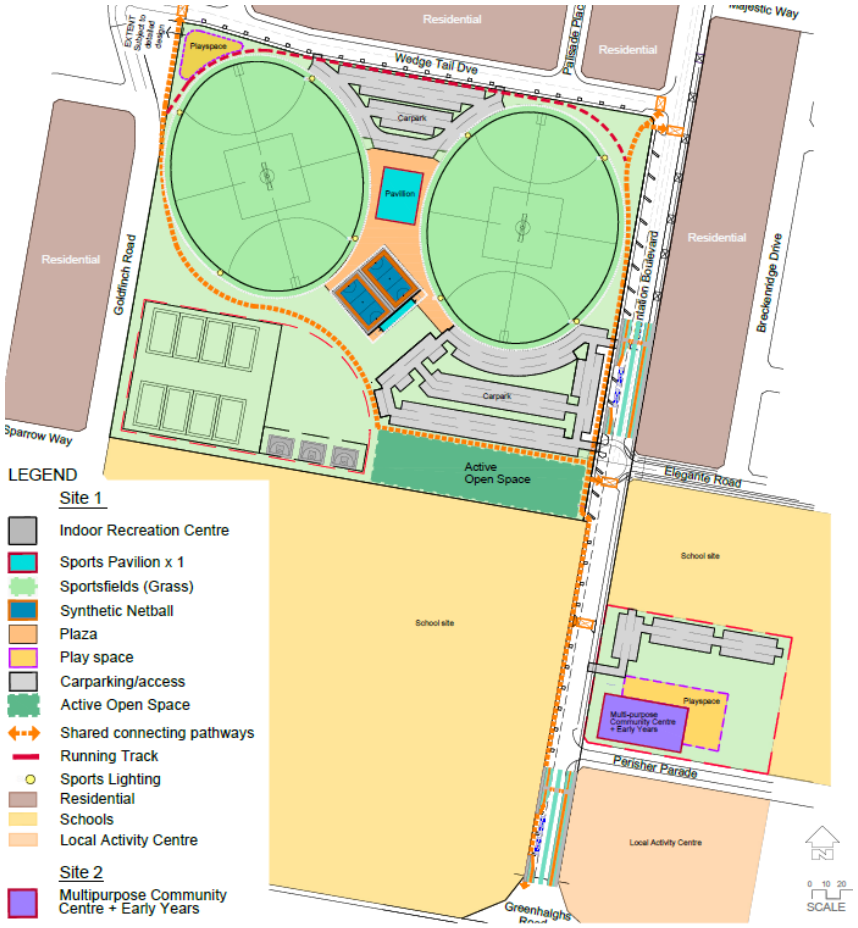


Figure 8 Greenhalghs Road LAC Community Facilities Concept Plan

CARNGHAM ROAD NEIGHBOURHOOD ACTIVITY CENTRE/HUB

106. The community facilities located in the Carngham Road NAC, (*see* Figure 9) comprises a state primary school, a multi-purpose community centre, an early years hub, two active open space reserves and a sports pavilion.

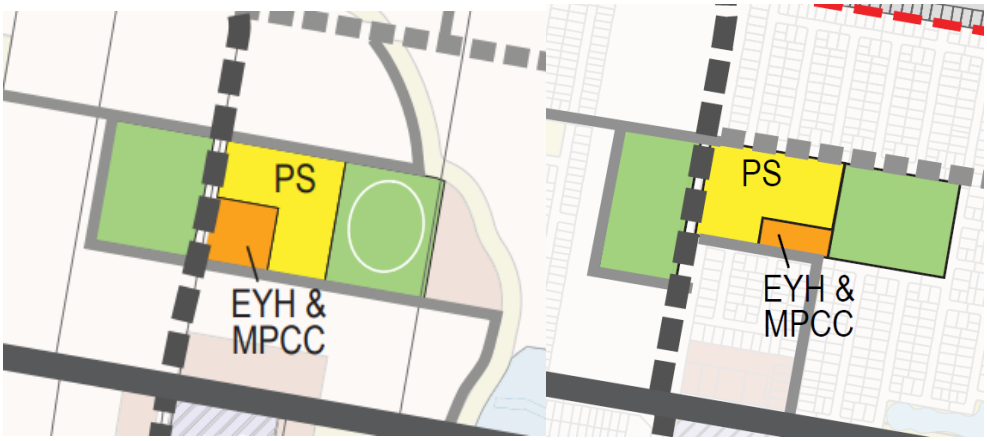


Figure 9 Carngham Road NAC/Hub as shown in BWPSP Plan 13 Community Facilities (existing left, proposed)

107. The review proposes minor changes to land uses in this hub.

- The location of the primary school and early years hub have been flipped
- The primary school area has been increased from 3.42ha to 4.07ha
- The early years hub area has been decreased from 1.3ha to 0.7ha

108. The change in the primary school and early years hub area is proposed as the early years hub has been delivered and has surplus land. DoE are supportive of reallocating this land to the primary school site.

109. In order to recognise that one of the 4ha sports reserves has been delivered, the active open space reserve and associated land project has been split into two projects, with the original project, DI_OS_5 deleted. The land projects have also been split accordingly.

110. A concept plan for the outstanding active open space reserve is shown in figure 10.

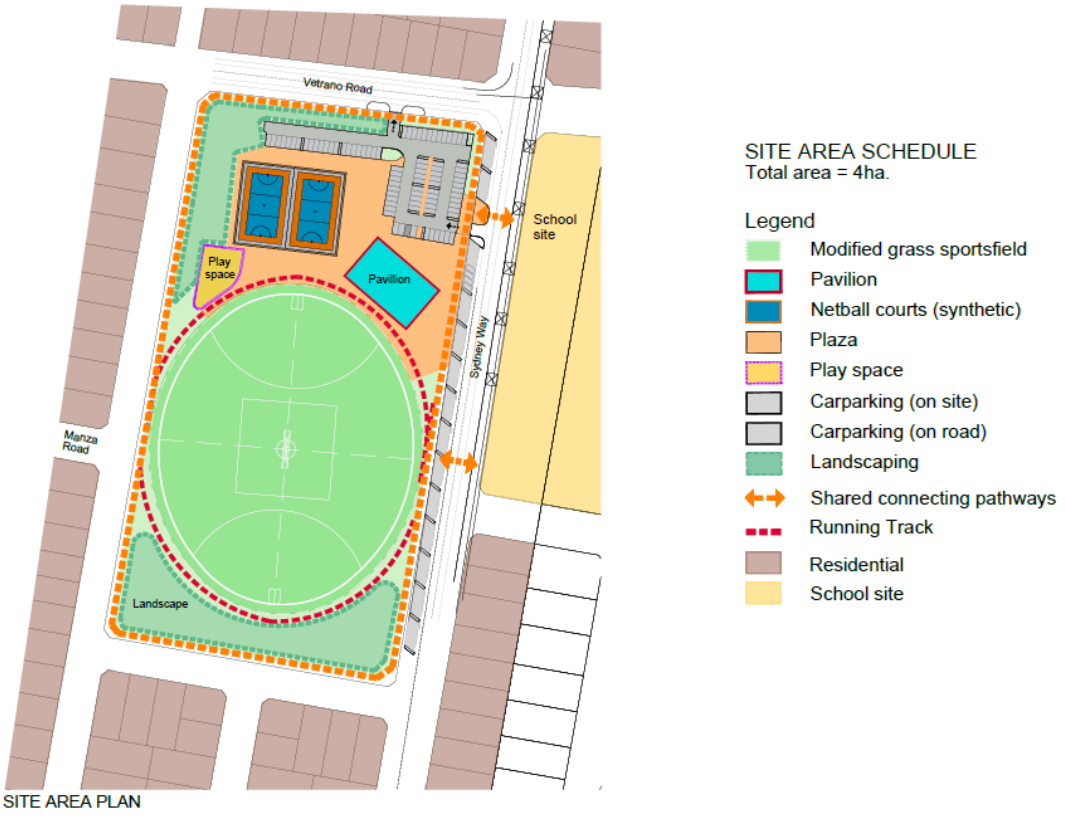


Figure 10 Carngham Road Active Open Space Concept Plan

ROSS CREEK ROAD / MORGAN STREET LOCAL ACTIVITY CENTRE/HUB (INCLUDING MINING PARK)

111. The PSP infrastructure identified in the Ross Creek Road / Morgan Street LAC, (*see* Figure 11) included a state primary school and an early years hub on Morgan Street.

112. Other infrastructure included a Regional Active Open Space reserve at MR Power Park with a sports pavilion and an indoor recreation centre. Although outside this hub, details of Mining Park are also included in this section.

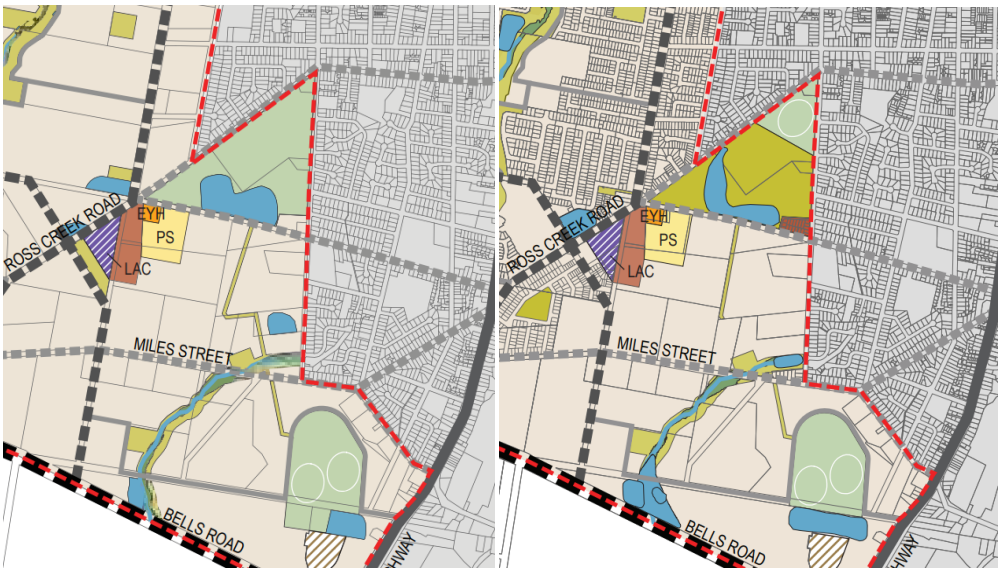


Figure 11 Morgan Park and Mining Park existing PSP left, revised PSP right

113. The key changes to this hub are:

- A change to the function of the reserve from a regional active open space reserve to a part active open space reserve (4ha) and part passive open space (13.63ha). See figure 14.
- The reserve will have some informal active recreation facilities such as a skate park and seniors gym equipment funded outside the DCP.
- Removal of a 4 court indoor recreation centre. The altered function of MR Power Park has resulted in a recommendation that this facility be removed with development contributions collected redirected towards the 8-court indoor recreation centre at Greenhalghs Road hub. See paragraph 114 for further discussion.
- The early years hub on Tait Street has been partially constructed but an extension of 247 square metres is included in the DCP
- The facilities on the Mining Park active open space reserve are largely unchanged although a change to drainage basin RB29 to increase its size does impinge on the available land which will reduce the overall size from 12.22ha to 11.13ha.

Figure 12 MR Power Park Concept Plan

114. Regarding the primary school site, there are minor boundary changes from the original PSP but the location and size are still generally in accordance with the objectives of the PSP. DoE have not explicitly commented on these changes but have referred to a response that they gave on a subdivision application to the south that provides 0.85ha of the required land for the school.

INDOOR RECREATION CENTRES/MR POWER PARK (DEMAND AND COST APPORTIONMENT)

115. The community and recreation infrastructure assessment undertaken by CPG in 2010 for the PSP recommended a total of 8-12 courts to be located in 3 indoor recreation centres.

116. In the final DCP there were two proposed indoor recreation centres. DI_OS_06, an 8 court indoor recreation centre located at Greenhalghs Road LAC and DI_OS_07, a 4 court indoor recreation centre located at MR Power Park.

117. ASR's assessment in the review has concluded that demand generated by Ballarat West is actually 4 courts rather than 8-12. This review therefore needs to consider adjusting the provision of the indoor recreation centres.

118. ASR have recommended the deletion of the 4 court facility at MR Power Park and redirection of any contributions from that project to the 8 court facility at Greenhalghs Road.

119. Although the City agrees that the demand for 4 courts would meet Ballarat West PSP's needs, it would be far more efficient to build an 8 court facility at Greenhalghs Road to enable the facilities to be used by future growth areas west of Ballarat West so it proposes retention of this facility.

120. This brings us to the question of how the external apportionment for this project should be dealt with which requires consideration of how the original DCP was prepared.

121. DI_OS_06 was one of three items in the original DCP (the others being DI_OS_01, MR Power Park Reserve and DI_OS_07 MR Power Park Indoor Recreation Centre) that had their apportionments adjusted by negotiations with submitters as part of the Advisory Committee process discussed in paragraph 11.

122. All three items were 100% apportioned to the DCP in the exhibited version of the DCP. Following public exhibition, apportionments to the DCP were adjusted down to 41% for the MR Power Park reserve and 20% to the indoor recreation centres. This adjustment was specifically to reduce the overall levy. This effectively meant Council agreed at the time to provide a 'subsidy' of 59% for MR Power Park Reserve and 80% for the indoor recreation centres.

123. Due to changes to the scope and cost required to deliver indoor recreation centres, the cost of DI_OS_06 has increased significantly from $13.6M in the original DCP to $58M under the review.

124. DI_OS_01 has decreased in scope and cost based on ASR recommendations from $12.06M in the original DCP to $8.43M under the review.

125. Retaining the original external apportionment of 80% for DI_OS_06 would result in council being responsible for funding $46M of the item, as compared with the original 'subsidy' of $10.9M. This is a funding obligation that goes beyond the intent of the agreement in the original DCP and not something that Council has factored into its long-term financial planning.

126. DI_OS_06 now has a different 'needs-based' cost apportionment, in that the ASR report identifies a need for 4 courts, which is only 50% of the 8-court item. If this apportionment was adopted (in accordance with the DCP principles), then Council would be responsible for funding half of the cost of this item (i.e. $29M).

127. Advice from the City's DCP consultant is that the most equitable and transparent way to address this is to remove the previous subsidised apportionments from DI_OS_01 and DI_OS_06 and

replace them with 'needs-based' apportionments, being: 100% for DI_OS_01 (i.e. no Council contribution, at least for the remainder of the DCP period, given all need is driven by the PSP area) and 50% for DI_OS_06 (i.e. Council pays for half of the item cost given only half the demand is from the PSP area).

128. In this way, all DCP principles would be adhered to, and Council would still be contributing to a similar overall cost as originally agreed, albeit the Council contributions would be directed towards OS-6 only and designed to cover external apportionment.

129. The total increase in the cost of community facilities projects funded by the CIL and the DIL in shown in the table below. Note that open space is included in a separate table as the land component is discussed further under paragraph 130.

130. The total increase in the cost of community facilities projects funded by the CIL and DIL in shown in table 4.

DCP	Community Facilities Construction	Community Facilities Land	Total
Existing	$60.49M	$12.20M	$72.69M
Revised	$78.65M	$9.20M	$88.35M
Increase/Decrease $	$18.16M	$3M	$15.66M
Increase %	30%	24.59.%	21.54%

Table 4: Community Facilities Costings (2024/25 dollars)

LAND FOR OPEN SPACE

131. As with other land uses and infrastructure, changes have occurred to the provision of open space across the PSP area and as discussed above, some changes have been made to the active open space reserves. This section of the report provides a summary of all the open space changes that have occurred and further changes proposed through the review.

132. The open space categories that are nominated as being creditable in the PSP and DCP are those that are unencumbered by constraints on the land. The categories are listed as Active Open Space, Passive Open Space (Local parks and Linear reserves and Other-Regional Recreation (classed as active).

133. As a result of the changes that have occurred and are proposed in the review, the creditable open space categories would change to the figures in the table 5. Note: the regional facility at MR Power Park has been deleted as a separate category in the land use budget and the area of 17.63 hectares has been added to the active open space (4ha) and passive open space (13.63ha).

134. The strategic justification for the change in the classification of MR Power Park includes that there are constraints on the land including a redesigned drainage basin and wetlands and protected mullock heaps which have reduced the area available for active open space.

Type of Open Space	Area in hectares	Percentage of GDA
Current DCP		
Active including regional (17.63ha)	57.61	5.26
Passive	58.15	5.31
Total	**115.76**	**10.57**
Revised DCP		
Active including regional (4ha)	36.94	3.35
Passive including regional (13.63ha)	65.11	5.91
Total	**102.05**	**9.26**

Table 5: Open Space Categories

135. In addition to the creditable open space, the PSP has 4 encumbered categories which although not included in the open space do make a tangible contribution to the open space across the PSP area. Those categories are drainage basins, drainage reserves, heritage conservation area and environmental conservation area. This encumbered land had a total of 108.74 hectares in the existing PSP. In the revised PSP the encumbered land has a total of 102.09 hectares.

136. These changes have reduced the percentage of active open space to 3.35%. The passive open space area has increased due to the part reclassification of MR Power Park.

137. Whilst overall creditable open space has been reduced to 9.26% of the GDA it is noted that in the PSP guidelines, the performance targets for open space is 10% overall with 3-5% for local parks and 5-7% for sports field reserves.

138. Relevantly the PSP guidelines now calculate open space on net developable area rather than gross developable area. When calculated on net developable area, the active open space percentage in the review would be 3.8% and the passive open space would be 6.7% giving a total creditable open space of 10.5%.

139. Whilst there is still a clear shortfall on the amount of active open space, the constraints on the land in the activity centres are a barrier to making up the gap and on balance the overall amount of creditable open space will deliver an acceptable outcome. Council will endeavour to compensate for the loss of active open space in Ballarat West by increasing the provision in its future growth areas.

140. Furthermore in addition to the creditable open space, the PSP has 4 encumbered categories which are identified as open space which make a tangible contribution to the open space across the PSP area. Those categories are drainage basins, drainage reserves, heritage conservation area and environmental conservation area. This encumbered land had a total of 108.74 hectares in the original PSP. In the revised PSP the encumbered land has a total of 102.09.

141. Taking into account the encumbered land, the overall creditable and non-creditable open space across the PSP is now 203.91 hectares which is 15.7% of the total development area or 20.79 hectares of the net developable area.

142. The total increase in Active Open Space projects in shown in the table 6 below.

DCP	Active Open Space Construction	Active Open Space Land	Total
Existing	$76.64M	$32.65M	$109.29M
Revised	$114.14M	$27.23M	$141.37M
Increase/Decrease $	$37.5M	$5.42M	$32.08M
Increase %	48.93%	16.6%	29.35%

Table 6: Active Open Space Costings (2024/25 dollars)

STATE GOVERNMENT AGENCY COMMUNITY INFRASTRUCTURE

143. In addition to consulting with DoE as discussed above, as part of the PSP review, ASR on behalf of Council consulted with a number of other state government agencies on community infrastructure. A summary of their responses is provided under the headings below.

DEPARTMENT OF JUSTICE AND COMMUNITY SAFETY

144. The Department of Justice and Community Safety (DJCS) provided an initial response which noted that the current PSP allocated 2 hectares of land on Ballarat-Carngham Road. DJCS noted that the land has since been developed for residential use, potentially leaving the precinct and surrounding areas without adequate emergency services coverage in the future.

145. DJCS have requested reinstatement of 2 hectares of land into the PSP to accommodate a variety of services. Whilst this may be possible, the development that has occurred will make this challenging. Moreover the DJCS response does not acknowledge that emergency services and a police station were allocated land in another location on Ballarat-Carngham Road.

146. If more land is required to provide coverage, it is recommended that this be addressed by providing it in one of the future western growth areas.

DEPARTMENT OF HEALTH

147. Department of Health commented that from an Early Parenting Centre (EPC) perspective, the Ballarat EPC currently which is under construction will be located at 10 Fawcett Rd, Lucas. This centre is located in the Alfredton West PSP area.

148. DH also note that long-term planning provision should also be made for Aboriginal-led service delivery from new spaces and at a minimum, organisations such as Ballarat and District Aboriginal Cooperative should be offered co-location opportunities for any new infrastructure builds related to community hubs or early years hubs.

149. The City agrees that there is the potential for co-location of services and a statement will be provided in the revised PSP to reflect this.

SPORT AND RECREATION VICTORIA

150. Sport and Recreation Victoria (SRV) advised that there are no regional scale sport and recreation priorities within the boundaries of the PSP.

151. In terms of local requirements and priorities, SRV are confident that the Ballarat City Council are best positioned to provide information that will inform the local community sport and active recreation infrastructure requirements for this PSP. Any information/support of specific open space land allocations that SRV would be able to provide to inform the development of the PSP would be derived from information they receive from Ballarat City Council.

152. SRV understand that there is strong community sport support and current and emerging participation and programming (particularly for basketball and netball). They say this supports demand for the provision of an indoor recreation facility in the area. SRV note that identifying the Construction of Indoor Recreation Centre adjacent to the Greenhalghs AOS Reserve (8 courts) at Community Hub 3, will help meet this demand and they support its continued inclusion in this PSP.

HOMES VICTORIA

153. Homes Victoria provided only high-level comments relating to the provision of social and affordable housing, namely:

a. Priorities/ expectations: a minimum of 4.5% to meet the national average, encouraging smaller dwelling typologies (1 & 2 BR) within activity centres to support long term availability of affordable market options

b. Locational preferences:

   i. Within activity centres

   ii. In residential areas ideally within 400m – 800m walking distance to services such as jobs, community facilities, public transport or other amenities, but not further away than 3km

c. If developed by HV, land area should be a minimum of 800sqm

154. The full responses from all agencies can be found in the ASR report together with details of all the PSP Community and Recreation Infrastructure Projects. The specifications and costings of the projects have also been provided in a dedicated DCP costings document which form part of the suite of the review documents.

TRANSPORT PROJECTS REVIEW

155. The purpose of undertaking a review of transport projects was to consider whether the road and intersection designs as originally proposed are going to be suitable to accommodate the expected level of traffic taking into account development activity in the PSP area.

156. Milward Engineering were engaged to undertake a review of the outstanding road and intersection projects and associated land acquisition projects. New traffic modelling was also undertaken as part of the methodology.

157. In total, 17 projects were reviewed of which, 11 were adjusted and 6 unchanged due to no change in the scope or costings.

158. Of the 11 adjusted projects, 6 are road projects and 5 are intersection projects. The scope and costing adjustments are discussed under the headings below.

ROAD PROJECTS

159. All six of the road projects are essentially corrections to road lengths required to address errors from the original DCP or to respond to development changes as approved.

DI_RD_11 NEW NORTH SOUTH LINK ROAD

160. DI_RD_11 is a north south road link between Greenhalghs Road and the northern boundary of sub-precinct 2. In the original DCP, the road was incorrectly measured at 670m whereas the correct measurement on review is 758m. Therefore it is proposed to increase the scope of the project in the DCP to allow for the construction of the additional 88m. The additional cost associated with this change including land acquisition has been estimated by Milward as $363,472.

DI_RD_12 NEW NORTH SOUTH LINK ROAD

161. DI_RD_12 is a north south road link between Greenhalghs Road and Glenelg Highway. In the original DCP the road was incorrectly measured at 400m whereas the correct measurement on review is 462m. Therefore it is proposed to increase the scope of the project in the DCP to allow for the construction of the additional 62m. The additional cost associated with this change including land acquisition has been estimated by Milward as $255,770.

DI_RD_21 CHERRY FLAT ROAD UPGRADE

162. DI_RD_21 is an upgrade to Cherry Flat Road between Schreenans Road and Bells Road. The road length listed in the DCP is 190m whereas the actual length required is 750m. There is no documentation to explain the reason for the major error. The additional cost associated with this change has been estimated by Milward to be $3,114,675.

DI_RD_23 COBDEN STREET NORTH UPGRADE

163. DI_RD_23 is an upgrade to Cobden Street between Ross Creek Road and Miles Street to a link road standard. The road length listed in the DCP is 378m whereas the actual length required is 400m. This change has arisen due to slight adjustment through an approved subdivision layout The additional cost associated with this change has been estimated by Milward to be $96,439.

DI_RD_24 COBDEN STREET SOUTH UPGRADE

164. DI_RD_24 is an upgrade to Cobden Street between Miles Street and Bells Road to a link road standard. The road length listed in the DCP is 491m whereas the actual length required is 480m. The reduced cost associated with this change has been estimated by Milward to be $45,434.

DI_RD_38 ROSS CREEK ROAD UPGRADE

165. DI_RD_38 is described in the DCP as being duplicated from Bells Road to Taits Street. The road scope and cost estimate omitted the section from Schreenans Road extension East to Tait Street. The Schreenans Road extension was renamed as DI_RD39 in the Transport Report. However it has been decided to include the adjustment as part of DI_RD_38 which the cost increased accordingly. The overall length is changed from 850m in the current DCP to 1080m in the revised DCP with an additional cost of $1,070,697.

INTERSECTION PROJECTS

166. In reviewing the intersections, Milward have had regard to the most appropriate form of intersection control solution between a roundabout and signalised intersection, considering the safety of pedestrians and cyclists as well as motor vehicles in designs. Consequently two intersections are recommended to be changed from roundabouts to controlled traffic lights.

167. Milward have also recommended that the design of two roundabouts incorporate measures that improve pedestrian and cyclists safety.

168. These four intersection project changes are strategically justified on the basis that they will improve road safety and deliver acceptable planning and infrastructure outcomes.

The fifth intersection project change relates to a correction to the road pavement standard.

DI_JNC_02 CARNGHAM RD / NEW N-S RD (NORTH) ROUNDABOUT

169. The images below show two design options for DI_JNC_02. As can be seen in figure 13, a roundabout as per the original DCP would have a significant impact on the existing dwelling at 163 Ballarat-Carngham Road and most likely require acquisition of the property. A signalised intersection on the other hand would not impact the dwelling as shown in figure 14.

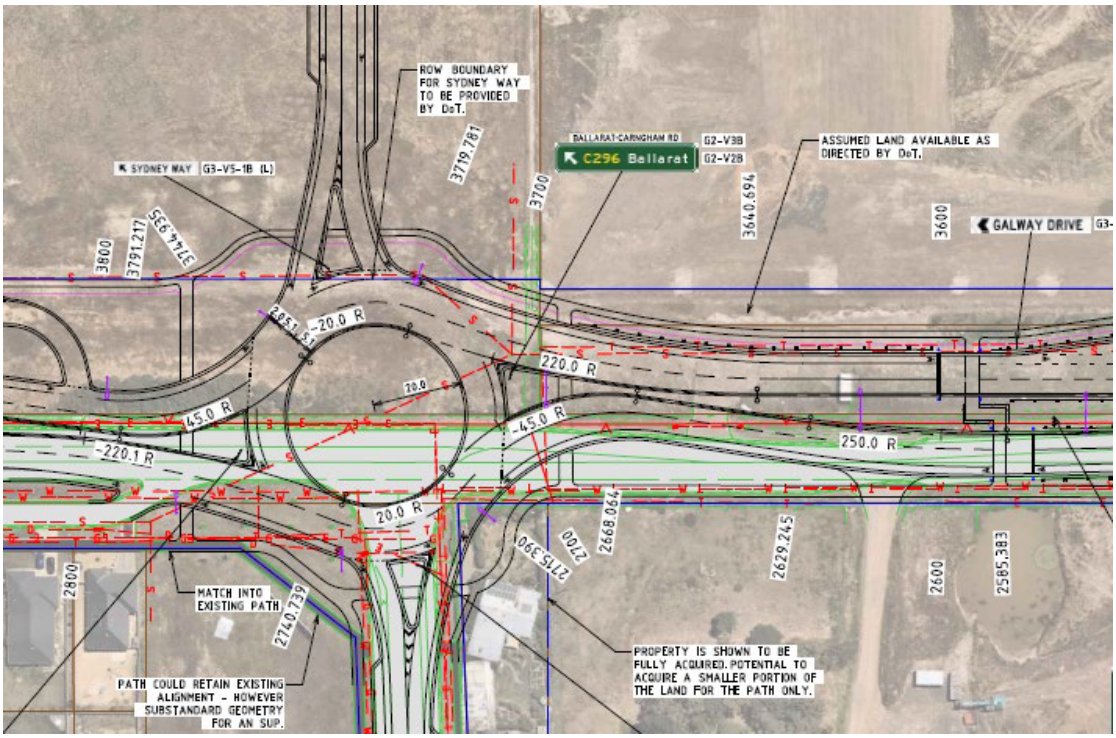


Figure 13: DTP concept design for functional layout plan for roundabout

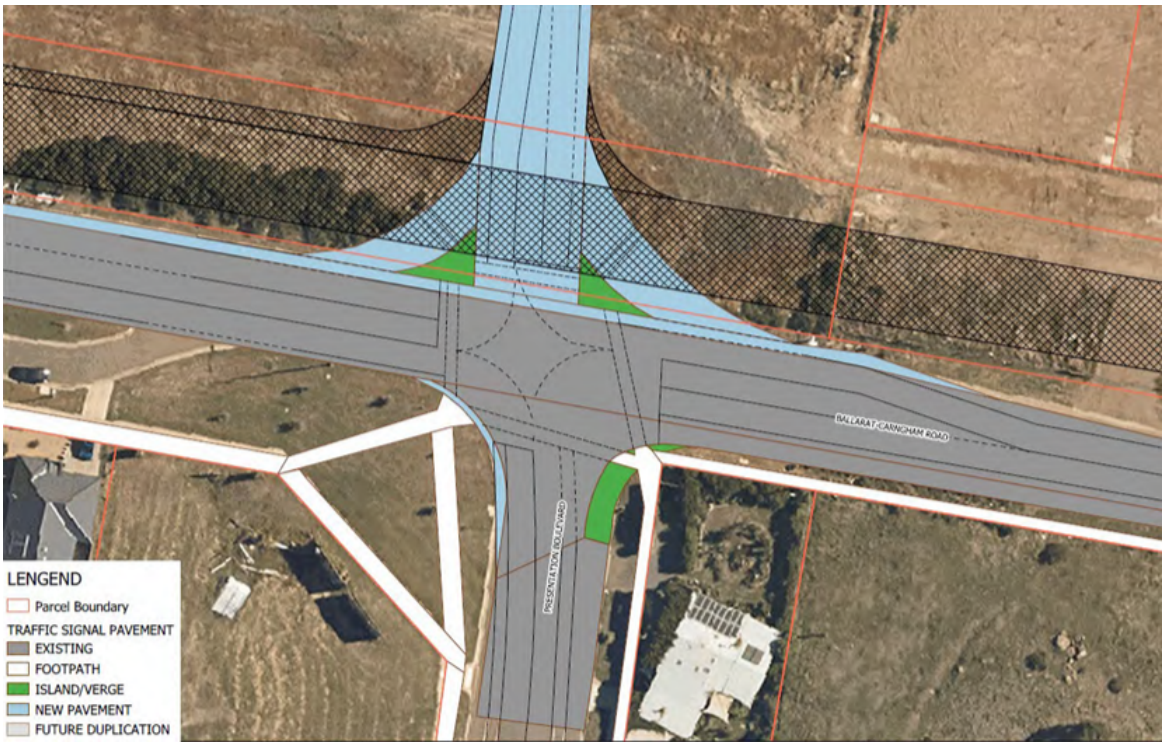


Figure 14: Milward concept plan for signalised intersection design

170. Furthermore the land to east of the intersection beyond the dwelling is where the Carngham Road NAC is to be located. This is of significance as a signalised intersection would have the benefit of enabling safer movement of pedestrians and cyclists between the future NAC and other facilities such as schools and community facilities on the north side of Ballarat-Carngham Road.

171. The additional costs associated with the intersection design change for DI_JNC_02 would be $1,427,889, 70% of which is apportioned to the DCP.

172. Ballarat-Carngham Road is an arterial road which is proposed to be duplicated in the future. Discussions on this design change are ongoing with the Department of Transport and Planning. As of February 2025 DTP are not supportive of the changes and their preference is for a roundabout.

DI_JNC_05 GREENHALGHS RD / NEW N-S RD (SOUTH) ROUNDABOUT

173. The proposed change to this roundabout is also influenced by alignment and land impact issues. The existing DCP land take for a roundabout design is shown in figure 15 in orange and it is clear that this would significantly impact existing dwellings, particularly on the north side of Greenhalghs Road. The land required for a signalised intersection design, shown in blue would require significantly less land and only from an existing development site (Winterfield South), the developer of which is in favour of this design change.

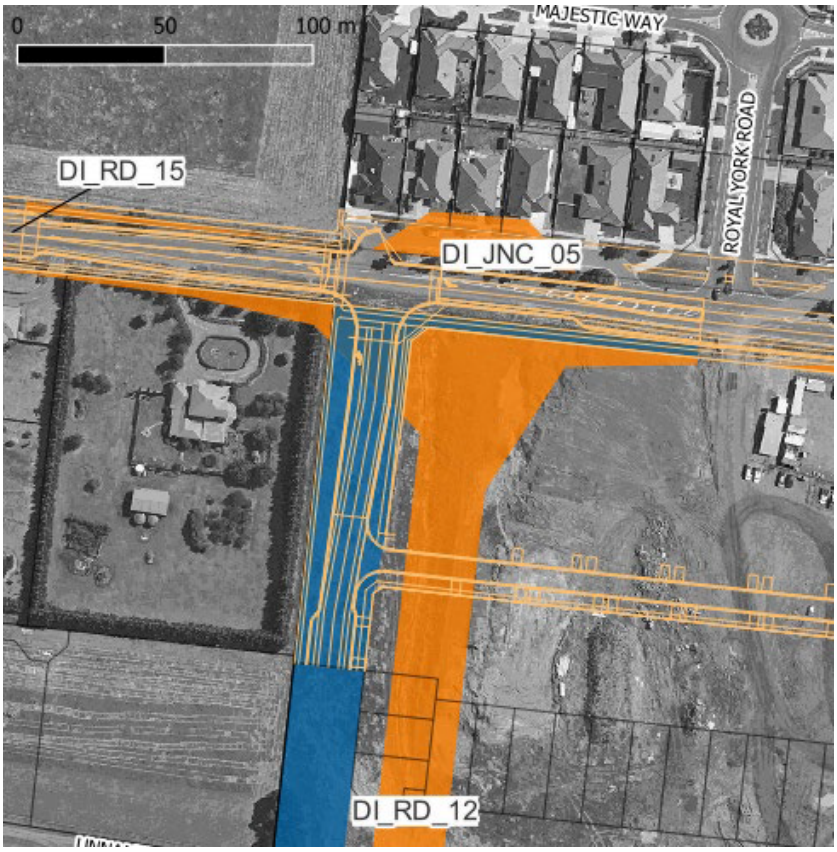


Figure 15: Milward concept plan comparing land requirements for signals and roundabout (note RD12 has been realigned as per the blue depiction)

174. The additional costs associated with the intersection design change of DI_JNC_05 would be $416,765 of which 58% is apportioned to the DCP.

175. In addition to the significantly reduced impact from the realignment and change from a roundabout, this signalised intersection would also have the benefit of enabling safer movement of pedestrians and cyclists.

DI_JNC_08 GLENELG HWY / NORTH SOUTH LINK ROAD ROUNDABOUT

176. DI_JNC_08 is a roundabout where DI_RD_12 joins Glenelg Highway. The reason that this project needs adjusting is that the roundabout was incorrectly originally costed at a local road standard, whereas the road pavement associated with the roundabout needs to be constructed to a VicRoads/DoT standard because Glenelg Highway is an arterial road.

177. The main difference to the standard specified for DI_JNC_08 in the DCP is that the road pavement for an arterial road is 200mm deeper than a Council road. Therefore it is proposed to increase the

scope in the DCP to reflect the required standard. This change has been estimated as increasing the cost by $319,453.

178. The developer of Winterfield Estate believes that the DCP review should also include increased construction costs they had been quoted to construct the project and the additional scope beyond that envisaged by the DCP.

179. Council officers do not agree with Goldfield's position because the review is not proposing to update standards to tender rates. To do otherwise would be inconsistent with how other road projects have been costed and delivered through the life of the DCP to date and would raise questions of equity as to why other road project costings had not been updated to market rates.

180. It is a fact that the design of DI_JNC_08 project as built, responds to a planning permit condition required by Department of Transport (DoT) for the developer to construct the roundabout to the satisfaction of, and at no cost to, the Head, Transport for Victoria. This condition meant the design required by DoT went beyond what the DCP allowed for as DoT required a much higher standard of design.

181. The City does not consider it appropriate to include the additional costs associated with the DoT required design. This is because the current DCP already sets out the basic function and standards for the roundabout to service the precinct which at a road network planning level is not required to change. The scope within the current DCP also provides a fixed value to the funding available for the works, including the road pavement area and standards. Officers are of the view that the design required by DoT were outside the scope of the DCP and the additional costs was a matter that needed to be resolved between DoT and the developer.

182. If Council were to adopt the standard and costing sought by the developer in line with the DoT design, a further complication is that the project is not fully funded by the DCP. Moreover 55% of the cost must be paid for by alternative funding sources because the project also serves existing traffic.

183. Despite the project being on an arterial road, DoT have advised the City that they are not able to a make a financial contribution. This means that Council will have to fund 55% of the cost of the intersection including any increase adopted through the revised DCP.

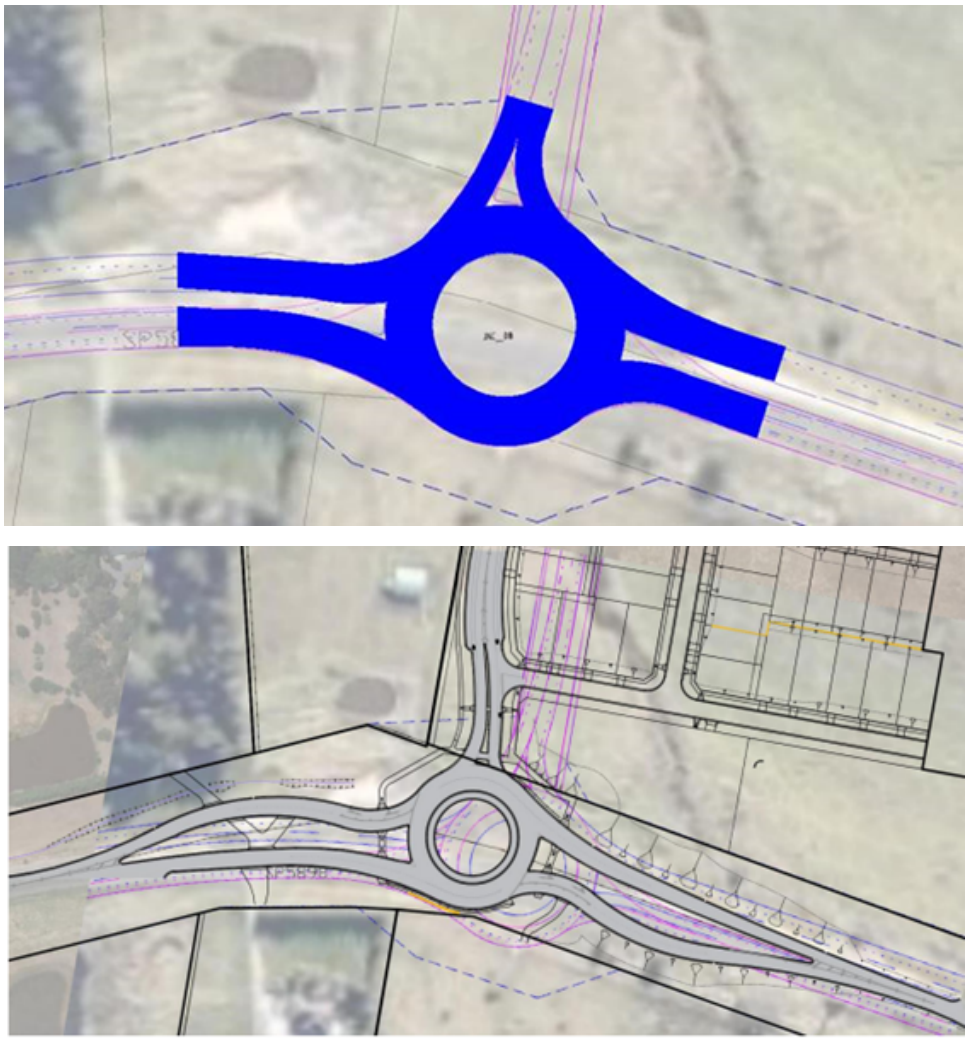


Figure 16 Extent of roundabout pavement required in current DCP (top) compared with the extent of DoT roundabout pavement required and constructed under the planning permit condition (bottom)

DI_JNC_11 CHERRY FLAT ROAD/SCHREENANS ROAD ROUNDABOUT AND DI_JNC_12 ROSS CREEK ROAD/COBDEN STREET ROUNDABOUT

184. It is proposed to include a change to both DI_JNC_11 and DI_JNC_12 to incorporate a roundabout design that would facilitate safer movement of pedestrians and cyclists with a design similar to that shown in figure 17.

185. The ultimate design of DI_JNC_11 will also add a fourth arm to the roundabout. However it is not proposed to revise the DCP to include the cost of the fourth arm as this directly benefits a development site to the west of Cherry Flat Road rather than the broader area.

186. The increased costs for DI_JNC_11 and DI_JNC_12 are $206,453 and $179,961 respectively.

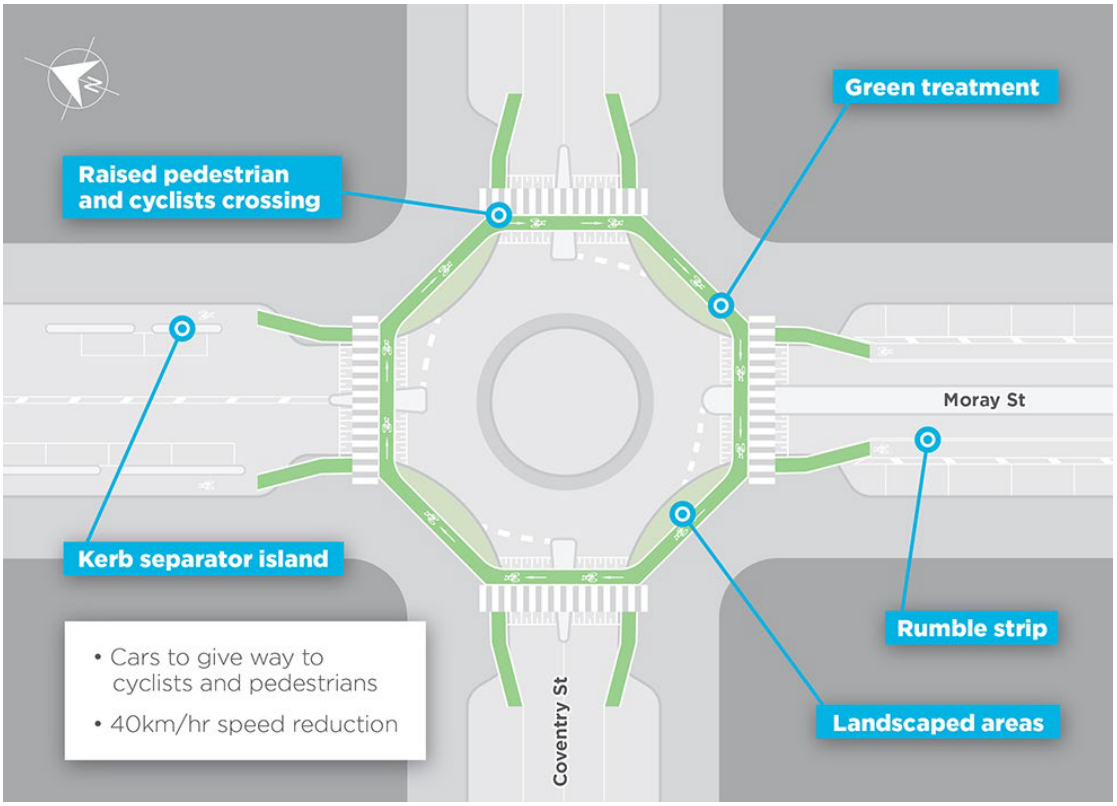


Figure 17: Example of pedestrian and cyclist friendly roundabout

PSP TRANSPORT CHANGES

187. In addition to reviewing the projects from a DCP perspective, regard has been had as to whether changes should also be made to the PSP to reflect other road network changes and projects not included in the DCP. The key changes are discussed below.

188. In the existing PSP there are a number of intersections which will not be delivered through the DCP and will be delivered and funded by either developers, Council, State government or a combination of one or more. It is proposed to add a further intersection into this category at Webb Road / Schreenans Road, which is required to serve proposed development which already benefits from a planning permit and has a permit condition requiring delivery of a roundabout.

189. It is also proposed to provide more guidance on cross sections. The PSP lacks detail on the intent of Key Access Streets, and no cross section is defined for this road type. A Key Access Street cross section as shown below will be included in the PSP.

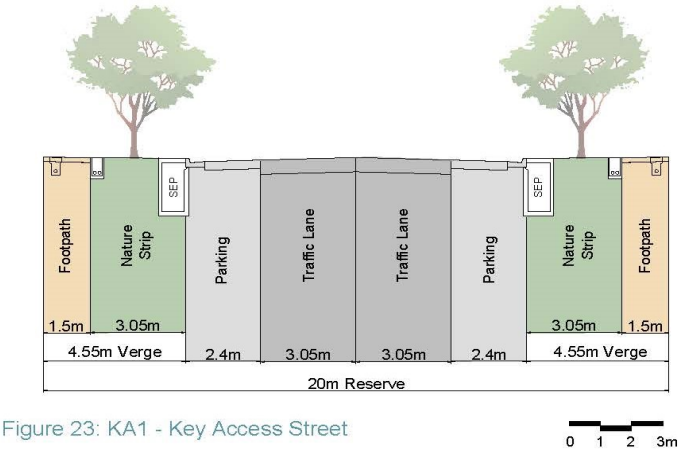


Figure 18: PSP Key Access Street Cross Section

190. It is also proposed to include reference in the PSP to the preference of adopting an 18m wide road reserve for local access streets in accordance with the Infrastructure Design Manual.

191. The total increase in DCP transport projects in shown in the table 7 below.

DCP	Transport Construction	Transport Land	Total
Existing	$78.02M	$18M	$96.02M
Revised	$85.42M	$17.29M	$102.71M
Increase/Decrease $	$7.4M	$0.71M	$6.69M
Increase %	9.48%	3.94%	6.98%

Table 7 Transport Project Costings (2024/25 dollars)

192. A full list of all the proposed DCP transport project changes under the review is included in the DCP costings document as attachment A of this report.

DRAINAGE PROJECTS REVIEW

193. The purpose of reviewing the infrastructure in the original 2011 drainage strategy is to ensure that the assets still to be delivered are going to be fit for purpose in accommodating future development in Ballarat West.

194. Whilst the original drainage strategy that guided the development of stormwater assets in the Ballarat West PSP was considered appropriate at that time, there is now a need to review and provide an update to the drainage strategy across the PSP area to bring it into line with the updated guidelines and standards that have been released since 2011.

Ballarat West PSP and DCP Review Background Report

195. Engeny were engaged to update the drainage strategy to ensure the drainage assets required for the remaining development will manage stormwater in a safe and efficient manner. The scope of the drainage strategy update is in three parts:

- Part A is a review of the current status of the strategy and its implementation. This included determining which assets were already constructed or committed due to the level of progression of design or construction work and which areas still required drainage, treatment or retardation assets.

- Part B is the crux of the strategy as this contains modelling updates that reflect key elements including changes made to the drainage scheme, storage available, updates to be compliant with Australian Rainfall and Runoff 2019, update to the MUSIC water quality model and consideration of rainwater tanks on lot scale and/or stormwater harvesting.

- Part C is the final report that summarises work undertaken as Part B.

196. The drainage assets are recognised in the DCP based on 20 drainage catchments as shown in figure 19. The assets within the catchments primarily comprise retarding basins and underground pipes. 14 of the catchments have increased in cost, 3 have decreased in cost and 3 are unchanged.

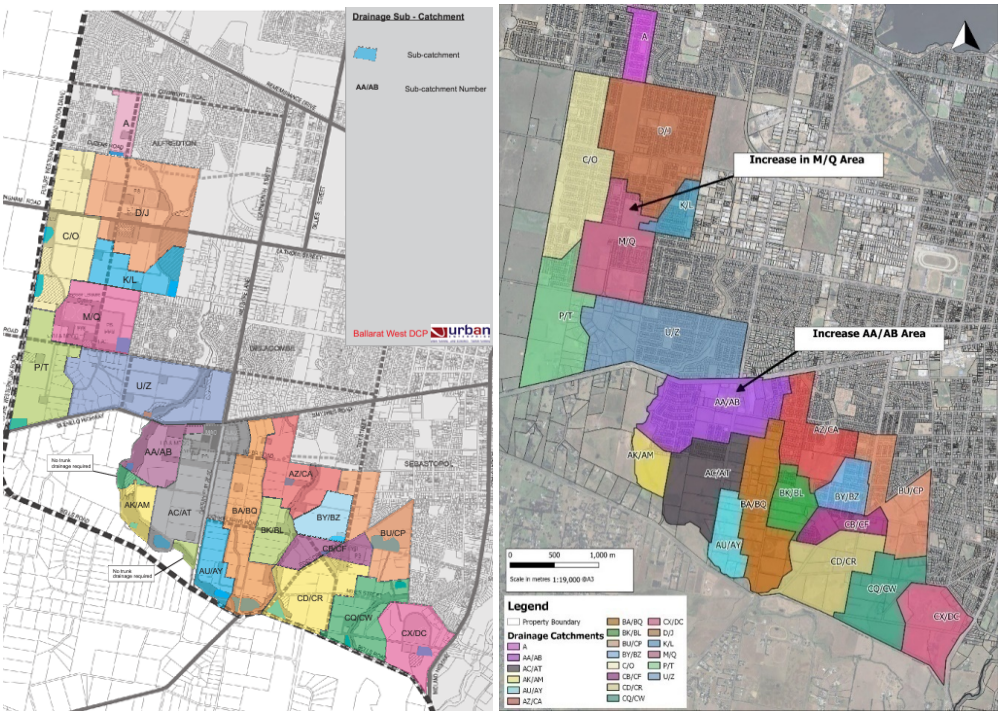


Figure 19: Drainage Sub-catchments existing left, revised right

197. All of the assets in the drainage strategy are shown in across the 3 sub-precincts in figures 20-22. These plans show the status of the drainage basins as completed in blue, partially completed or designed/approved in red and undeveloped assets in purple. Drainage pipes are also shown.

198. Engeny modelled the developed conditions to include details of the already built retarding basins and adjusted the sizing of the retarding basins which have not been built to try and achieve the best retardation outcomes possible.

199. The updated modelling factors in future densities of 20 dwellings per hectare on the remaining undeveloped land. This is to ensure that the increase in density that has been occurring in recent years can continue to be accommodated and to ensure that future yields are broadly consistent with those outlined in the Precinct Structure Planning Guidelines: New Communities in Victoria, (VPA October 2021).

200. It is important to note that despite the changes proposed, the objectives and location of key infrastructure is still broadly in line with the original drainage strategy.

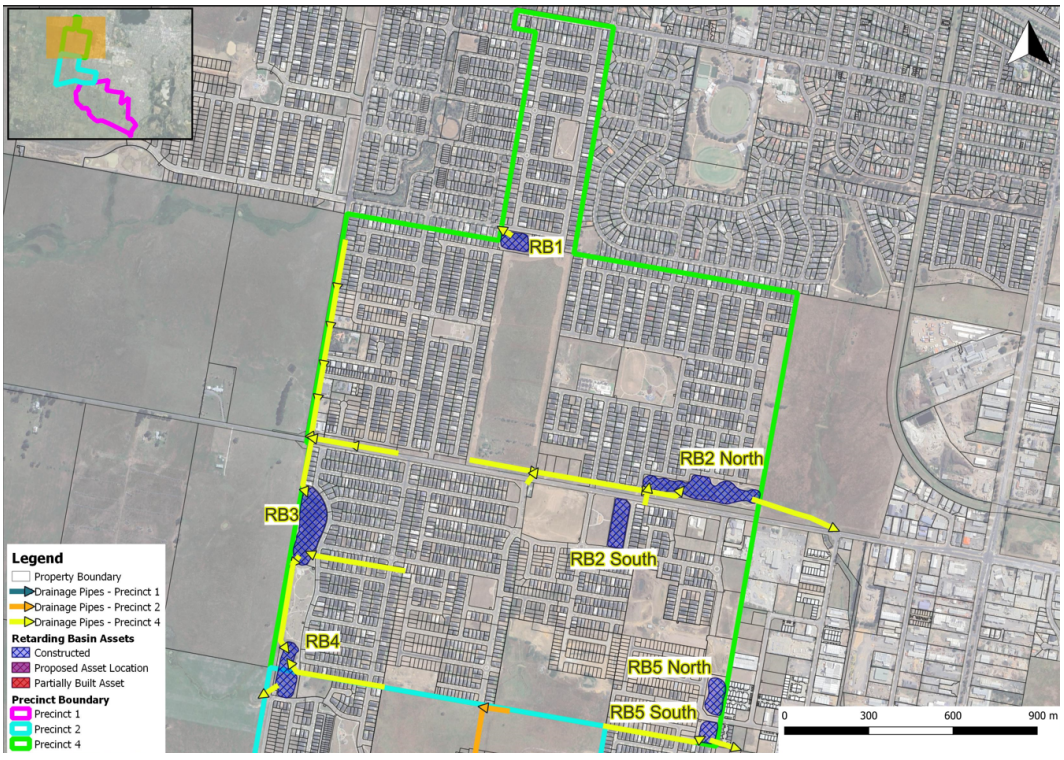


Figure 20: Drainage Strategy Projects (basins and pipes) Sub Precinct 4

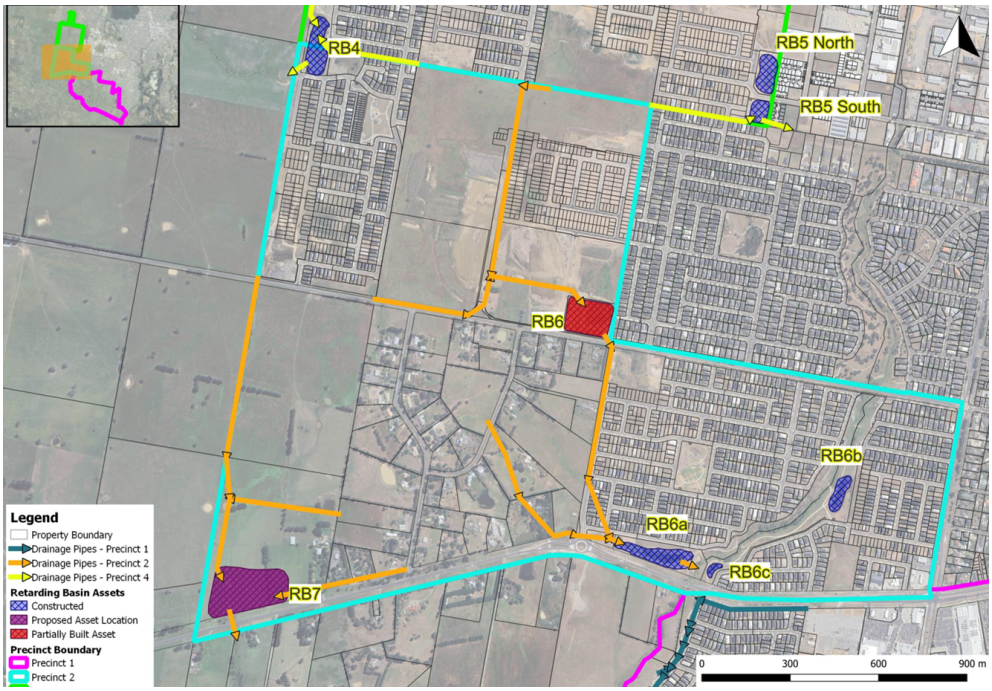


Figure 21: Drainage Strategy Projects (basins and pipes) Sub Precinct 2

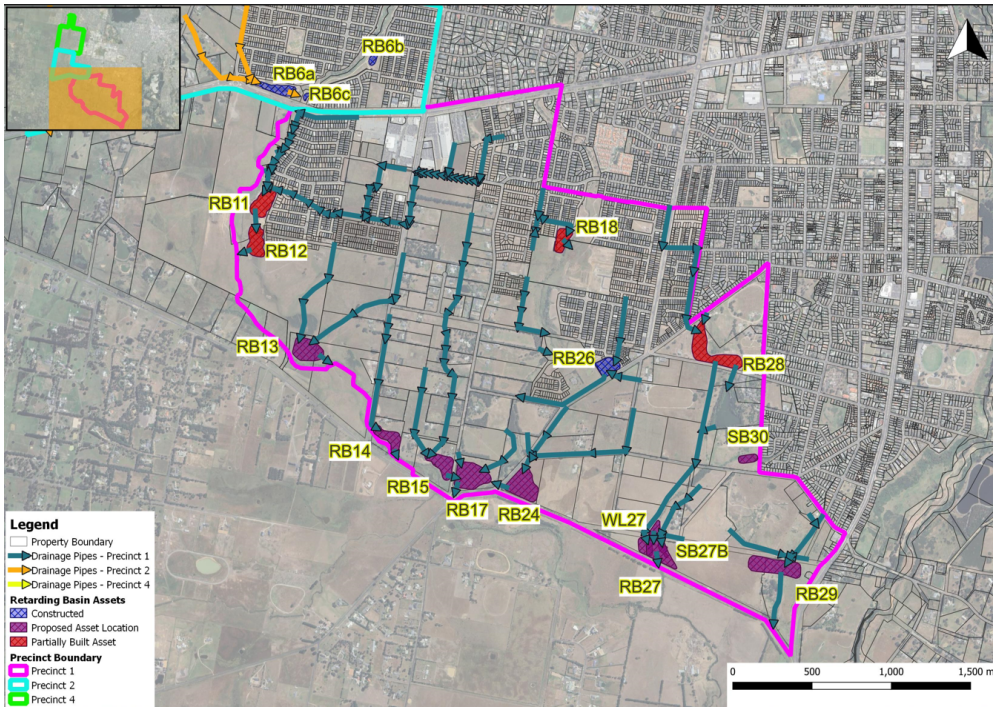


Figure 22: Drainage Strategy Projects (basins and pipes) Sub Precinct 1

201. The revised drainage strategy will be implemented through changes to the PSP and more specifically the DCP. The assets (retardation basins and pipes) are nominated and costed as DCP projects as part of 20 sub-catchments. The land and costing changes to the sub-catchments that are subject to the revisions are documented in the Appendix 3. A summary of some of the key changes to the retarding basins are discussed the headings beneath.

RB 06

202. This basin is currently in the process of being delivered in a location which is broadly in accordance with what was proposed in the 2011 drainage strategy. However the shape and size of the wetland asset has changed for technical reasons that are explained in the revised strategy.

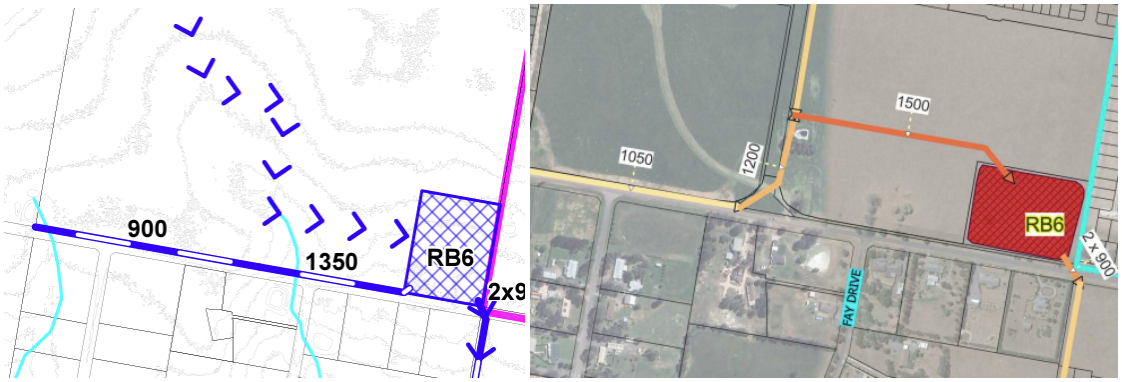


Figure 23 RB06 original footprint and location left, proposed right

RB 06A, B AND C

203. RB06A, B and C are integrated sediment ponds/retarding basins that have been proposed to replace a series of biofilters as part of the stormwater treatment measures of Precinct 2. Again the technical reasons are explained in detail in the revised strategy.

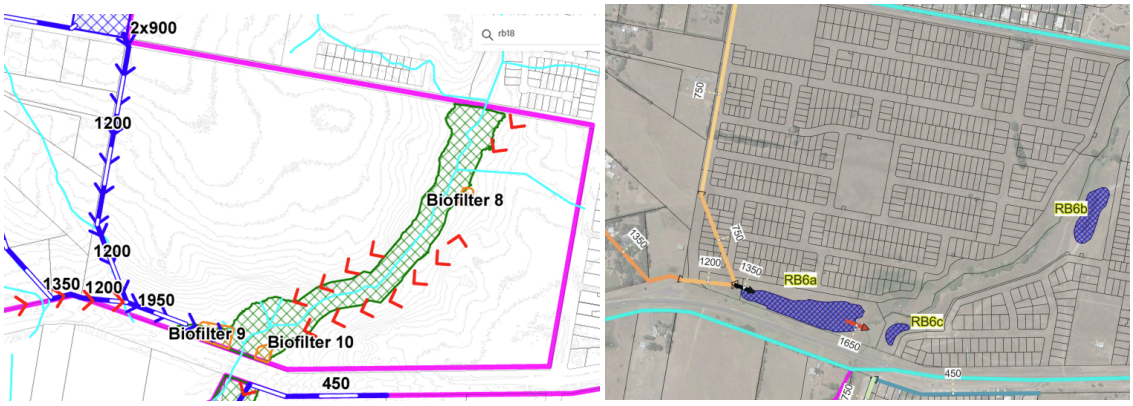


Figure 24 RB06A, B, C original footprints and locations left, proposed right

RB 07

204. This basin is located on PSP property number 208 and 209 (520 Glenelg Highway). It has been enlarged from the original strategy to allow space for the maintenance paths, sedimentation drying and lower extended detention depth in the wetland.

205. The land has an approved subdivision permit and a condition was imposed which provides an opportunity to the permit holder to provide an alternative functional layout that demonstrates that the original strategy requirements can be accommodated within the design parameters.

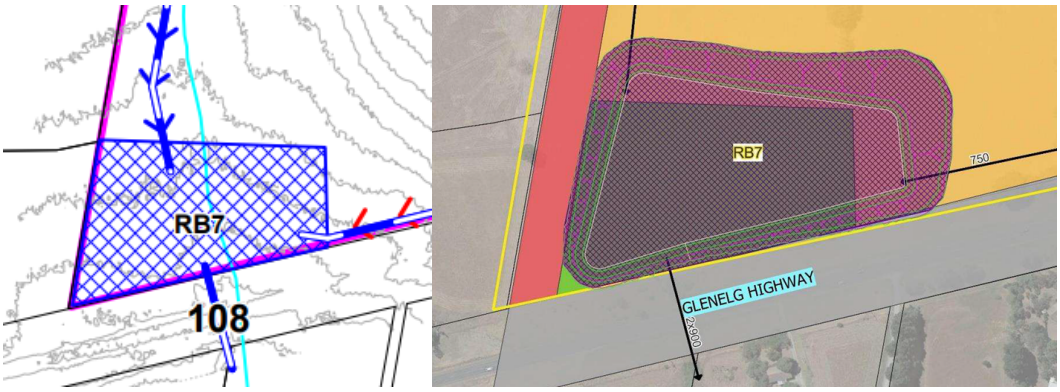


Figure 25 RB07 original footprint left, proposed footprint right

RB 11

206. This basin is located on PSP property number 2 (known as the Pinnacle Estate). Together with RB12 it has been enlarged from the original strategy due to pipe diversions which required the basin to be enlarged to will allow space for the maintenance paths, sedimentation drying and lower extended detention depth in the wetland. The basin will serve catchment AA/AB.

207. Catchment AA/AB has been subject to a large amount of development including Pinnacle Estate which is around 50% developed. The catchment has also increased in size from the original strategy. The basin serves a number of other development sites and the extended scope is required in the near future to ensure development does not stall in this catchment.

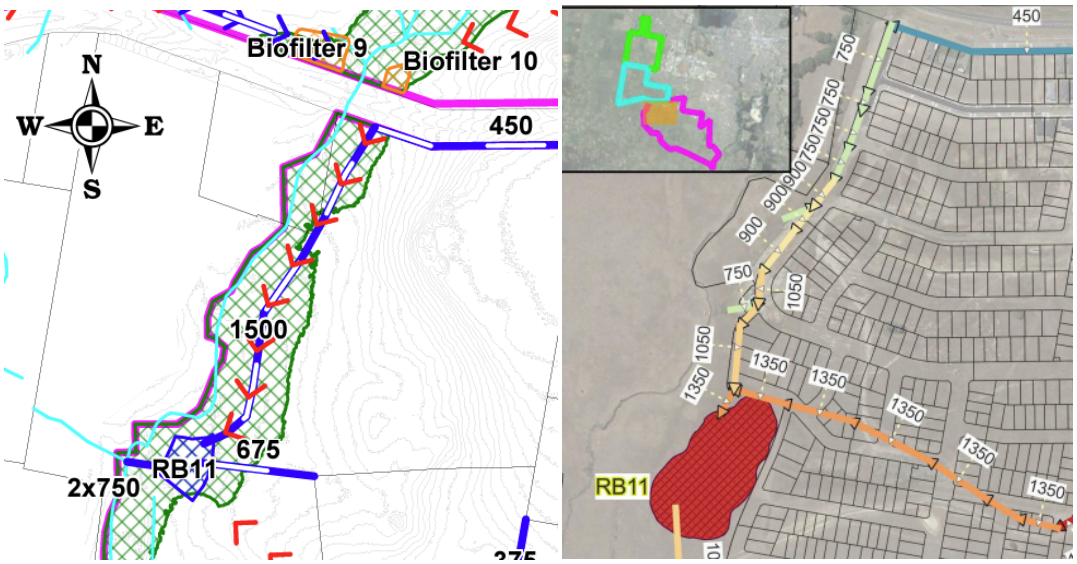


Figure 26 RB11 original footprint left, proposed footprint right

RB 12

208. As with basin RB11, RB12 has been adjusted to accommodate pipe diversions that were constructed because the areas to the south, where the 2011 strategy directed the pipe drainage, were not yet developing and therefore constructing pipes through these areas would be disruptive and expensive with the infrastructure not required in the short to medium term.

209. RB12 was also moved further north next to RB11.

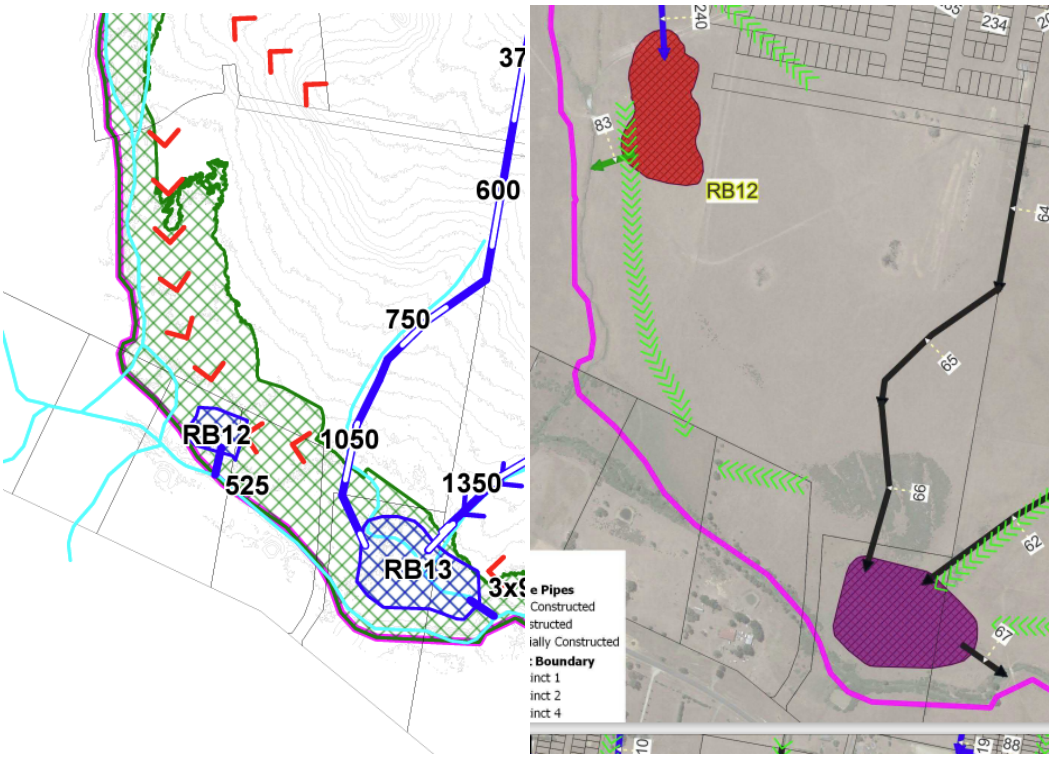


Figure 27 RB12 original footprint and location left and proposed right

RB 13

210. The pipe diversions discussed above mean that RB13 can be reduced in size from the 2011 drainage strategy, with the location adjusted slightly.

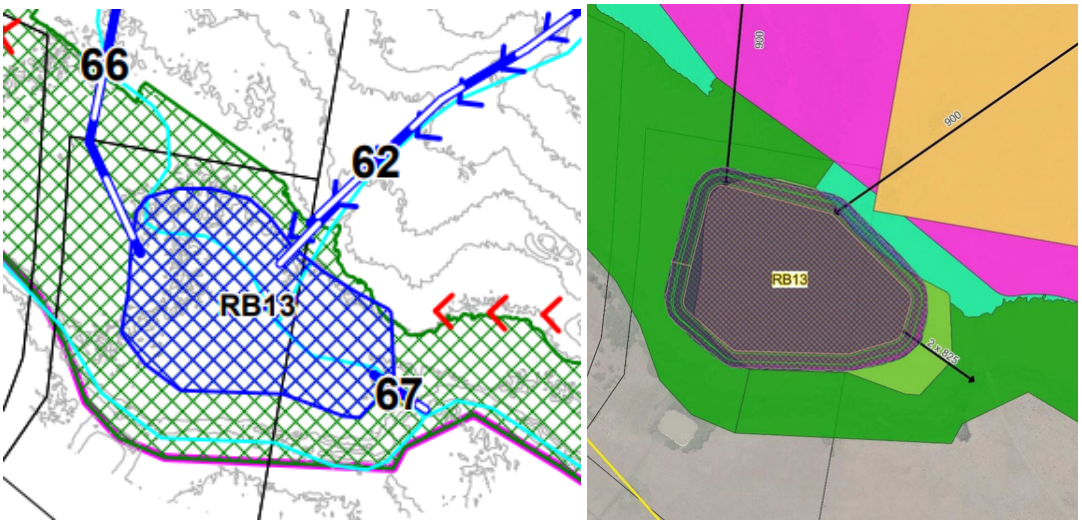


Figure 28 RB13 original footprint left, proposed footprint right

RB 14

211. This basin has been moved further west and is now proposed to be located within a single parcel. This move should assist with the development staging in the area and should help to simply the construction by reducing the need for multiple land owners to be involved. The basin is still located within open space adjacent to Winter Creek so there is no loss of developable area.

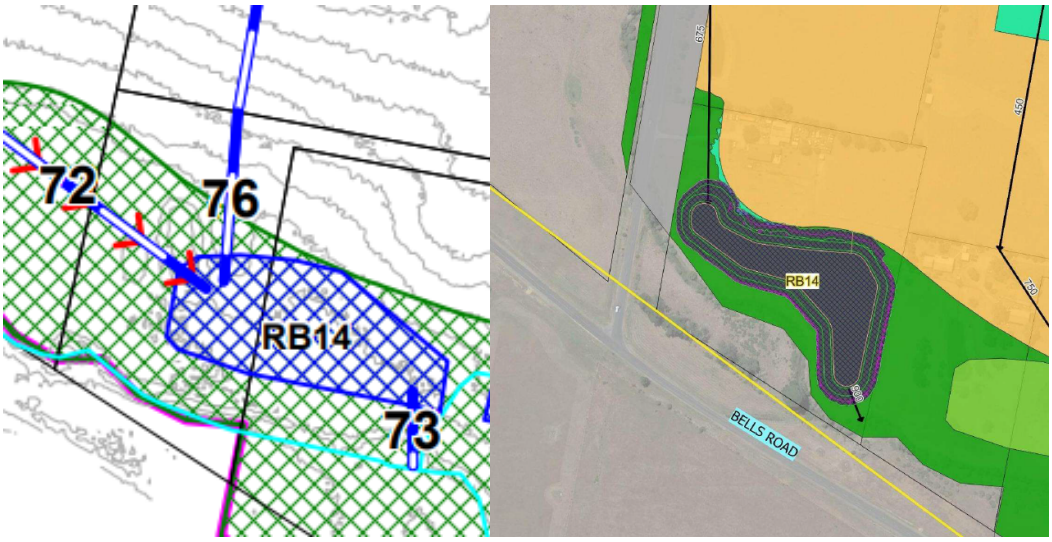


Figure 29 RB14 original footprint and location left, and proposed right

RB 15 AND RB 17

212. The proposed locations of these two basins are very similar to the previous strategy. The main change is that the footprint has been enlarged to respond to the revised design and to allow space for the maintenance paths, sedimentation drying and lower extended detention depth in the wetland. The extra drying space will not affect NDA as it will encroach only onto public open space which can still be used for that purpose.

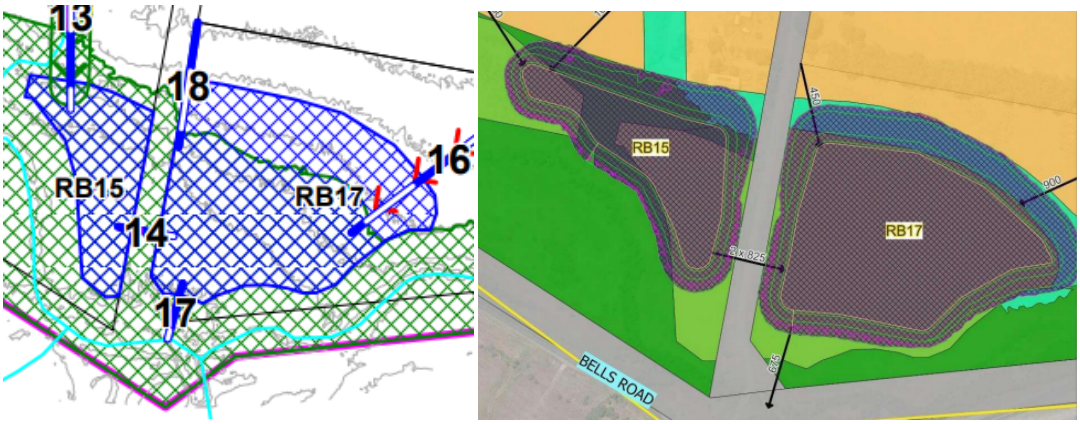


Figure 30 RB15 and 17 original footprint left, proposed footprint right

RB 18

213. Retarding basin 18 has been moved closer to Bonshaw Creek, enlarged and extended over two parcels.

214. RB18 was moved to increase the catchment which can drain to it, allowing for better flow control and stormwater quality treatment. This location also provides better connectivity between the wetland habitat and the creek habitat and corridor. It also helps to limit the number of drainage outfalls required into Bonshaw Creek and reduces the velocity of the flows discharging to Bonshaw Creek.

215. The asset is currently partially constructed, with the northern section already built. The southern section will be built when the parcel on which it sits is developed. Figure 31 shows the layout of the retarding basin.

Figure 31 RB18 original footprint and location left, proposed right

RB 24

216. The proposed locations and size of this basin is also very similar to the previous strategy. The main change is that the footprint has been enlarged to respond to the revised design and to allow space for the maintenance paths, sedimentation drying and lower extended detention depth in the wetland. The extra drying space will not affect NDA as it will encroach only onto public open space which can still be used for that purpose.

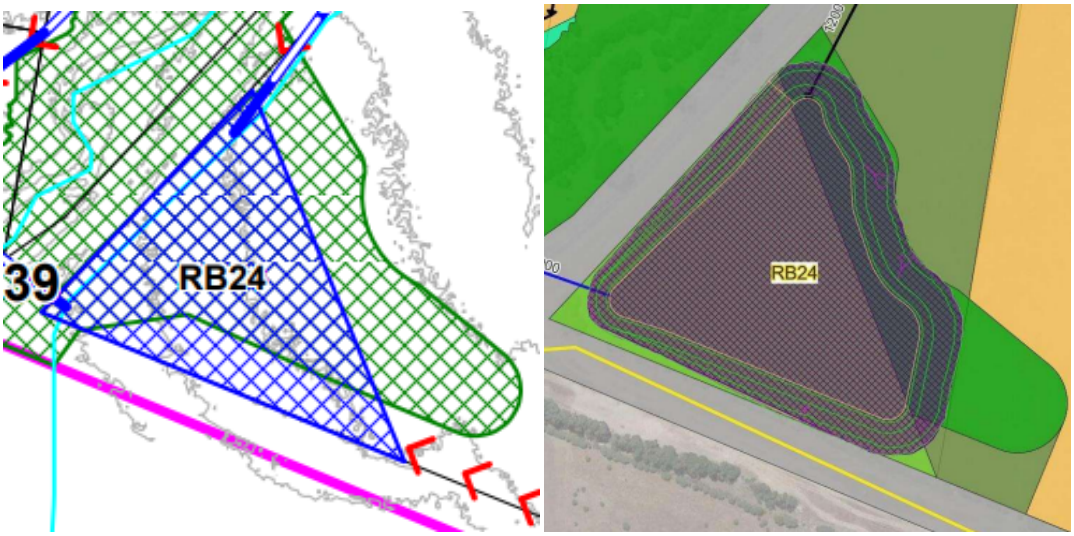


Figure 32: RB24 original footprint left, proposed footprint right

RB 27

217. This basin has been significantly reconfigured under the review. The asset will now have a wetland and a sedimentation basin. A major embankment in the order of 5 metres in height and a culvert is also required to traverse under the embankment. Full details of the rationale for this change are outlined in detail in the drainage strategy.

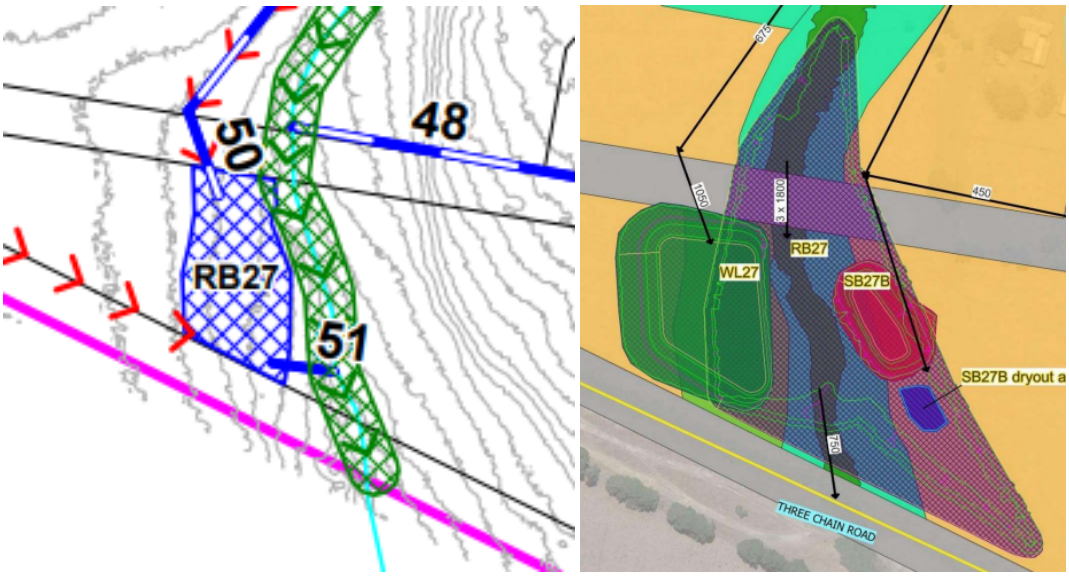


Figure 33: RB27 original footprint left, proposed footprint right

RB 29

218. This basin has been enlarged and extended west to allow space for the maintenance paths, sedimentation drying and lower extended detention depth in the wetland.

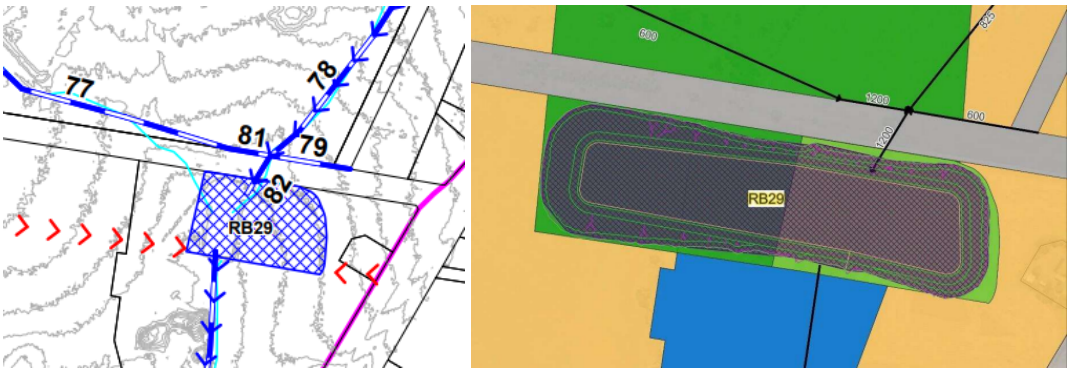


Figure 34: RB29 original footprint left, proposed footprint right

RB 30/SB30

219. This retarding basin has been replaced with a sedimentation basin (SB30) and relocated southwards from PSP property number 129 to 128. The reason for the change is that an online retarding basin is no longer required and that a sedimentation basin in the waterway can manage flows.

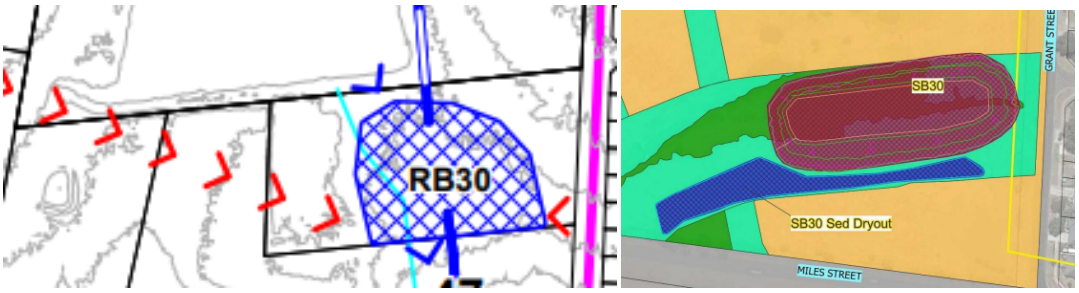


Figure 35: RB30 original footprint left, proposed footprint right

220. In addition to the updates to the designs and costing of basins and wetlands, Engeny have updated the pipe assets that are associated with the basin system to reflect any changes in length and size. All costs have been based on original costing rates and methodology and indexed to June 2023.

221. The total increase in drainage assets in shown in table 8.

DCP	Drainage Construction	Drainage Land	Total
Existing	$115.69M	$22.87M	$138.56M
Revised	$143.31M	$35.39M	$178.70M
Increase $	$27.62M	$12.52M	$40.14M
Increase %	23.87%	54.74%	28.97%

Table 8 Drainage Project Costing (2024/25 dollars)

LAND PROJECTS AND VALUATIONS

222. Where the land required to deliver DCP projects has been changed this will be reflected in the amended DCP. In the case of projects that have been delivered, the land has been adjusted to match the credits given to land owners.

223. Where projects are yet to be delivered the land take has been adjusted as required. Opteon Solutions have prepared a report of Land Value Assessments for these projects.

224. The review has found that for some projects the amount of land has decreased and for some increased. The most significant increase is for the changes to the retarding basins discussed above which will increase from 34 hectares to 46 hectares.

225. Taking into account Opteon's updated valuations for projects under review and the adjusted land credits for projects delivered, the total value of all land required in the DCP has increased from $85.7M to $89.6M.

226. The full details of the adjustments are in the project tables in Appendix A. Projects without land changes are omitted from the tables and can be found in the PSP and DCP land use budget tables.

OTHER PROJECTS

227. The original DCP did not include strategic planning costs associated with the preparation of DCP. It is assumed this is because at that time legislation in the Planning and Environment Act 1987 or Ministerial Guideline did not enable planning costs as a project.

228. In 2015 the Act amended S. 46I(1)(b) to allow the inclusion of, *"….reasonable costs and expenses incurred by the planning authority in preparing the plan and any strategic plan or precinct structure plan relating to, or required for, the preparation of the development contributions plan (the plan preparation costs)."*

229. In light of the legislative change and that it is now common practice to include strategic planning costs in DCPs, it is appropriate to include the costs associated with the preparation of the PSP and DCP. The total costs amount to $432,465.

BALLARAT WEST DCP LEVIES AND FUNDING SHORTFALL

230. As with most DCPs, infrastructure in the BWDCP is partly funded through two levies, a Development Infrastructure Levy (DIL) and a Community Infrastructure Levy (CIL).

231. The DIL levy for financial year 2024/25 is $341,627 for residential development and $235,924 for commercial development.

232. The proposed DIL under the review would have a rate of $421,701 for residential development and $277,301 for commercial development. The proposed levy is based on infrastructure as shown in $M in the table 9.

FY24/25 Review				
Project Type	**Construction**	**Land**	**Residential**	**Commercial**
Community Facilities	$ 13,912	$ 9,832	$ 23,744	$ -
Open Space	$ 91,417	$ 29,239	$ 120,656	$ -
Road Construction	$ 60,688	$ 17,573	$ 78,262	$ 78,262
Traffic Management	$ 14,840	$ 211	$ 15,051	$ 15,051
Other	$ 1,497	$ -	$ 1,497	$ 1,497
Drainage	$ 146,083	$ 36,408	$ 182,491	$ 182,491
Total	**$ 328,438**	**$ 93,263**	**$ 421,701**	**$ 277,301**

Table 9 Proposed Project Values and Levies.

233. There will be no change to the CIL as this is payable per dwelling and capped under the Planning and Environment Act 1987, the current rate being $1450 (indexed July 24/25).

234. Whilst the DIL and CIL make a large contribution towards the infrastructure funding in Ballarat West, there is still a significant funding gap between the amount of dollars collectable under the DCP and the overall cost of the infrastructure required. This means that other funding needs to be provided by federal, state and/or local government.

235. There a funding gap in both the DIL and the CIL. Whilst funding gaps are common in DCPs and Council has factored this into its financial planning, changing social and economic circumstances have meant that the scope and costings of many infrastructure projects have increased significantly since the BWDCP was originally costed. As those costs have increased this has had a cumulative impact on the shortfall.

236. As the CIL is capped by legislation there is a limit to what funds can be collected which creates the CIL shortfall.

237. The existing DIL shortfall is made up from funds that are required to pay for the proportion of PSP infrastructure demand that is created by existing development beyond the boundary of the PSP.

238. In the Ballarat West DCP the existing external apportionment DIL shortfall is around $49.3M. Under the review, the external apportionment shortfall would decrease to $43.4M. This is due to the changes to some projects such as the adjustment to the demand/apportionment of the 8-court indoor recreation centre and the deletion of the 4-court indoor recreation centre.

239. In addition to the existing DIL external apportionment shortfall, the amount of money that can be collected under the DIL will be further reduced in the review by $33.2M due to the fact that around 40% of the precinct has already been developed and the additional DIL rate cannot be collected on this land. Furthermore as and when Statement of Compliance is issued for further subdivision stages prior to the incorporation of the DCP into the planning scheme, the shortfall will increase.

240. The existing CIL shortfall is around $27.9M. Due to the revised scope and costings of a number of projects under the review the CIL shortfall would increase to $41.6M.

241. In total under the review the DCP funding gap or shortfall for the DCP would increase from $77.1 to around $118.3M. This means that Council would, over the life of the DCP need to provide funds or obtain grants to cover the cost. To date Council has been awarded $8M in grants towards the funding gap.

242. Table 10 shows a comparison of the existing and revised infrastructure costs and DCP shortfall.

Development Funding Type	Existing DCP		Revised DCP	
DIL Developer	319.7M	77%	370.8M	72%
DIL Council (External Apportionment)	49.3M	12%	43.4M	8%
DIL Council (Uncollectable DIL)	-	0%	33.2M	6%
CIL Developer/Community	20.7M	5%	22.5M	4%
CIL Council (Grants)	27.9M	7%	41.6M	8%
Total	**417.6M**	**100%**	**511.6M**	**100%**

Table 10: DCP Infrastructure Costs and Shortfall

243. Although it is acknowledged that the infrastructure and levy that developers and landowners would pay will increase significantly; as a share of the increased costs, Council and other funding sources will need to contribute more as a percentage.

244. The consequences of the costs of DCP projects not keeping pace with actual construction costs is significant and goes beyond the DCP projects that Council's typically take responsibility for, like the community and recreation projects.

245. In most DCPs, including the BWDCP, it is common for developers to undertake the bulk of road and drainage projects as Works-In-Kind (WIK) by negotiation and agreement with Council. As important as it is to review all outstanding infrastructure projects in the current context to inform Council's financial planning, it is also critical to ensure that projects are accurately costed to ensure that it is going to be viable for developers to deliver infrastructure as WIK.

246. Feedback from some developers is that for some planned and future projects, the DCP will not cover the costs of these projects. If WIK for DCP infrastructure becomes less viable, developers may not be inclined to undertake WIK and Council may have to deliver additional DCP projects which carries further financial risks for Council in terms of increasing the shortfall.

GROWLING GRASS FROG CONSERVATION MANAGEMENT PLAN (GGF CMP)

247. Prior to the development of original PSP, Ecology Partners undertook a Flora and Fauna Assessment for the Ballarat West Growth Area in January 2012 which was informed by targeted threatened fauna surveys in May 2011 to ascertain the likelihood of occurrence of the nationally significant Growling Grass Frog (GGF), Dwarf Galaxias and Australian Grayling within the study area.

248. The original fauna surveys found that the GGF was detected at 8 sites in Precinct 1 and a GGF CMP was prepared. Dwarf Galaxias and Australian Grayling were not recorded in the study area.

249. Mount Galaxias, listed as threatened under the Flora and Fauna Guarantee Act 1988, were also recorded at two sites in Precinct 1. It was not recommended that the CMP take into the account the presence of Mount Galaxias.

250. This background work led to the development of a Growling Grass Frog Conservation Management Plan, December 2011 and a Native Vegetation Precinct Plan, March 2012 both prepared by SMEC.

251. Key elements of the 2011 GGF CMP were that an offset trigger was identified in Precinct 1 of the BWPSP in the Bonshaw area (*see* figure 36), delivery of compensation habitat and a regime of establishment and monitoring of the habitat.

Figure 36: Growling Grass Frog Offset Trigger Area

252. As part of the PSP review, the City engaged Practical Ecology to undertake a review of the GGF CMP. The aim of reviewing the GGF CMP is to establish a strategic framework for the efficient management of the GGF as the remaining development occurs in Precinct 1.

253. Practical Ecology undertook target surveys within and around Precinct 1. Despite suitable habitat being prevalent, no GGF were found on any of the sites, surveyed although some were recorded in an adjacent site in the Golden Plains Shire.

254. Practical Ecology have stated that given the species' highly mobile nature, it is highly likely that the GGFs still utilise the habitat and they will need to be given consideration throughout the planning and development process. In light of the presence of the GGF in the locality a draft revised GGF CMP has been prepared. However at this stage it is not proposed to be included in this amendment. Further investigation is required to determine whether the revised GGF will be required in the future.

255. The Department of Environment, Energy and Climate Action (DEECA) were consulted on the planning scheme amendment, specifically in regard to the potential impacts on the Growling Grass Frog. In their response DEECA included the following key points:

- From a State perspective, DEECA has no authority to require a GGF CMP
- There is no specific mechanism mandating one under State legislation or regulations outside of the Melbourne Strategic Assessment area.
- Notwithstanding these limitations, DEECA supports City of Ballarat's proposed retention, review and update of the GGF CMP but recommends the City review and (re) confirm its reasons for having a GGF CMP in the PSP
- Various comments on the draft GGF CMP.

256. Following the DEECA response, advice was sought from DTP on how best to deal with the GGF in the planning scheme amendment. The advice given was to provide greater weight to the existing CMP by including the following in the PSP:

- Update to Plan 8 Future Urban Structure to include the GGF Offset Trigger Area
- Addition of a planning and design guideline at 5.3.1 General: The following planning and design guidelines must be met:
    - Biodiversity habitats along Winter Creek or other suitable locations for the relocation of the Growling Grass Frog
- Addition of a planning and design guideline at 5.3.1 General: The following planning and design guidelines should be met:
    - Growling Grass Frog (GGF) Compensatory habitats should be setback more than 35m from Winter Creek and may be co-located with existing stormwater infrastructure. Road crossings are discouraged in these areas and pedestrian and cycling links, and linear infrastructure is to be designed to allow for the efficient movement of GGF.
- Deletion of Ballarat West Conservation Management Plan from Implementation 5.5.2 and 5.6.2 due to the relevant content now being included in the PSP.
- Addition of new section at 5.6 Biodiversity Assets: 5.6.4 Growling Grass Frog Conservation Management Plan: The following objectives must be met:
    - Development on any site identified in the Ballarat West Conservation Management Plan as being a site where Growling Grass Frogs have been found or as being within the Growling Grass Frog Offset Trigger Area must ensure the long-term viability of the Growling Grass Frogs
    - Increase the amount of high quality GGF habitat in the by the creation of compensatory wetland habitat;
    - Incorporate the compensatory habitat prior to the removal of currently used habitat to ensure successful dispersal and colonisation; and
    - Develop a monitoring program to assess the effectiveness of the CMP and/or provide further management actions that may be required to ensure the objectives are met.

    The following design guidelines should be met:
    - Kensington and Winter Creek are the preferred location for GGF compensatory habitat.
    - Any new GGF habitats should be consistent with the design standards outlined in the CMP.
- The UGZ Schedule 2 was also updated to give clarity to the implementation on the GGF requirements in the PSP.

BALLARAT WEST NATIVE VEGETATION PRECINCT PLAN (NVPP)

257. The Native Vegetation Precinct Plan (NVPP) that applies to the PSP area together with Environmental Offset Areas has also been reviewed including an audit of the vegetation that has been removed and retained in accordance with the NVPP.

258. All PSP parcels where vegetation was shown as being retained or removed and offset have now been developed.

259. The BWNVPP was prepared by SMEC Consultants in March 2012 and incorporated into the planning scheme as part of C158.

260. At that time NVPPs were prepared in accordance with the three-step approach to net gain as set out in Native Vegetation Management – a Framework for Action (Department of Sustainability and Environment (DSE) 2002).

261. The BWNVPP required first party offsets to be established in identified offset areas with an area of 25ha and a further 22.7ha of potential offsets. The offsets equated to 18.6 trees per hectare for the removal of the scattered trees discussed below. The offsets were to be secured through an on-title legal agreement prior to subdivision and include commitment to manage the offset in perpetuity.

262. Surveys undertaken for the BWNVPP in 2011 recorded 57 remnant trees scattered widely over the precinct area. The BWNVPP identified challenges with establishing meaningful conservation areas given the scattered nature of the trees. A total of 20 trees were shown to be retained, all in precincts 2 and 4. The other 37 trees were identified as being suitable for removal.

263. The City has undertaken an audit of all permits granted on land where the 57 remnant trees were recorded. Of the 20 trees originally shown as being retained, 13 have been removed or are dead and 7 have been retained over three development sites.

264. Of the 37 trees suitable for removal, 4 remain standing, 3 at 15 Masada Boulevard, Winter Valley and 1 at 77 Cherry Flat Road, Bonshaw.

ENVIRONMENTAL OFFSET AREAS

265. 13ha of Plains Grassy Woodland (PGW) in the west of sub-precincts of 2 and 4 was adopted to conserve the precinct's most intact native vegetation. In addition, two other small areas of PGW and Creekline Herb-rich Woodland areas (CHRW) were also recommended as offset areas in sub-precinct 2 and 4.

266. The most northern PGW offset area in sub-precinct 4 and further CHRW offset areas in sub-precinct 1 did not include any scattered trees for retention. It seems these were nominated for offsets on a locational basis rather than due to existing vegetation.

267. The environmental offset areas in the BWPSP have not been used to secure any first party native vegetation offsets. It is likely that this is because legislation has changed twice since the BWNVPP was prepared and that the native vegetation guidelines now allow for third party offsets. It would therefore not be reasonable to enforce requirements in a BWNVPP which relies on superseded guidelines.

268. Another factor favouring the removal of offset sites is that they are likely to conflict with the need to manage native vegetation to reduce the risk to life and property from bushfire. For instance under the current guidelines an offset area cannot be established with 50m of dwelling.

269. It is also of relevance that under the 2017 PSP review Amendment C203; Schedule 2, 2.5 Specific provisions, Potential Environmental Offset Area to the Urban Growth Zone was amended to delete the requirements for the offset areas to be used for native vegetation offsets.

270. Despite this change to the Schedule no changes were made to the offset areas text or the land use budget in the PSP. Moreover, the explanatory report for C203 makes no reference to this change.

271. Given the fact that the offset areas have not been implemented as envisaged and first party offsets are not appropriate in an urbanised area, updating and in some cases removing the majority of the offset areas from the PSP is proposed. This change would also bring the PSP document into consistency with the Schedule as revised under C203.

272. The only areas where it is proposed to retain some Environmental Offset Area is in creek lines where the areas may be beneficial for future Growling Grass Frog habitat.

PROPOSED CHANGES TO PLANNING SCHEME ORDINANCE

273. The review necessitates making some changes to the Ballarat planning scheme ordinances, specifically the schedule 2 to the Urban Growth Zone, schedule 1 to the Development Contributions Plan Overlay and schedule to clause 72.04 Incorporated Documents The key changes are summarised in table 11.

Ordinance Heading	Change Proposed and Reason
Schedule 2 to Clause 37.07 Urban Growth Zone	
1.0 The Plan	New future urban structure plan to reflect the proposed PSP changes.
2.3 Specific provisions – Use of land	The current drafting of Section 3 Use (Prohibited) suggests that the use of the land for warehouses and industry are prohibited under the Commercial 2 Zone and

	Mixed Use Zone respectively. This is inconsistent with the requirements of the Commercial 2 and Mixed Use Zones, where a Planning Permit is required for the use of land for industry and warehouse in its respective zones. This provision has been updated to refer to the applied zones to ensure consistency with the requirements of the relevant zone.
2.4 Specific provisions - Subdivision	The current drafting of this provision when read literally suggests that a permit cannot be granted for multi-lot subdivision of unserviced land. The first dot point "create no more than one additional lot" under the clause has been deleted to remove any ambiguity.
2.5 Specific provisions – Buildings and works	This provision has been updated to the latest Building Regulations and to reference Victorian Planning Authority's Small Lot Housing Code (November 2024 or as amended). The provision as currently drafted references the Small Lot Housing Code (SLHC) in the Ballarat West PSP. This version of the SLHC in the PSP has since been superseded.
3.0 Application requirements Subdivision – Rural Interface Area	This requirement will be removed as most of the parcels in the Rural Interface Area on Plan 11 (Housing) in the Ballarat West PSP have been further developed.
3.0 Application requirements Subdivision – Subdivision, use and buildings and works applications – Noise Emission Buffer	This requirement has been updated to reference the latest EPA policy Noise Protocol. The policy SEPP-N1 as currently referenced has since been superseded.
3.0 Application requirements- Growling Grass Frog Offset Trigger Area	Amendment to the wording to make reference to objectives and guidelines that have been extracted from the GGF CMP and put into the PSP and include requirements for applicants to provide advice regarding approvals under the *Flora and Fauna Guarantee Act 1987* and/or *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) and if required a GGF Compensatory Offset Plan.
4.0 Conditions and requirements for permits Development Contributions Plan	This clause has a requirement that where a Development Contributions Plan (DCP) has not been incorporated into the planning scheme an owner is required to enter into an agreement under section 173 of the Planning and Environment Act to provide development contributions. This is an unnecessary requirement and is redundant as Ballarat West has a DCP.
4.0 Conditions and requirements for permits for land identified as having a Medium Potential for Contamination	This clause includes a condition which affects land identified as having a Medium Potential for Contamination. The condition makes reference to the superseded practice note for potentially contaminated land and Environmental Protection Act 1970. The condition is proposed to be updated to reference the current practice note Planning Practice Note 30 for Potentially Contaminated Land (30 July 2021) and the Environmental Protection Act 2017 and include wording that is consistent with that in Victoria Planning Provision clause 45.03 Environmental Audit Overlay.

4.0 Conditions and requirements for permits – Growling Grass Frog Offset Trigger Area	This condition is proposed to be updated to reference the Growling Grass Frog Offset Trigger Area in Precinct 1 on Plan 8 (Future Urban Structure) in the Ballarat West PSP.
6.0 Decision guidelines	All documents referenced in this clause will be updated to the amended PSP and DCP.
Schedule 1 to Clause 45.06 Development Contributions Plan Overlay	
2.0 Summary of costs	This table is updated to reflect new costs
3.0 Summary of contributions	This table is updated to reflect new contributions
Schedule to Clause 53.01 Public open space contribution and subdivision	
1.0 Subdivision and public open space contribution	The amount of contribution for public open space for land covered by the Ballarat West Precinct Structure Plan is updated from 5.31% of GDA to 5.91% of GDA.
Schedule 1 to Clause 72.04 Incorporated Documents	
1.0 Incorporated documents	New dates will be applied to the BWPSP and BWDCP. The Victorian Planning Authority's Small Lot Housing Code (November 2024) which is currently incorporated into Metropolitan Melbourne planning schemes will also be included.

Table 11: Summary of Planning Scheme Change Ordinances

SUPPORTING DOCUMENTS

274. The supporting documents of relevance to this project include:

- Growling Grass Frog Conservation Management Plan 2011
- Native Vegetation Precinct Plan- Ballarat West Growth Area 2011
- Ballarat West Precinct Structure Plan SMEC October 2016
- Ballarat West Development Contributions Plan Urban Enterprise June 2017
- Engeny Water Management Ballarat West Growth Area PSP Review Precinct 2 April 2020
- Engeny Water Management Ballarat West Growth Area PSP Review Precinct 1 November 2021
- DCP Project Review GHD 1 December 2021
- ASR Research: Ballarat West Precinct Structure Plan Review – Community and Recreation Infrastructure 29 May 2024
- Engeny Ballarat West Review Drainage Strategy Update 19 December 2024
- Milward Engineering Management: Ballarat West Precinct Structure Plan Transport Projects Review February 2024
- Opteon Solutions Land Value Assessments for the Ballarat West DCP Review June 2024

Ballarat West PSP and DCP Review Background Report

- DRAFT Ballarat West Development Contributions Plan Urban Enterprise February 2025
- DRAFT Ballarat West Precinct Structure Plan SMEC February 2025

APPENDICES

6

APPENDIX A PROPOSED CHANGES TO DCP TRANSPORT PROJECTS AND COSTINGS 24/25

Project Number and Description	Current status	Proposed change	Current DCP Costing	Proposed DCP Costing	Increase / decrease
Road Construction Projects					
DI_RD_11 New north south link road	Commencement	Realignment in accordance with approved subdivision layout and minor costing adjustment	$2,802,060	$3,165,532	13%
DI_RD_12 New north south link road	Pre-planning	Adjusted scope and costing to correct measurement error. Also realigned westward to accord with approved subdivision plan	$1,681,194	$1,936,964	15%
DI_RD_21 Cherry Flat Road Upgrade	Pre-planning	Adjusted scope and costing to correct measurement error.	$1,192,617	$4,307,291	261%
DI_RD_23 Cobden Street North	Pre-planning	Slight realignment and costing adjustment	$1,687,144	$1,783,582	6%
DI_RD_24 Cobden Street South	Pre-planning	Slight realignment and costing adjustment	$2,058,156	$2,012,722	-2%
DI_RD_Ross Creek Road Upgrade (items RD_38 & RD_39 in the transport review)	Pre-planning	Adjusted scope and costing to correct measurement error.	$3,869,820	$4,940,516	28%
Intersection Construction Projects					
DI_JNC_02 Carngham Rd / New N-S Rd	Planning	Adjusted scope and costing to change the intersection from roundabout to signalised.	$1,882,644	$3,310,533	76%
DI_JNC_05 Greenhalghs Rd / New N-S Rd	Planning	Adjusted scope and costing to change the intersection from roundabout to signalised.	$1,484,496	$1,901,261	28%
DI_JNC_08 New N-S Road/Glenelg Highway	Part delivered	Adjusted scope and costing to reflect change in road pavement standard from local to arterial	$1,493,718	$1,813,170	21%
DI_JNC_11 Cherry Flat Road/Schreenans Road	Pre-planning	Adjusted scope and costing to improve safety	$1,373,363	$1,579,816	15%
DI_JNC_12 Ross Creek Road/Schreenans Road	Pre-planning	Adjusted scope and costing to improve safety	$1,026,460	$1,206,421	18%
Road and Intersection Land Projects					
DI_LA_17 Land for Schreenans Road widening	Pre-planning	Increase in area required from 0.30ha to 0.42ha	$412,750	$578,500	40%
DI_LA_18 Land for Schreenans Road widening	Pre-planning	Decrease in area required from 0.83ha to 0.69ha	$800,000.00	$690,000	-14%
DI_LA_24 Land for north south link road (4)	Pre-planning	Decrease in area required from 6.56ha to 6.14ha	$6,169,000.00	$5,398,000	-12%

APPENDIX B PROPOSED CHANGES TO DRAINAGE CATCHMENT COSTINGS 24/25

Project Number and Description	Current status	Key changes	Current DCP Costing	Proposed DCP Costing	Increase / decrease
DI_DR_AA/AB	Adjusted scope and costings including pipe changes and resizing and relocation of basin RB11		$3,376,846	$6,009,936	78%
DI_DR_AC/AT	Adjusted scope and costings including pipe changes and resizing and relocation of basin RB13		$9,166,574	$10,646,060	16%
DI_DR_AK/AM	Adjusted scope and costings including pipe changes and resizing and relocation of basin RB12		$1,175,210	$4,446,269	278%
DI_DR_AU/AY	Adjusted scope and costings including pipe changes and resizing and relocation of basin RB14		$3,447,409	$4,163,369	21%
DI_DR_AZ/CA	Adjusted scope and costings including pipe changes, resizing and relocation of basin RB18 and removal of bioretention areas		$2,187,589	$3,951,612	81%
DI_DR_BA/BQ	Adjusted scope and costings including pipe changes and resizing of basins RB15 and RB17		$12,230,206	$13,915,348	14%
DI_DR_BK/BL	Adjusted scope and costings including pipe changes and removal of bioretention areas		$647,527	$482,585	-25%
DI_DR_BU/CP	Adjusted scope and costings including pipe changes and resizing of basin RB28		$14,533,126	$11,549,186	-21%
DI_DR_BY/BZ	Adjusted scope and costings including pipe changes and resizing of basin RB25 as built		$2,718,377	$2,773,808	2%
DI_DR_CB/CF	Adjusted scope and costings including pipe changes, resizing of basin RB25 as built and removal of bioretention areas		$1,845,896	$2,007,755	9%
DI_DR_CD/CR	Adjusted scope and costings including pipe changes, resizing of basin RB24 and removal of bioretention areas		$6,417,825	$8,035,539	25%
DI_DR_CQ/CW	Adjusted scope and costings including pipe changes, resizing and relocation of basin RB27 and removal of bioretention areas		$6,080,322	$11,242,998	85%

Project Number and Description	Current status	Key changes	Current DCP Costing	Proposed DCP Costing	Increase / decrease
DI_DR_CX/DC	Adjusted scope and costings including pipe changes, resizing and relocation of basin RB29 and removal of bioretention areas		$3,820,814	$8,342,828	118%
DI_DR_KL	Adjusted scope and costings including pipe changes and resizing of basin RB5 as built		$4,899,899	$4,195,090	-14%
DI_DR_M/Q	Adjusted scope and costings including pipe changes and resizing of basin RB6		$6,914,095	$7,213,611	4%
DI_DR_P/T	Adjusted scope and costings including pipe changes and resizing of basin RB7		$7,217,952	$10,494,469	45%
DI_DR_U/Z	Adjusted scope and costings including pipe changes, removal of bioretention areas and replacement with RBs 6A, 6B and 6C		$4,458,024	$9,293,039	108%
DI_DR_A	Unchanged		$1,436,159	$1,436,159	0%
DI_DR_C/O	Unchanged		$10,178,020	$10,178,020	0%
DI_DR_D/J	Unchanged		$12,454,841	$12,934,851	0%
Land for Retarding Basins					
DI_LA_RB1	Acquired	Increase from 0.5ha to 0.9ha	$475,000	$838,500	77%
DI_LA_RB2	Acquired	Decrease from 3.87ha to 3.86ha	$3,483,000	$3,474,000	0%
DI_LA_RB4	Acquired	Decrease from 1.69ha to 1.15ha	$1,394,250	$965,750	-31%
DI_LA_RB5	Acquired	Decrease from 1.54ha to 1.09ha	$847,000	$599,500	-29%
DI_LA_RB6	Not acquired	Decrease from 2.61ha to 2ha	$2,218,500	$ 1,700,000	-23%
DI_LA_BIO	NA	Removed and replaced with RB6a, RB6B and RB6C. See below	$641,750	NA	-100%
DI_LA_RB6a	Acquired	Biofilter changed to basin land with area of 1.6ha	NA	$1,400,000	100%
DI_LA_RB6b	Acquired	Biofilter changed to basin land with area of 0.57ha	NA	$627,000	100%

Project Number and Description	Current status	Key changes	Current DCP Costing	Proposed DCP Costing	Increase / decrease
DI_LA_RB6c	Acquired	Biofilter changed to basin land with area of 0.14ha	NA	$122,500	100%
DI_LA_RB7	Not acquired	Increase from 2.12ha to 3.86ha	$1,696,000	$3,088,000	82%
DI_LA_RB11	Not acquired	Increase from 0.62ha to 1.9ha	$527,000	$1,615,000	206%
DI_LA_RB12	Not acquired	Increase from 0.62ha to 2.23ha	$323,000	$1,895,500	487%
DI_LA_RB13	Not acquired	Increase from 2.12ha to 2.37ha	$647,750	$1,986,000	207%
DI_LA_RB14	Not acquired	Increase from 1ha to 1.74ha	$758,500	$1,391,000	83%
DI_LA_RB15	Not acquired	Increase from 0.86ha to 2.25ha	$645,000	$1,687,500	162%
DI_LA_RB17	Not acquired	Increase from 2.63ha to 3.56ha	$1,906,750	$2,581,000	35%
DI_LA_RB18	Not acquired	Increase from 0.79ha to 1.04ha	$691,250	$910,000	32%
DI_LA_RB24	Not acquired	Increase from 2.14ha to 3.6ha	$1,444,500	$2,430,000	68%
DI_LA_RB25	Removed	Combined with RB26	$910,000	NA	-100%
DI_LA_RB26	Not acquired	Increase from 0.39ha to 1.43ha	$429,000	$1,339,000.00	212%
DI_LA_RB27	Not acquired	Increase from 0.39ha to 4.48ha	$391,000	$2,689,000.00	588%
DI_LA_RB29	Not acquired	Increase from 1.54ha to 3.43ha	$962,500	$2,089,250	117%
DI_LA_RB30	Not acquired	Project removed	$1,170,000	NA	-100%
DI_LA_SB30	Not acquired	New land project 0l59ha	NA	$649,000	100%

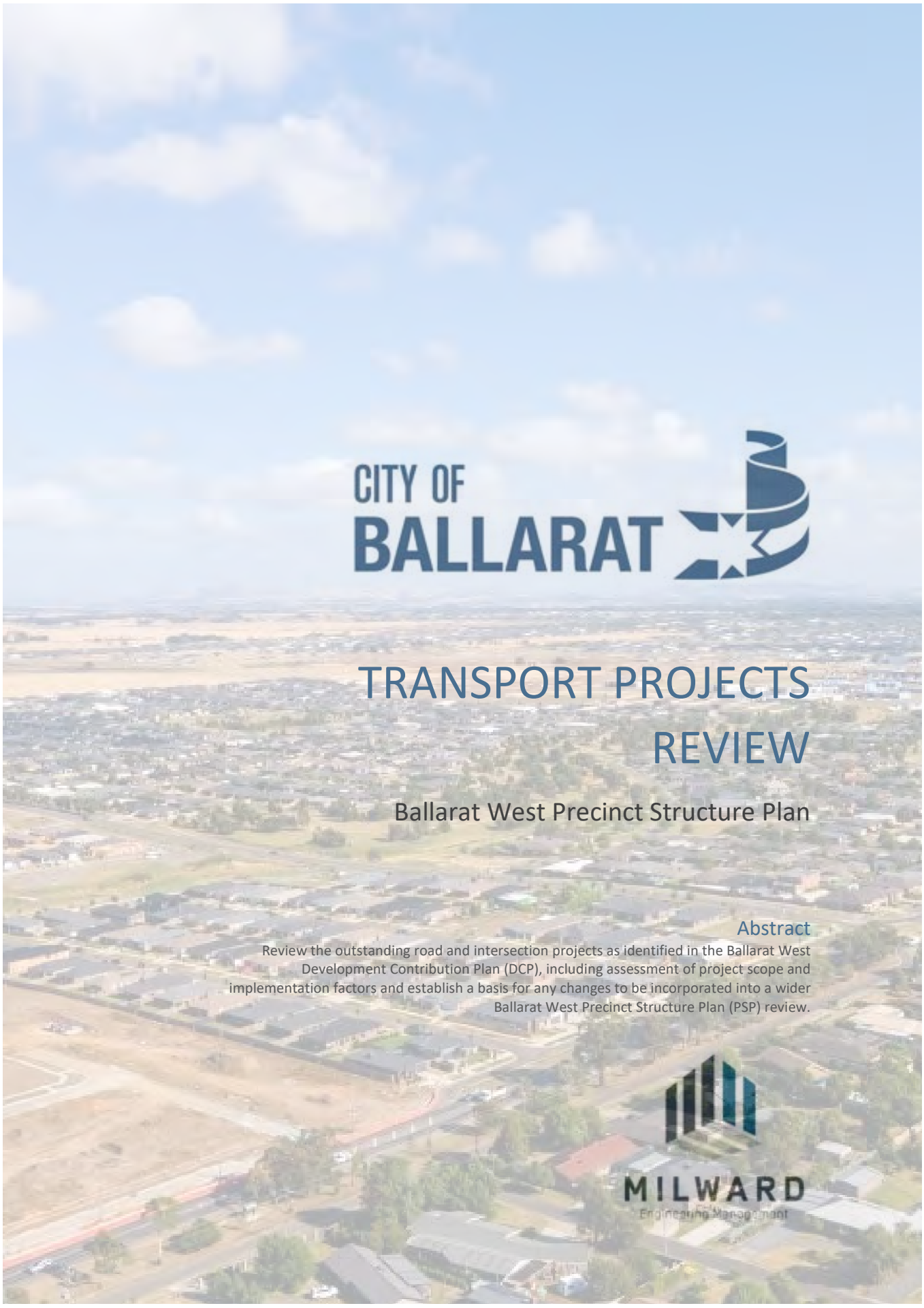
APPENDIX C PROPOSED CHANGES TO COMMUNITY AND RECREATION PROJECTS DCP COSTINGS 2024/25

Project Number and Description	Current status	Proposed change	Current DCP Costing	Proposed DCP Costing	Increase / decrease
Delacombe Major Activity Centre/Hub Construction					
CI_CF_1 Library	In planning stage	Adjusted scope and costing	$8,949,186	$16,197,281	81%
CI_CF_2 , CI_CF_3 and DI_CF_1 Early years hub and Community Centre	In planning stage	Adjusted scope and costing The projects are to be combined as a single project and building to increase efficiencies.	$14,716,125	$12,921,950	-12%
CI_OS_3 Sports Pavilion	Pre-planning	Adjusted scope and costing	$2,518,850	$3,435,868	36%
DI_OS_3 Active Open Space	Pre-planning	Adjusted scope and costing	$5,318,298	$8,611,293	62%
Delacombe Major Activity Centre/Hub Land					
DI_LA_1 Land for library (1ha)	No land has been acquired	No change	$3,750,000	$3,375,000.	10%
DI_LA_2 Land for Early Years Hub (0.5ha)	1 ha Land at 26 Valiant Road has been acquired	These two land projects have been consolidated to deliver the two construction projects. Land reduced to 1ha	$5,625,000	$3,750,000	-33%
DI_LA_3 Land for Community Centre (1ha)					
DI_LA_11 Land for Active Open Space (8ha)	Land with a total area of 3.5ha has been acquired.	To reduce the land project from 8ha to 3.5ha. This is necessary because the 8ha was deemed unsuitable for a reserve due to the steep topography.	$8,409,000	$4,625,000	-45%
Greenhalghs Road Local Activity Centre/Hub Construction					

Project Number and Description	Current status	Proposed change	Current DCP Costing	Proposed DCP Costing	Increase / decrease
DI_CF_3 and CI_CF_5 Community Centre and early years hub	Pre-planning	Adjusted scope and costing and relocation.	$9,462,034	$12,921,950	37%
CI_OS_4 Sports Pavilion	Pre-planning	Adjusted scope and costing.	$1,976,520	$4,803,100	143%
DI_OS_4 Active Open Space	Pre-planning	Adjusted scope and costing commensurate with a revised land size, (*see* DI_LA_12)	$6,989,317	$12,343,805	77%
DI_OS_6 Indoor recreation centre	Pre-planning	Adjusted scope and costing and relocation.	$19,243,680	$58,004,362	201%
Greenhalghs Road Local Activity Centre/Hub Land					
DI_LA_5 Land for Community Centre and Early Years Hub (0.5ha)	No land has been acquired	DI_LA_5 and DI_LA_6 consolidated into 1.3ha of LAC Early Years Hub site consolidated with Level 1 Multipurpose Community Centre.	$425,000	$1,105,000	100%
DI_LA_6 Land for Community Centre and Early Years Hub (0.8ha)			$680,000		-100%
DI_LA_12 Land for Active Open Space (11ha) including land for the indoor recreation centre	No land has been acquired	To reduce the land project from 11ha to 10.03ha. This reduction is required as land from the adjoining property to the west has been developed.	$9,325,750	$7,675,500	-18%
DI_LA_12a Land the Indoor recreation centre	No land has been acquired	Indoor recreation centre location has been moved with the area increased to 1.3ha		$1,105,000	100%

Project Number and Description	Current status	Proposed change	Current DCP Costing	Proposed DCP Costing	Increase / decrease
Carngham Road Neighbourhood Activity Centre/Hub Construction					
DI_OS_5 Active Open Space	Part-delivered	Deletion of project and replacement with two projects as below.	$5,644,165	NA	-100%
DI_OS_5a Active Open Space	Completed	New project line to acknowledge that part of the original project DI_OS_5 has been delivered and is now described as DI_OS_5a.	NA	$2,782,272	100%
DI_OS_5b Active Open Space	Pre-planning	New project line to acknowledge that DI_OS_5b will be delivered as a separate project including facilities as originally proposed and updated costings.	NA	$8,434,635	100%
CI_OS_5 Sports Pavilion	Pre-planning	Adjusted scope and costing.	$1,898,847	$3,435,868	81%
DI_LA_7 Land for early hub – NAC (Sub Precinct 4)	Pre-planning	DI_LA_7 & DI_LA_8 consolidated into one.	$450,000	$630,000	40%
DI_LA_8Land for Level 1 Multi Purpose Community Centre – NAC (Sub-Precinct 4)	Pre-planning	DI_LA_7 & DI_LA_8 consolidated into one.	$720,000	NA	-100%
DI_LA_13 Land for Active Open Space (8ha)	Part-delivered (4ha)	None	NA	NA	NA
Ross Creek Road / Morgan Street Local Activity Centre/Hub					
DI_CF_2 Community Centre and early years hub	Part-delivered	Adjusted scope and costings to allow for a 403sqm extension to accommodate additional kinder facilities required to meet the state government's Three-Year-Old kinder reform program.	$2,670,178	$4,704,420	76%

Project Number and Description	Current status	Proposed change	Current DCP Costing	Proposed DCP Costing	Increase / decrease
DI_OS_1 Active Open Space (MR Power Park)	Part-delivered	Adjusted scope and costing to allow for a different range of facilities to those originally proposed. The Active Open Space component is 4ha.	$17,636,226	$8,434,635	-52%
CI_OS_1 Sports Pavilion	Pre-planning	Adjusted scope and costing.	$1,976,520	$2,066,580	5%
DI_OS_7 Indoor recreation centre	Pre-planning	Deletion of project	$12,479,126	NA	-100%
Other (Mining Park)					
DI_OS_2 Active Open Space (Mining Park)	Pre-planning	Adjusted costing.	$9,325,392	$15,524,363	66%
CI_OS_2 Sports Pavilion	Pre-planning	Adjusted scope and costing.	$1,597,167	$3,435,868	115%
DI_LA_9 and 10 Land for Active Open Space at Mining Park (12.03ha)	No land has been acquired	Reduced land area to 11.27 ha	7719,000	$6,623,500	-14%
Other Projects					
DI_O_4 Strategic Planning Costs	Part-complete	Introduction of new project to cover strategic planning costs	NA	$432,465	100%



CITY OF BALLARAT

TRANSPORT PROJECTS REVIEW

Ballarat West Precinct Structure Plan

Abstract

Review the outstanding road and intersection projects as identified in the Ballarat West Development Contribution Plan (DCP), including assessment of project scope and implementation factors and establish a basis for any changes to be incorporated into a wider Ballarat West Precinct Structure Plan (PSP) review.

MILWARD

Engineering Management

DOCUMENT CONTROLS

Business Name	**Milward Engineering Management Pty Ltd**				
Document Title	**Transport Projects Review** **Ballarat West Precinct Structure Plan**				
Document No.		Issue	**3.3**	Date	**13 February 2023**
Document Controller	[redacted], Development & Technical Services Manager – Milward Engineering Management Pty Ltd				
Client	[redacted] Manager Sustainable Growth – City of Ballarat				
Authorised by	[redacted], **Manager Sustainable Growth – City of Ballarat**				
[redacted]	14/02/2024 **(Date)**				

Change History

Issue	Date	Description of change	Author
3.3	13 February 2024	Minor amendments to Final Draft for endorsement	[redacted], Senior Project Manager – Milward Engineering Management Pty Ltd
3.2	31 January 2024	Further amendments to Final Draft following Project Control Group and DCP Consultant feedback for endorsement	[redacted], Senior Project Manager – Milward Engineering Management Pty Ltd
3.1	22 December 2023	Amendments to Final Draft following Project Control Group and DCP Consultant feedback for endorsement	[redacted], Senior Project Manager – Milward Engineering Management Pty Ltd
3.0	25 May 2023	Final Draft issued to Project Control Group for comment	[redacted], Senior Project Manager – Milward Engineering Management Pty Ltd
2.1	11 April 2023	Second Draft issued to Project Control Group for comment	[redacted], Senior Project Manager – Milward Engineering Management Pty Ltd
2.0	07 February 2023	Second Draft	[redacted], Project Manager – Milward Engineering Management Pty Ltd
1.0	15 June 2022	First Draft issued to Project Control Group for comment	[redacted], Senior Project Manager – Milward Engineering Management Pty Ltd
0.1	14 April 2022	First Draft	[redacted] Project Manager – Milward Engineering Management Pty Ltd

Disclaimer

EXECUTIVE SUMMARY

Review Intent

The purpose of this review is to understand how the implementation of the road network to support the Ballarat West Precinct Structure Plan (PSP) is likely meeting the current and future needs of the precinct.

The scope of identified outstanding road and intersection projects (and associated land acquisition projects) and their suitability including their function, alignments, land requirements and delivery strategies are considered.

This information and the engineering principles are still relevant today, however there are a range of design factors such as Safe Systems and/or Road Safety Audit principles that have been used in this report other qualitative and quantitative assessments of each PSP project include:

1. Whether the scope of the projects as outlined in the DCP are appropriate for the development that is occurring
2. Determination of the most appropriate intersection control solution between a roundabout and a signalised intersection considering the safety and efficiency of pedestrian and cyclists as well as motor vehicles.
3. Consideration of the accuracy of any road length measurements.
4. Whether the costings of the road and intersection projects as outlined in the DCP are appropriate considering the scope and the corrected length (as required).
5. Consideration of whether the current DCP land projects are adequate to deliver the projects.
6. A review of the thresholds for the timing of the delivery of the projects to ensure the safe and satisfactory operational performance of road infrastructure.
7. A review and if required, an update of relevant PSP Cross Sections

This report includes recommendations for consideration only by the City of Ballarat and its representatives. Subsequent PSP and DCP planning and documentation to be prepared by others informed by this report will include formalisation of their own recommendations which are ultimately adopted by the City of Ballarat as the Planning Scheme Amendment.

Precinct Structure Plan

The Ballarat West Precinct Structure Plan (PSP) is a comprehensive plan which provides direction for future urban development within the Ballarat West Precinct and is informed by the Ballarat West Growth Area Plan. The Ballarat West PSP describes how land is expected to be developed and identifies the community infrastructure and services required to support development.

This infrastructure which supports the PSP is typically provided through several mechanisms including:

- Subdivision construction works by developers.
- Development contributions (community infrastructure levy and development infrastructure levy).
- Utility service providers including road and drainage authorities; and
- Capital works projects by City of Ballarat, state government agencies and community groups.

Land Acquisition

Aside from these project specific changes, the mechanism for the associated land acquisition should be clarified and strengthen in the PSP update, as securing land ahead of project delivery is one of the

key challenges in implementing the PSP and keeping up with development activity. As a minimum all land required for infrastructure projects are to be represented in the PSP.

Irrespective of whether the land acquisition is funded by the DCP or could potentially be gifted as part of future subdivision, it is highly recommended that a Public Land Acquisition Overlay (PAO) is prepared and included in the Ballarat Planning Scheme Amendment with the identified land.

Development Contribution Plan

The Ballarat West Development Contribution Plan (DCP) was prepared concurrently with the PSP. The DCP sets out requirements for development proponents to contribute toward the necessary infrastructure to support the implementation of the Ballarat West PSP.

There are two (2) key prompts which have informed recommendations to the DCP.

1. A recommended change to the PSP, which is associated with an existing DCP project and/or would warrant a change to the DCP.
2. The review identifies and justifies a change to a DCP project scope in response to the changing needs of the precinct and/or where errors are evident.

Summary of Changes

Table 1 - Recommended Road and intersection treatment changes to be reflected in the PSP and DCP

Project Name / Location (Precinct)	Original Description	Recommendation Description	Comments
DI_JNC_02 Carngham Rd / New N-S Rd (North) (Precinct 4)	Roundabout	Change to traffic signalisation	PSP and DCP to be updated. Project scope and cost estimated updated to reflect the change, noting extent of land acquisition reduced. Provision of safer crossing controls for vulnerable road users with proximity to neighbourhood activity centre is better delivered by traffic signals.
DI_RD_03b New N-S Road (North) between Cuzens Road and Carngham Road (Precinct 4)	Link Road 2	Realignment	Alignment has been affected by adjacent development areas thus impacting the intersection design of DI_JNC_02
DI_RD_04 New N-S Road (North) between Carngham Road and sub-precinct 4 southern boundary (Precinct 4)	Link Road 2	Realignment	Alignment has been affected by incomplete land acquisition thus impacting the intersection design of DI_JNC_02
DI_JNC_04 Greenhalghs Rd / New N-S Rd (North) (Precinct 2)	Roundabout	Realignment	Intersection has moved northwards thus land acquisition of the southern side land is no longer required

Project Name / Location (Precinct)	Original Description	Recommendation Description	Comments
DI_JNC_05 Greenhalghs Rd / New N-S Rd (South) (Precinct 2)	Roundabout	Change to traffic signalisation	PSP and DCP to be updated. Project scope and cost estimated updated to reflect the change, noting extent of land acquisition reduced. Required land acquisition on northern side for roundabout not possible due to existing urban development.
DI_JNC_08 Glenelg Hwy / New NS Rd (South) (Precinct 2)	Roundabout	Roundabout	DCP correction Pavement design standard amended from local road design to arterial road design.
DI_RD_11 New N-S Road construction – sub-precinct 2 northern section (Precinct 2)	Link Road 2	Realignment	Road realigned westward within the same development site to reflect actual development configuration
DI_RD_12 New N-S Road construction – sub-precinct 2 southern section (Precinct 2)	Link Road 2	Realignment	DCP correction. Project scope and cost estimated updated to reflect increased length in Link Road of ~62m to correct the total length of road required between DI_JNC_05 and DI_JNC_08. Road realigned westward adjacent to low density zoned land reflecting actual development configuration.
DI_RD_21 Cherry Flat Road Upgrade - Schreenans Lane to Bells Road (Precinct 1)	Duplicated Link Road	Duplicated Link Road	DCP correction. Project scope and cost estimated updated to reflect increased length in Duplicated Link Road of ~560m to reflect extension through to Bells Rd with land acquisition already covered by an existing Public Acquisition Overlay (PAO)
DI_JNC_11 Cherry Flat Rd / Schreenans Rd (Precinct 1)	Roundabout	Amendment to scope	Project to incorporate fourth roundabout arm and associated land acquisition reflecting development configuration
DI_RD_38 Ross Creek Road Upgrade (Precinct 1)	Link Road 2	Service road provisions	DCP correction. The PSP describes DI_RD_38 as being from Bells Road to Taits Street. The road scope and cost estimate omit the

Project Name / Location (Precinct)	Original Description	Recommendation Description	Comments
DI_RD_39 Ross Creek Road Upgrade - Schreenans Lane extension East to Tait Street (Precinct 1)	Link Road 2	Service road provisions	section from Schreenans Lane extension East to Tait Street. Projects are to be corrected to reflect the full length intended. Existing cross section treatment to be retained, but support for addition of service roads to support safe connections are encouraged as optional
Webb Road / Schreenans Road (Precinct 1)	NA	New roundabout project	Existing government roads proposed as Link Road and Key Access Street with bus route are configured as an uncontrolled crossroad intersection. Note this is a PSP project only and will be delivered by developers.
Key Access Streets (All precincts)	Not provided	Apply standard cross sections	Apply a new Key Access Streets cross section except for when bus routes are identified which applies the Collector Street (Constrained) cross section
Local Access Streets (All precincts)	Not provided	Reference use of 18m wide road reserves for local access streets	Include reference in PSP to preference for adopting 18m wide road reserves for local access streets

Network Implementation

The findings and recommendations from this review will be further considered to formally prepare revised documentation related to the Ballarat West PSP and DCP in support of an amendment to the Ballarat Planning Scheme.

In parallel to this, and to support the streamlining of implementation associated with these strategic plans it is recommended that priority and short-term projects have detailed designed completed to be 'construction ready', with medium-term projects advanced to functional design and/or preliminary site investigations to inform future budgets and integration with development.

Progressing design will also benefit the progress of land acquisition, irrespective of the mechanism used to secure land.

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INTRODUCTION

REVIEW PURPOSE

To review the remaining roads and intersections as identified in the Ballarat West Precinct Structure Plan (PSP) and consider development activity since the PSP was adopted, suitability of the outstanding projects including their function, alignments, land requirements and delivery strategies.

To enable the review to be comprehensive, background research and consideration on the original documentation and subsequent implementation of the PSP and DCP are captured in this report.

This report includes recommendations for consideration only by the City of Ballarat and its representatives. Subsequent PSP and DCP planning and documentation to be prepared by others will be informed by this report but will include formalisation of their own recommendations which are ultimately adopted by the City of Ballarat as the Planning Scheme Amendment.

STUDY OUTPUTS

The outcomes of the project are:

1. Whether the scope of the road and intersection projects as outlined in the DCP are appropriate for the development that is occurring
2. Determination of the most appropriate intersection control solution between a roundabout and a signalised intersection considering the safety and efficiency of pedestrian and cyclists as well as motor vehicles
3. Consideration of the accuracy of any road length measurements
4. Whether the costings of the road and intersection projects as outlined in the DCP are appropriate considering the scope and the corrected length (as required)
5. Consideration of whether the current DCP land projects are adequate to deliver the projects.
6. A review of the thresholds for the timing of the delivery of the projects to ensure the safe and satisfactory operational performance of road infrastructure.
7. A review and if required, an update of relevant PSP Cross Sections

BACKGROUND

The City of Ballarat (Council) is undertaking a review of the designs, funding and delivery mechanisms of planned roads and intersections as listed in Table 1. Delivery of these transport projects are funded by a Development Contribution Plan (DCP) which is driven by the over-arching Ballarat West Precinct Structure Plan document.

The Ballarat West DCP is the single source of truth for the project costings; this report will discuss how certain projects were either not correctly scoped (i.e., civil or land acquisition) thus cost or suggest including additional projects where current standards exceed those when the PSP/DCP were developed.

Table 2 - Roads and junctions selected for review.

DCP Project Code	Project Description
DI_RD_03b	North of Ballarat-Carngham Road
DI_RD_11	North-South Link Road
DI_RD_12	North-South Link Road
DI_RD_20	Cherry Flat Upgrade north of Schreenans Road
DI_RD_21	Cherry Flat Upgrade south of Schreenans Road
DI_RD_23	Cobden Street construction north
DI_RD_24	Cobden Street construction south
DI_RD_31a	Schreenans Road upgrade
DI_RD_31b	Schreenans Road extension west
DI_RD_31c	Schreenans Road Creek Crossing
DI_RD_31d	Schreenans Road extension east
DI_RD_38	Ross Creek Road Upgrade
DI_RD_39	Ross Creek Road Upgrade
DI_JNC_02	Carngham Rd / New N-S Rd (North) Roundabout
DI_JNC_05	Greenhalghs Road / New N-S Road (South) Roundabout
DI_JNC_08	Glenelg Hwy / New N-S Road (South) Roundabout
DI_JNC_11	Cherry Flat Road / Schreenans Road Roundabout
DI_JNC_12	Ross Creek Road / Schreenans Road extension/ Cobden St (realignment) Roundabout

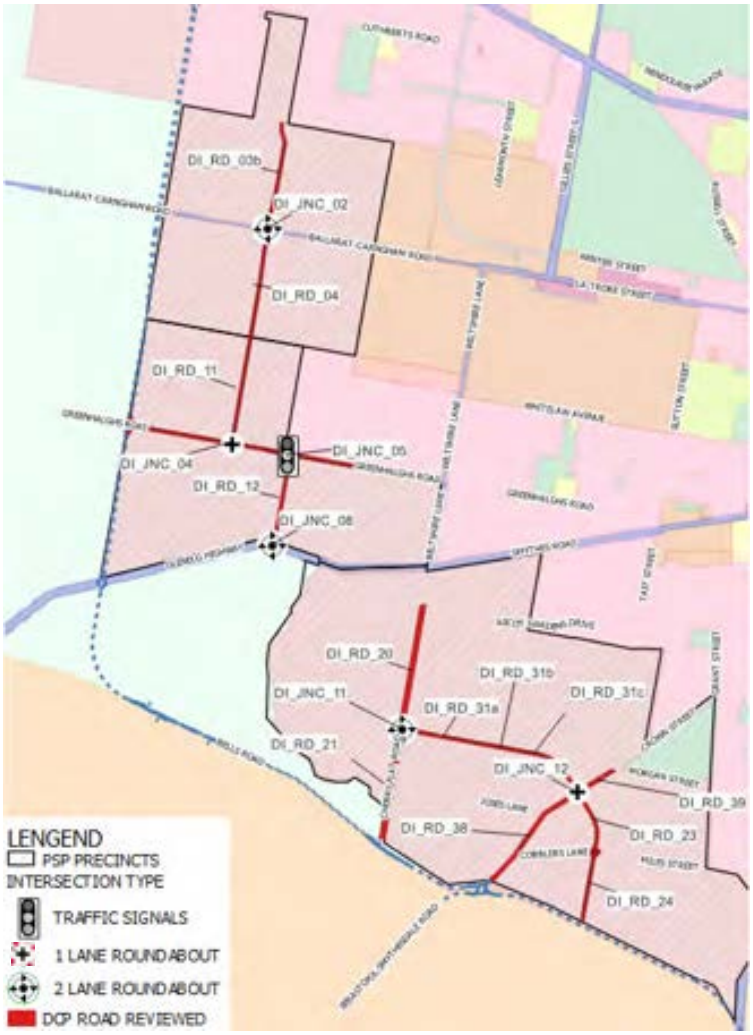


Figure 1 - Locality plan study's roads and junctions

PSP EVOLUTION

There have been many changes to the PSP since its existence post-October 2016, which as individual items do not necessarily impact the immediate areas in where they are located. The cumulative impacts of these changes on the wider PSP need to be periodically analysed and assessed against the desired objectives.

Driving factors resulting in these changes include:

1. Multiple Responsible Authorities – Infrastructure requirements of City of Ballarat and Regional Roads Victoria (DTP) i.e., funding priorities and political interest.
2. Developer Driven – the nature of and timing of the land released for development is typically driven by the developer, with some development locations “out of sequence”.
3. Contemporary Design Standards – design requirements are continually updated to reflect new approaches; these changes can create additional costs for implementation.

4. Scope Changes – changes to project scope occurs to mitigate land acquisition and/or other challenges which are assessed against the desired outcomes of the PSP.
5. Unaccounted Infrastructure – portions of several roads and intersections were not included in the original PSP requiring corrections to be made.

This review will consider the decision-making processes and whether improvements are warranted to ensure the PSP's aims and costs are not impacted in the long term.

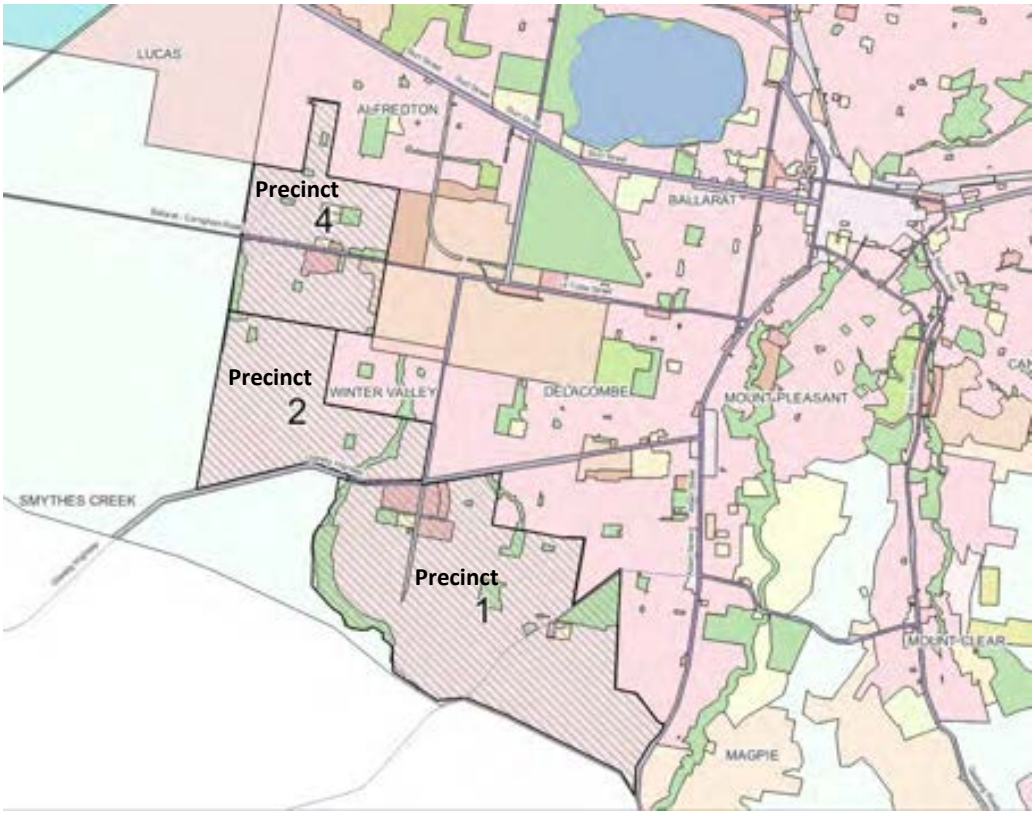


Figure 2 – Ballarat West Precinct Structure Plan overview map

SUPPORTING DOCUMENTS

This review considered the original Future Traffic Estimates & Road Infrastructure Requirements, SMEC 2011 report which informed the original road transport network in the PSP. Additional studies, strategies and reports have all linked back to the SMEC 2011 report that have in general improved on justifying the road network within the PSP. These documents include:

Document/Study/Report Name	Synopsis – Influence on PSP
Ballarat Strategy 2040 Part 4 Transport, City of Ballarat 2015	Outlines the key concepts, principles, and long-term actions to manage change so incremental short-term decisions consider our long-term challenges and opportunities. Two key platforms, the '10 Minute City' and the 'City in the Landscape' i.e., creating communities rather than satellite areas that feed the Ballarat CBD thus being less reliant on car use for short trips.

Document/Study/Report Name	Synopsis – Influence on PSP
Draft Schreenans Road Bridge Traffic Assessment Report, ESR Transport Planning 2015	Reviews the drivers and the needs for the new bridge joining Schreenans Road and Ross Creek Road and whether there are suitable alternatives such as: • Joses Lane • Upgrading Webb Road • Settlers Drive/Edmund Street Concludes that a bridge is required more so for pedestrians and cyclists as alternatives are available for cars.
Victorian Integrated Transport Model – City of Ballarat Phase 4 Preferred Scenario, AECOM 2016	Review of the existing transport networks (E.g., road, rail, bus) with projected growth scenarios. The preferred approach to managing future growth is to increase mode share away from vehicle traffic, which links to the Ballarat Strategy 2040 Identifies the timing of each PSP road project to support the project growth in the Victorian Integrated Transport Model (VITM) APPENDIX B presents an audit of the roads to be upgraded to what has been built to date.
Ballarat Cycling Action Plan, City of Ballarat 2017	Focuses on linking destinations and continuous and safe cycling routes for all types of users (families and children in particular). Routes predominately off-road or quieter streets Integrated with urban design, amenity, and landscaping improvements. Prioritises projects such as a safe route from the PSP to the CBD (Glenelg Highway to Yarrowee Creek trail); shared paths and bike lanes within the PSP join onto this priority route.
Ballarat Integrated Transport Plan, City of Ballarat 2019	Plan developed with the following discussion papers/inputs: • Ballarat's Urban Transit Future Background Paper, Movement and Place Consulting 2019 • Connecting Ballarat, Public Transport Users Association 2018 • Ballarat Walking Framework – Evolution Roadmap, Movement and Place Consulting 2019 • Ballarat's Future Rail Network Background Paper, Movement and Place Consulting 2019 The integrated transport plan builds on the above-mentioned documents and integrates with freight and public transport. Identifies priorities actions, namely: • Bus service improvements i.e., direct from PSP to CBD • Completion of the Ballarat Link Road • Walking and cycling routes
Bonshaw Creek Sub-Precinct Transport Network Review, ESR Transport Planning 2021.	This report extends on the Schreenans Road Bridge Traffic Assessment report with further analysis of the traffic impacts should the bridge not proceed. Further analysis, namely detailed design of the proposed bridge is required to truly understand the merits of continuing this project funded under the DCP model.

Document/Study/Report Name	Synopsis – Influence on PSP
Greenhalghs Road/Innsbruck Road, Winter Valley SIDRA Analysis Report, ESR Transport Planning 2022	Report on the re-designed intersection i.e., roundabout to traffic signals and the impact to traffic movements at the intersection and their flow-on effects to the wider network. Concludes that will be during peak times the backing up of traffic, there is no detrimental impact to the wider network outside the morning peak period. This modelling was used to inform Memo – DI_JNC_05 options, Milward Engineering Management 2022 in recommending traffic signals at the Greenhalghs Road/Innsbruck Road intersection.
Intersection Treatment Option for Carngham Road/Presentation Boulevard and Sydney Way, Milward Engineering Management 2022	Draft report discussing the available options at the intersection considering: • The challenges of land acquisition • The realignment of the intersection roads, Presentation Boulevard and Sydney Way • Potential high-speed traffic of a duplicated Carngham Road further creating unsafe environment for pedestrians and cyclists crossing given the collector status of Presentation Boulevard and Sydney Way. The draft report recommends that the intersection changes to traffic signals to create a safer crossing point for pedestrians and cyclists, noting that further traffic modelling is required to understand the overall impacts of vehicle traffic movements in the wider PSP area.
Ballarat-Carngham Road Duplication between Dyson Drive and Wiltshire Lane Preliminary Drawings, SMEC 2022	Detailed design plans for the eventual duplication of Carngham Road between Wiltshire Lane and Dyson Drive. The plans show that all intersections along the route use roundabouts, P-turns or left-in/left-out treatments. There is only one signalised pedestrian crossing approx. 200m east of Presentation Boulevard/Sydney Way. Later discussions with DTP have indicated that there is further work required and they are open to modifying the Presentation Boulevard/Sydney Way intersection to traffic signals instead of roundabout.
Ballarat West Precinct Structure Plan Review Transport Assessment Report, ESR Transport Planning 2023	Reviewing traffic forecasting that informed the original PSP, the road network layout, intersections, and cross sections. The review considers infrastructure within or adjacent the PSP Growth Area and is focussed on road network infrastructure. This review is made in the context that much of the Growth Area development has already occurred, and therefore modifying planned road infrastructure should only be in response to significant issues or for significant benefits.

Table 3 - Roads and junctions' part of the DCP either delivered or commenced, excluded from this study.

DCP Project Code	Project Description
DI_RD_09	Glenelg Hwy / Wiltshire Ln / Cherry Flat Rd Signalised Intersection
DI_JNC_10	Cherry Flat Rd / Webb Rd Signalised Intersection
DI_RD_19	Cherry Flat Road Upgrade - Glenelg Highway to Webb Road
DI_RD_22	Tait Street upgrade
DI_RD_03a	New N-S Road (North) between Cuthberts Road and Cuzens Road (now Sydney Ave)
DI_RD_15	Greenhalghs Road upgrade - central section
DI_RD_16	Greenhalghs Road upgrade - eastern section
DI_RD_14	Greenhalghs Road upgrade - western section

KEY CONSIDERATIONS

MANAGING CHANGE

While the review included scope to determine appropriate solutions, consideration of accuracy issues, and update costings there was a clear mandate to make only necessary changes. This position was presented by Council as limiting the likely cost increases to the DCP and having high regard for consistency of implementation with the 50% of the PSP area already permitted under the original PSP and DCP.

Key aspects of the review have been aligned to follow:

- Unit quantities are adjusted where material errors, gaps or changes can be identified;
- Unit rates are indexed and not updated, unless there are errors or material changes identified; and
- Any material changes to scope (such as change from roundabout to signals) is captured.

Such parameters are to have any update align with the existing PSP / DCP, where the core elements, intents and outcomes are largely unchanged – a type of addendum. A potential challenge is that a 'brand new' PSP / DCP could present new methodology, projects and development outcomes when aligned to current greenfield development planning practices.

Ultimately the review is restricted to alignment with the outcomes of previous work, while undertaking enough critical analysis to identify any matters which cannot be ignored or excluded from an update to the PSP / DCP.

DEPARTMENT OF TRANSPORT AND PLANNING (DTP)

DTP has been consulted throughout this review to ensure the implementation of works, funding, timing and any staging or works are coordinated. Carngham Road and the Glenelg Highway are the two arterial roads the bisect the PSP area. The demarcation line between new PSP roads and existing DTP roads is sometimes unclear as it is dependent on the local context, this review explores two PSP projects DI_JNC_02 and DI_JNC_08 where new local roads intersect with the existing arterial roads.

In developing the original PSP, DTP (as its predecessors, Regional Roads Victoria, VicRoads etc.) have earmarked the extension of Dyson Drive in Alfredton (known as Ballarat Link Road) to continue southwards around the outer boundary of the PSP to the Midland Highway near the Colac Road intersection.

Portions of the planned Ballarat Link Road relies on the widening of existing road reserves, creating new road reserves (mainly in Precinct 2) to ultimately build a duplicated road. DCP project DI_LA_25 is for land acquisition where the widened collector roads interface with the proposed Ballarat Link Road i.e., Greenhalghs, and Carngham Roads. Upgrades to Carngham Road and the Ballarat Link Road construction are projects delivered by DTP.

TRAFFIC MODELLING

In developing the original PSP, each road and intersection used traffic modelling to estimate the volumes of traffic from within the PSP area and traffic that would enter/pass from outside the area. The DCP projects factor in a split between new and existing demands with the ratio of new demand typically funded by the DCP and ratio of existing demand by external sources such as the City of Ballarat and/or DTP etc.

This review includes an assessment of traffic modelling to confirm whether the original assumptions that informed the PSP and DCP still align with the actual development completed and the future development anticipated. Where there are identified deviations from the original projections, recommendations will be provided.

SUB-CONSULTANT – TRAFFIC

ESR Transport Planning (ESR) have been engaged in a sub-consultant capacity to undertake a review of the traffic modelling that underpins the PSP's Road network and their respective cross sections. The scope of the consultancy was as follows:

1. Dwelling density increases – both from zoning discrepancies and density changes (lots/ha)
2. Future traffic volume forecast – comparing the available traffic models that informed the PSP and Ballarat's Integrated Transport Plan
3. Potential new projects and/or where changes to the network are warranted.
4. Review the application of Key Access Streets – Cross Section (which is not part of the original set of PSP cross sections)

The report of this sub-consultancy is in APPENDIX B; the main findings of this report are:

Traffic Modelling

- SMEC forecasting was based on 26,640 new residents in the Growth Area over the 20 years to 2031, this compares with actual population growth for the entire Ballarat LGA of 20,260 in the 10 years to 2021.
- The SMEC forecasting likely underestimates trip generation within the established rural residential areas, i.e., Masada Boulevard and Webb Road localities (further discussion in the LAND USE PROJECTIONS section).
- The model does not consider if some trips are double counted, given some trips are shared between land uses (e.g., trip from a dwelling to nearby shopping / employment) and therefore should not be assigned onto the road network twice (i.e., surrounding the Delacombe Town Centre).

Road Hierarchy and Cross Sections

- The layout of the PSP's 4-lane roadways provides an even spatial distribution for Arterials/Duplicated Link Roads (DLR). Therefore, the Duplicated Link Roads, namely Ballarat Link Road and Cherry Flat Road will have a functional role within the network more akin to an Arterial Road.
- The separation of the PSP's 4-lane roadways are slightly greater than the ideal one-mile grid in Sub-Precinct's 2 and 4, while almost double at 3.0km in Sub-Precinct 1.
- Given the spatial distribution, Key Access Streets will have a functional role within the network more akin to a Collector Street classification.

Active Transport Crossings

Non-car movement of people within the precinct has been analysed further in this report, and has highlighted four pedestrian/shared paths crossings where further vehicle traffic control is warranted for the safe crossing by more vulnerable road users:

1. Ballarat-Carngham Road/Ballarat Link Road (which is outside of this study)
2. Ballarat-Carngham Road/DI_JNC_02
3. Glenelg Highway/DI_JNC_08
4. Cherry Flat Road (DI_RD_21) where it crosses Winters Creek.

ESR's above-mentioned findings have been integrated into the relevant sections of this report.

LAND ACQUISITION

Many of the roads and junctions in this review will require land acquisition, whether this is to acquire small areas for splays at intersections or an entire section of property so there is sufficient land in the road reserve for the road itself, footpaths, shared paths, and underground services. Many road upgrades are typically delayed until the land acquisition is resolved.

The PSP/DCP has identified properties where portions of land are to be excised to enable the delivery of road and intersection projects. There are multiple pathways for the land to be acquired:

1. Gifted land – Developers design their subdivision with a requirement for portions to be gifted to the Responsible Authority (either the City of Ballarat or DTP).
2. Section 173 Agreement – Typically used in parallel with planning permit approvals to formalise the implementation and compensation for land and other DCP projects.
3. Public Acquisition Overlay (PAO) – Implemented under the Ballarat Planning Scheme to establish the future compulsory land acquisition for a public purpose. Once establish the City of Ballarat would need to action the formal process.
4. By Negotiation – The Responsible Authority (either the City of Ballarat or DTP) would negotiate ultimately enter into an agreement with landowners for land acquisition.

This report will consider the following examples:

1. The junction at Cherry Flat Road and Schreenans Road (DI_JNC_11) is one example where through reviewing project priorities, the roundabout is to be delivered prior to the duplication of Cherry Flat Road. Three properties are affected by the construction of the roundabout, whereas only one property is affected by the duplication project. In reviewing, land acquisition in the DCP, it became apparent that the intersection splays were omitted from the DCP estimates.
2. The delayed land acquisition has resulted in redesign of projects. For example, a redesign of the roundabout intersection of the new North-South Connector and Greenhalghs Road (DI_JNC_05) to traffic signals as existing development constrained the land available for the circulating roadway portion of the roundabout. Figure 3 compares the original roundabout design concept with the finalised traffic signal design.
3. Parts of the road land acquisition can be used by the acquisition for the intersection, the land acquisition is not for the intersection specifically (and vice versa). There may be a timing gap for the land acquisition for the road and junction. For efficiency, the land acquisition for the road and junction should occur simultaneously for efficiency and certainty to the affected landowner(s).

Figure 3 - Original roundabout footprint vs traffic signals for DI_JNC_05

Table 5 lists the land acquisitions relevant to the roads and junctions listed in Table 3.

Table 4 -Land acquisition for the selected intersections

PSP Project Number	Linked to PSP Road Project Number	Project Name	Indicative Delivery Trigger(s)	Estimated Land Area to be Acquired *(ha)*	Estimated Land Acquisition Cost *(2023 $ estimate)*
DI_LA_14	Ballarat Western Link Road	Western Link Road - Stage 2b land acquisition	In stages as immediately adjacent land is subdivided OR when required for road construction.	4.90	1,890,145
DI_LA_17	DI_JNC_11, DI_RD_31a, DI_RD_31b, DI_RD_31c	Land for Schreenans Road widening	In stages as immediately adjacent land is subdivided OR when required for road construction.	0.68	517,109
DI_LA_18	DI_JNC_12, DI_RD_31d	Land for Schreenans Road extension (re-routed)	In stages as immediately adjacent land is subdivided OR when required for road construction.	0.69	414,000

PSP Project Number	Linked to PSP Road Project Number	Project Name	Indicative Delivery Trigger(s)	Estimated Land Area to be Acquired *(ha)*	Estimated Land Acquisition Cost *(2023 $ estimate)*
DI_LA_19	DI_JNC_12, DI_RD_23	Land for Cobden Street extension (re-routed)	In stages as immediately adjacent land is subdivided OR when required for road construction.	0.66	330,000
DI_LA_20	DI_RD_24	Land for Cobden Street widening	In stages as immediately adjacent land is subdivided OR when required for road construction.	0.40	232,750
DI_LA_21	DI_RD_24	Land for Cobden Street link to Bells Road	In stages as immediately adjacent land is subdivided OR when required for road construction.	0.08	28,601
DI_LA_22	DI_JNC_04, DI_JNC_05, DI_JNC_08, DI_RD_11, DI_RD_12, DI_RD_16	Land for new north south road in sub-precinct 2	In stages as immediately adjacent land is subdivided OR when required for road construction.	3.51	1,509,913
DI_LA_23	DI_JNC_05, DI_RD_14, DI_RD_15, DI_RD_16	Land for widening of Greenhalghs Road	In stages as immediately adjacent land is subdivided OR when required for road construction.	0.87	334,442
DI_LA_24	DI_JNC_02, DI_RD_03b, DI_RD_04	Land for new north south road in sub-precinct 4	In stages as immediately adjacent land is subdivided OR when required for road construction.	4.11	2,002,500
PAO2	DI_RD_21	Land for duplicated Cherry Flat Road	In stages as immediately adjacent land is subdivided OR when required for road construction.	0.99	594,336
Total				16.89	7,853,795

Note: Not all land projects listed are fully funded by DCP. The PAO2 is a separate project, and there may also be land areas around intersections which are not included in the land project.

DEVELOPMENT ENVIRONS

Further analysis of the following is required to understand and verify the road and intersection projects identified:

1. **Population projections** – .id forecast have last completed the projections pre-COVID in 2019, these differ from the original forecasts used in developing the original PSP/DCP circa 2010. It is important to compare the original projections to see if there is a “step” change in growth, noting post-COVID travel patterns may have changed.
2. **Land uptake** – following on from the population projects, the rate which new dwellings have been built may have been a higher rate than originally forecast.

3. **Rezoning/modifications to planned land use** – there are small areas where one type of land use was planned, and the actual differs e.g., proposed industrial land changed to residential near Carngham Road.
4. **Actual vs Planned Growth patterns** – actual growth patterns differ from the "preferred" growth patterns, areas in precincts 2 & 4 started development from the western edge rather than their eastern edges adjacent to the existing developed areas.
5. **Modelled vs Actual Traffic Movements** – traffic is generated by where people live vs their destination, which is further compounded by certain planned destinations e.g., schools are not yet built within the PSP.
6. **Staged development** - many of the roads in this study have the land acquired or portions thereof for the construction of the road and intersections. This is due to the staged nature of the development in the PSP and the detailed design within these areas.
7. **Concept vs detailed design** – the PSP was developed using standard cross section templates with their position not finalised and based on typical practices at that time. Several completed/proposed sections are now in different locations.
8. **Land acquisition for intersection splays** – there are some landholders that are affected by the planned land acquisition that have not had (relatively) small portions of their land acquired. In one instance this has required an intersection to be re-aligned and redesigned to avoid land acquisition that would have delayed development.
9. **Construction Price Index** – actual CPI since the adoption of the PSP/DCP has been used to index costs of both the DCP levy and the project value / budget. Feedback from the development industry suggests that this indexation has not (in all cases) aligned with the actual cost of implementation.
10. **Changes to Design Standards and Legislation** – factors include:
    a. Infrastructure Design Manual is an evolving document where the minimum design requirements have changed.
    b. Roads transferring from Council to Regional Roads Victoria; DTP roads tend to carry higher percentages of heavy traffic, as such, pavement design tend to use more material in arterial roads, for example Cherry Flat Road may in the long term become an arterial road once the Ballarat Link Road is built.
    c. New and updated Council Plans – for example, the Ballarat Integrated Transport Action Plan sets here clearer mandates for reducing car-dependency by increasing opportunities for walking and bike riding, connecting pedestrian, and cycling routes to key destinations and public transport and enhancing safety, amenity and accessibility for pedestrians and cyclists, and at bus shelters. These actions also link to links to Council's Health and Wellbeing Plan 2021-31 plan.

The analysis of the Development Environs has been completed for each project in the form of a multi-Criteria Assessment, as discussed in the following section.

MULTI-CRITERIA ASSESSMENT (MCA)

In general, the MCAs are a tool that assists, in the case of this review, in providing a consistent framework to review each project's delivery risk to the principle aims of PSP.

The risks MCA considers the items listed in the Development Environs section, the tabular score summary of the Development Environs MCA is listed in Table 6, where the higher the score the greater the risk.

Table 5 – Project risks MCA results summary

Group	ID	Precinct	4			2					1											
		Item	DI_RD_03b	DI_JNC_02	DI_RD_04	DI_RD_11	DI_JNC_04	DI_JNC_05	DI_RD_12	DI_JNC_08	DI_RD_20	DI_JNC_11	DI_RD_21	DI_RD_31a	DI_RD_31b	DI_RD_31c	DI_RD_31d	DI_JNC_12	DI_RD_38	DI_RD_39	DI_RD_23	DI_RD_24
Growth Demand	1	Population Projections	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	Land Uptake	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1
	3	Rezoning/ Modification to Land Use	1	2	1	1	1	2	1	1	2	2	2	3	3	3	3	1	1	1	1	1
	4	Actual vs Planned Growth Patterns	1	3	1	1	1	1	1	1	1	1	1	3	3	3	2	2	2	2	2	2
Develop-ment Activity	5	Modelled vs Actual Traffic Movements	1	2	1	1	1	2	1	1	1	3	2	2	3	2	2	1	2	2	3	1
	6	Staged Development	1	1	1	1	1	1	1	1	2	3	3	3	3	3	3	1	1	1	1	1
Project scope & cost estimate	7	Concept vs Actual Design	1	1	1	1	1	2	1	1	1	2	2	3	3	2	3	1	1	1	1	1
	8	Land Acquisition	1	2	1	1	1	2	1	1	3	3	3	3	3	1	3	1	2	2	1	1
	9	Construction Costs	1	1	1	1	1	3	1	3	1	2	2	2	2	3	3	2	1	1	3	2
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1
Project Deliver-ability	11	Ease of Delivery	11	17	11	10	10	16	10	12	15	21	19	23	24	21	22	13	13	13	15	12

Table 6 – Project risks MCA results summary for alternative alignments and extra junctions

Group	ID	Precinct	1		
		Item	DI_JNC_X1	DI_RD_X1	DI_RD_X2
Growth Demand	1	Population Projections	1	1	1
	2	Land Uptake	2	2	1
	3	Rezoning/ Modification to Land Use	3	2	2
	4	Actual vs Planned Growth Patterns	3	1	1
Develop-ment Activity	5	Modelled vs Actual Traffic Movements	3	3	2
	6	Staged Development	3	2	2
Project scope & cost estimate	7	Concept vs Actual Design	3	2	2
	8	Land Acquisition	2	3	1
	9	Construction Costs	2	3	3
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	2	3	1
Project Deliver-ability	11	Ease of Delivery	24	22	16

PRECINCT CHANGES

LAND USE PROJECTIONS

The development of the PSP is predicated on the population forecasts completed for the City of Ballarat by id forecast. The available data was published in 2017 following the 2016 Census and according to the website (https://forecast.id.com.au/ballarat/).

The id forecast areas differ from the PSP areas (Figure 4), making it difficult to marry actual development with the forecasts. To overcome this, an analogue of estimating growth using the parcel creation date in the www.data.vic.gov.au parcel data set was used to create the actuals in years 2011 and 2016 in the following tables.

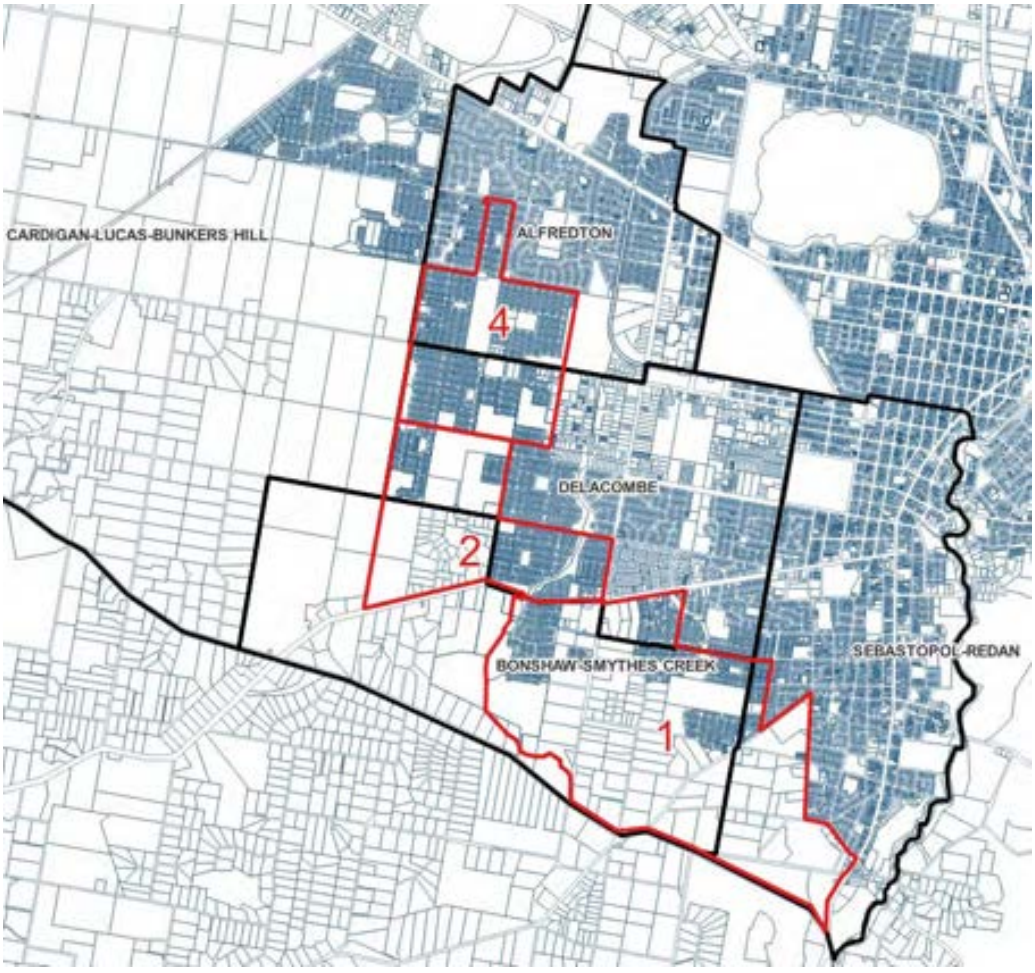


Figure 4 - overview map of ID Forecast Areas (black) and the subject area (red)

The id forecast data was modified to incorporate the actual data from land.vic.gov.au, City of Ballarat and allocated the forecast areas in Figure 4 to PSP precincts. This incorporated calculating the actual lots created to 2021 and the net dwelling growth from 2021 to 2041.

The following land availability projections (Table 8) also incorporated the adopted densities for future developments at a parcel level, supplied by the City of Ballarat.

Table 7 - Forecast net change of dwellings by precinct in five-year periods from 2011 to 2041.

Precinct	2011	2016	2021	2026	2031	2036	2041	Lots available	% Developed by 2041
4	660	698	2,657	3,235	3,676	3,676	3,676	3,676	100.0%
2	838	838	1,358	2,480	3,905	4,156	4,156	4,156	100.0%
1	598	713	1,728	2,127	2,615	5,129	7,894	8,104	97.4%
Total	**2,096**	**2,249**	**5,743**	**7,842**	**10,196**	**12,961**	**15,726**	**15,936**	**99.9%**

Note: Precinct 3 is the Lucas development area and is excluded from the PSP

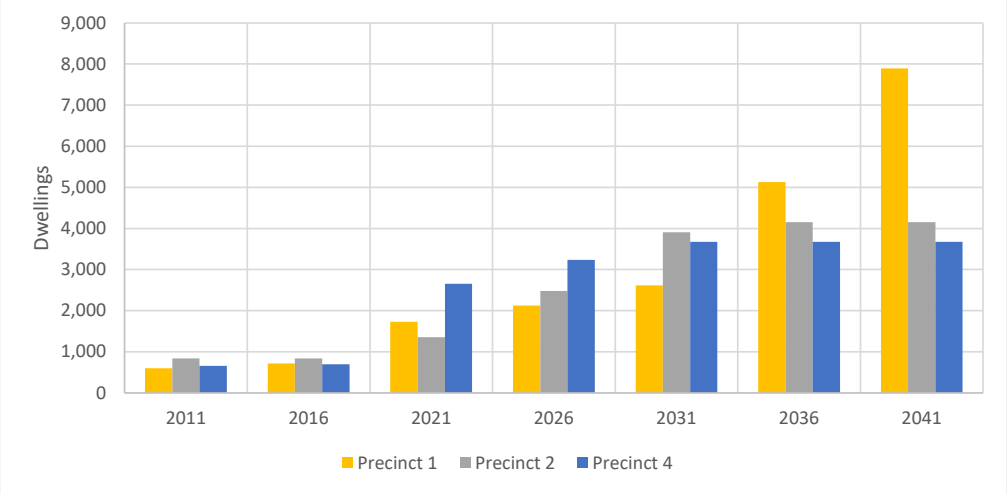


Figure 5 – Actual parcel data from 2011 to 2021 and re-forecasted ID projections after 2021 to 2041

Table 9 lists the remaining lots available for each precinct, in five-year intervals, starting from 2021 using data supplied by the City of Ballarat where:

- a minimum lot density of 15 lots/hectare is used for existing/approved subdivisions and
- up to 20 lots/hectare for future proposed developments in line with current State Government policy.
- Precincts 4 and 2 become fully developed in 2031 and 2036 respectively; in theory, the growth in these areas continue irrespective of the available lots. This growth would then "transfer" to Precinct 1, this presents the highest possible growth scenario for Precinct 1.

Table 8 – Remaining lots available by year

Precinct	2021		2026		2031		2036	
	Remaining Lots	% of Total	Remaining Lots	% of Total	Remaining Lots	% of Total	Remaining Lots	% of Total
4	1,019	28%	441	12%	0	0%	0	0%
2	2,798	67%	1,676	40%	554	13%	0	0%
1	6,376	79%	5,977	74%	5,441	67%	3,895	48%
Total	10,192	64%	8,093	51%	5,994	38%	3,895	24%

LAND UPTAKE CHANGES TO THE OVERALL PSP AREA

The over-arching result of applying the above forecasts to the PSP is that not all available lots are developed by 2036 in Precinct 1. Based on the available data, the revised growth steps-up from 2021 and continues to the end of the forecasting period.

10 years have passed since the original projections, Figure 6 shows the upwards step-change where the 2011 projections under-estimated the dwellings by 651 dwellings.

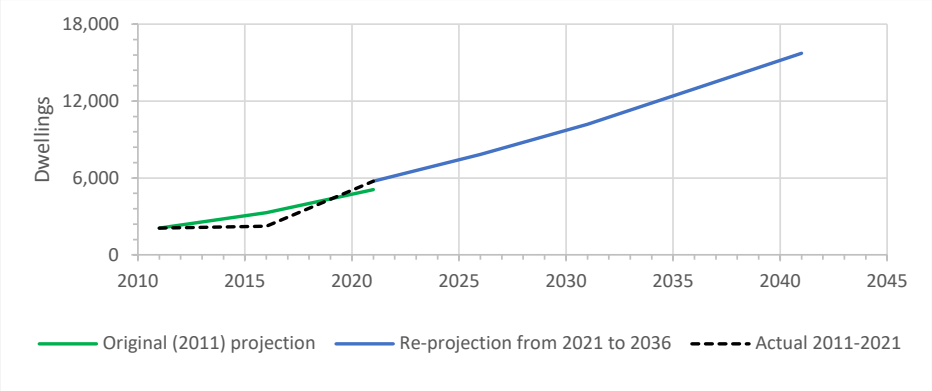


Figure 6 – Projected dwellings, original 2011 to 2021, re-projected from 2021 to 2036

In short, the projected dwellings used in the 2011 forecast, will be developed 2-3 years ahead of the original projection, this is more pronounced when reviewing at the individual precinct level starting the northern-most, Precinct 4, first down to Precinct 1 as the last, mirroring the actual general development trend.

LAND UPTAKE CHANGES TO PRECINCT 4

Actual net dwellings in Precinct 4 are 1,334 dwellings higher than the original 2011 projection indicating DCP items that service this precinct are brought forward or completed by 2026. Full development of Precinct 4 is reached by approximately 2027 with the assumption that the dwelling demand is moved to Precinct 1.

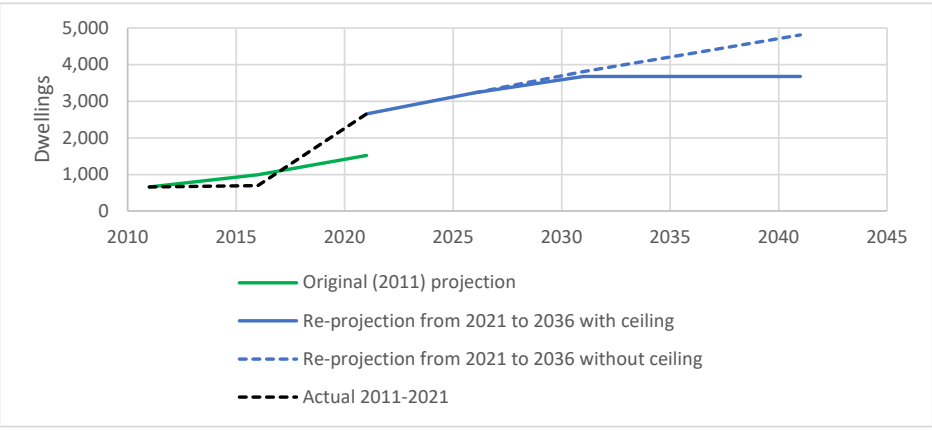


Figure 7 – Precinct 4 net dwellings using 2011 & 2021 projections.

LAND UPTAKE CHANGES TO PRECINCT 2

The actual net dwellings are lower than the 2011 projection, however, full development of Precinct 2 reached by 2027, the remaining dwelling demand moves to Precinct 1 (Figure 9).

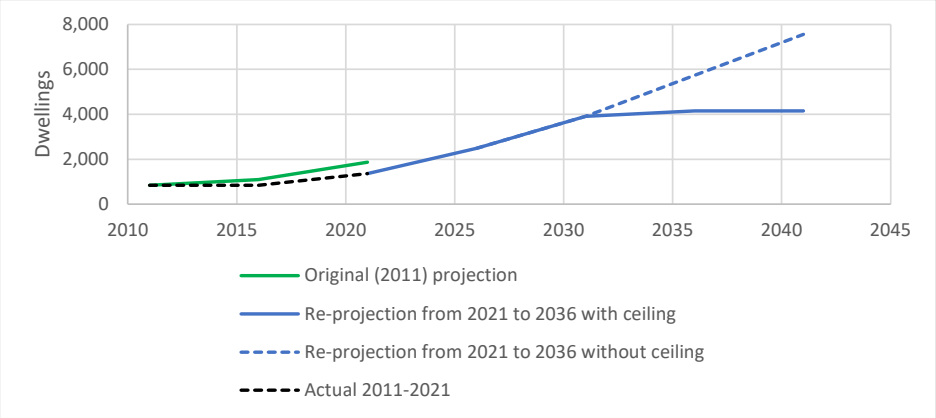


Figure 8 – Precinct 2 net dwellings using 2011 & 2021 projections.

LAND UPTAKE CHANGES TO PRECINCT 1

The net dwellings are higher than the 2011 projection i.e., 2,740 more than projected, as the "overflow" from Precincts 2 & 4 transfer to Precinct 1. There are 8,100 available lots for residential in Precinct 1 and 5,629 lots are taken up; the remaining undeveloped lots would be developed in the 2036-2041 period notwithstanding other development areas being adopted in the Ballarat Planning Scheme.

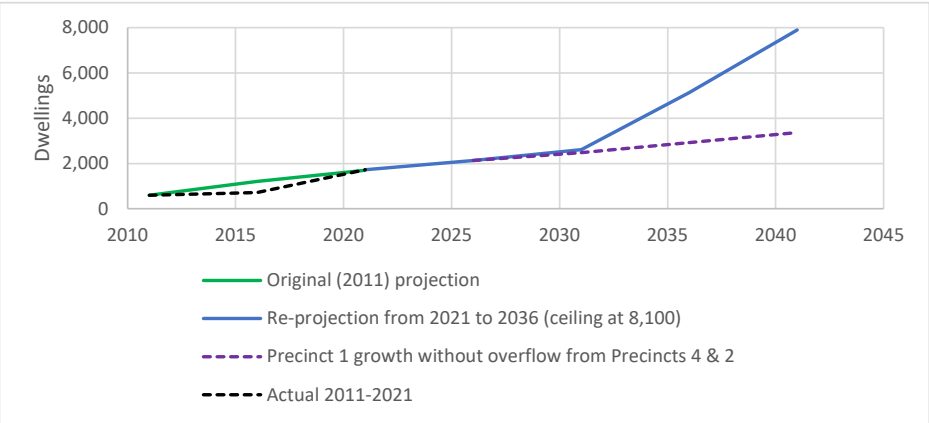


Figure 9 – Precinct 1 net dwellings using 2011 & 2021 projections (development ceiling at 8,100 dwellings).

The changes in the population/dwelling growth will be used to inform the construction timing of each road and junction studied in this report.

TRAFFIC GENERATION FORECASTS

The current lot densities are generally aligning with the planned densities, this is further acknowledged in the Bonshaw Creek Sub-Precinct Transport Network Review "urban development has been occurring at approximately the same densities when the PSP was prepared".

The following has arisen during the review of the traffic modelling data:

1. Recent advice from the City of Ballarat states that future developments where they are in the process of gaining approval of their development plan or those that are yet to commence planning will subdivide from 17-18 lots/ha (observed trend) to ultimately 20 lots/ha (new target set by Victorian Planning Authority).
2. Seven traffic nodes have seen a reduction in the number of dwellings.
3. 13 nodes have seen an increase in estimated number of dwellings.
4. In reviewing the lot development in the existing Rural Residential area between Cherry Flat Road and Bonshaw creek, the projections appear to have not considered residential development and the incorrect assigning of general office-related traffic of these areas. The consequence of this is the traffic from these areas will be much higher (up to 7900 vehicle movements) than the original projections, this is summarised in Table 10.
5. Traffic estimates at the Delacombe Town Centre may be higher than projected.

Table 9 - Differences in traffic modelling trip generation and lot yields

Model-Zone	Trip Type	Original	Revised	% Diff. (forecast vs actual lots)	Comments
2-19	Residential	48	921	1819%	Existing low density residential, assumed rezoned to UGZ in new model, traffic loads would be much higher 8400 movements per day
2-21	Residential	411	1050	155%	Catchment approaching full development, three lots are to be developed as UGZ
1-7	Residential	718	1460	103%	Residential lots are over-estimated in projections given the POS/drainage infrastructure earmarked for this catchment will reduce the developable area
1-9	Residential from low to higher density	38	921	2323%	Original estimate considered these as rural residential, now UGZ being developed, further modelling work is required to understand how this impacts the wider transport network
1-13	Residential from low to higher density	190	1302	585%	This should be general residential, traffic model would be underestimating this catchment's impact, i.e., approx. 1636 dwellings x 9 = 14,724 movements/day

The impact of these changes with respect to residential development is shown in Figure 10 which only shows the impact to residential areas where there is a significant difference (100% or more). The main causes for the divergence from the original estimate can be explained by:

1. Original assumptions are incrementally changed as developments occur,
2. Movement of a residential area to another location within the precinct, and
3. Density changes e.g., low density residential to UGZ or State Government policy.

Further traffic modelling is required to ascertain what the future traffic loads are and to test whether the proposed roads reviewed in this study are still suitable.

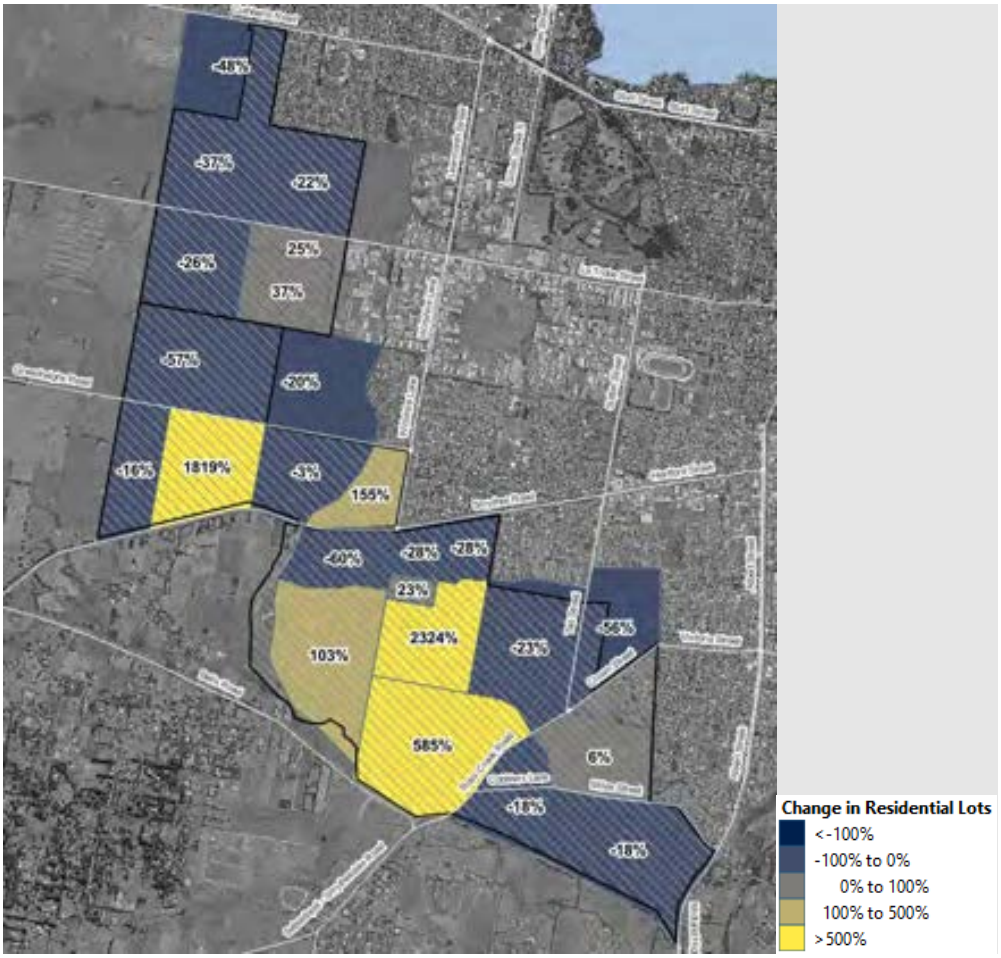


Figure 10 - Changes in dwellings in each traffic modelling node

LAND ACQUISITION COSTS

In reviewing the land acquisition costs, through the detailed design phase, roads and junctions may have been realigned to fit in with the developer's ambitions/vision for their development site or to overcome a site-specific issue (e.g., water mains, drainage etc).

A GIS-based assessment was undertaken where the proposed and actual (revised) areas of land acquisition were mapped.

In mapping these areas:

- the original data was updated to reflect the actual road casement/property boundaries where the land acquisition has been completed (e.g., parts of DI_JNC_02)
- new data was created:
    - where junctions were relocated or modified (e.g., DI_JNC_04)
    - missing splays (e.g., DI_RD_31b)
    - new roads connecting at proposed junctions (e.g., DI_LA_11)

While most of the land acquisition has been mapped within the PSP area, some of the land acquisition relates to the Ballarat Link Road. The Ballarat Link Road is not integral to the PSP's Road network, which is the main reason as why it is outside of this review, however, portions of its alignment are within the PSP and intersect with some of the roads analysed in this review.

The results of the analysis highlighted that additional land is to be acquired on top of the original estimated land estimates. There is acknowledgement where the area of land acquisition differs from the DCP estimates at the impacted road/junction sections. This additional land will need to be acquired through planning permits / subdivisions and via public acquisition overlays.

APPENDIX H lists all the affected properties where land acquisition has changed from the original estimate for the studied roads. In some cases, an affected property may have multiple road/junction projects that require different areas of land acquisition, although it would be best for the property owner and Council that all portions are acquired at the same time. There are increases and decreases for each parcel listed in APPENDIX H.

Opteon had previously been engaged by the City of Ballarat to review land acquisition costs for the land acquisition projects in PSP and were used to estimate the revised land acquisition costs in this review. Where there are properties not valued by Opteon, their respective property values are estimated using a regression line with a 2nd order polynomial providing the best-fit curve (Figure 11).

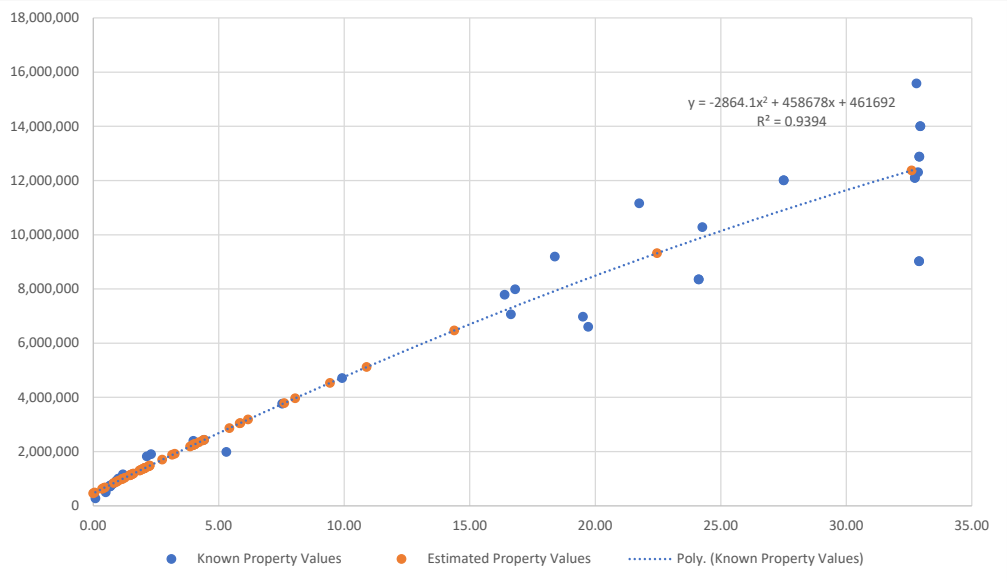


Figure 11 – Regression line used to estimate missing land values using parcel areas.

In summary, the estimated land acquisition costs for the reviewed DCP projects (using the latest available land valuations, 2023), have reduced from $8,196,815 to $7,347,226, saving $849,590 (10%) from the original estimates. This estimate includes portions of the Ballarat Link Road that are within the PSP boundary – there are further land acquisitions outside of the PSP that have been excluded from DCP and this review.

The cost impacts to the revised land acquisition DCP projects are listed Table 11 which for 5 DCP projects have not changed, 1 project increased, however, this has been offset by the reduced costs for the remaining 5 projects.

Table 10 - Estimated costs for revised land area and cost by Land Acquisition ID

Land Acquisition ID	Original Estimate		Revised Estimate		Change in Area	Change in Land Acquisition Costs
	Area Excised	Excised Land Value	Area Excised	Excised Land Value		
DI_LA_14	4.91	1,584,810	4.91	1,584,810		
DI_LA_17	0.30	247,149	0.33	212,150	-0.03	34,998
DI_LA_18	0.83	497,626	0.69	414,000	0.14	83,626
DI_LA_19	0.66	330,000	0.66	330,000		
DI_LA_20	0.40	232,750	0.40	232,750		
DI_LA_21	0.08	28,601	0.08	28,601		
DI_LA_22	4.11	1,678,545	3.51	1,509,913	0.60	168,633
DI_LA_23	0.96	392,279	0.87	334,442	0.09	57,836
DI_LA_24	4.16	2,265,500	4.11	2,002,500	0.05	263,000
DI_LA_25	0.39	130,718	0.39	130,718		
PAO2	0.99	594,336	0.99	594,336		
Total	17.79	7,982,313	16.94	7,374,219	0.85	608,094

APPENDIX H lists the impacts to all properties where land is to be acquired for the PSP road network under this study.

The impacts to the individual properties are discussed in the following Road and Intersection Review section.

ROAD AND INTERSECTION DESIGN

KEY ACCESS STREET ROAD CROSS SECTION

The PSP includes road cross sections that set the minimum cross section width that would best service the projected traffic demands for any given profile, except for the Key Access Street cross section which has been reference but no specific profile provided.

Since the development of the PSP, the City of Ballarat has developed and is applying the profile known as Key Access Street. In several locations the Key Access Street has also adopted the Collector Street: Constrained minimum cross section to service public transport and active transport routes. The differences between the two profiles are as follows (Table 12).

Table 11 - comparison of Key Access Street and Collector Street: Constrained Road profiles

Road Section	Key Access Street	Collector Street: Constrained
Reserve width	20m	20m
Travel lanes	3.05m	4.2m
Bicycle lanes	NA – shared with traffic lane	NA – shared with traffic lane
Parking	2.25m (inclusive of kerb tray)	2.3m (inclusive of kerb tray)
Nature strip/verge	4.55m	3.5m
Footpath (within verge)	1.5m	1.5m

Key points to note are:

1. The Key Access Street travel lane width is narrower than the desirable 3.5m minimum.
2. Neither profile has dedicated allocation to on-road bicycle lanes.
3. Both provided similar parking provisions and are slightly greater than industry minimums.
4. Wider nature strip/verge provisions in the Key Access Street – allowing for greater space for tree planting and services.
5. The practice of adopting the Collector Street: Constrained minimum cross section where public transport and active transport routes are required is appropriate.

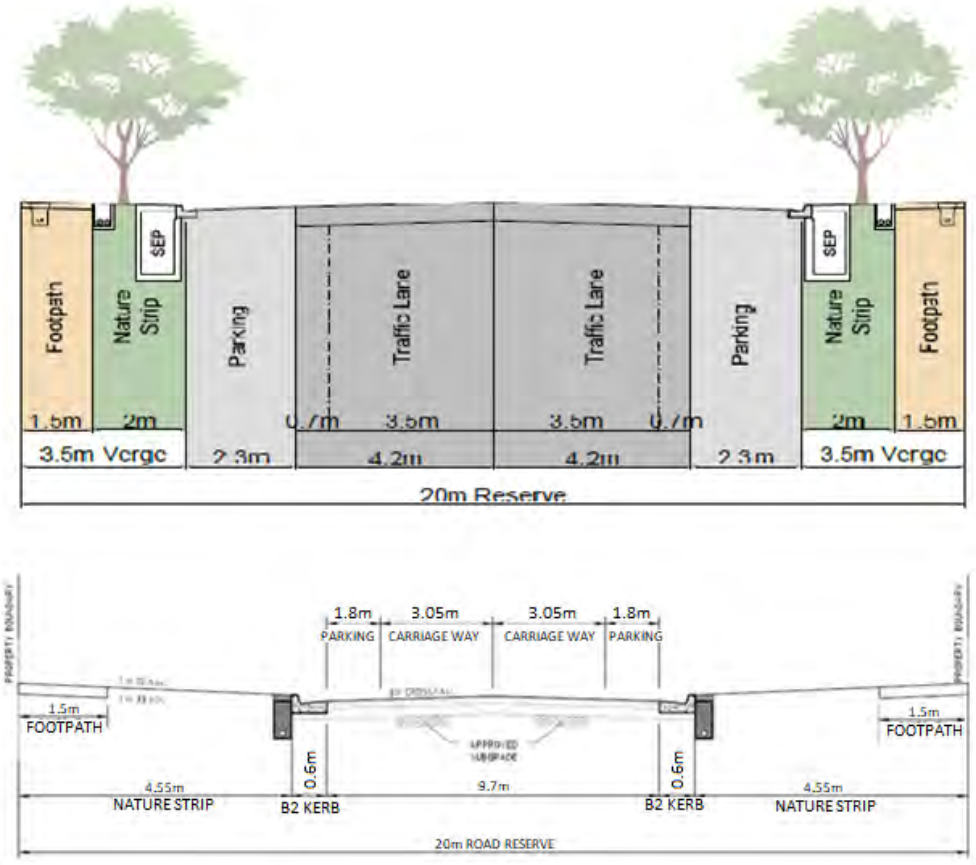


Figure 12 – Collector Street: Constrained and Key Access Street cross sections

It is recommended that Key Access Streets cross section implemented by Council is adopted as the minimum standard, except for when bus routes are identified which then applies the Collector Street (Constrained) cross section for all roads designated as Key Access Streets.

QUANTITY CORRECTIONS

UNIT RATES

Unit rates have not been critically assessed as part of this review, instead are indexed using '3101 Road and bridge construction Victoria' from the Australian Bureau of Statistics (ABS).

A key reason for this is that limited information was available on the original unit rates adopted, in particular for road construction which meant all new justification would need to be developed. Additionally, Council does not maintain a register of unit rates which can be applied to represent local cost which would put a reliance on industry rates as found from Rawlinsons and other reference sources.

A concept to increase contingency amounts from the nominal 15% of the construction cost to 20%, was raised to improve the resilience of project amounts against latent conditions and any impacts of escalation and standard changes which may have occurred but remain unquantified since cost estimates were prepared initially. This will be further considered as part of the updated DCP documentation.

ROAD LENGTHS

The adopted lengths for several individual road sections in the original PSP were found to not match their plotted lengths in the GIS. Of these, sections that were found to be within 10% of the original estimate had no further analysis undertaken given the preliminary estimates have adopted a project contingency of 15%.

Table 13 (and Figure 50) lists only road projects where their differences are greater 10% of the original estimate.

Table 12 – Road projects original and revised estimated lengths

PSP Project ID	Project Name	Estimated Road Length (m)	Revised Road Length (m)	Difference in Length (m)	% Difference Estimate vs Revised Road Length
DI_RD_12	New N-S Road construction - sub precinct 2 southern section	400	462	-62	17%
DI_RD_21	Cherry Flat Road Upgrade - Schreenans Road to Bells Road	190	750	-560	295%

INTERSECTIONS

When developing the DCP estimates, the consultant delivered concept designs rather than detailed designs for each intersection. As intersections went through detailed design, all activities, civil works (to the standard of the day) and ancillary works have been incorporated into the final design.

One such intersection that experienced an approved design considered to be at a much higher standard than the original estimate is DI_JNC_08. A review undertaken by consultant GHD recommended that:

1. The road pavement standards adopted in the DCP for DI_JNC_08 be substituted from the Council (local road) standards to VicRoads (arterial) standards to reflect the relevant road authority standards applicable.
2. Design standards regarding roundabout design currently in the DCP are no longer current. Similar DCP projects should be reviewed against current design standard and applied where appropriate.

ROUNDABOUT DESIGN

This review of the PSP/DCP has an opportunity to strengthen its objectives to improve roundabout designs rather than retrofitting road safety improvements in a constrained budget environment later.

A key objective of roundabout design is the application of road safety typically requiring significant space to ensure that all road users are catered for. It is widely accepted that pedestrian and cycling safety at roundabouts is not as effective as traffic signals where dedicated time/phase for pedestrian and cyclists is given.

The Melbourne Metro Tunnel project funded an upgrade to Moray St to create an alternative safe cycling route while St Kilda Road is narrowed for the Metro Tunnel works. St Kilda Road has one of the highest bicycle counts of most metropolitan Melbourne roads and one of the highest car-vehicle accident rates.

The following schematic Figure 13 shows road safety elements that enhance pedestrian and cyclist safety without adversely affecting the vehicle traffic movements. The example design has been applied to a 30m wide road reserve, whereas PSP uses a mix of reserve widths from 20m.

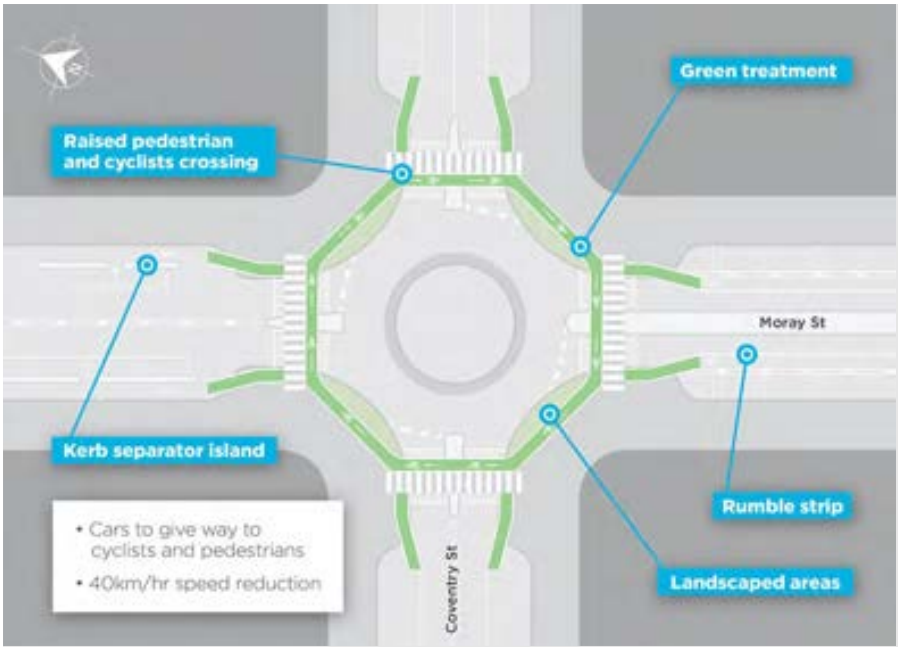


Figure 13 - Possible roundabout design incorporating physical separation of vehicle and cyclist traffic.

(Source: https://bigbuild.vic.gov.au/projects/metro-tunnel/construction/road-network/moray-street)

Figure 14 -before and after the treatment is applied in Figure 13 at Moray St, South Melbourne

(Source: https://safesystemsolutions.com.au/safe-system-snippet-89-moray-street-roundabout/)

For this concept design to work in the PSP context with a typical 20-24m road reserve:

- Potentially smaller roundabout annulus and larger apron for turning articulated vehicle traffic.
- Slip lanes for bicycles are required, like Wendouree Parade/Haddon St off the roundabout's approaches and departures (Figure 15).
- Raised pavements to reduce traffic speeds given the approaches/departures are straightened to create the additional space for the shared path area, reverse curves use more land at the expense of other users when land availability is low.
- Raised pavements are located so that there is an average car space between the hold line and the raised pavement.
- Line marking/green matting is laid to enforce priority.
- Improve streetlighting to illuminate the difference treatments for motorists.

The cost implications for these treatments are relatively low when considering against the typical civil costs for a roundabout, the estimated additional material costs (2021$) are namely:

- Asphalt for the raised pavements ($5,000 per raised pavement)
- Line marking, green matting ($300 per metre) and road signs
- Streetlighting – increased lumens for the lanterns ($500 per lantern)

Figure 15 – Wendouree Parade/Haddon St intersection with bicycle lane

The estimated cost increase to DI_JNC_11 and DI_JNC_12 to apply such treatments is approx. 15-18% (Table 14), cost breakdown in APPENDIX D. However, it should be noted that these are preliminary costs and that detailed designs are required to fully understand these. The cost of retrofitting road safety treatments is typically greater than building these as part of the initial construction.

Table 13 - Estimated costs summary for Moray St treatment at DI_JNC_11 and DI_JNC_12, details in APPENDIX D

	DI_JNC_11	DI_JNC_12
Original Estimate	$1,137,034.76	$849,826.96
Revised Estimate	$1,307,961.52	$998,820.65
Difference	$170,926.77	$148,993.69
% increase/decrease	15%	18%

A potential roundabout at the intersection of Webb Road and Schreenans Road is another candidate for this treatment as it provides a uniform treatment of all intersections along the Schreenans Road axis. This intersection has commitment for delivery as part of the surrounding development (not a DCP project), however this report includes a recommendation that a roundabout treatment here is included as part the PSP review.

It is recommended that DI_JNC_11 and DI_JNC_12 designs consider incorporating the above-listed treatments where possible.

LOCAL ACCESS STREETS

Requirements are specified in the Ballarat Planning Scheme, Infrastructure Design Manual, and Road Management Act Code of Practice for management of infrastructure in road reserves provide guidance for road authorities, utilities, and providers of public transport in planning and managing their infrastructure in road reserves ensuring the amenity and liveability of streets. As these requirements are applied at the lowest level of planning, and the extent of guidance is widely accepted this has not been an item previous covered by the PSP.

Council has for many years required road reservations for local access streets at 18m, specified wider than the typical minimum of 16m. The differing requirement is based upon reserve widths needing to accommodate desirable carriageway widths and verge widths as outlined within the Infrastructure Design Manual but also having greater regard for planning and design of green infrastructure for Ballarat and ensuring any challenges from the competing space demands for utilities, road user needs and amenity outcomes can be appropriately provisioned.

DEVELOPMENT CONTRIBUTION PLAN SCOPE CHANGES

DCP was estimated using the best-available information and using accepted assumptions at the time. With review of the DCP, there is potential adjustments along with scope / designs changes and it is understood that project contingency is considered a provision for any design standard changes.

Council has encountered situations where the actual DCP project costs are more than the available contingencies. For example:

1. DI_JNC_08: the adopted pavement design in the DCP was incorrectly stated as a local road, whereas the project needed to adopt arterial road standards.
    a. This is not a scope change, but a correction for an error in the original documentation and the infrastructure standard applicable with no modification to quantity or unit rate costs used at the time.
2. DI_RD_21: the estimated length of duplicated road in the DCP is 190m, whereas the full length of this road section is 750m.
    a. This is not a scope change, but a correction to an error in the original documentation with no modification to the unit rate cost used at the time.

This review has been undertaken following discussions with Council to establish informal policy positions for identified adjustments to projects.

Where a scope of project has been fundamentally changed (i.e., roundabout to signalisation) and/or the quantities / unit rates have been adjusted including due to corrections, the revised project should be included in the DCP review and accounted for.

Projects that remain fundamentally unchanged and/or have had corrections that do not alter the quantities / unit rates applied, are not subject to further revisions other than that required to make the project current for the DCP review.

COMMON PRECINCT LEVEL THEMES/ISSUES

This review has identified common themes at a Precinct level as listed in Table 15. All projects and their respective risks using the MCA framework is provided in APPENDIX D as one table and a tabular MCA score summary is listed in Table 6.

Table 14 - Common themes identified from reviewing individual PSP projects.

Group	Precinct 4	Precinct 2	Precinct 1
1. Population Projections	Precinct's dwelling creation is 1,334 dwellings or 88% higher than the original PSP projection (there is no increase in precinct's lot yield).	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.
2. Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area (there is no increase in precinct's lot yield).		Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side; however, development will be at 15-20 lots/hectare depending on location
3. Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP		Surrounding land use has remained as per PSP, although the properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered in the traffic model to remain as low density residential, when several blocks in this area are developed as residential.
4. Actual vs Planned Growth Patterns	The development area is currently under construction, planned development in accordance with the PSP.		Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek).
5. Modelled vs Actual Traffic Movements	Modelling required for DI_JNC_02 change to traffic signals		Additional modelling required – potentially significantly higher traffic loads from certain areas

Group	Precinct 4	Precinct 2	Precinct 1
6. Staged Development	Nil		Fragmented property ownership creates uncertainty in timing/scheduling of certain roads
7. Concept vs Actual Design	Roads have moved westward without adversely affecting the cross section/function. Roundabout may possibly be modified to traffic signals		Duplicated section of Cherry Flat Road is the only road in review that has been delivered in part. Other roads/junctions have not been built, although planning & design underway for most roads/junctions
8. Land Acquisition	Nil		
9. Construction Costs	Additional civil costs associated with changing standards since the PSP development. Increased costs due to traffic signals instead of roundabouts		Additional civil costs associated with changing standards since the PSP development.
10. Active vs Car Dependant Transport	No changes to cross sections that prevent footpaths or shared paths. Opportunities to create safer pedestrian/cyclist crossing treatments rather than retrofitting at a significantly higher cost in the future		

INDIVIDUAL PROJECT ASSESSMENTS

The following reviews each road and intersection project as nominated in Table 3, generally starting in the north in Precinct 4 and heading south by Precinct 2 and then Precinct 1.

NORTH SOUTH LINK (Sydney Way, Cuzens Road to Carngham Road)

DI_RD_03b North of Ballarat-Carngham Road (Precinct 4)

The proposed road creates a new north-south collector road, joining Carngham Road in the south to Sydney Way, Alfredton (DI_RD_03a) as shown in Figure 16.

Table 15 - MCA for DI_RD_03b

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling increase of 1,334 or 88% above the original 2014 projection and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP The neighbouring property to the east (property 213) is fully subdivided with no allowance for DI_RD_03b within this property.	
	4	Actual vs Planned Growth Patterns	Surrounding developments have their own connections to other arterial roads (Dyson Drive, Carngham Road) – this road would be built as part of the development of Lot 1 of PS807486.	
Development Activity	5	Modelled vs Actual Traffic Movements	The road's primary function is to connect the proposed schools with the surrounding developed areas.	
	6	Staged Development	Surrounding developments have their own connections to other roads – this road would be built as part of the development of Lot 1 of PS807486	
Project scope & cost estimate	7	Concept vs Actual Design	It is estimated that the alignment will move approximately 35 metres westward into Lot 1 of PS807486 or Property 230.	
	8	Land Acquisition	The realignment has meant the northern arm into proposed roundabout at Carngham Road is now off-90 degrees.	
	9	Construction Costs	Detailed design is required to understand the total project costs even though the proposed road has been marginally shortened.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	The N-S road will have footpaths, shared paths and cycle lanes that will connect to the wider network	

Group	ID	Item	Comments	Risk
Project Deliverability	11	Ease of Delivery	This delivery of this project is considered low risk of being further delayed given the single developer delivering the road as per PSP requirements	

The consequence of the realignment is the need to realign the intersection with Carngham Road and possibly altering the proposed roundabout (DI_JNC_02), which is discussed in the next section.

Land Acquisition

The land acquisition DCP identification number is DI_LA_24, which is adjacent to land acquisitions for DI_JNC_02, DI_RD_03a and DI_RD_04.

The alignment change has meant that while the road remains to be built, the burden of the delivering the land for the road falls onto 180 Carngham Road as listed in Table 17.

Table 16 - Changes to land acquisition for DI_RD_03b

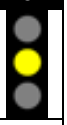
Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
170 Carngham Road	213	0.53	251,750	0.00	0	0.53	251,750
180 Carngham Road	230	1.30	650,000	1.81	905,000	-0.51	-255,000
Total		1.83	901,750	1.81	905,000	0.02	-3,250

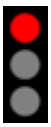
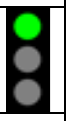
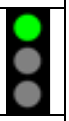
DI_JNC_02 Carngham Road / New N-S Road Roundabout

The proposed junction connects the proposed north-south collector road with Carngham Road (DI_RD_03a) as shown in Figure 17. Table 18 outlines the how the proposed intersection treatment measures against the multiple criteria assessment.

Link roads DI_RD_03b and DI_RD_04 connects planned primary and secondary schools, public open space in precincts 2 and 4, creating a potential for high vehicle, pedestrian and cycling traffic volumes between precincts.

Table 17 - MCA for DI_JNC_02

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling increase of 1,334 or 88% above the original 2014 projection and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	

Group	ID	Item	Comments	Risk
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP The proposed NAC on the southeast corner presents a challenge that the property at 163 Carngham Road would be acquired to make the intersection operate as a roundabout	
	4	Actual vs Planned Growth Patterns	This intersection would be built as part of Regional Roads Victoria's Carngham Road improvements (including duplication) coupled with the development of Lot 1 of PS807486 (PSP property ID 230).	
Development Activity	5	Modelled vs Actual Traffic Movements	The intersection's function is to create a safer intersection with an arterial road (Carngham Road) for the N-S connector where there are proposed schools, sporting facilities and shops adjacent to the N-S road. Current traffic movements service only the southern side where the current intersection treatment is adequate, the norther arm would, in time, require roundabout/traffic signals.	
	6	Staged Development	Surrounding developments have their own connections to other roads (see Actual Vs Planned above)	
Project scope & cost estimate	7	Concept vs Actual Design	The northern roundabout arm will move approximately 35 metres westward into Lot 1 of PS807486, Property 230 and still requires the acquisition of 163 Carngham Road for a roundabout	
	8	Land Acquisition	The realignment moves the northern arm at the proposed roundabout at Carngham Road is now off-90 degrees where splays are still required. There is the potential need to modify the intersection to traffic signals for safer pedestrian/cyclist movements at Carngham Road, this may reduce the need to acquire 163 Carngham Road or at least the only acquiring a 5x5m splay instead of acquiring more than 50% of the property.	
	9	Construction Costs	Detailed design is required to understand the total project costs even though the proposed road has been marginally shortened.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	The N-S road will have footpaths, shared paths and cycle lanes that will connect to the wider network; there are no details about how non-vehicle traffic will safely cross intersection. VicRoads Traffic Engineering Manual discusses that car-pedestrian crash data at roundabouts is less than at signalised intersections although the perception is that it is less safe. Treatments such as raised pavements or pedestrian operated signals could be installed to reduce vehicle approach and departure speeds, however this needs to be considered as part of the wider transport network especially traffic movements around the NAC	

Group	ID	Item	Comments	Risk
Project Deliverability	11	Ease of Delivery	The delivery of this project is medium risk of being delayed due to unresolved design-related issues (interface with DTP controlled road).	

Figure 16 - DI_ RD_03b/DI_JNC_02 locality plan with orignal proposed alignment (orange) and revised alignment (red)

Land Acquisition

The original alignment will need altering considering the approved subdivision on the north-eastern corner (property 213) has made no allowance for the N-S road. It is estimated that the alignment will move approximately 40metres westward into Lot 1 of PS807486. The red marked area in Figure 17 shows a revised alignment for the 24m wide reserve with the proposed roundabout at

this intersection as per the DCP. The land use budget for the original planned alignment and revised alignment for the affected properties are listed in Table 19.

The southeast corner (property 216) is earmarked for a neighbourhood activity centre (NAC) where an allowance has been made for an intersection splay, however the current dwelling on this corner presents challenges until it is acquired for the road or sold to the owner of the NAC development area.

The land acquisition for the southwest corner of the intersection has been completed, with a minor increase from the proposed acquisition area to account for the "minor" westerly movement of the proposed intersection. This westerly movement of the proposed intersection results in less land to be acquired to the east, resulting in a marginal decrease of $45,870 in the estimated land acquisition costs as listed in Table 19.

Table 18 - estimated changes in land acquisition costs from realigning DI_JNC_02

Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
170 Carngham	213	0.06	28,500	0.00	0	0.06	28,500
155 Carngham	216	0.05	23,750	0.08	38,000	-0.03	-14,250
163 Carngham	217	0.08	240,000	0.00	0	0.08	240,000
165 Carngham	218	0.10	47,500	0.13	61,750	-0.03	-14,250
180 Carngham	230	0.18	90,000	0.20	100,000	-0.02	-10,000
Total		0.47	429,750	0.41	199,750	0.06	230,000

Development/Land Acquisition Timing

The following at a meeting 19 October 2022 between Council and the developer of 180 Carngham Road:

> *DTP will be involved in the design approval of the intersection treatment, but it is not yet determined who will design the infrastructure.*
>
> *Cardno now Stantec indicated that we are currently designing the first stage of the development and would expect to be able to vest the central reserve to council in 2024/25 – council confirmed that there is no requirement on the developer to make improvements to this land.*

This suggested timing coincides with recent discussions with DTP who are designing the Carngham Road duplication, where detailed designs are likely to be completed by July 2023.

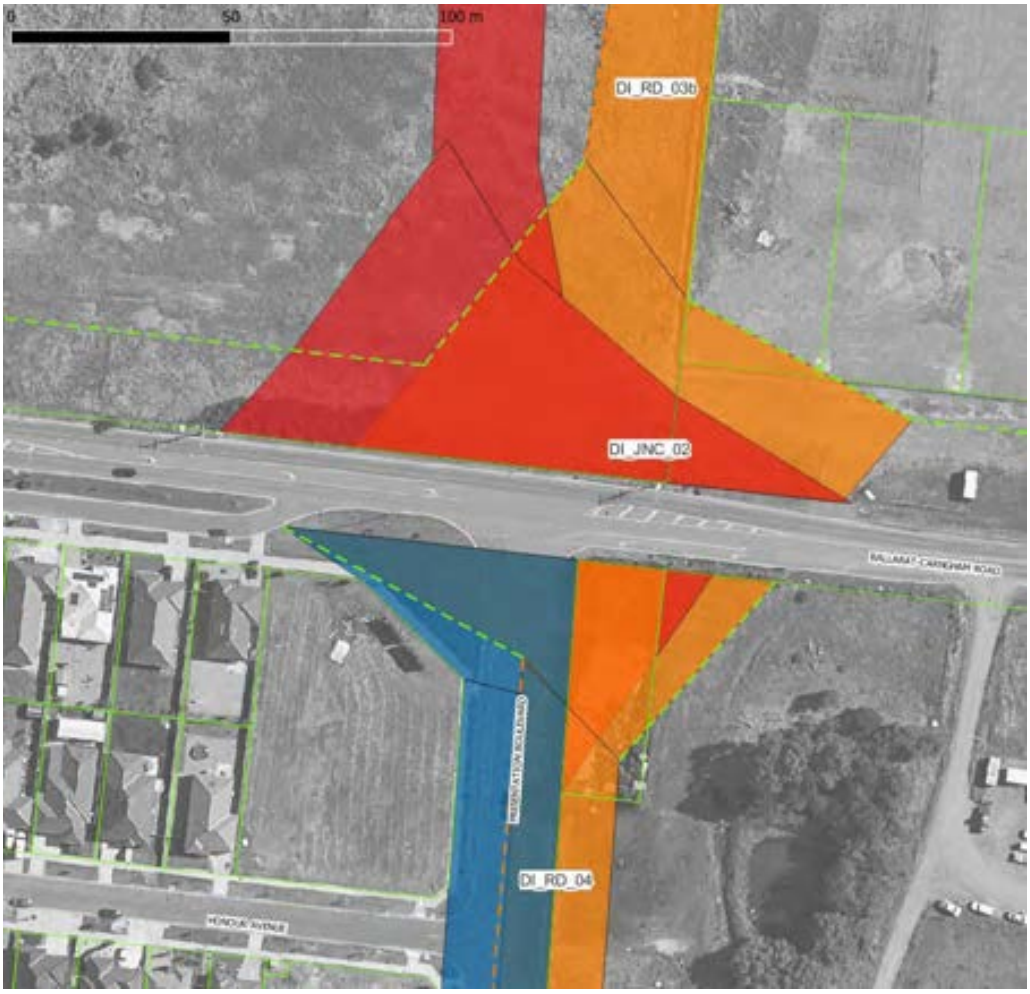


Figure 17 - Proposed alignment (orange), proposed realignment (red) and acquired land (blue)

Intersection Treatment

There are several factors that warrant further discussion that may impact on the proposed intersection design, these being:

1. The land acquisition issues surrounding 163 Carngham Road
2. Vehicle and pedestrian traffic movements surrounding the future NAC.
3. Shared path network interconnection

The PSP has adopted a roundabout for the intersection treatment, the SMEC traffic report identified the level of service to being for this treatment:

> *"…represents reasonably free flow, and speeds at the free-flow speed are generally maintained. The lowest average spacing between vehicles is about 110m, or 18 car lengths. The ability to manoeuvre within the traffic the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still easily absorbed, though local deterioration in service may be more severe than for Level of Service A."*

Milward Engineering Management Pty Ltd have previously compiled a draft report analysing the merits of traffic signals versus the adopted roundabout (APPENDIX I). In summary, the report recommends adopting traffic signals at the junction, this is due to:

1. Replaces the roundabout with traffic signals with full control of all traffic, pedestrian, and cyclist movements.
2. Retains existing Carngham Road turning lanes.
3. Protects 163 Carngham Rd from land acquisition until such a time the NAC is built on the southeast corner.
4. Increases the radius of the kerb on the southeastern corner to better protect pedestrians – even the Regional Roads Victoria concept designs acquire a portion of this property.
5. Minimizes the land acquisition requirement on the northern side to only the development itself.
6. Requires minimal widening of the existing Carngham Rd pavement for bicycle lanes heading east.
7. Modifies Presentation Boulevard to better align with Sydney Way and retain the north-heading bicycle lane through the intersection.
8. Utilizes existing road reserve on the southern side.
9. Replaces painted island with right-turning lane in future Sydney Way
10. Is scalable to allow for the future duplication of Carngham Road with little modification to the current road alignment.

Further analysis has been undertaken by ESR to further analyse the roundabout vs traffic signals; the findings largely confirm the above issues and recommends that traffic signals are the most appropriate intersection treatment.

Figure 18 -Areas of responsibility (as hatching) of the proposed intersection of Carngham Road, Presentation Boulevard, Sydney Way

A concept design for the signalized intersection was developed to better understand the cost impacts and is summarized in the following section.

Figure 19 shows the functional layout plan from DTP for a roundabout treatment at the junction and Figure 20 shows the concept design for a signalized intersection to possibly replace the original proposed roundabout.

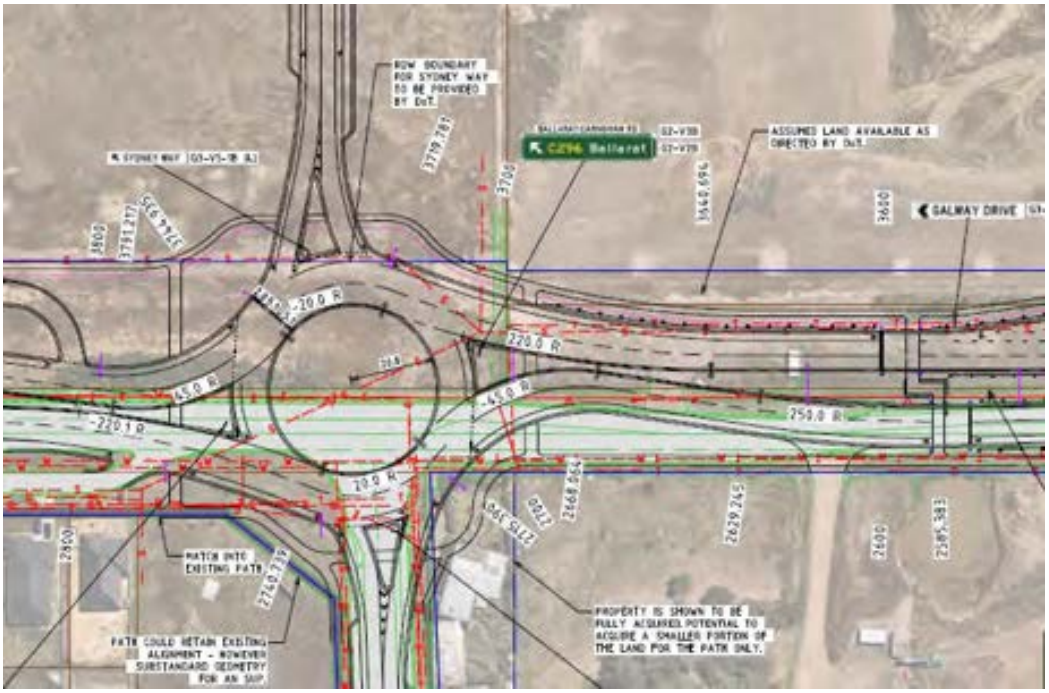


Figure 19 - DTP functional layout plan for two-lane roundabout (note pedestrian operated signals approx.200m east)

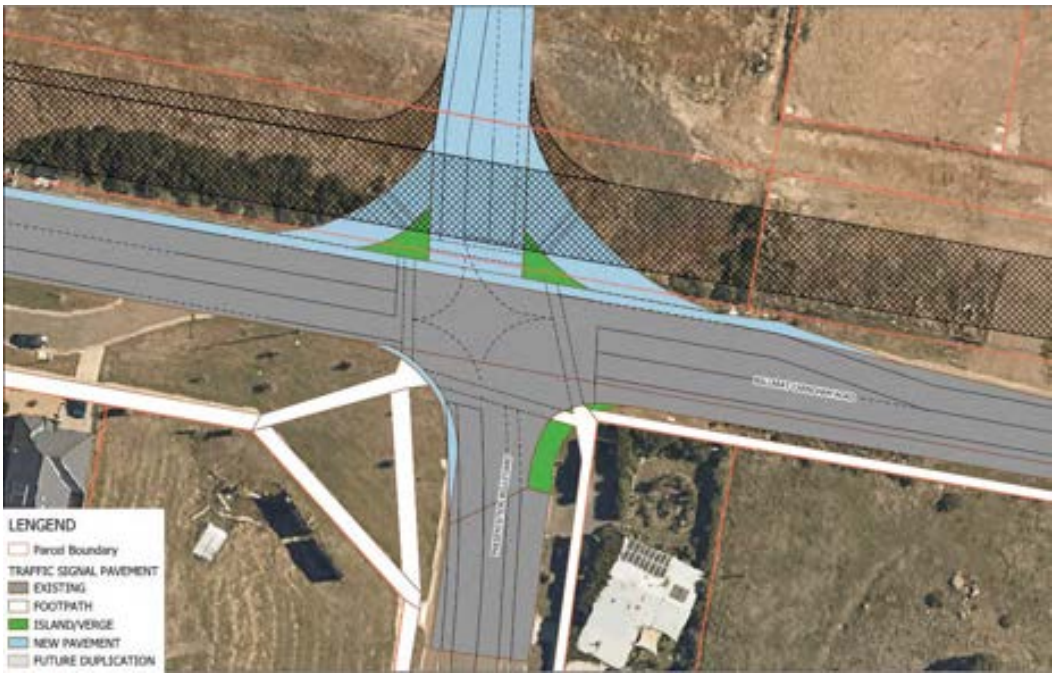


Figure 20 - Concept design for traffic signals for DI_JNC_02 (Milward Engineering Management)

Costs of intersection treatments

In developing the cost estimation for the intersection treatment, Presentation Boulevard (DI_RD_03b) and Sydney Way (DI_RD_04) are to be Council-controlled roads; Carngham Road is a DTP controlled road. The urban development on either side of the road triggers the intersection treatment requiring the two road authorities to reach an agreement regarding the design and cost sharing.

Discussions with DTP have yielded design plans for the duplication of Carngham between Dyson Drive and Wiltshire Lane. Six (6) additional functional layouts have been developed considering both roundabouts and traffic signals within 60, 70 and 80 km/h speed environments. These additional functional layout plans have been costed using the DCP methodology and are summarized in Table 20.

Table 19 - Estimated construction and land acquisition costs of each roundabout assessed by DTP.

	Description	Construction Costs	Land Acquisition Costs	Total	Comments
1	80 km/h Roundabout	2,403,043	565,000	2,968,043	Essentially all of 163 Carngham Road is acquired for there is little that remains for the property owner, option 5's construction costs are assumed to be the closest
2	60 km/h Roundabout	2,294,632	10,000	2,304,632	Approx 20 sq m of land acquired
3	80 km/h Compact Roundabout	2,823,448	10,000	2,833,448	Approx 20 sq m of land acquired
4	80km/h Raised Intersection	3,346,663	10,000	3,356,663	No land acquisition required, POS ~200m east of intersection remains, additional raised pavements
5	70 km/h Roundabout	2,512,322	60,000	2,572,322	Approx 170 sq m of land acquired of 163 Carngham Road is acquired, POS located 250m from intersection not included given N-S crossings are within roundabout
6	70 km/h Compact Roundabout	2,403,043	0	2,403,043	No land acquisition required, two lots of POS ~200m east/west of intersection included given there are no N-S ped crossings at roundabout
7	70 km/h Raised Intersection	2,740,856	0	2,740,856	No land acquisition required

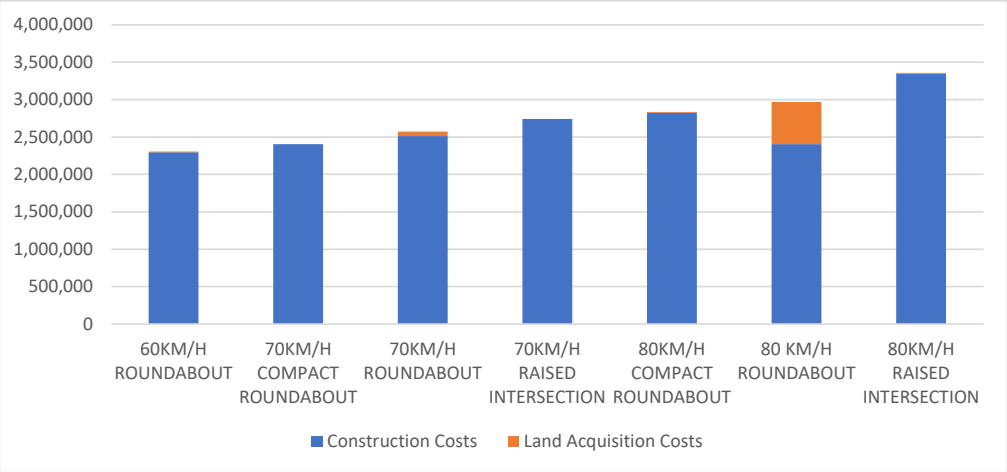


Figure 21 - Estimated construction and land acquisition costs of each roundabout assessed by DTP ranked from lowest to highest.

The above estimates considered:

1. Existing DCP cost estimation sheet with indexing to 2021 dollars
2. Revised pavement design to VicRoads 740mm deep pavement rather than Council 540mm deep pavement considering the intersection is on an arterial road.
3. GIS to estimate pavement areas.

No commitment has been made by DTP to the timing of these works; these works would be funded by DTP nor has there been a commitment to one of the above-listed options.

Each option listed in Table 20 are significantly higher than the costs developed in the original DCP at $1.91 million for the duplicated roundabout treatment which is nominally $500,000 less than option 1 in Table 20.

The lowest of the traffic signal options is Option 7: 70 km/h Raised Intersection at $2.74 million, which is $436,000 more than the preferred roundabout option (Option 2: 60 km/h roundabout) or approximately $830,000 more than the original DCP estimate.

Recommendation

It is recommended that while the traffic signals are a costlier the intersection treatment, it is the most appropriate solution to what will be a busy intersection for all road users and will create safer crossing points for the more vulnerable road users i.e., pedestrians and cyclists.

DI_RD_04 New N-S Road between Carngham Road and DI_RD_11

This section of road heads south from DI_JNC_02 to the southern boundary of Precinct 4, connecting into DI_RD_11. The DCP land acquisition task identifier is DI_LA_24, which is the same land acquisition task for DI_RD_03a, DI_RD_03b and DI_JNC_02.

Figure 22 - Proposed alignment (orange), proposed realignment (red) and acquired land (blue)

Land Acquisition

This section is effectively now a built road or road reserve wholly within property 218 (Figure 22) as Presentation Boulevard, as such the MCA is not required for this item. The proposed alignment was to share the road reserve with property 216 and 217 (also the NAC) which are no longer required, this has resulted in a minor increase to the land acquired (Table 21).

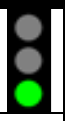
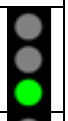
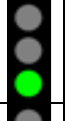
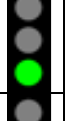
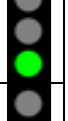
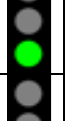
Table 20 - changes to land acquisition for DI_RD_04 (Presentation Boulevard)

Address	Property ID	Original		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
155 Carngham	216	0.93	441,750	0.00	0	0.93	441,750
163 Carngham	217	0.02	60,000	0.00	0	0.02	60,000
165 Carngham	218	0.91	432,250	1.89	897,750	-0.98	-465,500
Total		1.86	934,000	1.89	897,750	-0.03	36,250

DI_RD_11 North-South Link Road

This section of road connects the southern end of Presentation Boulevard (DI_RD_04) with Greenhalghs Road (DI_JNC_04). The section of road is being built as part of the Winterfield North development and will serve as a north-south collector road that ultimately connects Greenhalghs Road in the south to Cuthberts Road in the north.

Table 21 - MCA for DI_RD_11

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP	
	4	Actual vs Planned Growth Patterns	The development area is currently under construction, planned development in accordance with the PSP	
Development Activity	5	Modelled vs Actual Traffic Movements	The yet to be built road continues the N-S collector, adjacent properties are currently under development	
	6	Staged Development	The Winterfield (north) development is currently in progress triggering the requirement to build the road	
Project scope & cost estimate	7	Concept vs Actual Design	The road alignment has been moved further west to connect into DI_RD_04, no change to the cross-section design	
	8	Land Acquisition	Roads intersecting with DI_RD_11 will have splays for uncontrolled T and crossroads.	

Group	ID	Item	Comments	Risk
	9	Construction Costs	The westward realignment has no significant impact on the original cost estimates.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	DI_RD_11 will have footpaths, shared paths and cycle lanes that will connect to the wider network and to the schools and public open space that are part of the Winterfield (north) development	
Project Deliverability	11	Ease of Delivery	This delivery of this project is considered relatively low risk.	

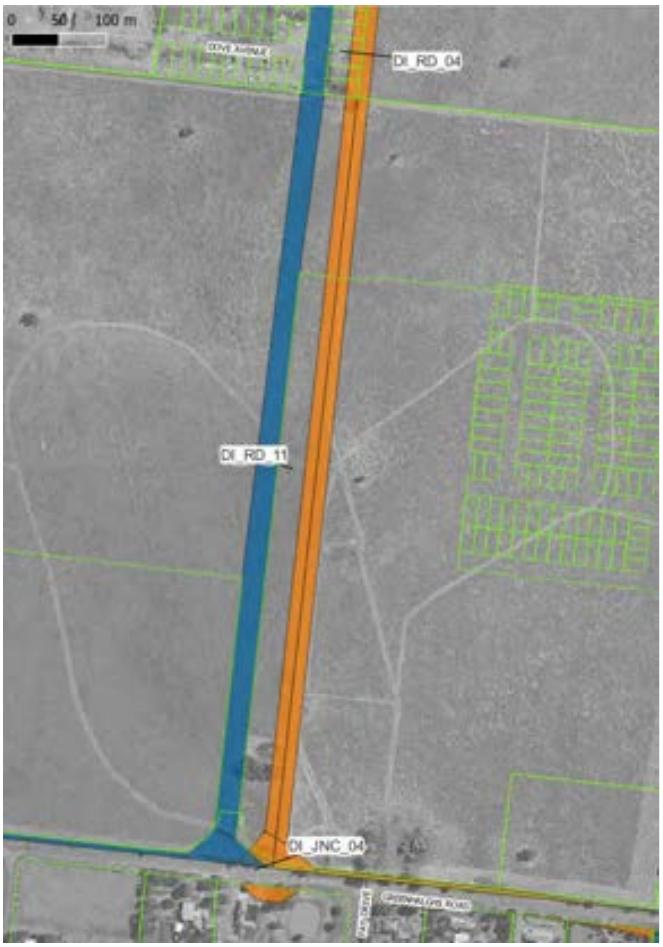


Figure 23 - Proposed (orange) and adopted alignments (blue) for DI_RD_11

Land Acquisition

In this case, the owner of the two properties (DCP property 156 and property 157) are the same therefore the altered, westward alignment of DI_RD_11 (and DI_JNC_04) still delivers this portion of the PSP/DCP with minimal changes to the land acquisition costs (Table 23).

Table 22 - Changes to land acquisition for DI_RD_11

Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
484 Greenhalghs Rd	156	0.94	399,500	1.79	760,750	-0.85	-361,250
464 Greenhalghs Rd	157	0.94	367,817	0.00	0	0.94	367,817
Total		1.88	767,317	1.79	760,750	0.09	6,567

Road Design

The proposed road's cross section has not changed from the proposed westward movement, as such there are no foreseeable issues relating to the design and the estimated road costs.

ESR has identified 1-2 possible roundabouts are required within the Winterfield North development area given the concentration of schools and public open space adjacent to DI_RD_11. ESR has correctly apportioned these roundabouts as a deliverable solely within the development area, thus the DCP will not require updating to reflect this.

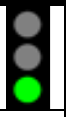
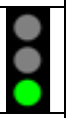
NORTH-SOUTH LINK (Carngham Rd to Glenelg Highway)

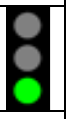
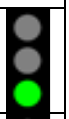
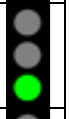
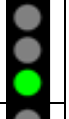
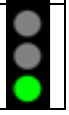
DI_JNC_04 Greenhalghs Road / New N-S Road (North) Roundabout

The proposed roundabout connects the existing Greenhalghs Road to the new N-S road DI_RD_12 (Figure 23). The concept design earmarked land acquisitions on both sides of Greenhalghs Road (Figure 24):

- the northern land acquisition would be part of the Winterfield North development; and
- the southern land acquisition would acquire a portion of 491 Greenhalghs Road, currently zone rural residential and is essentially part of the PSP.

Table 23 - MCA for DI_JNC_04

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at the original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP.	
	4	Actual vs Planned Growth Patterns	The development area is currently under construction, planned development in accordance with the PSP	

Group	ID	Item	Comments	Risk
Development Activity	5	Modelled vs Actual Traffic Movements	The intersection's function is to create a safer intersection with Greenhalghs Road for the N-S connector where there are proposed schools, sporting facilities and shops adjacent along the N-S road corridor.	
	6	Staged Development	The junction will serve as the main entrance for the Winterfield (north) development which in time will connect with DI_RD_04 at the northern end.	
Project scope & cost estimate	7	Concept vs Actual Design	The westward movement of DI_RD_11 has no significant impact on the original estimates. The northward movement of roundabout avoids the acquisition of properties on the southern side of Greenhalghs Road.	
	8	Land Acquisition	The land has already been subdivided for the splays and northward movement of the proposed roundabout.	
	9	Construction Costs	Detailed design is required to understand the total project costs relative the DCP cost estimates, however it is likely that these increases will be relatively minor.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	The Greenhalghs Road shared path is located on the northern side, minimising the need for safer crossing points until DI_JNC_05 to the east.	
Project Deliverability	11	Ease of Delivery	This delivery of this project is considered relatively low risk.	

Land Acquisition

The Winterfield development is now underway after gaining approval to relocate DI_RD_12 further westwards with the same reserve width as per the PSP (LR2 cross section). The development also considers the new junction DI_JNC_04, the new intersection design moves the proposed roundabout northwards to avoid land acquisition on the southern side (0.07 ha of 491 Greenhalghs Road). This portion of the land acquisition is no longer required and is an example of how intersection land is gifted by the developer at the time of development to enable the development to proceed with the triggering of the DCP project providing access to their development.

Net impacts of moving the roundabout northwards on existing land budget are listed in Table 25.

Table 24- Net changes to DI_JNC_04

Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
484 Greenhalghs Rd	156	0.07	29,750	0.13	55,250	-0.06	-25,500
464 Greenhalghs Rd	157	0.06	23,478	0.00	0	0.06	23,478
491 Greenhalghs Rd	207	0.07	64,225	0.00	0	0.07	64,225
Total		0.20	117,453	0.13	55,250	0.07	62,203

Intersection Treatment

The 2011 SMEC transport report determined the level of service at category C:

> *provides for flow with speeds still at or near the free flow speed of the freeway. Freedom to manoeuvre within the traffic stream is noticeably restricted at LOS C, and lane changes require more vigilance on the part of the driver. Minimum average spacings are in the range of 70m, or 11 car lengths. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.*

The SMEC report also states in the context of the SIDRA analyses with:

> *Pedestrians do not have right of way when crossing at a roundabout intersection, and therefore are not included in most of the intersection analyses.*

Both Greenhalghs Road and the N-S road have the allowance for shared path facilities on top of 1.5m wide footpaths. The Eastward continuation of the shared path along Greenhalghs Road would eventually connect with the Glenelg Highway cycling corridor (Ballarat Cycling Action Plan 2017-2025). The shared path will travel on the northern side of Greenhalghs Road and switch over to the southern side at DI_JNC_05.

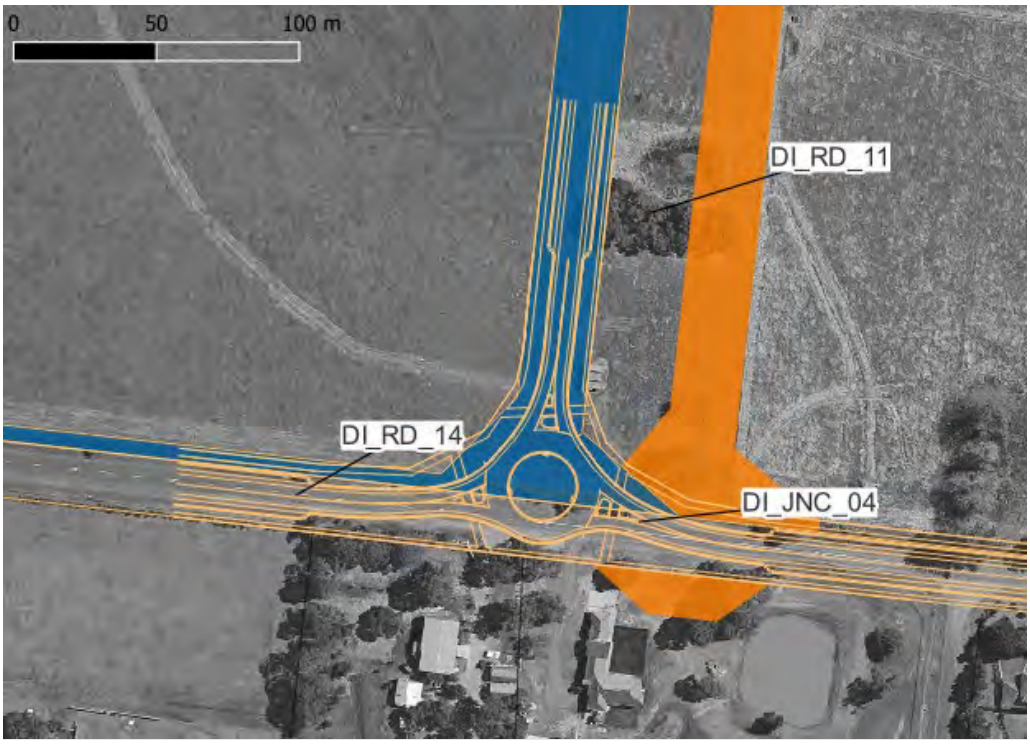


Figure 24 - Redesigned DI_JNC_04 (blue) and original alignment (orange)

The results of the changes of the intersection redesign can be seen in Table 25 for the adjacent properties. The changes also result in the no land acquisition of portions of property on the southern side of Carngham Road.

Road Design and Costs

The following elements were considered in developing a revised estimate for the modified intersection, namely:

1. Land acquisition on the southern side of Greenhalghs Road is no longer required.
2. Intersection splays are part of the land gifted by the developer.
3. Greenhalghs Road remains a Council-managed Road, thus pavement depth remains the same.

Table 25 - Revised estimated costs for DI_JNC_04

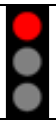
	Original	Revised	Difference
Project estimate	$1,184,119	$1,184,119	$0.00
Land acquisition cost	$117,453	$55,250	$62,203
Total	$1,301,572	$1,239,369	$62,203

DI_JNC_05 Greenhalghs Road / New N-S Road (South) Roundabout

The proposed junction connects the N-S road with Greenhalghs Road, the original roundabout design includes land acquisition on the north side, which is now fully developed since the development of the PSP.

Table 26 - MCA for DI_JNC_05

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare - there would be no significant deviation from the original assumptions for the area	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP. low density residential property on the southwestern corner prevents the creation of splays for proposed roundabout	
	4	Actual vs Planned Growth Patterns	The development area is currently under construction, planned development in accordance with the PSP	
Development Activity	5	Modelled vs Actual Traffic Movements	The intersection's function is to create a safer intersection with Greenhalghs Road for the N-S collector and DI_RD_12.	
	6	Staged Development	The Winterfield's (south) development is currently in progress triggering the requirement to build the intersection	
Project scope & cost estimate	7	Concept vs Actual Design	The junction has been modified from a roundabout to traffic signals to avoid acquiring land other than from Winterfield (south)	

Group	ID	Item	Comments	Risk
	8	Land Acquisition	There is the potential need to modify the intersection to traffic signals given the spatial constraints. There are no splays acquired for slip lanes should the junction become traffic signalled.	
	9	Construction Costs	Replacing the proposed roundabout to traffic signals incurs a significant cost, these are detailed below.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	The Greenhalghs Road and DI_RD_12 will have footpaths, shared paths and cycle lanes that will connect to the wider network. Traffic signals will allow pedestrian and cyclists to cross in a regulated manner, given the shared path does transitions from the southern to the northern side of Greenhalghs Road.	
Project Deliverability	11	Ease of Delivery	The delivery of this project is moderate risk of being delayed due to the identified solution of traffic signals instead of a roundabout.	

Land Acquisition

The minor realignment of DI_RD_12 also affects the intersection of DI_JNC_05, a small portion of rural residential land (453 Greenhalghs Road) was to be acquired for the proposed roundabout, however landowner has no plans for development, in lieu of applying a PAO, a negotiated acquisition would be required. Given the critical timing of this infrastructure, signalisation is an alternative which both maintains the desired level of traffic management and road safety as well as requiring less land at a greater cost.

Land acquisition is required on the south-east corner of the Winterfield South development. A solution will be delivered that results in a re-designed intersection with minimal land acquisition. The developer is currently awaiting approval change the proposed roundabout design to traffic signals.

Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
Winterfield South	158	0.27	117,834	0.10	43,642	0.17	74,192
453 Greenhalghs Rd	163	0.04	37,000	0.00	0	0.04	37,000
Total		0.31	154,834	0.10	43,642	0.21	111,192

Intersection Treatment

The main benefits of changing from a roundabout to traffic signals at this intersection are:

- Reduced land acquisition, in this case, only one property is affected instead of four (noting that when the DCP was being developed, the Yorkdale Estate was in its infancy).
- Provision of safer crossing options for pedestrians and cyclists/better connections to the proposed shared path network.

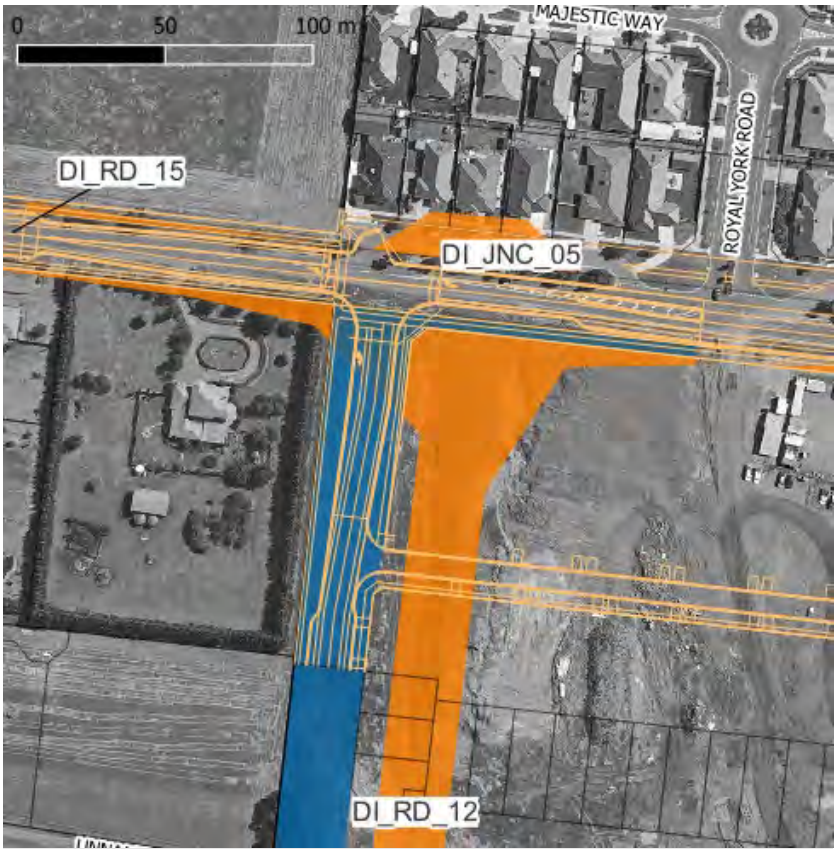


Figure 25 - Redesigned DI_JNC_05 (blue) and original alignment (orange)

Cost of intersection treatments

Conversely there are disadvantages to moving away from the proposed roundabout to signals, DCP costings are in:

- The traffic report predicted that the roundabout would operate below capacity in 2031, suggesting that a higher standard of treatment such as traffic signals may be an over-provision.
- The costs of traffic signals are higher, preliminary estimates show an increase of $345,050 (APPENDIX K).

The 2011 SMEC transport report does not analyse this intersection, however its proximity to DI_JNC_04 would largely indicate a similar level of service, i.e. (category C):

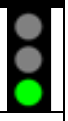
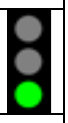
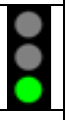
> *…provides for flow with speeds still at or near the free flow speed of the freeway. Freedom to manoeuvre within the traffic stream is noticeably restricted at LOS C, and lane changes require more vigilance on the part of the driver. Minimum average spacings are in the range of 70m, or 11 car lengths. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.*

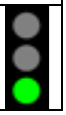
Concept designs have been developed by Milward Engineering Management Pty Ltd (Dec 2021) and are in APPENDIX L. Axiom Consulting have been engaged to complete the detailed design of the signalised intersection.

DI_RD_12 New N-S Road construction (Innsbruck Road)

This section of road connects the Greenhalghs Road (DI_JNC_05) with the Glenelg Highway (DI_JNC_08) via a new collector road. This section of road is being built as part of the Winterfield South development.

Table 27 - MCA for DI_RD_12

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare - there would be no significant deviation from the original assumptions for the area	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP	
	4	Actual vs Planned Growth Patterns	The development area is currently under construction, planned development in accordance with the PSP, although the road is now immediately adjacent to western property boundary	
Development Activity	5	Modelled vs Actual Traffic Movements	The road's function is to create a N-S collector joining Glenelg Highway and Greenhalghs Road. The adopted road profile LR2 is considered appropriate.	
	6	Staged Development	The Winterfield (south) development is currently in progress triggering the requirement to build the road and intersections (DI_JNC_05 and DI_JNC_08) The revised position of the road allows for future connections for the low-density residential area which is under it is own development as a future PSP by Council.	
Project scope & cost estimate	7	Concept vs Actual Design	The road alignment has moved westward but is still inside property 158 (Winterfield South).	
	8	Land Acquisition	The proposed splays have been reduced or eliminated at the junctions (see DI_JNC_05 and DI_JNC_08). New splays will be required for any future western connection from the low-density residential area.	

Group	ID	Item	Comments	Risk
	9	Construction Costs	There are changes to the construction costs that can only be ascertained from detailed design and would be reflected more in the junction designs at each end.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	There are changes to the construction costs that can only be ascertained from detailed design and would be reflected more in the junction designs at each end. DI_RD_12 will have footpaths, shared paths and cycle lanes that will connect to the wider network, especially the southern end where it will connect to Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	
Project Deliverability	11	Ease of Delivery	This project is considered relatively low risk of altering from the original PSP concepts.	

Land Acquisition

The proposed and adopted alignments differ; the adopted alignment is immediately adjacent to the western boundary, rather than being approximately 45m off said boundary and the adopted road profile (LR2) does not change, Figure 26 shows the proposed alignment in orange and adopted alignment in blue, Table 29 lists the impacts to the proposed and adopted land acquisition for the affected property 158.

Table 28 – Estimated land acquisition costs for DI_RD_12

Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
Winterfield South	158	1.40	610,992	1.47	641,542	-0.07	-30,550

In Figure 26 the southern end of the proposed N-S connects to the Glenelg Highway (DI_JNC_08), the intersection has moved approximately 20m to the west and does not adversely affect the overall layout of the proposed intersection.

Figure 26 – Redesigned DI_RD_12 (blue) and original alignment (orange)

Road Design

While the road cross section itself remains the same, the DCP costings referred to an estimated road length of 400m, which in reviewing this road project has been underestimated by 62m. Thus, the revised length increases the overall costs of the DCP project by $211,758 or 15%, excluding land acquisition (Table 30).

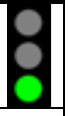
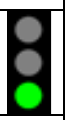
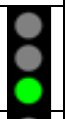
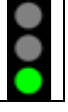
Table 29 - Original and revised cost estimates for DI_RD_12

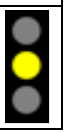
Cost Estimate Version	Estimated Length (m)	Estimated Construction Costs	Difference (%)
Original	400	$1,391,893.82	
Revised	462	$1,603,651.59	
Difference	120	$211,757.77	15%

DI_JNC_08 Glenelg Hwy / New N-S Road (Innsbruck Road) Roundabout

The southern end of the N-S collector road terminates at the Glenelg Highway with a roundabout as the adopted junction treatment. The current cross section for the Glenelg Highway is a two-lane highway which at an undetermined date would be widened to a duplicated road when the traffic demand warrants this.

Table 30 - MCA for DI_JNC_08

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare - there would be no significant deviation from the original assumptions for the area	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP	
	4	Actual vs Planned Growth Patterns	The development area is currently under construction, planned development in accordance with the PSP. Minor realignment of DI_RD_12 has resulted in a minor reduction in land acquisition	
Development Activity	5	Modelled vs Actual Traffic Movements	The proposed roundabout is considered adequate for the current and future traffic demands, DTP have ensured the design also caters for the future possible duplication (outside of the PSP).	
	6	Staged Development	The Winterfield (south) development is currently in progress triggering the requirement to build the road (DI_RD_12) and the junction.	
Project scope & cost estimate	7	Concept vs Actual Design	The northern arm has moved westward but there is still enough road reserve for the proposed junction.	

Group	ID	Item	Comments	Risk
	8	Land Acquisition	The proposed splays have been reduced or eliminated at the junction.	
	9	Construction Costs	Council's review of the originally estimated DCP costs and the recently awarded tender shows significant underestimation. These differences can be attributed to changed standards/construction requirements, water main relocation and changing from Council to VicRoads pavement design, more discussion as to these caused are listed below.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	The proposed roundabout will have footpaths, shared paths and cycle lanes crossing points that connect to Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	
Project Deliverability	11	Ease of Delivery	This delivery of this project is considered moderate risk of being delayed due to unresolved land acquisition and design-related issues.	

Land Acquisition

The concept design for the PSP/DCP is for a single lane roundabout and would be redesigned when the Glenelg Highway is duplicated (date unknown, delivered by DTP) – this has ramifications with the timing of the land acquisition of portions of land for two properties on the southern side of Glenelg Highway (439 Glenelg Highway and Lot L PS845411). The land acquisition for these properties is not a DCP project.

The adopted land alignment differs from the proposed alignment (Figure 27), which results in less land being acquired for properties 158 and 171 (Table 32), noting that property 158 has two intersections (i.e. DI_JNC_05 and DI_JNC_08).

Table 31 - Proposed and revised land acquisitions for DI_JNC_08

Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
Winterfield South	158	0.13	56,735	0.07	30,550	0.06	26,185
420 Glenelg Hwy	171	0.01	8,214	0.00	0	0.01	8,214
Total		0.14	64,949	0.07	30,550	0.06	26,185

Intersection Treatment

The 2011 SMEC transport report discusses that the traffic movements for the duplicated Glenelg Highway would operate as effectively as a single lane roundabout on all approaches, the determined the level of service at category A:

> *…primarily free-flow operations. Average operating speeds at the free-flow speed generally prevail. Vehicles are almost completely unimpeded in their ability to manoeuvre within the traffic stream. Even at the maximum density for LOS A, the average spacing between vehicles is about 160m, or 26 car lengths, which affords the motorist with a high level of physical and psychological comfort. The effects of incidents or point breakdowns are easily absorbed at this level.*

There are large land areas allocated to both the Glenelg Highway reserve (currently 60m wide) and the adjacent parklands create the necessary space for pedestrian and cyclist networks on the northern side of the Glenelg Highway without modifying the intersection design.

ESR's recommendation is to incorporate a formal crossing at DI_JNC_08, this crossing design would be more suited the next Growth Investigation Area transport and movement investigations which the southern side of the Glenelg Highway will be part of. This is made more challenging at the roundabout considering the volume of earthworks required to achieve the design surface levels creates a steep embankment on the southern side of the road.

Figure 27 – Redesigned DI_JNC_12 (blue) and original alignment (orange)

A review of the proposed roundabout design has been completed by GHD, who recommends for the intersection:

- The road pavement standards adopted in the DCP for DI_JNC_08 be substituted from the Council (local road) standards to VicRoads (arterial) standards to reflect the relevant road authority standards applicable.
- Design standards regarding roundabout design currently in the DCP are no longer current. Similar DCP projects should be reviewed against current design standard and applied where appropriate.

Figure 28 - SMEC vs Reeds (adopted) design footprints for DI_JNC_08

Cost of Intersection Treatment

The GHD report assessed changes in scope and cost estimation between DCP concept, detailed design and tenders suggesting an increased the cost of DI_JNC_08 by 71% in 2020 and 153% when the project was tendered in 2021. The cost estimations summarised in Table 33 and detailed in APPENDIX M.

Table 32 - cost estimation summary from the original design estimate (SMEC) and revised estimates by GHD and DTP (indexed to 2021)

Source	DCP	External	Total Estimated Cost	Difference from original estimate
Original estimate (SMEC, 2014)	675,522	825,638	1,574,092	-
Revised estimate (Reeds 2020)	939,490	1,148,265	2,087,755	33%
Tendered estimate (Winslow)	1,395,033	1,705,041	3,100,074	96%

A short coming of the original DCP estimations is not being able to confirm at such an early stage of planning the extent of underground services and the respective authorities' upgrading and/or augmentation plans. In this case, Glenelg Highway has two water mains to relocate at significant cost to the project, however only a modest $20,000 was provisioned in the initial cost estimate.

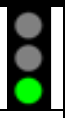
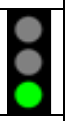
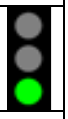
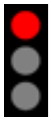
This review recommends that the DCP be amended to reflect the correction to the road pavement standard, but not recognise any additional costs incurred because of detailed design.

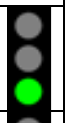
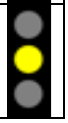
CHERRY FLAT ROAD (Ascot Gardens Drive to Bells Road)

DI_RD_20 Cherry Flat Upgrade north of Schreenans Road

This section is a duplicated road under the DCP and approximately 380m (~45%) of the proposed 840m duplicated road is already built by Council as part of the Delacombe town centre development. The remaining single lane section will not require land acquisition as the road reserve in this section is already 40m, conforming to the DCP requirements of DLR1.

Table 33 - MCA for DI_RD_20

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side; however, development will be at 15-20 lots/hectare depending on location	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP, although the properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered to remain as low density residential, when several blocks in this area are developed as residential.	
	4	Actual vs Planned Growth Patterns	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	The existing duplicated road adequately serves the traffic demands of the area.	
	6	Staged Development	The further duplication of Cherry Flat beyond the current extent is based on the development of the western side of road, however, the area bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were not considered as a trigger for further duplication works in the PSP.	
Project scope & cost estimate	7	Concept vs Actual Design	The staged development of this road would adequately serve the current and future traffic demands.	
	8	Land Acquisition	The southern end of this section terminates at a proposed roundabout (DI_JNC_11) which requires further land acquisition for the splays/roundabout. Land acquisition is a “mix” of PAO and DCP-related land acquisition.	

Group	ID	Item	Comments	Risk
	9	Construction Costs	The construction costs are largely dependent on the construction timing of the adjacent development sites. Previous section was delivered by Council instead of the developers.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This section has footpaths, shared paths and cycle lanes that connect into Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	
Project Deliverability	11	Ease of Delivery	This delivery of this project is relatively moderate risk of being delayed due to unresolved land acquisition and design-related issues.	

Land Acquisition

Approved or pending development applications that will impact on the operation of Cherry Flat Road Areas shown in Figure 29. The development area west of this section of road has been proposed with a fourth arm of the proposed roundabout at DI_JNC_11 be approved, which is discussed in the DI_JNC_11 section. Preliminary subdivision plans show the allowance for the roundabout for property 9.

As stated in the DCP, the duplication of the remaining section is proposed to be delivered "in stages as immediately adjacent land is subdivided OR when required for road construction". Unlike the western side of Cherry Flat Road, the eastern side does not have any known plans for development in the immediate future, however, this section is already 40m wide, which presents no barrier to the duplication until after Schreenans Road.

Cherry Flat Road is classified as DLR1/2 in the PSP documentation with only 40m wide reserve being considered. Developments adjacent to Cherry Flat Road have service roads, therefore widening the reserve to 60m, assuming both sides are developed. Reviewing the DCP estimates shows that only 40m wide reserve is being funded by the PSP, the remaining 20m (10m each side of the road) to achieve the aspirational 60m is delivered by the landowners/developers.

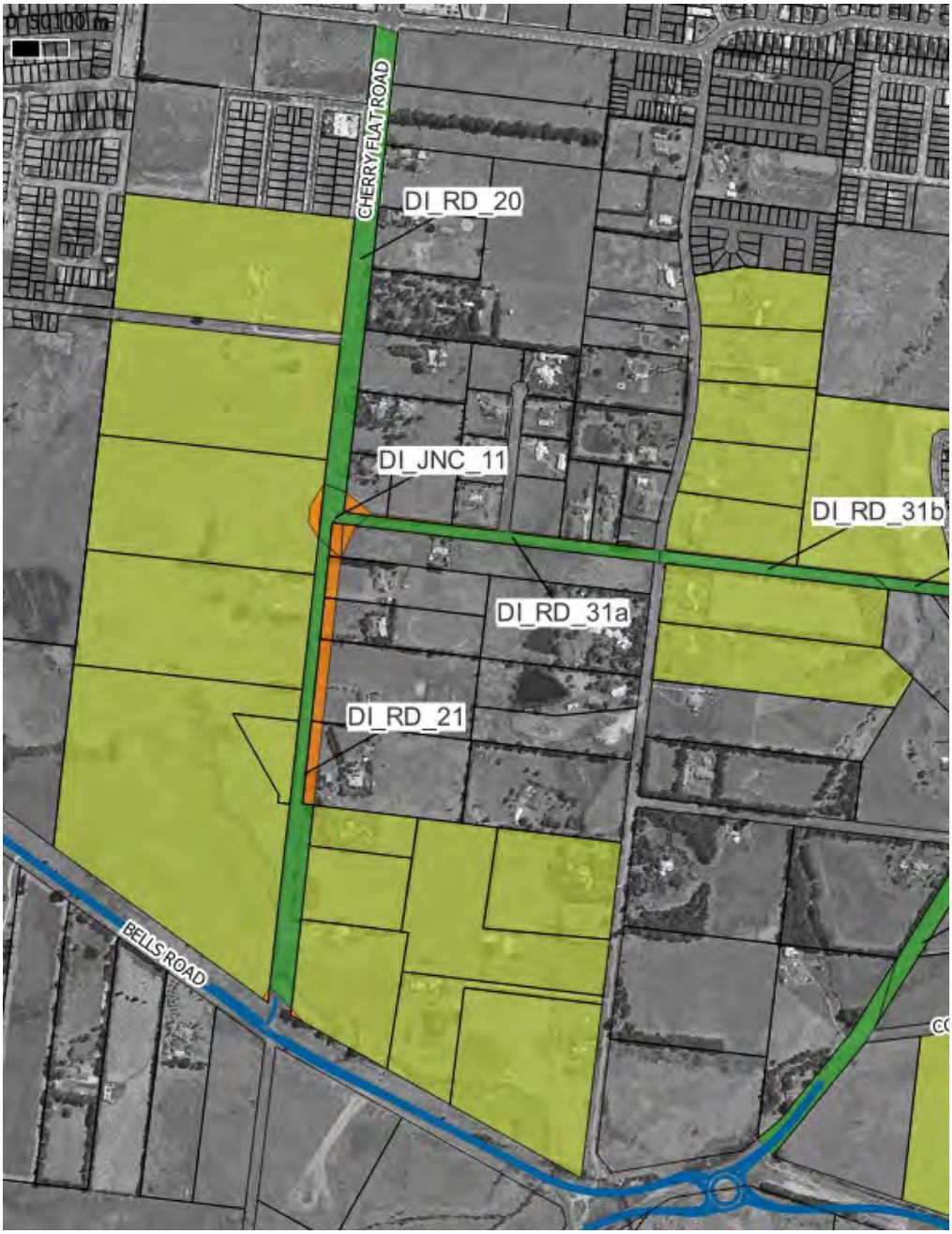


Figure 29 – future development areas adjacent to Cherry Flat Rd

Figure 30 – DI_RD_20, existing road reserve (green), proposed (orange), additional (yellow).

Road Design

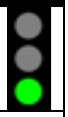
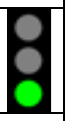
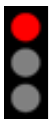
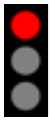
The SMEC traffic modelling considered the area east of Cherry Flat Road to Bonshaw Creek to effectively generate low density residential level of traffic whereas the properties are zoned UGZ, creating additional traffic that would either go to Ascot Gardens Drive or Cherry Flat Road.

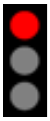
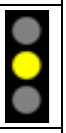
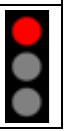
Only concept designs have been developed for the further duplication of Cherry Flat Road at this stage. There are not issues identified that would suggest detailed design in accordance with the original scope would be unreasonably beyond the DCP estimates.

DI_JNC_11 Cherry Flat Road / Schreenans Road Roundabout

The proposed treatment in the DCP is a roundabout at the Cherry Flat Road/Schreenans Road intersection.

Table 34 - MCA for DI_RD_20

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side; however, development will be at 15-20 lots/hectare depending on location	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP, although the properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered to remain as low density residential, when several blocks in this area are developed as residential.	
	4	Actual vs Planned Growth Patterns	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	The duplicated Cherry Flat Road would adequately serve the north-south traffic demands to the junction. The Schreenans Road arm cross section (LR2) was developed using the SMEC traffic modelling, however the new forth arm proposed to connect the development site on the western side warrants further investigation to understand the traffic movement impacts this new arm creates.	
	6	Staged Development	The further duplication of Cherry Flat Road is planned for south of the intersection. However as discussed above, the area bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were not directly considered as a well-defined trigger (unlike the west side) for further duplication works.	

Group	ID	Item	Comments	Risk
Project scope & cost estimate	7	Concept vs Actual Design	The traffic modelling suggests that the level of service at the roundabout delivers is the best solution for the intersection. Other options, namely traffic signals would impact the overall movements and create unnecessary traffic wait times outside of peak flow periods.	
	8	Land Acquisition	The south-eastern corner of the intersection has an existing Public Acquisition Overlay unlike the other land acquisitions within the PSP. While a PAO achieves the same outcome as the other land acquisitions in PSP, the process differs and the funding for this acquisition is outside the PSP and possibly not budgeted by Council.	
	9	Construction Costs	The design standards have changed since the development of the PSP, as such, it is expected the costs for the intersection treatment to increase accordingly.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This junction will have footpaths, shared paths and cycle lanes intersecting that will connect into the wider network. May need to investigate treatments that create a safer crossing for more vulnerable users.	
Project Deliverability	11	Ease of Delivery	This project has a high number of high-risk items i.e., unresolved land acquisition (PAO2/splays) and design-related issues (fourth arm and pavement design).	

Land Acquisition

As discussed in DI_RD_20, the future development area to the west of Cherry Flat Road is to develop in the immediate future. This future development site would best connect into the road network as a fourth arm at this junction (Figure 31). Thus, the internal road network would be best designed to channel internal traffic to this new roundabout arm. This development would also trigger the construction of the roundabout rather than when Cherry Flat Road and/or Schreenans Road is upgraded/widened, thus the land acquisition is required at this time (Table 36).

This assumes that land acquisition of the properties on the eastern side (111 Cherry Flat Road and 149 Schreenans Road) proceeds for the creation of the roundabout. Table 36 lists the original proposed land acquisition for two land acquisition projects, DI_LA_17 and PAO2 for the three impacted properties. The review has identified splays for creating the roundabout that were considered in the plans, however this did not carry across into the land acquisition estimates, the area and estimated values are listed in the additional columns in Table 36, adding $212,150 to the land acquisition budget.

The additional land acquisition and delivery mechanism (i.e., PAO) needs to be recognised in the PSP to ensure the land is made available at the appropriate time. If these land parcels are not funded by the DCP it will be at Council's expense.

Table 35 - Land acquisition areas for DI_JNC_11

Address	Property ID	LA Project	Proposed		Additional		Revised	
			Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
111 Cherry Flat Road	55	DI_LA_17	0.03	30,750	0.08	82,000	0.11	112,750
		PAO2	0.00	0	0.00	0	0.00	0
132 Cherry Flat Road	9	DI_LA_17	0.00	0	0.18	88,748	0.18	88,748
		PAO2	0.00	0	0.00	0	0.00	0
149 Schreenans Road	69	DI_LA_17	0.00	0	0.07	41,402	0.07	41,402
		PAO2	0.10	59,146	0.00	0	0.10	59,146
Total			0.13	89.896	0.33	212,150	0.46	302,046

Note: *Proposed and additional columns are combined unlike previous land acquisition tables*

A possible alternative is to re-align the roundabout so only land acquisition on 132 Cherry Flat Road proceeds, avoiding the acquisition of 111 Cherry Flat Road and 149 Schreenans Road. This has the benefit of negotiating with one landowner and potentially reduces the land acquisition costs by $88,748. This option is negated as it significantly impacts the alignment of future duplicated Cherry Flat Road south of the intersection. Noting that there is already a development plan proposed for 132 Cherry Flat Road implementing this project as per the original alignment would not be practical.

Figure 31 – DI_JNC_11, existing road reserve shown as green, proposed shown as orange.

Cost of Intersection Treatment

The civil construction cost of the junction is expected to increase with the inclusion of the fourth arm by approximately $120,250 as summarised in Table 37.

Table 36 - estimated costs 3- and 4-armed roundabout for DI_JNC _11

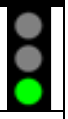
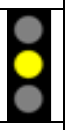
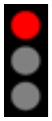
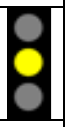
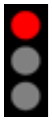
Roundabout Type	Estimated Cost (2021 costs)
3 arms	$1,137,034.76
4 arms	$1,257,282.72
Change	$120,247.96

While the PSP should recognise the additional roundabout arm and connectivity, this amendment only serves the adjoining development and not the broader precinct which DCP projects are intended to do. Hence, the DCP should not be updated to reflect this change other than to reflect the development component.

DI_RD_21 Cherry Flat Upgrade south of Schreenans Road

Cherry Flat continues for 850m to Bells Road/Ballarat Link Road where a portion of the road is a duplicated link road for 190m at the northern end. Approximately 490m of the 850m section of road requires further land acquisition (PAO2) on the eastern side to achieve the minimum 40m road reserve for the duplicated link road.

Table 37 - MCA for DI_RD_21

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side; however, development will be at 15-20 lots/hectare depending on location	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP, although the properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered to remain as low density residential, when several blocks in this area are developed as residential.	
	4	Actual vs Planned Growth Patterns	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	The duplicated Cherry Flat Road would adequately serve the north-south traffic demands, especially when the Ballarat Link Road is built after 2036.	
	6	Staged Development	The further duplication of Cherry Flat Road is planned for south of the intersection to only 190m, however development on either side of would necessitate further duplication ~600m longer. The fragmented lot ownership/development on the eastern side warrants further investigation.	
Project scope & cost estimate	7	Concept vs Actual Design	Traffic modelling is required to determine whether the remaining duplication is required	
	8	Land Acquisition	The intersection is subject to PSP-related land acquisition (further acquisition required) and PAO2 for a duplicated Cherry Flat Road. Five properties are subject to the existing PAO2, where two already have a 20m carriageway easement over the nominated alignment. The PAO2 is not funded by the DCP and would be subject to Council funding.	
	9	Construction Costs	Cherry Flat Road is also earmarked as an arterial road upon duplication. As such the design standards differ, could require additional funding to deliver this section of road.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This section of Cherry Flat Road has an allowance for footpaths, shared paths and cycle lanes that run parallel and would continue to connect into Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	

Group	ID	Item	Comments	Risk
Project Deliverability	11	Ease of Delivery	The above listed issues regarding the funding of and finalising the PAO2, 120m of 750m of the full length to be duplicated, this project is at risk of not meeting the aims of the PSP.	

Land Acquisition

The duplicated Cherry Flat Road alignment affects five (5) properties where an existing Public Acquisition Overlay (PAO2) is already in place. Other properties were included in the PAO2 although their subdivision has created the required road reserve for these three (3) properties (Figure 32). Delivery of the PAO2 sits outside the DCP but should be recognised in the PSP and referred to Council for budget consideration and delivery.

The southern end of Cherry Flat Road terminates at Bells Road, which is earmarked as the Ballarat Link Road and is the boundary between City of Ballarat and Golden Plains Shire Councils. The Ballarat Link Road construction timing is assumed to be outside of the DCP timeframes (beyond 2035).

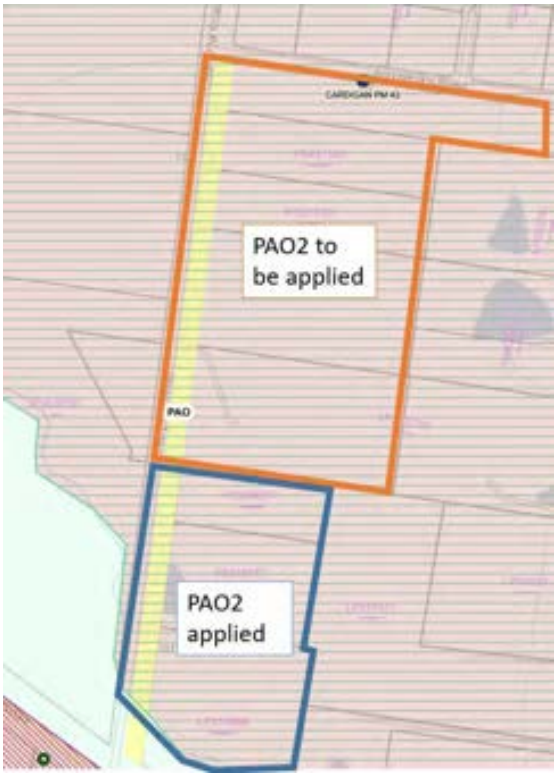


Figure 32 – properties where PAO2 applies.

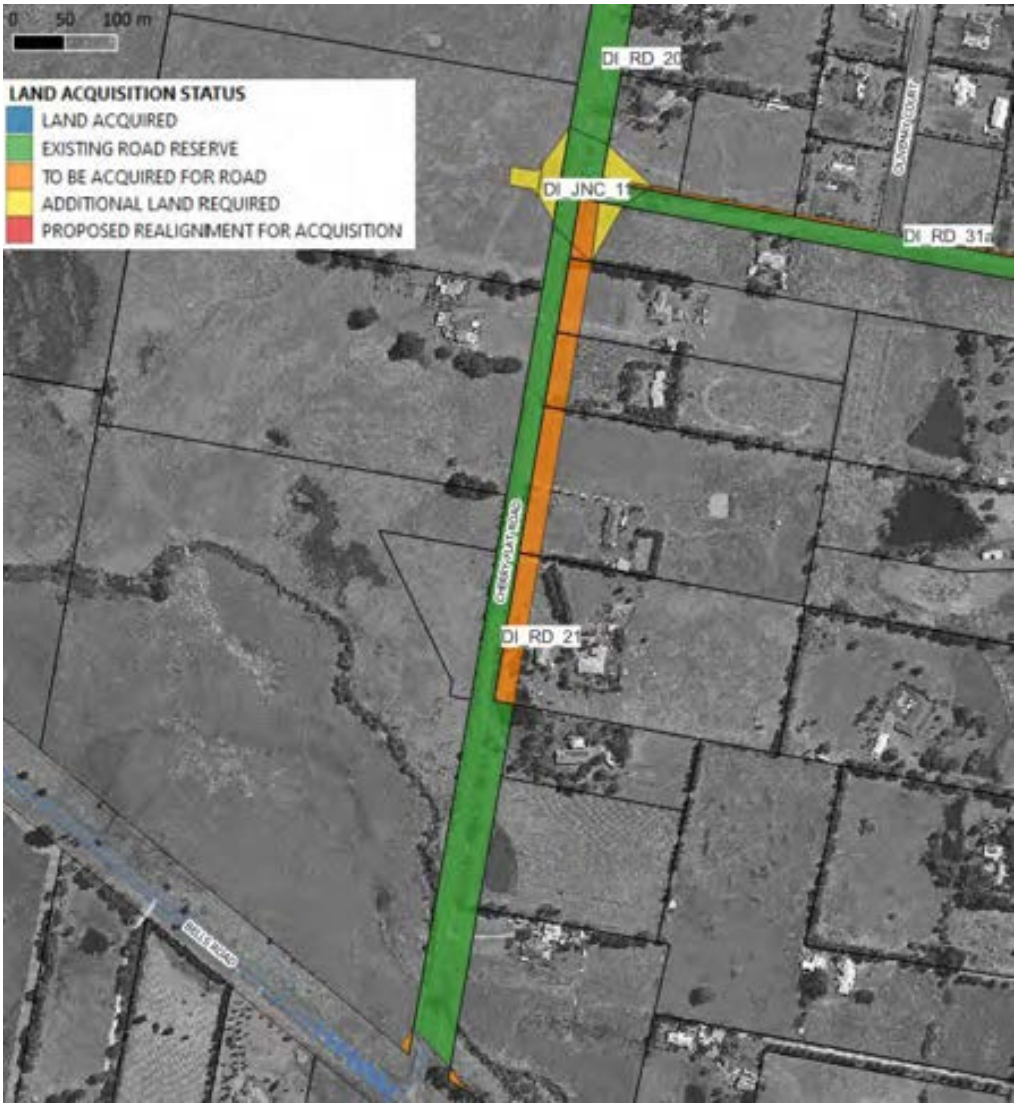


Figure 33 – DI_RD_21 existing road reserve (green) and proposed widening (orange)

The DCP states the trigger(s) for the duplication being access to adjacent development areas as required OR when a bus route is required along this section of Cherry Flat Road is created. The listing of only 190m when this entire section was marked as a duplicated link road, estimated duplication length 750m, there is no documentation to explain the reason for the apparent shortfall.

There is also no information regarding the application of the PAO2 for properties at 133 and 139 Cherry Flat Road (properties 70 and 71), these properties already have a 20m easement, as viewed in data.vic.gov.au. All properties have the PAO2 listed in the online VICPLAN property reports. Table 39 Land acquisition summary for DI_RD_21.

Table 38 Land acquisition summary for DI_RD_21

Address	Property ID	Land Acquisition ID	Proposed	
			Area Excised	Excised Land Value
149 Schreenans Road	69	PAO2	0.01	5,915
		DI_LA_17	0.10	59,146
133 Cherry Flat Road	70	PAO2	0.15	101,875
139 Cherry Flat Road	71	PAO2	0.15	101,875
149 Cherry Flat Road	73	PAO2	0.29	162,900
155 Cherry Flat Road	76	PAO2	0.29	162,625
Total			0.99	594,336

*Property 69 is also affected by the land acquisition for DI_JNC_11

Road Design and Costs

The DCP costs are largely for creating the duplicated road from the roundabout at the Schreenans Road with land acquisition for this is under a Public Acquisition Overlay. The allocated $816,000 is not considered sufficient to bring the full length of the road up to DLR1 standard considering the civil costs for the were approximately $1.73 million (indexed to 2021 values) and will only deliver 190m of the 895m section. The 895m section is further reduced given each end of the road will be a roundabout treatment, further reducing the duplicated road length to 750m.

The following estimate (Table 40) assumes full pavement reconstruction of the existing road to the same standard as DI_RD_20.

Table 39 – Revised construction costs for DI_RD_21

Description	Indexation (Jun 2021)	Comments
Revised estimate	$3,566,092.36	
Original Estimate	$987,391.08	Noting the line marking, drainage etc. still required for the full 750m
Change	$2,578,701.29	

The revised estimate increases the construction costs of DI_RD_21 to $3,566,092 (up 261%) from the original $987,391 DCP estimate.

This estimate excludes land acquisition costs associated with PAO2 properties. The PAO2/additional splays would be a separate Council funded capital works project to ensure the additional splays are incorporated in an updated PSP, noting that the DCP is not funding this item.

SCHREENANS ROAD (DI_RD_31a to d)

The PSP/DCP lists for four sub-projects for Schreenans Road that connects Cherry Flat Road with Ross Creek Rd. The cross-section profile for Schreenans Road is Link Road 2, requiring a minimum 24m wide road reserve. The current road reserve width is 20m, requiring an additional 4 m on the northern side of Schreenans Road to create the required 24m for the Link Road 2 profile.

The sequence of construction for the road sections would be timed with the subdivision of the adjacent land, which is more challenging given the fragmented ownership. Figure 34 shows recent Council advice of emerging development areas in Precinct 1; the developments adjacent to Cherry Flat Rd have been discussed previously in the DI_RD_20, DI_JNC_11 and DI_RD_21 sections.

Figure 34 – development areas adjacent to Schreenans Road (located in green area)

DI_RD_31a Schreenans Road upgrade (between Cherry Flat and Webb Roads)

This section starts at Cherry Flat Road (DI_JNC_11) through to Webb Road where splays already exist on the northern side (properties 42 and 64). New splays will need to be considered for the future improved intersection of Schreenans Road/Webb Road intersection.

Table 40 - MCA for DI_RD_31a

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side; however, development will be at 15-20 lots/hectare depending on location	

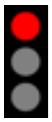
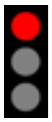
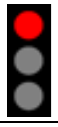
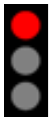
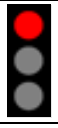
Group	ID	Item	Comments	Risk
	3	Rezoning/ Modification to Land Use	Properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered to remain as low density residential, when several blocks in this area are developed as residential (15 lots/hectare), creating significant increases to traffic in the area.	
	4	Actual vs Planned Growth Patterns	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. Further analysis is required to understand how this translates to the low-density residential area is required.	
Development Activity	5	Modelled vs Actual Traffic Movements	The proposed road would adequately serve the traffic demands of the area, although there is uncertainty with reviewing/increasing the densities to the areas adjacent to the proposed road.	
	6	Staged Development	Fragmented property ownership increases the risk of ad hoc development adjacent to the road	
Project scope & cost estimate	7	Concept vs Actual Design	The existing traffic modelling will need to be reviewed considering the increased housing densities in the adjacent low density residential areas	
	8	Land Acquisition	The splays at the Cherry Flat Rd end have been discussed in the previous section (DI_JNC_11) which requires further land acquisition for the splays/roundabout. The widening of the road reserve on the northern side ignores the need to create splays at the Webb Road intersection for a possible roundabout (not considered in the PSP).	
	9	Construction Costs	Subject to the traffic analysis, the construction costs are likely to increase given the increase in traffic loads and potential intersection treatments.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This section has footpaths, shared paths and cycle lanes that connect into the wider network, especially Cherry Flat Road and Delacombe Town Centre.	
Project Deliverability	11	Ease of Delivery	Given the above listed issues regarding the housing density, this project is at risk being delivered without meeting the PSP performance criteria of meeting the traffic loads at full development.	

Figure 35 – DI_RD_31a existing road reserve (green), future land acquisition (orange)

Land Acquisition

Table 42 lists the required area of land for each impacted property for DI_RD_31a road widening.

Table 41 – DI_RD_31a land acquisition

Address	Property ID	Original	
		Area Excised	Excised Land Value
134 Webb Road	42	0.03	30,000
120 Schreenans Road	43	0.02	22,000
124 Schreenans Road	44	0.02	21,000
8 Olivemay Road	48	0.04	40,000
1 Olivemay Road	52	0.03	33,000
111 Cherry Flat Road	55	0.11	112,750
Schreenans Road	56	0.05	48,750
Total		0.30	307,500

The DCP has not considered what type of intersection will be adopted at Webb Road for the original SMEC plans show an uncontrolled crossroad and any intersection treatment will be outside of the DCP.

New Roundabout - Schreenans Road and Webb Road

There is the potential need to include a new junction in the PSP at the intersection of Schreenans Road and Webb Road. The former rural living properties adjacent to Webb Road are part of the PSP, where developments at the northern end of Webb Road have commenced.

Of all the junctions in the PSP, DI_JNC_12 is the closest representation to the proposed roundabout at Schreenans Road and Webb Road. This roundabout will be used to develop a preliminary understanding of the financial and land acquisition implications.

Figure 36 - Additional splays for DI_JNC_X1

Land Acquisition

Four properties are impacted by the proposed roundabout, two of these properties are already impacted by the acquisition to create a wider road reserve, i.e., 133 and 134 Webb Road. Table 43 lists the area required and estimated land acquisition costs on top of the any other land acquisitions for the respective properties.

Table 42 - Estimated land acquisition for new roundabout at Schreenans Road and Webb Road

Address	Property ID	Revised	
		Area Excised	Excised Land Value
134 Webb Road	42	0.03	30,000
133 Webb Road	64	0.02	16,500
149 Schreenans Road	69	0.05	23,658
104 Schreenans Road	84	0.07	16,889
Total		0.17	87,048

Cost of Intersection Treatment

The proposed new roundabout at Schreenans Land and Webb Road is estimated to be $850,000. Delivery of the proposed roundabout has already been discussed and is understood to be incorporated with an adjoining development as part of the local infrastructure requirements. As this roundabout already has a funding and delivery mechanism, it is not being considered for inclusion into the DCP, however is recommended to be reflected in the PSP.

DI_RD_31b Schreenans Road extension west

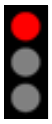
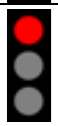
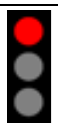
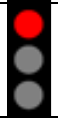
This section is like DI_RD_31a, where the properties on the northern side will have a 4m wide strip of land acquired to create the 24m road reserve from the existing 20m reserve.

Figure 34 shows development adjacent to Webb Road and Schreenans Rd (DI_RD_31b), this development area is relatively isolated to neighbouring development areas where they are potentially building more infrastructure in an out-of-sequence manner. This would trigger the need to acquire the 4 m wide strip of land for DI_RD_31a and DI_RD_3b.

Figure 37 – DI_RD_31b & DI_RD_31c existing road reserve (green) and future land acquisition (orange)

Table 43 - MCA for new roundabout at Schreenans Road and Webb Road intersection

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side; however, development will be at 15-20 lots/hectare depending on location	
	3	Rezoning/ Modification to Land Use	Properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered to remain as low density residential, when several blocks in this area are developed as residential (15 lots/hectare), creating significant increases to traffic in the area.	
	4	Actual vs Planned Growth Patterns	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. Further analysis is required to understand how this translates to the low-density residential area is required.	

Group	ID	Item	Comments	Risk
Development Activity	5	Modelled vs Actual Traffic Movements	The approaching roads may adequately serve the traffic demands of the area, although some form of intersection treatment is required given the increasing the densities to the areas adjacent to the proposed road.	
	6	Staged Development	Fragmented property ownership increases the risk of ad hoc development adjacent to the road	
Project scope & cost estimate	7	Concept vs Actual Design	The existing traffic modelling will need to be reviewed considering the increased housing densities in the adjacent areas from low density residential to UGZ	
	8	Land Acquisition	The widening of the road reserve on the northern side ignores the need to create splays at the Webb Road intersection for a possible roundabout (not considered in the PSP).	
	9	Construction Costs	Subject to the traffic analysis, the construction costs are likely to mirror the construction costs of DI_JNC_12.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	Footpaths, shared paths, and cycle lanes are part of the cross section.	
Project Deliverability	11	Ease of Delivery	The above listed issues highlight that traffic modelling will be required.	

Land Acquisition

The land acquisition for DI_RD_31b relies on only acquiring properties on the northern side of the unnamed road (Schreenans Road heads south at the Webb Road intersection. The cost impact of this acquisition is outlined in Table 45.

Table 44 - Land acquisition for DI_RD_31b & DI_RD_31c

Address	Property ID	Original	
		Area Excised	Excised Land Value
133 Webb Road	64	0.09	74,250
90 Clydesdale Drive	68	0.05	21,187
Total		0.14	95,437

DI_RD_31c Schreenans Road Creek Crossing

The land acquisition for the crossing (DI_LA_17) is an extension of that required for DI_RD_31b section (Table 45). The creek crossing is located at possibly one of the deepest locations of Bonshaw Creek relative to the surrounding area (greater than 10m). The proposed crossing may require additional earthworks (and possibly retaining walls) into the existing ground to reduce the

height of the bridge embankments and span lengths. Figure 38 shows the elevation profile/cross section where the proposed bridge passes over Bonshaw Creek and 1% AEP flood level.

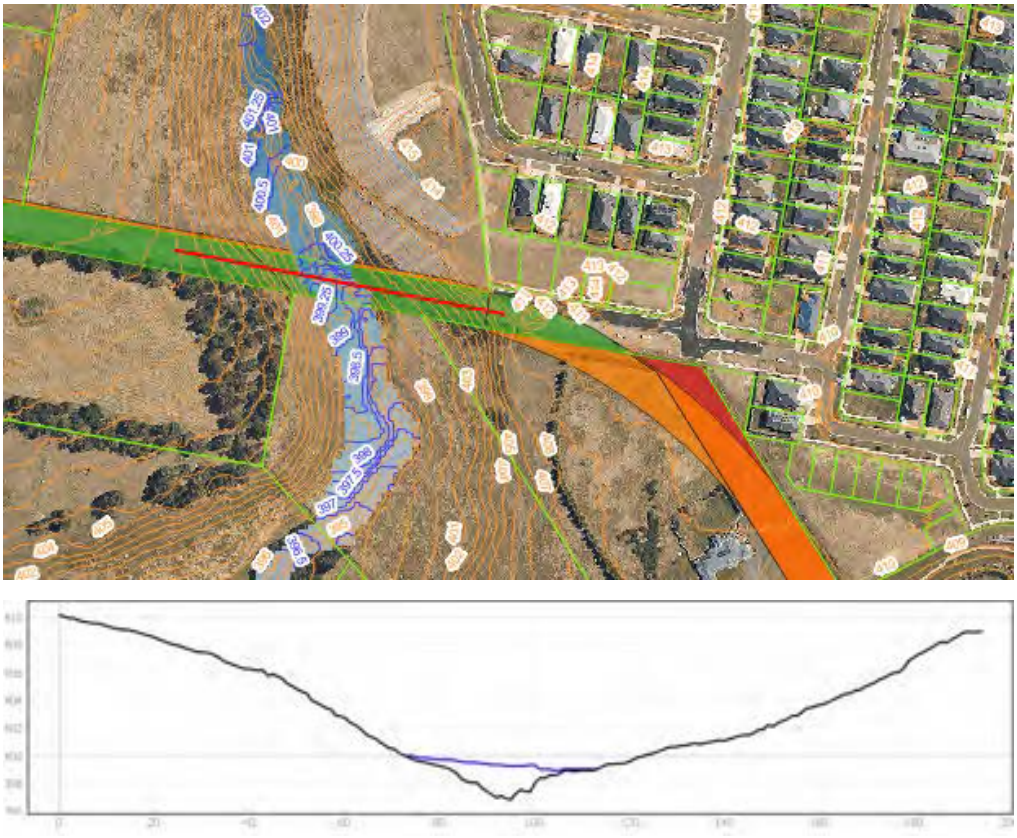
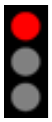
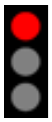
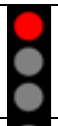


Figure 38 - Centreline cross section of proposed road bridge (DI_RD_31c) and 1% AEP flood level (blue)

Table 45 - MCA for DI_RD_31c

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side; however, development will be at 15-20 lots/hectare depending on location	

Group	ID	Item	Comments	Risk
	3	Rezoning/ Modification to Land Use	Properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered to remain as low density residential, when several blocks in this area are developed as residential (15 lots/hectare), creating significant increases to traffic in the area.	
	4	Actual vs Planned Growth Patterns	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. Further analysis is required to understand how this translates to the low-density residential area is required.	
Development Activity	5	Modelled vs Actual Traffic Movements	The proposed bridge is included to address a large gap between creek crossings (i.e., Ascot Garden Drive and Joses Lane) over Bonshaw Creek. Modelling to date suggests that the bridge is not warranted until 2030+.	
	6	Staged Development	Cannot be staged given it is proposed to be a two-way bridge.	
Project scope & cost estimate	7	Concept vs Actual Design	There are no concept designs for the proposed bridge.	
	8	Land Acquisition	The widening of the road reserve on the northern side is proposed, however there may be more land required (Council reserve available)	
	9	Construction Costs	The height of the proposed bridge will determine the costs where there is at least 12 m from bottom of the creek channel to the develop-able land.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	Previous traffic analysis has commented that a bridge is required in this location to best connect footpaths, shared paths, and cycle lanes to the wider network, while vehicle traffic have alternative locations to cross.	
Project Deliverability	11	Ease of Delivery	The above listed issues highlight many unknowns as to whether the project would continue.	

The ESR has reviewed this crossing in detail (in 2015 and 2021). The following summarises the reports' findings:

1. Cost – the report states the estimated costs are considerably higher than a similar bridge located upstream at Ascot Garden Drive
2. Traffic volume – the SMEC report estimates 22,500 vpd while VITM 8,500 vpd, while the ESR reports estimates 5,000-15,000 vpd, as there are large discrepancies between the various models, it would suggest the proposed bridge could be over-servicing.

3. Need – there are alternative routes to the proposed bridge for vehicle traffic that are within 1 km of the proposed bridge site with Joses Lane and Webb Road Key Access Streets.
4. Location – the houses fronting Carthew Road are currently fronting a cul de sac, the bridge's construction would change the road priority for the residents as per the PSP.
5. Alternative Routes – Joses Lane is within 600m of the proposed bridge, and it already has a crossing that would be relatively simpler and cheaper to upgrade for the collector road standard. However, this would require reallocating the land acquisition for DI_RD_31b to Joses Lane and N-S section of Schreenans Road to widen the road reserve to 24m. Preliminary land acquisition estimate 4,010 sq m are required to create the 24 m road reserve, this cost would be funded by the avoided bridge construction costs at Schreenans Road.

In additional to the ESR report, the traffic volumes in this area are underestimated with the now UGZ only generating traffic in the SMEC model aligning with low density residential use. The traffic generation from this area is potentially 10 times greater than originally forecasted.

Land Acquisition

The land acquisition for the bridge itself is through a Council reserve, where approximately 0.04 ha is required, this amount may increase depending on the adopted bridge design and the amount of cut/fill.

Bridge Design

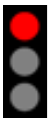
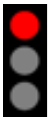
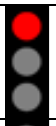
The challenge of the site is that there is 12m elevation change from surrounding area to the bottom of Bonshaw Creek. It would be prudent to engage a bridge designer to further consider the design options and develop functional designs and cost estimates before progressing any detailed design. This design work would support management of the DCP budget allocation but is not intended to redefine the project scope or seek an amendment to the DCP value.

DI_RD_31d Schreenans Road extension east

This section starts from the eastern abutment of the proposed crossing through to Ross Creek Road and largely bounded to the north by the "Ploughman's Arms" development. One section of the road is already within an established road reserve and while the development immediately to the south is under detailed design (Figure 40).

Table 46 - MCA for DI_RD_31d

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed road is at original density of 15 lots/hectare.	
	3	Rezoning/ Modification to Land Use	Surrounding land use has remained as per PSP Realignment is driven by developer not the PSP	

Group	ID	Item	Comments	Risk
	4	Actual vs Planned Growth Patterns	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	The proposed road would adequately serve the traffic demands of the area without the bridge (DI_RD_31c). As discussed in previous sections, the increased lot development in the low density residential and the construction of the bridge would significantly alter the traffic patterns.	
	6	Staged Development	Development is occurring in stages, development on the southern side may reduce the land available for the road and Settlers Drive intersection	
Project scope & cost estimate	7	Concept vs Actual Design	The road without the bridge connection would adequately service the adjacent developments, in fact, it would be over-designed as a standalone road. The LR2 profile is considered an appropriate profile for the modelled traffic demands. It will need to be validated when in the increased lot yields in the low-density residential areas for this would increase the traffic demands.	
	8	Land Acquisition	The splays at the Ross Creek Road end are required for the future roundabout (DI_JNC_12). The PSP concept design showed a sweeping corner and the detailed design of PLP202167SC has altered this into a more straightened alignment. The intersection of Carthew Road and Settlers Drive will require additional analysis as the intersection may need additional control (i.e., traffic signals or roundabout).	
	9	Construction Costs	Subject to the traffic analysis, the construction costs are likely to increase given the potential intersection treatment at Settlers Drive	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This section has footpaths, shared paths and cycle lanes that connect into the wider network.	
Project Deliverability	11	Ease of Delivery	Given the above listed issues regarding the alignment, this project is at risk being delivered without meeting the PSP performance criteria of meeting the traffic loads at full development.	

Land Acquisition

The PSP proposed that only one property (Property 86) to be the only affected property for this proposed road. By changing the proposed road from a sweeping bend to a more angular configuration has reduced the amount of land to be acquired (Table 48).

Table 47 - Land acquisition DI_RD_31d (not considering ESR's recommendation)

Address	Property ID	Original		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
36 Ross Creek Road	86	0.76	456,000	0.62	372,000	0.14	84,000
Total			456,000	0.62	372,000	0.14	84,000

The development on the southern side of DI_RD_31d is currently under detailed planning, a preliminary layout is in Figure 40. The development is staged from Joses Lane, heading north to Stage 4b, this implies that there is the opportunity the proposed road's alignment following the more curved alignment of the original PSP.

The plans show the proposed road is now straightened to create additional residential lots in Stage 4a, however this is not suitable solution for the future transport network operation.

ESR was engaged to review the alignment; the recommendation from the report is that more land is required to create a curve radius of 160m and to fit in the Settlers Drive intersection (as T-intersection). This recommended alignment still requires land acquisition (Table 49), however, it is less than the original PSP/DCP alignment as listed in Table 48.

This alignment is still problematic considering it may result in a controlled intersection with Settlers Drive intersection such as a roundabout. However, the preliminary Council roundabout design has been produced for discussion only and alternative solutions are still being considered.

Table 48 - Land acquisition for DI_RD_31d after considering ESR Transport's recommended alignment.

Address	Property ID	Proposed		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
36 Ross Creek Road	86	0.76	456,000	0.69	414,000	0.14	42,000
Total			456,000	0.69	414,000	0.14	42,000

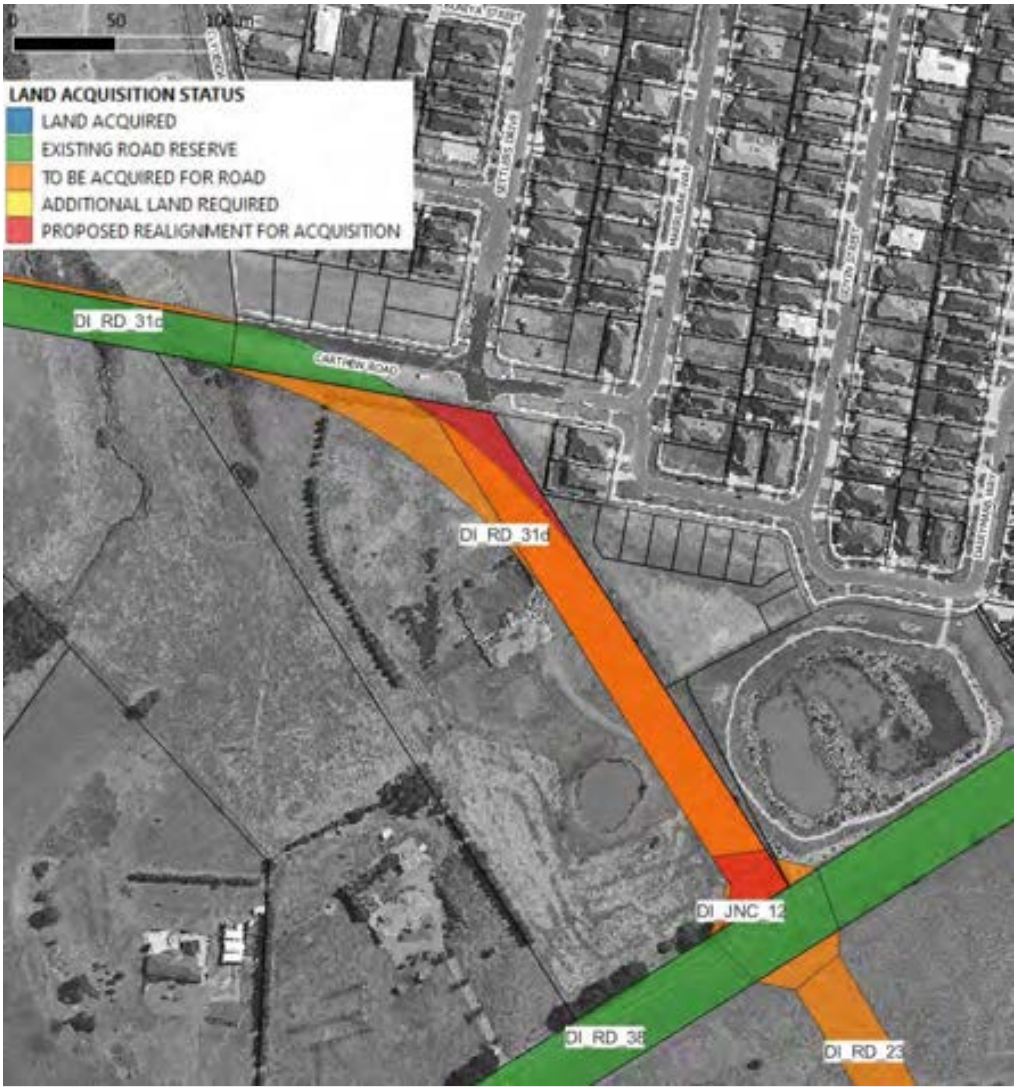


Figure 39 – DI_RD_31d proposed alignment (orange), existing road reserve (green), proposed re-alignment (red), note the aerial photography accuracy is poor for the Ploughman's Estate.

Figure 40 - Future lot layout adjacent to DI_RD_31d

Road Design

Assuming the 160m radius curve alignment by ESR is adopted, existing properties facing Carthew Road will be facing the completed Schreenans Road extension, this section of road will be widened to LR2 cross section. This will also require the redesigning of the DI_RD_31d-Carthew Road - Settlers Road intersection.

An initial functional layout plan has been developed by Council to test this concept as shown in Figure 41 with the reduced land available, however this would be further improved should the ESR alignment be adopted.

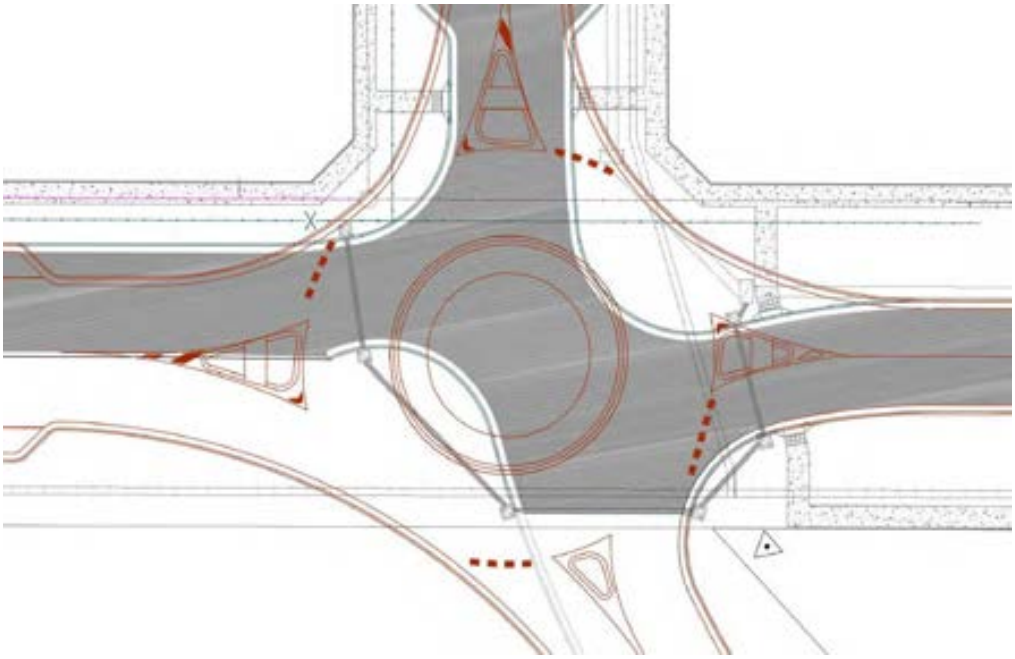


Figure 41 - initial functional layout plan for DI_RD_31d/Settlers Drive intersection.

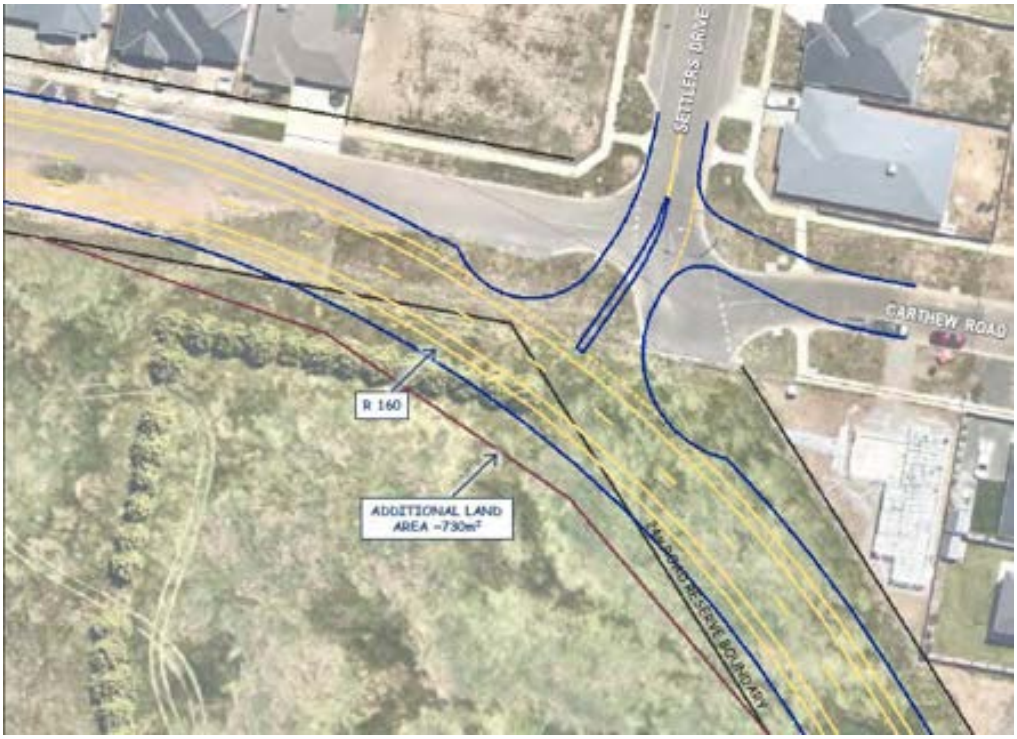


Figure 42 - Realigned DI_RD_31d (source: ESR Transport Planning)

The main benefits of the proposed ESR alignment are:

- Self-explanatory road – the through-route is obvious to the driver; the small annulus roundabout is not an appropriate treatment for LR2 cross section when the through-route needs to turn.
- Improved sightlines – larger radius curve allows driver to see further, potentially reducing the need to further intersection treatment(s)
- Space for properties facing Carthew Road – the alternative alignment places through-traffic very close to pedestrians and houses i.e., run-off road crashes risk increases.

Road Design Costs

It is recommended that a detailed design is undertaken of the ESR Alignment is carried out and this is completed in tandem with the Bonshaw Creek bridge (DI_RD_31c) options assessment for there are multiple design issues that do not allow for an estimation of the revised road alignment and intersection treatment as discussed above.

Alternative to Schreenans Road

The ESR transport report discusses alternative routes should DI_RD_31c – the Bonshaw Creek bridge not be built (Figure 43). This reduction may not be fully realised given an alternative route would require other road and bridge upgrades within the PSP but not funded in the DCP.

The ESR report discusses the alternative alignment being the N-S heading section of Schreenans and Joses Lanes (Figure 43), however it stopped short of suggesting re-aligning DI_RD_23 to directly connect Miles and Prince Streets, thus creating a direct link to Albert Street (Midland Highway) at an established signalised intersection and bypassing established areas of Sebastopol.

This route also has land acquisition and would require negotiation with these landholders for the alternative route to be realised. One such example is 2 Joses Lane, which is currently under development would require significant redesign to accommodate the 4 m wide addition road reserve. Essentially, development activity no longer enables this outcome to be considered.

Figure 43 - Alternative alignment for DI_RD_31b & DI_RD_31c

Webb Road/Schreenans Road Reclassification

As discussed in DI_RD_31a and DI_RD_31b, the area adjacent to Webb Road and Schreenans Road where it heads in north-south direction was not modelled with urban growth zone traffic loads. This area was initially modelled using low-density rural living zone traffic generation, several lots are now being subdivided into residential areas, hence the reclassification of this section of Webb Road and Schreenans Road is considered.

The reprojected traffic volumes are discussed in the TRAFFIC MODELLING and TRAFFIC GENERATION FORECASTS sections of this study. The result of having increased traffic loads on Webb Road is already being realised with properties at the northern end of Webb Road developed at ~15 lots/ha, other existing lots are also in the planning stages as detailed in APPENDIX B and Figure 34.

Figure 44 – DI_RD_X2 alignment in magenta hatch

Land Acquisition

ESR has recommended that Webb Road is reclassified from its current Key Access Street to Collector Street: Constrained (CS1) cross section. Both road cross sections utilise the 20m road reserve thus not requiring further land acquisition from the adjacent properties.

Road Design

It is recommended that Key Access Streets cross section implemented by Council is adopted as the minimum standard, except for when bus routes are identified which then applies the Collector Street (Constrained) cross section for all roads designated as Key Access Streets.

Part of Webb Road is already being delivered as part of adjoining development as local infrastructure. This approach can be maintained for the remaining section of Webb Road.

ROSS CREEK ROAD (Tait Street to Three Chain Road)

DI_JNC_12 Ross Creek Road / Schreenans Road extension/ Cobden St (realigned) Roundabout

The proposed junction connects the Schreenans Road extension and the realigned Cobden St with Ross Creek Road with a roundabout. The eastern side is earmarked to have a NAC and already has schools/childcare centre adjacent to the intersection.

Table 49 - MCA for DI_JNC_12

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed junction is at UGZ (15-20 lots/hectare) or part of the LAC.	
	3	Rezoning/ Modification to Land Use	No significant changes to date	
	4	Actual vs Planned Growth Patterns	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	The proposed roundabout would adequately service the expected traffic volumes.	
	6	Staged Development	Development is occurring in stages	
Project scope & cost estimate	7	Concept vs Actual Design	Ross Creek Road commences at the Tait St roundabout, the proposed roundabout ensures allow free-flowing traffic throughout the day.	

Group	ID	Item	Comments	Risk
	8	Land Acquisition	Splays have been accounted for in the DCP for this junction	
	9	Construction Costs	The design standards have changed since the development of the PSP, as such, it is expected the costs for the intersection treatment to increase accordingly.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This junction will have footpaths, shared paths and cycle lanes intersecting that will connect into the wider network. May need to investigate treatments that create a safer crossing for more vulnerable users.	
Project Deliverability	11	Ease of Delivery	Given the above listed issues regarding the alignment, it is recommended to continue with the original alignment.	

Land Acquisition

The land acquisition for the proposed junction is tied into the development of DI_RD_31d and DI_RD_23, it is likely that land acquisition will be less than originally proposed.

Table 50 – Land acquisition for DI_JNC_12

Address	Property ID	Original		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
28 Ross Creek Road	86	0.06	36,000	0.07	42,000	-0.01	-6,000
36 Ross Creek Road	87	0.01	5,626	0.00	0	0.01	5,626
30 Cobden Street	97	0.05	41,626	0.07	0	-0.02	41,626
Total			83,253	0.14	42,000	-0.02	41,253

Junction Design

The 2011 SMEC traffic report has determined the level of service for the proposed roundabout treatment as:

> *primarily free-flow operations. Average operating speeds at the free-flow speed generally prevail. Vehicles are almost completely unimpeded in their ability to manoeuvre within the traffic stream. Even at the maximum density for LOS A, the average spacing between vehicles is about 160m, or 26 car lengths, which affords the motorist with a high level of physical and psychological comfort. The effects of incidents or point breakdowns are easily absorbed at this level.*

Knowing this intersection is adjacent to a Local Activity Centre/schools, it may be prudent to revisit the traffic modelling in this area. ESR also notes concerns about traffic travelling direct to Albert St (Midland Highway) through mainly Crown Street (the continuation of Ross Creek Road). More traffic counts and modelling may be required to determine this impact given the level of development already in place.

Estimated Costs

The review of this junction has shown a reduction to the land acquisition costs and possible adjustments to the roundabout design i.e., geometry and possible pavement design that may increase the total cost of the junction, however this would be estimated at the detailed design phase.

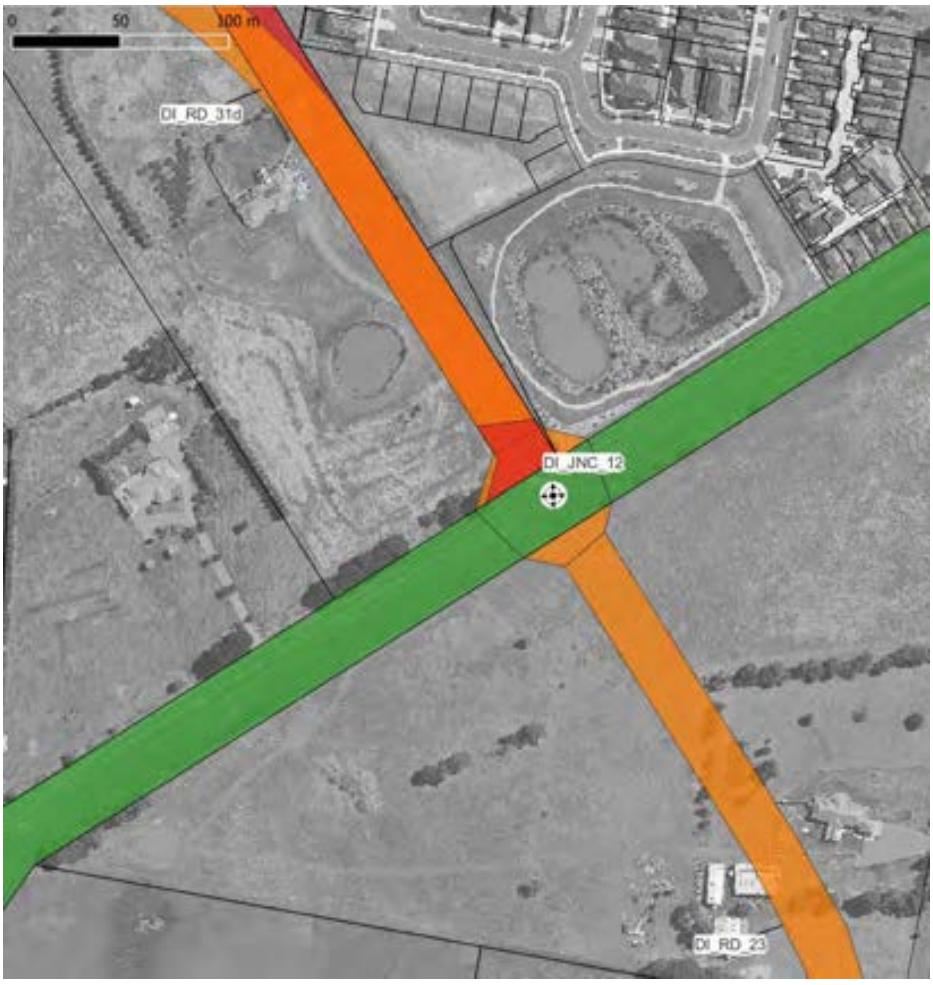


Figure 45 – DI_JNC_12 proposed alignment (orange), existing road reserve (green) and proposed re-alignment (red)

DI_RD_38 Ross Creek Road Upgrade

Ross Creek Road is an existing road with a reserve width of 30m with no plans within the DCP to widen the reserve further (Figure 47) from DI_JNC_12 and Bells Road/Three Chains Road at an estimated length of 850m, not from Tait St/Morgan St roundabout which increases the estimated length to 1080m, the additional 230m relates to DI_RD_39. The adopted road cross section profile for Ross Creek Road is Local Link Road 2 which has a minimum width of 24m.

Ross Creek Road carries a significant portion of traffic that is generated outside of the PSP, e.g., from Golden Plains Shire.

Table 51 - MCA for DI_RD_38

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed junction is at UGZ (15-20 lots/hectare) or part of the LAC.	
	3	Rezoning/ Modification to Land Use	No significant changes to date	
	4	Actual vs Planned Growth Patterns	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	There is a potential flow-on effect of underestimating the traffic generated for Schreenans Road that needs further analysis to ensure the road design is suitable	
	6	Staged Development	Ross Creek Road is already 30m wide, thus being a suitable width for proposed cross section. Adjacent developments would require service roads to be constructed on their land as part of the gifted assets process	
Project scope & cost estimate	7	Concept vs Actual Design	ESR have recommended that the cross section matches the Tait St cross-section LR3 instead of LR2, which is possible to deliver if the service roads are in the adjacent development areas	
	8	Land Acquisition	No additional land acquisition is required for the LR2 cross section and conceptually for the LR3 cross section if the service roads are in the adjacent development	
	9	Construction Costs	It is considered that building to LR2 cross section would not see any significant increase to projected construction costs.	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This section of road will have footpaths, shared paths, and cycle lanes adjacent and intersecting that will connect into the wider network.	
Project Deliverability	11	Ease of Delivery	Rated as moderate risk until LR2/LR3 cross section is resolved	

Land Acquisition

ESR has proposed that Ross Creek Road is upgraded from LR2 to LR3 to separate local from through traffic, which essentially continues the road profile found in Tait Street. ESR also mentions that the LR3 profile could be modified to suit the existing 30m road reserve, however this will most likely result in the loss of the bicycle lanes, centre turning lane, narrower nature strips and median strips, potentially negating the objectives of the PSP.

A possible approach to achieving the widened road reserve width as per ESR's report to retain all bicycle lanes, centre turning land and median strip is to ensure developers adjacent to the road, include 10m for their service roads on the southern side of Cherry Flat Road. The advantages of taking this approach are:

1. Staged/incremental approach – the current rural profile adequately services current traffic demand.
2. Properties at the southern end of Ross Creek Road are designated Public Open Space or similar – service roads are not required for this section.

The disadvantages of this approach are:

1. Missed opportunity on the northern side given recent development planning approval on the northern side, these properties directly access/face the road i.e., no service road facing these properties.
2. Additional construction costs, up to $363,000 should the LR3 cross section be employed.
3. Additional land acquisition costs, up to $482,276.

This profile would offset the land acquisition specifically for the Ross Creek Road upgrade itself. Figure 46 shows and Table 53 lists the properties on the southern side where land acquisition could take place, given planning permit approval for has been granted on the northern side of Ross Creek Road.

The recommended approach to balance access aspirations and site constraints is to maintain the existing LR2 cross section treatment, but for the PSP to strengthen support for the addition of service roads for safer connections which are encouraged as optional.

Figure 46 - properties where 10m is acquired for widened Ross Creek Road reserve (red) on the southern side.

Table 52 –properties that may be acquired for a potential widened 40m road reserve in Ross Creek Road

Address	Comment
30 Cobden Street	Land allocated for a general residential, LAC and passive open space, impacted by two DCP road projects DI_RD_38 and DI_RD_39
81 Ross Creek Road	
37 Cobblers Lane	
39 Miles Street	Significant portion of parcel will be reserved for drainage and open space – it is unlikely that a service road would be required, thus Ross Creek Road reserve would remain the current width
7 Cobden Street	Land zoned for education purposes and small section already acquired for the intersection treatment at Tait St/Ross Creek Road roundabout

Table 53 – estimated land acquisition costs for DI_RD_38

Address	Property ID	Original		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
30 Cobden Street*	97	0.00	0	0.26	130,000	-0.26	-130,000
81 Ross Creek Road	98	0.00	0	0.22	123,431	-0.22	-123,431
37 Cobblers Lane	100	0.00	0	0.15	84,208	-0.15	-84,208
39 Miles Street	101	0.00	0	0.26	144,637	-0.26	-144,637
Total		0.00	0	0.89	482,276	-0.89	-482,276

*This property is also affected by DI_RD_39, only the portion for DI_RD_38 is shown above

DI_RD_39 Ross Creek Road Upgrade

Ross Creek Road is an existing road with a reserve width of 30m with no plans within the DCP to widen the reserve further from Tait St/Morgan St roundabout and DI_JNC_12. Maps in the PSP and DCP do not clearly show this section of road given its length and some of the existing documentation refers to this section as DI_RD_38. The estimated length of DI_RD_39 is 200m which is 30m shorter than planned at 230m.

This section passes a proposed Local Activity Centre of which the existing rural-standard road cross section would not be an appropriate cross section in the long term. The issues discussed in the previous section for DI_RD_38 also relate to DI_RD_39.

The PSP describes the road and always intended to be a DCP project, even though the road was omitted from the DCP - it does not fundamentally change what the DCP delivers.

Land Acquisition

There is no additional land acquisition for the existing section of Ross Creek Road. Table 55 lists the estimated areas and land values for the impacted properties should a 40m wide road reserve be pursued as shown in Figure 46.

Table 54 – estimated land acquisition costs for DI_RD_39

Address	Property ID	Original		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
30 Cobden Street*	97	0.00	0	0.24	120,000	-0.24	-120,000
7 Cobden Street	119	0.00	0	0.05	42,848	-0.05	-42,848
Total		0.00	0	0.29	-162,848	-0.29	-162,848

*This property is also affected by DI_RD_38, only the portion for DI_RD_39 is shown above

Road Design and Costs

The proposed crossed section is to remain as LR2 as per the discussion in DI_RD_38, however there is only a minor change in the estimated length of 30m, increasing the estimated costs by $112,171 or by 14%, which is within the contingency of the original cost estimate (Table 56).

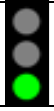
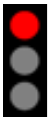
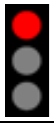
Table 55 - original and revised estimation for DI_RD_39

	Estimated Costs	Difference
Original estimation	774,279.45	
Revised	886,450.73	
Difference	112,171.27	14%

DI_RD_23 Cobden Street (North)

The existing alignment of Cobden St is redirected to the proposed DI_JNC_12 on Ross Creek Road. The creates a new 24m wide road reserve through property 97. The realignment improves the future through traffic movements and this section of Cobden Street becomes a street for the proposed shopping strip.

Table 56 - MCA for DI_RD_23

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed junction is at UGZ (15-20 lots/hectare) or part of the LAC.	
	3	Rezoning/ Modification to Land Use	No significant changes to date	
	4	Actual vs Planned Growth Patterns	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	The realignment of Cobden Street ultimately connects to DI_JNC_12 thus creating a four-arm roundabout. It is also uncertain about how the original Cobden Street alignment will connect into the new alignment. It needs to be resolved given the issues that are now faced at Di_RD_31d/Carthew Road/Settlers Drive intersection	
	6	Staged Development	Development adjacent to the proposed road would allow the road to be built to the required cross section	
Project scope & cost estimate	7	Concept vs Actual Design	LR2 cross section is considered adequate for the proposed road and the modelled traffic volumes Roundabout construction will be required when Cobblers Lane/Miles Street is similarly upgraded	
	8	Land Acquisition	PSP & DCP accounts for the extra width required for the 24 m road reserve	
	9	Construction Costs	Further detailed design is required for the intersection of the old and new Cobden Road intersection to avoid the issue that is now present at Settlers Drive/DI_RD_31d	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This section of road will have footpaths, shared paths, and cycle lanes adjacent and intersecting that will connect into the wider network.	

Group	ID	Item	Comments	Risk
Project Deliverability	11	Ease of Delivery	This project is at risk being delivered without meeting the PSP performance criteria of meeting the traffic loads at full development at the junction of the old and new Cobden Streets.	

Land Acquisition

There is one property, property 97 that is affected by the Cobden realignment, the value of the land acquisition is outlined in Table 58.

Table 57 – Land acquisition associated with DI_RD_23

Address	Property ID	Original		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
30 Cobden Street	97	0.61	305,000	0.61	305,000	0.00	0
Total			305,000	0.61	305,000	0.00	0

Road Design

The future connection to the Ballarat Link Road will also need to be part of this analysis as this would fundamentally change travel patterns in the area with more traffic potentially travelling south.

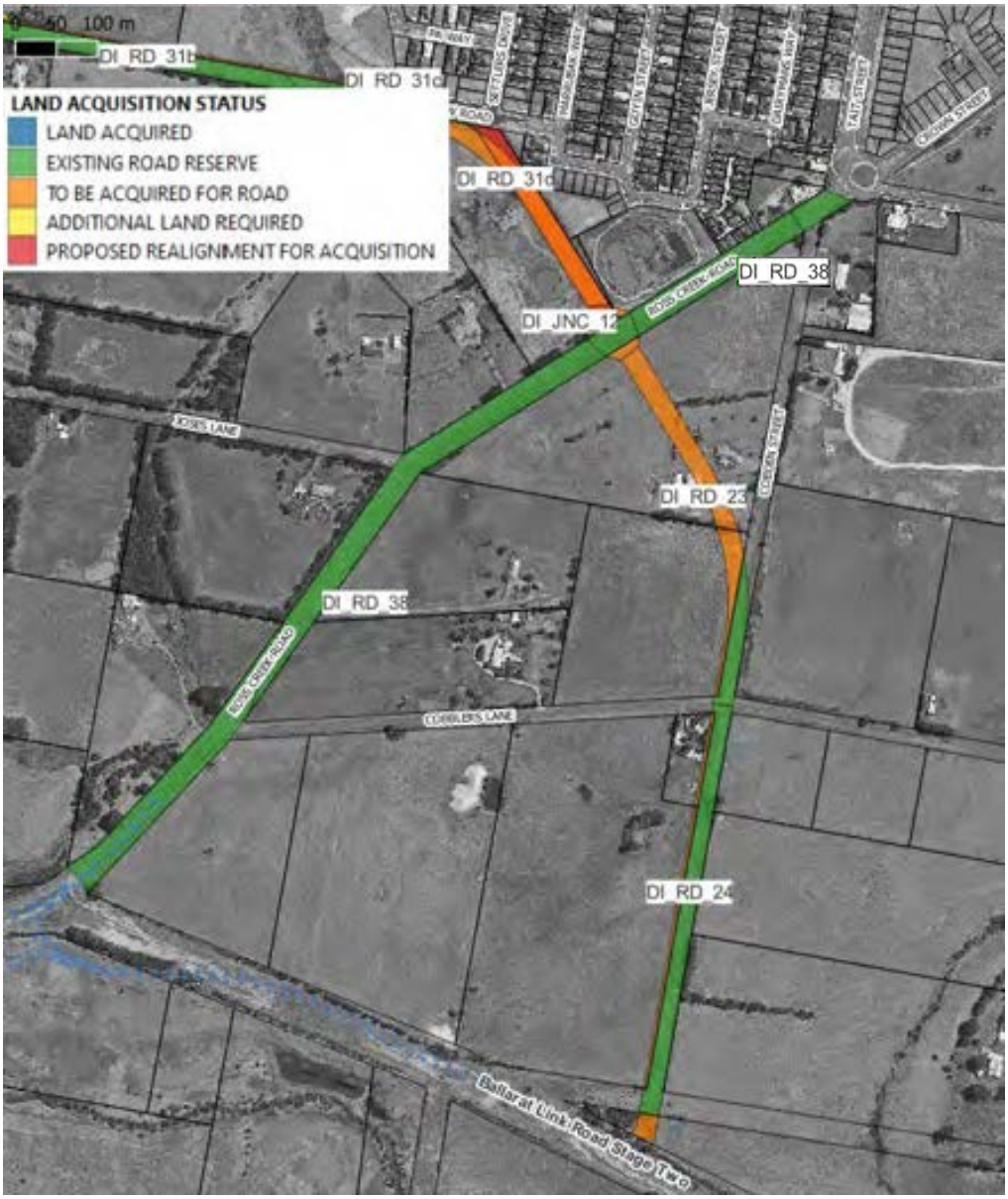


Figure 47 – DI_RD_23, DI_RD_24, & DI_RD_38 proposed alignment (orange), existing road reserve (green), proposed re-alignment (red)

DI_RD_24 Cobden Street (South)/Diamonds Road Widening

This section of Cobden Street starts at the end of DI_RD_23 through to the Ballarat Link Road. It includes the widening (and possible renaming) of Diamonds Road at the southern end (Figure 48).

Table 58 - MCA for DI_RD_24

Group	ID	Item	Comments	Risk
Growth Demand	1	Population Projections	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	
	2	Land Uptake	Development adjacent to the proposed junction is at UGZ (15-20 lots/hectare)	
	3	Rezoning/ Modification to Land Use	No significant changes to date	
	4	Actual vs Planned Growth Patterns	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	
Development Activity	5	Modelled vs Actual Traffic Movements	The trigger for the construction of this section is the Ballarat Link Road. This road was identified as one of the connecting roads.	
	6	Staged Development	Development adjacent to the proposed road would allow the road to be built to the required cross section	
Project scope & cost estimate	7	Concept vs Actual Design	LR2 cross section is considered adequate for the proposed road and the modelled traffic volumes Roundabout construction will be required when Cobblers Lane/Miles Street is similarly upgraded	
	8	Land Acquisition	PSP & DCP accounts for the extra width required for the 24 m road reserve	
	9	Construction Costs	No significant changes to the proposed road have been identified to date, Ballarat Link Road intersection treatment is not listed in the DCP to any detail	
Delivery to Council's Strategic Aims	10	Active vs Car-dependant transport	This section of road will have footpaths, shared paths, and cycle lanes adjacent and intersecting that will connect into the wider network.	
Project Deliverability	11	Ease of Delivery	This project is considered moderate risk	

Figure 48 – DI_RD_24 existing road (green) and future widening (orange)

Figure 34 shows the next development area(s) being adjacent to DI_RD_24 and is also facing Miles Street, Cobblers Lane, Ross Creek Road, and the Ballarat Link Road. The development of these areas is seen to not impact the alignment of nor the current DCP road classification LR2.

Land Acquisition

There are six properties affected by this proposed road, as detailed in Table 60.

Table 59 – Land acquisition associated with DI_RD_24

Address	Property ID	Original		Revised		Change	
		Area Excised	Excised Land Value	Area Excised	Excised Land Value	Area Excised	Excised Land Value
Cobblers Lane	99	0.26	122,710	0.13	60,230	0.13	62,480
39 Miles Street	103	0.13	51,300	0.13	51,300	0.00	0
54 Cobblers Lane	104	0.10	72,730	0.10	72,730	0.00	0
Miles Street	125	0.04	15,810	0.04	15,810	0.00	0
39 Miles Street	130	0.04	29,280	0.04	29,280	0.00	0
39 Miles Street	154	0.08	25,540	0.08	25,540	0.00	0
	Total	0.65	317,370	0.52	254,890	0.13	62,480

Road Design

As mentioned in the previous section, there is additional traffic modelling required to better understand how the proposed Ballarat Link Road will affect traffic loads along this section and whether the LR2 profile remains the most appropriate cross section profile.

DELIVERY PRIORITISATION

The selected roads and junctions in Table 3 have been analysed to determine their construction sequence to possibly assist with Council's budgeting.

Criteria used to determine the sequencing in additional to indicative timing from the geographic location of development are listed in Table 61.

Table 60 - Prioritisation matrix for PSP roads and junctions

Group	Criteria	Score	Comments/Description
Project timing	1-2 years	5	Serving existing approved development(s)
	3-5 years	2	Developments nearing approval
	6+ years	0	Future/long term development
Precinct needs	"Back-log" project	5	Adjacent development is nearing completion
	Addressing gaps/finalise network	2	Essentially the final link in a sub-precinct
	Unlocking development	0	Allows for future expansion
Delivery method	Council	5	
	Developer	2	
	DoT/DTP	0	Arterial roads are delivered outside of Council and in a manner that Council can only influence

Table 62 lists the individual scores for the outstanding DCP road and intersection projects, identifies land acquisition projects and their construction timing (sorted by construction timing). It should be noted that there are other projects that require implementation in the PSP which are not part of this table or this review.

Table 61 – Prioritisation results for studied DCP roads and intersections, excluding the Ballarat Link Road

PRECINCT	DCP ID	Planned Construct-ion Year	Timing (years)	Precinct Needs	Delivery Method	Final Score	Land Acquisition Project(s)
4	DI_JNC_02	2025	1-2	Backlog project	DTP / Council	12	DI_LA_24
4	DI_RD_03b	2025	1-2	Address gaps/finalise network	Developer	12	DI_LA_24
2	DI_JNC_08	2025	1-2	Address gaps/finalise network	Developer	12	DI_LA_22
2	DI_RD_11	2025	1-2	Address gaps/finalise network	Developer	12	DI_LA_22
2	DI_RD_12	2025	1-2	Unlocking development	Developer	10	DI_LA_22
1	DI_JNC_12	2025	1-2	Unlocking development	Developer	10	DI_LA_18 DI_LA_19
1	DI_RD_31d	2025	1-2	Unlocking development	Developer	10	DI_LA_18
1	DI_RD_23	2030	3-5	Unlocking development	Developer	7	DI_LA_19
2	DI_JNC_04	2030	3-5	Address gaps/finalise network	Council	6	DI_LA_22
2	DI_JNC_05	2030	3-5	Address gaps/finalise network	Council	6	DI_LA_22 DI_LA_23
1	DI_RD_31a	2030	3-5	Address gaps/finalise network	Council	6	DI_LA_17
1	DI_RD_38	2030	3-5	Address gaps/finalise network	Council	6	
1	DI_RD_39	2030	3-5	Address gaps/finalise network	Council	6	
1	DI_RD_24	2035	6+	Unlocking development	Developer	5	DI_LA_20 DI_LA_21
1	DI_RD_31b	2035	6+	Unlocking development	Developer	5	DI_LA_17
1	DI_RD_20	2030	3-5	Unlocking development	Council	4	
1	DI_RD_21	2030	3-5	Unlocking development	Council	4	PAO2
1	DI_RD_31c	2035	6+	Address gaps/finalise network	Council	4	DI_LA_17
1	DI_JNC_11	2035	6+	Unlocking development	Council	2	DI_LA_17 PAO2

NETWORK CONSTRUCTION COSTS AND TIMING

Previous sections discussed the land acquisition requirements, land development growth rates and traffic modelling, this information has been applied to each project to determine their indicative timing. Table 64 and Figure 49 summarises the estimated PSP costs to 2035.

Table 63 lists the original and revised costs for each of the PSP projects in this review, that in summary have increase by 14% overall.

Table 62 - Original and revised PSP project costs

PSP PROJECT	ORIGINAL			REVISED			% CHANGE	TIMING
	TOTAL PROJECT COSTS	COSTS TO DCP	COST TO COUNCIL	TOTAL PROJECT COSTS	COSTS TO DCP	COST TO COUNCIL		
DI_JNC_02	1,558,678	1,091,075	596,528	2,740,856	1,918,599	822,257	-76%	2025
DI_RD_03b	2,457,684	2,457,684	0	2,457,684	2,457,684	0	0%	2025
DI_JNC_05	1,229,044	712,845	584,516	1,574,092	912,973	661,119	-28%	2030
DI_JNC_08	1,236,678	556,505	715,895	1,501,160	675,522	825,638	-21%	2025
DI_RD_11	2,319,881	2,319,881	0	2,620,807	2,620,807	0	-13%	2025
DI_RD_12	1,391,894	1,391,894	0	1,603,652	1,603,652	0	-15%	2025
DI_JNC_11	1,137,035	761,813	394,740	1,307,962	876,334	431,627	-15%	2035
DI_JNC_12	849,827	713,855	146,633	998,821	839,009	159,811	-18%	2025
DI_RD_20	2,897,596	2,897,596	0	2,897,596	2,897,596	0	0%	2030
DI_RD_21	987,391	987,391	0	3,566,092	3,566,092	0	-261%	2030
DI_RD_23	1,396,820	1,396,820	0	1,476,664	1,476,664	0	-6%	2030
DI_RD_24	1,703,989	1,703,989	0	1,666,373	1,666,373	0	2%	2035
DI_RD_31a	1,320,047	1,174,842	170,010	1,320,047	1,174,842	145,205	0%	2030
DI_RD_31b	1,020,036	907,832	122,702	1,020,036	907,832	112,204	0%	2035
DI_RD_31c	10,788,871	9,602,095	1,189,572	10,788,871	9,602,095	1,186,776	0%	2035
DI_RD_31d	951,034	846,420	154,774	951,034	846,420	104,614	0%	2025
DI_RD_38	3,203,901	2,851,472	352,429	3,203,901	2,851,472	352,429	0%	2030
DI_RD_39	774,279	689,109	85,171	886,451	788,941	97,510	-14%	2030
Total	38,408,803	33,785,429	5,020,582	43,766,215	38,405,220	5,360,996	-14%	

As discussed throughout the review, project costs are likely to change as detailed designs and construction costs are compared to the original design intent of the PSP. The DEVELOPMENT CONTRIBUTION PLAN SCOPE CHANGES section discusses the indexation of DCP projects absorbing the cost escalation where revised project costs are within 20% of the original estimate. Of the listed projects above, four (4) projects exceeding this threshold are:

- DI_JNC_02 – changed intersection design to traffic signals.
- DI_JNC_05 – changed intersection design to traffic signals.
- DI_JNC_08 – changes to pavement design standards.
- DI_RD_21 – original estimate only considered 190m of road, not the full 750m.

The period up to 2025 has the highest land acquisition costs and considering the challenges already faced in acquiring land, may further delay some projects into the 2030-2035 period.

Two (2) other projects have proposed changes which are identified for the DCP:

- DI_RD_12 – original estimate only considered 400m of road, not the full 462m.
- DI_RD_38 / DI_RD_39 – original project split and revised with original estimate only considered 850m of road, not the full 1080m.

Table 63 – Total estimated land acquisition and construction costs for the PSP (indexed to 2021)

Construction Year	Land Acquisition Projects	DCP Land Acquisition Costs	Non-DCP Sources Land Acquisition	DCP Construction Costs	Non-DCP Sources Construction Costs	Total Costs
2025	DI_LA_18, DI_LA_19, DI_LA_22, DI_LA_23, DI_LA_24	2,827,224	124,367	10,961,693	1,912,320	15,825,604
2030	DI_LA_17, DI_LA_19, DI_LA_22, DI_LA_23, PAO2	1,109,439	67,969	14,390,893	1,718,069	17,286,369
2035	DI_LA_17, DI_LA_20 DI_LA_21, PAO2	461,698	32,813	13,052,634	1,730,607	15,277,753
Total		4,398,362	225,149	38,405,220	5,306,996	48,389,726

Note: not all portions of the land acquisition project need to be completed at once

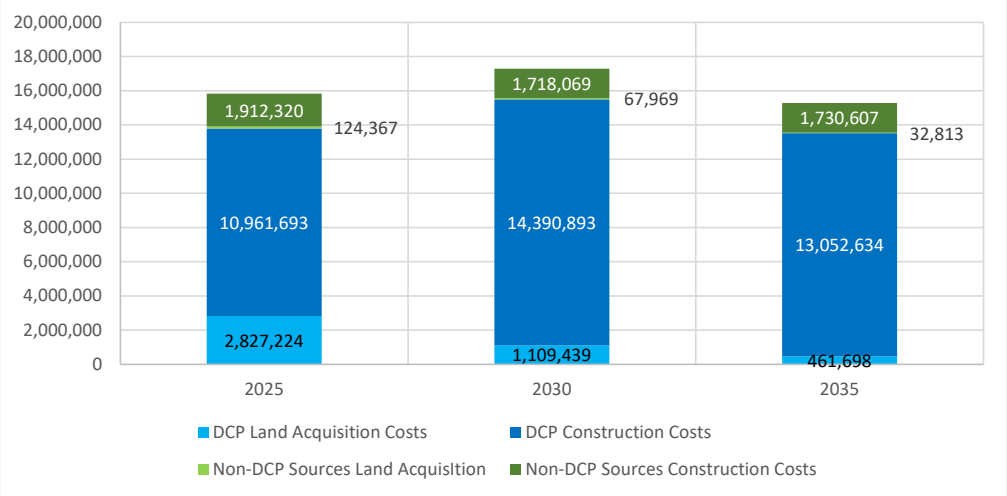


Figure 49 – Chart of total estimated land acquisition and construction costs for the PSP

Figure 51 maps each project listed in Table 64, where in general, the more immediate projects are closer to the activity centres and schools proposed in Ballarat West (marked orange).

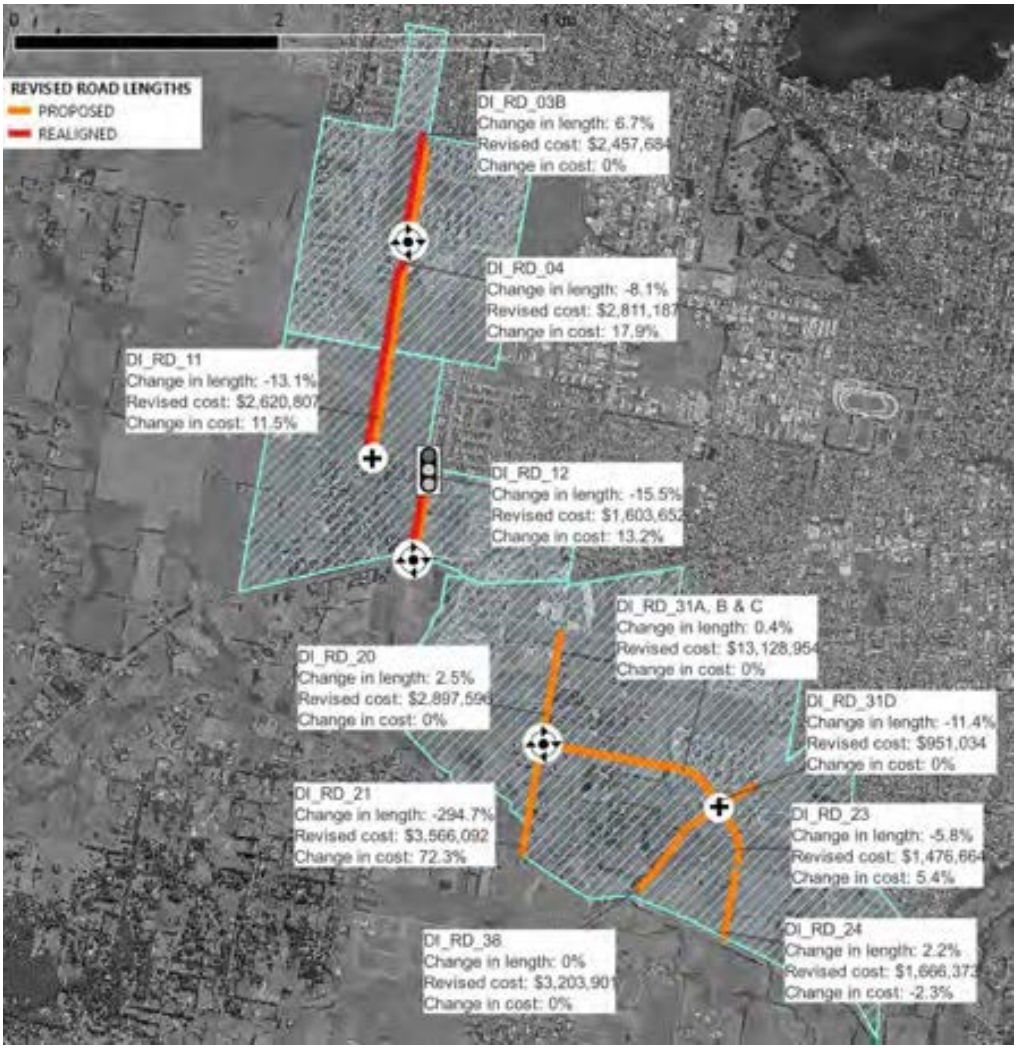


Figure 50 - Revised lengths and costs for studied roads.

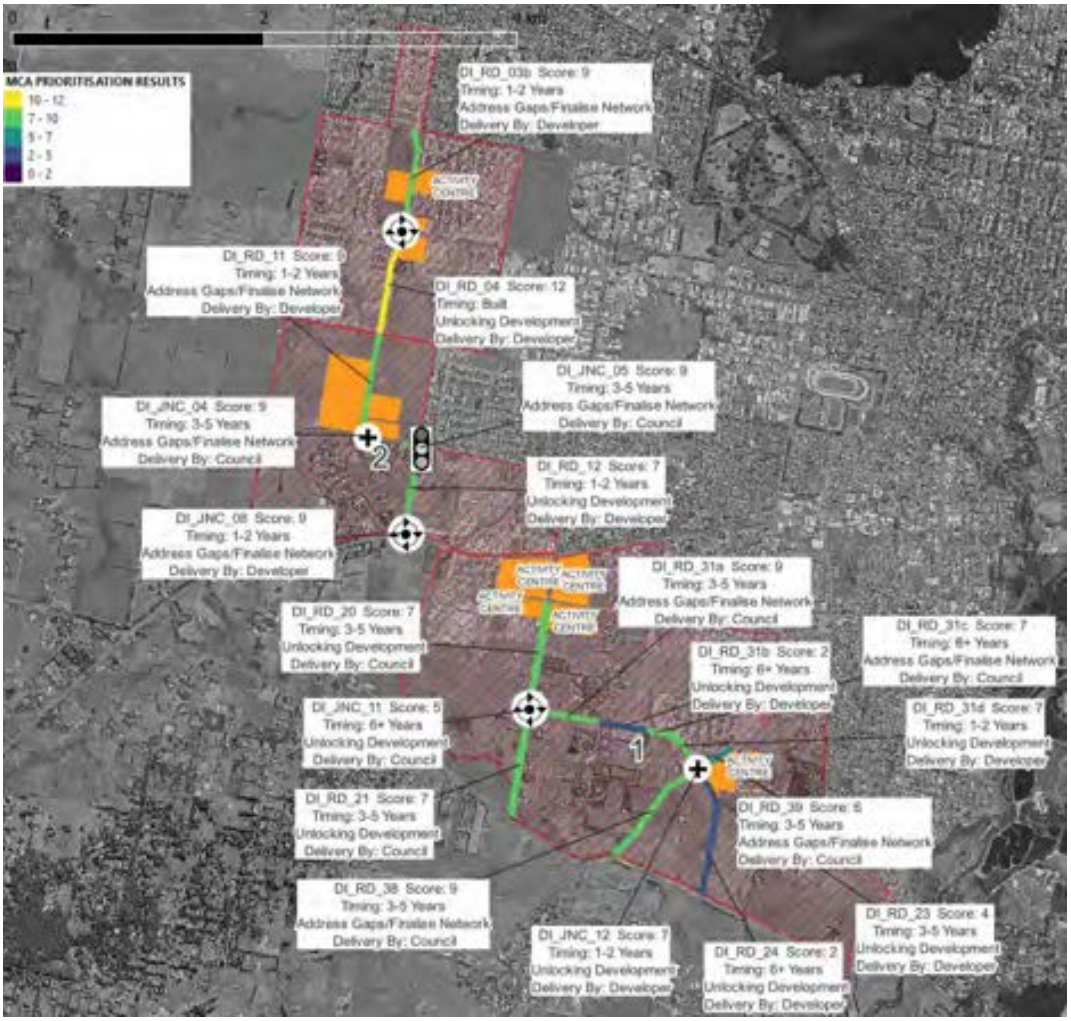


Figure 51 - map of each scored project

FINDINGS AND RECOMMENDATIONS

SUMMARY OF FINDINGS

This study has reviewed 17 road and intersection projects in the Ballarat West Precinct Structure Plan (PSP) area which also form part of the Ballarat West Development Contributions Plan (DCP). The review has:

1. Reviewed the project scopes and consider them appropriate for the precinct development, except for:
    a. DI_JNC_02 – changes in N_S road approach alignments necessitating changing from roundabout to traffic signals.
    b. DI_JNC_05 – change from roundabout to traffic signals given land acquisition challenges.
    c. DI_JNC_08 – changes in pavement design and relocating existing services.
    d. DI_RD_12 – revised road lengths given changes to intersections at each end from 400m to 462m section of road.
    e. DI_RD_21 – revised road length, original estimate only considered duplicating 190m to 750m section of road.
    f. DI_RD_38 / DI_RD_39 – revised road length, original estimate only considered duplicating 850m to 1080m section of road.
2. Determined the most appropriate intersection control solution between a roundabout and a signalised intersection considering the safety and efficiency of pedestrian and cyclists as well as motor vehicles.
3. Verified all selected road length measurements and corrected where applicable.
4. Costed the road and intersection projects considering the scope and the corrected lengths.
5. Identified the current DCP land acquisition projects are adequate to deliver the projects.
6. Reviewed the delivery timing of the selected projects.
7. Confirmed the adopted road cross sections are still appropriate for the project demand/use and have indicated that additional traffic modelling is required certain roads and junctions.

ADDITIONAL TRAFFIC MODELLING

Part of this study has been to identify whether additional traffic modelling, by ESR, is required to confirm the PSP's original assumptions still apply, this is to ensure the future road network caters for the projected traffic volumes (i.e., vehicle, pedestrians, cyclists, e-scooters etc).

ESR reviewed all available data, with reference to the 2020 Ballarat Integrated Transport Action Plan. This document includes a technical reference with future traffic volume forecasts for Ballarat, defined in the report "Victorian Integrated Transport Model (VITM) – City of Ballarat Phase 4: Preferred Scenario", by AECOM Australia, dated 02/03/16.

Based on ESR's findings, further traffic modelling is not warranted given, the main findings of the report are:

1. Apparent double-counting of traffic, especially at the Delacombe Town Centre and possibly at the smaller NAC/LACs.
2. The changing of individual intersection designs would not significantly change how the overall network operates.

DETAILED DESIGNS

It is recommended that detailed designs delivered by Council for the following roads and junctions:

1. Cherry Flat Road:
    a. Continuing the duplication of DI_RD_20 to Schreenans Road,
    b. Junction of Cherry Flat Road and Schreenans Road and
    c. Design DI_RD_21
2. Ross Creek Road (between Morgan Street and Joses Lane) – to support the development on the northern side Ross Creek Road.
3. Schreenans Road bridge (DI_RD_31c) – it was assumed that a single span bridge is required, however there are other design options that may reduce the cost of this crossing. This should also consider DI_RD_31d and any changes in alignment proposed with development.

It is recommended that Council advocates for DTP to complete the Carngham Road Duplication/Presentation Boulevard/N-S Collector Road design based on traffic signalisation using the 70km/h design speed.

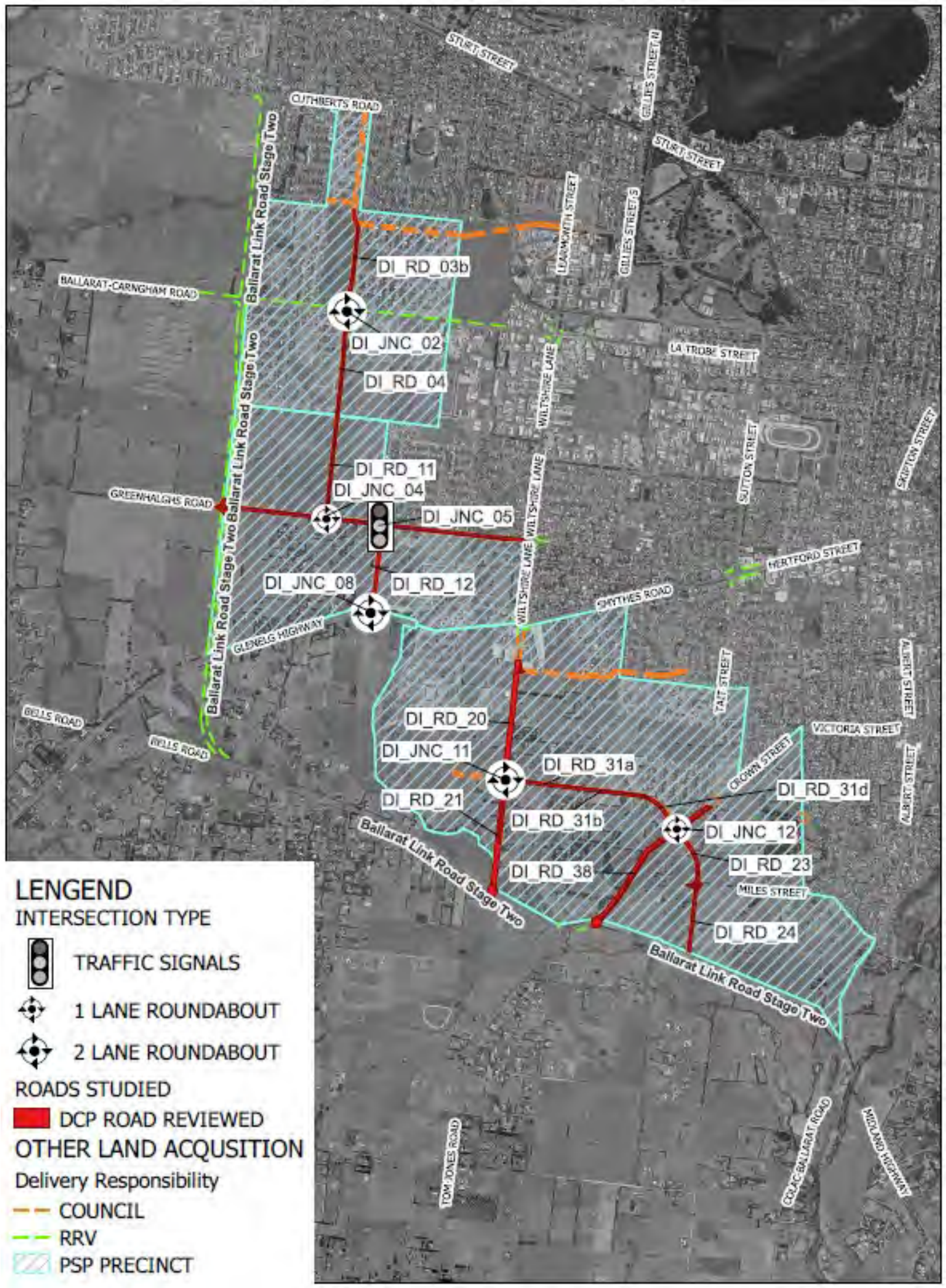
NETWORK CONSTRUCTION COSTS AND TIMING

Previous sections discussed the land acquisition requirements, land development growth rates and traffic modelling, this information has been applied to each project to determine their indicative timing. Table 64 and Figure 49 summarises the estimated PSP costs to 2035.

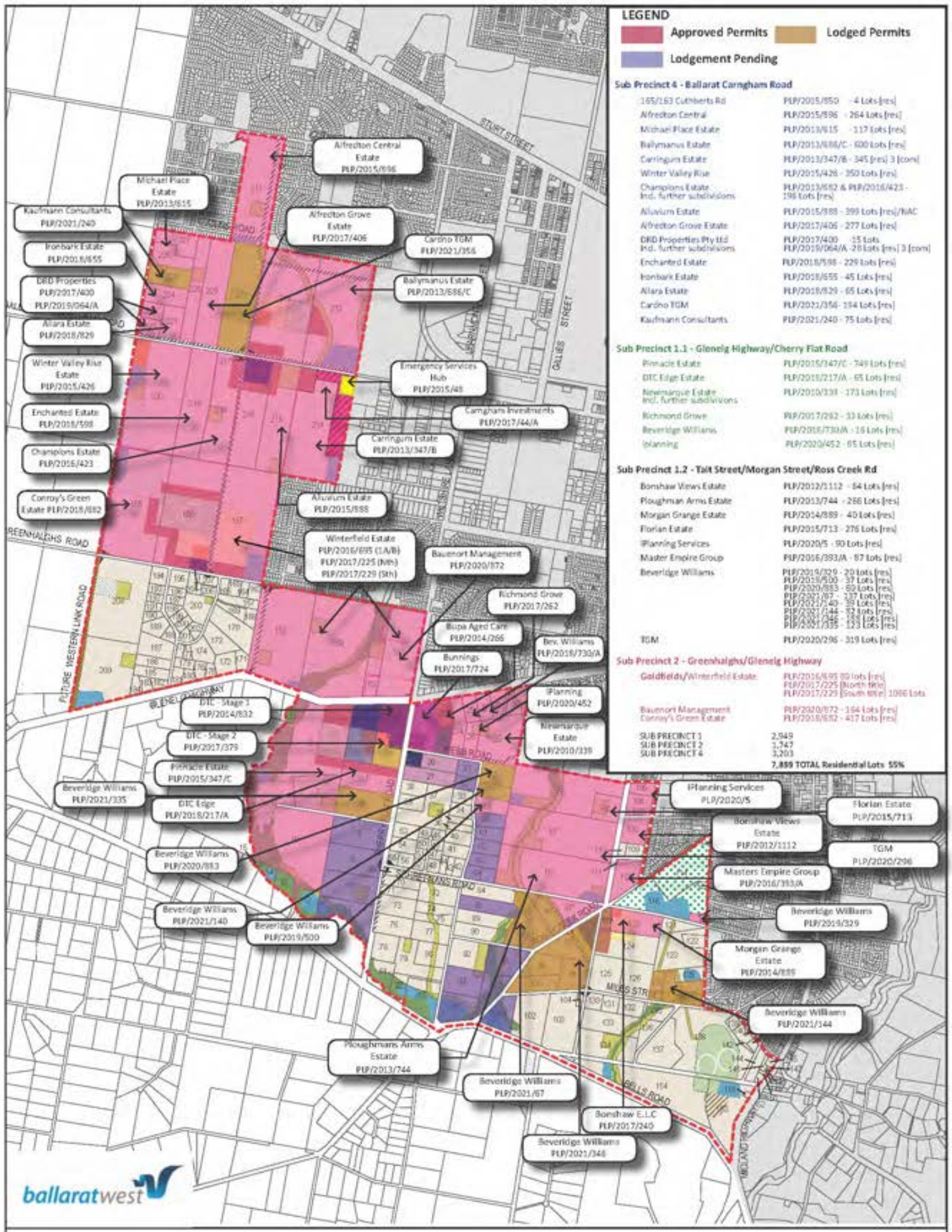
The DEVELOPMENT CONTRIBUTION PLAN SCOPE CHANGES section discusses the PSP will absorb the cost escalation where revised project costs are with 20% of the original estimate.

APPENDICES

APPENDIX A. PROPOSED ROADS ASSESSED



APPENDIX B. Development Status within Ballarat West Precinct Structure Plan



BALLARAT WEST PRECINCT STRUCTURE PLAN PLANNING PERMITS
June 2021

APPENDIX C. ESR Report

BALLARAT WEST PRECINCT STRUCTURE PLAN REVIEW

Transport Assessment Report

DRAFT

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DOCUMENT CONTROL

Date: 22/03/23
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PREPARED FOR

CITY OF BALLARAT

DISCLAIMER

Contents

1 Introduction

1.1 Overview

The Ballarat West Precinct Structure Plan (PSP) was gazetted on 1 November 2012. It provides a comprehensive framework for the future development of the Ballarat West Growth Area. Prepared alongside the PSP was a Development Contributions Plan (DCP) defining developer funded infrastructure. The City of Ballarat (Council) periodically reviews the PSP and DCP.

ESR Transport Planning has been engaged to inform a PSP review regarding transport infrastructure.

Our study scope has included reviewing traffic forecasting that informed the PSP, the road network layout and cross sections, as well as intersections. The review considers infrastructure within or adjacent the PSP Growth Area and is focussed on road network infrastructure. This review is made in the context that much of the Growth Area development has already occurred, and therefore modifying planned road infrastructure should only be in response to significant issues or for significant benefits.

Technical analysis and assessments are set out in report Sections 2, 3 and 4. Recommendations are set out in Section 5.

1.2 Referenced Information

Documents

- Aecom Australia, 02/03/16, *Victorian Integrated Transport Model - City of Ballarat Phase 4: Preferred Scenario*.
- Austroads, 2020, *Guide to Traffic Management Part 3: Transport Study and Analysis Methods*.
- Ballarat Planning Scheme.
- City of Ballarat, 2021 (v7), *Road Management Plan*.
- Local Government Infrastructure Design Association, 2019, *Infrastructure Design Manual*.
- SMEC Australia, 20/12/11, *Ballarat West Precinct Structure Plans Future Traffic Estimates and Road Infrastructure Requirements*.
- Victorian State Government, June 2019, *Victoria in Future 2019 (VIF2019) Population and Household Projections*.

Drawings / Data / Information

- Australian Bureau of Statistics, Census QuickStats (www.abs.gov.au).
- City of Ballarat, Data Exchange, (www.data.ballarat.vic.gov.au)
- SMEC Australia, 19/12/11, *General Arrangement Drawings*.
- Online maps from Google, Nearmap, VicPlan, VicEmergency and Public Transport Victoria.
- Traffic volume data from the Department of Transport (www.data.vic.gov.au).
- Traffic volume data from the City of Ballarat.

1.3 Terms

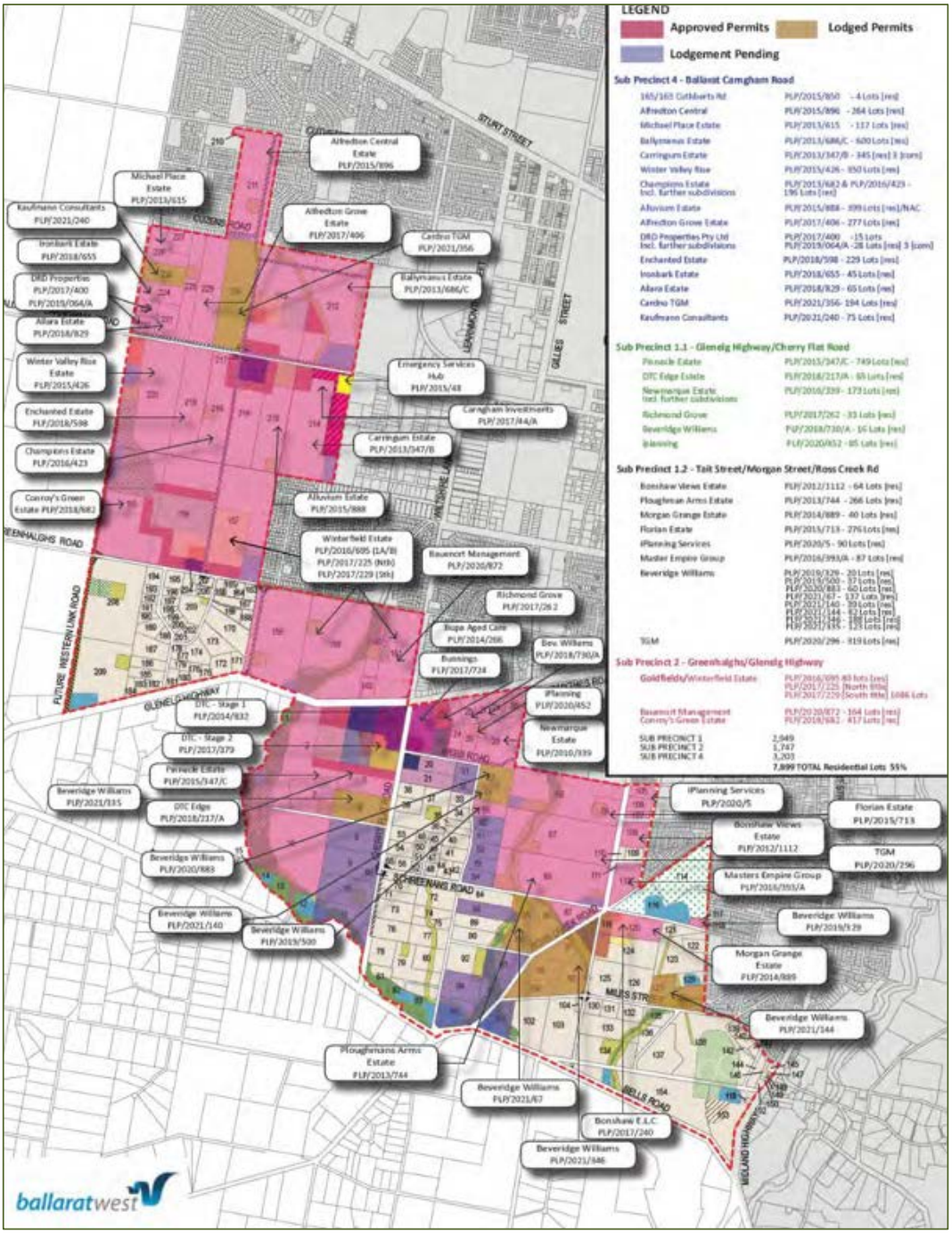
- DCP Development Contributions Plan

- DOS degree of saturation
- dwl dwelling
- IDM Infrastructure Design Manual
- LGA local government area
- MAC Major Activity Centre
- NAC Neighbourhood Activity Centre
- PSP Precinct Structure Plan
- PT public transport
- px persons
- VITM Victorian Integrated Transport Model
- vpd vehicle movements per day
- vph vehicle movements per hour

1.4 Growth Area Development Status

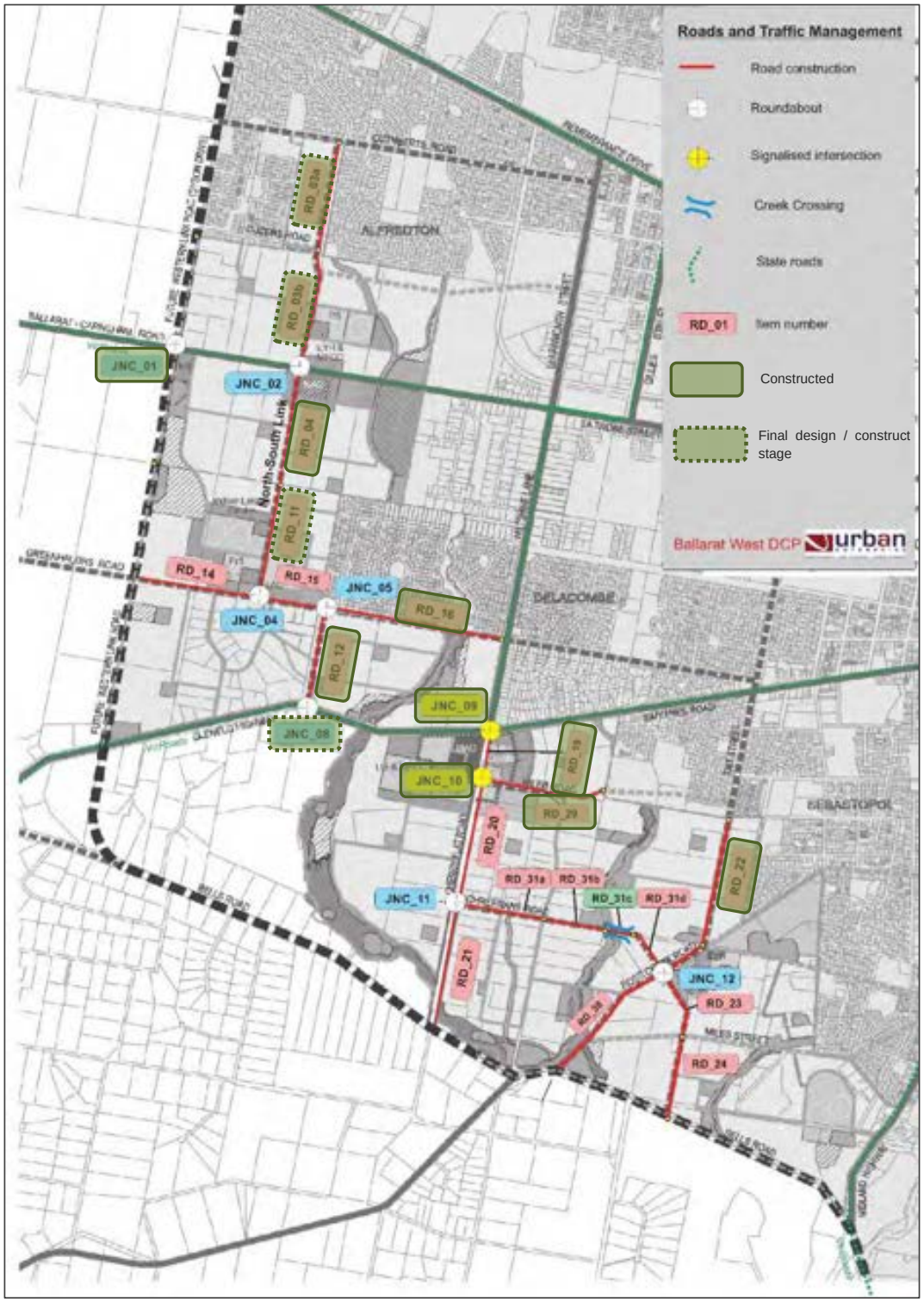
Figure's 1.1 and 1.2 define land development that has occurred or is in planning stages, along with DCP projects that have been delivered or are in final design / construction stages.

Figure 1.1 Status of Growth Area Development



Source: City of Ballarat, June 2021.

Figure 1.2 Status of DCP Road and Intersection Projects



2 Traffic Volume Forecasts

2.1 Overview

The PSP was informed by a transport study incorporating traffic volume forecasting prepared by SMEC Australia in 2011 (report: '*Ballarat West Precinct Structure Plans Future Traffic Estimates and Road Infrastructure Requirements*', 20/12/11).

Since that time, traffic volume forecasting has been undertaken as part of the Ballarat Integrated Transport Action Plan, prepared by Aecom Australia in 2016 (report: '*Victorian Integrated Transport Model - City of Ballarat Phase 4: Preferred Scenario*', 02/03/16).

2.2 Purpose of Traffic Forecasting

Strategic models such as the Victorian Integrated Transport Model (VITM) are high level tools typically used to analyse travel demand changes throughout a large area, such as Ballarat. The ability of a strategic model to accurately predict traffic volumes in a local neighbourhood is dependent on the complexity of the model and extent of model calibration for that precinct. Most often, a broad area is modelled and volumes are not regarded as an accurate prediction of future traffic along all road segments, but rather the differences between scenarios provide insight to assist transport and land use planners.

2.3 Input Parameters

Table 2.1 has been prepared to compare input parameters used by SMEC with the Aecom forecasting and current (2023) expectations. A focus of the comparison is residential trip generation given it's the predominate trip generator in the Growth Area.

Table 2.1 Traffic Volume Forecasting Input Parameters

DESCRIPTION	SMEC 2011	AECOM 2016	CURRENT EXPECTATIONS
Existing (Base) Year	none	2013	
Future Years	2031	2021, 2031, 2041	
Geographic Extents	Ballarat West Growth Area	City of Ballarat Local Government Area (LGA)	
Existing Land Use	N/A	98,393 px / 39,672 dwl	Census data (LGA) px: 93,501 (2011) 101,686 (2016) 113,763 (2021)
Future Land Use (General)	+11,099 dwl (based on 15 lots / Ha) / +26,640 px	+12,700 dwl / +30,490 px / 128,886 px (2031) +18,630 dwl / +44,720 px / 143,115 px (2041)	Victoria in Future: 135,438 px (2031) 145,926 px (2036) +17,475 dwl / +41,940 px (2011-2031) Recent development permits and plans are in the range of 17-18 lots / Ha. It is understood new PSP guidelines set a target for 20 lots / Ha. Approximately 40% of Growth Area lots delivered, with a further 20% permitted or under construction. Additional Ballarat growth is planned within a Northern Growth Area which is to be rezoned with accompanying PSP and DCP, as well as North-western and Western Growth Areas for which strategic plans are to be prepared. The North-western and Western Growth Areas will contribute to higher traffic within the Ballarat West Growth Area (particularly along east-west routes). Refer Figure 2.2. Residential developments are anticipated south of the Ballarat West Growth Area within the Golden Plains LGA.
Future Land Use (at Locations)	No dwelling growth assumed for area of Masada Blvd (Model 2, Zone 19) with existing low density rural residential		Potential for ~980-1,300 dwellings (15-20 lots / Ha)
	No dwelling growth assumed for area of Webb Rd (Model 1, Zone 9) with existing low density rural residential		Residential estate development occurring, potential for ~900-1,200 dwellings (15-20 lots / Ha)
Traffic Generation Rates	9 vpd / dwelling, dwellings only + other land use trip generation	8.7 vpd / dwelling, all car trips + commercial vehicle trips / employee (based on reported 3.68 trips / person (98.2% car, 1.8% PT)	9 vpd is a typically adopted dwelling rate

DESCRIPTION	SMEC 2011	AECOM 2016	CURRENT EXPECTATIONS
Network	Model consisted of arterial and link / trunk collector roadways, with a layout consistent with the PSP.	Very similar model layout for the Growth Area to SMEC	Growth Area development has generally occurred consistent with the PSP planned network layout

Notes:
vpd = vehicle movements per day
[1] To determine dwellings (dwl) versus population, 2.4 persons (px) per dwelling adopted (source: 2021 Census).

Key outcomes:

- SMEC forecasting was based on 26,640 new residents in the Growth Area over the 20 years to 2031, this compares with actual population growth for the entire Ballarat LGA of 20,260 in the 10 years to 2021, and the Victoria in Future state government estimates for the entire Ballarat LGA of 41,940 in the 20 years (2011-2031). Whilst areas other than the Growth Area will accommodate some of the expected growth, it is likely SMEC forecasting represents an underestimate of eventual population growth.
- The SMEC forecasting likely significantly underestimates trip generation within the Masada Boulevard and Webb Road localities.
- From the SMEC reported summary of trip generation for all land uses, it appears the model may double count some trips, given some trips are shared between land uses (e.g. trip from a dwelling to nearby shopping / employment) and therefore should not be assigned onto the road network twice. A key location is likely to be surrounding the Delacombe Town Centre.

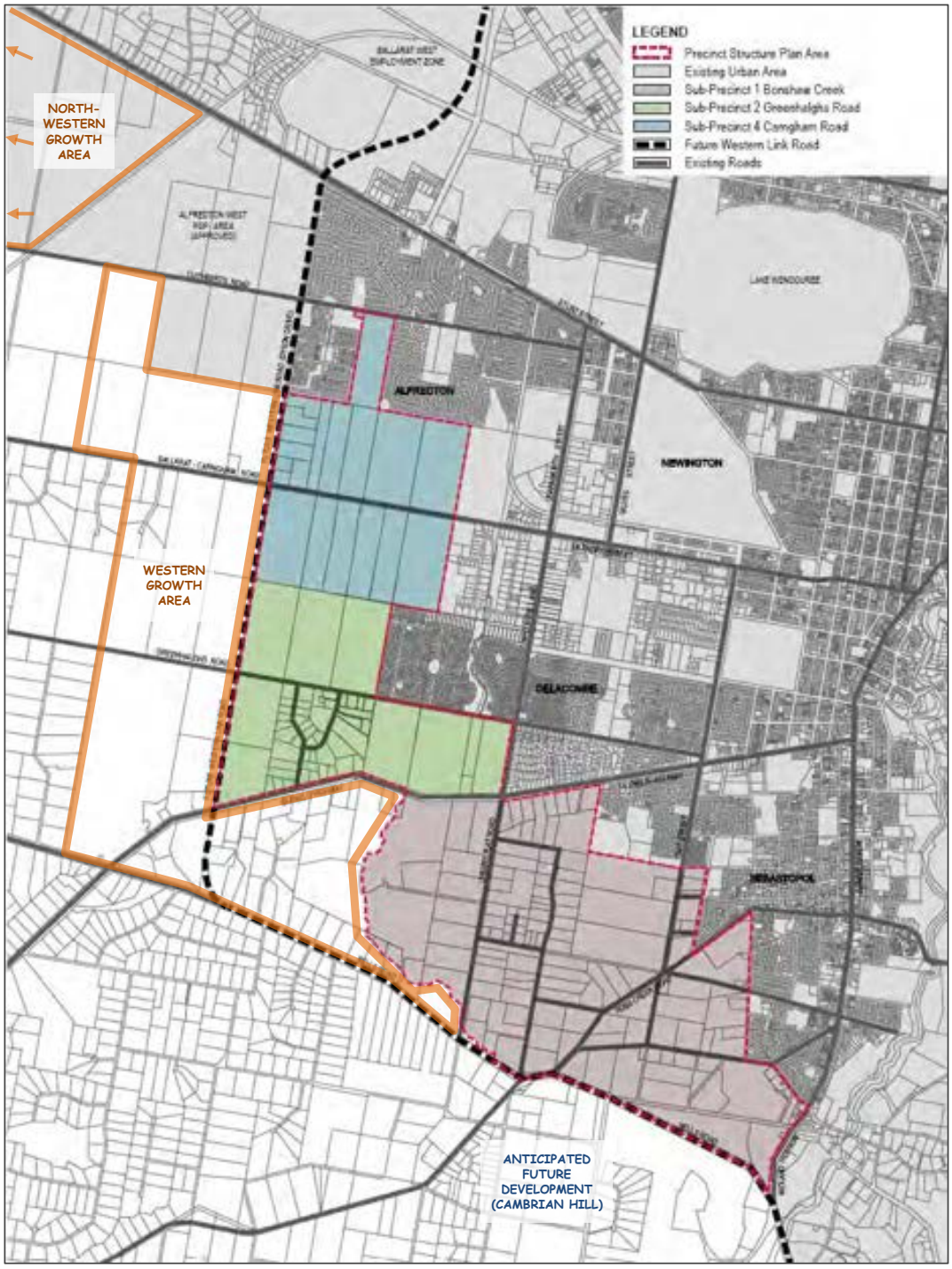
Figure 2.1 SMEC Traffic Generation by Land Use

Data source: SMEC 2011, Appendix D

Key outcomes:

- The vast majority of traffic is attributed to residential land use.
- The next highest traffic generators are 'major activity centre' (Delacombe Town Centre) followed by 'industrial'.

Figure 2.2 Nearby Future Growth Areas



2.4 Forecasting Results

Road Segments

Table 2.2 has been prepared to compare SMEC forecast daily traffic volumes for numerous road segments against existing traffic volumes (data collected in recent years) and the AECOM ultimate growth forecasts (2041).

Please note that AECOM data is only available for relatively few roadway segments in the Growth Area, so the table below is not a comprehensive assessment.

Table 2.2 Comparison of Traffic Volume Forecasts

Road Name	Segment	Existing VPD (two-way)	SMEC 2031 VPD (two-way)	VITM 2041 VPD (two-way) [1]	SMEC Difference (VPD)	SMEC Difference (%)	
Albert St	south of Hertford St	28,000	35,750	27,200	8,550	31%	
Albert St	south of Victoria St	19,000	25,000	15,000	10,000	67%	
Dyson Dr	south of Sturt St		20,500	18,400	2,100	11%	
Learmonth St	north of Winter St	14,000	20,500	7,000	13,500	193%	[1]
Wiltshire Ln	Greenhalghs Rd - Glenelg Hwy	8,600	18,750	12,400	6,350	51%	
Ballarat Link Rd	west of Cherry Flat Rd		18,750	3,000	15,750	525%	[1]
Wiltshire Ln	south of Ballarat-Carngham Rd	13,000	17,000	15,800	1,200	8%	
North South Road 1	north of Greenhalghs Rd		16,000	7,400	8,600	116%	[2]
Cuthberts Rd	west of Learmonth St	10,000	15,750	14,200	1,550	11%	
Ballarat-Carngham Rd	North South Road 1 - Wiltshire Ln		15,250	13,800	1,450	11%	
Ascot Gardens Dr	east of Cherry Flat Rd	3,700	15,000	4,200	10,800	257%	[2]
Cherry Flat Rd	north of Schreenans Rd	3,500	14,000	10,800	3,200	30%	
Dyson Dr	north of Ballarat-Carngham Rd		13,750	11,800	1,950	17%	
Greenhalghs Rd	North South Road 1 - Wiltshire Ln	1,800	13,000	6,400	6,600	103%	[3]
Tait St	south of Ascot Gardens Dr	3,000	12,500	7,400	5,100	69%	
North South Road 1	south of Curthberts Rd		12,000	4,400	7,600	173%	[3]
Victoria St	west of Albert St	6,000	11,000	10,400	600	6%	
Dyson Dr	north of Greenhalghs Rd		10,750	7,600	3,150	41%	
Ballarat-Carngham Rd	east of Dyson Dr		10,250	9,600	650	7%	
Cuthberts Rd	east of Dyson Dr		10,250	6,800	3,450	51%	
Glenelg Hwy	west of Wiltshire Ln	5,000	8,250	12,200	-3,950	-32%	
Glenelg Hwy	east of Dyson Dr	5,000	8,250	7,200	1,050	15%	
Grant St	north of Miles St	1,600	7,750	3,200	4,550	142%	[3]
Sturt St	east of Dyson Dr		7,500	9,800	-2,300	-23%	
Schreenans Rd	east of Cherry Flat Rd		7,000	2,400	4,600	192%	[3]
Ross Creek Rd	Schreenans Rd - Bells Rd	2,900	4,500	8,000	-3,500	-44%	

VPD = vehicle movements per day

Data sources: SMEC 2011, Appendix F. AECOM 2016, Figure 48 (one-way volumes doubled).

[1] Difference attributed to AECOM volumes much lower than reasonable expectations.

[2] Difference attributed to SMEC volumes much lower than reasonable expectations.

[3] Difficult to define a reason for the difference, considered reasonable to expect future volumes between these forecasts.

Key outcomes:

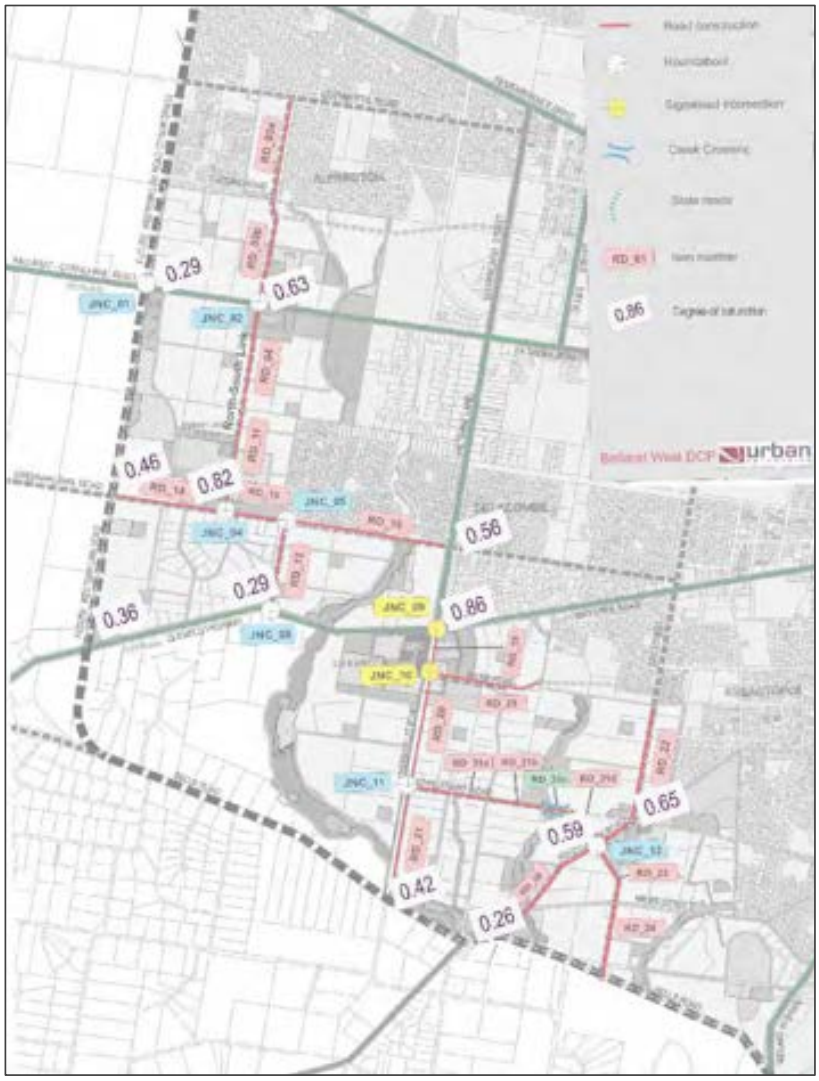
- For the most part, the SMEC forecast volumes are higher than those by AECOM. This provides some confidence that PSP roadway planning based on SMEC forecasts isn't underestimating future traffic needs. However, it is noted that some of the AECOM forecast volumes are considerably lower than reasonable expectations.
- The locations where SMEC volumes indicate a lower functional classification than AECOM are Ross Creek Road (last row of table) and the Glenelg Highway at Wiltshire Lane.
- Although SMEC adopted low density land use within the Masada Boulevard and Webb Road localities, indicating there may be an underestimation of trip generation, SMEC volumes in these areas are significantly higher than AECOM.

Intersection Volumes

SMEC forecasting was used to estimate intersection volumes that were for PSP intersection planning. The daily volume forecasts were converted to peak hour volumes using a 9% peak to daily ratio. There was no specification of the time of the peak hour, where typically intersection designs would be assessed for morning (AM) and afternoon (PM) peak periods. And it does not appear that assessments were made regarding the directional bias that occurs during AM and PM peaks. Figure 2.3 summarises the intersection analysis results for degree of saturation (DOS)[1].

[1] A regularly used performance measure is the degree of saturation (DOS) which is the ratio of arrival traffic volumes to capacity. DOS values above 0.9 are typically considered poor performance while values less than 0.6 are typically considered excellent performance.

Figure 2.3 Intersection Analysis Degree of Saturation Results



Data sources: SMEC 2011, Table 9.

Key outcomes:

- Only 4 analysed intersections have DOS results exceeding 0.6:
  - Glenelg Highway / Wiltshire Lane / Cherry Flat Road (0.86)
  - Greenhalghs Road / North-South Road (0.82)
  - Ross Creek Road / Tait Street / Morgan Street (0.65)
  - Ballarat-Carngham Road / North-South Road (0.63)
- Whilst there may be concern regarding the lack of AM and PM directionality assessed, the mostly low DOS results alleviate such concerns for many intersections.
- DCP junctions JNC_05, JNC_10, JNC_11 were not analysed.

2.5 Forecasting Review Conclusion

Given all of the above, the SMEC forecasts appear to be conservative in terms of trip generation and resultant traffic volumes, comparatively against AECOM forecasts and our reasonable expectations. So whilst there is new information indicating a significantly greater number of dwellings will eventuate in the Growth Area, the forecasts are considered to remain a useful input to road planning decisions. (Remembering that given its very nature, traffic forecasting cannot be described as correct or incorrect).

It is important that engineering judgement is adopted to define adequate road infrastructure, rather than relying solely on traffic forecasts to indicate adequacy or otherwise. And it appears this was the case when the PSP was prepared, with a conservative approach adopted. This is demonstrated by PSP intersection layouts that for most cases provide operating performance well beyond satisfactory when measured against the forecast volumes.

It is also noted that in the specific local areas where the SMEC forecasting didn't assume dwelling growth, which is erroneous compared to current expectations[2], the local road network has a layout providing similar traffic dispersal to other localities within the Growth Area.

Therefore, this forecasting review does not provide evidence of any specific inadequacy of the PSP road network.

[2] Masada Blvd (Model 2, Zone 19), and Webb Rd (Model 1, Zone 9).

3 Road Hierarchy and Cross Sections

3.1 Overview of Roadway Classifications

The City of Ballarat classify municipal urban road types as follows:

Classification	Definition
Link Roads	Roads other than Arterial roads that link significant destinations[1] and are designed for efficient movement of people and goods between and within regions. Also provide property access[2]. Link roads may consist of a number of roads which form a route.
Collector Roads	Roads other than arterial or link roads that connect a substantial number of local roads and streets to higher order roads, or to significant destinations, and provide property access and movement of traffic within local areas.
Sealed Primary Access Roads	Roads other than arterial, link or collector roads, that provide access to the street address of occupied properties[3].
Unsealed Primary Access Roads	
Sealed Secondary Access Roads	Roads other than arterial, link, collector or primary access roads that provide access to properties other than to the street address, or access to non-occupied abutting properties[4].
Unsealed secondary Access Roads	

Source: City of Ballarat, Road Management Plan.

Arterial roads are typically under the management of the Department of Transport and Planning.

Road network planning guidelines for urban residential areas specify that ideally arterial roads be provided at approximately 1.6km spacing's (one mile grid) and Link / Collector Streets approximately half way between (i.e. 800m).

Guidelines for roadway capacity specify that a 2-lane urban roadway can accommodate daily traffic volumes in the order of 15,000 - 20,000 vpd without experiencing high delays during commuter peak periods[3]. However, without flaring at intersections to provide additional lanes, it is typically intersections which form a lower capacity constraint in urban road networks.

In residential areas, it is desirable for roadways to accommodate traffic activity below an indicative maximum volume that is specified by type of roadway. Indicative maximum volumes are well below theoretical capacity, and take into account the implications of traffic activity on residential amenity and efficient intersection operation.

For residential subdivisions, the Planning Scheme and Infrastructure Design Manual (IDM) classify Collector and Access roadways as follows:

[3] Interrupted flow capacity = 900 vph lane (Austroads Guide to Traffic Management Part 3), with 10% peak to daily ratio = 18,000 vpd.

Table 3.1 Indicative Maximum Volumes by Roadway Type

ROADWAY TYPE	PLANNING SCHEME	IDM
Collector Street (level 2)	3000 - 7000 vpd	6000 - 12000 vpd
Collector Street (level 1)	3000 vpd	2500 - 6000 vpd
Access Street (level 2)	2000 - 3000 vpd	0 - 2500 vpd
Access Street (level 1)	1000 - 2000 vpd	-

[1] Two divided carriageways.

The PSP classifies road types, and assigns cross sections as follows:

Table 3.2 PSP Classifications and Cross Section Allocation

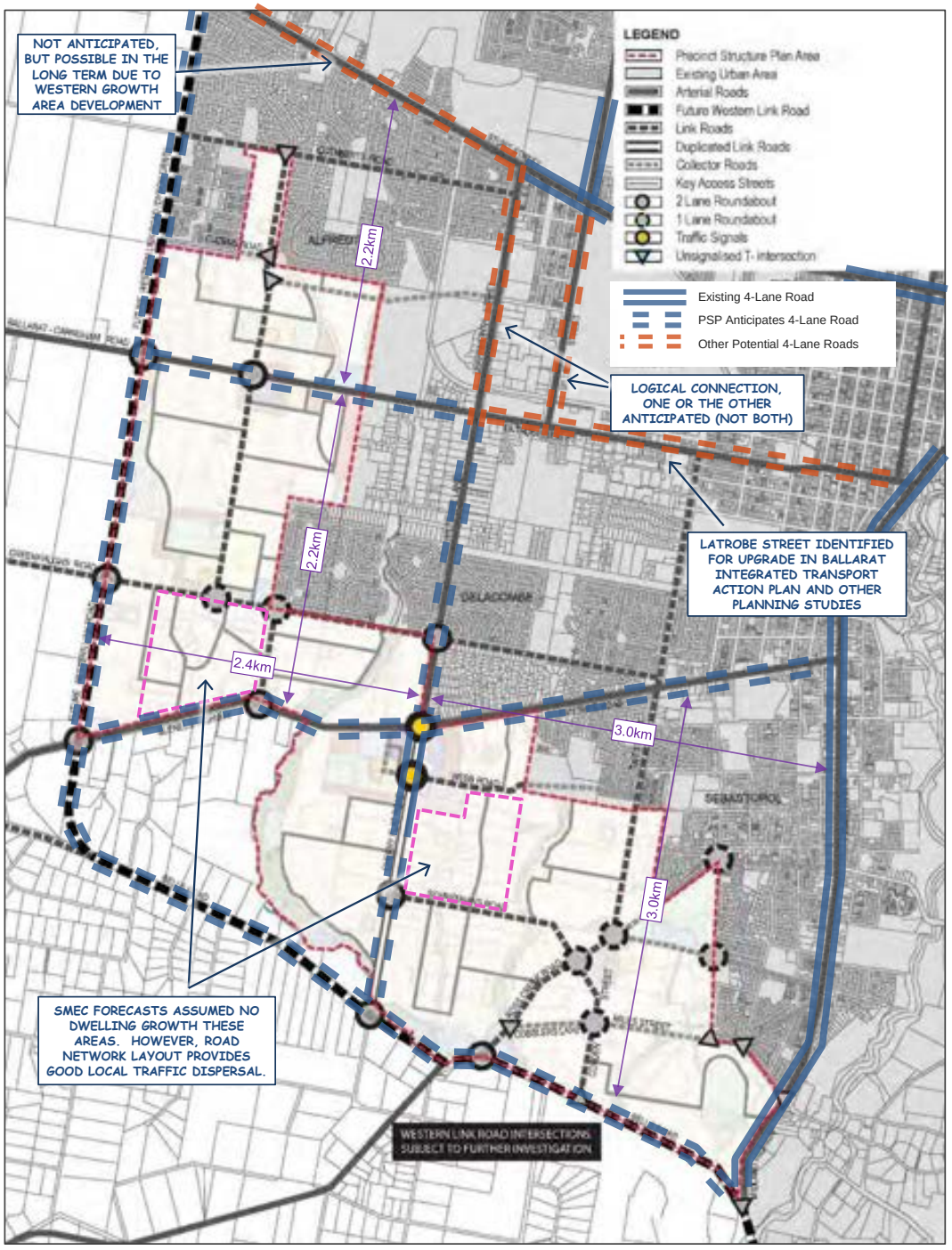
CLASSIFICATION	CROSS SECTIONS
Arterial Roads	(unspecified)
Future Western Link Road Link Roads Duplicated Link Roads	LR1 -> DLR2 LR2 & LR3 LR2 -> DLR1/2
Collector Roads Key Access Streets	CS1 & CS2 (unspecified)

It is noted that a Duplicated Link Road (DLR) has a higher functionality than a Link Road (LR), and could therefore be listed above it within PSP documentation.

3.2 Network Layout and Hierarchy Overview

Figure 3.1 shows the PSP road network plan highlighting future 4-lane roadways.

Figure 3.1 Layout of 4-Lane Roadways



Key outcomes:

- The layout of the PSP's 4-lane roadways provides an even spatial distribution for Arterials / Duplicated Link Roads (DLR). Therefore, the Duplicated Link Roads, namely Ballarat Link

Road and Cherry Flat Road will have a functional role within the network more akin to an Arterial road.

- The separation of the PSP's 4-lane roadways are slightly greater than the ideal one-mile grid in Sub-Precinct's 2 and 4, while almost double at 3.0km in Sub-Precinct 1.
- Given the spatial distribution, Key Access Streets will have a functional role within the network more akin to a Collector Street classification.

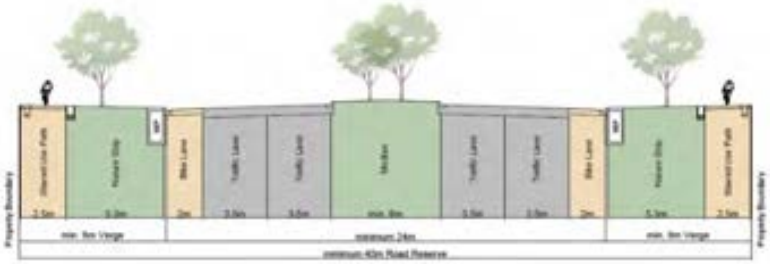
3.3 Cross Sections Overview

Whilst the PSP specifies numerous cross sections, it is noted that the Planning Scheme, Infrastructure Design Manual (IDM), and Austroads publications include extensive cross section design guidance, so it could be considered unnecessary to specify exacting cross sections, unless a roadway has uniquely local requirements. Section 5.9.3 the PSP does include text that network design to be "generally in accordance with the road cross sections in Figure 9-11", and other circumstances for implementing alternative cross section dimensions.

The PSP cross sections are shown below along with review commentary.

DLR1 – Duplicated Link Road with Verge on Both Sides

(CHERRY FLAT ROAD ONLY)



DLR2 – Duplicated Link Road with Service Road on Both Sides

(BALLARAT LINK ROAD AND CHERRY FLAT ROAD)

Comments:

- DLR1 is virtually the same as a DLR2 without service roads (and therefore positioning the shared path within the 8m verge), and is only applicable to Cherry Flat Road.

- Ballarat Link Road is only specified with a DLR2, although not all locations will have developer services roads, such as alongside reserves. In these circumstances the verge (outer separator) should include a shared path (as per DLR1).
- Given the similarities between DLR1 and DLR2, along with the similarities of Notes 1 and 2 to Table 7 regarding access management, the PSP could consolidate these cross sections into one with appropriate notations.
- It is noted that Dyson Drive, which forms the Ballarat Link Road north of Ballarat-Carngham Road, provides approximately 20m width east of the allocated 40m main carriageway land, making the cross section in this area somewhat different to the PSP.
- Service roads aren't typically separated into traffic and parking lanes, and a 5.5m width could be considered a minimum width.

LR1 – Interim Link Road with Service Road on One Side

(BALLARAT LINK ROAD ONLY)

Comments:

- The minimum 7m outer separator doesn't match the 8m specification for the ultimate (DLR1/2) cross section.
- Uncertainty regarding what should be provided left side of the carriageway (the pavement shouldn't extend to a property boundary, a verge is needed).
- Left side of the two-way traffic lanes would be better defined as an interim shoulder bike lane (without kerb), as this area will ultimately become a median.
- Service roads aren't typically separated into traffic and parking lanes, and a 5.5m width could be considered a minimum width.

LR2 – Link Road with On-Road Bike Lane

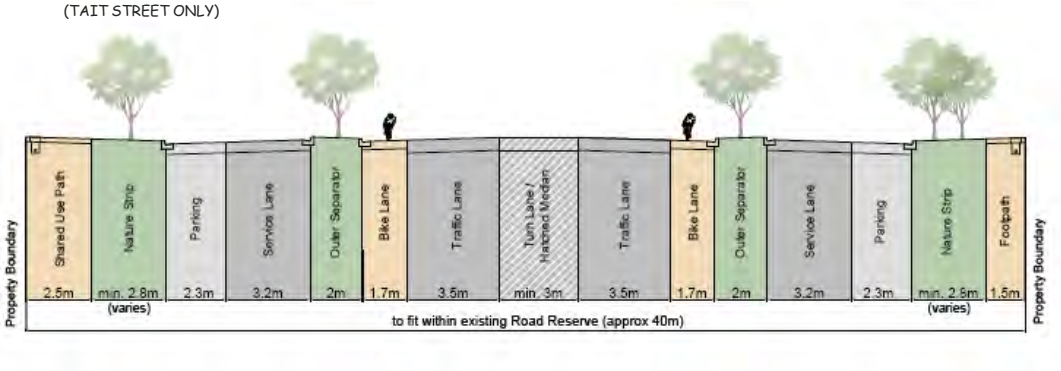
(LR2 & CS2 ARE IDENTICAL)

Comments:

- Ideal to specify parking lane as indented (or kerb outstands at intersections), to improve pedestrian safety and amenity at intersections and other road crossings.
- 3.1m traffic lanes would be sufficient[4], providing a wider verge and reducing pedestrian road crossing distances. Limiting excessive carriageway width could also provide speed management benefits.

LR3 – Duplicated Link Road with Service Road on Both Sides

(TAIT STREET ONLY)



Comments:

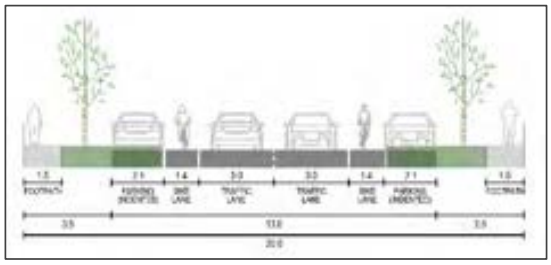
- Use of the title Duplicated Link Road is not strictly correct. A 'duplicated' roadway is a term typically used to describe roadways with separate carriageways divided by a median (not linemarking or turn lanes). It also could lead to confusion given Duplicated Link Road is the title of DLR1 and DLR2.
- Service roads aren't typically separated into traffic and parking lanes, and a 5.5m width could be considered a minimum width.

[4] Including for buses, noting Austroads Road Design Guides specify minimum widths of 3.0m lane + 1.2m bicycle lane when buses and cyclist share a 60kph roadway.

CS1 - Collector Street Constrained

Comments:

- Ideal to specify parking lane as indented (or kerb outstands at intersections), to improve pedestrian safety and amenity at intersections and other road crossings.
- Where parking turnover is low (e.g. residential frontages) a better allocation of road space would be as shown in the figure below.



CS2 - Collector Street Unconstrained

(LR2 & CS2 ARE IDENTICAL)

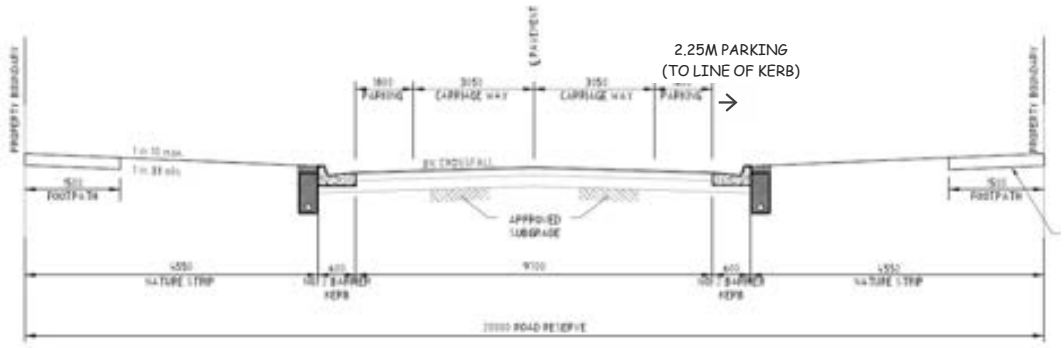
Comments:

- Ideal to specify parking lane as indented (or kerb outstands at intersections), to improve pedestrian safety and amenity at intersections and other road crossings.

- 3.1m traffic lanes would be sufficient[5], providing a wider verge and reducing pedestrian road crossing distances. Limiting excessive carriageway width could also provide speed management benefits.

The PSP lacks detail on the intent of Key Access Streets, and no cross section is defined for this road type. Council has provided a Key Access Street cross section as shown below.

Key Access Street (currently not within PSP, figure provided by City of Ballarat, Jan.2023)



Comments:

- Used extensively to date, examples include Galway Drive, Donegal Drive, Erskine Road, Wedge Tail Drive, Neway Avenue.
- Ideal to specify parking lane as indented (or kerb outstands at intersections), to improve pedestrian safety and amenity at intersections and other road crossings. Note given narrow carriageway lanes, indentation should be less than full parking lane width, such as 2.0m.

Where roadways have a side that generates very few vehicle trips, such as open space reserves (mainly utilised by local residents as active transport destinations), a car parking lane on that side can be excessive and detrimental to speed management objectives. Accordingly, it would be prudent for the PSP to add further information regarding potential local variations to specified cross sections.

Figure 3.2 Kensington Boulevard Alongside Kensington Creek Reserve

[5] Including for buses, noting Austroads Road Design Guides specify minimum widths of 3.0m lane + 1.2m bicycle lane when buses and cyclist share a 60kph roadway.

4 Intersections (and Road Crossings)

4.1 Intersection Control

The PSP shows 2 traffic signal controlled intersections, 9 dual-lane roundabouts, 7 single-lane roundabouts, and other lower traffic volume locations give-way / uncontrolled.

Research indicates fewer vehicular accidents occur at roundabouts compared to other intersections (traffic signals, stop, give-way). There can be a perception that roundabouts are less safe for pedestrians, but accident research does not provide compelling evidence of this. For cyclists, research suggests they are over represented in accidents at roundabouts.

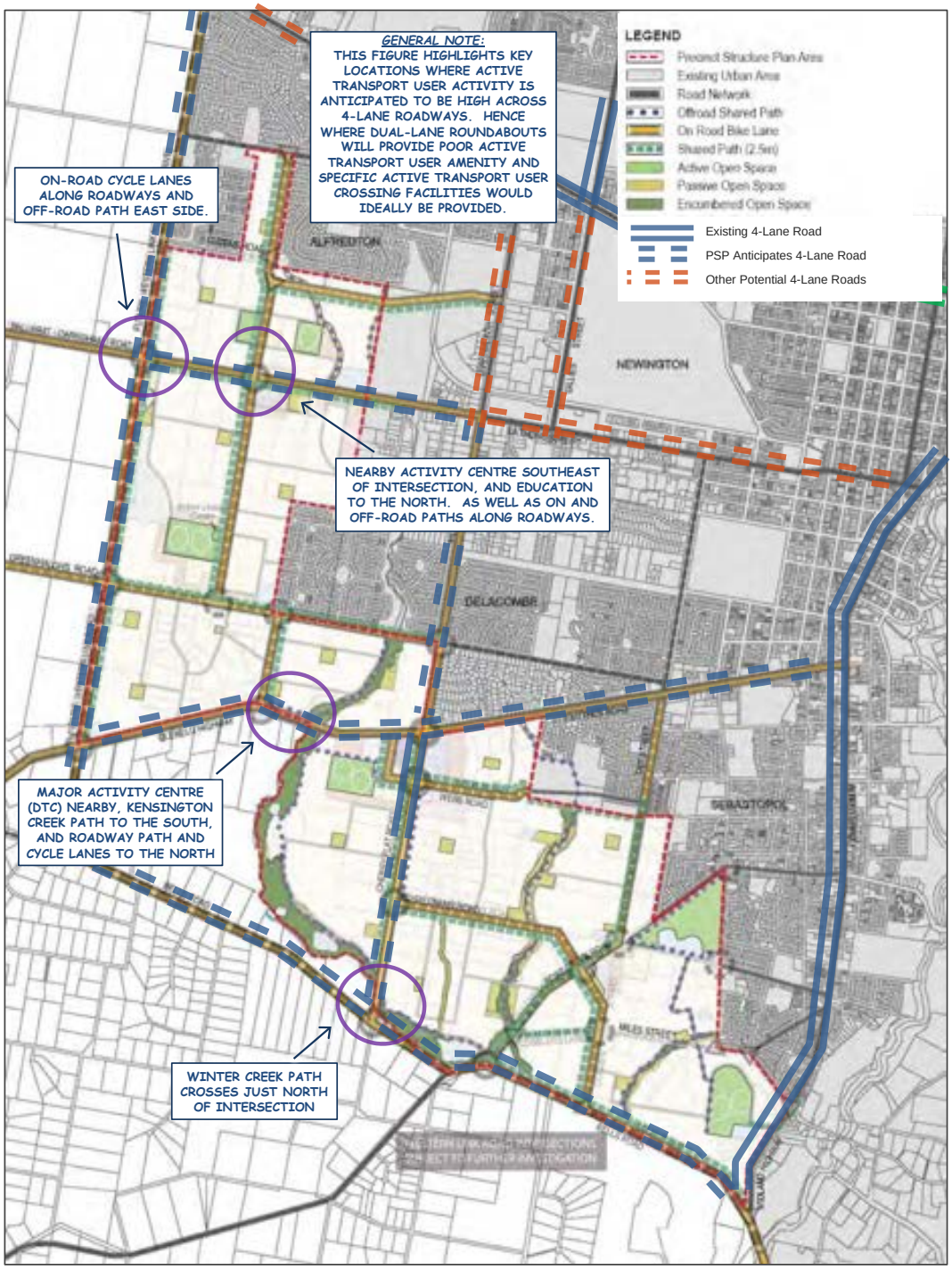
Some pedestrians (particularly the elderly, children, or mobility impaired) suffer reduced accessibility at roundabouts, especially at dual lane roundabouts, given vehicles have priority over pedestrians.

Roundabouts will generally have a greater land area requirement, so it's prudent for the PSP and DCP to set aside sufficient land for a roundabout in the knowledge either a roundabout or signals can be accommodated.

4.2 Active Transport Crossings

When selecting appropriate intersection treatments, it is important to consider the need for such intersections to provide active transport road crossings, particularly at multi-lane intersections. Therefore, Figure 4.1 shows the PSP walking and trails network plan, and how they interact with future 4-lane roadways.

Figure 4.1 Walking and Trails Network as well as Layout of 4-Lane Roadways



The PSP and DCP specify that active transport infrastructure (shared paths / trails) are the responsibility of developers to construct within each development, and this is appropriate. However, the key locations shown in the figure above highlight crossings of roadway infrastructure that are DCP project items. And whilst footpaths will be included as part of intersection

construction, standard dual lane roundabouts will not fulfill a safe and user friendly crossing for active transport users. Therefore, there may be circumstances where implementation of traffic signals as opposed to roundabouts may be a better outcome for all road users. Or in addition to a roundabout, locating crossing facilities nearby (as opposed to at the roundabout) will provide better amenity to active transport users (making it easier to determine gaps in passing traffic). Where high demands for vulnerable road users exists (children, elderly, mobility impaired), a signalised crossing may be necessary.

4.3 Cuthberts Road / North-South Road

The PSP specifies a give-way T-intersection at Cuthberts Road and North-South Road (not DCP funded), and it has now been constructed with the south approach named Sydney Way. Traffic forecasting indicates relatively large traffic volumes along these Link Roads, although the forecasting may be quite conservative. Elsewhere along the North-South Road's length, intersections with Link or Arterial Roads are specified with roundabout control and are DCP funded. A large proportion of traffic utilising Sydney Way could be anticipated to turn right towards Ballarat, and high traffic volumes and delays for a right turn movement at a give-way approach is typically the impetus for a roundabout or traffic signal intersection upgrade. Property boundaries do not provide the large chamfers / splays to accommodate a typically sized roundabout. While traffic signals will have adverse impacts to existing residential property access. Therefore, other traffic management measures may be most appropriate for safe traffic management (e.g. pedestrian operated signals adjacent, or speed management devices).

Given development in this precinct has occurred and the intersection is constructed as per the PSP, no action is required under this PSP review. However, the above has been described to inform ongoing management of the nearby road network.

5 Recommendations

5.1 Preamble

Section 5 of this report outlines specific items or matters where a modification to the PSP and / or DCP are recommended, or should be considered with further input from key stakeholders.

The analysis above has informed these recommendations, yet in some circumstances additional contextual analysis has been included below.

5.2 Road Classifications

***Recommendation 1*: If updating PSP drawings, the 'Duplicated Link Road' should be above 'Link Road' in map legends (to be consistent with the highest to lowest through traffic functionality) .**

***Recommendation 2*: The PSP refers to a 'future Western Link Road'. Stage 1 of this roadway's construction has seen it named 'Ballarat Link Road'. Changing this term accordingly would reduce confusion.**

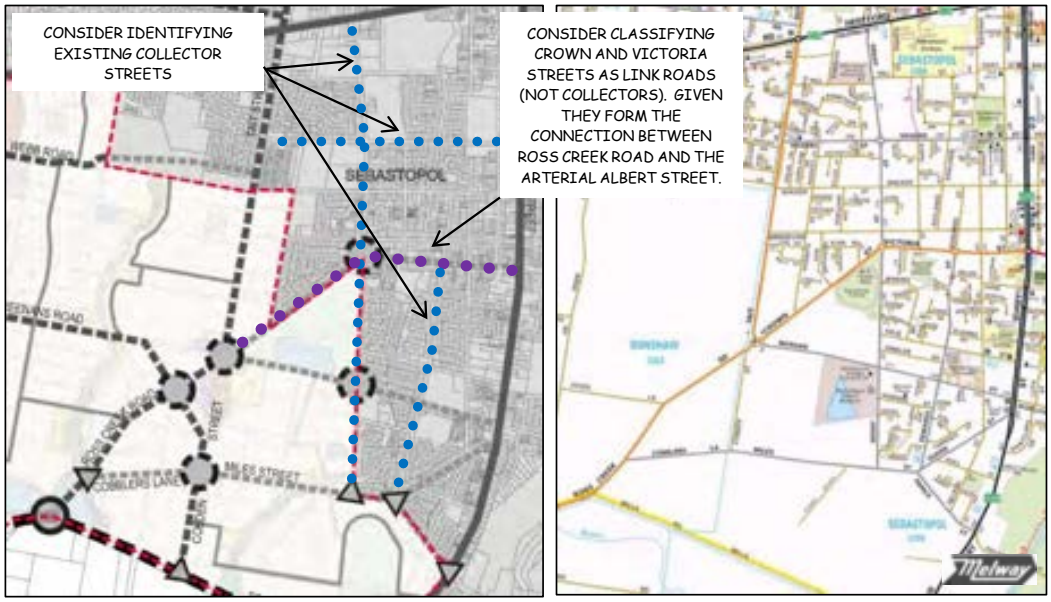
While it may not be for the PSP to nominate roadways transitioning to a future arterial classification, it is noted that Cherry Flat Road is a logical continuation of the Wiltshire Lane arterial roadway. Its designation as an arterial, along with the Ballarat Link Road, would also complete a typical grid of arterial roads (Smythes Road, Albert Street, Ballarat Link Road, Cherry Flat Road).

***Recommendation 3*: In consultation with the Department of Transport and Planning, consider a revision to the PSP adding an indication that Ballarat Link Road and Cherry Flat Road may be reclassified as Arterial Roads following long term development growth.**

Development within the Bonshaw Sub-Precinct will increase travel demands towards Albert Street (Midland Highway) and the east end of Smythes Road (Glenelg Highway), through established neighbourhoods and transport networks within Sebastopol. There is a fine grain Collector Street network in these areas such that increased traffic demands are likely to be well dispersed. The PSP has some identification of these Collector Streets, although, not all are specified as per the examples shown in the figure below.

Furthermore, given they form a continuation of Ross Creek Road, the Crown Street - Victoria Street route may function more like Sub-Arterials / Link Roads, rather than the PSP defined Collector Streets.

Figure 5.1 Sebastopol Road Network Details



***Recommendation 4**: If updating PSP drawings, ensure correct roadway classifications are shown adjacent to the Growth Area.*

***Recommendation 5**: If updating PSP drawings, consider changing Crown Street and Victoria Street to be classified as Link Roads.*

5.3 Road Cross Sections

Section 3.3 of this report outlines a range of commentary regarding PSP cross sections. Whilst wholesale changes could be made to improve the PSP, much of the Growth Area is developed and significant changes at this time could be disruptive to development planning currently underway. Also, functionality differences may be too minor to warrant making significant revisions to the PSP. Whilst all recommendations in Section 3.3 should be considered, those that are considered necessary or having significant benefit are set out as follows.

***Recommendation 6**: Remove reference to LR3 as a "duplicated" cross section, as this is not correct terminology.*

***Recommendation 7**: Modify LR1 cross section, and / or modify Note 1 to Table 7 to clarify interim cross section intent for the Ballarat Link Road.*

***Recommendation 8**: Add a notation to Table 7, or elsewhere in Section 5.9, specifying parking lanes should be indented (or kerb outstands at intersections).*

***Recommendation 9**: Include a Key Access Street cross section into the PSP, as per the design shown in Section 3.3 of this report.*

Tait Street and Ross Creek Road are approximately 1.6km from Albert Street and Cherry Flat Road, and they provide connectivity that would see them likely to function as Sub-Arterial or Link Roads in future. The PSP nominates both Tait Street and Ross Creek Road as Link Roads. Tait

Street is nominated with an LR3 40m cross section incorporating service roads for property access and a central strip to accommodate turn lanes at intersections. However, Ross Creek Road is nominated with an LR2 24m cross section without these features. This cross section poses the risks that intersections will lack the turn lanes necessary to safety and efficiently manage turning traffic demands and that property access will disrupt it's through traffic functionality.

***Recommendation 10*: It would be prudent to nominate Ross Creek Road with a cross section the same or similar to Tait Street. And to include notations similar to those for Tait Street regarding access management (e.g. minimising uncontrolled intersections).**

The PSP defines Miles Street with a CS1 Collector Street cross section (20m without cyclist infrastructure), and Cobblers Lane (the continuation of Miles Street) with a CS2 Collector Street cross section (24m with shared path and on-road bicycle lanes). Both roadways have an existing 20m road reserve. Ideally, Miles Street should have its nominated cross section changed to be consistent with Cobblers Lane. However, in Section 3.3 of this report an alternative 20m CS1 cross section is discussed that includes bicycle lanes.

***Recommendation 11*: Specify Miles Street with a CS2 cross section, or alternatively with the alternative CS1 with bicycle lanes cross section.**

5.4 Junction 02

A roundabout is planned for the intersection of Ballarat-Carngham Road / North-South Road (now named Sydney Way north approach and Presentation Boulevard south approach).

Presentation Boulevard to the south has been constructed and Sydney Way forms part of a permit approved estate. Their alignment is slightly west than envisaged by the PSP. The roundabout construction as planned requires land from neighbouring development, however, property owners to the southeast side of the intersection do not have development intentions, and land acquisition is not part of the DCP. The development that has occurred to the south, and pending to the north, triggers the roundabout's need, however, its construction is being delayed by the unavailability of land to the southeast.

The PSP specifies land to the southeast as a Neighbourhood Activity Centre (NAC). And education facilities will exist alongside Sydney Way to the north. As noted in Section 4.2 above, Ballarat-Carngham Road in this location would ideally have a safe and attractive crossing for active transport users.

The issue has been considered at length by Council and the Department of Transport and Planning as part of consideration of nearby development applications. And it is understood that the Department of Transport and Planning are undertaking project planning for the duplication of Ballarat-Carngham Road, although its construction is not funded. This planning work has included preparation of design drawings for a roundabout constructed slightly to the west which would negate the need to acquire land to the southeast, combined with a signalised pedestrian crossing a short distance east of the intersection. As well as an alternative traffic signalised intersection, including pedestrian crossings, which again would negate the need to acquire land to the southeast.

Expectations of long term traffic activity at the intersection dictates that a signalised intersection with a geometry including 2 through traffic lanes in the east and west-bound directions, and auxiliary turn lanes, could be expected to provide satisfactory operating performance.

It is the authors view that a signalised intersection represents the best transport planning outcome.

***Recommendation 12*: In consultation with the Department of Transport and Planning, revise the PSP and DCP specifying Junction 02 as a signalised intersection.**

5.5 North-South Road Cross Intersections

The PSP does not specify intersection control at 2 cross intersections between North-South Road and 2 Key Access Streets in the education precinct north of Ballarat-Carngham Road. Given previous and planned development, only 1 cross intersection will eventuate in this area. Uncontrolled cross intersections are best avoided due to safety shortcomings. A roundabout would be an appropriate intersection control (and speed management device) at this intersection and planning for the proposed development anticipates a roundabout. As a local access intersection, this is not considered a DCP project.

***Recommendation 13*: If updating PSP drawings to reflect the as built network, show a single lane roundabout at this intersection.**

5.6 Junction 05

The PSP identifies the North-South Road forming T-intersections with Greenhalghs Road, with DCP funded roundabouts (JNC_04, JNC_05). The DCP specifies that T-intersections (i.e. uncontrolled give-way intersections) will function satisfactory in the interim period prior to project triggers.

At junction 05, the south approach is being constructed as Innsbruck Road. Land north of the intersection is not within the Growth Area and has established residential properties, inhibiting construction of a roundabout as specified by the PSP. Accordingly, it is understood development planning is underway for a traffic signalised intersection.

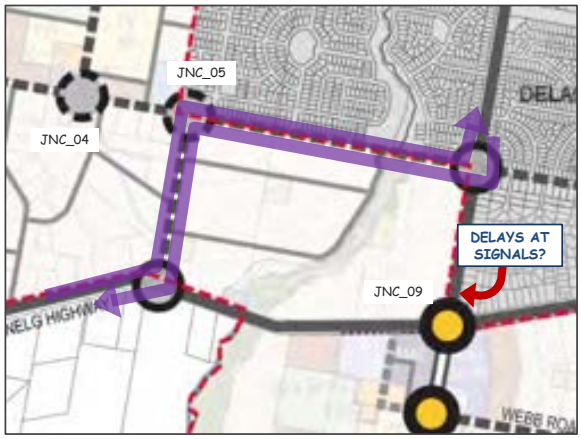
***Recommendation 14*: Revise the PSP and DCP specifying Junction 05 as a signalised intersection.**

5.7 Junction 09

A traffic signal upgrade of the intersection of Glenelg Highway / Wiltshire Lane / Cherry Flat Road (JNC_09) has recently been delivered. Whilst the PSP anticipated most approaches with double right turn lanes, single right turn lanes are currently provided, and the constructed layout may be designed for future upgrade with additional lanes.

Due to the layout of the nearby PSP road network, if motorists experience excessive delays at Junction 05, there is a risk that nearby link roads will be utilised as a short cut between the arterial roads as shown in the figure below.

Figure 5.2 Potential Short Cut between Glenelg Highway and Wiltshire Lane



The need for double right turn lanes at Junction 09, particularly on the north approach, is anticipated in future.

***Recommendation 15*: In collaboration with the Department of Transport and Planning, ensure additional right turn capacity can be implemented at Junction 09.**

5.8 Cherry Flat Road Intersections (JNC_11)

The PSP specifies a 3 approach roundabout at the Cherry Flat Road / Schreenans Road intersection, and development of land west of Cherry Flat Road incorporating Key Access Streets forming nearby T intersections with Cherry Flat Road. Roundabouts have safety benefits managing turning traffic compared to give-way intersections. So it's more desirable that development of land west of Cherry Flat Road has a Key Access Street network that includes a fourth approach to the Cherry Flat Road / Schreenans Road intersection (JNC_11). The PSP design for this intersection shows the roundabout encroaching into private land on the west side.

***Recommendation 16*: Modify the PSP to show a Key Access Street forming a west approach to the Cherry Flat Road / Schreenans Road intersection.**

Figure 5.3 Realignment of Key Access Road as Forth Approach to Junction 11

5.9 Webb Road

The PSP defines Webb Road as a Key Access Street, it currently has a 20m road reserve. The roadway provides a long central spine locally and is likely to be a highly trafficked local street. Nearby development is currently occurring and construction of Webb Road has commenced at its northern end, appearing to be a 20m Collector Street Constrained (CS1) cross section.

***Recommendation 17*: If updating PSP drawings to reflect the as built network, show Webb Road as a Collector Road.**

The PSP does not specify intersection control at the Schreenans Road / Webb Road intersection. Uncontrolled cross intersections are best avoided due to safety shortcomings. A roundabout would be an appropriate intersection control (and speed management device) at this intersection. As a local access intersection, this is not considered a DCP project.

***Recommendation 18*: If updating PSP drawings, show a single lane roundabout at this intersection.**

5.10 Schreenans Road

The PSP shows Schreenans Road extending over Bonshaw Creek, the bridge is DCP funded at an estimated cost of approximately $9M. It is understood that although there has been previous investigation into the need for and economic value of the bridge crossing, it is to remain as part of the PSP and DCP.

Schreenans Road curves between the bridge and Ross Creek Road. The PSP / DCP incorporates land for the roadways straight sections, however, the land acquisition doesn't include any chamfer / splay at the curve. Ideally a large radius curve would be provided for a through priority Link Road which would require additional land as a chamfer / splay.

The affected land to the south is subject to a planning permit application for what is known as the River Gum Rise estate.

Development of the Ploughmans Arms estate has occurred to the north. This development has implemented an intersection at the centre of the curve inconsistent with the PSP's intent, given it gives priority to a north-south aligned Key Access Street (known as Settlers Drive) rather than Schreenans Road, and that it incorporates a fourth roadway approach (known as Carthew Road).

The sketches below have been prepared to compare potential roadway layouts with a desirable curve radius and an undesirable radius if constrained by current PSP / DCP land areas.

Figure 5.4 Potential Schreenans Road / Settlers Drive Intersection Layout with Additional Land Provisions

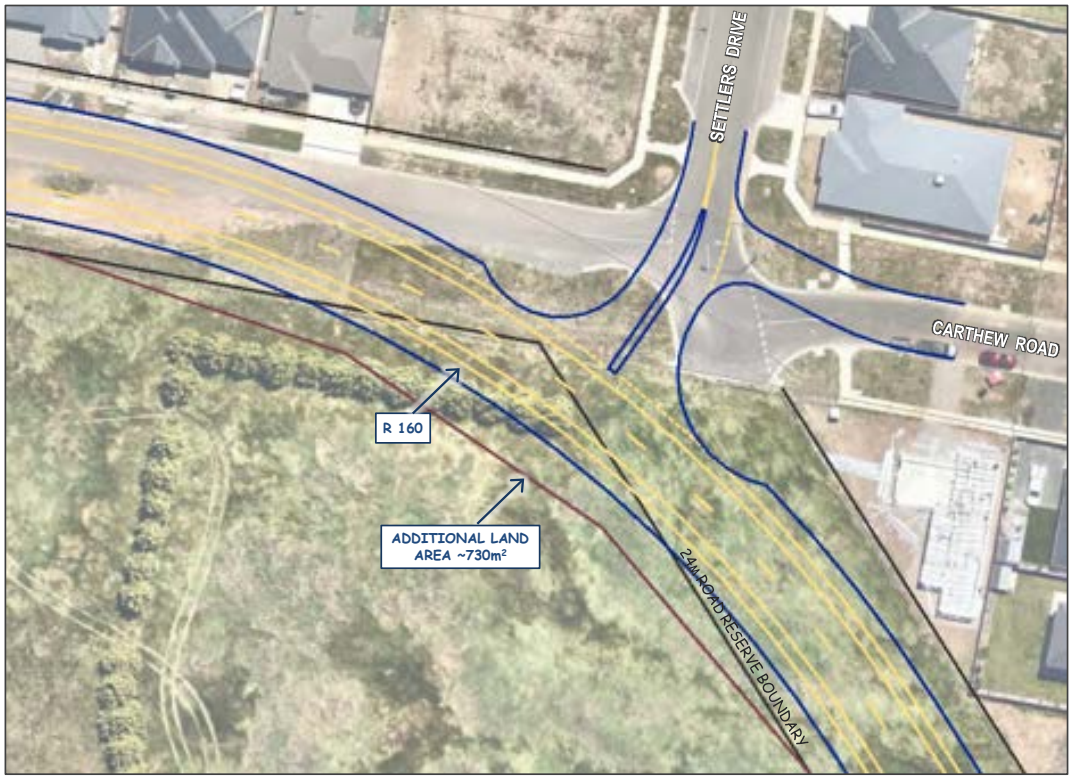
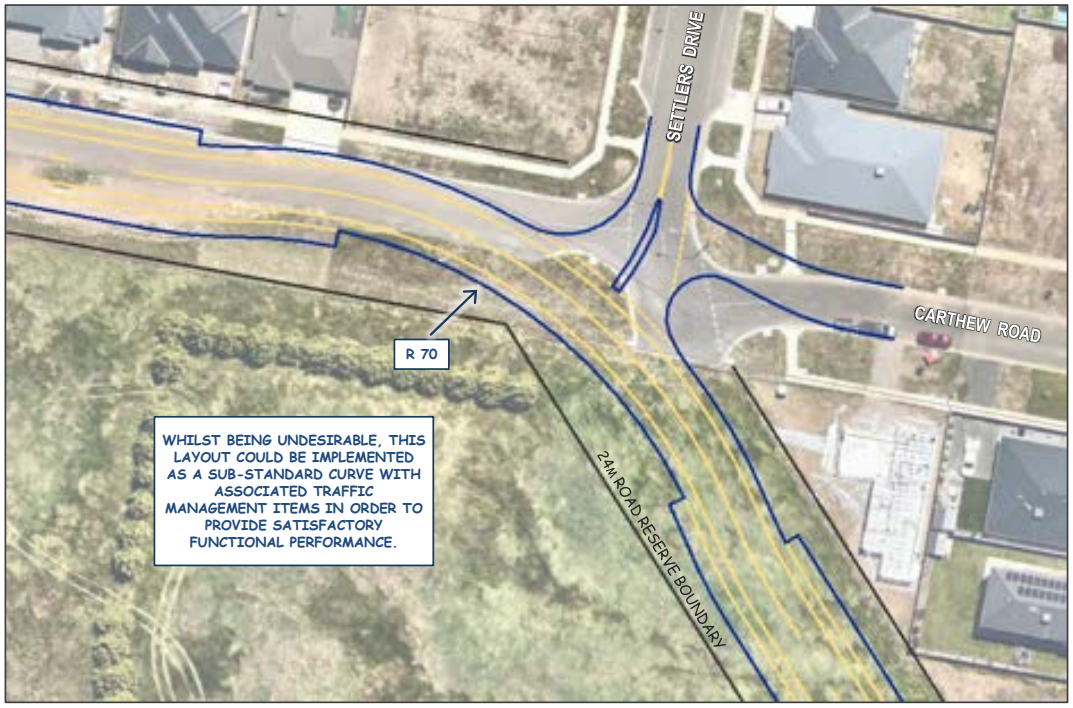


Figure 5.5 Potential Schreenans Road / Settlers Drive Intersection Layout within Current Land Provisions



It is understood that consideration is being given to the provision of a roundabout at the intersection, which would also require additional land than currently provided by the PSP / DCP, especially as the non-perpendicular approaches will pose difficulties achieving a suitable geometric layout.

***Recommendation 19*: Either via the PSP / DCP revision or other mechanism, ensure that sufficient land is available for the alignment of Schreenans Road and its intersection with Settlers Drive to achieve normal design minima geometry.**

5.11 Albert Street / Prince Street / Docwra Street Intersection

The Albert Street / Prince Street / Docwra Street intersection has recently been upgraded to traffic signal control.

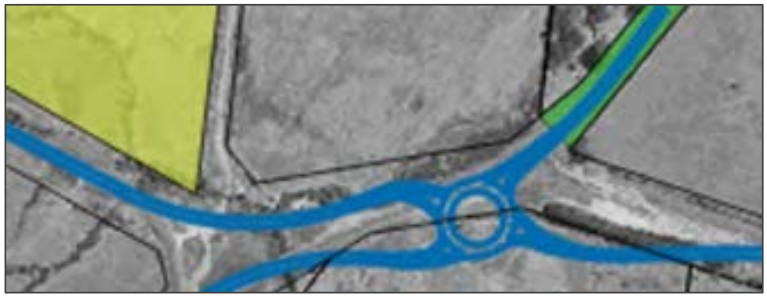
***Recommendation 20*: If updating PSP drawings, show traffic signals at this intersection.**

5.12 Ballarat Link Road, Bonshaw

The PSP states that the Ballarat Link Road intersections in Bonshaw are "subject to further investigation". The DCP does not include land acquisition or intersection works in this section of the Ballarat Link Road. Yet the provision of roundabouts along the Ballarat Link Road in Bonshaw will likely require land beyond the existing road reserves.

The following drawing of the Ballarat Link Road is taken from the City of Ballarat website.

Figure 5.6 Ballarat Link Road Plan in Bonshaw



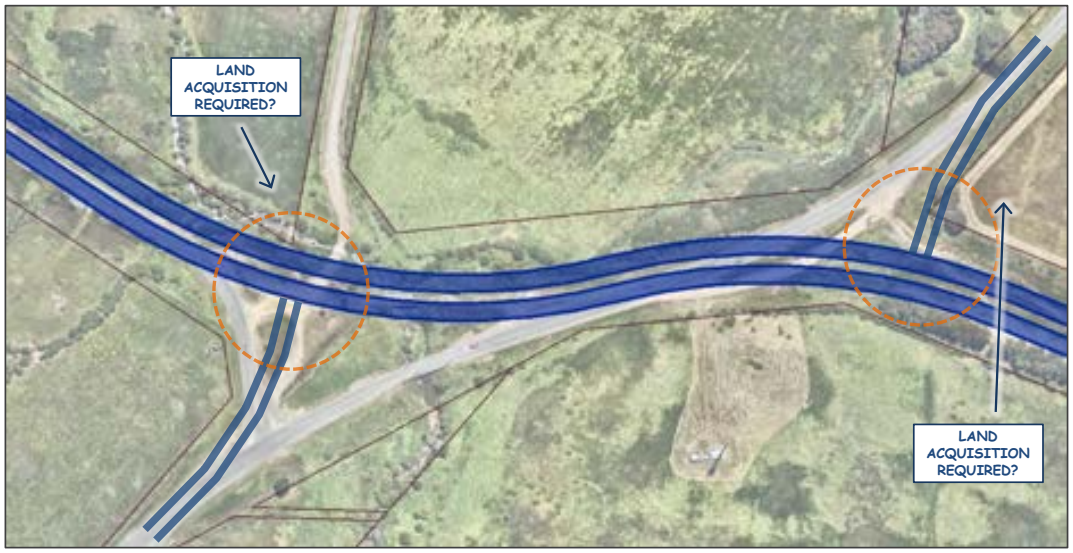
Source: City of Ballarat data exchange

Winter Creek and Bonshaw Creek traverse the area. The DCP incorporates land acquisition for drainage infrastructure (retarding basins).

Figure 5.7 DCP Drainage Land Acquisition in Bonshaw

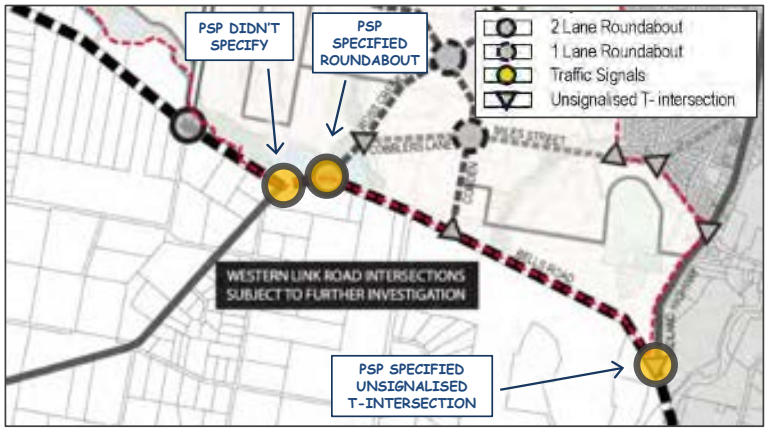
The following drawing shows that for the Ballarat Link Road to have a large radius curve at the Ross Creek Road and Sebastopol-Smythesdale Road intersections, and for those intersections to align near perpendicular, land beyond the existing road reserves will likely be required.

Figure 5.8 Ballarat Link Road Large Radius Alignment Sketch



The figure below shows what the author considers most likely to be the appropriate intersection treatment along the Ballarat Link Road in Bonshaw.

Figure 5.9 PSP Road Network Plan in Bonshaw



***Recommendation 21*: Revise the PSP to show current expectations of most likely intersection treatments along the Ballarat Link Road.**

***Recommendation 22*: Either via the PSP / DCP revision or other mechanism, ensure that in the vicinity of the Ross Creek Road and Sebastopol-Smythesdale Road intersections, sufficient land remains available for future provision of the Ballarat Link Road.**

5.13 Active Transport Crossings

Following on from the discussion in Section 4, the PSP and DCP should have further information specifying path / trail road crossings that need to be incorporated into DCP projects. Uncontrolled shared path crossings are very low cost items but their inclusion into DCP projects (if not already allowed for) will ensure a suitable active transport network is delivered.

***Recommendation 23*: For Junction 01, provide additional design direction specifying the eastern approach to incorporate a shared path crossing facility.**

***Recommendation 24*: For Junction 08, provide additional design direction specifying the provision of an uncontrolled shared path crossing located east of the intersection.**

***Recommendation 25*: For the southern end of Cherry Flat Road (RD_21), provide additional design direction specifying the provision of an uncontrolled shared path crossing located north of the Ballarat Link Road.**

Note: Active transport users at Junction 02 have been addressed as part of the recommendation above for that intersection.

APPENDIX D. PROJECT RISK MULTI-CRITERIA ASSESSMENT (MCA)

		Group	Growth Demand				Development Activity		Project scope & cost estimate			Delivery to Council's Strategic Aims	Project Deliverability
		ID	1	2	3	4	5	6	7	8	9	10	11
	PSP ID	Item	Population Projections	Land Uptake	Rezoning/ Modification to Land Use	Actual vs Planned Growth Patterns	Modelled vs Actual Traffic Movements	Staged Development	Concept vs Actual Design	Land Acquisition	Construction Costs	Active vs Car-dependant transport	Ease of Delivery
Precinct 4	DI_RD_03b	Comments	Net dwelling increase of 1,334 or 88% above the original 2014 projection and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP The neighbouring property to the east (property 213) is fully subdivided with no allowance for DI_RD_03b within this property.	Surrounding developments have their own connections to other arterial roads (Dyson Drive, Carngham Road) – this road would be built as part of the development of Lot 1 of PS807486.	The road's primary function is to connect the proposed schools with the surrounding developed areas.	Surrounding developments have their own connections to other roads – this road would be built as part of the development of Lot 1 of PS807486	It is estimated that the alignment will move approximately 35 metres westward into Lot 1 of PS807486 or Property 230.	The realignment has meant the northern arm into proposed roundabout at Carngham Road is now off-90 degrees.	Detailed design is required to understand the total project costs even though the proposed road has been marginally shortened.	The N-S road will have footpaths, shared paths and cycle lanes that will connect to the wider network	This delivery of this project is considered low risk of being further delayed given the single developer delivering the road as per PSP requirements
	DI_RD_03b	Risk score	2	1	1	1	1	1	1	1	1	1	11
	DI_JNC_02	Comments	Net dwelling increase of 1,334 or 88% above the original 2014 projection and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP The proposed NAC on the south east corner presents a challenge that the property at 163 Carngham Road would be acquired to make the intersection operate as a roundabout	This intersection would be built as part of Regional Roads Victoria's Carngham Road improvements (including duplication) coupled with the development of Lot 1 of PS807486 (PSP property ID 230).	The intersection's function is to create a safer intersection with an arterial road (Carngham Road) for the N-S connector where there are proposed schools, sporting facilities and shops adjacent to the N-S road. Current traffic movements service only the southern side where the current intersection treatment is adequate, the norther arm would, in time, require roundabout/traffic signals.	Surrounding developments have their own connections to other roads (see Actual vs Planned above)	The northern roundabout arm will move approximately 35 metres westward into Lot 1 of PS807486, Property 230 and still requires the acquisition of 163 Carngham Road for a roundabout	The realignment moves the northern arm at the proposed roundabout at Carngham Road is now off-90 degrees where splays are still required. There is the potential need to modify the intersection to traffic signals for safer pedestrian/cyclist movements at Carngham Road, this may reduce the need to acquire 163 Carngham Road or at least the only acquiring a 5x5 m splay instead of acquiring more than 50% of the property.	Detailed design is required to understand the total project costs even though the proposed road has been marginally shortened.	The N-S road will have footpaths, shared paths and cycle lanes that will connect to the wider network; there are no details about how non-vehicle traffic will safely cross intersection. VicRoads Traffic Engineering Manual discusses that car-pedestrian crash data at roundabouts is less than at signalised intersections although the perception is that it is less safe. Treatments such as raised pavements or pedestrian operated signals could be installed to reduce vehicle approach and departure speeds, however this needs to be considered as part of the wider transport network especially traffic movements around the NAC	The delivery of this project is medium risk of being delayed due to unresolved design-related issues (interface with RRV controlled road).
	DI_JNC_02	Risk score	2	1	2	3	2	1	1	2	1	2	17
	DI_RD_04	Comments	Net dwelling increase of 1,334 or 88% above the original 2014 projection and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP	Road is largely completed and conforms to the LR2 cross section as specified in the PSP.	The road's primary function is to connect the proposed schools with the surrounding developed areas.	The road has been built in stages as per the development site it is located in.	The road has generally moved westward, into property 218, property 216 no longer has portions of the road in its development area.	All land has been acquired for the construction of this road	Completed in stages by the developer	The N-S road will have footpaths, shared paths and cycle lanes that will connect to the wider network	This road is largely completed
	DI_RD_04	Risk score	2	1	1	1	1	1	1	1	1	1	11
Precinct 2	DI_RD_11	Comments	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP	The development area is currently under construction, planned development in accordance with the PSP	The yet to be built road continues the N-S collector, adjacent properties are currently under development	The Winterfield (north) development is currently in progress triggering the requirement to build the road	The road alignment has been move further west to connect into DI_RD_04, no change to the cross section design	Roads intersecting with DI_RD_11 will have splays for uncontrolled T and cross roads.	The westward realignment has no significant impact on the original cost estimates.	DI_RD_11 will have footpaths, shared paths and cycle lanes that will connect to the wider network and to the schools and public open space that are part of the Winterfield (north) development	This delivery of this project is considered relatively low risk.
	DI_RD_11	Risk score	1	1	1	1	1	1	1	1	1	1	10
	DI_JNC_04	Comments	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at the original density of 15 lots/hectare – there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP.	The development area is currently under construction, planned development in accordance with the PSP	The intersection's function is to create a safer intersection with Greenhalghs Road for the N-S connector where there are proposed schools, sporting facilities and shops adjacent along the N-S road corridor.	The junction will serve as the main entrance for the Winterfield (north) development which in time will connect with DI_RD_04 at the northern end.	The westward movement of DI_RD_11 has no significant impact on the original estimates. The northward movement of roundabout avoids the acquisition of properties on the southern side of Greenhalghs Road.	The land has already been subdivided for the splays and northward movement of the proposed roundabout.	Detailed design is required to understand the total project costs relative the DCP cost estimates, however it is likely that these increases will be relatively minor.	The Greenhalghs Road shared path is located on the northern side, minimising the need for safer crossing points until DI_JNC_05 to the east.	This delivery of this project is considered relatively low risk.
	DI_JNC_04	Risk score	1	1	1	1	1	1	1	1	1	1	10
	DI_JNC_05	Comments	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare - there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP. LDRZ property on the south western corner prevents the creation of splays for proposed roundabout	The development area is currently under construction, planned development in accordance with the PSP	The intersection's function is to create a safer intersection with Greenhalghs Road for the N-S collector and DI_RD_12.	The Winterfield's (south) development is currently in progress triggering the requirement to build the intersection	The junction has been modified from a roundabout to traffic signals to avoid acquiring land other than from Winterfield (south)	As detailed in the following discussion, there is the potential need to modify the intersection to traffic signals given the spatial constraints. There are no splays acquired for slip lanes should the junction become traffic signalled.	Replacing the proposed roundabout to traffic signals incurs a significant cost, these are detailed below.	The Greenhalghs Road and DI_RD_12 will have footpaths, shared paths and cycle lanes that will connect to the wider network. Traffic signals will allow pedestrian and cyclists to cross in a regulated manner, given the shared path does transitions from the southern to the northern side of Greenhalghs Road.	The delivery of this project is considered to be moderate risk of being delayed due to the identified solution of traffic signals instead of a roundabout.
	DI_JNC_05	Risk score	1	1	2	1	2	1	2	2	3	1	16
	DI_RD_12	Comments	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare - there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP	The development area is currently under construction, planned development in accordance with the PSP, although the road is now immediately adjacent to western property boundary	The road's function is to create a N-S collector joining Glenelg Highway and Greenhalghs Road. The adopted road profile LR2 is considered appropriate.	The Winterfield (south) development is currently in progress triggering the requirement to build the road and intersections (DI_JNC_05 and DI_JNC_08) The revised position of the road allows for future connections for the LDRZ area which is under it is own development as a future PSP by Council.	The road alignment has moved westward but is still inside property 158 (Winterfield South).	The proposed splays have been reduced or eliminated at the junctions (see DI_JNC_05 and DI_JNC_08). New splays will be required for any future western connection from the LDRZ area.	There are changes to the construction costs that can only be ascertained from detailed design and would be reflected more in the junction designs at each end.	There are changes to the construction costs that can only be ascertained from detailed design and would be reflected more in the junction designs at each end. DI_RD_12 will have footpaths, shared paths and cycle lanes that will connect to the wider network, especially the southern end where it will connect to Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	This project is considered relatively low risk of altering from the original PSP concepts.
	DI_RD_12	Risk score	1	1	1	1	1	1	1	1	1	1	10
	DI_JNC_08	Comments	Net dwelling decrease of 516 or 38% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare - there would be no significant deviation from the original assumptions for the area	Surrounding land use has remained as per PSP	The development area is currently under construction, planned development in accordance with the PSP. Minor realignment of DI_RD_12 has resulted in a minor reduction in land acquisition	The proposed roundabout is considered adequate for the current and future traffic demands, RRV have ensure the design also caters for the future possible duplication (outside of the PSP).	The Winterfield (south) development is currently in progress triggering the requirement to build the road (DI_RD_12) and the junction.	The northern arm has moved westward but there is still enough road reserve for the proposed junction.	The proposed splays have been reduced or eliminated at the junction.	Council's review of the originally estimated DCP costs and the recently awarded tender shows significant underestimation. These differences can be attributed to changed standards/construction requirements, water main relocation and changing from Council to VicRoads pavement design, more discussion as to these caused are listed below.	The proposed roundabout will have footpaths, shared paths and cycle lanes crossing points that connect to Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	This delivery of this project is considered moderate risk of being delayed due to unresolved land acquisition and design-related issues.
	DI_JNC_08	Risk score	1	1	1	1	1	1	1	1	3	1	12
Precinct 1	DI_RD_20	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side, however development will be at 15-20 lots/hectare depending on location	Surrounding land use has remained as per PSP, although the properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were considered to remain as LDRZ, when several blocks in this area are developed as residential.	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The existing duplicated road adequately serves the traffic demands of the area.	The further duplication of Cherry Flat beyond the current extent is based on the development of the western side of road, however, the area bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were not considered as a trigger for further duplication works in the PSP.	The staged development of this road would adequately serve the current and future traffic demands.	The southern end of this section terminates at a proposed roundabout (DI_JNC_11) which requires further land acquisition for the splays/roundabout. Land acquisition is a "mix" of PAO and DCP-related land acquisition.	The construction costs are largely dependent on the construction timing of the adjacent development sites. Previous section was delivered by Council instead of the developers.	This section has footpaths, shared paths and cycle lanes that connect into Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	This delivery of this project is relatively moderate risk of being delayed due to unresolved land acquisition and design-related issues.
	DI_RD_20	Risk score	1	2	2	1	1	2	1	3	1	1	15
	DI_JNC_11	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side, however development will be at 15-20 lots/hectare depending on location	Surrounding land use has remained as per PSP, although the properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road and Ross Creek Road were considered to remain as LDRZ, when several blocks in this area are developed as residential.	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The duplicated Cherry Flat Road would adequately serve the north-south traffic demands to the junction. The Schreenans Road arm cross section (LR2) was developed using the SMEC traffic modelling, however the new forth arm proposed to connect the development site on the western side warrants further investigation to understand the traffic movement impacts this new arm creates.	The further duplication of Cherry Flat Road is planned for south of the intersection. However as discussed above, the area bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road, and Ross Creek Road were not directly considered as a well-defined trigger (unlike the west side) for further duplication works.	The traffic modelling suggests that the level of service at the roundabout delivers is the best solution for the intersection. Other options, namely traffic signals would impact the overall movements and create unnecessary traffic wait times outside of peak flow periods.	The south eastern corner of the intersection has an existing Public Acquisition Overlay unlike the other land acquisitions within the PSP. While a PAO achieves the same outcome as the other land acquisitions in PSP, the process differs and the funding for this acquisition is outside the PSP and possibly not budgeted by Council.	The design standards have changed since the development of the PSP, as such, it is expected the costs for the intersection treatment to increase accordingly.	This junction will have footpaths, shared paths and cycle lanes intersecting that will connect into the wider network. May need to investigate treatments that create a safer crossing for more vulnerable users.	This project has a high number of high risk items i.e. unresolved land acquisition (PAO2/splays) and design-related issues (fourth arm and pavement design).
	DI_JNC_11	Risk score	1	2	2	1	3	3	2	3	2	2	21
	DI_RD_21	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side, however development will be at 15-20 lots/hectare depending on location	Surrounding land use has remained as per PSP, although the properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road and Ross Creek Road were considered to remain as LDRZ, when several blocks in this area are developed as residential.	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The duplicated Cherry Flat Road would adequately serve the north-south traffic demands, especially when the Ballarat Link Road is built after 2036.	The further duplication of Cherry Flat Road is planned for south of the intersection to only 190 m, however development on either side of would necessitate further duplication ~600m longer. The fragmented lot ownership/development on the eastern side warrants further investigation.	Traffic modelling is required to determine whether the remaining duplication is required	The intersection is subject to DCP-related land acquisition and PAO2 for a duplicated Cherry Flat Road. Five properties are subject to the existing PAO2, where two already have a carriageway easement over the nominated alignment. The PAO2 is not funded by the DCP and would be subject to Council/DoT funding to finalised.	Cherry Flat Road is also earmarked as an arterial road upon duplication. As such the design standards differ, could require additional funding to deliver this section of road.	This section of Cherry Flat Road has an allowance for footpaths, shared paths and cycle lanes that run parallel and would continue to connect into Ballarat's Strategic Cycling Corridor along the Glenelg Highway.	The above listed issues regarding the funding of and finalising the PAO2, 120 m of 895 m of the full length to be duplicated, this project is at risk of not meeting the aims of the PSP.
	DI_RD_21	Risk score	1	2	2	1	2	3	2	3	2	1	19

		Group	Growth Demand				Development Activity		Project scope & cost estimate			Delivery to Council's Strategic Aims	Project Deliverability
		ID	1	2	3	4	5	6	7	8	9	10	11
	PSP ID	Item	Population Projections	Land Uptake	Rezoning/ Modification to Land Use	Actual vs Planned Growth Patterns	Modelled vs Actual Traffic Movements	Staged Development	Concept vs Actual Design	Land Acquisition	Construction Costs	Active vs Car-dependant transport	Ease of Delivery
	DI_RD_31a	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side, however development will be at 15-20 lots/hectare depending on location	Properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road and Ross Creek Road were considered to remain as LDRZ, when several blocks in this area are developed as residential (15 lots/hectare), creating significant increases to traffic in the area.	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. Further analysis is required to understand how this translates to the LDRZ area is required.	The proposed road would adequately serve the traffic demands of the area, although there is uncertainty with reviewing/increasing the densities to the areas adjacent to the proposed road.	Fragmented property ownership increases the risk of ad hoc development adjacent to the road	The existing traffic modelling will need to be reviewed considering the increased housing densities in the adjacent areas from LDRZ to GRZ	The splays at the Cherry Flat Rd end have been discussed in the previous section (DI_JNC_11) which requires further land acquisition for the splays/roundabout. The widening of the road reserve on the northern side ignores the need to create splays at the Webb Road intersection for a possible roundabout (not considered in the PSP).	Subject to the traffic analysis, the construction costs are likely to increase given the increase in traffic loads and potential intersection treatments.	This section has footpaths, shared paths and cycle lanes that connect into the wider network, especially Cherry Flat Road and Delacombe Town Centre.	Given the above listed issues regarding the housing density, this project is at risk being delivered without meeting the PSP performance criteria of meeting the traffic loads at full development.
	DI_RD_31a	Risk score	1	2	3	3	2	3	3	3	2	1	23
	DI_RD_31b	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side, however development will be at 15-20 lots/hectare depending on location	Properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road and Ross Creek Road were considered to remain as LDRZ, when several blocks in this area are developed as residential (15 lots/hectare), creating significant increases to traffic in the area.	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. Further analysis is required to understand how this translates to the LDRZ area is required.	The approaching roads may adequately serve the traffic demands of the area, although some form of intersection treatment is required given the increasing the densities to the areas adjacent to the proposed road.	Fragmented property ownership increases the risk of ad hoc development adjacent to the road	The existing traffic modelling will need to be reviewed considering the increased housing densities in the adjacent areas from LDRZ to GRZ	The widening of the road reserve on the northern side ignores the need to create splays at the Webb Road intersection for a possible roundabout (not considered in the PSP).	Subject to the traffic analysis, the construction costs are likely to mirror the construction costs of DI_JNC_12.	Footpaths, shared paths, and cycle lanes are part of the cross section.	The above listed issues highlight that traffic modelling will be required.
	DI_RD_31b	Risk score	1	2	3	3	3	3	3	3	2	1	24
	DI_RD_31c	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side, however development will be at 15-20 lots/hectare depending on location	Properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road and Ross Creek Road were considered to remain as LDRZ, when several blocks in this area are developed as residential (15 lots/hectare), creating significant increases to traffic in the area.	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. Further analysis is required to understand how this translates to the LDRZ area is required.	The proposed bridge is included to address a large gap between creek crossings (i.e. Ascot Garden Drive and Joses Lane) over Bonshaw Creek. Modelling to date suggests that the bridge is not warranted until 2030+.	Cannot be staged given it is proposed to be a two-way bridge.	There are no concept designs for the proposed bridge.	The widening of the road reserve on the northern side is proposed, however there may be more land required (Council reserve available)	The height of the proposed bridge will determine the costs where there is at least 12 m from bottom of the creek channel to the develop-able land.	Previous traffic analysis has commented that a bridge is required in this location to best connect footpaths, shared paths and cycle lanes to the wider network, while vehicle traffic have alternative locations to cross.	The above listed issues highlight many unknowns as to whether the project would continue.
	DI_RD_31c	Risk score	1	2	3	3	2	3	2	1	3	1	21
	DI_RD_31d	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare.	Surrounding land use has remained as per PSP Realignment is driven by developer not the PSP	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The proposed road would adequately serve the traffic demands of the area without the bridge (DI_RD_31c). As discussed in previous sections, the increased lot development in the LDRZ and the construction of the bridge would significantly alter the traffic patterns.	Development is occuring in stages, development on the southern side may reduce the land available for the road and Settlers Drive intersection	The road without the bridge connection would adequately service the adjacent developments, in fact, it would be over-designed as a standalone road. The LR2 profile is considered an appropriate profile for the modelled traffic demands. It will need to be validated when in the increased lot yields in the LDRZ areas for this would increase the traffic demands.	The splays at the Ross Creek Road end are required for the future roundabout (DI_JNC_12). The PSP concept design showed a sweeping corner and the detailed design of PLP202167SC has altered this into a more straightened alignment. The intersection of Carthew Road and Settlers Drive will require additional analysis as the intersection may need additional control (i.e. traffic signals or roundabout).	Subject to the traffic analysis, the construction costs are likely to increase given the potential intersection treatment at Settlers Drive	This section has footpaths, shared paths and cycle lanes that connect into the wider network.	Given the above listed issues regarding the alignment, this project is at risk being delivered without meeting the PSP performance criteria of meeting the traffic loads at full development.
	DI_RD_31d	Risk score	1	1	3	2	2	3	3	3	3	1	22
	DI_RD_38	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed junction is at GRZ (15-20 lots/hectare) or part of the LAC.	No significant changes to date	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	There is a potential flow-on effect of underestimating the traffic generated for Schreenans Lane that needs further analysis to ensure the road design is suitable	Ross Creek Road is already 30 m wide, thus being a suitable width for proposed cross section. Adjacent developments would require service roads to be constructed on their land as part of the gifted assets process	ESR have recommended that the cross section matches the Tait St cross-section LR3 instead of LR2, which is possible to deliver if the service roads are located in the adjacent development areas	No additional land acquisition is required for the LR2 cross section and conceptually for the LR3 cross section as long as the service roads are located in the adjacent development	It is considered that building to LR2 cross section would not see any significant increase to projected construction costs.	This section of road will have footpaths, shared paths and cycle lanes adjacent and intersecting that will connect into the wider network.	Rated as moderate risk until LR2/LR3 cross section is resolved
	DI_RD_38	Risk score	1	1	1	2	2	1	1	2	1	1	13
	DI_RD_39	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed junction is at GRZ (15-20 lots/hectare) or part of the LAC.	No significant changes to date	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	There is a potential flow-on effect of underestimating the traffic generated for Schreenans Lane that needs further analysis to ensure the road design is suitable	Ross Creek Road is already 30 m wide, thus being a suitable width for proposed cross section. Adjacent developments would require service roads to be constructed on their land as part of the gifted assets process	ESR have recommended that the cross section matches the Tait St cross-section LR3 instead of LR2, which is possible to deliver if the service roads are located in the adjacent development areas	No additional land acquisition is required for the LR2 cross section and conceptually for the LR3 cross section as long as the service roads are located in the adjacent development	It is considered that building to LR2 cross section would not see any significant increase to projected construction costs.	This section of road will have footpaths, shared paths and cycle lanes adjacent and intersecting that will connect into the wider network.	Rated as moderate risk until LR2/LR3 cross section is resolved
	DI_RD_39	Risk score	1	1	1	2	2	1	1	2	1	1	13
	DI_RD_23	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed junction is at GRZ (15-20 lots/hectare) or part of the LAC.	No significant changes to date	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The realignment of Cobden Street ultimately connnects to DI_JNC_12 thus creating a four-arm roundabout. It is also uncertain about how the original Cobden Street alignment will connect into the new alignment. It needs to be resolved given the issues that are now faced at Di_RD_31d/Carthew Road/Settlers Drive intersection	Development adjacent to the proposed road would allow the road to be built to the required cross section	LR2 cross section is considered adequate for the proposed road and the modelled traffic volumes Roundabout construction will be required when Cobblers Lane/Miles Street is similarly upgraded	PSP & DCP accounts for the extra width required for the 24 m road reserve	Further detailed design is required for the intersection of the old and new Cobden Road intersection so as to avoid the issue that is now present at Settlers Drive/DI_RD_31d	This section of road will have footpaths, shared paths and cycle lanes adjacent and intersecting that will connect into the wider network.	This project is at risk being delivered without meeting the PSP performance criteria of meeting the traffic loads at full development at the junction of the old and new Cobden Streets.
	DI_RD_23	Risk score	1	1	1	2	3	1	1	1	3	1	15
	DI_RD_24	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed junction is at GRZ (15-20 lots/hectare)	No significant changes to date	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The trigger for the construction of this section is the Ballarat Western Link Road. This road was identified as one of the connecting roads.	Development adjacent to the proposed road would allow the road to be built to the required cross section	LR2 cross section is considered adequate for the proposed road and the modelled traffic volumes Roundabout construction will be required when Cobblers Lane/Miles Street is similarly upgraded	PSP & DCP accounts for the extra width required for the 24 m road reserve	No significant changes to the proposed road have been identified to date, Ballarat Western Link Road intersection treatment is not listed in the DCP to any detail	This section of road will have footpaths, shared paths and cycle lanes adjacent and intersecting that will connect into the wider network.	This project is considered low risk
	DI_RD_24	Risk score	1	1	1	2	1	1	1	1	2	1	12

		Group	Growth Demand				Development Activity		Project scope & cost estimate			Delivery to Council's Strategic Aims	Project Deliverability
		ID	1	2	3	4	5	6	7	8	9	10	11
	PSP ID	Item	Population Projections	Land Uptake	Rezoning/ Modification to Land Use	Actual vs Planned Growth Patterns	Modelled vs Actual Traffic Movements	Staged Development	Concept vs Actual Design	Land Acquisition	Construction Costs	Active vs Car-dependant transport	Ease of Delivery
	DI_JNC_X1	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of 15 lots/hectare on the western side. PSP allocated Low Density Residential traffic volumes on the eastern side, however development will be at 15-20 lots/hectare depending on location	Properties bounded by Ascot Garden Drive, Cherry Flat Road, Webb Road and Ross Creek Road were considered to remain as LDRZ, when several blocks in this area are developed as residential (15 lots/hectare), creating significant increases to traffic in the area.	Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct. Further analysis is required to understand how this translates to the LDRZ area is required.	The approaching roads may adequately serve the traffic demands of the area, although the proposed rondabout treatment will require additional modelling to confirm treatment is appropriate.	Fragmented property ownership increases the risk of ad hoc development adjacent to the road	The existing traffic modelling will need to be reviewed considering the increased housing densities in the adjacent areas from LDRZ to GRZ	Additional splays are required to accommodate suggested roundabout on top of the land acquisition for the Schreenans Road widening	Subject to the traffic analysis, the construction costs are likely to mirror the construction costs of DI_JNC_12.	This will need to be considered in the traffic analysis about how to best connect/manage footpaths, shared paths and cycle lanes.	traffic modelling and negotiation with the affected landowners will be required before this junction proceeds.
	DI_JNC_X1	Risk score	1	2	3	3	3	3	3	2	2	2	24
	DI_RD_X1	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of up to 20 lots/hectare.	Surrounding land use has changed to the PSP - changing from LDRZ to UGZ	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The proposed realignment may not adequately serve the traffic demands of the area for it is a less-direct route between Precinct 1 and the Delacombe Town Centre.	Development is occuring in stages	The LR2 profile is considered an appropriate profile for the modelled traffic demands. It will need to be validated when in the increased lot yields in the LDRZ areas for this would increase the traffic demands.	Schreenans and Joses Lanes will be require further widening to accommodate the LR2 profile. Splays at Joses Lane and Schreenans Road will be required for the roundabout. The design for PLP202167SC, adjacent to Joses Lane will require significant redesign unless the acquisition is made for the southern side of Joses Lane.	In comparison to the original alignment, the construction costs are likely to be significantly less for the bridge crossing, however the length of road is approx. 135m longer.	This section has footpaths, shared paths and cycle lanes that connect into the wider network. The proposed alignment would be used less by non-vehicle traffic as it is less direct route for most users to the Delacombe Town Centre and the wider network.	Given the above listed issues regarding the alignment, it is recommended to continue with the original alignment.
	DI_RD_X1	Risk score	1	2	2	1	3	2	2	3	3	3	22
	DI_RD_X2	Comments	Net dwelling decrease of 33 or 2% below the original 2014 projections and the actual lots determined in 2021.	Development adjacent to the proposed road is at original density of up to 20 lots/hectare.	Surrounding land use has changed to the PSP - changing from LDRZ to UGZ	While part of Precinct 1, this section (east side of Bonshaw Creek) has not seen the scale of development as the area adjacent to Cherry Flat Road/Delacombe Town Centre (west side of Bonshaw Creek). Revised year 2036 projections indicate that an additional 1,312 dwellings in the precinct.	The proposed road would adequately serve the traffic demands although some investigation of the cross section is required.	Development is occuring in stages	The Collector Road (Constrained) profile is considered an appropriate profile for the modelled traffic demands.	Collector Road (Constrained) profile can fit in the existing road reserve(s)	Key Access Street is a narrower profile to collector road standard, in any case, the costs of applying the profile has not been factored in the DCP	This section has footpaths, shared paths and cycle lanes that connect into the wider network.	Given the above listed issues regarding the alignment, this project is at risk or remaining Key Access Street profile.
	DI_RD_X2	Risk score	1	1	2	1	2	2	2	1	3	1	16

APPENDIX E. COST ESTIMATES FOR MORAY STREET-STYLE ROUNDABOUT TREATMENT FOR DI_JNC_11 AND DI_JNC_12

JNC_11: Cherry Flat Rd and Schreenans Rd Roundabout

						99	104.7 Jun-13	107.1 Jun-14	107.4 Jun-15	105.1 Jun-16	105.9 Jun-17	117.1 Jun-18	120.7 Jun-19	121.5 Jun-20	119.8 Jun-21
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	461.7	$ 2,077.65	$ 2,197.27	$ 2,247.64	$ 2,253.94	$ 2,205.67	$ 2,222.46	$ 2,457.50	$ 2,533.05	$ 2,549.84	$ 2,514.17
	Cut place & Compact and disposal	cu m	$ 35.00	3070.31	$ 107,460.68	$ 113,647.80	$ 116,252.91	$ 116,578.55	$ 114,081.99	$ 114,950.36	$ 127,107.53	$ 131,015.19	$ 131,883.56	$ 130,038.27
	Swale drain formation	lin m	$ 10.00	884	$ 8,840.00	$ 9,348.97	$ 9,563.27	$ 9,590.06	$ 9,384.69	$ 9,456.12	$ 10,456.20	$ 10,777.66	$ 10,849.09	$ 10,697.29
	sawcut existing Pavement	lin m	$ 7.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	3821	$ 61,136.00	$ 64,655.95	$ 66,138.04	$ 66,323.30	$ 64,902.97	$ 65,396.99	$ 72,313.39	$ 74,536.52	$ 75,030.55	$ 73,980.74
	40mm Base Course Asphalt	sq m	$ 14.00	3821	$ 53,494.00	$ 56,573.96	$ 57,870.78	$ 58,032.88	$ 56,790.09	$ 57,222.37	$ 63,274.22	$ 65,219.45	$ 65,651.73	$ 64,733.14
	Prime coat	sq m	$ 2.00	3821	$ 7,642.00	$ 8,081.99	$ 8,267.25	$ 8,290.41	$ 8,112.87	$ 8,174.62	$ 9,039.17	$ 9,317.06	$ 9,378.82	$ 9,247.59
	180mm Base Course crushed rock	sq m	$ 12.42	4617	$ 57,343.14	$ 60,644.71	$ 62,034.85	$ 62,208.62	$ 60,876.40	$ 61,339.78	$ 67,827.09	$ 69,912.29	$ 70,375.67	$ 69,390.99
	280mm Subbase Course crushed rock	sq m	$ 18.90	4617	$ 87,261.30	$ 92,285.44	$ 94,400.86	$ 94,665.29	$ 92,638.01	$ 93,343.15	$ 103,215.13	$ 106,388.27	$ 107,093.41	$ 105,594.99
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	4617	$ 55,404.00	$ 58,593.93	$ 59,937.05	$ 60,104.95	$ 58,817.78	$ 59,265.49	$ 65,533.42	$ 67,548.11	$ 67,995.82	$ 67,044.44
Kerb & Channel	Type SM2	lin m	$ 40.00	884	$ 35,360.00	$ 37,395.88	$ 38,253.09	$ 38,360.24	$ 37,538.75	$ 37,824.48	$ 41,824.81	$ 43,110.63	$ 43,396.36	$ 42,789.17
Footpath	Concrete	sq m	$ 45.00	252	$ 11,340.00	$ 11,992.91	$ 12,267.82	$ 12,302.18	$ 12,038.73	$ 12,130.36	$ 13,413.27	$ 13,825.64	$ 13,917.27	$ 13,722.55
Concrete Splitter Islands		sq m	$ 75.00	271	$ 20,325.00	$ 21,495.23	$ 21,987.95	$ 22,049.55	$ 21,577.35	$ 21,741.59	$ 24,040.98	$ 24,780.08	$ 24,944.32	$ 24,595.30
Drainage	Subsoil Drains	lin m	$ 18.00	884	$ 15,912.00	$ 16,828.15	$ 17,213.89	$ 17,262.11	$ 16,892.44	$ 17,021.02	$ 18,821.16	$ 19,399.78	$ 19,528.36	$ 19,255.13
	Flush out Risers/outlets	No	$ 590.00	10	$ 5,900.00	$ 6,239.70	$ 6,382.73	$ 6,400.61	$ 6,263.54	$ 6,311.21	$ 6,978.69	$ 7,193.23	$ 7,240.91	$ 7,139.60
	Drainage Pits	No	$ 2,100.00	4	$ 8,400.00	$ 8,883.64	$ 9,087.27	$ 9,112.73	$ 8,917.58	$ 8,985.45	$ 9,935.76	$ 10,241.21	$ 10,309.09	$ 10,164.85
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	300	$ 48,000.00	$ 50,763.64	$ 51,927.27	$ 52,072.73	$ 50,957.58	$ 51,345.45	$ 56,775.76	$ 58,521.21	$ 58,909.09	$ 58,084.85
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00	0.2	$ 2,000.00	$ 2,115.15	$ 2,163.64	$ 2,169.70	$ 2,123.23	$ 2,139.39	$ 2,365.66	$ 2,438.38	$ 2,454.55	$ 2,420.20
	Signage	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Tactile pavers	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	0.1	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
Landscaping		item	$ 25,000.00	0.1	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	8	$ 28,000.00	$ 29,612.12	$ 30,290.91	$ 30,375.76	$ 29,725.25	$ 29,951.52	$ 33,119.19	$ 34,137.37	$ 34,363.64	$ 33,882.83
	High Pressure Sodium Lantern	item	$ 750.00	8	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching	lin m	$ 180.00	150	$ 27,000.00	$ 28,554.55	$ 29,209.09	$ 29,290.91	$ 28,663.64	$ 28,881.82	$ 31,936.36	$ 32,918.18	$ 33,136.36	$ 32,672.73
	Electrical pit	No	$ 1,600.00	8	$ 12,800.00	$ 13,536.97	$ 13,847.27	$ 13,886.06	$ 13,588.69	$ 13,692.12	$ 15,140.20	$ 15,605.66	$ 15,709.09	$ 15,489.29
Services Relocating/alteration	Telstra	item	$ 50,000.00	0.5	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
	Electrical	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Water	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Other	item	$ -		$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	0	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 751,695.77	$ 794,975.22	$ 813,198.15	$ 815,476.01	$ 798,012.37	$ 804,086.68	$ 889,127.01	$ 916,461.40	$ 922,535.71	$ 909,627.80
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 75,169.58	$ 79,497.52	$ 81,319.81	$ 81,547.60	$ 79,801.24	$ 80,408.67	$ 88,912.70	$ 91,646.14	$ 92,253.57	$ 90,962.78
Contingency		item	15.00%		$ 112,754.36	$ 119,246.28	$ 121,979.72	$ 122,321.40	$ 119,701.86	$ 120,613.00	$ 133,369.05	$ 137,469.21	$ 138,380.36	$ 136,444.17
				TOTAL	**$ 939,619.71**	**$ 993,719.02**	**$ 1,016,497.68**	**$ 1,019,345.01**	**$ 997,515.47**	**$ 1,005,108.35**	**$ 1,111,408.76**	**$ 1,145,576.75**	**$ 1,153,169.64**	**$ 1,137,034.76**

Applying Moray St-style safety treatments

						99	104.7	107.1	0	105.1	105.9	0	0	0	0
							Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jan-00
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		0	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing		0	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	461.7	$ 2,077.65	$ 2,197.27	$ 2,247.64	$ 2,253.94	$ 2,205.67	$ 2,222.46	$ 2,457.50	$ 2,533.05	$ 2,549.84	$ 2,514.17
	Cut place & Compact and disposal	cu m	$ 35.00	3070.31	$ 107,460.68	$ 113,647.80	$ 116,252.91	$ 116,578.55	$ 114,081.99	$ 114,950.36	$ 127,107.53	$ 131,015.19	$ 131,883.56	$ 130,038.27
	Swale drain formation	lin m	$ 10.00	884	$ 8,840.00	$ 9,348.97	$ 9,563.27	$ 9,590.06	$ 9,384.69	$ 9,456.12	$ 10,456.20	$ 10,777.66	$ 10,849.09	$ 10,697.29
	sawcut existing Pavement	lin m	$ 7.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	3821	$ 61,136.00	$ 64,655.95	$ 66,138.04	$ 66,323.30	$ 64,902.97	$ 65,396.99	$ 72,313.39	$ 74,536.52	$ 75,030.55	$ 73,980.74
	40mm Base Course Asphalt	sq m	$ 14.00	3821	$ 53,494.00	$ 56,573.96	$ 57,870.78	$ 58,032.88	$ 56,790.09	$ 57,222.37	$ 63,274.22	$ 65,219.45	$ 65,651.73	$ 64,733.14
	Prime coat	sq m	$ 2.00	3821	$ 7,642.00	$ 8,081.99	$ 8,267.25	$ 8,290.41	$ 8,112.87	$ 8,174.62	$ 9,039.17	$ 9,317.06	$ 9,378.82	$ 9,247.59
	180mm Base Course crushed rock	sq m	$ 12.42	4617	$ 57,343.14	$ 60,644.71	$ 62,034.85	$ 62,208.62	$ 60,876.40	$ 61,339.78	$ 67,827.09	$ 69,912.29	$ 70,375.67	$ 69,390.99
	280mm Subbase Course crushed rock	sq m	$ 18.90	4617	$ 87,261.30	$ 92,285.44	$ 94,400.86	$ 94,665.29	$ 92,638.01	$ 93,343.15	$ 103,215.13	$ 106,388.27	$ 107,093.41	$ 105,594.99
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	4617	$ 55,404.00	$ 58,593.93	$ 59,937.05	$ 60,104.95	$ 58,817.78	$ 59,265.49	$ 65,533.42	$ 67,548.11	$ 67,995.82	$ 67,044.44
Raised Pavements		item	$ 5,000.00	6	$ 30,000.00	$ 31,727.27	$ 32,454.55	$ 32,545.45	$ 31,848.48	$ 32,090.91	$ 35,484.85	$ 36,575.76	$ 36,818.18	$ 36,303.03
Kerb & Channel	Type SM2	lin m	$ 40.00	884	$ 35,360.00	$ 37,395.88	$ 38,253.09	$ 38,360.24	$ 37,538.75	$ 37,824.48	$ 41,824.81	$ 43,110.63	$ 43,396.36	$ 42,789.17
Footpath	Concrete	sq m	$ 45.00	252	$ 11,340.00	$ 11,992.91	$ 12,267.82	$ 12,302.18	$ 12,038.73	$ 12,130.36	$ 13,413.27	$ 13,825.64	$ 13,917.27	$ 13,722.55
Concrete Splitter Islands		sq m	$ 75.00	271	$ 20,325.00	$ 21,495.23	$ 21,987.95	$ 22,049.55	$ 21,577.35	$ 21,741.59	$ 24,040.98	$ 24,780.08	$ 24,944.32	$ 24,595.30
Drainage	Subsoil Drains	lin m	$ 18.00	884	$ 15,912.00	$ 16,828.15	$ 17,213.89	$ 17,262.11	$ 16,892.44	$ 17,021.02	$ 18,821.16	$ 19,399.78	$ 19,528.36	$ 19,255.13
	Flush out Risers/outlets	No	$ 590.00	10	$ 5,900.00	$ 6,239.70	$ 6,382.73	$ 6,400.61	$ 6,263.54	$ 6,311.21	$ 6,978.69	$ 7,193.23	$ 7,240.91	$ 7,139.60
	Drainage Pits	No	$ 2,100.00	4	$ 8,400.00	$ 8,883.64	$ 9,087.27	$ 9,112.73	$ 8,917.58	$ 8,985.45	$ 9,935.76	$ 10,241.21	$ 10,309.09	$ 10,164.85
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	300	$ 48,000.00	$ 50,763.64	$ 51,927.27	$ 52,072.73	$ 50,957.58	$ 51,345.45	$ 56,775.76	$ 58,521.21	$ 58,909.09	$ 58,084.85
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 5.00	600	$ 3,000.00	$ 3,172.73	$ 3,245.45	$ 3,254.55	$ 3,184.85	$ 3,209.09	$ 3,548.48	$ 3,657.58	$ 3,681.82	$ 3,630.30
	Signage	No	$ 250.00	24	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
	Tactile pavers	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Green matting	m	$ 300.00	240	$ 72,000.00	$ 76,145.45	$ 77,890.91	$ 78,109.09	$ 76,436.36	$ 77,018.18	$ 85,163.64	$ 87,781.82	$ 88,363.64	$ 87,127.27
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	0.1	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
Landscaping		item	$ 25,000.00	0.1	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	8	$ 28,000.00	$ 29,612.12	$ 30,290.91	$ 30,375.76	$ 29,725.25	$ 29,951.52	$ 33,119.19	$ 34,137.37	$ 34,363.64	$ 33,882.83
	High Pressure Sodium Lantern	item	$ 1,250.00	8	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching	lin m	$ 180.00	150	$ 27,000.00	$ 28,554.55	$ 29,209.09	$ 29,290.91	$ 28,663.64	$ 28,881.82	$ 31,936.36	$ 32,918.18	$ 33,136.36	$ 32,672.73
	Electrical pit	No	$ 1,600.00	8	$ 12,800.00	$ 13,536.97	$ 13,847.27	$ 13,886.06	$ 13,588.69	$ 13,692.12	$ 15,140.20	$ 15,605.66	$ 15,709.09	$ 15,489.29
Services Relocating/alteration	Telstra	item	$ 50,000.00	0.5	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
	Electrical	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Water	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Other	item	$ -		$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	0	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 864,695.77	$ 914,481.28	$ 935,443.60	$ 938,063.89	$ 917,975.00	$ 924,962.44	$ 1,022,786.61	$ 1,054,230.09	$ 1,061,217.53	$ 1,046,369.22
Professional Fees	Survey, Geotech, Pavement & Design	item	0.00%		$ 86,469.58	$ 91,448.13	$ 93,544.36	$ 93,806.39	$ 91,797.50	$ 92,496.24	$ 102,278.66	$ 105,423.01	$ 106,121.75	$ 104,636.92
Contingency		item	0.00%		$ 129,704.36	$ 137,172.19	$ 140,316.54	$ 140,709.58	$ 137,696.25	$ 138,744.37	$ 153,417.99	$ 158,134.51	$ 159,182.63	$ 156,955.38
				TOTAL	**$ 1,080,869.71**	**$ 1,143,101.60**	**$ 1,169,304.50**	**$ 1,172,579.86**	**$ 1,147,468.75**	**$ 1,156,203.05**	**$ 1,278,483.26**	**$ 1,317,787.61**	**$ 1,326,521.91**	**$ 1,307,961.52**

JNC_12: Ross Creek Rd and Schreenans Rd Roundabout															
					99	104.7	107.1	107.4	105.1	105.9	117.1	120.7	121.5	119.8	
						Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01	
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01	
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	313.7	$ 1,411.65	$ 1,492.93	$ 1,527.15	$ 1,531.43	$ 1,498.63	$ 1,510.04	$ 1,669.74	$ 1,721.07	$ 1,732.48	$ 1,708.24	
	Cut place & Compact and disposal	cu m	$ 35.00	2086.105	$ 73,013.68	$ 77,217.49	$ 78,987.52	$ 79,208.77	$ 77,512.50	$ 78,102.51	$ 86,362.64	$ 89,017.68	$ 89,607.69	$ 88,353.92	
	Swale drain formation	lin m	$ 10.00	495	$ 4,950.00	$ 5,235.00	$ 5,355.00	$ 5,370.00	$ 5,255.00	$ 5,295.00	$ 5,855.00	$ 6,035.00	$ 6,075.00	$ 5,990.00	
	sawcut existing Pavement	lin m	$ 7.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	2691	$ 43,056.00	$ 45,534.98	$ 46,578.76	$ 46,709.24	$ 45,708.95	$ 46,056.87	$ 50,927.85	$ 52,493.53	$ 52,841.45	$ 52,102.11	
	40mm Base Course Asphalt	sq m	$ 14.00	2691	$ 37,674.00	$ 39,843.11	$ 40,756.42	$ 40,870.58	$ 39,995.33	$ 40,299.76	$ 44,561.87	$ 45,931.84	$ 46,236.27	$ 45,589.35	
	Prime coat	sq m	$ 2.00	2691	$ 5,382.00	$ 5,691.87	$ 5,822.35	$ 5,838.65	$ 5,713.62	$ 5,757.11	$ 6,365.98	$ 6,561.69	$ 6,605.18	$ 6,512.76	
	180mm Base Course crushed rock	sq m	$ 12.42	3137	$ 38,961.54	$ 41,204.78	$ 42,149.30	$ 42,267.37	$ 41,362.20	$ 41,677.04	$ 46,084.81	$ 47,501.59	$ 47,816.44	$ 47,147.40	
	280mm Subbase Course crushed rock	sq m	$ 18.90	3137	$ 59,289.30	$ 62,702.93	$ 64,140.24	$ 64,319.91	$ 62,942.48	$ 63,421.58	$ 70,129.06	$ 72,285.04	$ 72,764.14	$ 71,746.04	
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Subgrade improvement (300mm depth)	sq m	$ 12.00	3137	$ 37,644.00	$ 39,811.38	$ 40,723.96	$ 40,838.04	$ 39,963.48	$ 40,267.67	$ 44,526.39	$ 45,895.26	$ 46,199.45	$ 45,553.04	
Kerb & Channel	Type SM2	lin m	$ 40.00	495	$ 19,800.00	$ 20,940.00	$ 21,420.00	$ 21,480.00	$ 21,020.00	$ 21,180.00	$ 23,420.00	$ 24,140.00	$ 24,300.00	$ 23,960.00	
Footpath	Concrete	sq m	$ 45.00	554	$ 24,930.00	$ 26,365.36	$ 26,969.73	$ 27,045.27	$ 26,466.09	$ 26,667.55	$ 29,487.91	$ 30,394.45	$ 30,595.91	$ 30,167.82	
Concrete Splitter Islands		sq m	$ 75.00	36	$ 2,700.00	$ 2,855.45	$ 2,920.91	$ 2,929.09	$ 2,866.36	$ 2,888.18	$ 3,193.64	$ 3,291.82	$ 3,313.64	$ 3,267.27	
Drainage	Subsoil Drains	lin m	$ 18.00	495	$ 8,910.00	$ 9,423.00	$ 9,639.00	$ 9,666.00	$ 9,459.00	$ 9,531.00	$ 10,539.00	$ 10,863.00	$ 10,935.00	$ 10,782.00	
	Flush out Risers/outlets	No	$ 590.00	10	$ 5,900.00	$ 6,239.70	$ 6,382.73	$ 6,400.61	$ 6,263.54	$ 6,311.21	$ 6,978.69	$ 7,193.23	$ 7,240.91	$ 7,139.60	
	Drainage Pits	No	$ 2,100.00	4	$ 8,400.00	$ 8,883.64	$ 9,087.27	$ 9,112.73	$ 8,917.58	$ 8,985.45	$ 9,935.76	$ 10,241.21	$ 10,309.09	$ 10,164.85	
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	150	$ 24,000.00	$ 25,381.82	$ 25,963.64	$ 26,036.36	$ 25,478.79	$ 25,672.73	$ 28,387.88	$ 29,260.61	$ 29,454.55	$ 29,042.42	
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Miscellaneous	Line Marking	item	$ 10,000.00	0.2	$ 2,000.00	$ 2,115.15	$ 2,163.64	$ 2,169.70	$ 2,123.23	$ 2,139.39	$ 2,365.66	$ 2,438.38	$ 2,454.55	$ 2,420.20	
	Signage	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Tactile pavers	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15	
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01	
Traffic Management		item	$ 60,000.00	0.1	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61	
Landscaping		item	$ 25,000.00	0.1	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25	
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Intersection Lighting	Pole	item	$ 3,500.00	8	$ 28,000.00	$ 29,612.12	$ 30,290.91	$ 30,375.76	$ 29,725.25	$ 29,951.52	$ 33,119.19	$ 34,137.37	$ 34,363.64	$ 33,882.83	
	High Pressure Sodium Lantern	item	$ 750.00	8	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61	
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51	
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	150	$ 27,000.00	$ 28,554.55	$ 29,209.09	$ 29,290.91	$ 28,663.64	$ 28,881.82	$ 31,936.36	$ 32,918.18	$ 33,136.36	$ 32,672.73	
	Electrical pit	No	$ 1,600.00	8	$ 12,800.00	$ 13,536.97	$ 13,847.27	$ 13,886.06	$ 13,588.69	$ 13,692.12	$ 15,140.20	$ 15,605.66	$ 15,709.09	$ 15,489.29	
Services Relocating/alteration	Telstra	item	$ 50,000.00	0.5	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53	
	Electrical	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01	
	Water	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01	
	Other	item	$ -		$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	0	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	
				Subtotal	$ 561,822.17	$ 594,169.50	$ 607,789.43	$ 609,491.92	$ 596,439.49	$ 600,979.47	$ 664,539.15	$ 684,969.04	$ 689,509.02	$ 679,861.57	
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 56,182.22	$ 59,416.95	$ 60,778.94	$ 60,949.19	$ 59,643.95	$ 60,097.95	$ 66,453.91	$ 68,496.90	$ 68,950.90	$ 67,986.16	
Contingency		item	15.00%		$ 84,273.32	$ 89,125.43	$ 91,168.41	$ 91,423.79	$ 89,465.92	$ 90,146.92	$ 99,680.87	$ 102,745.36	$ 103,426.35	$ 101,979.24	
				TOTAL	**$ 702,277.71**	**$ 742,711.88**	**$ 759,736.79**	**$ 761,864.91**	**$ 745,549.36**	**$ 751,224.33**	**$ 830,673.93**	**########**	**$ 861,886.28**	**$ 849,826.96**	

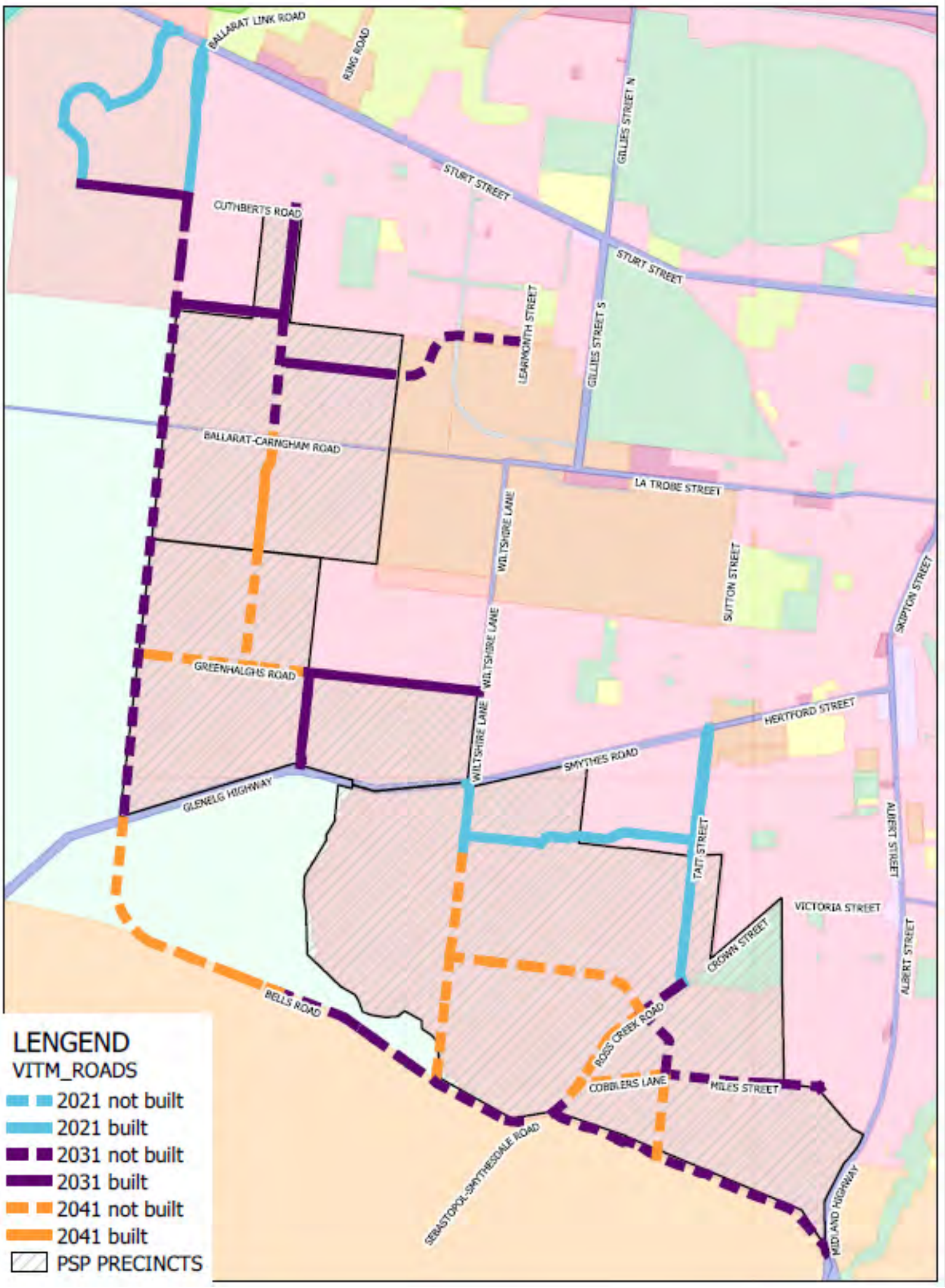
IV

Applying Moray St-style safety treatments

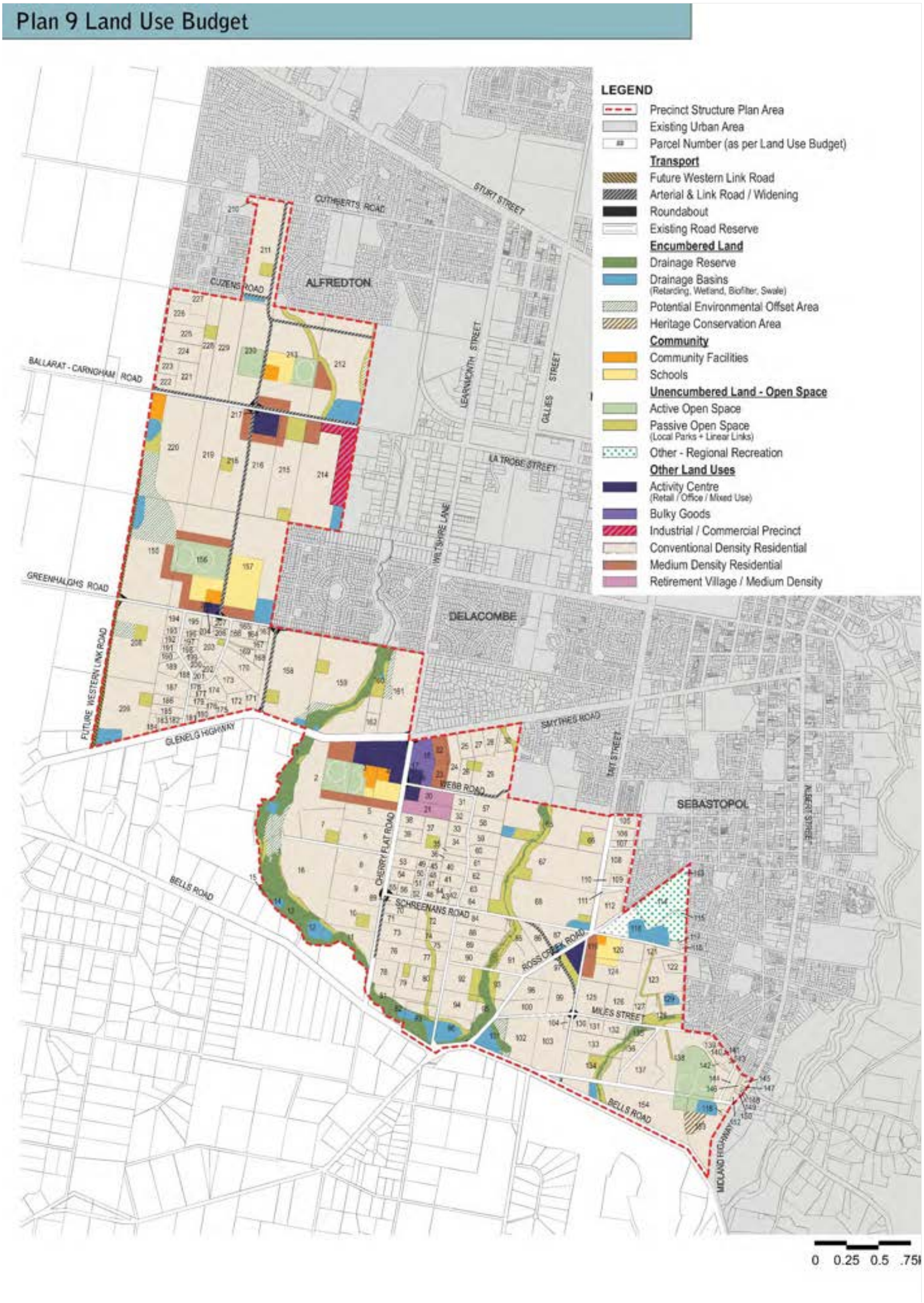
Description	Detail	Unit	Rate	Qty	Amount	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	313.7	$ 1,411.65	$ 1,492.93	$ 1,527.15	$ 1,531.43	$ 1,498.63	$ 1,510.04	$ 1,669.74	$ 1,721.07	$ 1,732.48	$ 1,708.24
	Cut place & Compact and disposal	cu m	$ 35.00	2086.105	$ 73,013.68	$ 77,217.49	$ 78,987.52	$ 79,208.77	$ 77,512.50	$ 78,102.51	$ 86,362.64	$ 89,017.68	$ 89,607.69	$ 88,353.92
	Swale drain formation	lin m	$ 10.00	495	$ 4,950.00	$ 5,235.00	$ 5,355.00	$ 5,370.00	$ 5,255.00	$ 5,295.00	$ 5,855.00	$ 6,035.00	$ 6,075.00	$ 5,990.00
	sawcut existing Pavement	lin m	$ 7.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	2691	$ 43,056.00	$ 45,534.98	$ 46,578.76	$ 46,709.24	$ 45,708.95	$ 46,056.87	$ 50,927.85	$ 52,493.53	$ 52,841.45	$ 52,102.11
	40mm Base Course Asphalt	sq m	$ 14.00	2691	$ 37,674.00	$ 39,843.11	$ 40,756.42	$ 40,870.58	$ 39,995.33	$ 40,299.76	$ 44,561.87	$ 45,931.84	$ 46,236.27	$ 45,589.35
	Prime coat	sq m	$ 2.00	2691	$ 5,382.00	$ 5,691.87	$ 5,822.35	$ 5,838.65	$ 5,713.62	$ 5,757.11	$ 6,365.98	$ 6,561.69	$ 6,605.18	$ 6,512.76
	180mm Base Course crushed rock	sq m	$ 12.42	3137	$ 38,961.54	$ 41,204.78	$ 42,149.30	$ 42,267.37	$ 41,362.20	$ 41,677.04	$ 46,084.81	$ 47,501.59	$ 47,816.44	$ 47,147.40
	280mm Subbase Course crushed rock	sq m	$ 18.90	3137	$ 59,289.30	$ 62,702.93	$ 64,140.24	$ 64,319.91	$ 62,942.48	$ 63,421.58	$ 70,129.06	$ 72,285.04	$ 72,764.14	$ 71,746.04
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	3137	$ 37,644.00	$ 39,811.38	$ 40,723.96	$ 40,838.04	$ 39,963.48	$ 40,267.67	$ 44,526.39	$ 45,895.26	$ 46,199.45	$ 45,553.04
Raised Pavements		item	$ 5,000.00	4	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
Kerb & Channel	Type SM2	lin m	$ 40.00	495	$ 19,800.00	$ 20,940.00	$ 21,420.00	$ 21,480.00	$ 21,020.00	$ 21,180.00	$ 23,420.00	$ 24,140.00	$ 24,300.00	$ 23,960.00
Footpath	Concrete	sq m	$ 45.00	554	$ 24,930.00	$ 26,365.36	$ 26,969.73	$ 27,045.27	$ 26,466.09	$ 26,667.55	$ 29,487.91	$ 30,394.45	$ 30,595.91	$ 30,167.82
Concrete Splitter Islands		sq m	$ 75.00	36	$ 2,700.00	$ 2,855.45	$ 2,920.91	$ 2,929.09	$ 2,866.36	$ 2,888.18	$ 3,193.64	$ 3,291.82	$ 3,313.64	$ 3,267.27
Drainage	Subsoil Drains	lin m	$ 18.00	495	$ 8,910.00	$ 9,423.00	$ 9,639.00	$ 9,666.00	$ 9,459.00	$ 9,531.00	$ 10,539.00	$ 10,863.00	$ 10,935.00	$ 10,782.00
	Flush out Risers/outlets	No	$ 590.00	10	$ 5,900.00	$ 6,239.70	$ 6,382.73	$ 6,400.61	$ 6,263.54	$ 6,311.21	$ 6,978.69	$ 7,193.23	$ 7,240.91	$ 7,139.60
	Drainage Pits	No	$ 2,100.00	4	$ 8,400.00	$ 8,883.64	$ 9,087.27	$ 9,112.73	$ 8,917.58	$ 8,985.45	$ 9,935.76	$ 10,241.21	$ 10,309.09	$ 10,164.85
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	150	$ 24,000.00	$ 25,381.82	$ 25,963.64	$ 26,036.36	$ 25,478.79	$ 25,672.73	$ 28,387.88	$ 29,260.61	$ 29,454.55	$ 29,042.42
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 5.00	500	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
	Signage	No	$ 250.00	24	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
	Tactile pavers	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Green matting	m	$ 300.00	240	$ 72,000.00	$ 76,145.45	$ 77,890.91	$ 78,109.09	$ 76,436.36	$ 77,018.18	$ 85,163.64	$ 87,781.82	$ 88,363.64	$ 87,127.27
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	0.1	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
Landscaping		item	$ 25,000.00	0.1	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	8	$ 28,000.00	$ 29,612.12	$ 30,290.91	$ 30,375.76	$ 29,725.25	$ 29,951.52	$ 33,119.19	$ 34,137.37	$ 34,363.64	$ 33,882.83
	High Pressure Sodium Lantern	item	$ 750.00	8	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	150	$ 27,000.00	$ 28,554.55	$ 29,209.09	$ 29,290.91	$ 28,663.64	$ 28,881.82	$ 31,936.36	$ 32,918.18	$ 33,136.36	$ 32,672.73
	Electrical pit	No	$ 1,600.00	8	$ 12,800.00	$ 13,536.97	$ 13,847.27	$ 13,886.06	$ 13,588.69	$ 13,692.12	$ 15,140.20	$ 15,605.66	$ 15,709.09	$ 15,489.29
Services Relocating/alteration	Telstra	item	$ 50,000.00	0.5	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
	Electrical	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Water	item	$ 20,000.00	0.5	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Other	item	$ -		$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	0	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 660,322.17	$ 698,340.71	$ 714,348.52	$ 716,349.50	$ 701,008.68	$ 706,344.62	$ 781,047.73	$ 805,059.45	$ 810,395.38	$ 799,056.52
Professional Fees	Survey, Geotech, Pavement & Design	item	0.00%		$ 66,032.22	$ 69,834.07	$ 71,434.85	$ 71,634.95	$ 70,100.87	$ 70,634.46	$ 78,104.77	$ 80,505.94	$ 81,039.54	$ 79,905.65
Contingency		item	0.00%		$ 99,048.32	$ 104,751.11	$ 107,152.28	$ 107,452.43	$ 105,151.30	$ 105,951.69	$ 117,157.16	$ 120,758.92	$ 121,559.31	$ 119,858.48
				TOTAL	**$ 825,402.71**	**$ 872,925.89**	**$ 892,935.65**	**$ 895,436.88**	**$ 876,260.85**	**$ 882,930.77**	**$ 976,309.67**	**############**	**$1,012,994.23**	**$ 998,820.65**

APPENDIX F. VICTORIAN INTEGRATED TRANSPORT MODEL

Adapted from Victorian Integrated Transport Model – City of Ballarat Phase 4, AECOM 2005



APPENDIX G. Development Contribution Plans Parcel Numbering Plan



APPENDIX H. LAND ACQUISTION BY PSP PROPERTY NUMBER

Ballarat West Precinct 1, 2 & 4: Property-specific land budget where property is affected by studied roads

					TRANSPORT (ORIGINAL ESTIMATE)			TRANSPORT (REVISED ESTIMATE)			TOTAL				ESTIMATED LAND ACQUISITION COSTS			
Property Number	Persistent Feature Identifier	Estimated Land Value ($/ha)	Land Valuation Source	Land Acquisition Project	Arterial Road / Widening	Roundabout	Road Reserve	Arterial Road / Widening	Roundabout	Road Reserve	Total (Original)	Total (Revised)	Net Difference	% Difference	Original	Revised	Net Difference	% Difference
9	2035434	493,044	2	DI_LA_17	0.00	0.12	0.00	0.00	0.18	0.00	0.12	0.18	-0.06	-47%	59,165	87,057	-27,892	-47%
42	2034421	1,000,000	1	DI_LA_17	0.02	0.00	0.00	0.03	0.03	0.00	0.02	0.06	-0.04	-202%	20,000	60,429	-40,429	-202%
43	2028681	1,100,000	1	DI_LA_17	0.01	0.00	0.00	0.02	0.00	0.00	0.01	0.02	-0.01	-88%	11,000	20,691	-9,691	-88%
44	2028681	1,050,000	1	DI_LA_17	0.01	0.00	0.00	0.02	0.00	0.00	0.01	0.02	-0.01	-95%	10,500	20,526	-10,026	-95%
48	2049706	1,000,000	1	DI_LA_17	0.03	0.00	0.00	0.04	0.00	0.00	0.03	0.04	-0.01	-19%	30,000	35,690	-5,690	-19%
52	2049699	1,100,000	1	DI_LA_17	0.02	0.00	0.00	0.03	0.00	0.00	0.02	0.03	-0.01	-58%	22,000	34,665	-12,665	-58%
55	2051432	1,025,000	1	DI_LA_17	0.03	0.08	0.00	0.03	0.08	0.00	0.11	0.11	0.00	4%	112,750	108,214	4,536	4%
56	2051433	975,000	1	DI_LA_17	0.04	0.00	0.00	0.05	0.00	0.00	0.04	0.05	-0.01	-14%	39,000	44,293	-5,293	-14%
64	2034422	825,000	1	DI_LA_17	0.06	0.00	0.00	0.09	0.02	0.00	0.06	0.12	-0.06	-94%	49,500	96,151	-46,651	-94%
68	2046063	423,733	1	DI_LA_17	0.08	0.00	0.00	0.11	0.00	0.00	0.08	0.11	-0.03	-37%	33,899	46,438	-12,539	-37%
69	2035443	591,462	2	DI_LA_17, PAO2	0.12	0.07	0.00	0.12	0.11	0.00	0.19	0.22	-0.03	-18%	112,378	132,890	-20,512	-18%
84	2028686	562,970	1		0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03	-0.03	-	0	14,847	-14,847	-
86	2041900	600,000	1	DI_LA_18	0.80	0.03	0.00	0.62	0.07	0.14	0.83	0.83	-0.00	-1%	498,000	500,759	-2,759	-1%
87	2046063	562,625	2	DI_LA_18	0.00	0.03	0.00	0.00	0.01	0.00	0.03	0.01	0.02	54%	16,879	7,724	9,155	54%
97	2027853	500,000	1	DI_LA_19, DEVELOPER	0.62	0.05	0.00	0.24	0.05	0.00	0.67	0.28	0.39	58%	335,000	142,372	192,628	58%
99	2005747	550,000	1	DI_LA_20	0.22	0.04	0.00	0.22	0.00	0.00	0.26	0.22	0.04	14%	143,000	122,867	20,133	14%
103	2000321	475,000	1	DI_LA_20	0.13	0.00	0.00	0.13	0.00	0.00	0.13	0.13	0.00	1%	61,750	60,908	842	1%
104	2031578	1,000,000	1	DI_LA_20	0.05	0.03	0.00	0.05	0.00	0.00	0.08	0.05	0.03	43%	80,000	45,424	34,576	43%
125	2023250	520,691	2	DI_LA_20	0.00	0.04	0.00	0.00	0.00	0.00	0.04	0.00	0.04	100%	20,828	0	20,828	100%
130	2000321	768,537	2	DI_LA_20	0.00	0.04	0.00	0.00	0.00	0.00	0.04	0.00	0.04	100%	30,741	0	30,741	100%
154	2000321	357,509	1	DI_LA_21	0.08	0.00	0.00	0.08	0.00	0.00	0.08	0.08	0.00	2%	28,601	28,094	506	2%
155	2012306	274,286	1	DI_LA_25, DI_LA_14, DI_LA_23	0.15	0.07	0.00	0.14	0.00	0.00	0.22	0.14	0.08	35%	60,343	39,188	21,155	35%
156	2012998	425,000	1	DI_LA_22, DI_LA_23	1.15	0.04	0.00	2.01	0.13	0.00	1.19	2.13	-0.94	-79%	505,750	907,363	-401,613	-79%
157	2012998	391,294	1	DI_LA_23, DI_LA_22	1.12	0.03	0.00	0.15	0.06	0.00	1.15	0.21	0.94	82%	449,989	82,527	367,462	82%
158	2012289	436,423	1	DI_LA_23, DI_LA_22	1.74	0.21	0.00	1.61	0.15	0.00	1.95	1.76	0.19	10%	851,025	770,112	80,913	10%
159	2012289	374,544	1	DI_LA_23	0.19	0.00	0.00	0.19	0.00	0.00	0.19	0.19	-0.00	-2%	71,163	72,413	-1,250	-2%
160	2012289	374,294	1	DI_LA_23	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	100%	14,972	0	14,972	100%
161	2012289	424,474	1	DI_LA_23, RRV	0.04	0.05	0.00	0.00	0.00	0.00	0.09	0.00	0.09	100%	38,203	0	38,203	100%
163	2039201	925,000	1	DI_LA_23	0.03	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.04	100%	37,000	0	37,000	100%
164	2039199	1,050,000	1	DI_LA_23	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	100%	10,500	0	10,500	100%
171	2040200	821,429	2	DI_LA_22	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01			11,041	11,041	0	
207	2045819	917,500	2	DI_LA_22	0.00	0.07	0.00	0.00	0.07	0.00	0.07	0.07	0.00	5%	64,225	60,981	3,244	5%
208	2012306	346,238	1	DI_LA_25, DI_LA_14	0.00	0.04	0.00	0.00	0.00	0.00	0.04	0.00	0.04	100%	13,850	0	13,850	100%
213	2036752	475,000	1	DI_LA_24, RRV	1.37	0.06	0.00	0.53	0.06	0.00	1.43	0.59	0.84	59%	679,250	281,537	397,713	59%
216	2001990	475,000	1	DI_LA_24	0.91	0.05	0.00	0.93	0.08	0.00	0.96	1.01	-0.05	-5%	456,000	478,710	-22,710	-5%
217	2001991	3,000,000	1	DI_LA_24, DEVELOPER	0.07	0.02	0.00	0.02	0.08	0.00	0.09	0.09	-0.00	-4%	270,000	279,663	-9,663	-4%
218	2001992	475,000	1	DI_LA_24	0.96	0.07	0.00	1.89	0.13	0.00	1.03	2.02	-0.99	-96%	489,250	960,482	-471,232	-96%
220	2001994	369,707	1	DI_LA_14, DEVELOPER, DI_LA_25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		-	0	0	0	-
222	2036748	850,000	1	DI_LA_25, RRV	0.32	0.02	0.00	0.00	0.00	0.00	0.34	0.00	0.34	100%	289,000	0	289,000	100%
230	2036751	500,000	1	DI_LA_24, RRV	1.86	0.07	0.00	1.81	0.20	0.00	1.93	2.01	-0.08	-4%	965,000	1,007,039	-42,039	-4%
				Sub-Total	12.28	1.35	0.00	11.14	1.55	0.14	13.63	12.84	0.80	6%	6,991,550	6,561,096	430,454	6%

Land valuation sources	1	Land Valuation report Feb 2023
	2	Estimated from regression line

Note: Non-DCP numbered projects refer to land acquisition projects outside of the DCP, however, irrespective of the land acquisition "trigger", acqusitition of all land is the simplest for the affected owner

III

APPENDIX I. DRAFT INTERSECTION TREATMENT OPTIONS FOR DI_JNC_02

Ballarat West Precinct Structure Plan

Discussion Paper: Intersection Treatment Options for Carngham Road/Presentation Boulevard and Sydney Way (DI_JNC_02)

Introduction

The Ballarat West Precinct Structure Plan has been developed to guide development on the western side of Ballarat. The PSP was developed in consultation with the community, development sector and service authorities to best deliver infrastructure and community services for the estimated 14,500 residential properties that will form the PSP area.

The PSP identified items such as roads, drainage, and their associated land requirements to ensure that growth areas are served using contemporary infrastructure. An outcome of the PSP is the development of the Developer Contribution Plan (DCP) which allocates costs and reserves land for each property within the PSP.

This discussion paper outlines the current state of development surrounding the intersection labelled DI_JNC_02 and proposes possible alternatives after considering contemporary road design practices and road safety.

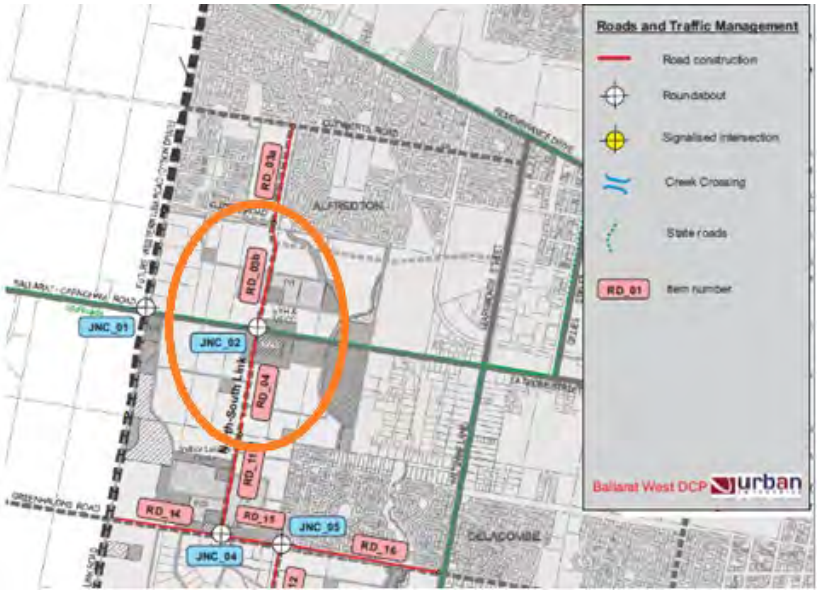


Figure 1 - Locality plan of DI_JNC_02

This intersection is located on Carngham Road at the recently built Presentation Boulevard, which in the PSP is known as RD_04. Future development to the north known as Carringum Estate is to build RD_03, which in their subdivision plan named Sydney Way.

It has been suggested that the initial roundabout concept included in the DCP to manage traffic movement warrants a review to better respond in creating a safer road environment for all users.

In practice, the incremental changes to the location of RD-03 and RD-04 further westward have triggered a review of the DCP given new roads require land acquisition. This report will ultimately inform a larger, precinct analysis of the DCP implementation and development changes.

This report recommends that DI_JNC_02 is modified to traffic signals in response to implementation challenges, and opportunity to provide greater safety outcomes for road users such as pedestrians and cyclists.

PSP objectives

North-South Road

The PSP lists design criteria for the proposed north-south road as having the following:

- Road cross section: Link road with on-road bike lanes (LR2)
- Road Reserve width: 24 m
- Traffic: 16,000 vpd
- Pedestrians: footpath & shared path
- Cyclists: on road bike lane and shared path
- Public Transport: Bus routes nominated
- Responsibility: Council

Figure 2 Nominated cross section for the north-south road RD-03 and RD-04

Carngham Road

The PSP considers the ultimate profile of Carngham Rd as:

- Road cross section: Arterial 2
- Road Reserve width: currently 20 m, design 40 m, although some sections are wider for service roads of up to 60 m.
- Traffic: 15,250 vpd
- Pedestrians: footpath & shared path
- Cyclists: on road bike lane and shared path
- Public Transport: Bus routes nominated
- Responsibility: Regional Roads Victoria

Figure 3 Carngham Rd cross sections

The above design criteria influences the selection of intersection treatment that would best suit all roads users.

DCP Intersection Design

The developed concept design for estimating the PSP costs for the road network is shown in Figure 4. This design using a generic road design template which is considered suitable for the development of the DCP, however as development proceeds, the actual conditions, contemporary engineering design and management principles are applied to ensure the original assumptions and desired outcomes are still relevant.

As can be seen in Figure 4, the concept design for Presentation Bvd (RD-04) proposes the road to pass through 163 Carngham Road. Owing to the current landowner not enabling the acquisition of their lot voluntarily, the subdivision on southern side has moved RD-04 to the western edge of 163 Carngham Road and the other house/property has been demolished. The results of these changes can be seen in Figure 5.

Figure 4 PSP concept design

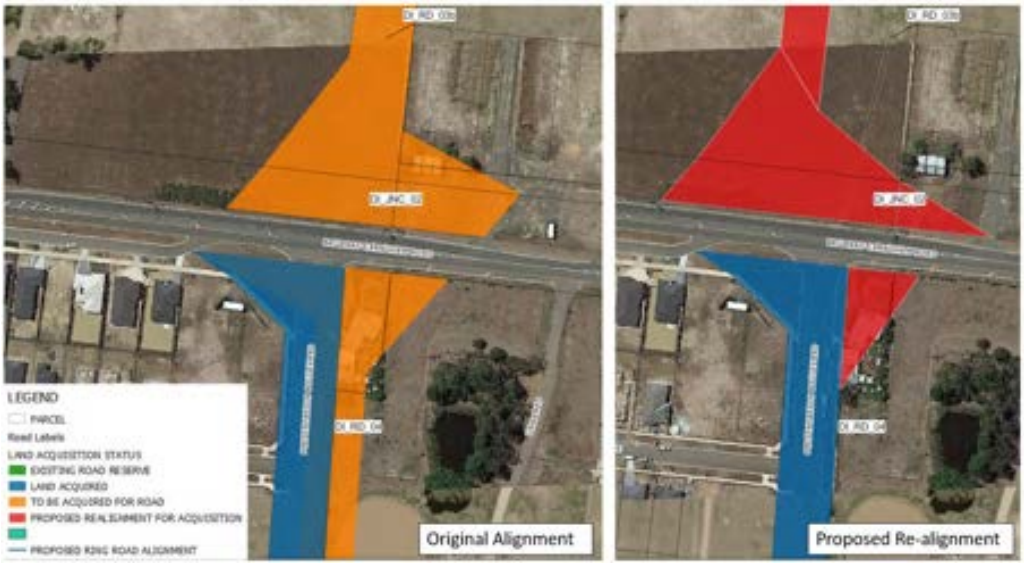


Figure 5 land acquisition envelopes at 163 Carngham Road

Current & Future State of Urban Development

The level of and type of development that exists adjacent to the intersection is summarised in the following table:

North east	Still in development as the Ballymanus Estate, land has been subdivided for the eventual widening of Carngham Road to a duplicated road. A large community health hub/childcare centre is earmarked for the properties closest to the intersection.

South east	Earmarked as Neighbourhood Activity Centre (NAC), construction start is currently unknown, it is uncertain how 163 Carngham Road is to be considered in this, for the purposed of this discussion, it is assumed that it remains.
South west	Largely developed with no further road upgrades required to service this area adjacent to the intersection.
North west	This area is now known as the Carringum Estate, this estate will carry the full width of RD-03 and is discussed in detail below.

The construction of the proposed roundabout as proposed in the DCP is impeded by the current site constraints, however the recent planning application for the north west corner, known as the Carringum Estate highlights the need to reassess the choice of intersection treatment for the north-south road. As will be discussed in the following sections, the "movement" of proposed roads presents opportunities and challenges for the DCP.

Ballymanus Estate

The development on the north east corner known as Ballymanus Estate is largely complete and has created another entrance onto Carngham Rd at Galway Drive, opposite Cumberland Bvd on the southern side of Carngham Rd. This has potentially split the north-south traffic movement of DI_RD_03 & 04 onto two roads.

A large community health hub/childcare centre is earmarked for the properties closest to the intersection. The RRV concepts show that a service road off Carngham Rd will be built for better access to these services.

Carringum Estate

The City of Ballarat has provided concept design plans for the Carringum Estate, which is located on the north eastern side of Carngham Road (Figure 6). This estate will accommodate the full width of DI_RD_03 (Sydney Way) and the 20 m widening of Carngham Rd and another 10 m for the Carngham Rd service road (Figure 6).

Figure 6 Portion of Carringum Estate concept design PLP/2013/347

South Side of Carngham Road

The development on the south western corner of the proposed intersection is largely complete. This includes a splay for the proposed roundabout. The south eastern corner will have the Neighbourhood Activity Centre, the concept design for the NAC is shown in Figure 7.

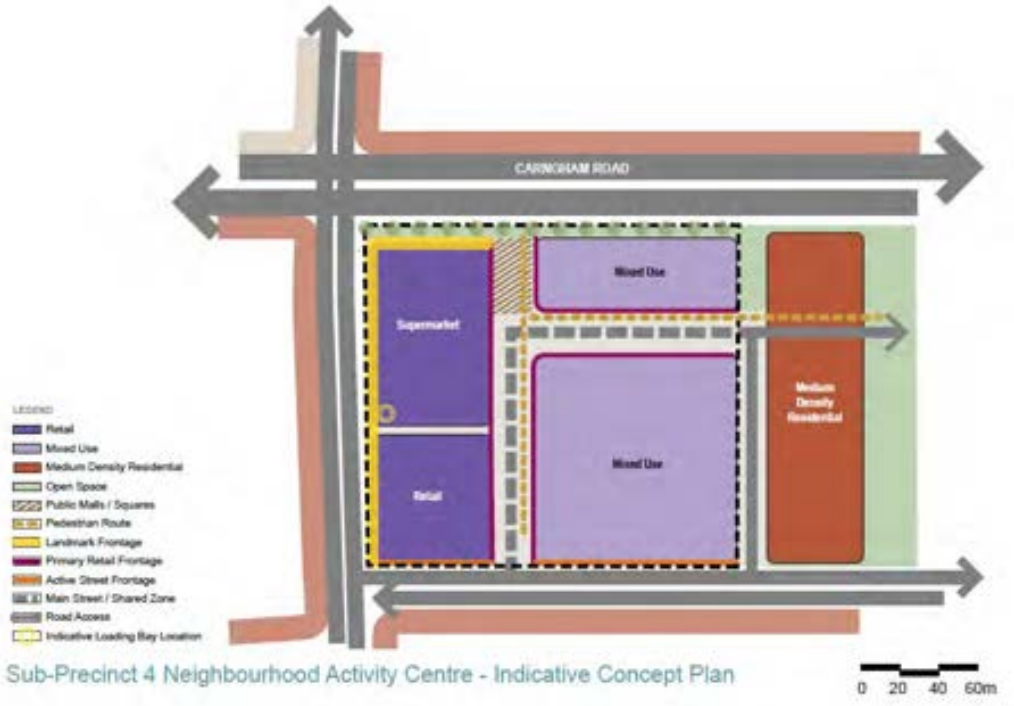


Figure 7 Concept design for the NAC on the south eastern corner

In summary, three of the four corners have made an allowance for the roundabout by the way of splays. An excerpt of the concept design is shown in Figure 6 for the Carringum Estate development (and RRV's design in Figure 10) shows that a roundabout continues to be the intersection treatment of the N-S road. A major difference to the PSP concept (Figure 4) are the north-south legs are no longer at right angles to Carngham Road. This displacement is also due the owner of the south eastern corner property not permitting acquiring any portion of their land (Figure 5).

The current road design of Carngham Rd has a left hand slip lane for traffic turning south off Carngham Road into Presentation Bvd. The current radius of the corner allows for long vehicles to turn into Presentation Bvd but has created the issue of no allowance for a pedestrian path on the southern side Carngham Rd. When considering the long term plan for footpaths/shared paths along both sides of Carngham Road, this is potentially a major safety issue when considering the south east corner will be the NAC. As will be discussed in RRV concepts, a portion of 163 Carngham Rd is to be acquired for the splay/intersection treatment (Figure 8).

Figure 8 Except of ultimate conditions by RRV for DI_JNC_02

It should be noted that pedestrian-operated signals are to be located approximately 100 m eastward from Presentation Bvd under the concept design in Figure 6. The future development of the Neighbourhood Activity Centre (NAC), east of Presentation Bvd will increase the use of these proposed signals, however it is unknown as to when this area will develop. The narrow verge (approx. 2.5m) between Presentation Bvd and the pedestrian signals will be a major source of complaints given pedestrians would feel unsafe walking this section of road (as a footpath) given Carngham Rd arterial classification/posted speed of 60 km/h.

Figure 6 and Figure 8 both show that the kerb line for the roundabout will bring the roadway closer to 163 Carngham Rd, further reducing the verge area/clearance thus further reducing safety in this area.

Other Intersections

As mentioned in the Ballymanus Estate section, the Cumberland Bvd/Galway Ave intersection with Carngham Rd needs to be analysed further. There as several treatment proposals for the Cumberland Bvd/Galway Ave intersection:

1. Left in/left out, with an island in Carngham Rd to enforce the left-in/left-out movement (Figure 6) as one interim option
2. Cross road intersections at DI_JNC_02 and Cumberland Bvd/Galway Ave with a future possible installation of traffic signals (Figure 9) that could be at either intersection
3. Traffic signals of the Cumberland Bvd/Galway Ave intersection for the duplicated Carngham Road and roundabout at JNC_02 (Figure 10).

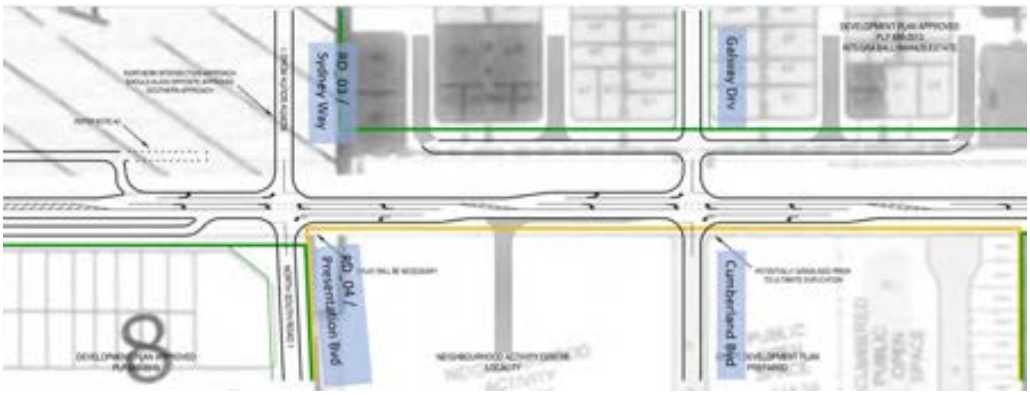


Figure 9 Interim intersection treatments (Carngham Rd remains a two-way road)

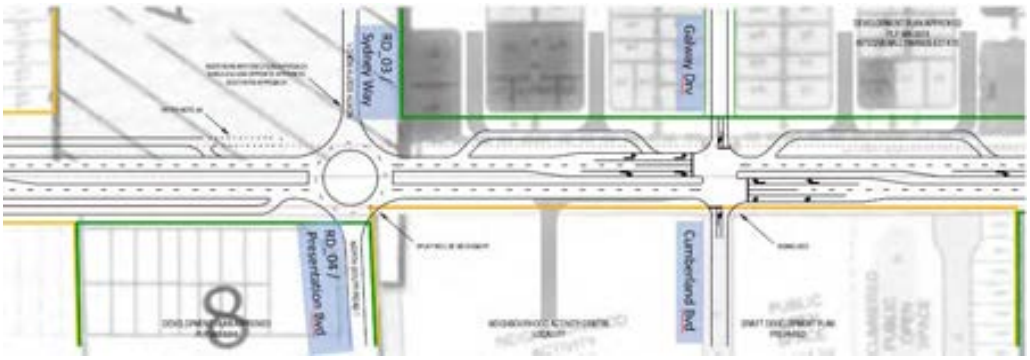


Figure 10 Ultimate design by RRV

The following section discusses the advantages and disadvantages of two broad-based options of retaining the roundabout or changing to traffic signals at DI_JNC_02.

Options Review for Intersection Design

Roundabout

A summary of the advantages and disadvantages for a roundabout intersection treatment in the following table (Table 1), with reference to Austroads design guidelines.

Table 1 advantages and disadvantages of a roundabout intersection treatment

Group	Advantages	Disadvantages
Operations /Movement	• Allows for freer flowing traffic • Reduces the wait times for low traffic volumes portions of the day • Better caters for incremental growth of traffic • Aligns with the current DCP	• Reducing the radius reduces the safety benefits generally attributed to roundabouts as deflecting vehicles will not reduce their speed. • No designated/safe crossing points for pedestrians • Minimal or no protection for vulnerable users ie motorcycles, pedestrian and cycling traffic • The Carngham Rd/Wiltshire Ln intersection is now signalized, the roundabout would not operate in a optimized way •
Design	• Caters for the off-perpendicular alignments of the north and south roads • Can be a staged design for the future duplication of Carngham Rd, although this would be a future DoT funded project, subject to traffic volumes	• The Carringum design moves the existing kerb closer to the 163 Carngham Road and reduces the area where a footpath is required, requiring further land acquisition • The circulating roadway for this intersection increases the land acquisition requirement whereas signals can be implemented within the existing road reserve • Design would need to consider the ultimate road design, potentially increasing the construction costs when duplicating Carngham Road • Creates a need to realign the intersection dues to challenges in securing land acquisitions
DCP Impact	TBC	•

The philosophy of the DCP is to fund and build the right infrastructure for when the demand requires it. The proposed roundabout considers the duplication of Carngham Rd, it can be seen in the proposed design of the Carringum Estate (Figure 6), the roundabout's diameter essentially matches the DCP design.

This will require the acquisition of a portion of 153 Carngham Rd to achieve this, of which to date, the owners have not entered into any discussion for this. As will be discussed in the following section, traffic signals would not require land acquisition and potentially better manage vehicle traffic at the intersection and the wider Ballarat West road network.

Traffic Signals

A preliminary design concept is in Appendix 1 using the current design standards and guidelines. The concept design avoids of any land acquisition of 153 Carngham Rd on the south east corner,

allows the future Sydney Ave (DI_RD_03) connection and the future Carngham Rd duplication without altering the existing road alignment.

A summary of the advantages and disadvantages for a signalised intersection treatment in the following table (Table 1).

Table 2 advantages and disadvantages of a signalised intersection treatment

Group	Advantages	Disadvantages
Operations/ movement	• Creates the future turning lane from Carngham Road into Sydney Way • Creates pedestrian crossings for all four sides of the intersection • Better protects the pedestrians waiting at the south eastern corner, the current design does not allow for pedestrians to safely navigate this section of the intersection. • Better manages the movement of all car/motorcyclist, pedestrian, and cyclist traffic at intersection	• Slows down car traffic by increasing the wait times especially for the side streets • Higher maintenance and operation costs
Design	• Does not alter any of the existing Carngham Road pavement • Current pavement location will be retained for the future Carngham Rd duplication • Eliminates any further land acquisition on the southern side of Carngham Road (appendix 2) • Better aligns Presentation Bvd with the proposed Sydney Way in the future development area on the north west corner of the intersection • Retains existing turning lanes from Carngham Road into Presentation Bvd • Requires marginal widening of Presentation Bvd to fit in the bicycle lane • Comparatively minor alterations to existing intersection design to incorporate bike lanes and alignment with north-south movement	• Signalised traffic control for low traffic volumes would be seen as overkill until ultimate development is reached •
DCP	TBC	•

Noting that this intersection will see a significant number of non-car users ie pedestrians and cyclists moving north and south through the intersection and mostly towards the NAC; signalizing this intersection could deliver multiple safety benefits to the most vulnerable road users.

The concept design in Appendix 1 allows slip lanes for the northern side of the intersection, although similar to roundabouts, slip lanes pose a hazard to pedestrians unless they are controlled either by signals, zebra crossings or raised pavements.

Modifying the intersection to traffic signals will still impact land acquisition on the northern side of Carngham Rd as discussed in the following section.

Land Acquisition Impacts

The Ballarat West Precinct Structure Plan estimated the areas for land acquisition for the Developer Contribution Plan. The development to date has significantly altered the alignments of both RD-03 (now Sydney Way) and RD-04 (now Presentation Bvd). The net impact will need to be assessed as part of a larger, precinct scale DCP review, but in summary the realignment has reduce the required area by the following (and is subject to further analysis).

Project Detailed Description	Area (m^2)
2014 PSP	7,977.32
Current Estimated	4,754.70
Percentage reduction (as of 04/04/2022)	40%

As discussed in the previous section, land acquisition of the south east corner will be avoided with the proposed concept design in the appendix.

Land acquisition is still required to the north of the existing Carngham Rd road reserve, of which, parcels have already been created for the 40 m wide reserve at the intersection as a DoT requirement, not funded by the DCP.

Portions of Carngham Rd will be wider at 60 m to cater for the service roads; which are assets gifted by the developer(s) to the Council given the requirement of no fence lines facing the road, Figure 6 and Figure 10 illustrates this.

The widened road reserve will cater for either intersection treatment option of the roundabout or traffic signals.

Concept Design

In summary the concept design:

1. Replaces the roundabout with traffic signals with full control of all traffic, pedestrian and cyclist movements
2. Retains existing Carngham Road turning lanes
3. Replaces painted island with right-turning lane in future Sydney Way
4. Requires minimal widening of the existing Carngham Rd pavement for bicycle lanes heading east
5. Increases the radius of the kerb on the south eastern corner to better protect pedestrians
6. Modifies Presentation Bvd to better align with Sydney Way and retain the north-heading bicycle lane
7. Protects 163 Carngham Rd from land acquisition
8. Utilizes existing road reserve on the the southern side

9. Minimises the land acquisition requirement on the northern side to that of the development itself
10. Is scalable to allow for the future duplication of Carngham Road with little modification to the current road alignment.

Appendix 1 shows the preliminary design concept, which shows that until the construction of RD-03 on the northern side. The widening of the existing Carngham Rd pavement is to include bicycle lanes when the signals are built.

Appendix 2 shows the changes of the land acquisition requirements from the original PSP to moving Sydney Way (RD-03) westward.

Estimated Costs

The estimated costs for the individual intersection treatments are as follows:

Treatment	Scenario: Two-Way Carngham Road Construction Costs	Scenario: Duplicated Carngham Road Construction Costs
Roundabout	$1,583,649.54	$1,869,817.00
Traffic Signals	$1,925,396.04	$2,334,744.01
Difference	-$341,746.50	-$464,927.01
Percentage (%)	22	25

Note: two-way relates to Figure 6 and duplicated according to the concept design in the appendix

The above estimates used the indexed DCP rates and quantities, and the pavement design is VicRoads 740mm deep pavement rather than Council 540mm deep pavement considering the intersection is an arterial road. The pavement area for each intersection treatment is the same, although in practice

The land acquisition costs are considered for the N-S road not the intersection.

The estimates show that traffic signals are a significantly higher cost than the roundabout, ie 22-25%, depending on the approach. The scenario of upgrading from either of the two-way scenarios to the duplicated scenario has not been evaluated at this time.

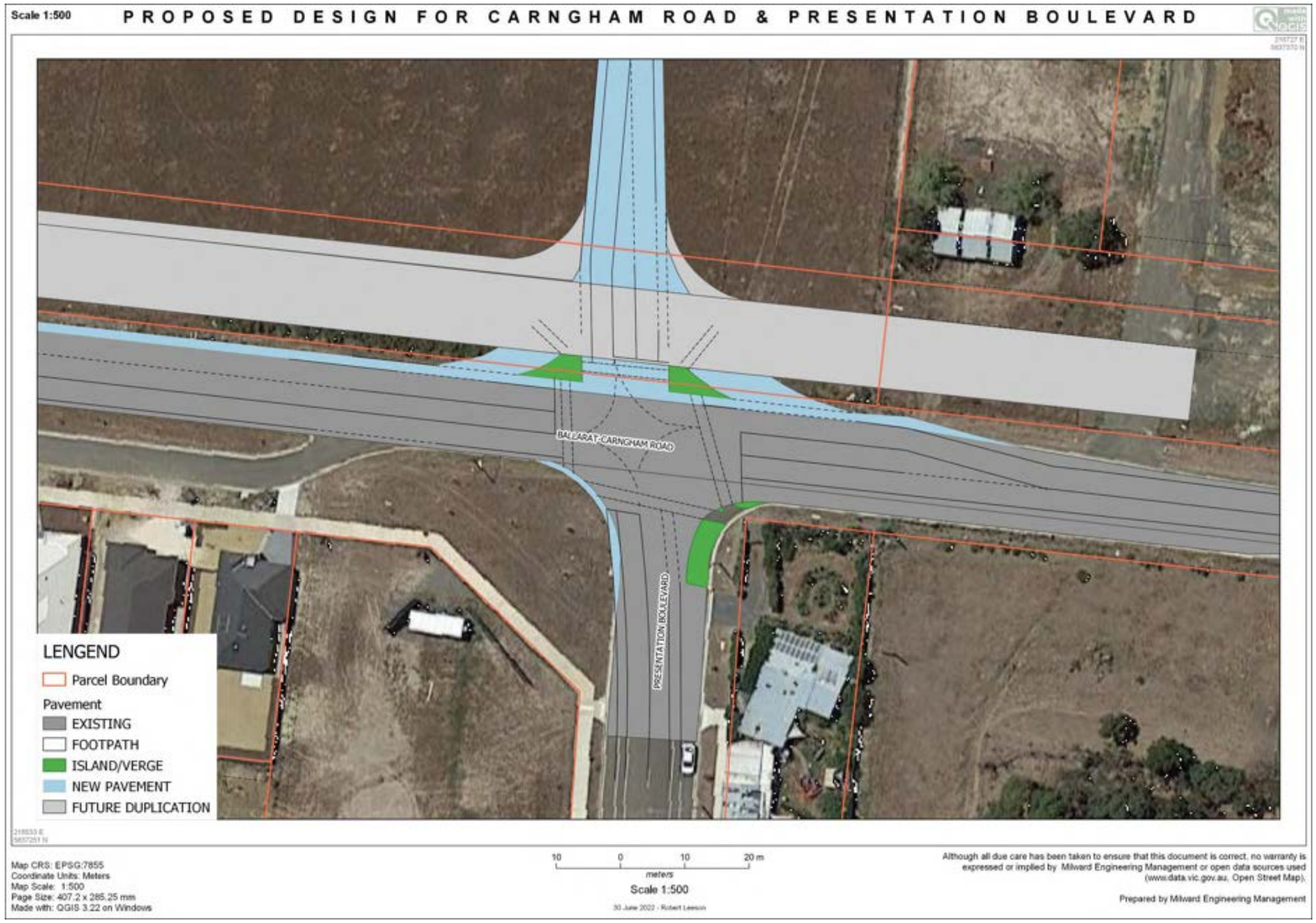
Conclusion/Next Steps

It is recommended that DI_JNC_02 is changed from a roundabout to traffic signals for the following reasons:

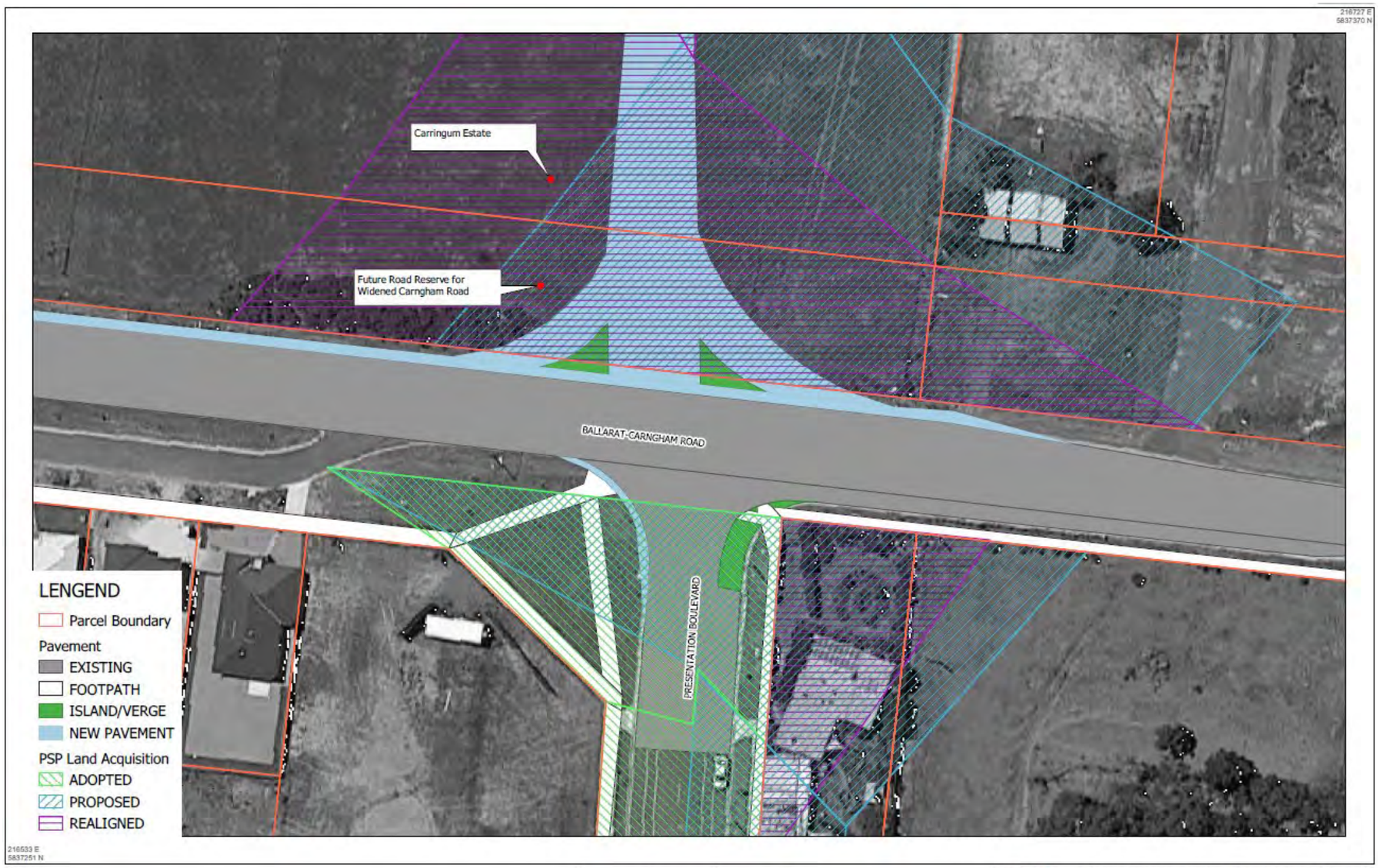
1. Reducing the need to modify the existing Carngham Rd alignment
2. Scalability with any future duplication of Carngham Rd
3. Delivering multiple safety improvements for non-vehicle traffic, especially providing controlled crossing where pedestrian desire to walk
4. Reducing the land acquisition area
5. Reducing the impact to the amenity of 163 Carngham Road.

Note that more detailed analysis and design is required to understand the true cost implications to the DCP.

Appendix 1 – Concept Design for Signalised Intersection at DI-JNC_02



Appendix 2 – Changes to Land Acquisition for Intersection



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Coordinate Units: Meters
Map Scale: 1:500
Page Size: 407.2 x 285.25 mm
Made with: QGIS 3.22 on Windows

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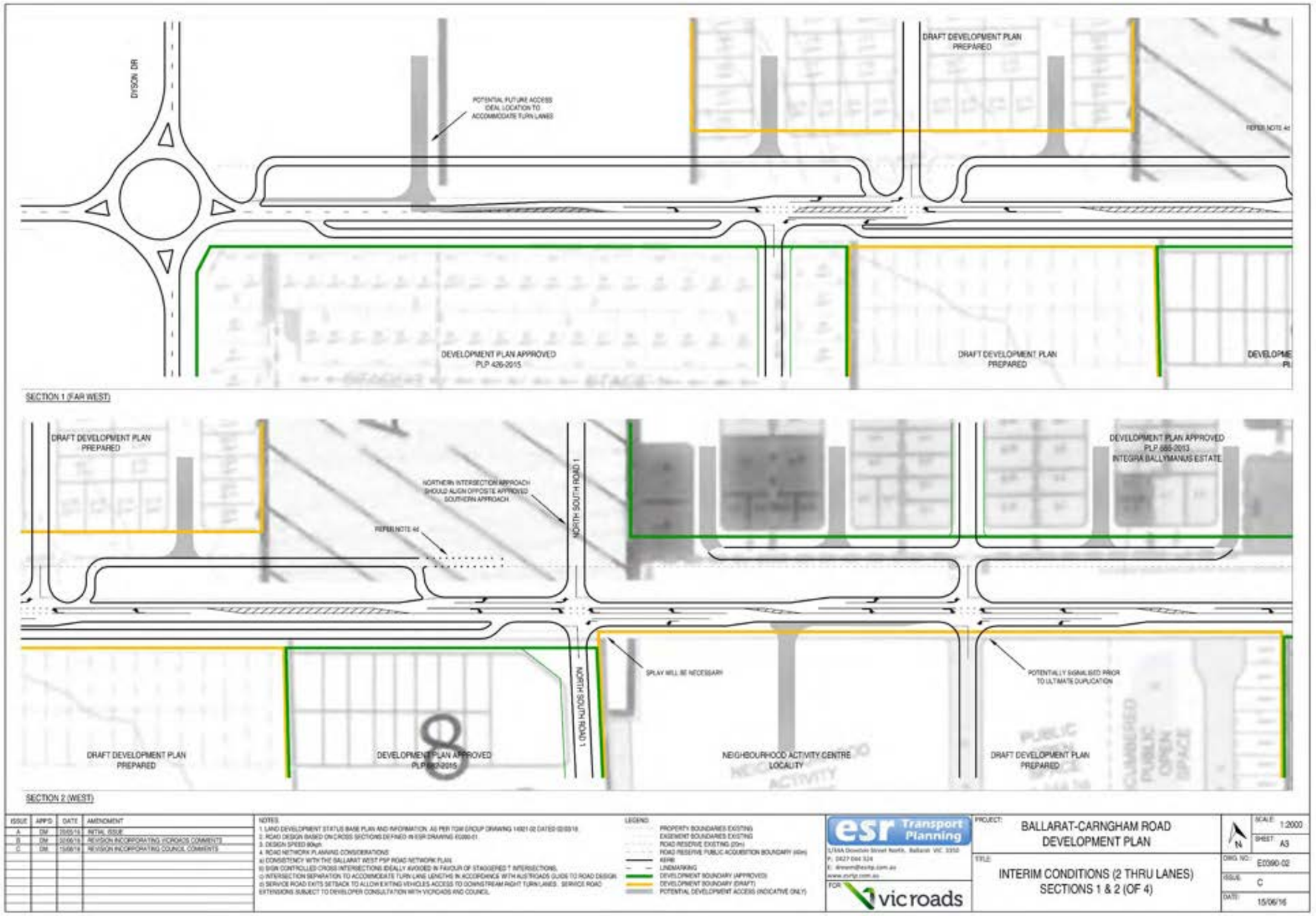
16 June 2022 - Robert Leeson

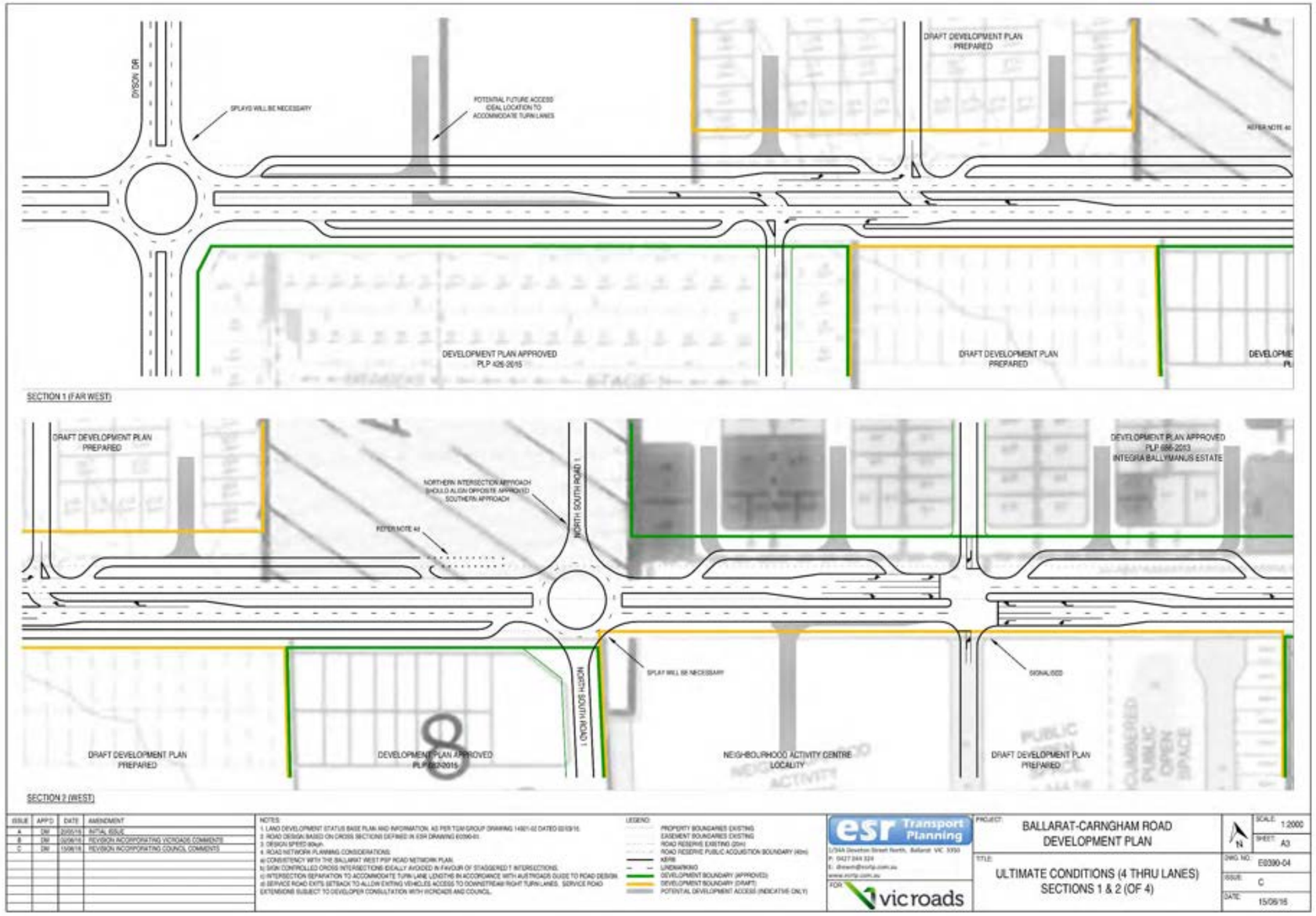
Although all due care has been taken to ensure that this document is correct, no warranty is expressed or implied by Milward Engineering Management or open data sources used (www.data.vic.gov.au, Open Street Map).

Prepared by Milward Engineering Management

Appendix 3 Interim conditions (RRV)



Appendix 4 Ultimate conditions (RRV)



IV

APPENDIX J. COST ESTIMATIONS FOR POSSIBLE INTERSECTION TREATMENTS FOR DI_JNC_02

JNC_02: Carngham Rd and New N-S Rd (North) Roundabout

Two-way traffic on Carngham Road

					Indexation	99	104.7 Jun-13	107.1 Jun-14	107.4 Jun-15	105.1 Jun-16	105.9 Jun-17	117.1 Jun-18	120.7 Jun-19	121.5 Jun-20	119.8 Jun-21
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	376.8001798	$ 1,695.60	$ 1,793.23	$ 1,834.33	$ 1,839.47	$ 1,800.08	$ 1,813.78	$ 2,005.60	$ 2,067.26	$ 2,080.96	$ 2,051.85
	Cut place & Compact and disposal	cu m	$ 35.00	2505.721196	$ 87,700.24	$ 92,749.65	$ 94,875.72	$ 95,141.47	$ 93,103.99	$ 93,812.68	$ 103,734.33	$ 106,923.43	$ 107,632.12	$ 106,126.15
	Swale drain formation	lin m	$ 10.00	1032	$ 10,320.00	$ 10,914.18	$ 11,164.36	$ 11,195.64	$ 10,955.88	$ 11,039.27	$ 12,206.79	$ 12,582.06	$ 12,665.45	$ 12,488.24
	Sawcut existing Pavement	lin m	$ 7.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pavement	Overlay Existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320	sq m	$ 13.40	3127.441493	$ 41,907.72	$ 44,320.58	$ 45,336.53	$ 45,463.52	$ 44,489.91	$ 44,828.56	$ 49,569.63	$ 51,093.55	$ 51,432.20	$ 50,712.57
	105mm, size 20, type SI asphalt with C320	sq m	$ 35.00	3127.441493	$ 109,460.45	$ 115,762.72	$ 118,416.31	$ 118,748.01	$ 116,204.99	$ 117,089.51	$ 129,472.92	$ 133,453.30	$ 134,337.83	$ 132,458.20
	75mm, size 20, type SF asphalt with C320	sq m	$ 26.60	3127.441493	$ 83,189.94	$ 87,979.67	$ 89,996.39	$ 90,248.48	$ 88,315.79	$ 88,988.03	$ 98,399.42	$ 101,424.51	$ 102,096.75	$ 100,668.23
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	3768.001798	$ 27,506.41	$ 29,090.12	$ 29,756.94	$ 29,840.29	$ 29,201.25	$ 29,423.53	$ 32,535.36	$ 33,535.60	$ 33,757.87	$ 33,285.54
	Lower base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	3768.001798	$ 38,056.82	$ 40,247.97	$ 41,170.56	$ 41,285.88	$ 40,401.73	$ 40,709.26	$ 45,014.68	$ 46,398.57	$ 46,706.10	$ 46,052.59
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	3768.001798	$ 63,302.43	$ 66,947.12	$ 68,481.72	$ 68,673.55	$ 67,202.88	$ 67,714.42	$ 74,875.90	$ 77,177.81	$ 77,689.35	$ 76,602.33
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	40mm Base Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	180mm Base Course crushed rock	sq m	$ 12.42	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	280mm Subbase Course crushed rock	sq m	$ 18.90	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	5354	$ 64,248.00	$ 67,947.13	$ 69,504.65	$ 69,699.35	$ 68,206.72	$ 68,725.89	$ 75,994.35	$ 78,330.64	$ 78,849.82	$ 77,746.57
Kerb & Channel	Type SM2	lin m	$ 40.00	1032	$ 41,280.00	$ 43,656.73	$ 44,657.45	$ 44,782.55	$ 43,823.52	$ 44,157.09	$ 48,827.15	$ 50,328.24	$ 50,661.82	$ 49,952.97
Footpath	Concrete	sq m	$ 45.00	493	$ 22,185.00	$ 23,462.32	$ 24,000.14	$ 24,067.36	$ 23,551.95	$ 23,731.23	$ 26,241.05	$ 27,047.77	$ 27,227.05	$ 26,846.09
Concrete Splitter Islands		sq m	$ 75.00	335	$ 25,125.00	$ 26,571.59	$ 27,180.68	$ 27,256.82	$ 26,673.11	$ 26,876.14	$ 29,718.56	$ 30,632.20	$ 30,835.23	$ 30,403.79
Drainage	Subsoil Drains	lin m	$ 18.00	1032	$ 18,576.00	$ 19,645.53	$ 20,095.85	$ 20,152.15	$ 19,720.58	$ 19,870.69	$ 21,972.22	$ 22,647.71	$ 22,797.82	$ 22,478.84
	Flush out Risers/outlets	No	$ 590.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pits	No	$ 2,100.00	12	$ 25,200.00	$ 26,650.91	$ 27,261.82	$ 27,338.18	$ 26,752.73	$ 26,956.36	$ 29,807.27	$ 30,723.64	$ 30,927.27	$ 30,494.55
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	395	$ 63,200.00	$ 66,838.79	$ 68,370.91	$ 68,562.42	$ 67,094.14	$ 67,604.85	$ 74,754.75	$ 77,052.93	$ 77,563.64	$ 76,478.38
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00	40	$ 8,000.00	$ 8,460.61	$ 8,654.55	$ 8,678.79	$ 8,492.93	$ 8,557.58	$ 9,462.63	$ 9,753.54	$ 9,818.18	$ 9,680.81
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Signage	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Tactile pavers	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	1	$ 60,000.00	$ 63,454.55	$ 64,909.09	$ 65,090.91	$ 63,696.97	$ 64,181.82	$ 70,969.70	$ 73,151.52	$ 73,636.36	$ 72,606.06
Landscaping		item	$ 25,000.00	1	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	10	$ 35,000.00	$ 37,015.15	$ 37,863.64	$ 37,969.70	$ 37,156.57	$ 37,439.39	$ 41,398.99	$ 42,671.72	$ 42,954.55	$ 42,353.54
	High Pressure Sodium Lantern	item	$ 750.00	10	$ 7,500.00	$ 7,931.82	$ 8,113.64	$ 8,136.36	$ 7,962.12	$ 8,022.73	$ 8,871.21	$ 9,143.94	$ 9,204.55	$ 9,075.76
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	200	$ 36,000.00	$ 38,072.73	$ 38,945.45	$ 39,054.55	$ 38,218.18	$ 38,509.09	$ 42,581.82	$ 43,890.91	$ 44,181.82	$ 43,563.64
	Electrical pit	No	$ 1,600.00	10	$ 16,000.00	$ 16,921.21	$ 17,309.09	$ 17,357.58	$ 16,985.86	$ 17,115.15	$ 18,925.25	$ 19,507.07	$ 19,636.36	$ 19,361.62
Services Relocating/alteration	Testra	item	$ 50,000.00	1	$ 50,000.00	$ 52,878.79	$ 54,090.91	$ 54,242.42	$ 53,080.81	$ 53,484.85	$ 59,141.41	$ 60,959.60	$ 61,363.64	$ 60,505.05
	Electrical	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Water	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Other	item	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee	incl Prom & controller	item	$ 75,000.00	0.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 1,046,953.62	$ 1,107,232.76	$ 1,132,613.46	$ 1,135,786.04	$ 1,111,462.88	$ 1,119,923.11	$ 1,238,366.35	$ 1,276,437.39	$ 1,284,897.62	$ 1,266,919.63
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 104,695.36	$ 110,723.28	$ 113,261.35	$ 113,578.60	$ 111,146.29	$ 111,992.31	$ 123,836.63	$ 127,643.74	$ 128,489.76	$ 126,691.96
Contingency		item	15.00%		$ 157,043.04	$ 166,084.91	$ 169,892.02	$ 170,367.91	$ 166,719.43	$ 167,988.47	$ 185,754.95	$ 191,465.61	$ 192,734.64	$ 190,037.94
				TOTAL	**$ 1,308,692.02**	**$ 1,384,040.95**	**$ 1,415,766.82**	**$ 1,419,732.56**	**$1,389,328.60**	**$1,399,903.89**	**$ 1,547,957.93**	**$ 1,595,546.74**	**$1,606,122.02**	**$ 1,583,649.54**

JNC_02: Carngham Rd/New N-S Road Signalised Intersection
Two-way traffic on Carngham Road

						Indexation	99	104.7 Jun-13	107.1 Jun-14	107.4 Jun-15	105.1 Jun-16	105.9 Jun-17	117.1 Jun-18	120.7 Jun-19	121.5 Jun-20	119.8 Jun-21
Description	**Detail**	**Unit**	**Rate**		**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment			$ 10,000.00		1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00		1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50		379.12	$ 1,706.04	$ 1,804.27	$ 1,845.63	$ 1,850.79	$ 1,811.16	$ 1,824.95	$ 2,017.95	$ 2,079.99	$ 2,093.78	$ 2,064.48
	Cut place & Compact and disposal	cu m	$ 35.00		2521.148	$ 88,240.18	$ 93,320.68	$ 95,459.83	$ 95,727.23	$ 93,677.20	$ 94,390.25	$ 104,372.98	$ 107,581.71	$ 108,294.77	$ 106,779.53
	Swale drain formation	lin m	$ 10.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	sawcut existing Pavement	lin m	$ 7.50		150	$ 1,125.00	$ 1,189.77	$ 1,217.05	$ 1,220.45	$ 1,194.32	$ 1,203.41	$ 1,330.68	$ 1,371.59	$ 1,380.68	$ 1,361.36
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40		2696.4	$ 36,131.76	$ 38,212.07	$ 39,087.99	$ 39,197.49	$ 38,358.06	$ 38,650.03	$ 42,737.67	$ 44,051.55	$ 44,343.52	$ 43,723.08
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00		2696.4	$ 94,374.00	$ 99,807.65	$ 102,095.51	$ 102,381.49	$ 100,188.96	$ 100,951.58	$ 111,628.24	$ 115,060.02	$ 115,822.64	$ 114,202.07
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60		2696.4	$ 71,724.24	$ 75,853.82	$ 77,592.59	$ 77,809.93	$ 76,143.61	$ 76,723.20	$ 84,837.46	$ 87,445.61	$ 88,025.20	$ 86,793.58
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30		3106.2	$ 22,675.26	$ 23,980.81	$ 24,530.51	$ 24,599.22	$ 24,072.42	$ 24,255.66	$ 26,820.94	$ 27,645.49	$ 27,828.73	$ 27,439.36
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10		3106.2	$ 31,372.62	$ 33,178.92	$ 33,939.47	$ 34,034.54	$ 33,305.68	$ 33,559.20	$ 37,108.42	$ 38,249.24	$ 38,502.76	$ 37,964.04
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80		3106.2	$ 52,184.16	$ 55,188.70	$ 56,453.77	$ 56,611.91	$ 55,399.55	$ 55,821.24	$ 61,724.90	$ 63,622.51	$ 64,044.20	$ 63,148.10
	Construction of Sealed Shoulders	sq m	$ 20.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00		595	$ 9,520.00	$ 10,068.12	$ 10,298.91	$ 10,327.76	$ 10,106.59	$ 10,183.52	$ 11,260.53	$ 11,606.71	$ 11,683.64	$ 11,520.16
	40mm Base Course Asphalt	sq m	$ 14.00		595	$ 8,330.00	$ 8,809.61	$ 9,011.55	$ 9,036.79	$ 8,843.26	$ 8,910.58	$ 9,852.96	$ 10,155.87	$ 10,223.18	$ 10,080.14
	Prime coat	sq m	$ 2.00		595	$ 1,190.00	$ 1,258.52	$ 1,287.36	$ 1,290.97	$ 1,263.32	$ 1,272.94	$ 1,407.57	$ 1,450.84	$ 1,460.45	$ 1,440.02
	180mm Base Course crushed rock	sq m	$ 12.42		685	$ 8,507.70	$ 8,997.54	$ 9,203.78	$ 9,229.57	$ 9,031.91	$ 9,100.66	$ 10,063.15	$ 10,372.52	$ 10,441.27	$ 10,295.18
	280mm Subbase Course crushed rock	sq m	$ 18.90		685	$ 12,946.50	$ 13,691.90	$ 14,005.76	$ 14,044.99	$ 13,744.21	$ 13,848.83	$ 15,313.49	$ 15,784.27	$ 15,888.89	$ 15,666.57
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00		3791.2	$ 45,494.40	$ 48,113.77	$ 49,216.67	$ 49,354.53	$ 48,297.59	$ 48,665.22	$ 53,812.06	$ 55,466.40	$ 55,834.04	$ 55,052.82
Kerb & Channel	Type SM2	lin m	$ 40.00		859	$ 34,360.00	$ 36,338.30	$ 37,171.27	$ 37,275.39	$ 36,477.13	$ 36,754.79	$ 40,641.98	$ 41,891.43	$ 42,169.09	$ 41,579.07
Footpath	Concrete	sq m	$ 45.00		195	$ 8,775.00	$ 9,280.23	$ 9,492.95	$ 9,519.55	$ 9,315.68	$ 9,386.59	$ 10,379.32	$ 10,698.41	$ 10,769.32	$ 10,618.64
Concrete Splitter Islands		sq m	$ 75.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Drainage	Subsoil Drains	lin m	$ 18.00		1032	$ 18,576.00	$ 19,645.53	$ 20,095.85	$ 20,152.15	$ 19,720.58	$ 19,870.69	$ 21,972.22	$ 22,647.71	$ 22,797.82	$ 22,478.84
	Flush out Risers/outlets	No	$ 590.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pits	No	$ 2,100.00		12	$ 25,200.00	$ 26,650.91	$ 27,261.82	$ 27,338.18	$ 26,752.73	$ 26,956.36	$ 29,807.27	$ 30,723.64	$ 30,927.27	$ 30,494.55
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00		395	$ 63,200.00	$ 66,838.79	$ 68,370.91	$ 68,562.42	$ 67,094.14	$ 67,604.85	$ 74,754.75	$ 77,052.93	$ 77,563.64	$ 76,478.38
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00		40	$ 8,000.00	$ 8,460.61	$ 8,654.55	$ 8,678.79	$ 8,492.93	$ 8,557.58	$ 9,462.63	$ 9,753.54	$ 9,818.18	$ 9,680.81
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00		1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Signage	No	$ 250.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Tactile pavers	No	$ 250.00		20	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Street Name Signs	No	$ 200.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	w-Beam barrier	lin m	$ 110.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00		1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00		1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00		1	$ 60,000.00	$ 63,454.55	$ 64,909.09	$ 65,090.91	$ 63,696.97	$ 64,181.82	$ 70,969.70	$ 73,151.52	$ 73,636.36	$ 72,606.06
Landscaping		item	$ 25,000.00		1	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 198,000.00		1	$ 198,000.00	$ 209,400.00	$ 214,200.00	$ 214,800.00	$ 210,200.00	$ 211,800.00	$ 234,200.00	$ 241,400.00	$ 243,000.00	$ 239,600.00
	Intersection Signals - T	item	$ 172,500.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00		0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00		15	$ 52,500.00	$ 55,522.73	$ 56,795.45	$ 56,954.55	$ 55,734.85	$ 56,159.09	$ 62,098.48	$ 64,007.58	$ 64,431.82	$ 63,530.30
	High Pressure Sodium Lantern	item	$ 750.00		15	$ 11,250.00	$ 11,897.73	$ 12,170.45	$ 12,204.55	$ 11,943.18	$ 12,034.09	$ 13,306.82	$ 13,715.91	$ 13,806.82	$ 13,613.64
	Distribution Box	item	$ 5,000.00		2	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00		200	$ 36,000.00	$ 38,072.73	$ 38,945.45	$ 39,054.55	$ 38,218.18	$ 38,509.09	$ 42,581.82	$ 43,890.91	$ 44,181.82	$ 43,563.64
	Electrical pit	No	$ 1,600.00		10	$ 16,000.00	$ 16,921.21	$ 17,309.09	$ 17,357.58	$ 16,985.86	$ 17,115.15	$ 18,925.25	$ 19,507.07	$ 19,636.36	$ 19,361.62
Services Relocating/alteration	Telstra	item	$ 50,000.00		1	$ 50,000.00	$ 52,878.79	$ 54,090.91	$ 54,242.42	$ 53,080.81	$ 53,484.85	$ 59,141.41	$ 60,959.60	$ 61,363.64	$ 60,505.05
	Electrical	item	$ 20,000.00		1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Water	item	$ 20,000.00		1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Other	item	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee	incl Prom & controller	item	$ 75,000.00		1.00	$ 75,000.00	$ 79,318.18	$ 81,136.36	$ 81,363.64	$ 79,621.21	$ 80,227.27	$ 88,712.12	$ 91,439.39	$ 92,045.45	$ 90,757.58
					Subtotal	$ 1,263,882.86	$ 1,336,651.87	$ 1,367,291.46	$ 1,371,121.41	$ 1,341,758.47	$ 1,351,971.67	$ 1,494,956.39	$ 1,540,915.77	$ 1,551,128.96	$ 1,529,425.93
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%			$ 126,388.29	$ 133,665.19	$ 136,729.15	$ 137,112.14	$ 134,175.85	$ 135,197.17	$ 149,495.64	$ 154,091.58	$ 155,112.90	$ 152,942.59
Contingency		item	15.00%			$ 189,582.43	$ 200,497.78	$ 205,093.72	$ 205,668.21	$ 201,263.77	$ 202,795.75	$ 224,243.46	$ 231,137.37	$ 232,669.34	$ 229,413.89
					TOTAL	**$ 1,579,853.58**	**$ 1,670,814.84**	**$ 1,709,114.32**	**$ 1,713,901.76**	**$ 1,677,198.09**	**$ 1,689,964.58**	**$ 1,868,695.49**	**$ 1,926,144.71**	**$ 1,938,911.21**	**$ 1,911,782.41**

VI

JNC_02: Carngham Rd and New N-S Rd (North) Roundabout

Duplicated Carngham Road

					Indexation	99	104.7 Jun-13	107.1 Jun-14	107.4 Jun-15	105.1 Jun-16	105.9 Jun-17	117.1 Jun-18	120.7 Jun-19	121.5 Jun-20	119.8 Jun-21
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	687.2	$ 3,092.40	$ 3,270.45	$ 3,345.41	$ 3,354.79	$ 3,282.94	$ 3,307.93	$ 3,657.78	$ 3,770.23	$ 3,795.22	$ 3,742.12
	Cut place & Compact and disposal	cu m	$ 35.00	4569.88	$ 159,945.80	$ 169,154.80	$ 173,032.27	$ 173,516.96	$ 169,801.05	$ 171,093.54	$ 189,188.42	$ 195,004.63	$ 196,297.12	$ 193,550.57
	Swale drain formation	lin m	$ 10.00	1032	$ 10,320.00	$ 10,914.18	$ 11,164.36	$ 11,195.64	$ 10,955.88	$ 11,039.27	$ 12,206.79	$ 12,582.06	$ 12,665.45	$ 12,488.24
	sawcut existing Pavement	lin m	$ 7.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSVS6+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	6872	$ 92,084.80	$ 97,386.65	$ 99,619.01	$ 99,898.06	$ 97,758.71	$ 98,502.83	$ 108,920.51	$ 112,269.04	$ 113,013.16	$ 111,431.91
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	6872	$ 240,520.00	$ 254,368.12	$ 260,198.91	$ 260,927.76	$ 255,339.92	$ 257,283.52	$ 284,493.86	$ 293,240.04	$ 295,183.64	$ 291,053.49
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	6872	$ 182,795.20	$ 193,319.77	$ 197,751.17	$ 198,305.10	$ 194,058.34	$ 195,535.47	$ 216,215.33	$ 222,862.43	$ 224,339.56	$ 221,200.66
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	6872	$ 50,165.60	$ 53,053.92	$ 54,270.06	$ 54,422.08	$ 53,256.61	$ 53,661.99	$ 59,337.29	$ 61,161.49	$ 61,566.87	$ 60,705.44
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	6872	$ 69,407.20	$ 73,403.37	$ 75,085.97	$ 75,296.30	$ 73,683.81	$ 74,244.67	$ 82,096.80	$ 84,620.70	$ 85,181.56	$ 83,989.72
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	6872	$ 115,449.60	$ 122,096.70	$ 124,895.48	$ 125,245.32	$ 122,563.16	$ 123,496.09	$ 136,557.05	$ 140,755.22	$ 141,688.15	$ 139,705.68
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	40mm Base Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	180mm Base Course crushed rock	sq m	$ 12.42	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	280mm Subbase Course crushed rock	sq m	$ 18.90	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	5354	$ 64,248.00	$ 67,947.13	$ 69,504.65	$ 69,699.35	$ 68,206.72	$ 68,725.89	$ 75,994.35	$ 78,330.64	$ 78,849.82	$ 77,746.57
Kerb & Channel	Type SM2	lin m	$ 40.00	1032	$ 41,280.00	$ 43,656.73	$ 44,657.45	$ 44,782.55	$ 43,823.52	$ 44,157.09	$ 48,827.15	$ 50,328.24	$ 50,661.82	$ 49,952.97
Footpath	Concrete	sq m	$ 45.00	493	$ 22,185.00	$ 23,462.32	$ 24,000.14	$ 24,067.36	$ 23,551.95	$ 23,731.23	$ 26,241.05	$ 27,047.77	$ 27,227.05	$ 26,846.09
Concrete Splitter Islands		sq m	$ 75.00	335	$ 25,125.00	$ 26,571.59	$ 27,180.68	$ 27,256.82	$ 26,673.11	$ 26,876.14	$ 29,718.56	$ 30,632.20	$ 30,835.23	$ 30,403.79
Drainage	Subsoil Drains	lin m	$ 18.00	1032	$ 18,576.00	$ 19,645.53	$ 20,095.85	$ 20,152.15	$ 19,720.58	$ 19,870.69	$ 21,972.22	$ 22,647.71	$ 22,797.82	$ 22,478.84
	Flush out Risers/outlets	No	$ 590.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pits	No	$ 2,100.00	12	$ 25,200.00	$ 26,650.91	$ 27,261.82	$ 27,338.18	$ 26,752.73	$ 26,956.36	$ 29,807.27	$ 30,723.64	$ 30,927.27	$ 30,494.55
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	395	$ 63,200.00	$ 66,838.79	$ 68,370.91	$ 68,562.42	$ 67,094.14	$ 67,604.85	$ 74,754.75	$ 77,052.93	$ 77,563.64	$ 76,478.38
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00	40	$ 8,000.00	$ 8,460.61	$ 8,654.55	$ 8,678.79	$ 8,492.93	$ 8,557.58	$ 9,462.63	$ 9,753.54	$ 9,818.18	$ 9,680.81
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Signage	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Tactile pavers	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	1	$ 60,000.00	$ 63,454.55	$ 64,909.09	$ 65,090.91	$ 63,696.97	$ 64,181.82	$ 70,969.70	$ 73,151.52	$ 73,636.36	$ 72,606.06
Landscaping		item	$ 25,000.00	1	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	10	$ 35,000.00	$ 37,015.15	$ 37,863.64	$ 37,969.70	$ 37,156.57	$ 37,439.39	$ 41,398.99	$ 42,671.72	$ 42,954.55	$ 42,353.54
	High Pressure Sodium Lantern	item	$ 750.00	10	$ 7,500.00	$ 7,931.82	$ 8,113.64	$ 8,136.36	$ 7,962.12	$ 8,022.73	$ 8,871.21	$ 9,143.94	$ 9,204.55	$ 9,075.76
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	200	$ 36,000.00	$ 38,072.73	$ 38,945.45	$ 39,054.55	$ 38,218.18	$ 38,509.09	$ 42,581.82	$ 43,890.91	$ 44,181.82	$ 43,563.64
	Electrical pit	No	$ 1,600.00	10	$ 16,000.00	$ 16,921.21	$ 17,309.09	$ 17,357.58	$ 16,985.86	$ 17,115.15	$ 18,925.25	$ 19,507.07	$ 19,636.36	$ 19,361.62
Services Relocating/alteration	Testra	item	$ 50,000.00	1	$ 50,000.00	$ 52,878.79	$ 54,090.91	$ 54,242.42	$ 53,080.81	$ 53,484.85	$ 59,141.41	$ 60,959.60	$ 61,363.64	$ 60,505.05
	Electrical	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Water	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Other	item	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee	incl Prom & controller	item	$ 75,000.00	0.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 1,507,594.60	$ 1,594,395.50	$ 1,630,943.25	$ 1,635,511.72	$ 1,600,486.79	$ 1,612,669.38	$ 1,783,225.53	$ 1,838,047.15	$ 1,850,229.74	$ 1,824,341.75
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 150,759.46	$ 159,439.55	$ 163,094.32	$ 163,551.17	$ 160,048.68	$ 161,266.94	$ 178,322.55	$ 183,804.72	$ 185,022.97	$ 182,434.17
Contingency		item	15.00%		$ 226,139.19	$ 239,159.33	$ 244,641.49	$ 245,326.76	$ 240,073.02	$ 241,900.41	$ 267,483.83	$ 275,707.07	$ 277,534.46	$ 273,651.26
				TOTAL	**$ 1,884,493.25**	**$ 1,992,994.38**	**$ 2,038,679.06**	**$ 2,044,389.65**	**$2,000,608.49**	**$2,015,836.72**	**$ 2,229,031.91**	**$ 2,297,558.94**	**$2,312,787.17**	**$ 2,280,427.19**

VII

n Rd/New N-S Road Signalised Intersection

Duplicated Carngham Road

					Indexation	99	104.7 Jun-13	107.1 Jun-14	107.4 Jun-15	105.1 Jun-16	105.9 Jun-17	117.1 Jun-18	120.7 Jun-19	121.5 Jun-20	119.8 Jun-21
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	687.5	$ 3,093.75	$ 3,271.88	$ 3,346.88	$ 3,356.25	$ 3,284.38	$ 3,309.38	$ 3,659.38	$ 3,771.88	$ 3,796.88	$ 3,743.75
	Cut place & Compact and disposal	cu m	$ 35.00	4571.875	$ 160,015.63	$ 169,228.65	$ 173,107.81	$ 173,592.71	$ 169,875.17	$ 171,168.23	$ 189,271.01	$ 195,089.76	$ 196,382.81	$ 193,635.07
	Swale drain formation	lin m	$ 10.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	sawcut existing Pavement	lin m	$ 7.50	150	$ 1,125.00	$ 1,189.77	$ 1,217.05	$ 1,220.45	$ 1,194.32	$ 1,203.41	$ 1,330.68	$ 1,371.59	$ 1,380.68	$ 1,361.36
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	6190	$ 82,946.00	$ 87,721.68	$ 89,732.49	$ 89,983.84	$ 88,056.81	$ 88,727.08	$ 98,110.87	$ 101,127.09	$ 101,797.36	$ 100,373.04
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	6190	$ 216,650.00	$ 229,123.79	$ 234,375.91	$ 235,032.42	$ 229,999.14	$ 231,749.85	$ 256,259.75	$ 264,137.93	$ 265,888.64	$ 262,168.38
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	6190	$ 164,654.00	$ 174,134.08	$ 178,125.69	$ 178,624.64	$ 174,799.35	$ 176,129.88	$ 194,757.41	$ 200,744.83	$ 202,075.36	$ 199,247.97
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	6190	$ 45,187.00	$ 47,788.68	$ 48,884.12	$ 49,021.05	$ 47,971.25	$ 48,336.40	$ 53,448.46	$ 55,091.63	$ 55,456.77	$ 54,680.83
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	6190	$ 62,519.00	$ 66,118.58	$ 67,634.19	$ 67,823.64	$ 66,371.18	$ 66,876.38	$ 73,949.24	$ 76,222.66	$ 76,727.86	$ 75,654.31
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	6190	$ 103,992.00	$ 109,979.42	$ 112,500.44	$ 112,815.56	$ 110,399.59	$ 111,239.93	$ 123,004.68	$ 126,786.21	$ 127,626.55	$ 125,840.82
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	595	$ 9,520.00	$ 10,068.12	$ 10,298.91	$ 10,327.76	$ 10,106.59	$ 10,183.52	$ 11,260.53	$ 11,606.71	$ 11,683.64	$ 11,520.16
	40mm Base Course Asphalt	sq m	$ 14.00	595	$ 8,330.00	$ 8,809.61	$ 9,011.55	$ 9,036.79	$ 8,843.26	$ 8,910.58	$ 9,852.96	$ 10,155.87	$ 10,223.18	$ 10,080.14
	Prime coat	sq m	$ 2.00	595	$ 1,190.00	$ 1,258.52	$ 1,287.36	$ 1,290.97	$ 1,263.32	$ 1,272.94	$ 1,407.57	$ 1,450.84	$ 1,460.45	$ 1,440.02
	180mm Base Course crushed rock	sq m	$ 12.42	685	$ 8,507.70	$ 8,997.54	$ 9,203.78	$ 9,229.57	$ 9,031.91	$ 9,100.66	$ 10,063.15	$ 10,372.52	$ 10,441.27	$ 10,295.18
	280mm Subbase Course crushed rock	sq m	$ 18.90	685	$ 12,946.50	$ 13,691.90	$ 14,005.76	$ 14,044.99	$ 13,744.21	$ 13,848.83	$ 15,313.49	$ 15,784.27	$ 15,888.89	$ 15,666.57
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	6875	$ 82,500.00	$ 87,250.00	$ 89,250.00	$ 89,500.00	$ 87,583.33	$ 88,250.00	$ 97,583.33	$ 100,583.33	$ 101,250.00	$ 99,833.33
Kerb & Channel	Type SM2	lin m	$ 40.00	859	$ 34,360.00	$ 36,338.30	$ 37,171.27	$ 37,275.39	$ 36,477.13	$ 36,754.79	$ 40,641.98	$ 41,891.43	$ 42,169.09	$ 41,579.07
Footpath	Concrete	sq m	$ 45.00	195	$ 8,775.00	$ 9,280.23	$ 9,492.95	$ 9,519.55	$ 9,315.68	$ 9,386.59	$ 10,379.32	$ 10,698.41	$ 10,769.32	$ 10,618.64
Concrete Splitter Islands		sq m	$ 75.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Drainage	Subsoil Drains	lin m	$ 18.00	1032	$ 18,576.00	$ 19,645.53	$ 20,095.85	$ 20,152.15	$ 19,720.58	$ 19,870.69	$ 21,972.22	$ 22,647.71	$ 22,797.82	$ 22,478.84
	Flush out Risers/outlets	No	$ 590.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pits	No	$ 2,100.00	12	$ 25,200.00	$ 26,650.91	$ 27,261.82	$ 27,338.18	$ 26,752.73	$ 26,956.36	$ 29,807.27	$ 30,723.64	$ 30,927.27	$ 30,494.55
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	395	$ 63,200.00	$ 66,838.79	$ 68,370.91	$ 68,562.42	$ 67,094.14	$ 67,604.85	$ 74,754.75	$ 77,052.93	$ 77,563.64	$ 76,478.38
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00	40	$ 8,000.00	$ 8,460.61	$ 8,654.55	$ 8,678.79	$ 8,492.93	$ 8,557.58	$ 9,462.63	$ 9,753.54	$ 9,818.18	$ 9,680.81
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Signage	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Tactile pavers	No	$ 250.00	20	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	1	$ 60,000.00	$ 63,454.55	$ 64,909.09	$ 65,090.91	$ 63,696.97	$ 64,181.82	$ 70,969.70	$ 73,151.52	$ 73,636.36	$ 72,606.06
Landscaping		item	$ 25,000.00	1	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	1	$ 207,000.00	$ 218,918.18	$ 223,936.36	$ 224,563.64	$ 219,754.55	$ 221,427.27	$ 244,845.45	$ 252,372.73	$ 254,045.45	$ 250,490.91
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	15	$ 52,500.00	$ 55,522.73	$ 56,795.45	$ 56,954.55	$ 55,734.85	$ 56,159.09	$ 62,098.48	$ 64,007.58	$ 64,431.82	$ 63,530.30
	High Pressure Sodium Lantern	item	$ 750.00	15	$ 11,250.00	$ 11,897.73	$ 12,170.45	$ 12,204.55	$ 11,943.18	$ 12,034.09	$ 13,306.82	$ 13,715.91	$ 13,806.82	$ 13,613.64
	Distribution Box	item	$ 5,000.00	2	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	200	$ 36,000.00	$ 38,072.73	$ 38,945.45	$ 39,054.55	$ 38,218.18	$ 38,509.09	$ 42,581.82	$ 43,890.91	$ 44,181.82	$ 43,563.64
	Electrical pit	No	$ 1,600.00	10	$ 16,000.00	$ 16,921.21	$ 17,309.09	$ 17,357.58	$ 16,985.86	$ 17,115.15	$ 18,925.25	$ 19,507.07	$ 19,636.36	$ 19,361.62
Services Relocating/alteration	Telstra	item	$ 50,000.00	1	$ 50,000.00	$ 52,878.79	$ 54,090.91	$ 54,242.42	$ 53,080.81	$ 53,484.85	$ 59,141.41	$ 60,959.60	$ 61,363.64	$ 60,505.05
	Electrical	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Water	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Other	item	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee	incl Prom & controller	item	$ 75,000.00	1.00	$ 75,000.00	$ 79,318.18	$ 81,136.36	$ 81,363.64	$ 79,621.21	$ 80,227.27	$ 88,712.12	$ 91,439.39	$ 92,045.45	$ 90,757.58
				Subtotal	$ 1,750,537.58	$ 1,851,326.10	$ 1,893,763.38	$ 1,899,068.04	$ 1,858,398.98	$ 1,872,544.74	$ 2,070,585.35	$ 2,134,241.27	$ 2,148,387.02	$ 2,118,327.29
Professional Fees	Survey, Geotech, Pavement & Design	Item	10.00%		$ 175,053.76	$ 185,132.61	$ 189,376.34	$ 189,906.80	$ 185,839.90	$ 187,254.47	$ 207,058.54	$ 213,424.13	$ 214,838.70	$ 211,832.73
Contingency		Item	15.00%		$ 262,580.64	$ 277,698.92	$ 284,064.51	$ 284,860.21	$ 278,759.85	$ 280,881.71	$ 310,587.80	$ 320,136.19	$ 322,258.05	$ 317,749.09
				TOTAL	**$ 2,188,171.97**	**$ 2,314,157.63**	**$ 2,367,204.22**	**$ 2,373,835.04**	**$ 2,322,998.73**	**$ 2,340,680.92**	**$ 2,588,231.69**	**$ 2,667,801.58**	**$ 2,685,483.78**	**$ 2,647,909.11**

APPENDIX K. DI_JNC_05 COSTINGS FOR POTENTIAL INTERSECTION TREATMENTS (ROUNDABOUT VS TRAFFIC SIGNALS

JNC_05: Greenhalghs Rd and New N-S Rd (South) Roundabout

						99	104.7 Jun-13	107.1 Jun-14	107.4 Jun-15	105.1 Jun-16	105.9 Jun-17	117.1 Jun-18	120.7 Jun-19	121.5 Jun-20	119.8 Jun-21
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	262.2	$ 1,179.90	$ 1,247.83	$ 1,276.44	$ 1,280.01	$ 1,252.60	$ 1,262.14	$ 1,395.62	$ 1,438.52	$ 1,448.06	$ 1,427.90
	Cut place & Compact and disposal	cu m	$ 35.00	1743.63	$ 61,027.05	$ 64,540.73	$ 66,020.17	$ 66,205.10	$ 64,787.30	$ 65,280.45	$ 72,184.52	$ 74,403.69	$ 74,896.83	$ 73,848.89
	Swale drain formation	lin m	$ 10.00	423	$ 4,230.00	$ 4,473.55	$ 4,576.09	$ 4,588.91	$ 4,490.64	$ 4,524.82	$ 5,003.36	$ 5,157.18	$ 5,191.36	$ 5,118.73
	sawcut existing Pavement	lin m	$ 7.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	2241	$ 35,856.00	$ 37,920.44	$ 38,789.67	$ 38,898.33	$ 38,065.31	$ 38,355.05	$ 42,411.49	$ 43,715.35	$ 44,005.09	$ 43,389.38
	40mm Base Course Asphalt	sq m	$ 14.00	2241	$ 31,374.00	$ 33,180.38	$ 33,940.96	$ 34,036.04	$ 33,307.15	$ 33,560.67	$ 37,110.05	$ 38,250.93	$ 38,504.45	$ 37,965.71
	Prime coat	sq m	$ 2.00	2241	$ 4,482.00	$ 4,740.05	$ 4,848.71	$ 4,862.29	$ 4,758.16	$ 4,794.38	$ 5,301.44	$ 5,464.42	$ 5,500.64	$ 5,423.67
	180mm Base Course crushed rock	sq m	$ 12.42	2622	$ 32,565.24	$ 34,440.21	$ 35,229.67	$ 35,328.35	$ 34,571.79	$ 34,834.94	$ 38,519.09	$ 39,703.28	$ 39,966.43	$ 39,407.23
	280mm Subbase Course crushed rock	sq m	$ 18.90	2622	$ 49,555.80	$ 52,409.01	$ 53,610.37	$ 53,760.53	$ 52,609.24	$ 53,009.69	$ 58,616.00	$ 60,418.03	$ 60,818.48	$ 59,967.52
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	2622	$ 31,464.00	$ 33,275.56	$ 34,038.33	$ 34,133.67	$ 33,402.69	$ 33,656.95	$ 37,216.51	$ 38,360.65	$ 38,614.91	$ 38,074.62
Kerb & Channel	Type SM2	lin m	$ 40.00	423	$ 16,920.00	$ 17,894.18	$ 18,304.36	$ 18,355.64	$ 17,962.55	$ 18,099.27	$ 20,013.45	$ 20,628.73	$ 20,765.45	$ 20,474.91
Footpath	Concrete	sq m	$ 45.00	398	$ 17,910.00	$ 18,941.18	$ 19,375.36	$ 19,429.64	$ 19,013.55	$ 19,158.27	$ 21,184.45	$ 21,835.73	$ 21,980.45	$ 21,672.91
Concrete Splitter Islands		sq m	$ 75.00	27	$ 2,025.00	$ 2,141.59	$ 2,190.68	$ 2,196.82	$ 2,149.77	$ 2,166.14	$ 2,395.23	$ 2,468.86	$ 2,485.23	$ 2,450.45
Drainage	Subsoil Drains	lin m	$ 18.00	423	$ 7,614.00	$ 8,052.38	$ 8,236.96	$ 8,260.04	$ 8,083.15	$ 8,144.67	$ 9,006.05	$ 9,282.93	$ 9,344.45	$ 9,213.71
	Flush out Risers/outlets	No	$ 590.00	28	$ 16,520.00	$ 17,471.15	$ 17,871.64	$ 17,921.70	$ 17,537.90	$ 17,671.39	$ 19,540.32	$ 20,141.05	$ 20,274.55	$ 19,990.87
	Drainage Pits	No	$ 2,100.00	25	$ 52,500.00	$ 55,522.73	$ 56,795.45	$ 56,954.55	$ 55,734.85	$ 56,159.09	$ 62,088.48	$ 64,007.58	$ 64,431.82	$ 63,530.30
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	250	$ 40,000.00	$ 42,303.03	$ 43,272.73	$ 43,393.94	$ 42,464.65	$ 42,787.88	$ 47,313.13	$ 48,767.68	$ 49,090.91	$ 48,404.04
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00	95	$ 19,000.00	$ 20,093.94	$ 20,554.55	$ 20,612.12	$ 20,170.71	$ 20,324.24	$ 22,473.74	$ 23,164.65	$ 23,318.18	$ 22,991.92
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Signage	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Tactile pavers	No	$ 250.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Street Name Signs	No	$ 200.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	w-Beam barrier	lin m	$ 110.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	1	$ 60,000.00	$ 63,454.55	$ 64,909.09	$ 65,090.91	$ 63,696.97	$ 64,181.82	$ 70,969.70	$ 73,151.52	$ 73,636.36	$ 72,606.06
Landscaping		item	$ 25,000.00	1	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	8	$ 28,000.00	$ 29,612.12	$ 30,290.91	$ 30,375.76	$ 29,725.25	$ 29,951.52	$ 33,119.19	$ 34,137.37	$ 34,363.64	$ 33,882.83
	High Pressure Sodium Lantern	item	$ 750.00	8	$ 6,000.00	$ 6,345.45	$ 6,490.91	$ 6,509.09	$ 6,369.70	$ 6,418.18	$ 7,096.97	$ 7,315.15	$ 7,363.64	$ 7,260.61
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	250	$ 45,000.00	$ 47,590.91	$ 48,681.82	$ 48,818.18	$ 47,772.73	$ 48,136.36	$ 53,227.27	$ 54,863.64	$ 55,227.27	$ 54,454.55
	Electrical pit	No	$ 1,600.00	8	$ 12,800.00	$ 13,536.97	$ 13,847.27	$ 13,886.06	$ 13,588.69	$ 13,692.12	$ 15,140.20	$ 15,605.66	$ 15,709.09	$ 15,489.29
Services Relocating/alteration	Telstra	item	$ 50,000.00	1	$ 50,000.00	$ 52,878.79	$ 54,090.91	$ 54,242.42	$ 53,080.81	$ 53,484.85	$ 59,141.41	$ 60,959.60	$ 61,363.64	$ 60,505.05
	Electrical	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Water	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Other	item	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	1.00	$ 75,000.00	$ 79,318.18	$ 81,136.36	$ 81,363.64	$ 79,621.21	$ 80,227.27	$ 88,712.12	$ 91,439.39	$ 92,045.45	$ 90,757.58
				Subtotal	$ 812,522.99	$ 859,304.62	$ 879,002.14	$ 881,464.33	$ 862,587.54	$ 869,153.38	$ 961,075.17	$ 990,621.46	$ 997,187.31	$ 983,234.89
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 81,252.30	$ 85,930.46	$ 87,900.21	$ 88,146.43	$ 86,258.75	$ 86,915.34	$ 96,107.52	$ 99,062.15	$ 99,718.73	$ 98,323.49
Contingency		item	15.00%		$ 121,878.45	$ 128,895.69	$ 131,850.32	$ 132,219.65	$ 129,388.13	$ 130,373.01	$ 144,161.28	$ 148,593.22	$ 149,578.10	$ 147,485.23
				TOTAL	**$ 1,015,653.74**	**$ 1,074,130.77**	**$ 1,098,752.68**	**$ 1,101,830.42**	**$ 1,078,234.42**	**$ 1,086,441.73**	**$ 1,201,343.97**	**$ 1,238,276.83**	**$ 1,246,484.13**	**$ 1,229,043.61**

IX

JNC_05 New: Greenhalghs Rd and New N-S Rd (South) Signalisation

			Indexation		99	104.7	107.1	107.4	105.1	105.9	117.1	120.7	121.5	119.8
					Revised Scope	Jun-13	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	1000	$ 4,500.00	$ 4,759.09	$ 4,868.18	$ 4,881.82	$ 4,777.27	$ 4,813.64	$ 5,322.73	$ 5,486.36	$ 5,522.73	$ 5,445.45
	Cut place & Compact and disposal	cu m	$ 35.00	1420	$ 49,700.00	$ 52,561.52	$ 53,766.36	$ 53,916.97	$ 52,762.32	$ 53,163.94	$ 58,786.57	$ 60,593.84	$ 60,995.45	$ 60,142.02
	Swale drain formation	lin m	$ 10.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	sawcut existing Pavement	lin m	$ 7.50	140	$ 1,050.00	$ 1,110.45	$ 1,135.91	$ 1,139.09	$ 1,114.70	$ 1,123.18	$ 1,241.97	$ 1,280.15	$ 1,288.64	$ 1,270.61
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	1095	$ 30,660.00	$ 32,425.27	$ 33,168.55	$ 33,261.45	$ 32,549.15	$ 32,796.91	$ 36,265.52	$ 37,380.42	$ 37,628.18	$ 37,101.70
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	2625	$ 42,000.00	$ 44,418.18	$ 45,436.36	$ 45,563.64	$ 44,587.88	$ 44,927.27	$ 49,678.79	$ 51,206.06	$ 51,545.45	$ 50,824.24
	40mm Base Course Asphalt	sq m	$ 14.00	2625	$ 36,750.00	$ 38,865.91	$ 39,756.82	$ 39,868.18	$ 39,014.39	$ 39,311.36	$ 43,468.94	$ 44,805.30	$ 45,102.27	$ 44,471.21
	Prime coat	sq m	$ 2.00	2625	$ 5,250.00	$ 5,552.27	$ 5,679.55	$ 5,695.45	$ 5,573.48	$ 5,615.91	$ 6,209.85	$ 6,400.76	$ 6,443.18	$ 6,353.03
	180mm Base Course crushed rock	sq m	$ 12.42	2625	$ 32,602.50	$ 34,479.61	$ 35,269.98	$ 35,368.77	$ 34,611.34	$ 34,874.80	$ 38,563.16	$ 39,748.70	$ 40,012.16	$ 39,452.32
	280mm Subbase Course crushed rock	sq m	$ 18.90	2625	$ 49,612.50	$ 52,468.98	$ 53,671.70	$ 53,822.05	$ 52,669.43	$ 53,070.34	$ 58,683.07	$ 60,487.16	$ 60,888.07	$ 60,036.14
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	875	$ 10,500.00	$ 11,104.55	$ 11,359.09	$ 11,390.91	$ 11,146.97	$ 11,231.82	$ 12,419.70	$ 12,801.52	$ 12,886.36	$ 12,706.06
Kerb & Channel	Type SM2	lin m	$ 40.00	560	$ 22,400.00	$ 23,689.70	$ 24,232.73	$ 24,300.61	$ 23,780.20	$ 23,961.21	$ 26,495.35	$ 27,309.90	$ 27,490.91	$ 27,106.26
Footpath	Concrete	sq m	$ 45.00	860	$ 38,700.00	$ 40,928.18	$ 41,866.36	$ 41,983.64	$ 41,084.55	$ 41,397.27	$ 45,775.45	$ 47,182.73	$ 47,495.45	$ 46,830.91
Concrete Splitter Islands		sq m	$ 75.00	130	$ 9,750.00	$ 10,311.36	$ 10,547.73	$ 10,577.27	$ 10,350.76	$ 10,429.55	$ 11,532.58	$ 11,887.12	$ 11,965.91	$ 11,798.48
Drainage	Subsoil Drains	lin m	$ 18.00	560	$ 10,080.00	$ 10,660.36	$ 10,904.73	$ 10,935.27	$ 10,701.09	$ 10,782.55	$ 11,922.91	$ 12,289.45	$ 12,370.91	$ 12,197.82
	Flush out Risers/outlets	No	$ 590.00	12	$ 7,080.00	$ 7,487.64	$ 7,659.27	$ 7,680.73	$ 7,516.24	$ 7,573.45	$ 8,374.42	$ 8,631.88	$ 8,689.09	$ 8,567.52
	Drainage Pits	No	$ 2,100.00	13	$ 27,300.00	$ 28,871.82	$ 29,533.64	$ 29,616.36	$ 28,982.12	$ 29,202.73	$ 32,291.21	$ 33,283.94	$ 33,504.55	$ 33,035.76
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	275	$ 44,000.00	$ 46,533.33	$ 47,600.00	$ 47,733.33	$ 46,711.11	$ 47,066.67	$ 52,044.44	$ 53,644.44	$ 54,000.00	$ 53,244.44
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
	Signage	No	$ 250.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Tactile pavers	No	$ 250.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Street Name Signs	No	$ 200.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	w-Beam barrier	lin m	$ 110.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Traffic Management		item	$ 60,000.00	1	$ 60,000.00	$ 63,454.55	$ 64,909.09	$ 65,090.91	$ 63,696.97	$ 64,181.82	$ 70,969.70	$ 73,151.52	$ 73,636.36	$ 72,606.06
Landscaping		item	$ 25,000.00	1	$ 25,000.00	$ 26,439.39	$ 27,045.45	$ 27,121.21	$ 26,540.40	$ 26,742.42	$ 29,570.71	$ 30,479.80	$ 30,681.82	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	1	$ 198,000.00	$ 209,400.00	$ 214,200.00	$ 214,800.00	$ 210,200.00	$ 211,800.00	$ 234,200.00	$ 241,400.00	$ 243,000.00	$ 239,600.00
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	12	$ 42,000.00	$ 44,418.18	$ 45,436.36	$ 45,563.64	$ 44,587.88	$ 44,927.27	$ 49,678.79	$ 51,206.06	$ 51,545.45	$ 50,824.24
	High Pressure Sodium Lantern	item	$ 750.00	12	$ 9,000.00	$ 9,518.18	$ 9,736.36	$ 9,763.64	$ 9,554.55	$ 9,627.27	$ 10,645.45	$ 10,972.73	$ 11,045.45	$ 10,890.91
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	300	$ 54,000.00	$ 57,109.09	$ 58,418.18	$ 58,581.82	$ 57,327.27	$ 57,763.64	$ 63,872.73	$ 65,836.36	$ 66,272.73	$ 65,345.45
	Electrical pit	No	$ 1,600.00	12	$ 19,200.00	$ 20,305.45	$ 20,770.91	$ 20,829.09	$ 20,383.03	$ 20,538.18	$ 22,710.30	$ 23,408.48	$ 23,563.64	$ 23,233.94
Services Relocating/alteration	Telstra	item	$ 50,000.00	1	$ 50,000.00	$ 52,878.79	$ 54,090.91	$ 54,242.42	$ 53,080.81	$ 53,484.85	$ 59,141.41	$ 60,959.60	$ 61,363.64	$ 60,505.05
	Electrical	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Water	item	$ 20,000.00	1	$ 20,000.00	$ 21,151.52	$ 21,636.36	$ 21,696.97	$ 21,232.32	$ 21,393.94	$ 23,656.57	$ 24,383.84	$ 24,545.45	$ 24,202.02
	Other	item	$ -	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	1	$ 75,000.00	$ 79,318.18	$ 81,136.36	$ 81,363.64	$ 79,621.21	$ 80,227.27	$ 88,712.12	$ 91,439.39	$ 92,045.45	$ 90,757.58
				Subtotal	$ 1,040,635.00	$ 1,100,550.35	$ 1,125,777.86	$ 1,128,931.30	$ 1,104,754.93	$ 1,113,164.11	$ 1,230,892.51	$ 1,268,733.78	$ 1,277,142.95	$ 1,259,273.46
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 104,063.50	$ 110,055.03	$ 112,577.79	$ 112,893.13	$ 110,475.49	$ 111,316.41	$ 123,089.25	$ 126,873.38	$ 127,714.30	$ 125,927.35
Contingency		item	15.00%		$ 156,095.25	$ 165,082.55	$ 168,866.68	$ 169,339.70	$ 165,713.24	$ 166,974.62	$ 184,633.88	$ 190,310.07	$ 191,571.44	$ 188,891.02
				TOTAL	**$ 1,300,793.75**	**$ 1,375,687.94**	**$ 1,407,222.33**	**$ 1,411,164.13**	**$ 1,380,943.67**	**$ 1,391,455.13**	**$ 1,538,615.64**	**$ 1,585,917.23**	**$ 1,596,428.69**	**$ 1,574,091.83**

x

APPENDIX L. DI_JNC_05 MEMORANDUM BY MEM DEC 2021

22.12.2021

Memo

To
Chris Duckett

From
Justin Hinch

CC
Lily Garrod

Re
DI_JNC_05 Review

Background

An initial review of the Ballarat West DCP (Urban Enterprise, March 2017) Project DI_JNC_05 at the Greenhalghs Road / New North-South Road (South) intersection has been undertaken with the understanding the adopted roundabout scope is to be changed to a signalised intersection following difficulties in achieving the necessary land acquisition which would facilitate delivering the project promptly.

The task required it is to review concept designs for the signalised intersection, establish a concept that can be achieved within the existing road reserve provisions and/or with land acquisition that is more likely to be achieved, and develop the cost estimates for consideration as part of the DCP update.

The City has internally prepared two (2) concept designs, both of which require land acquisition to the west encroaching on private land at 453 Greenhalghs Road which has no development planned and would ideally be avoided.

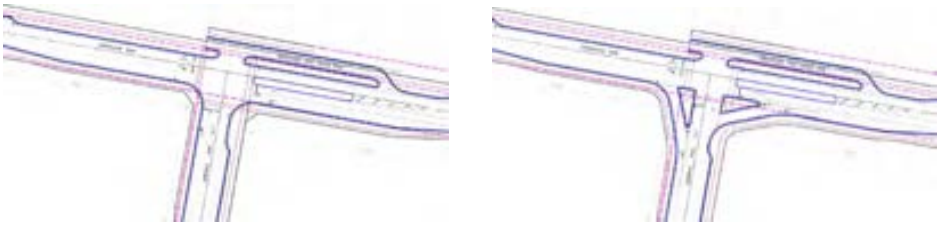


Figure 1 - Signalised intersection concepts

An option to acquire land to the east has been suggested to achieve additional land provision for the intersection, as this land is currently being developed (known as Winterfield South) and may be more practical given the proposed development had shown this area as a court bowl for local lot access. Winterfield's original development proposal included the splays on their land. DCP land projects DI_LA_22 and DI_LA_23 require Winterfield developments to the north and to the south to provide land funded under the DCP for the new North-South Road and Greenhalghs Road widening respectively.

Milward Engineering Management Pty Ltd

T: 0429 080 282
E: justin@milward.com.au
40 Kepler Street
Warrnambool VIC 3280
www.milward.com.au

Figure 2 – Winterfield South development latest plan showing a court bowl and road land provisions

The total project cost in the DCP (2017) for a roundabout was estimated at $1.015M with 42% or $0.427M calculated as the existing / external demand. Indexation of the roundabout cost into 2021 values equates to $1.229M with a 0.516M external contribution required, with a key aim of the design review to keep the cost of any scope changes as close as possible to the original amounts (including indexation).

A review of the cost estimate by the developer (Winterfield / Reeds) calculated the roundabout treatment in November 2020 at $1.938M, an increase of $0.709M (58%).

Traffic Analysis

The DCP is supported by a traffic report (SMEC Australia Pty Ltd, December 2011) that outlines required traffic modelling, refinement of the road hierarchy, preparation of functional layout plans and civil estimates for road and intersection construction components of the work.

The DI_JNC_05 intersection is within Precinct 2: Greenhalghs Road Precinct and proposed as a single lane roundabout at the ‘T’ junction of two ‘link’ roads. Both link roads are expected to accommodate public transport bus routes and provision of bike lanes on-road for Greenhalghs Road and the new North-South Road. A shared path is also proposed in Greenhalghs Road.

Table 1 - Road Classification Summary and Proposed Road Reserve Reservations

	Greenhalghs Road	North-South Road (South)
Road Category	Link	Link
Indicative Traffic	13,000vpd	9,500vpd
Lanes	2	2
Posted Speed Limit	60km/h	60km/h
Bus Route	Yes	Yes
Bike Lane	Yes, on-road	Yes, Copenhagen
Shared Path	Yes	No
Existing Road Reserve Width	20m	N/A
Proposed Road Reserve Width	24m (+4m)	24m

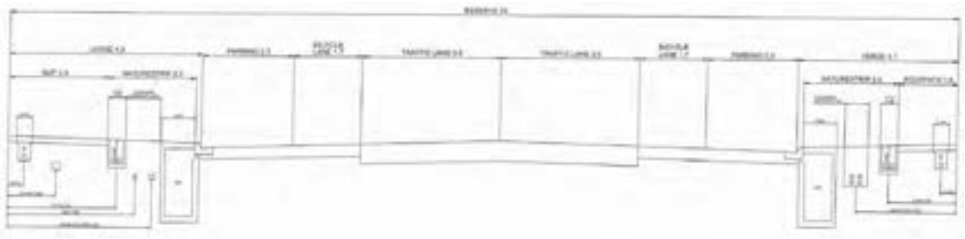


Figure 3 - Ultimate Arrangement - Link Road with On-Road Bicycle Lanes

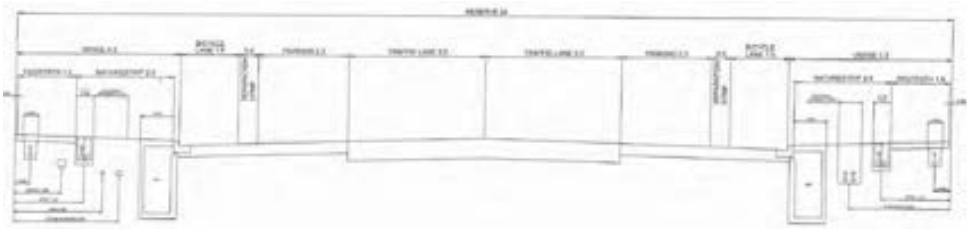
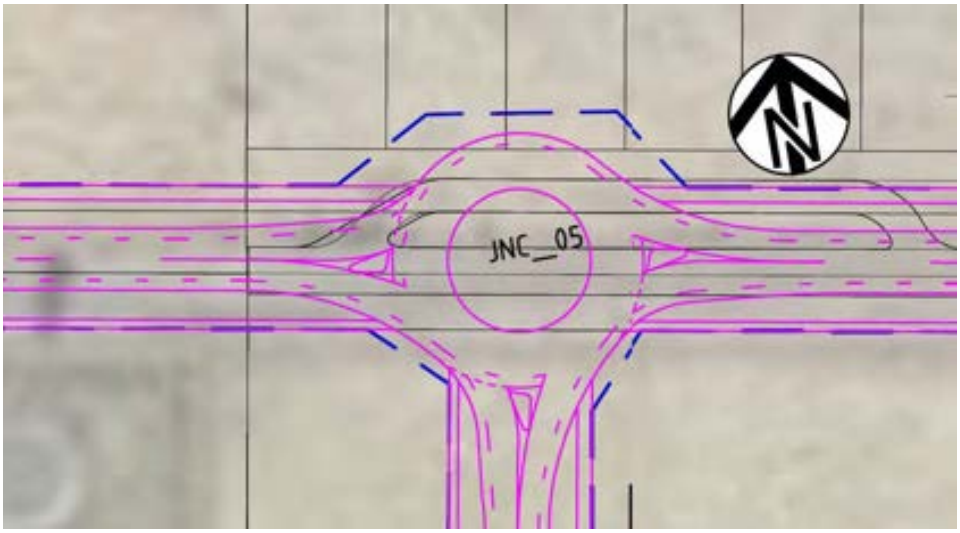


Figure 4 - Ultimate Arrangement - Link Road with Copenhagen Bicycle Lanes

While the traffic report did not specifically include the DI_JNC_05 intersection, analysis, and commentary on similar and/or connected intersections suggest that a single lane roundabout is more than sufficient to meet intersection the performance criteria and as such was adopted.



It is noted that no land acquisition for the intersection was included in the DCP, other than the standard road reserve widening associated with the link roads. It is noted that the concept plan alignment for the North-South Road was offset further east away from the land parcel boundary potentially with the land acquisition challenges in mind, whereas the adopted alignment is hard against the land parcel boundary. Land acquisition to the north boundary of Greenhalghs Road was a significant factor in changing to a signalised intersection, as existing developed lots occupied the proposed land acquisition area which now cannot be achieved.

Land acquisition for Greenhalghs Road (DI_LA_23) also changes from the north-side on the west approach to the new North-South Road to the south-side on the east approach resulting in a constricted land provision for left-hand turns out of the new North-South Road into Greenhalghs Road and an alignment change for the link road at the intersection which are key issues to review.

Design Considerations

- All traffic lanes, including turning lanes and center medians have been adopted the standard lane widths of 3.5m which allows for large vehicles to pass or overtake, without either vehicle having to move sideways towards the outer edge of the lane (Austroads, February 2021) also considered appropriate for urban arterial roads.
- While Copenhagen bicycle lanes have been identified for the North-South Road, this has not been adopted in the design phase, with bicycle lanes now situated between the parking lane and traffic lane as per the Ultimate Arrangement - Link Road with On-Road Bicycle Lanes.
- Diversion tapers for turning lanes assume an operating speed of 60km/h a stop condition taper of 50-55m. This could potentially be reduced to 20-25m through detailed design considering further the urban right-turn movement criteria (Austroads, February 2021).
- Storage length is the greater of either 1) the length of one design turning vehicle; or 2) calculated number of car spaces (minus 1) multiplied by 8.0m or as per SIDRA analysis. Adopted 50m on the west and south approaches (which can accommodate 2 semi-trailer trucks or 6 standard cars). This could potentially be reduced 20-25m through the detailed design once SIDRA analysis is undertaken.
- Due to the length of tapers and vehicle storage required, it is likely that the south approach will need to be designed in conjunction with the subdivisional roads which propose an intersection approximately 70m to the south.
- The median separating existing traffic lanes and service road on Greenhalghs Road is proposed to be narrowed by approximately 0.5-1.0m and vegetation trimmed / removed to achieve desired traffic lane widths and limit diversion of through traffic movements. Even if center medians are reduced to 2.5-3.0m (an absolute minimum) a road safety audit during the detailed design phase is to assess if narrowing can be avoided.
- The existing service road is not able to be truncated to remove access from the intersection, as this would impede access to waste collection services and potentially be problematic for emergency services. Entry to the service road via the western end will remain as an ‘entry only’ with access from all legs / approaches of the intersection. Exit from the service road will remain at the eastern end. Consideration on whether exit

is a ‘left out only’ or vehicles can right-turn into Greenhalghs Road will need road safety criteria applied to design options to determine the appropriate treatment.

- On-street parking provisions will need to be removed along the tapers / approaches to the intersection, reallocating this provision to the additional turning lane. This will have limited impact, with only the residential property on the south-west corner to have no abutting on-street parking but note this is a large lot (1.09ha) and would not need this provision – although may limit future development.
- While land acquisition of the south-west residential property is not being proposed to implement the intersection design, the large / dense vegetation bordering the property may need to be trimmed to achieve best practice sight distance outcomes. As the land will remain privately owned, consultation on this issue should be reviewed once detailed design has been completed and road safety audit undertaken.
- The intersection design generally maintains the existing cross section and functions to the east. This cross section does not formally provide for on-road bicycle lanes for the full length in both directions. The service road will be utilised along with on-road bicycle lanes to achieve suitable provisions. The design includes a recommendation to install an off-road intersection safety treatment at Royal York Road in between the service road connections and would ideally be undertaken in conjunction with intersection and road works.
- The proposed shared path along Greenhalghs Road transitions from a northern boundary alignment, west of the intersection to a southern boundary alignment, east of the intersection and hence provision for the shared path at the crossing locations is required. This is provided on the west side of the intersection, and no provision for pedestrians to cross is proposed on the east side of the intersection to limit the number of conflict points (as the service road would also need a crossing).
- Major drainage is to be installed through the intersection as part of DI_DR_06 works from a basin north-west of the intersection with a 1,200mm diameter outfall heading south along the new North-South Link Road, assumed to be closer to the western boundary (either in the verge or parking lane). Drainage is assumed to connect road pavement areas to this outfall via kerb and channel.

Refer to attached Functional / Concept Plan which proposes the intersection layout and key considerations.

Land Provision

As a result of the design considerations, the south approach deviates off its centered alignment within the 24m road reserve to the east by approximately 3m which would require an additional 217m2 of land acquisition to accommodate the alignment change and intersection splay.

The land required is already proposed as a road reserve for local lot access via a driveway and is not expected to result in any detrimental impact on the access or amenity with the land acquisition not included in the cost estimates.

Coordination of the intersection design with the subdivision design is necessary to coordinate this outcome.

Cost Estimate

It was noted in a preliminary review of the existing roundabout cost estimate used to inform the DCP an allowance for 'Vicroads 10 year Maintenance Fee incl prom & controller' was included. It is understood that this cost would only be applicable to signalised intersections.

In preparing a new cost estimate for a signalised intersection the following was applied:

- Rates and indexation consistent with other DCP signalised intersections
- Descriptions / details of cost items, no new or amended items are included

Scope	Amount
Original DCP Project Cost Estimate 'Roundabout' (Indexed June 2021)	$1,229,043.61
Revised DCP Project Cost Estimate 'Signalised Intersection' (Adopts Original DCP Rates, Indexed June 2021)	$1,574,091.83
Cost Estimate Variance	$345,048.22

Based on the Functional / Concept Plan and adopting the cost estimate rationale from the original DCP it is assessed the signalised intersection treatment would cost $345,048.22 (28%) more than the roundabout treatment.

Noting the DCP cost estimate is indexed from 2012, there are likely various cost increases related to item rates (which the indexation partially mitigates). As a sensitivity assessment of the signalised intersection cost estimate, new item rates have been adopted typically from knowledge of VicRoads cost estimates and tender rates as listed below which provides the 'upper' cost estimate potential.

Item	Original Rate *(Indexed June 2021)*	Revised Rate	% Increase
Site Establishment	$10,000.00	$50,000.00	400%
40mm Profiling & Asphalt Overlay	$33.88/$m^2$	$44.00/$m^2$	30%
40mm Asphalt Wearing Course	$19.36/$m^2$	$35.00/$m^2$	81%
40mm Asphalt Base Course	$16.94/$m^2$	$35.00/$m^2$	107%
180mm Crushed Rock Base Course	$15.03/$m^2$	$19.00/$m^2$	26%
280mm Crushed Rock Subbase Course	$22.87/$m^2$	$28.00/$m^2$	22%
300mm Subgrade Improvement	$14.52/$m^2$	$48.00/$m^2$	231%
Kerb & Channel	$48.40/l.m	$110.00/l.m	127%
Concrete Footpath	$54.45/$m^2$	$125.00/$m^2$	130%
Splitter Islands / Channelised Median	$90.76/$m^2$	$160.00/$m^2$	76%
375mm dia. Drainage Pipe	$193.62/l.m	$260.00/l.m	34%
Traffic Signals – Cross Road	$239,600.00	$250,000.00	4%

Scope	Amount
Revised DCP Project Cost Estimate 'Signalised Intersection' (Adopts Original DCP Rates, Indexed June 2021)	$1,574,091.83
Revised DCP Project Cost Estimate 'Signalised Intersection' (Revised DCP Rates for selected items, Indexed Original DCP Rates for all other items - June 2021)	$1,943,440.44
Cost Estimate Variance	$369,348.61

If a new cost estimate was prepared using 2021 item rates, it is assessed that signalised intersection would cost $369,348.61 (23%) more than the 2021 indexed item rates, noting this sensitivity analysis focused on a selected items only and not the entire cost estimate. It is expected that this 'upper' cost estimate would closer reflect tendered rates.

In assessing the impacts of changing the DCP Project DI_JNC_05 from a roundabout to a signalised intersection, this would cost $714,396.83 (58%) more to deliver. In lieu of a formal DCP review, it is assumed that any additional cost would be considered part of the 'external' liability to fund.

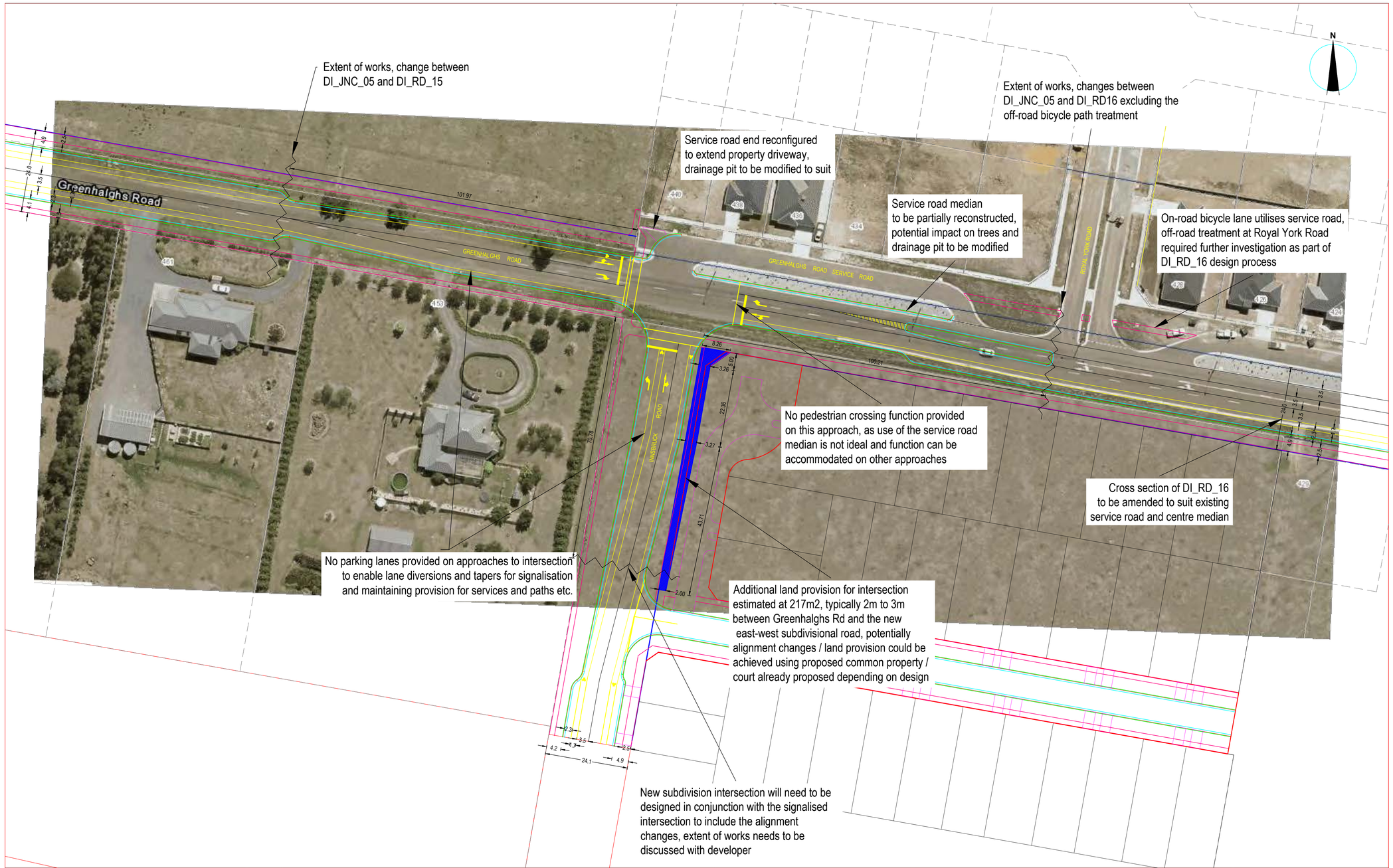
Funding	Original DCP Roundabout *(Indexed June 2021)*	Revised DCP Signalisation *(Indexed June 2021)*	Revised DCP Signalisation *(Revised Item Rates)*
DCP (58%)	$712,845.30	$912,973.26	$1,127,195.46
External (42%)	$516,198.32	$661,118.57	$816,244.99
Total Funding	$1,229,043.62	$1,574,091.83	$1,943,440.45
Funding Liability (External plus DCP shortfall)	$516,198.32	$861,246.53	$1,230,595.15

Conclusion

1. Confirm the Winterfield development is open to redesign of the subdivision roads (i.e. court bowl and intersection) to accommodate the south approach to the signalised intersection, and any terms or conditions.
2. Land acquisition of the Winterfield land is expected to be over a proposed road reserve for local lot access and should not need financial compensation (i.e. DCP funded).
3. Land acquisition of the private residential property on the south-west corner can be avoided but may require some trimming of boundary vegetation to achieve best practice sight distances for the intersection.
4. Reconstruction / narrowing of the service road median is proposed which contains established vegetation to be trimmed / removed but anticipate this would be reviewed once detailed design and road safety audit are completed
5. In assessing the impacts / liability of changing the DCP Project DI_JNC_05 from a roundabout to a signalised intersection, this would cost $715,000 (approximately 60%) more to deliver.
6. The external budget allocation to cover the external demand outlined in the DCP, plus the shortfall between the DCP funding and the increased cost estimate is calculated at $1.23 million.

Attachments

1. Function / Concept Plan
2. Original DCP Cost Estimate & Indexation
3. Revised DCP Scope Cost Estimate & Indexation
4. Revised DCP Scope & Rates Cost Estimate



ISSUE/VER	AMENDMENT	DATE
P2	PEER REVIEW AND ALIGNMENT SHIFT	12/21
P1	PRELIMINARY ISSUE FOR DISCUSSION	10/21

EVERY CARE HAS BEEN TAKEN TO ENSURE THAT THE INFORMATION SHOWN ON THIS DRAWING IS ACCURATE HOWEVER SOME VARIATIONS FROM RECORDS MAY EXIST, AND COMPLETE ACCURACY CANNOT BE GUARANTEED.

PRELIMINARY

1:500 1:1000 — 10 5 0 10 20 — A1 A3

WARNING
THE LOCATION OF UNDERGROUND SERVICES SHOWN IS BASED ON INFORMATION SUPPLIED BY OTHER AUTHORITIES AND SHOULD BE PROVEN ON SITE. ALL WORKS NEAR SERVICES SHALL COMPLY WITH REQUIREMENTS OF RELEVANT AUTHORITY.

CITY OF BALLARAT

GREENHALGHS ROAD AND INNSBRUCK ROAD INTERSECTION FUNCTIONAL DESIGN

CITY OF BALLARAT

SURVEYED	–	–
DRAWN	J.HINCH	12/21
DESIGNED	J.HINCH	12/21
FILE		

CHECKED

COORDINATOR DESIGN & DRAINAGE

APPROVED

EXECUTIVE MANAGER INFRASTRUCTURE

DRAWING NUMBER 2021-X1-SK01

REVISION/ISSUE P2

1 OF 1

JNC_05: Greenhalghs Rd and New N-S Rd (South) Roundabout

					Indexation		99		119.8
							Original		**Jun-21**
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**		**Indexation**		
Site Establishment			$ 10,000.00	1	$ 10,000.00		$ 12,101.01		
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00		$ 12,101.01		
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	262.2	$ 1,179.90		$ 1,427.80		
	Cut place & Compact and disposal	cu m	$ 35.00	1743.63	$ 61,027.05		$ 73,848.89		
	Swale drain formation	lin m	$ 10.00	423	$ 4,230.00		$ 5,118.73		
	sawcut existing Pavement	lin m	$ 7.50	0	$ -		$ -		
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	0	$ -		$ -		
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	0	$ -		$ -		
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	0	$ -		$ -		
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	0	$ -		$ -		
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	0	$ -		$ -		
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	0	$ -		$ -		
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	0	$ -		$ -		
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -		$ -		
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	2241	$ 35,856.00		$ 43,389.38		
	40mm Base Course Asphalt	sq m	$ 14.00	2241	$ 31,374.00		$ 37,965.71		
	Prime coat	sq m	$ 2.00	2241	$ 4,482.00		$ 5,423.67		
	180mm Base Course crushed rock	sq m	$ 12.42	2622	$ 32,565.24		$ 39,407.23		
	280mm Subbase Course crushed rock	sq m	$ 18.90	2622	$ 49,555.80		$ 59,967.52		
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -		$ -		
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -		$ -		
	Prime coat	sq m	$ 2.00	0	$ -		$ -		
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -		$ -		
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -		$ -		
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -		$ -		
	Subgrade improvement (300mm depth)	sq m	$ 12.00	2622	$ 31,464.00		$ 38,074.62		
Kerb & Channel	Type SM2	lin m	$ 40.00	423	$ 16,920.00		$ 20,474.91		
Footpath	Concrete	sq m	$ 45.00	398	$ 17,910.00		$ 21,672.91		
Concrete Splitter Islands		sq m	$ 75.00	27	$ 2,025.00		$ 2,450.45		
Drainage	Subsoil Drains	lin m	$ 18.00	423	$ 7,614.00		$ 9,213.71		
	Flush out Risers/outlets	No	$ 590.00	28	$ 16,520.00		$ 19,990.87		
	Drainage Pits	No	$ 2,100.00	25	$ 52,500.00		$ 63,530.30		
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00		$ -		$ -		
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	250	$ 40,000.00		$ 48,404.04		
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00	95	$ 19,000.00		$ 22,991.92		
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00		$ -		$ -		
Miscellaneous	Line Marking	item	$ 10,000.00	1	$ 10,000.00		$ 12,101.01		
	Signage	No	$ 250.00		$ -		$ -		
	Tactile pavers	No	$ 250.00		$ -		$ -		
	Street Name Signs	No	$ 200.00		$ -		$ -		
	w-Beam barrier	lin m	$ 110.00		$ -		$ -		
Nett Gain		No	$ 1,500.00	1	$ 1,500.00		$ 1,815.15		
Environmental Management		item	$ 10,000.00	1	$ 10,000.00		$ 12,101.01		
Traffic Management		item	$ 60,000.00	1	$ 60,000.00		$ 72,606.06		
Landscaping		item	$ 25,000.00	1	$ 25,000.00		$ 30,252.53		
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	0	$ -		$ -		
	Intersection Signals - T	item	$ 172,500.00	0	$ -		$ -		
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -		$ -		
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -		$ -		
Intersection Lighting	Pole	item	$ 3,500.00	8	$ 28,000.00		$ 33,882.83		
	High Pressure Sodium Lantern	item	$ 750.00	8	$ 6,000.00		$ 7,260.61		
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00		$ 6,050.51		
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	250	$ 45,000.00		$ 54,454.55		
	Electrical pit	No	$ 1,600.00	8	$ 12,800.00		$ 15,489.29		
Services Relocating/alteration	Telstra	item	$ 50,000.00	1	$ 50,000.00		$ 60,505.05		
	Electrical	item	$ 20,000.00	1	$ 20,000.00		$ 24,202.02		
	Water	item	$ 20,000.00	1	$ 20,000.00		$ 24,202.02		
	Other	item	$ -		$ -		$ -		
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	1.00	$ 75,000.00		$ 90,757.58		
				Subtotal	$ 812,522.99		$ 983,234.89		
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 81,252.30		$ 98,323.49		
Contingency		item	15.00%		$ 121,878.45		$ 147,485.23		
				TOTAL	**$ 1,015,653.74**		**$ 1,229,043.61**		

JNC_05 New: Greenhalghs Rd and New N-S Rd (South) Signalisation

			Indexation		99	119.8
					Revised Scope	Jun-21
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**
Site Establishment			$ 10,000.00	1	$ 10,000.00	$ 12,101.01
Clearing & Grubbing			$ 10,000.00	1	$ 10,000.00	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 4.50	1000	$ 4,500.00	$ 5,445.45
	Cut place & Compact and disposal	cu m	$ 35.00	1420	$ 49,700.00	$ 60,142.02
	Swale drain formation	lin m	$ 10.00	0	$ -	$ -
	sawcut existing Pavement	lin m	$ 7.50	140	$ 1,050.00	$ 1,270.61
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 28.00	1095	$ 30,660.00	$ 37,101.70
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ 13.40	0	$ -	$ -
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ 35.00	0	$ -	$ -
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ 26.60	0	$ -	$ -
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ 7.30	0	$ -	$ -
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ 10.10	0	$ -	$ -
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ 16.80	0	$ -	$ -
	Construction of Sealed Shoulders	sq m	$ 20.00	0	$ -	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 16.00	2625	$ 42,000.00	$ 50,824.24
	40mm Base Course Asphalt	sq m	$ 14.00	2625	$ 36,750.00	$ 44,471.21
	Prime coat	sq m	$ 2.00	2625	$ 5,250.00	$ 6,353.03
	180mm Base Course crushed rock	sq m	$ 12.42	2625	$ 32,602.50	$ 39,452.32
	280mm Subbase Course crushed rock	sq m	$ 18.90	2625	$ 49,612.50	$ 60,036.14
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ 14.00	0	$ -	$ -
	35mm Base Course Asphalt	sq m	$ 12.25	0	$ -	$ -
	Prime coat	sq m	$ 2.00	0	$ -	$ -
	150mm Base Course crushed rock	sq m	$ 10.35	0	$ -	$ -
	200mm Subbase Course crushed rock	sq m	$ 13.50	0	$ -	$ -
	Subgrade improvement (200mm depth)	sq m	$ 8.00	0	$ -	$ -
	Subgrade improvement (300mm depth)	sq m	$ 12.00	875	$ 10,500.00	$ 12,706.06
Kerb & Channel	Type SM2	lin m	$ 40.00	560	$ 22,400.00	$ 27,106.26
Footpath	Concrete	sq m	$ 45.00	860	$ 38,700.00	$ 46,830.91
Concrete Splitter Islands		sq m	$ 75.00	130	$ 9,750.00	$ 11,798.48
Drainage	Subsoil Drains	lin m	$ 18.00	560	$ 10,080.00	$ 12,197.82
	Flush out Risers/outlets	No	$ 590.00	12	$ 7,080.00	$ 8,567.52
	Drainage Pits	No	$ 2,100.00	13	$ 27,300.00	$ 33,035.76
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ 130.00	0	$ -	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 160.00	275	$ 44,000.00	$ 53,244.44
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ 200.00	0	$ -	$ -
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ 260.00	0	$ -	$ -
Miscellaneous	Line Marking	item	$ 10,000.00	1	$ 10,000.00	$ 12,101.01
	Signage	No	$ 250.00	0	$ -	$ -
	Tactile pavers	No	$ 250.00	0	$ -	$ -
	Street Name Signs	No	$ 200.00	0	$ -	$ -
	w-Beam barrier	lin m	$ 110.00	0	$ -	$ -
Nett Gain		No	$ 1,500.00	1	$ 1,500.00	$ 1,815.15
Environmental Management		item	$ 10,000.00	1	$ 10,000.00	$ 12,101.01
Traffic Management		item	$ 60,000.00	1	$ 60,000.00	$ 72,606.06
Landscaping		item	$ 25,000.00	1	$ 25,000.00	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 198,000.00	1	$ 198,000.00	$ 239,600.00
	Intersection Signals - T	item	$ 172,500.00	0	$ -	$ -
	Intersection Signals - divided cross	item	$ 207,000.00	0	$ -	$ -
	Intersection Signals - divided T	item	$ 184,000.00	0	$ -	$ -
Intersection Lighting	Pole	item	$ 3,500.00	12	$ 42,000.00	$ 50,824.24
	High Pressure Sodium Lantern	item	$ 750.00	12	$ 9,000.00	$ 10,890.91
	Distribution Box	item	$ 5,000.00	1	$ 5,000.00	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 180.00	300	$ 54,000.00	$ 65,345.45
	Electrical pit	No	$ 1,600.00	12	$ 19,200.00	$ 23,233.94
Services Relocating/alteration	Telstra	item	$ 50,000.00	1	$ 50,000.00	$ 60,505.05
	Electrical	item	$ 20,000.00	1	$ 20,000.00	$ 24,202.02
	Water	item	$ 20,000.00	1	$ 20,000.00	$ 24,202.02
	Other	item	$ -	0	$ -	$ -
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 75,000.00	1	$ 75,000.00	$ 90,757.58
				Subtotal	$ 1,040,635.00	$ 1,259,273.46
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 104,063.50	$ 125,927.35
Contingency		item	15.00%		$ 156,095.25	$ 188,891.02
				TOTAL	**$ 1,300,793.75**	**$ 1,574,091.83**

JNC_05 New: Greenhalghs Rd and New N-S Rd (South) Signalisation

Revised Scope & Rates

Description	Detail	Unit	Rate	Qty	Amount
Site Establishment			$ 50,000.00	1	$ 50,000.00
Clearing & Grubbing			$ 12,101.01	1	$ 12,101.01
Earth Works	Topsoil strip, stockpile & respread	sq m	$ 5.45	1000	$ 5,445.45
	Cut place & Compact and disposal	cu m	$ 42.35	1420	$ 60,142.02
	Swale drain formation	lin m	$ -	0	$ -
	sawcut existing Pavement	lin m	$ 9.08	140	$ 1,270.61
Pavement	Overlay existing pavement WC Asphalt 40mm, SIZE 14mm TYPE V (PSV56+) ASPHALT Incl Rotormilling	sq m	$ 44.00	1095	$ 48,180.00
VicRoads 740mm deep pavement	40mm, size 14, type V asphalt with C320 binder	sq m	$ -	0	$ -
	105mm, size 20, type SI asphalt with C320 binder	sq m	$ -	0	$ -
	75mm, size 20, type SF asphalt with C320 binder	sq m	$ -	0	$ -
	Base 100mm, SIZE 20 CLASS 2 (E=500MPa)	sq m	$ -	0	$ -
	Lower Base 150mm, SIZE 20 CLASS 3 (E=500MPa)	sq m	$ -	0	$ -
	Lower subbase 270mm, 20mm CLASS 4 FCR	sq m	$ -	0	$ -
	Construction of Sealed Shoulders	sq m	$ -	0	$ -
Council 540mm deep pavement	40mm Wearing Course Asphalt	sq m	$ 35.00	2625	$ 91,875.00
	40mm Base Course Asphalt	sq m	$ 35.00	2625	$ 91,875.00
	Prime coat	sq m	$ 2.42	2625	$ 6,353.03
	180mm Base Course crushed rock	sq m	$ 19.00	2625	$ 49,875.00
	280mm Subbase Course crushed rock	sq m	$ 28.00	2625	$ 73,500.00
Council 420mm deep pavement	35mm Wearing Course Asphalt	sq m	$ -	0	$ -
	35mm Base Course Asphalt	sq m	$ -	0	$ -
	Prime coat	sq m	$ -	0	$ -
	150mm Base Course crushed rock	sq m	$ -	0	$ -
	200mm Subbase Course crushed rock	sq m	$ -	0	$ -
	Subgrade improvement (200mm depth)	sq m	$ -	0	$ -
	Subgrade improvement (300mm depth)	sq m	$ 48.00	875	$ 42,000.00
Kerb & Channel	Type SM2	lin m	$ 110.00	560	$ 61,600.00
Footpath	Concrete	sq m	$ 125.00	860	$ 107,500.00
Concrete Splitter Islands		sq m	$ 160.00	130	$ 20,800.00
Drainage	Subsoil Drains	lin m	$ 21.78	560	$ 12,197.82
	Flush out Risers/outlets	No	$ 713.96	12	$ 8,567.52
	Drainage Pits	No	$ 2,541.21	2	$ 5,082.42
	Drainage Pipe 300mm dia CRB Bk Fill	lin m	$ -	0	$ -
	Drainage Pipe 375mm dia CRB Bk Fill	lin m	$ 260.00	275	$ 71,500.00
	Drainage Pipe 450mm dia CRB Bk Fill	lin m	$ -	0	$ -
	Drainage Pipe 525mm dia CRB Bk Fill	lin m	$ -	0	$ -
Miscellaneous	Line Marking	item	$ 12,101.01	1	$ 12,101.01
	Signage	No	$ -	0	$ -
	Tactile pavers	No	$ -	0	$ -
	Street Name Signs	No	$ -	0	$ -
	w-Beam barrier	lin m	$ -	0	$ -
Nett Gain		No	$ 1,815.15	1	$ 1,815.15
Environmental Management		item	$ 12,101.01	1	$ 12,101.01
Traffic Management		item	$ 72,606.06	1	$ 72,606.06
Landscaping		item	$ 30,252.53	1	$ 30,252.53
Traffic signals	Intersection Signals - cross	item	$ 250,000.00	1	$ 250,000.00
	Intersection Signals - T	item	$ -	0	$ -
	Intersection Signals - divided cross	item	$ -	0	$ -
	Intersection Signals - divided T	item	$ -	0	$ -
Intersection Lighting	Pole	item	$ 4,235.35	12	$ 50,824.24
	High Pressure Sodium Lantern	item	$ 907.58	12	$ 10,890.91
	Distribution Box	item	$ 6,050.51	1	$ 6,050.51
	Lighting Conduit & Cable (incl. trenching)	lin m	$ 217.82	300	$ 65,345.45
	Electrical pit	No	$ 1,936.16	12	$ 23,233.94
Services Relocating/alteration	Telstra	item	$ 60,505.05	1	$ 60,505.05
	Electrical	item	$ 24,202.02	1	$ 24,202.02
	Water	item	$ 24,202.02	1	$ 24,202.02
	Other	item	$ -	0	$ -
Vicroads 10 year Maintenance Fee incl Prom & controller		item	$ 90,757.58	1	$ 90,757.58
				Subtotal	$ 1,554,752.35
Professional Fees	Survey, Geotech, Pavement & Design	item	10.00%		$ 155,475.24
Contingency		item	15.00%		$ 233,212.85
				TOTAL	**$ 1,943,440.44**

XI

APPENDIX M. COST ESTIMATES AND COMPARISONS BETWEEN ORIGINAL PSP AND ACTUAL

Winterfield Estate Stage 11
JNC_08 Intersection - Tender Comparison to Estimate
Updated by COB 22/12/2021

	Council June 2021 Indexation Amount	Council June 2021 Indexation Amount (Revised Quantities)	Reeds Estimate November 2020	Difference Value (red = over-budget)	% Difference (Council 2021 Index. Amount & Reeds Estimate)	Reeds Estimate Excluding non-DCP Items	Winslow Tender Price 30 April 2021	Difference Value (red = over-budget)	% Difference (Council 2021 Index. Amount & Winslow Tender Price)	Winslow Tender Price Excluding non-DCP Items	Comments
R&D Civil Works *(breakdown below)*											
Traffic Management	$21,564.00	$21,564.00	$42,000.00	-$20,436	-95%	$42,000.00	$257,477.62	-$235,914	-1094%	$257,477.62	
Site Establishment	$11,980.00	$11,980.00	$41,500.00	-$29,520	-246%	$41,500.00	$107,711.28	-$95,731	-799%	$107,711.28	
Earthworks	$149,576.35	$143,298.83	$31,164.10	$118,412	79%	$31,164.10	$379,092.64	-$229,516	-153%	$379,092.64	
Pavement	$377,769.37	$979,465.63	$1,110,050.00	-$732,281	-194%	$1,110,050.00	$1,126,123.72	-$748,354	-198%	$1,126,123.72	
Concrete Works (Kerb, Footpath)	$82,530.22	$112,671.90	$127,250.00	-$44,720	-54%	$127,250.00	$154,110.60	-$71,580	-87%	$154,110.60	
Drainage	$108,050.02	$117,763.40	$123,940.00	-$15,890	-15%	$123,940.00	$151,077.81	-$43,028	-40%	$151,077.81	
Ancillaries	$25,757.00	$25,757.00	$22,500.00	$3,257	13%	$22,500.00	$51,379.21	-$25,622	-99%	$51,379.21	
Electrical Conduits	$0.00	$0.00	$30,000.00	-$30,000		$0.00	$28,707.61	-$28,708			Not in DCP scope
Electrical Reticulation	$94,402.40	$94,402.40	$51,800.00	$42,602	45%	$51,800.00	$50,000.00	$44,402	47%	$50,000.00	
Retaining Walls	$0.00	$0.00	$0.00	$0		$0.00	$75,000.00	-$75,000			Not in DCP scope
Service Relocations											
Telstra	$59,900.00	$59,900.00	$50,000.00	$9,900	17%	$50,000.00	$50,000.00	$9,900	17%	$50,000.00	
Electrical	$23,960.00	$23,960.00	$20,000.00	$3,960	17%	$20,000.00	$20,000.00	$3,960	17%	$20,000.00	
Water	$23,960.00	$23,960.00	$20,000.00	$3,960	17%	$20,000.00	$348,743.80	-$324,784	-1356%	$348,743.80	
New Water Main	$0.00	$0.00	$0.00	$0		$0.00	$106,093.20	-$106,093			Not in DCP scope
SUB-TOTAL CONSTRUCTION	**$979,449.36**	**$1,614,723.16**	**$1,670,204.10**	-$690,755	-71%	**$1,640,204.10**	**$2,905,517.49**	-$1,926,068	-197%	**$2,695,716.68**	
Professional Fees (10%)	$97,944.94	$161,472.32	$167,020.41	-$69,075	-71%	$164,020.41	$290,551.75	-$192,607	-197%	$269,571.67	
Contingency	$146,917.40	$242,208.47	$250,530.62	-$103,613	-71%	$246,030.62	$75,510.00	$71,407	49%	$134,785.83	Increase Tender Contingency to 5%
TOTAL	**$1,224,311.70**	**$2,018,403.95**	**$2,087,755.13**	**-$863,443**	-71%	**$2,050,255.13**	**$3,271,579.24**	-$2,047,268	-167%	**$3,100,074.18**	

DCP Cost Estimate Variation (Amount)	$0.00	$794,092.25	$863,443.43			$825,943.43	$2,047,267.54			$1,875,762.48
DCP Cost Estimate Variation (%)	0	65%	71%			67%	167%			153%
Funding										
DCP (45%)	$550,940.26	$908,281.78	$939,489.81			$922,614.81	$1,472,210.66			$1,395,033.38
External (55%)	$673,371.43	$1,110,122.17	$1,148,265.32			$1,127,640.32	$1,799,368.58			$1,705,040.80
External Liability (includes DCP shortfall)	$673,371.43	$1,467,463.69	$1,536,814.86			$1,499,314.86	$2,720,638.97			$2,549,133.92
Increase in External Liability (%)	0%	53%	58%			55%	137%			125%

APPENDIX N. ORIGINAL AND REVISED COST ESTIMATES FOR CHERRY FLAT ROAD (DI_RD_21)

RD_21 Cherry Flat Road **Original length - 190 m**

Road Type: Arterial	**Between: Schreenans Rd - Bells Rd**					99	104.7	107.1	107.4	105.1	105.9	117.1	**120.7**	121.5	**119.8**
							Jun-13	**Jun-14**	**Jun-15**	**Jun-16**	**Jun-17**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**		**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00		$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Upgrade Existing		item	$ 344,062.91	1	$ 344,062.91		$ 363,872.59	$ 372,213.51	$ 373,256.12	$ 365,262.74	$ 368,043.05	$ 406,967.34	$ 419,478.72	$ 422,259.02	$ 416,350.87
Line Marking		lin m	$ 15.00	190	$ 2,850.00		$ 3,014.09	$ 3,083.18	$ 3,091.82	$ 3,025.61	$ 3,048.64	$ 3,371.06	$ 3,474.70	$ 3,497.73	$ 3,448.79
Miscellaneous	Signage	No	$ 35.00	190	$ 6,650.00		$ 7,032.88	$ 7,194.09	$ 7,214.24	$ 7,059.75	$ 7,113.48	$ 7,865.81	$ 8,107.63	$ 8,161.36	$ 8,047.17
	Tactile pavers	No	$ 250.00	6	$ 1,500.00		$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
	Drainage	item	$ 250.00	190	$ 47,500.00		$ 50,234.85	$ 51,386.36	$ 51,530.30	$ 50,426.77	$ 50,810.61	$ 56,184.34	$ 57,911.62	$ 58,295.45	$ 57,479.80
	Excavation of rock	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Box Culvert Crossing	m2	$ 3,600.00	50	$ 180,000.00		$ 190,363.64	$ 194,727.27	$ 195,272.73	$ 191,090.91	$ 192,545.45	$ 212,909.09	$ 219,454.55	$ 220,909.09	$ 217,818.18
Environmental Management		item	$ 5,000.00	1	$ 5,000.00		$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 17,203.15	1	$ 17,203.15		$ 18,193.63	$ 18,610.68	$ 18,662.81	$ 18,263.14	$ 18,402.15	$ 20,348.37	$ 20,973.94	$ 21,112.95	$ 20,817.54
Landscaping		lin m	$ 50.00	190	$ 9,500.00		$ 10,046.97	$ 10,277.27	$ 10,306.06	$ 10,085.35	$ 10,162.12	$ 11,236.87	$ 11,582.32	$ 11,659.09	$ 11,495.96
Lighting		lin m	$ 150.00	190	$ 28,500.00		$ 30,140.91	$ 30,831.82	$ 30,918.18	$ 30,256.06	$ 30,486.36	$ 33,710.61	$ 34,746.97	$ 34,977.27	$ 34,487.88
Services Relocating/alteration	Electrical	item			$ -		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -		$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 652,766.05		$ 690,349.55	$ 706,174.19	$ 708,152.26	$ 692,986.99	$ 698,261.87	$ 772,110.15	$ 795,847.10	$ 801,121.97	$ 789,912.86
							$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 65,276.61		$ 69,034.96	$ 70,617.42	$ 70,815.23	$ 69,298.70	$ 69,826.19	$ 77,211.01	$ 79,584.71	$ 80,112.20	$ 78,991.29
Contingency		item	15%	1	$ 97,914.91		$ 103,552.43	$ 105,926.13	$ 106,222.84	$ 103,948.05	$ 104,739.28	$ 115,816.52	$ 119,377.06	$ 120,168.30	$ 118,486.93
				TOTAL	**$ 815,957.57**		**$ 862,936.94**	**$ 882,717.73**	**$ 885,190.33**	**$ 866,233.74**	**$ 872,827.34**	**$ 965,137.69**	**$ 994,808.87**	**$ 1,001,402.47**	**$ 987,391.08**

Road Type: Arterial	**Between: Schreenans Rd - Bells Rd**	**Revised length - 750 m**												
						Jun-13	**Jun-14**	**Jun-15**	**Jun-16**	**Jun-17**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Upgrade Existing		item	$ 1,358,143.06	1	$ 1,358,143.06	$1,436,339.17	$1,469,263.85	$ 1,473,379.44	$ 1,441,826.62	$1,452,801.51	$ 1,606,450.02	$ 1,655,837.04	$ 1,666,811.93	$ 1,643,490.29
Line Marking		lin m	$ 15.00	750	$ 11,250.00	$ 11,897.73	$ 12,170.45	$ 12,204.55	$ 11,943.18	$ 12,034.09	$ 13,306.82	$ 13,715.91	$ 13,806.82	$ 13,613.64
Miscellaneous	Signage	No	$ 35.00	750	$ 26,250.00	$ 27,761.36	$ 28,397.73	$ 28,477.27	$ 27,867.42	$ 28,079.55	$ 31,049.24	$ 32,003.79	$ 32,215.91	$ 31,765.15
	Tactile pavers	No	$ 250.00	6	$ 1,500.00	$ 1,586.36	$ 1,622.73	$ 1,627.27	$ 1,592.42	$ 1,604.55	$ 1,774.24	$ 1,828.79	$ 1,840.91	$ 1,815.15
	Drainage	item	$ 250.00	750	$ 187,500.00	$ 198,295.45	$ 202,840.91	$ 203,409.09	$ 199,053.03	$ 200,568.18	$ 221,780.30	$ 228,598.48	$ 230,113.64	$ 226,893.94
	Excavation of rock	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Box Culvert Crossing	m2	$ 3,600.00	150	$ 540,000.00	$ 571,090.91	$ 584,181.82	$ 585,818.18	$ 573,272.73	$ 577,636.36	$ 638,727.27	$ 658,363.64	$ 662,727.27	$ 653,454.55
Environmental Management		item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 67,907.15	1	$ 67,907.15	$ 71,816.96	$ 73,463.19	$ 73,668.97	$ 72,091.33	$ 72,640.08	$ 80,322.50	$ 82,791.85	$ 83,340.60	$ 82,174.51
Landscaping		lin m	$ 50.00	750	$ 37,500.00	$ 39,659.09	$ 40,568.18	$ 40,681.82	$ 39,810.61	$ 40,113.64	$ 44,356.06	$ 45,719.70	$ 46,022.73	$ 45,378.79
Lighting		lin m	$ 150.00	750	$ 112,500.00	$ 118,977.27	$ 121,704.55	$ 122,045.45	$ 119,431.82	$ 120,340.91	$ 133,068.18	$ 137,159.09	$ 138,068.18	$ 136,136.36
Services Relocating/alteration	Electrical	item			$ -	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 2,357,550.21	$2,493,287.95	$2,550,440.68	$ 2,557,584.77	$ 2,502,813.41	$2,521,864.32	$ 2,788,577.07	$ 2,874,306.17	$ 2,893,357.08	$ 2,852,873.89
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 235,755.02	$ 249,328.80	$ 255,044.07	$ 255,758.48	$ 250,281.34	$ 252,186.43	$ 278,857.71	$ 287,430.62	$ 289,335.71	$ 285,287.39
Contingency		item	15%	1	$ 353,632.53	$ 373,993.19	$ 382,566.10	$ 383,637.72	$ 375,422.01	$ 378,279.65	$ 418,286.56	$ 431,145.92	$ 434,003.56	$ 427,931.08
				TOTAL	**$ 2,946,937.76**	**$3,116,609.94**	**$3,188,050.85**	**$ 3,196,980.97**	**$ 3,128,516.76**	**$3,152,330.40**	**$ 3,485,721.33**	**$ 3,592,882.71**	**$ 3,616,696.35**	**$ 3,566,092.36**

APPENDIX O. ESTIMATIONS FOR ALTERNATIVE BONSHAW CREEK CROSSING VIA JOSES LANE (DI_RD_31C)

Original Alignment

RD_31 Schreenans Lane (E-W) — Base Year

Road Type: Link 2 — **Between: Ross Creek Rd - Cherry Flat Rd**

						99	104.7	107.1	107.4	105.1	105.9	117.1	**120.7**	**121.5**	**119.8**
							Jun-13	**Jun-14**	**Jun-15**	**Jun-16**	**Jun-17**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**		**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00		$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Extension		item	$ 1,826,957.93	1	$ 1,826,957.93		$ 1,932,146.41	$ 1,976,436.30	$ 1,981,972.54	$ 1,939,528.06	$ 1,954,291.36	$ 2,160,977.51	$ 2,227,412.34	$ 2,242,175.64	$ 2,210,803.63
Line Marking		lin m	$ 15.00	1305	$ 19,575.00		$ 20,702.05	$ 21,176.59	$ 21,235.91	$ 20,781.14	$ 20,939.32	$ 23,153.86	$ 23,865.68	$ 24,023.86	$ 23,687.73
Miscellaneous	Signage	No	$ 35.00	1305	$ 45,675.00		$ 48,304.77	$ 49,412.05	$ 49,550.45	$ 48,489.32	$ 48,858.41	$ 54,025.68	$ 55,686.59	$ 56,055.68	$ 55,271.36
	Tactile pavers	No	$ 250.00	10	$ 2,500.00		$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
	Drainage	item	$ 250.00	1305	$ 326,250.00		$ 345,034.09	$ 352,943.18	$ 353,931.82	$ 346,352.27	$ 348,988.64	$ 385,897.73	$ 397,761.36	$ 400,397.73	$ 394,795.45
	Excavation of rock	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Management		item	$ 5,000.00	1	$ 5,000.00		$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 91,347.90	1	$ 91,347.90		$ 96,607.32	$ 98,821.82	$ 99,098.63	$ 96,976.40	$ 97,714.57	$ 108,048.88	$ 111,370.62	$ 112,108.78	$ 110,540.18
Landscaping		lin m	$ 50.00	1305	$ 65,250.00		$ 69,006.82	$ 70,588.64	$ 70,786.36	$ 69,270.45	$ 69,797.73	$ 77,179.55	$ 79,552.27	$ 80,079.55	$ 78,959.09
Lighting		lin m	$ 150.00	1305	$ 195,750.00		$ 207,020.45	$ 211,765.91	$ 212,359.09	$ 207,811.36	$ 209,393.18	$ 231,538.64	$ 238,656.82	$ 240,238.64	$ 236,877.27
Services Relocating/alteration	Electrical	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 2,588,305.82		$ 2,737,329.49	$ 2,800,076.30	$ 2,807,919.65	$ 2,747,787.29	$ 2,768,702.90	$ 3,061,521.33	$ 3,155,641.54	$ 3,176,557.15	$ 3,132,111.49
Bridge Structure		item	$ 8,400,000	**1**	$ 8,400,000.00		$ 8,883,636.36	$ 9,087,272.73	$ 9,112,727.27	$ 8,917,575.76	$ 8,985,454.55	$ 9,935,757.58	$ 10,241,212.12	$ 10,309,090.91	$ 10,164,848.48
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 258,830.58		$ 273,732.95	$ 280,007.63	$ 280,791.97	$ 274,778.73	$ 276,870.29	$ 306,152.13	$ 315,564.15	$ 317,655.71	$ 313,211.15
Contingency		item	15%	1	$ 388,245.87		$ 410,599.42	$ 420,011.44	$ 421,187.95	$ 412,168.09	$ 415,305.43	$ 459,228.20	$ 473,346.23	$ 476,483.57	$ 469,816.72
				TOTAL	**$ 11,635,382.28**		**$ 12,305,298.23**	**$ 12,587,368.10**	**$ 12,622,626.84**	**$ 12,352,309.87**	**$ 12,446,333.17**	**$ 13,762,659.24**	**$ 14,185,764.05**	**$ 14,279,787.34**	**$ 14,079,987.85**
							$ 8,916.00	$ 9,429.35	$ 9,645.49	$ 9,672.51	$ 9,465.37	$ 9,537.42	$ 10,546.10	$ 10,870.32	$ 10,942.37	$ 10,789.26

							Jun-13	**Jun-14**	**Jun-15**	**Jul-16**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**
Section	**Length**	**%**	**Road Cost**	**Bridge Cost**	**SubTotal**	**Prof fees**	**Contingency**	**TOTAL COST**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Cherry Flat Rd - Webbs Rd	440	34%	$ 872,685.49	0	$ 872,685.49	$ 87,268.55	$ 130,902.82	$ 1,090,856.86	$ 1,153,663.77	$ 1,180,108.79	$ 1,183,414.41	$ 1,158,071.27	$ 1,166,886.28	$ 1,290,296.35	$ 1,329,963.87	$ 1,338,778.87	$ 1,320,046.99
Webbs Rd - Bridge	340	26%	$ 674,347.88	0	$ 674,347.88	$ 67,434.79	$ 101,152.18	$ 842,934.85	$ 891,467.46	$ 911,902.24	$ 914,456.59	$ 894,873.26	$ 901,684.85	$ 997,047.18	$ 1,027,699.35	$ 1,034,510.95	$ 1,020,036.31
Bridge	208	16%	$ 412,542.23	$ 8,400,000.00	$ 8,812,542.23	$ 41,254.22	$ 61,881.33	$ 8,915,677.79	$ 9,429,004.69	$ 9,645,142.33	$ 9,672,159.54	$ 9,465,027.63	$ 9,537,073.51	$ 10,545,715.85	$ 10,869,922.31	$ 10,941,968.19	$ 10,788,870.70
Bridge - Ross Creek Rd	317	24%	$ 628,730.23	0	$ 628,730.23	$ 62,873.02	$ 94,309.53	$ 785,912.78	$ 831,162.31	$ 850,214.74	$ 852,596.29	$ 834,337.71	$ 840,688.52	$ 929,599.87	$ 958,178.51	$ 964,529.33	$ 951,033.85
TOTAL	1305	1	$ 2,588,305.82	$ 8,400,000.00	$ 10,988,305.82	$ 258,830.58	$ 388,245.87	**$ 11,635,382.28**	**$ 12,305,298.23**	**$ 12,587,368.10**	**$ 12,622,626.84**	**$ 12,352,309.87**	**$ 12,446,333.17**	**$ 13,762,659.24**	**$ 14,185,764.05**	**$ 14,279,787.34**	**$ 14,079,987.85**

Joses Lane Alignment

Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Extension		item	$ 2,197,949.38	1	$ 2,197,949.38	$ 2,324,497.98	$ 2,377,781.61	$ 2,384,442.06	$ 2,333,378.59	$ 2,351,139.79	$ 2,599,796.69	$ 2,679,722.13	$ 2,697,483.33	$ 2,659,740.77
Line Marking		lin m	$ 15.00	1570	$ 23,550.00	$ 24,905.91	$ 25,476.82	$ 25,548.18	$ 25,001.06	$ 25,191.36	$ 27,855.61	$ 28,711.97	$ 28,902.27	$ 28,497.88
Miscellaneous	Signage	No	$ 35.00	1570	$ 54,950.00	$ 58,113.79	$ 59,445.91	$ 59,612.42	$ 58,335.81	$ 58,779.85	$ 64,996.41	$ 66,994.60	$ 67,438.64	$ 66,495.05
	Tactile pavers	No	$ 250.00	10	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
	Drainage	item	$ 250.00	1570	$ 392,500.00	$ 415,098.48	$ 424,613.64	$ 425,803.03	$ 416,684.34	$ 419,856.06	$ 464,260.10	$ 478,532.83	$ 481,704.55	$ 474,964.65
	Excavation of rock	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Management		item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 109,897.47	1	$ 109,897.47	$ 116,224.90	$ 118,889.08	$ 119,222.10	$ 116,668.93	$ 117,556.99	$ 129,989.83	$ 133,986.11	$ 134,874.17	$ 132,987.04
Landscaping		lin m	$ 50.00	1570	$ 78,500.00	$ 83,019.70	$ 84,922.73	$ 85,160.61	$ 83,336.87	$ 83,971.21	$ 92,852.02	$ 95,706.57	$ 96,340.91	$ 94,992.93
Lighting		lin m	$ 150.00	1570	$ 235,500.00	$ 249,059.09	$ 254,768.18	$ 255,481.82	$ 250,010.61	$ 251,913.64	$ 278,556.06	$ 287,119.70	$ 289,022.73	$ 284,978.79
Services Relocating/alteration	Electrical	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 3,110,346.85	$ 3,289,427.43	$ 3,364,829.78	$ 3,374,255.07	$ 3,301,994.49	$ 3,327,128.60	$ 3,679,006.23	$ 3,792,109.75	$ 3,817,243.86	$ 3,763,833.87
Bridge Structure		item	$ 8,400,000	**1**	$ 8,400,000.00	$ 8,883,636.36	$ 9,087,272.73	$ 9,112,727.27	$ 8,917,575.76	$ 8,985,454.55	$ 9,935,757.58	$ 10,241,212.12	$ 10,309,090.91	$ 10,164,848.48
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 311,034.69	$ 328,942.74	$ 336,482.98	$ 337,425.51	$ 330,199.45	$ 332,712.86	$ 367,900.62	$ 379,210.97	$ 381,724.39	$ 376,383.39
Contingency		item	15%	1	$ 466,552.03	$ 493,414.11	$ 504,724.47	$ 506,138.26	$ 495,299.17	$ 499,069.29	$ 551,850.93	$ 568,816.46	$ 572,586.58	$ 564,575.08
				TOTAL	**$ 12,287,933.57**	**$ 12,995,420.65**	**$ 13,293,309.95**	**$ 13,330,546.11**	**$ 13,045,068.87**	**$ 13,144,365.30**	**$ 14,534,515.36**	**$ 14,981,349.31**	**$ 15,080,645.74**	**$ 14,869,640.82**
					$ 9,416.04	$ 9,958.18	$ 10,186.44	$ 10,214.98	$ 9,996.22	$ 10,072.31	$ 11,137.56	$ 11,479.96	$ 11,556.05	$ 11,394.36

Section	**Length**	**%**	**Road Cost**	**Bridge Cost**	**SubTotal**	**Prof fees**	**Contingency**	**TOTAL COST**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Cherry Flat Rd - Webbs Rd	440	28%	$ 871,689.56	$ -	$ 871,689.56	$ 87,168.96	$ 130,753.43	$ 1,089,611.95	$ 1,152,347.19	$ 1,178,762.02	$ 1,182,063.88	$ 1,156,749.66	$ 1,165,554.61	$ 1,288,823.84	$ 1,328,446.09	$ 1,337,251.04	$ 1,318,540.53
Webbs Rd - Schreenans - Joses Lane	1130	72%	$ 2,238,657.29	$ 665,000.00	$ 2,903,657.29	$ 223,865.73	$ 335,798.59	$ 3,463,321.61	$ 3,662,724.98	$ 3,746,684.29	$ 3,757,179.20	$ 3,676,718.19	$ 3,704,704.63	$ 4,096,514.75	$ 4,222,453.72	$ 4,250,440.16	$ 4,190,968.98
Cobben St realignment	470	100%	$ 314,375.00	$ -	$ 314,375.00	$ 31,437.50	$ 47,156.25	$ 392,968.75	$ 415,594.22	$ 425,120.74	$ 426,311.55	$ 417,181.98	$ 420,357.48	$ 464,814.55	$ 479,104.32	$ 482,279.83	$ 475,531.88
Ross Creek/Joses Lane Roundabout		100%	$ 751,695.77	$ -	$ 751,695.77	$ 75,169.58	$ 112,754.36	$ 939,619.71	$ 993,719.02	$ 1,016,497.68	$ 1,019,345.01	$ 997,515.47	$ 1,005,108.35	$ 1,111,408.76	$ 1,145,576.75	$ 1,153,169.64	$ 1,137,034.76
TOTAL	1570		$ 4,176,417.62	$ 665,000.00	$ 4,841,417.62	$ 417,641.76	$ 626,462.64	**$ 5,885,522.02**	**$ 6,224,385.41**	**$ 6,367,064.73**	**$ 6,384,899.65**	**$ 6,248,165.30**	**$ 6,295,725.07**	**$ 6,961,561.91**	**$ 7,175,580.89**	**$ 7,223,140.66**	**$ 7,122,076.14**

Bridge cost estimated using cost estimation for a replacement 3 cell (3.05 x 2.04 x 19 m) box culvert structure to built in Golden Plains Shire

APPENDIX P. ORIGINAL AND REVISED COST ESTIMATES FOR ROSS CREEK ROAD UPGRADE (DI_RD_38 & DI_RD_39)

RD_38 Ross Creek Road

Road Type: Link 2 **Between: Bells Rd - DI_JNC_12 (Realigned Cobden St)**

						99	104.7	107.1	107.4	105.1	105.9	117.1	**120.7**	**121.5**	119.8
							Jun-13	**Jun-14**	**Jun-15**	**Jun-16**	**Jun-17**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**		**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00		$ 10,575.76	$ 10,818.14	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Upgrade Existing		item	$ 1,596,290.15	1	$ 1,596,290.15		$1,688,197.77	$1,726,895.71	$ 1,731,732.96	$1,694,647.43	$ 1,707,546.74	$ 1,888,137.14	$ 1,946,184.06	$ 1,959,083.37	$ 1,931,672.33
Line Marking		lin m	$ 15.00	850	$ 12,750.00		$ 13,484.09	$ 13,793.18	$ 13,831.82	$ 13,535.61	$ 13,638.64	$ 15,081.06	$ 15,544.70	$ 15,647.73	$ 15,428.79
Miscellaneous	Signage	No	$ 35.00	850	$ 29,750.00		$ 31,462.88	$ 32,184.09	$ 32,274.24	$ 31,583.08	$ 31,823.48	$ 35,189.14	$ 36,270.96	$ 36,511.36	$ 36,000.51
	Tactile pavers	No	$ 250.00	8	$ 2,000.00		$ 2,115.15	$ 2,163.64	$ 2,169.70	$ 2,123.23	$ 2,139.39	$ 2,365.66	$ 2,438.38	$ 2,454.55	$ 2,420.20
	Drainage	item	$ 250.00	850	$ 212,500.00		$ 224,734.85	$ 229,886.36	$ 230,530.30	$ 225,593.43	$ 227,310.61	$ 251,351.01	$ 259,078.28	$ 260,795.45	$ 257,146.46
	Excavation of rock	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Management		item	$ 5,000.00	1	$ 5,000.00		$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 79,814.51	1	$ 79,814.51		$ 84,409.89	$ 86,344.79	$ 86,586.65	$ 84,732.37	$ 85,377.34	$ 94,406.86	$ 97,309.20	$ 97,954.17	$ 96,583.62
Landscaping		lin m	$ 50.00	850	$ 42,500.00		$ 44,946.97	$ 45,977.27	$ 46,106.06	$ 45,118.69	$ 45,462.12	$ 50,270.20	$ 51,815.66	$ 52,159.09	$ 51,429.29
Lighting		lin m	$ 150.00	850	$ 127,500.00		$ 134,840.91	$ 137,931.82	$ 138,318.18	$ 135,356.06	$ 136,386.36	$ 150,810.61	$ 155,446.97	$ 156,477.27	$ 154,287.88
Services Relocating/alteration	Electrical	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 2,118,104.66		$2,240,056.14	$2,291,404.13	$ 2,297,822.63	$ 2,248,614.14	$ 2,265,730.14	$ 2,505,354.10	$ 2,582,376.09	$ 2,599,492.09	$ 2,563,120.59
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 211,810.47		$ 224,005.61	$ 229,140.41	$ 229,782.26	$ 224,861.41	$ 226,573.01	$ 250,535.41	$ 258,237.61	$ 259,949.21	$ 256,312.06
Contingency		item	15%	1	$ 317,715.70		$ 336,008.42	$ 343,710.62	$ 344,673.40	$ 337,292.12	$ 339,859.52	$ 375,803.12	$ 387,356.41	$ 389,923.81	$ 384,468.09
				TOTAL	**$ 2,647,630.83**		**$2,800,070.18**	**$2,864,255.17**	**$ 2,872,278.29**	**$ 2,810,767.68**	**$ 2,832,162.67**	**$ 3,131,692.63**	**$ 3,227,970.11**	**$ 3,249,365.11**	**$ 3,203,900.74**
						$ 3,114.86	$ 3,294.20	$ 3,369.71	$ 3,379.15	$ 3,306.79	$ 3,331.96	$ 3,684.34	$ 3,797.61	$ 3,822.78	$ 3,769.29

Road Type: Link 3 **Between: Bells Rd - DI_JNC_12 (Realigned Cobden St)**

Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.14	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Upgrade Existing		item	$ 1,720,697.50	1	$ 1,720,697.50	$1,819,767.96	$1,861,481.84	$ 1,866,696.08	$ 1,826,720.28	$ 1,840,624.90	$ 2,035,289.67	$ 2,097,860.49	$ 2,111,765.11	$ 2,082,217.78
Line Marking		lin m	$ 15.00	850	$ 12,750.00	$ 13,484.09	$ 13,793.18	$ 13,831.82	$ 13,535.61	$ 13,638.64	$ 15,081.06	$ 15,544.70	$ 15,647.73	$ 15,428.79
Miscellaneous	Signage	No	$ 35.00	850	$ 29,750.00	$ 31,462.88	$ 32,184.09	$ 32,274.24	$ 31,583.08	$ 31,823.48	$ 35,189.14	$ 36,270.96	$ 36,511.36	$ 36,000.51
	Tactile pavers	No	$ 250.00	8	$ 2,000.00	$ 2,115.15	$ 2,163.64	$ 2,169.70	$ 2,123.23	$ 2,139.39	$ 2,365.66	$ 2,438.38	$ 2,454.55	$ 2,420.20
	Drainage	item	$ 250.00	850	$ 212,500.00	$ 224,734.85	$ 229,886.36	$ 230,530.30	$ 225,593.43	$ 227,310.61	$ 251,351.01	$ 259,078.28	$ 260,795.45	$ 257,146.46
	Excavation of rock	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Management		item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 86,034.88	1	$ 86,034.88	$ 90,988.40	$ 93,074.09	$ 93,334.80	$ 91,336.01	$ 92,031.25	$ 101,764.48	$ 104,893.02	$ 105,588.26	$ 104,110.89
Landscaping		lin m	$ 50.00	850	$ 42,500.00	$ 44,946.97	$ 45,977.27	$ 46,106.06	$ 45,118.69	$ 45,462.12	$ 50,270.20	$ 51,815.66	$ 52,159.09	$ 51,429.29
Lighting		lin m	$ 150.00	850	$ 127,500.00	$ 134,840.91	$ 137,931.82	$ 138,318.18	$ 135,356.06	$ 136,386.36	$ 150,810.61	$ 155,446.97	$ 156,477.27	$ 154,287.88
Services Relocating/alteration	Electrical	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 2,248,732.38	$2,378,204.85	$2,432,719.57	$ 2,439,533.91	$ 2,387,290.63	$ 2,405,462.21	$ 2,659,864.25	$ 2,741,636.34	$ 2,759,807.91	$ 2,721,193.32
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 224,873.24	$ 237,820.48	$ 243,271.96	$ 243,953.39	$ 238,729.06	$ 240,546.22	$ 265,986.43	$ 274,163.63	$ 275,980.79	$ 272,119.33
Contingency		item	15%	1	$ 337,309.86	$ 356,730.73	$ 364,907.94	$ 365,930.09	$ 358,093.59	$ 360,819.33	$ 398,979.64	$ 411,245.45	$ 413,971.19	$ 408,179.00
				TOTAL	**$ 2,810,915.47**	**$2,972,756.06**	**$3,040,899.46**	**$ 3,049,417.39**	**$ 2,984,113.29**	**$ 3,006,827.76**	**$ 3,324,830.32**	**$ 3,427,045.43**	**$ 3,449,759.89**	**$ 3,401,491.65**
					$ 3,306.96	$ 3,497.36	$ 3,577.53	$ 3,587.55	$ 3,510.72	$ 3,537.44	$ 3,911.57	$ 4,031.82	$ 4,058.54	$ 4,001.75

RD_39 : Ross Creek Road

Road Type: Link 2	Between: Tait St - DI_JNC_12 (Cobden St (realigned))					99	104.7	107.1	107.4	105.1	105.9	117.1	**120.7**	**121.5**	119.8
							Jun-13	**Jun-14**	**Jun-15**	**Jun-16**	**Jun-17**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Upgrade Existing		item	$ 375,597.68	1	$ 375,597.68	$ 397,223.00	$ 406,328.40	$ 407,466.58	$ 398,740.57	$ 401,775.70	$ 444,267.56	$ 457,925.66	$ 460,960.79	$ 454,511.14
Line Marking		lin m	$ 15.00	200	$ 3,000.00	$ 3,172.73	$ 3,245.45	$ 3,254.55	$ 3,184.85	$ 3,209.09	$ 3,548.48	$ 3,657.58	$ 3,681.82	$ 3,630.30
Miscellaneous	Signage	No	$ 35.00	200	$ 7,000.00	$ 7,403.03	$ 7,572.73	$ 7,593.94	$ 7,431.31	$ 7,487.88	$ 8,279.80	$ 8,534.34	$ 8,590.91	$ 8,470.71
	Tactile pavers	No	$ 250.00	10	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
	Drainage	item	$ 250.00	200	$ 50,000.00	$ 52,878.79	$ 54,090.91	$ 54,242.42	$ 53,080.81	$ 53,484.85	$ 59,141.41	$ 60,959.60	$ 61,363.64	$ 60,505.05
	Excavation of rock	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Management		item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 18,779.88	1	$ 18,779.88	$ 19,861.15	$ 20,316.42	$ 20,373.33	$ 19,937.03	$ 20,088.79	$ 22,213.38	$ 22,896.28	$ 23,048.04	$ 22,725.56
Landscaping		lin m	$ 50.00	200	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Lighting		lin m	$ 150.00	200	$ 30,000.00	$ 31,727.27	$ 32,454.55	$ 32,545.45	$ 31,848.48	$ 32,090.91	$ 35,484.85	$ 36,575.76	$ 36,818.18	$ 36,303.03
Services Relocating/alteration	Electrical	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 511,877.57	$ 541,349.31	$ 553,758.46	$ 555,309.60	$ 543,417.50	$ 547,553.88	$ 605,463.26	$ 624,076.99	$ 628,213.38	$ 619,423.56
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 51,187.76	$ 54,134.93	$ 55,375.85	$ 55,530.96	$ 54,341.75	$ 54,755.39	$ 60,546.33	$ 62,407.70	$ 62,821.34	$ 61,942.36
Contingency		item	15%	1	$ 76,781.64	$ 81,202.40	$ 83,063.77	$ 83,296.44	$ 81,512.62	$ 82,133.08	$ 90,819.49	$ 93,611.55	$ 94,232.01	$ 92,913.53
				TOTAL	**$ 639,846.96**	**$ 676,686.63**	**$ 692,198.07**	**$ 694,137.00**	**$ 679,271.87**	**$ 684,442.35**	**$ 756,829.08**	**$ 780,096.24**	**$ 785,266.72**	**$ 774,279.45**

Road Type: Link 2	Corrections made: revised length					99	104.7	107.1	107.4	105.1	105.9	117.1	120.7	121.5	119.8
							Jun-13	**Jun-14**	**Jun-15**	**Jun-16**	**Jun-17**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**
Description	**Detail**	**Unit**	**Rate**	**Qty**	**Amount**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**	**Indexation**
Site Establishment		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Upgrade Existing		item	$ 431,937.34	1	$ 431,937.34	$ 456,806.46	$ 467,277.66	$ 468,586.56	$ 458,551.66	$ 462,042.06	$ 510,907.70	$ 526,614.51	$ 530,104.91	$ 522,687.81
Line Marking		lin m	$ 15.00	230	$ 3,450.00	$ 3,648.64	$ 3,732.27	$ 3,742.73	$ 3,662.58	$ 3,690.45	$ 4,080.76	$ 4,206.21	$ 4,234.09	$ 4,174.85
Miscellaneous	Signage	No	$ 35.00	230	$ 8,050.00	$ 8,513.48	$ 8,708.64	$ 8,733.03	$ 8,546.01	$ 8,611.06	$ 9,521.77	$ 9,814.49	$ 9,879.55	$ 9,741.31
	Tactile pavers	No	$ 250.00	10	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
	Drainage	item	$ 250.00	230	$ 57,500.00	$ 60,810.61	$ 62,204.55	$ 62,378.79	$ 61,042.93	$ 61,507.58	$ 68,012.63	$ 70,103.54	$ 70,568.18	$ 69,580.81
	Excavation of rock	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Management		item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 21,596.87	1	$ 21,596.87	$ 22,840.32	$ 23,363.88	$ 23,429.33	$ 22,927.58	$ 23,102.10	$ 25,545.38	$ 26,330.73	$ 26,505.25	$ 26,134.39
Landscaping		lin m	$ 50.00	230	$ 11,500.00	$ 12,162.12	$ 12,440.91	$ 12,475.76	$ 12,208.59	$ 12,301.52	$ 13,602.53	$ 14,020.71	$ 14,113.64	$ 13,916.16
Lighting		lin m	$ 150.00	230	$ 34,500.00	$ 36,486.36	$ 37,322.73	$ 37,427.27	$ 36,625.76	$ 36,904.55	$ 40,807.58	$ 42,062.12	$ 42,340.91	$ 41,748.48
Services Relocating/alteration	Electrical	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 586,034.20	$ 619,775.57	$ 633,982.46	$ 635,758.32	$ 622,143.38	$ 626,879.01	$ 693,177.83	$ 714,488.16	$ 719,223.79	$ 709,160.58
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 58,603.42	$ 61,977.56	$ 63,398.25	$ 63,575.83	$ 62,214.34	$ 62,687.90	$ 69,317.78	$ 71,448.82	$ 71,922.38	$ 70,916.06
Contingency		item	15%	1	$ 87,905.13	$ 92,966.33	$ 95,097.37	$ 95,363.75	$ 93,321.51	$ 94,031.85	$ 103,976.67	$ 107,173.22	$ 107,883.57	$ 106,374.09
				TOTAL	**$ 732,542.75**	**$ 774,719.46**	**$ 792,478.07**	**$ 794,697.90**	**$ 777,679.23**	**$ 783,598.76**	**$ 866,472.29**	**$ 893,110.21**	**$ 899,029.74**	**$ 886,450.73**

Road Type: Link 3 **Corrections made: revised length & LR3 cross section**

Description	Detail	Unit	Rate	Qty	Amount	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation	Indexation
Site Establishment		item	$ 10,000.00	1	$ 10,000.00	$ 10,575.76	$ 10,818.18	$ 10,848.48	$ 10,616.16	$ 10,696.97	$ 11,828.28	$ 12,191.92	$ 12,272.73	$ 12,101.01
Road Construction / Upgrade Existing		item	$ 465,600.50	1	$ 465,600.50	$ 492,407.80	$ 503,695.09	$ 505,106.00	$ 494,289.02	$ 498,051.44	$ 550,725.44	$ 567,656.37	$ 571,418.80	$ 563,423.64
Line Marking		lin m	$ 15.00	230	$ 3,450.00	$ 3,648.64	$ 3,732.27	$ 3,742.73	$ 3,662.58	$ 3,690.45	$ 4,080.76	$ 4,206.21	$ 4,234.09	$ 4,174.85
Miscellaneous	Signage	No	$ 35.00	230	$ 8,050.00	$ 8,513.48	$ 8,708.64	$ 8,733.03	$ 8,546.01	$ 8,611.06	$ 9,521.77	$ 9,814.49	$ 9,879.55	$ 9,741.31
	Tactile pavers	No	$ 250.00	10	$ 2,500.00	$ 2,643.94	$ 2,704.55	$ 2,712.12	$ 2,654.04	$ 2,674.24	$ 2,957.07	$ 3,047.98	$ 3,068.18	$ 3,025.25
	Drainage	item	$ 250.00	230	$ 57,500.00	$ 60,810.61	$ 62,204.55	$ 62,378.79	$ 61,042.93	$ 61,507.58	$ 68,012.63	$ 70,103.54	$ 70,568.18	$ 69,580.81
	Excavation of rock	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Retaining Wall	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Management		item	$ 5,000.00	1	$ 5,000.00	$ 5,287.88	$ 5,409.09	$ 5,424.24	$ 5,308.08	$ 5,348.48	$ 5,914.14	$ 6,095.96	$ 6,136.36	$ 6,050.51
Traffic Management		item	$ 23,280.03	1	$ 23,280.03	$ 24,620.39	$ 25,184.75	$ 25,255.30	$ 24,714.45	$ 24,902.57	$ 27,536.27	$ 28,382.82	$ 28,570.94	$ 28,171.18
Landscaping		lin m	$ 50.00	230	$ 11,500.00	$ 12,162.12	$ 12,440.91	$ 12,475.76	$ 12,208.59	$ 12,301.52	$ 13,602.53	$ 14,020.71	$ 14,113.64	$ 13,916.16
Lighting		lin m	$ 150.00	230	$ 34,500.00	$ 36,486.36	$ 37,322.73	$ 37,427.27	$ 36,625.76	$ 36,904.55	$ 40,807.58	$ 42,062.12	$ 42,340.91	$ 41,748.48
Services Relocating/alteration	Electrical	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Water	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Telstra	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Other	item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Native Vegetetion Offset requirements		item			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
				Subtotal	$ 621,380.53	$ 657,156.98	$ 672,220.75	$ 674,103.72	$ 659,667.61	$ 664,688.86	$ 734,986.46	$ 757,582.11	$ 762,603.37	$ 751,933.20
Professional Fees	Survey, Geotech, Pavement & Design	item	10%	1	$ 62,138.05	$ 65,715.70	$ 67,222.07	$ 67,410.37	$ 65,966.76	$ 66,468.89	$ 73,498.65	$ 75,758.21	$ 76,260.34	$ 75,193.32
Contingency		item	15%	1	$ 93,207.08	$ 98,573.55	$ 100,833.11	$ 101,115.56	$ 98,950.14	$ 99,703.33	$ 110,247.97	$ 113,637.32	$ 114,390.51	$ 112,789.98
				TOTAL	**$ 776,725.66**	**$ 821,446.22**	**$ 840,275.94**	**$ 842,629.65**	**$ 824,584.51**	**$ 830,861.08**	**$ 918,733.07**	**$ 946,977.64**	**$ 953,254.21**	**$ 939,916.50**

Planning today for the communities of tomorrow

Ballarat West Precinct Structure Plan Review – Community and Recreation Infrastructure

Final Report

May 29th, 2024

Version 6

Prepared for Ballart City Council
by ASR Research Pty Ltd
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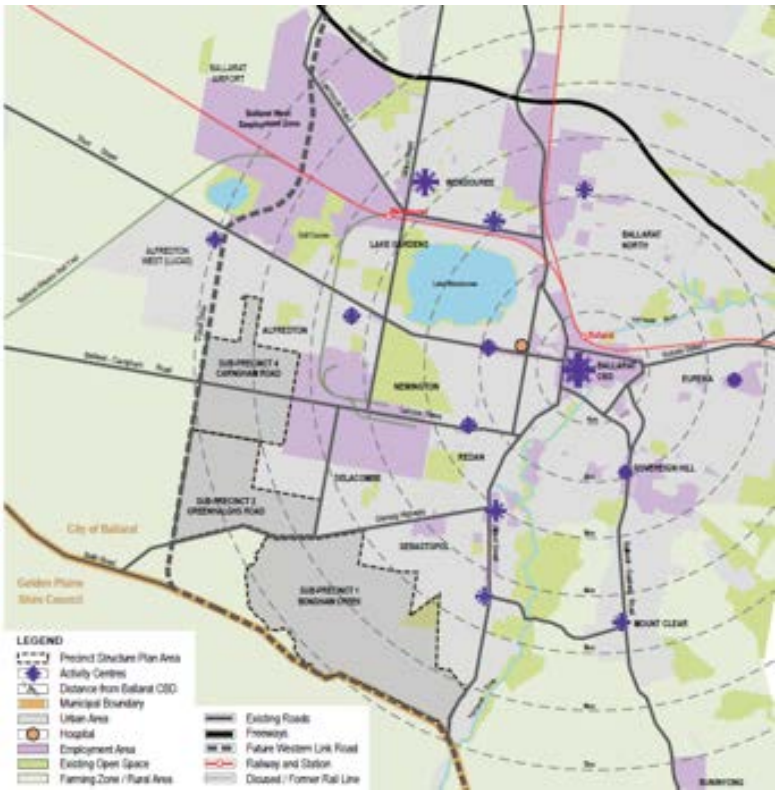
1 Introduction

1.1 Background

The City of Ballarat has commenced a review of the Ballarat West Precinct Structure Plan (PSP) and the Ballarat West Development Contributions Plan[1] (DCP). As part of this process Council engaged ASR Research Pty Ltd to assist with the review of community infrastructure projects in the PSP including early learning facilities, multipurpose community centres, active open space reserves, and pavilions. As shown in Figure 1 below, the Ballarat West PSP is located west of the Ballarat Central Business District (CBD).

Figure 1 – Location of Ballarat West PSP in Relation to the Ballarat Urban Area



Source: City of Ballarat, Ballarat West Precinct Structure Plan (October 2016), Plan 2

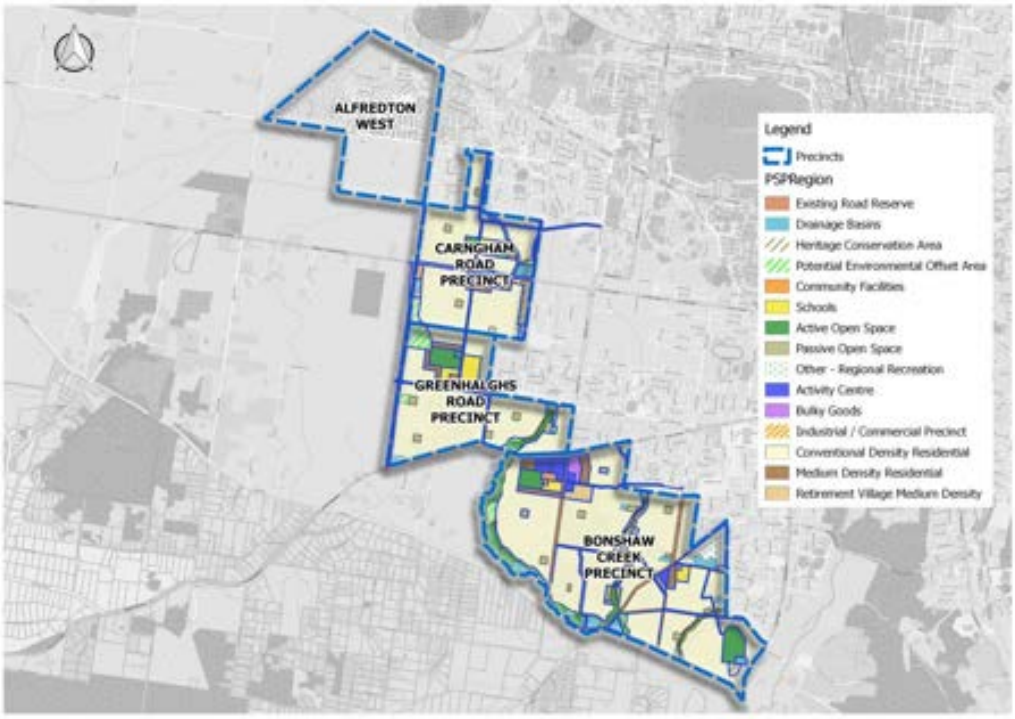
The Ballarat West PSP forms a major part of the Ballarat West Growth Area which caters for primarily residential growth and provides services and infrastructure for new communities.

[1] The original The Ballarat West Development Contributions Plan (DCP) was approved by the Minister for Planning under Amendment C167 Development Contributions Plan on 30 October 2014. The revised DCP, approved in March 2017, was prepared in response to a change to the Community Infrastructure Levy cap introduced by a Governor in Council Order on 11 October 2016.

The Growth Area, shown in Figure 2 below, will provide around 18,000 new houses at full development to accommodate a population of more than 40,000 people. It comprises 1,1717 hectares of greenfield land and includes four planning precincts located to the west of Alfredton, Delacombe and Sebastopol. The precincts are:

- Bonshaw Creek- Precinct 1;
- Greenhalghs Road - Precinct 2;
- Alfredton West (Lucas) - Precinct 3; and
- Carngham Road - Precinct 4.

Figure 2 - Ballarat West Growth Area Precincts



The Ballarat West PSP is supported by a Development Contributions Plan (DCP), which will form the basis of the levy to be paid by development proponents as part of the development of the precinct. Throughout this document, any reference to the PSP also includes the DCP.

The Ballarat West PSP and DCP is a long-term plan for urban development. It describes how the land is expected to be developed, the services planned to support development and how they will be delivered. The PSP and

DCP documents were prepared by the City of Ballarat in consultation with Council departments, government agencies, services authorities, and other major stakeholders.

The Ballarat West PSP and DCP were approved in 2016. The PSP includes a requirement at section 1.5 that Council monitor the implementation of the PSP and evaluate its effectiveness at least every five years. It states that the content may be revised and updated following the review. Section 4.6 of the DCP also states the following:

> *"The City of Ballarat will undertake ongoing accounting and review of this DCP in terms of:*
> - *The relevance of projects listed in the DCP;*
> - *The level of contributions collected;*
> - *The construction costs of infrastructure projects;*
> - *The land costs of infrastructure projects;*
> - *Updating the DCP to reflect any relevant amendments to the Planning and Environment Act, or any new Ministerial Directions relating to development contributions."*

1.2 Review Objectives

The following report was prepared to inform further consultation with City of Ballarat community infrastructure departments and external State agencies such as the Department of Education (DE) and Department of Health (DH).

The objectives of the review were to:

1. Review the population projections for the Ballarat West PSP area.
2. Review whether the community infrastructure being provided in the Ballarat West PSP and DCP is adequate having consideration for the level of development that has already been approved.
3. Apply the standard community facility, and sports and recreation designs included in the VPA's Benchmarking Infrastructure Costings to the PSP community infrastructure projects.
4. Prepare cost estimates based on the designs prepared in order to inform the review of the Ballarat West PSP and DCP.
5. Provide recommendations / options on how any changes to community infrastructure provision could be addressed through the PSP and DCP.

In addition to these primary objectives the assessment also assesses the impact of higher residential densities on community infrastructure demand, and the amount and type of community infrastructure required to support that demand.

1.3 Review Scope

The scope of community infrastructure assessed as part of this review is limited to the following the infrastructure forms:

1. Active open space and supporting amenities (e.g. pavilions and carparking);
2. Multipurpose community centres; and
3. Education facilities.

Items 1 and 2 form represent the majority of community infrastructure forms identified in the Ballarat West DCP.

Beyond these items demand estimates for a much larger suite of services and facilities is presented in this report for contextual purposes (refer to Appendix 2 for more details).

2 Methodology

The Background Report has been developed to ensure both City of Ballarat departments and external agency stakeholders have sufficient information to make informed decisions about the future community infrastructure of the Ballarat West PSP area. To achieve this objective the report includes the following:

1. An overview of the community infrastructure planning process as it applies to growth areas.
2. A review of many of the more relevant statutory and strategic documents likely to have the most significant influence on the community infrastructure outcomes associated with the development of the Ballarat West PSP.
3. A review of the original development and population assumptions for the Ballarat West PSP to determine to what extent these original assumptions remain valid and assess the implications for community infrastructure provision.
4. The main existing and planned community infrastructure within the Ballarat West PSP including those items specifically identified within the Ballarat West DCP.
5. A preliminary review of the implications of the revised dwelling and population assumptions for community infrastructure provision within the Ballarat West PSP.
6. A preliminary comparison of the key Ballarat West DCP community infrastructure cost items with the VPA endorsed benchmark costings for community infrastructure items.
7. A summary of key findings.

3 The Ballarat West PSP & Associated Strategic Work

3.1 Overview of the Ballarat West PSP

Figure 3 on the following page shows the future urban structure plan for the Ballarat West PSP area, the vision for which includes:

> *"…a place where people can enjoy healthy, affordable and sustainable lifestyles. The community will be a vibrant and prosperous series of neighbourhoods which offer housing choice and diversity supported by schools and community facilities and a network of passive and active open spaces which cater for a range of recreational pursuits. The neighbourhoods will be interconnected by a walkable street and trail network, with access to public transport to ensure that all residents have access to a range of community, retail and recreational uses within their community."*

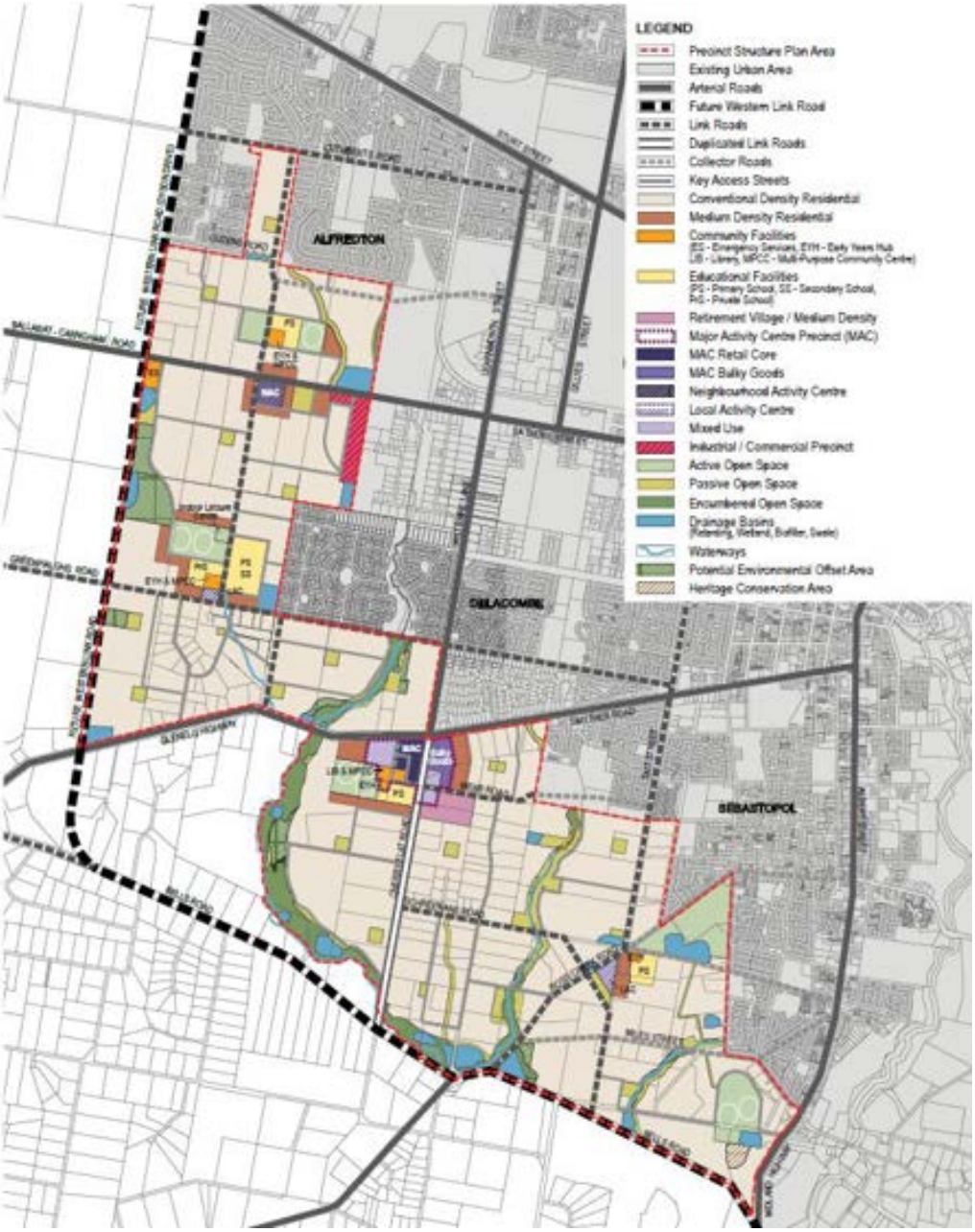
The vision is to be realised through the application of the following principles and objectives of integrated neighbourhood design:

- To establish a sense of place and community;
- To create greater housing choice;
- To create highly accessible and vibrant activity centres;
- Deliver integrated, accessible and adaptable community facilities;
- Provide for local employment and business activity;
- Provide better transport choices; and
- Deliver environmentally sustainable communities.

The Ballarat West PSP makes the following development assumptions, and a key focus of the review process, in relation to residential densities, dwelling yields and overall population yield:

- A total of 14,485 dwellings consisting of:
  - 13,359 conventional dwellings (based on an average conventional density of at least 15 dwellings per 1 hectare of net residential area – NRA); and
  - 1,083 medium density dwellings (based on an average medium density of at least 25 dwellings per 1 hectare of net residential area).
- An estimated total population of 36,212 people, based on an average household size of 2.5.

Figure 3 - Ballarat West PSP Future Urban Structure



Source: City of Ballarat, Ballarat West Precinct Structure Plan (October 2016), Plan 8

As shown in Figure 3, the Ballarat West PSP seeks to service the changing needs of the community through the provision of accessible, integrated and adaptable community facilities. The Ballarat West PSP makes provision for a range of community infrastructure to serve the diverse needs of the local community. Community facilities will be delivered as early as possible to foster a sense of community in the new neighbourhoods.

Community & Early Years Hubs

A network of community and early years hubs are provided within Ballarat West. These hubs are co-located with schools and where appropriate, activity centres, to create focal points for community activity and interaction within each neighbourhood.

The Precinct offers a wide range of education facilities; government primary and secondary and non government primary schools. Early Years Hubs are co-located with schools and provide opportunities for the provision of kindergarten, childcare, child and maternal health and flexible community spaces. All schools and Early Years Hubs within the Precinct are located on the connector street network to maximise community access by walking, cycling and public transport.

Open Space

The open space network within the Precinct will cater for the diverse ages and interests within the local community. The open spaces range from neighbourhood to regional parks and will provide for a variety of active and passive recreational pursuits.

The Winter, Kensington and Bonshaw Creek linear parks will provide a green link with a shared path network through the heart of the development. This linear park network will provide connections to open spaces and other key community uses.

Other components of the open space network include neighbourhood parks, passive open space (conservation areas and linear open space) as well as active open space (including district and regional sport reserves).

Further details on the community infrastructure provision items proposed for the Ballarat West PSP are summarised in Section 7.1 of this report.

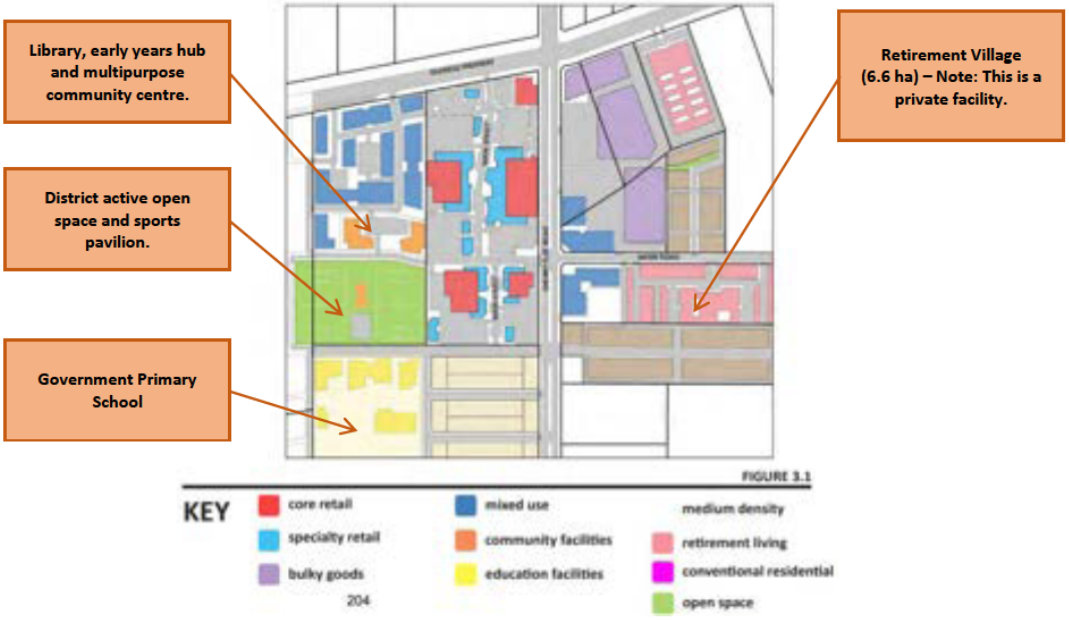
3.2 Ballarat West Major Activity Centre Urban Design Framework

The purpose of the Ballarat West Major Activity Centre Urban Design Framework (UDF) is to provide clear guidance to the community, the City of Ballarat and developers on how the Major Activity Centre (Delacombe

Town Centre) located in Sub - Precinct 1 of the Ballarat West Precinct Structure Plan (BWPSP) is to be developed and structured over an approximate timeframe of 30 years. As shown in Figure 4 below, community infrastructure forms a key part of the UDF and consists of:

- **Community facilities** - the activity centre is to provide a range of facilities that support the future community of the precinct. These community facilities are to form a cluster of buildings on the south western portion of the activity centre. **Community facilities** will **consist of a** multipurpose community facility, early years hub and a regional library;
- **An education facility** - a site of 3.5 hectares west of Cherry Flat Road and south of a key east-west link road, has been set aside in the precinct structure plan to accommodate a primary school to meet the future needs of the community; and
- **District active open space** - an area of 3.5 hectares for active open space will be provided along the western side of the activity centre. The site is to accommodate at least 2 soccer fields and a sports pavilion.
- **Retirement Village** - a significant portion of the activity centre has been reserved for retirement living.

Figure 4 - Ballarat West Major Activity Centre (Delacombe Town Centre) Urban Design Framework - January 2017 Update



Source: City of Ballarat, Ballarat West Major Activity Centre Urban Design Framework (January 2017), Figure 3.1

4 Overview of the Community Infrastructure Planning Process

4.1 Key Elements of Community infrastructure Planning

The community infrastructure planning process typically involves an interrelated set of considerations. These include:

- Scope - Defining what services and facilities to plan for.
- Policy and regulation – Government policies and regulation play a significant role in the provision of both public and private social infrastructure provision.
- Demand – what the future demand for a given service or facility is likely to be. Demand calculations are often associated with the use of provision benchmarks (refer to Section 2.3 for more details).
- Supply – what existing and planned provision is required to service the demand. As with demand calculations, supply calculations are often associated with the use of provision benchmarks (refer to Section 2.3 for more details).
- Models of provision – how are services and facilities best configured / arranged to meet demand (e.g. land size, facility type, multiservice / shared use of resources etc) and by whom (e.g. public / private).
- Distribution and location – how the facility or service should best be geographically / spatially delivered (i.e. catchment area).
- Timing of provision – when should services and facilities be delivered and by whom.
- Funding – how will services and facilities be funded.

4.2 Community Infrastructure Planning Guidelines

4.2.1 Victorian Planning Authority Endorsed Guidelines

Community infrastructure objectives are a central element of many key State Government planning policies and strategies such as *Plan Melbourne 2017-2050*. The Victorian Planning Authority (VPA) plays an important role in implementing many of the directions contained within Melbourne's metropolitan strategy. There are also a number of reports that have been prepared on behalf of the VPA that focus on or include community infrastructure planning guidelines. They key documents include:

- Precinct Structure Planning Guidelines (2021);
- Planning for Community Infrastructure in Growth Areas Communities – PCIGAC (2008);

- Kindergarten Infrastructure Needs Assessment in Greenfield Growth Areas (2015)[2];
- A Short Guide to Growth Area Community Infrastructure Planning (2009);
- A Strategic Framework for Creating Liveable New Communities – April 2008;
- A Strategic Framework for Creating Liveable New Communities – The Framework at a Glance;
- Community Infrastructure – Liveability Planning Checklist – April 2008; and
- Creating Liveable New Communities Promising Practice: A book of good practice – case studies.

Of these documents the Precinct Structure Planning Guidelines (PSP Guidelines), the Planning for Community Infrastructure in Growth Areas Communities (PCIGAC) and the Kindergarten Infrastructure Needs Assessment in Greenfield Growth Areas contain most of the key provision guidelines or benchmarks used by the VPA in the planning of greenfield sites. Key provision guidelines contained within these documents are used throughout this review.

A more detailed description of the proposed Ballarat West PSP and DCP community infrastructure initiatives are presented in Section 7 of this Background report.

4.3 Issues with the Application of Current Provision Benchmarks

Although community infrastructure covers a potentially wide variety of services and facilities provided by all forms of Government, the private for-profit sector and not-for-profit organisations, much of what is planned for within Precinct Structure Plan (PSP) location largely focus on the following six infrastructure forms:

1. Passive and active open space (bundled together under the term unencumbered public open space);
2. Indoor recreation facilities;
3. Local multipurpose community centres which can have many potential configurations but are typically classified into two main types (Levels 1 & 2 - refer to Section 4.4.3 for more details);
4. Higher order community centres (Level 3 centres which can accommodate services such as libraries, youth programs and Planned Activity Groups - refer to Section 4.4.3 for more details);
5. Government primary and secondary Schools; and
6. Non-Government Schools.

Although indicative provision benchmarks exist for many of these infrastructure forms, there remain many issues with the acceptance of benchmarks as a tool for planning in greenfield locations, ranging from whether specific benchmarks are too high or too low to whether there are better methods for determining and responding to community infrastructure need. Some of the key issues are summarised below:

[2] Note: The Kindergarten Infrastructure Needs Assessment in Greenfield Growth Areas report was developed in 2015, prior to the introduction of the Universal Access policies (i.e. 15 hours of 3 year old kindergarten and 30 hours of pre-prep).

- Benchmarks provide simplicity but are often 'narrow' (i.e. linked to only a population or dwelling number as a trigger for provision) when other variables and criteria are not taken into account (e.g. age cohort profiles) and used in isolation from other important assessment steps (e.g. the existing capacity of the nearest facilities to a PSP location).
- Most benchmarks are currently expressed as an infrastructure driven model (e.g. 1 Government Primary School per 3,000 dwellings) rather than a demand based model (e.g. 66 4 year olds per 4 year old Kindergarten room).
- Some forms of community infrastructure are more difficult to quantify the demand for (e.g. community meeting spaces, youth services and arts / cultural activities) and thus make the task of assigning a benchmark far more difficult.
- Explicit policies stating preferred provision standards and models of delivery across PSP growth area remains in varying states of 'maturity'.
- There is often a lack of clarity about preferred provision levels and models with many forms of State based social infrastructure (e.g. health and emergency services).

4.4 Provision & Cost Benchmarks

4.4.1 Overview

This section provides a brief description of the key community infrastructure provision benchmarks, facility configuration models and cost benchmarks used to review the adequacy of both the number of facilities planned for within the Ballarat West PSP and the cost estimates identified in the Ballarat West PSP.

4.4.2 Open Space & Recreation

The VPA PSP Guidelines include some key provision targets for open space and recreation planning. Its focus has largely (but not exclusively) been on 'local' scale provision as opposed to regional / sub-regional provision. Key guidelines are:

- Unencumbered passive open space (3 to 5% of Net Developable Area or NDA); and
- Active open space - sports grounds and outdoor court based facilities such as tennis and netball (5 to 7% of NDA).

In addition to these documented measures, are other less well documented factors / guidelines influencing open space and recreation outcomes include:

- Encumbered open space, particularly open space set aside for drainage purposes and as part of linear networks along rivers and creeks, typically represent a significant proportion of the gross area of a PSP site. The contribution these assets provide by way of informal recreation outcomes and improved physical and mental health is considerable. Encumbered open space provision outcomes are not prescriptively derived as each PSP site provides unique topographical, hydrological and environmental characteristics.
- There has been the occasional application of a regional active open space benchmark in previous growth area planning exercises (30 hectares per 50,000 people), but the benchmark is not contained within current PSP guidelines, is not well known and has not been applied uniformly across all Melbourne's growth areas.

In addition to these PSP guideline provision benchmarks this review includes demand-based estimates for organised sport derived from the AusPlay Survey[3] (AusPlay) which provides the major source of participation data for sport and other informal physical activities in Australia. These estimates are contained within Appendix 2 of this report and referred to in Section 8.

4.4.3 Multipurpose Community Centres

For the purposes of this assessment a multipurpose community centre is defined as a building owned and or managed by Local Government which accommodates a range of services and offers flexible community spaces made available to local residents and community groups for a variety of potential uses.

In the context of greenfield locations community centres have primarily incorporated a range of early years services and offered flexible community meeting spaces. However, the potential range of services and functions a community centre can incorporate is very broad. In order to ensure the effective and efficient use of capital and operational resources contemporary community centres are multipurpose (i.e. offering more than one service and function) rather than stand-alone (i.e. dedicated to one service or function only), and, where practical, co-located with other community infrastructure and public open space. Land area allocations in greenfield locations are reasonably generous in comparison to the actual building footprint provided in order to allow for sufficient on-site car parking and facilitate longer term expansion requirements as local needs evolve and change and shifts in government policy occur (e.g. the Victorian State Government's proposed introduction of 15 hours per week of funded 3 year old Kindergarten over the coming decade).

Other key characteristics and issues associated with multipurpose community centres are outlined below.

[3] Ausplay is a large scale national population tracking survey funded and led by Sport Australia. AusPlay collects participation data; not membership data. The club sport data in AusPlay relates to how participation took place (e.g. survey respondents who self-identified that they participated in an activity through a sports club or association).

- Although not all multipurpose community centres are identical, it is possible to describe the types of services and functions typically incorporated into such facilities.
- Typically, such facilities are a combination of a few (but rarely all) of the following services and functions: Kindergarten; Maternal & child health; Playgroups; Occasional child care; long day child care; community meeting spaces; Planned Activity Groups; Neighbourhood houses / adult education; and Library.
- Multipurpose community centres can vary greatly in size depending on the services and activities to be accommodated within it and can typically range from 500 square metres to 2,500 square metres.
- Unlike public open space (both passive and active), the VPA PSP Guidelines do not specify a quantitative measure of how many facilities should be provided either using an area based standard (as applies to public open space) or a population based standard. Municipal Planning schemes do not provide any guidance on this matter either.
- In the absence of specific PSP Guidelines and statutory requirements, the VPA has tended to rely on the provision guidelines outlined in the Planning for Community Infrastructure in Growth Area Communities (2008).
- However, it is possible to estimate the level of demand for specific service types likely to be generated by a PSP.

The *Planning for Community Infrastructure in Growth Area Communities* – PCIGAC (2008) report includes guidelines for many discrete services and functions that would typically be accommodated within a Council multipurpose community centre. However, it is assumed that most of these could be included as part of two main types of community centre:

- Level 1 Community Centres provided @ 1 centre per 8,000 to 10,000 people on 0.8 hectare sites; and
- Level 3 Community Centres @ 1 centre per 40,000 to 50,000 people on 1.5 hectare sites.

The *Kindergarten Infrastructure Needs Assessment in Greenfield Growth Areas* (2015) refers to two key benchmarks in relation to the provision of Kindergarten programs, of which Local Government is a major provider:

- 1 kindergarten room per 1,400 households at the peak; and
- 1 kindergarten room per 2,100 households in the long term.

Under the proposed roll-out of the Victorian State Government's Best Start, Best Life Policy (June 2022), the City of Ballarat will adopt a provision of ratio of one licenced kindergarten place per 1 child aged 4 years of age and one licenced kindergarten place per 2 children aged 3 years of age. Council's preferred kindergarten room size

equates to a room with capacity to accommodate 33 licenced places (based on 3.25 square metres per licenced place). A Level 1 community centre will typically include 3 to 4 kindergarten rooms each.

It should be noted that this assessment evaluates the impact of the proposed roll-out of the Victorian State Government's Best Start, Best Life Policy (June 2022) which assumes 15 hours of 3 year old kindergarten and 30 hours of pre-prep per week.

Due to the large variety of possible community configuration options the analysis focuses on the following 3 types of community centres:

- Level 1 community facility (1,200 m2 building footprint & 0.8 ha of land) @ 1 centre per 9,000 people;
- Level 2 community facility (1,500 m2 building footprint & 1 ha of land) @ 1 centre per 25,000 people; and
- Level 3 community facility (2,500 m2 building footprint & 1.5 ha of land) @ 1 centre per 50,000 people.

In relation to community centres City of Ballarat has adopted the following provision ratios

- 1 Level 1 community centre per 10,000 people on 0.8 ha of land;
- Every second Level 1 Centre (approximately 20,000 people) is upgraded into a larger community centre with larger community meeting space that is capable of accommodating a neighbourhood house, and is provided on 1.2 ha of land;
- 1 Level 3 community centre per 60,000 people on 1.5 ha of land.

The scope of services and activities covered by these facilities include Kindergarten, Maternal & Child Health, Playgroups, Occasional Child Care, Neighbourhood Houses, Libraries and a variety of flexible community meeting spaces and consulting rooms.

Appendix 4 shows indicative community centre configurations for each of the 3 types of community centres considered by the review and which are included in the VPA commissioned *Benchmark Infrastructure and Costs Guide* (prepared by Cardno). Level 1 and 2 community centres both include Kindergarten and Maternal and Child Health rooms as well as multipurpose community meeting spaces. Level 2 centres have larger community meeting spaces that are capable of accommodating a neighbourhood house service. Level 3 community centres differ from Level 1 centres by not including early years services such as Kindergarten and Maternal and Child Health. Instead, these facilities include higher order services (i.e. services provided to a larger population catchment) such a Library and specialised community space for other service forms and population target groups.

4.4.4 Government Education Provision

There are two key Government education provision benchmarks used for PSP planning purposes. These are:

- 1 Government Primary School per 3,000 dwellings (3.5 ha site); and
- 1 Government Secondary School per 10,000 dwellings (8.4 ha site).

The Department of Education and Training (DET) also identifies a long-term enrolment (LTE) objective for each primary and secondary school. These are:

- Government Primary Schools: 450-475 long term enrolments and generally with a maximum capacity of 600 enrolments; and
- Government Secondary Schools: 1,100 long term enrolments and generally with a maximum capacity to accommodate 50% more (approximately 1,600 to 1,700 enrolments).

4.5 Cost Estimate Benchmarks for Key DCP Community Infrastructure Items

The VPA has also prepared the Benchmark Infrastructure and Costs Guide (prepared by Cardno) to provide context and to guide us in the use of benchmark designs and costs in preparing an Infrastructure Contributions Plan (ICP), the term now used instead of Development Contributions Plan (DCP) when preparing new PSPs. The Guide covers:

- The role of scope and cost estimates in ICPs;
- The development of the benchmark design and costs;
- Role of the Benchmark Infrastructure and Costs Guide in preparing ICPs, including how to adjust the estimates to deal with scope variations if needed; and
- How the Benchmark Infrastructure and Costs Guide will be reviewed and kept up to date; and
- Reproduces the results of the Cardno work.

The use of the guide was approved by the VPA Board on 9 October 2019.

The benchmark cost estimates for the development of community centres, sports reserve and sporting pavilions are used by this report to review the adequacy of cost estimates for key DCP community infrastructure items identified in the Ballarat West DCP.

A summary of the key community infrastructure benchmark costs for the 2023/2024 financial year are presented in Table 2 on the following page and includes 1 July 2023 index costs.

Table 1 – Key Community Infrastructure Benchmark Cost Estimates for the 2023/2024 Financial Year (1 July 2023)

Community Infrastructure BIC

ITEM	CATEGORY	DESCRIPTION	STANDARD	COST APPLICATION	ESTIMATE P50	ESTIMATE P90
37	Community Facilities	Level 1 Facility	Contemporary standard	Bldg floor area	$7,980,915	$8,894,189
38	Community Facilities	Level 2 Facility	Contemporary standard	Bldg floor area	$9,429,758	$10,440,090
39	Community Facilities	Level 3 Facility	Above contemporary standard allowing for place making architectural features	Bldg floor area	$12,583,535	$13,833,587
Sports Pavilion BIC						
40	Sports and Recreation Facilities	Sports Pavilion 2 playing areas	Contemporary standard multi-purpose facility	Bldg floor area	$1,887,355	$1,936,468
41	Sports and Recreation Facilities	Sports Pavilion 3 playing areas	Contemporary standard multi-purpose facility	Bldg floor area	$3,142,083	$3,219,262
Sports and Recreation Facility BIC						
42	Sports and Recreation Facilities	Sports and recreation facility 5 to 6 hectare site	Contemporary senior and junior sporting competition standard	Per Reserve	$8,117,731	$9,379,476
43	Sports and Recreation Facilities	Sports and recreation facility 8 to 10 hectare site	Contemporary senior and junior sporting competition standard	Per Reserve	$10,537,147	$12,108,773

BENCHMARK INFRASTRUCTURE COST ITEM	BENCHMARK ITEMS	1 JULY 2023 INDEX
Roads and Intersection	1 to 16	1.24
Bridges and Culverts	17 to 36	1.24
Community Infrastructure	37 to 39	1.17
Sports Pavilion	40 to 41	1.17
Sports & Recreation Facility	42 to 43	1.17

Source: Review of Benchmark Infrastructure Costings: Benchmark Infrastructure Costing, Prepared for VPA by Cardno (1 July 2022)

5. Review of Key Policies & Strategic Documents

5.1 Overview

This section reviews many of the more relevant statutory and strategic documents likely to have the most significant influence on the community infrastructure outcomes associated with the development of the Ballarat West PSP. The material reviewed includes:

- City of Ballarat Community Infrastructure Needs & Gap Analysis Report (June 2021);
- City of Ballarat Community Infrastructure Plan 2022 to 2037;
- Precinct Structure Planning (PSP) Guidelines (2021), prepared by the Victorian Planning Authority (VPA);
- Other City of Ballarat strategic documents of relevance to this review; and
- Non-Council strategic documents of relevance to this review.

A more detailed summary of the PSP Guidelines, Council and non-Council strategic documents are presented in Appendix 1 of this Background Report.

5.2 City of Ballarat Community Infrastructure Planning Policy (2020)

City of Ballarat (Council) is a provider of community infrastructure including community centres, public halls, sports pavilions, aquatic facilities, libraries, early years facilities, senior citizens centres and playgrounds. It owns and manages community facilities and delivers services to the community through those facilities. Council also supports the provision of community infrastructure by other providers through direct funding and/or advocacy. A holistic and strategic planning approach ensures that Council understands communities' current and future needs for community infrastructure and enables it to meet those needs effectively and efficiently.

This policy outlines Council's commitment to an integrated and strategic planning process for the delivery of Community Infrastructure across the Ballarat municipality. The purpose of this policy is to:

- Provide the general community, stakeholder organisations and Council employees with an understanding of Council's objectives and approach to providing for community services infrastructure in Ballarat;
- To direct sound decision making about planning, funding, delivering and negotiating for community infrastructure;

- To demonstrate commitment to community and stakeholder engagement when planning for community infrastructure; and
- To assist with a coordinated approach within Council to undertake this work.

The Community Infrastructure Planning Policy provides a set of agreed guiding principles which set out the underlying philosophy that should be followed in the prioritisation, planning, design and provision of community infrastructure to promote more consistent understanding and practice.

5.3 City of Ballarat Community Infrastructure Needs & Gap Analysis Report

The Community Infrastructure Needs and Gap Analysis Report was prepared as a key source of evidence to inform the development of the 2022-2037 City of Ballarat Community Infrastructure Plan (see Section 5.3 for more details). This report has collated information gathered in the community infrastructure audit phase of the process and considered it in relation to the provision and service standards, agreed hierarchies, and demand assessments to identify both current and future gaps in community infrastructure provision. It has included a review of existing plans, strategies, policies, and known projects, recognising the contributions that have already been made by the community to these processes. It also offered an opportunity for community facility managers to provide information and feedback. The analysis is presented by both service area and planning area.

The Ballarat West PSP is located within the South West Planning District. The key findings and recommendations associated with the South West Planning District are summarised below[4].

1. Assessment of Desired Provision Standards within the planning area has identified:
    a. Adequate provision of community meeting spaces including those available to seniors' groups until at least 2031.
    b. Adequate provision of kindergarten places until 2026 where there is a deficit of 36 places, increasing to 67 by 2031.
    c. A deficit of 1 maternal and child health room in 2021, increasing to 2 rooms in 2026. An additional 2 rooms are planned as part of the Delacombe Town Centre Community Hub facility.
    d. A surplus of library service provision with a facility in Sebastopol and outreach service in Delacombe. This is appropriate given the vulnerabilities experienced within these communities.
    e. Adequate provision of youth friendly spaces with opportunity to ensure youth friendly design principles are incorporated in Delacombe Town Centre developments.

[4] Note: A number of these recommendations are reflected in the current Ballarat West PSP.

f. A deficit of football ovals with an additional oval indicated as a gap in 2021, and an additional oval required by 2031.
g. Sufficient provision of cricket ovals until 2031 when an additional oval is likely to be required.
h. A significant surplus of soccer pitches with the regional soccer facility being located within the planning district as well as several local clubs.
i. Adequate provision aquatic facilities with a splash park at Victory Park.
j. A surplus of tennis courts with the significant indoor Tennis Ballarat facility which is privately owned.
k. A deficit outdoor netball courts with 1 additional court being required currently to meet provision standards and 2 courts required by 2031.
l. Adequate provision of lawn bowling greens
m. The requirements for localised arts and cultural infrastructure should be informed by the audit currently being undertaken and fed into the draft Community Infrastructure Plan.

2. There is extensive community infrastructure provision planned within the Ballarat West Growth Area Precinct Structure Plan which will meet any of the identified gaps within the planning area over the next 10 years. This includes:
   - A multipurpose community hub at Delacombe Town Centre with design planned for 21/22 and delivery in 25/26. This will provide the additional kindergarten places required, maternal and child health rooms, and a branch library with inclusive community meeting spaces.
   - Planned recreation facilities at Delacombe Town Centre include 2 soccer fields and accompanying pavilion to be delivered in 24/25.
   - A multipurpose community centre at the Greenhalghs Rd sub-precinct including kindergarten facilities and community meeting rooms, planned for design in 27/28 and delivery in 31/32.
   - Planned delivery of recreation facilities at Greenhalghs Rd sub precinct in 28/29, including 2 football/ cricket ovals, pavilion, and a netball court, along with an indoor recreation facility in 35/36.
   - An additional sports oval, pavilion, and athletics track are also planned for delivery at MR Power Park in 25/26 - 28/29, followed by an indoor recreation facility.
   - Whilst not within the timeframe scope for the Community Infrastructure Plan, there are also plans for an additional 3 soccer fields and pavilion to be located in Mining Park Estate.
3. It should be noted that ongoing review of most appropriate community facility typology and timing within the growth areas to ensure that the right facilities are delivered at the right time is required. This review needs to consider desired provision standards but also participation rates in various sporting clubs and activities and ensure that there is not supply in surplus to demonstrated community need.
4. Fitness for purpose assessments highlight some issues with the Bonshaw Maternal Child Health and Kindergarten facility. Toilet facilities are inadequate, location of kitchenette is poor, small community

room makes programming difficult and the outdoor timber services are slippery when wet. It needs to be acknowledged that these building issues do not impact on the service, and quality of service delivery by MCH team. Due to the high utilisation of this service planning to rectify constraints with current building should be considered.

5. Other existing projects which have been identified in the South West planning district include:
    a. Replacement of current Sebastopol Senior Citizens Centre (due to poor building condition) with a new multipurpose community facility with staged early years facilities.
    b. Master Planning at Marty Busch Recreation Reserve in 21/22 considering the needs of the broad range of activities and clubs which operate from the site into the future.
    c. Expansion and amenity upgrade at Sebastopol South Kindergarten.
    d. Doug Dean – (Oval, pavilion and changerooms) concept planning undertaken at the site to address facility changeroom issues. Full upgrade to facility will be subject to future funding. Clubs currently accessing new school stadium for change rooms and Doug Dean Stadium for social space.
    e. Trekardo Park - Soccer Club pavilion and soccer pitches: Refurbishment to facility currently being undertaken. Lighting upgrade completed. Long term planning in place for improvements to pitch surfaces. (Note: Refurbishment has been completed)
    f. Pleasant St Reserve - West soccer pitch (#2): Long term planning in place for improvements to soccer pitch. (Note: Two sized soccer pitches and one junior sized soccer pitch at reserve currently being upgraded)

5.4 City of Ballarat Community Infrastructure Plan 2022-2037

The Community Infrastructure Plan was developed over an 18 month period and demonstrates evidence based decision making. The Plan will guide future planning and decision making around investment in facilities to ensure the equitable, efficient and sustainable provision of high quality community infrastructure that meets community's current and future needs.

This Plan was informed by the Community Infrastructure Needs and Gap Analysis Report. For this process, Council gathered information about existing facilities and its population forecasts to consider the service needs- and related infrastructure- that Ballarat's growing and changing population will have over the next 10 years.

Facilities included in the scope of this Plan were:

- Community hubs;
- Halls and meeting spaces;
- Library services;

- Kindergartens; and
- Maternal and Child Health services.

Many other facilities play a role in supporting Ballarat communities and will be included in future iterations of this plan or future plans.

Priorities for the South West Planning Area (which includes the Ballarat West PSP) include:

- Ensuring existing facilities are fit-for-purpose to enable service and participation continuity;
- Ensuring there are locally accessible facilities for programs, services and activities to support residents of all ages;
- Ensuring there are appropriate spaces for services to support vulnerable communities;
- Monitoring participation trends to ensure responsive planning to changing community needs; and
- Ensuring appropriate facilities are built at the correct time to meet the needs of the growing population.

Implementation of the community infrastructure planning process identifies major capital projects and timeframes for delivery, including the following Ballarat West PSP projects:

Capital Project	Proposed Design Date	Proposed Construction Date
Alfredton (Ballymanus) Community Hub	Completed	2022-24
Delacombe Library and Community Hub	2025-26	2026-28
Delacombe Early Years Facility	2025-26	2026-28
Winter Valley Community Hub	2030-31	2034-36

5.5 Implications

The implications of the documents reviewed are referred to, where applicable, throughout the course of the review process.

6 Ballarat West PSP Development & Population Analysis

6.1 Overview

The section provides a review of the original development and population assumptions for the Ballarat West PSP to determine to what extent these original assumptions remain valid and assess the implications for community infrastructure provision.

Although public open space provision requirements are largely determined by the amount of Net Developable Area (NDA) available in any given PSP, community infrastructure provision levels are largely based on dwelling and population assumptions. Therefore, if the underlying dwelling and population assumptions have changed then the number of community infrastructure items, or the capacity of existing planned items may need to also change.

6.2 Original PSP Development Assumptions

The Ballarat West DCP (page 7) makes the following assumptions in relation to residential densities, dwelling capacity and population capacity of the Ballarat West PSP:

- A total of 14,485 dwellings consisting of:
  - 13,359 conventional dwellings (based on an average conventional density of at least 15 dwellings per net residential hectare; and
  - 1,083 medium density dwellings (based on an average conventional density of at least 25 dwellings per net residential hectare).
- An estimated total population of 36,212 people, based on an average household size of 2.5.

6.3 Review of Development Assumptions

Table 2 below compares the difference between the original Ballarat West PSP dwelling and population estimates and the current projected dwelling and population capacities of the PSP. It is expected that for the remaining undeveloped land, densities will be closer to 20 dwellings per hectare than 15 and therefore, Council estimates that the PSP will accommodate approximately 1,000 more dwellings than originally forecast and approximately 2,700 more residents. By full development it is estimated the PSP will accommodate approximately 15,500 dwellings and be home to approximately 42,000 residents.

Table 2 – Comparison of Original and Revised Ballarat West PSP Dwelling and Population Capacities

	Original Dwelling & Population Capacity for Ballarat West PSP	Revised Dwelling & Population Capacity for Ballarat West PSP	Difference (+/-)
Dwelling yield	14,441	15,441	**1,000**
Average overall household size	2.7	2.7	**0**
Population yield	38,991	41,691	**2,700**

6.4 Current Dwelling and Population Estimate for the Ballarat West PSP

According to 2021 Census of Population and Housing[5], the Ballarat West PSP area accommodates approximately 2,200 dwellings and has a population of approximately 6,200 residents.

Based on Council's most recently updated planning data (October 2023), the Ballarat West PSP has 9,170 lots which have either been completed, partially completed or have received planning approval (approximately 59% of the total revised dwelling capacity of the PSP). This supply consists of:

- 5,380 titled lots;
- 3,790 under construction/permit issued; and
- 6,230 zoned supply.

[5] Source: Australian Bureau of Statistics (ABS), using Mesh Block geographic units which encompass the Ballarat West PSP area. Mesh Blocks are the smallest geographic areas defined by the ABS and form the building blocks for the larger regions of the Australian Statistical Geography Standard (ASGS). They broadly identify land use such as residential, commercial, primary production and parks.

7 Existing & Planned Community Infrastructure within Ballarat West PSP

7.1 Overview

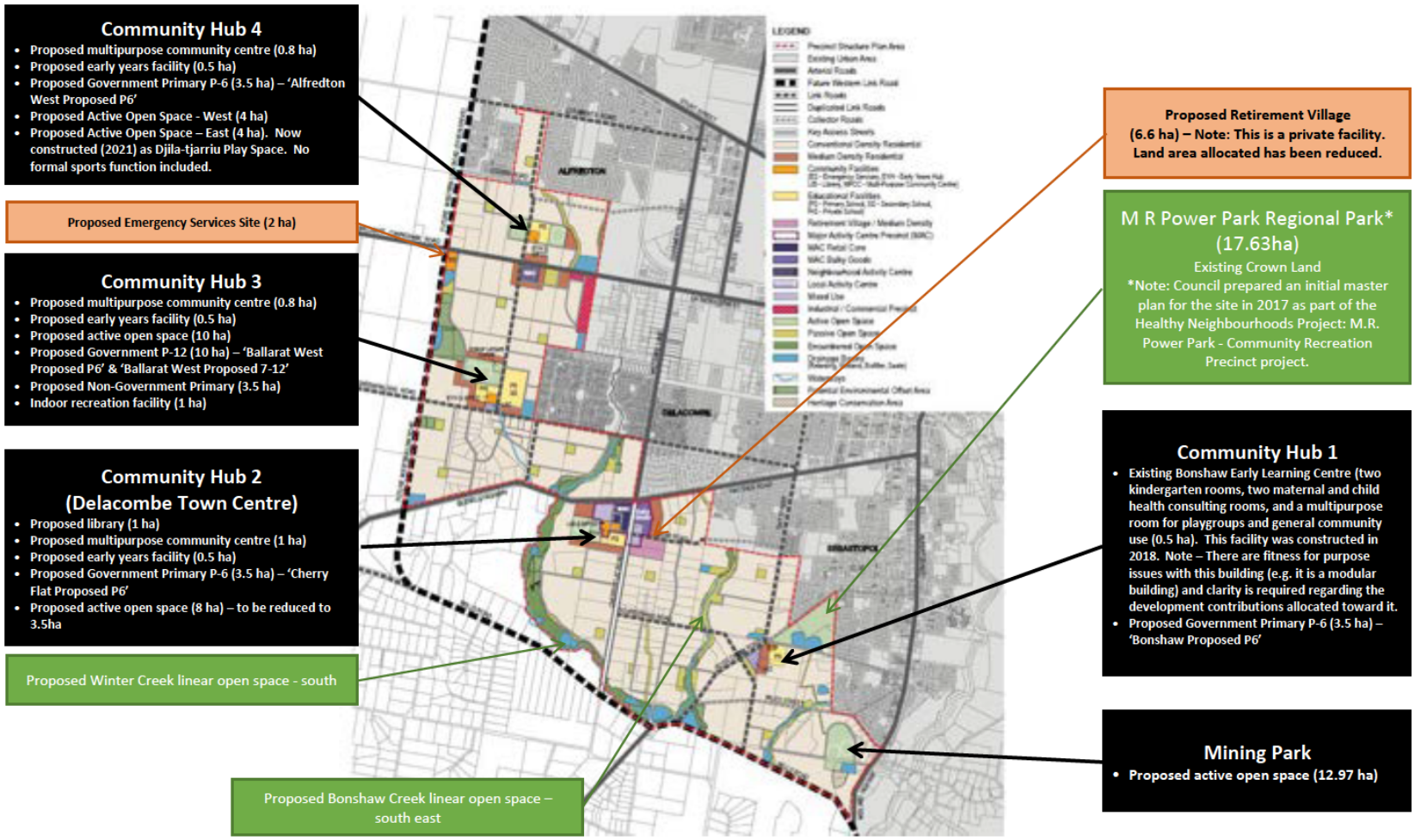
This section identifies both the main existing and planned community infrastructure within the Ballarat West PSP. Figure 5 on the following page shows the location and distribution of community infrastructure items identified by the PSP. Most of the community infrastructure is to be delivered across 4 major community infrastructure hubs. In summary, the PSP proposes to deliver the following community infrastructure:

- 26 neighbourhood / passive parks (25.35 hectares) and 1 existing regional park (17.7 hectares);
- 4 new active open space (39 hectares);
- Linear open space (30.1 ha) including Winter Creek and Bonshaw Creek;
- 4 early years hubs;
- 3 multipurpose community centres (one Level 3 and two Level 1's);
- 1 Library;
- 1 Indoor recreation facility;
- 4 Government primary schools;
- 1 Government secondary school;
- 1 non-Government school site;
- An emergency services site; and
- A privately owned / operated retirement village site.

It is anticipated that a large number of other services operated by the private and not-for-profit community sector will also be accommodated within the Ballarat West PSP. For the purposes of this review, the items identified in the PSP are distinct from these other services and facilities in the following manner:

- They reflect items which are to be either totally or partially funded by the DCP (either land or construction, or both); or
- Are proposed education sites with a specified land allocation and in a specific location that are to be purchased by either the Department of Education and Training (DET) or a non-government education provider such as Catholic Education Ballarat.

Figure 5 – Location of Main Existing and Planned Community Infrastructure Items within the Ballarat West PSP



7.2 Ballarat West DCP Community Infrastructure Items and Costs

The Ballarat West DCP specifies the community infrastructure items which are to be funded by development either as land or construction cost, or both. There are two main forms of community infrastructure funded by the Ballarat West DCP: 1) active recreation items (both for land acquisition and construction), and 2) multipurpose community centres (both for land and construction).

These items are summarised in Table 3 below. While identified in the Ballarat West PSP, education sites and emergency services sites are not subject to DCP funding, and therefore not identified in the table below.

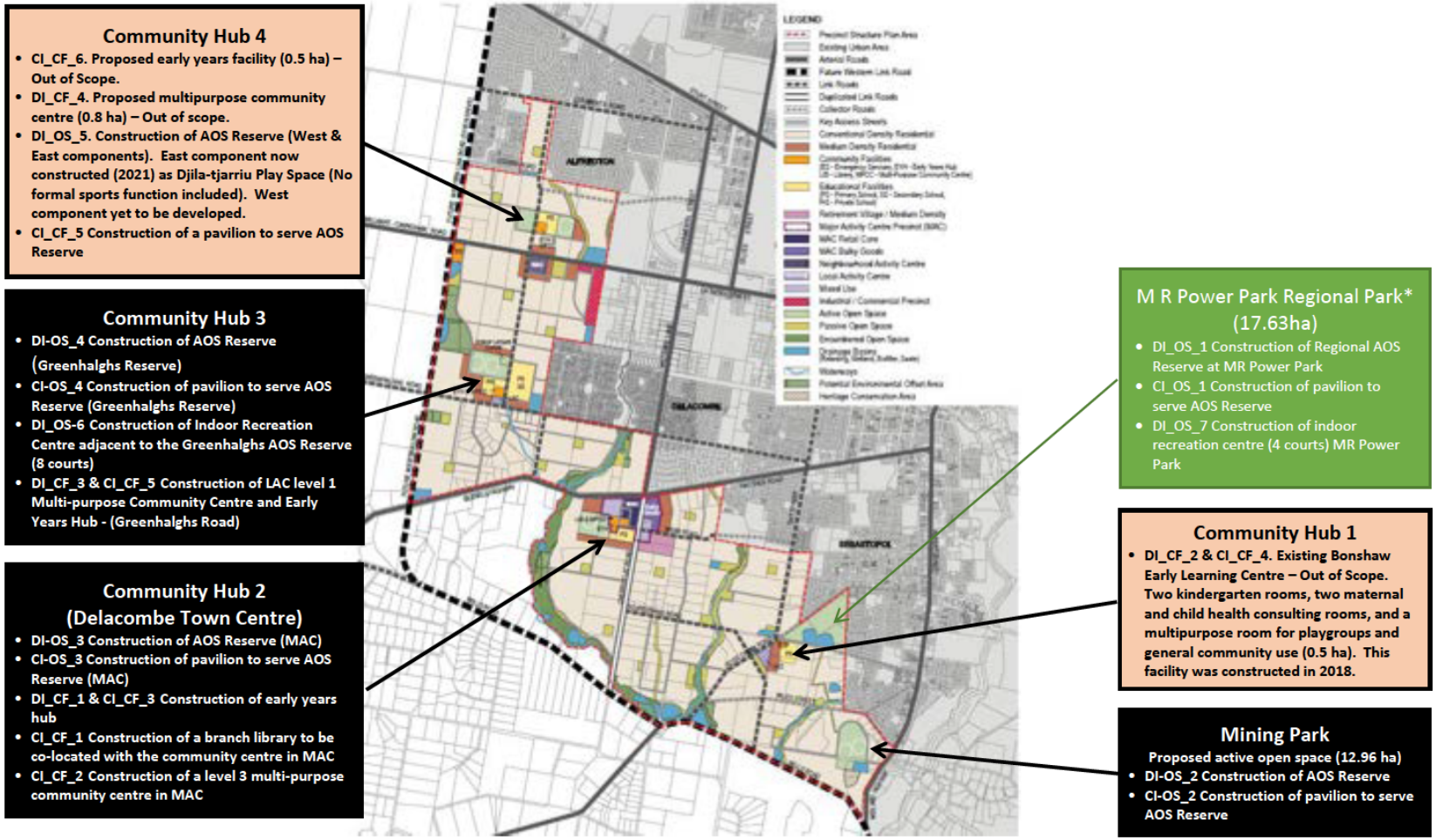
Table 3 – Current DCP Community Infrastructure Items & Costs

DCP Project Code	Project Description	Actual or Anticipated DCP delivery date	Notes
CI_CF_1	Construction of a branch library to be co-located with the community centre in MAC (DTC sub - precinct 1)	2027-2028	There is a need to understand the expected catchment that may come from Western and North Western Growth Areas and whether the capacity should be future proofed to at least partially meet this demand
CI_CF_2	Construction of a level 3 multi-purpose community centre in MAC (DTC sub-precinct 1)	2027-2028	Project is subject to review due to an adopted Urban Design Framework which has changed the land uses in the MAC and the land available is now deficient.
CI_CF_3 and DI_CF_1	Construction of early years hub - MAC - (DTC sub-precinct 1)	2027-2028	As above. The project has a CIL and DIL component.
CI_CF_5 DI_CF_3	Construction of LAC level 1 Multi-purpose Community Centre and Early Years Hub - (Greenhalghs Road sub-precinct 2)	2028-2029	This project is proximate to Western Growth Area so may create a demand from future development. A permit has been issued for subdivision so location is unable to be altered. The project has a CIL and DIL component.
CI_OS_1	Construction of a pavilion to serve Regional AOS Reserve at MR Power Park	2029	
CI_OS_2	Construction of a pavilion to serve AOS Reserve - Mining Park	2051	
CI_OS_3	Construction of a pavilion to serve AOS Reserve - Glenelg Highway reserve (MAC DTC)	2026-2028	
CI_OS_4	Construction of a pavilion to serve AOS Reserve - Greenhalghs reserve (LAC)	2029	
CI_OS_5	Construction of a pavilion to serve AOS Reserve - Carngham reserve (NAC)	2026-2028	
DI_OS_1	Construction of Regional AOS Reserve at MR Power Park (sub-precinct 1)	2027-2029	This project has had a masterplan prepared. There has been some discussion about being upgraded to AFL standard
DI_OS_2	Construction of AOS Reserve - Mining Park (sub-precinct 1)	2047-2048	
DI_OS_3	Construction of AOS Reserve - MAC (DTC sub-precinct 1)	2026-2028	This reserve is currently under review with other facilities in the MAC

DCP Project Code	Project Description	Actual or Anticipated DCP delivery date	Notes
DI_OS_4	Construction of AOS Reserve - Greenhalghs reserve (LAC)	2028	
DI_OS_5	Construction of AOS Reserve- Carngham reserve (sub-precinct 4)	2026-2028	This project is split over 2 reserves. One reserve has been delivered.
DI_OS_6	Construction of Indoor Recreation Centre (8 courts) adjacent to LAC - Carngham reserve	2050-2051	
DI_OS_7	Construction of Indoor Recreation Centre (4 courts) MR Power Park (sub-precinct 1)	2033-2036	

Figure 6 on the following page shows the location each of the DCP community infrastructure items.

Figure 6 – Location of Community Facility, Active Open Space and Recreation DCP Items within the Ballarat West PSP (Excluding Land Acquisition Items)



7.3 Ballarat West DCP Funding Mechanisms

The DCP provides for the charging of a 'development infrastructure levy' (DIL) pursuant to section 46J(a) of the Act towards works, services or facilities. It also provides for the charging of a 'community infrastructure levy' (CIL) pursuant to section 46J(b) of the Act, as some items are classified as community infrastructure under the Act.

Contributions relating to development infrastructure are to be made by developers generally at the time of subdivision or as otherwise specified by the DCP. If subdivision is not applicable payments must be made prior to construction of buildings and works.

The current DIL rate is:

- Residential Levy - $316,339.67 per net developable area; and
- Commercial Levy - $220,837.78 per net developable area.

For community infrastructure, contributions are to be made by the home-buyer at the time of building approval. Contributions relating to community infrastructure will be paid for at a 'per dwelling'. The Planning and Environment Act 1987 stipulates that the amount that may be contributed under a community infrastructure levy. For all residential development within the Ballarat West PSP, City of Ballarat currently applies a CIL of $1,346 per dwelling[6].

[6] The maximum CIL levy amount payable under a DCP is $1,346 for the 2023-2024 Financial Year.

8 Summary of Key Issues & Trends

This section summarises the main community infrastructure findings of this report and presents an indicative community infrastructure plan that will form the basis of future discussions with Ballarat City Council officers and other external agencies including State Government Departments. It provides a detailed assessment of the implications of the revised dwelling and population assumptions (presented in Section 6.4) for community infrastructure provision within the Ballarat West PSP.

8.1 Key Community Infrastructure Issues and Trends

Since the preparation of the original community infrastructure assessment in 2012 and 2017, a key background technical document used to assist with the preparation of the Ballarat West PSP, there have been a number of significant land use and demographic trends, Government policy changes and initiatives, and community infrastructure planning documents that are likely to be significant considerations for the review process. These include:

- The original cost estimates for community infrastructure in the Ballarat West PSP pre-date the VPA benchmarking costing study prepared by Cardno. Consequently, cost estimates for future facilities are likely to be higher, along with changes to facility configuration assumptions at each hub location;
- Higher residential densities in PSP areas than originally forecast by urban planners and demographers will be a key consideration;
- The Victorian Government is investing almost $5 billion over ten years so that children across the state will have access to two years of kindergarten programs. More recently, the Victorian State Government expanded on this policy through the release of its *Best Start, Best Life Policy* (June 2022). The implementation of this policy will result in children having access to 30 hours of four year old kindergarten per week, and 15 hours of three year old kindergarten per week. Assessing the impact of this proposed change on all proposed community facilities within the Ballarat West PSP will form a core component of our review. This policy change will be very significant on the proposed community facilities within the Ballarat West PSP;
- Now that a residential community has begun to emerge within the Ballarat West PSP, both formal and informal recreation trends are likely to be more observable and may inform how future active open space reserves should be developed and which sports should be allocated to each.
- The impact of other recreation trends such as the growth in female sports participation, the construction of more synthetic playing fields and an increasing need for indoor multi-purpose court stadiums will also be considered;

- Changes to community infrastructure delivery models including an increasing trend toward multi-storey schools and community centres in order maximise floor area outcomes and to use land more efficiently;
- Whilst being a long talked about aspiration of government agencies, the shared use of community infrastructure (e.g. joint school / community facilities) continues to be gradually implemented across Victoria and remains a worthwhile planning strategy;
- Changes to the development planning contributions system including funding arrangements and a larger list of allowable community service forms, has potentially significant ramifications for the future planning of community facilities;
- Unlike 10 years ago, many more State agencies have, or are in the process of, developing detailed provision strategies for growth areas. The review process is very timely from this perspective and may lead to a clearer picture of provision strategies for the Ballarat West PSP; and
- The ongoing development and increasing sophistication of local government strategies and facility standards needs to also be considered by the review.

8.2 Preliminary Community Infrastructure Assessment

Table 4 on the following pages provides a detailed assessment of the implications of the revised dwelling and population assumptions for community infrastructure provision within the Ballarat West PSP. The detailed calculations, benchmarks and data sources used to inform the assessment are presented in Appendix 3 of this report.

Table 4 – Potential Requirements within the Ballarat West PSP

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
Early years services			
Kindergartens	Although the Ballarat West PSP / DCP does not specify the number of kindergarten rooms to be provided within the PSP, there are 4 proposed early years facilities, all of which will include kindergarten services. These facilities are: • Community Hub 1 Early Years Hub – the already constructed Bonshaw Early Years Centre (0.5 ha). This facility includes two kindergarten rooms. • Community Hub 2 Early Years Hub (0.5 ha). • Community Hub 3 Early Years Hub (0.5 ha). • Community Hub 4 Early Years Hub - the soon to be constructed Alfredton Community Hub (0.5 ha). This facility will include three kindergarten rooms. Ballarat City Council proposes to expand the Bonshaw Early Learning Centre, an integrated children's centre which opened in 2018, from two kindergarten rooms to three.	Approximately 14 kindergarten rooms under the present kindergarten policy environment (15 hours of four year old kindergarten per week, and 15 hours of three year old kindergarten per week) and 21 kindergarten rooms under the proposed kindergarten policy environment[7] (30 hours of four year old kindergarten per week, and 15 hours of three year old kindergarten per week). Response measures based on the implementation of the proposed policy change to kindergarten services will require further input from the Department of Education (DE) prior to confirming the kindergarten provision strategy for the Ballarat West PSP. Kindergartens are to be located within all proposed multipurpose community centres and / or proposed Government Primary Schools (containing kindergarten rooms licensed for 33 places each) and co-located with proposed government primary schools[8].	Given that one early years facility has already been constructed (Bonshaw Early Learning Centre) with 2 kindergarten rooms (proposed to be expanded to 3 rooms) and the soon to be constructed Alfredton Community Hub will include 3 kindergarten rooms, the remaining 2 facilities would need to accommodate a further 8 kindergarten rooms (4 rooms per facility) under the present kindergarten policy environment. However, under the proposed kindergarten policy initiative, this figure would increase to 15 rooms (approximately 7 to 8 rooms per facility). It is recommended Council engage with DE to discuss adopting a shared approach to the delivery and funding of future kindergarten facilities within the Ballarat West PSP with a view to incorporating a minimum of 2 kindergarten rooms at every proposed government primary school (4 schools and 8 rooms).
Maternal & Child Health	Although the Ballarat West PSP / DCP does not specify the number of MCH rooms to be provided within the PSP, there are 4 proposed early years facilities, some of which will include MCH services. These facilities are:	Although the demand estimates indicate a need for approximately 5 MCH consulting rooms located within multipurpose community centres, Council typically provides two MCH rooms in a multipurpose community centre. On this basis, if four multipurpose community centres are constructed there will be eight MCH	In light of the pressure to supply a far larger number of kindergarten rooms over the coming decade than originally anticipated, it is recommended Council identify only one further early years facility for MCH service provision within the Ballarat West PSP, preferably the Community Hub 2 early years facility located within the Delacombe Town Centre.

[7] Victorian State Government Best Start, Best Life Policy (June 2022). In 2023, families in Ballarat have access to between 5 and 15 hours a week of kindergarten programs for three-year-olds. Pre-Prep rolls out in Ballarat City from 2029 with 16 to 20 Hours per week for 40 weeks of the year, with all children receiving 30 hours by 2032.

[8] It is State Government policy that new government primary schools must have a kindergarten co-located with the school (Source: *Victorian Government School Site Selection Criteria – Toolbox*, October 2021, Department of Education & Training, page 2)

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	• Community Hub 1 Early Years Hub – the already constructed Bonshaw Early Learning Centre (0.5 ha). This facility has been built and includes two MCH consulting rooms. • Community Hub 2 Early Years Hub (0.5 ha). • Community Hub 3 Early Years Hub (0.5 ha). • Community Hub 4 Early Years Hub - the soon to be constructed Alfredton Community Hub (0.5 ha). This facility will include two MCH consulting rooms.	rooms provided for within the Ballarat West PSP. These rooms are typically converted into consultant suites when MCH services are no longer required to be provided from the centre.	The Department of Health also provided feedback in relation to service provision needs aligned with MCH services. The Department confirmed that the Ballarat Early Parenting Centre is currently under construction and located at 10 Fawcett Rd, Lucas (located just outside the northwest boundary of the Ballarat West PSP) and anticipates that MCH services will be co-located in new early years hubs where spaces will be available for other complementary health services.
Long Day Child Care	The current Ballarat West PSP does not refer specifically to long day child care provision. However, provision is not included as part of the four early years hubs proposed for the Ballarat West PSP. Therefore, it can be assumed that all provision will need to be met by the private or not-for-profit community sector.	The Ballarat West PSP may generate demand for as many as 1,300 long day child care places, the equivalent of 10 to 11 large sized long day child care centres.	Continue to encourage private and community based long day child care provision across the Ballarat West PSP, especially close to community infrastructure hubs.
Youth	The Ballarat West PSP does not refer specifically to youth service or youth facility provision. A Youth Hub is proposed to be built between 2026/27 and 2027/28 as part of Council's Community Infrastructure Plan. A feasibility study for this facility is currently in progress. The proposed Youth Hub will not be built in the Ballarat West PSP area, nor any of the other future growth areas. The Hub will be established centrally in the City of Ballarat.	Although there are no specific youth service facility benchmarks or demand estimators, this assessment recommends Council identify which of the future community facilities can and should provide a youth service function.	Future community facilities in the Ballarat West PSP will be designed for flexible use and include spaces for young people based on existing examples such as the Ballarat and Sebastopol Libraries.
Education facilities			
Government Primary Schools	The Ballarat West PSP includes provision for 4 Government Primary Schools. These facilities are:	This assessment estimates the need for potentially 5 Government Primary school sites. However, there are a number of existing Government Primary Schools located a short	Based on the data regarding revised dwelling yield and densities for the Ballarat West PSP, DE has confirmed that number of Government primary school sites (four) is sufficient to satisfy future demand within the Ballarat West PSP. However, DE

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	• Community Hub 1 Government Primary School (3.5 ha) – 'Bonshaw Proposed P6'. • Community Hub 2 Government Primary School (Delacombe Town Centre) - 'Cherry Flat Proposed P6'. • Community Hub 3 Government Primary School site (included as part of a 10 ha P-12 site) – 'Ballarat West Proposed P6'. • Community Hub 4 Government Primary School site (3.5 ha) – 'Alfredton West Proposed P6'.	distance east of the Ballarat West PSP boundary which may reduce this requirement estimate. The Department of Education (DE) was consulted as part of the Review to confirm future Government primary school provision needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DE.	have identified site specific location and configuration issues with all proposed Government primary school sites that it wishes to address with Council and developers to ensure consistency with the *Victorian Government School Site Selection Criteria Guidance* document. Refer to Appendix 5 for a copy of the formal response received from DE for more details.
Government Secondary Schools	The Ballarat West PSP includes provision for 1 Government Secondary School to be located within Community Hub 2 (Major Activity Centre – included as part of a 10 ha P-12 Government School site). This site is referred to by the Department of Education (DE) as 'Ballarat West Proposed 7-12'.	This assessment estimates the need for 1.5 Government Secondary school sites. The Department of Education (DE) was consulted as part of the Review to confirm future Government secondary school provision needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DE.	Based on the data regarding revised dwelling yield and densities for the Ballarat West PSP, DE has confirmed that number of Government secondary school sites (one) is sufficient to satisfy future demand within the Ballarat West PSP. However, DE have identified site specific location and configuration issues with the proposed school site that it wishes to address with Council and developers to ensure consistency with the *Victorian Government School Site Selection Criteria Guidance* document. Refer to Appendix 5 for a copy of the formal response received from DE for more details.
Government Specialist Schools	The Ballarat West PSP does not include provision for a Government Specialist School.	The Department of Education (DE) was consulted as part of the Review to confirm future Government specialist school provision needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DE.	DE notes that the existing land holdings with Ballarat Local Government Area (LGA) is expected to be sufficient to meet specialist education demand in Ballarat over the next 20 years. The department will continue to monitor the educational needs of students with disability in the Ballarat LGA and consider opportunities to strengthen inclusive education options as appropriate.
Non-Government Schools	The Ballarat West PSP includes provision for 1 non-Government School site.	Most likely no further requirement needed. However, the following enrolment demands are anticipated for the Ballarat West PSP: • 1,200 Catholic Primary School enrolments;	Formal feedback received from Diocese of Ballarat Catholic Education Limited (DOBCEL) has confirmed the need for a Catholic primary school within the Ballarat West PSP. DOBCEL will now pursue the opportunity to acquire the non-Government school

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
		• 500 other non-Government Primary school enrolments; • 1,000 Catholic Secondary School enrolments; and • 700 other non-Government Secondary school enrolments. The Diocese of Ballarat Catholic Education Limited (DOBCEL) was consulted as part of the Review to confirm future catholic school provision needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DOBCEL.	site identified for Community Hub 3 and wish to contribute to discussions to refine the layout and siting of a Catholic primary school in this location to ensure an optimum solution for the Hub.
Higher Education	The Ballarat West PSP does not include provision for a higher education facility. The nearest higher education facilities are the Australian Catholic University (located 7 kilometres north east of the Delacombe Town Centre) and Federation University, regional Victoria's largest education institution, which has the following four campus locations in Ballarat: • Camp Street (Arts Academy located 8 kilometres north east of the Delacombe Town Centre); • Gillies Street (TAFE and vocational education located 7 kilometres north of the Delacombe Town Centre); • Mt Helen (TAFE and Higher education located 10 kilometres south east of the Delacombe Town centre); and • SMB (VCAL, TAFE and higher education located 6 kilometres north east of Delacombe Town Centre).	Most likely no requirement needed. However, the following enrolment demands are anticipated for the Ballarat West PSP: • 850 TAFE enrolments; and • 1,700 university enrolments.	Given the proximity of existing higher education facilities to the Ballarat West PSP and Federation University's focus on acquiring State / Federal Government funding to establish an integrated University Campus in the heart of the Ballarat CBD, large scale investment in additional campus facilities within the Ballarat West PSP appears unlikely. However, it is recommended that Council continue to liaise with both Federation University and the Australian Catholic University to identify potential long term provision needs in the wider Ballarat West Growth Area.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	Federation University is part of a coalition of local organisations (called "Ballarat. Now and Into the Future 2022") which are advocating for six transformational projects in Ballarat including the Ballarat University Town which aims to establish an integrated University Campus in the heart of the Ballarat CBD. This project is seeking funding to relocate Federation University's Arts Academy and developing state-of-the-art teaching facilities on the SMB campus.		
Libraries, community centres, learning centres, community meeting spaces and arts / cultural facilities			
Library	The current Ballarat West PSP includes provision for a new Library facility (1,800 square metres) within Community Hub 2 (Delacombe Town Centre) on a 1-hectare site and co-located with a Level 3 multipurpose community centre and an early years facility.	The Ballarat West PSP generates a need for 1 library facility and will generate the equivalent of 217,000 loans per annum and 177,000 visits per annum.	No change recommended. This assessment supports the need for a new library facility within the Ballarat West PSP with a minimum floor area of 1,800 square metres.
Level 1 multipurpose community centre	Although the Ballarat West PSP does not adopt a community centre hierarchy it does include provision for 3 multipurpose community centres: • Community Hub 2 (1 ha); • Community Hub 3 Multipurpose Community Centre (0.8 ha); and • Community Hub 4 Multipurpose Community Centre (0.8 ha). The Community Hub 4 facility is referred to as the Alfredton Community Hub which is currently under construction and expected to	The Ballarat West PSP generates a population catchment sufficient to justify 2 Level 1 multipurpose community centres.	For the purposes of this Review it is recommend that both the soon to be constructed Alfredton Community Hub (Community hub 4) and existing Bonshaw Early Learning Centre (Community Hub 1) be classified as Level 1 multipurpose community centres. It is also recommended that the Existing Bonshaw Early Learning Centre (Community Hub 1) be classified as a Level 1 multipurpose community centre and that it be expanded to include additional kindergarten and community meeting space capacity.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	be complete in early 2024. The purpose-built facility (which incorporates the Community Hub 4 Early Years Hub) will feature three preschool rooms to accommodate 99 children at a time, two community rooms, a meeting room, and associated staff facilities.		
Level 2 multipurpose community centre	The Ballarat West PSP does not identify any proposed Level 2 Community Centres.	The Ballarat West PSP generates a population catchment sufficient to justify 2 Level 2 multipurpose community centres.	For the purposes of this Review it is recommend that both the proposed Community Hub 3 multipurpose community centre and early years facility be amalgamated and classified as a Level 2 multipurpose community centre and incorporate a Neighbourhood House service.
Level 3 multipurpose community centre	The Ballarat West PSP does not identify any proposed Level 3 Community Centres. However, when the proposed 1 hectare Community Hub 2 Library (Delacombe Town centre) and proposed 1 hectare Community Hub 2 multipurpose community centre are viewed together, they can be classified as a Level 3 Community Centre.	The Ballarat West PSP generates a population catchment sufficient to justify 0.7 of a Level 3 multipurpose community centre.	For the purposes of this Review it is recommend that both the proposed Community Hub 2 (Delacombe Town Centre) library and multipurpose community centre be amalgamated and classified as a Level 3 multipurpose community centre.
Neighbourhood House / Learning centre	The Ballarat West PSP does not identify any proposed Neighbourhood House / Learning Centre facilities. The nearest existing Neighbourhood Houses are: • Ballarat Neighbourhood Centre (located 3 kilometres east of the Delacombe Town Centre). • Ballarat East Neighbourhood House (located 8 kilometres east of the Delacombe Town Centre); • Wendouree Neighbourhood Centre (located 9 kilometres north of the Delacombe Town Centre); and	One Neighbourhood House service incorporated within one of the three proposed multipurpose community centres.	Review community centre provision strategy to determine the feasibility of expanding / reconfiguring one of the remaining proposed multipurpose community centres as a preferred location for one Neighbourhood House service, preferably at Community Hub 3.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	• Ballarat North Neighbourhood House (located 10 kilometres north east of the Delacombe Town Centre)		
Arts / cultural facilities	The Ballarat West PSP does not identify any dedicated arts and cultural facilities. However, it is feasible to allocate and configure arts and cultural spaces within one or more of the multipurpose community centres proposed for the PSP. Council's Arts and Cultural Infrastructure Report (2021) identifies how the proposed Ballarat West PSP community facilities will support arts and cultural activities. These include: • The new Delacombe Library and Community Hub is a $18.1 million project expected to be designed in FY25-26 which is identified in the Ballarat West Development Contributions Plan. Similar to the Ballarat Library model, it is expected that the development will include dedicated spaces for arts and cultural programming, including multipurpose meeting rooms, coworking spaces and maker spaces. • Alfredton Early Years and Community Hub (Ballymanus). The Alfredton Early Years and Community Hub is a project identified in the Ballarat West Development Contributions plan which is expected to commence construction in FY22-23. The development is expected to include an early years kindergarten and a number of multipurpose community rooms which could have the potential to service arts and cultural programming and activities.	By full development almost 10,000 people may participate in activities such as drama, singing or playing a musical instrument, dance and art and craft activities. Although it is difficult to determine where such activities will be undertaken, it is reasonable to assume that proposed Council community centres can play a significant role in meeting some of the demand for arts and cultural activities.	Review community centre provision strategy to determine the feasibility of expanding / reconfiguring one of the remaining proposed multipurpose community centres as a preferred location for arts and cultural activities, preferably at Community Hub 2 (Delacombe Town Centre). It is also recommended that Council ensure that arts and cultural facilities are embedded in the proposed multipurpose community centre spaces and recreation facilities including: • Soundproofing meeting rooms to make them dual rehearsal spaces / recording spaces; • Provision of wet spaces (such as large kitchen environments) which can be used as wet work spaces (ceramics, mosaics, painting) with wipe clean surfaces; • Improved WIFI network service permitting good upload and download capacity for creative businesses; and • Sprung floors in large sporting areas (such as a basketball court) to make it suitable for dance rehearsal.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	Greenhaulghs Road Sub-precinct (Winter Valley). A community hub and kindergarten is planned for development in FY31-32 in the Greenhaulghs Road Sub-precinct which is identified in the Ballarat West Development Contributions Plan. There is an opportunity to service arts and cultural needs through the community hub.		
Major open space reserves (active and passive)			
Local unencumbered passive open space	The current Ballarat West PSP includes provision for 58.15 hectares of unencumbered passive open space and linear open spaces.	The overall supply of proposed passive open space within the Ballarat West PSP will increase because of a number of key changes that have occurred since approval of the original PSP including Council's preference to identity and configure MR Power Park (17.63 hectares) as a predominantly passive open space performing a range of natural and informal recreational functions. These changes will result in an additional 6.73 hectares of passive open space provision for the Ballarat West PSP and increase overall supply to 64.88 hectares which equates to 6.61% of the NDA of the PSP (and 5.85% of the Gross Developable Area). The Ballarat West PSP generates a need equating to 39 hectares based on the application of 4% of NDA for passive open space, distributed across a network of local parks generally located within 400 metres of residential dwellings).	The overall supply of proposed passive open space within the Ballarat West PSP will increase because of a number of key changes that have occurred since approval of the original PSP. Overall supply will increase from 58.15 hectares to 64.88 hectares generating a surplus of 25.88 hectares when measured against current performance targets identified in the PSP Guidelines 2.0 (note: this surplus has been offset by a large corresponding decrease in 22.06 hectares of active open space). It is recommended Council identify the hierarchy of open spaces proposed for the Ballarat West PSP in line with the hierarchy outlined by the Ballarat Open Space Strategy (BOSS) and clearly distinguish between Neighbourhood, District and Regional open spaces.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
		This indicates a present surplus of approximately 25.88 hectares of passive open space.	
Local formal & informal active open space	The current Ballarat West PSP includes provision for approximately 57.61 hectares of active open space to be delivered across the following five sites: • M R Power Regional Park (An existing 17.63 hectare reserve will perform a dual regional / local sports reserve role). • Mining Park (a 12.97 hectare); • Community Hub 2 (originally a proposed 8 hectare reserve, now reduced to 3.5 hectares); • Community Hub 3 (a proposed 10 hectare reserve); and • Community Hub 4 (a proposed 8 hectare reserve split across two reserve sites). The overall supply of proposed active of open space within the Ballarat West PSP will significantly reduce because of a number of key changes that have occurred since approval of the original PSP including: • Council's preference to identity and configure MR Power Park as a predominantly passive open space performing a range of natural and informal recreational functions and reduce the active open space function to approximately 4 hectares; • A reduction in the size of the Community Hub 2 active open space reserve (originally a proposed 8 hectare reserve, now reduced to 3.5 hectares); and	The revised Ballarat West PSP includes provision for approximately 36.94 hectares of active open space which equates to 3.76% of the NDA of the PSP (and 3.34% of the Gross Developable Area). Active open spaces are to be delivered across the following five sites: • M R Power Regional Park (a proposed 4 hectare active open space component); • Mining Park (a proposed 11.13 hectare active open space); • Community Hub 2 (a proposed 3.5 hectare reserve); • Community Hub 3 (a proposed 10.33 hectare reserve); and • Community Hub 4 (an 8 hectare reserve split across 2 sites, one already completed and one yet to be completed). The Ballarat West PSP generates a need equating to approximately 59 hectares of local active open space based on the application of 6% of NDA for active open space guideline. This indicates a present shortfall of approximately 22.06 hectares of traditional active open space, although the majority of this shortfall will still be used for informal active recreation.	The overall supply of proposed active of open space within the Ballarat West PSP will significantly reduce because of a number of key changes that have occurred since approval of the original PSP. Overall supply will decrease from 57.61 hectares to 36.94 hectares leaving a shortfall of 22.06 hectares based on the VPA PSP benchmark of 6% of NDA (note: this shortfall has been offset by a large corresponding surplus of 25.88 hectares of passive open space). In response to this reduced supply of active open space it is recommended that Council assess implementing the following measures: • The embellishment of MR Power Park and Djila-tjarriu Park with a diverse range of informal recreation facilities. • Where feasible, it is recommended that Council identify opportunities for informal recreation opportunities as part of the development of encumbered open spaces. • Investigate opportunities to secure active open space land in the adjoining future Ballarat West Growth Area and / or Ballarat North West Growth Area; • Evaluate how current projects identified in the Ballarat West DCP toward active open space developments are to be utilised in light of the changes identified by this review.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	• Community Hub 4 active open space reserve (proposed allocation of 8 hectares of active open space across 2 separate sites) • A reduction in the size of the active open space function of Mining Park from 12.97 hectares to 11.13 hectares due to drainage requirements.		
Encumbered open spaces such as drainage reserves, drainage basins, conservation land and heritage land.	The current Ballarat West PSP indicates that the PSP will contain 108.74 hectares of encumbered open space consisting of drainage basins, drainage reserves, heritage conservation areas and environmental conservation areas.	The review of the Ballarat West PSP indicates that the total supply of encumbered public open space will decrease to 102.09 hectares (a net decline of 6.65 hectares) of drainage basins, drainage reserves, heritage conservation areas and environmental conservation areas	The review of the Ballarat West PSP indicates that the total supply of encumbered public open space will decrease to 102.09 (a net decline of 6.65 hectares). Although not classified as credited open space, these open spaces will provide a tangible contribution to the open space values and functions of the PSP including providing some additional opportunities for informal recreation infrastructure provision (e.g. trails and outdoor gym equipment).
Regional open space	The current Ballarat West PSP includes the existing MR Power Park (17.63 hectares) which is identified as a regional open space with a major focus on the provision of active open space. However, since the preparation of the PSP Council prepared a Master Plan for the site indicating a predominantly passive open space and informal recreation role for MR Power Park.	The revised Ballarat West PSP includes the existing MR Power Park (17.63 hectares) which is identified as a regional open space with a predominantly passive open space function (13.63 hectares) and a smaller active open space function (4 hectares).	It is recommended that the revised Ballarat West PSP identify MR Power Park as regional open space with a predominantly passive open space and informal recreation function (13.63 hectares) and a smaller active open space function (4 hectares).
Indoor recreation facilities			
Multipurpose indoor court facility	The Ballarat West PSP includes two proposed Council indoor recreation centres. These are: • Community Hub 3 indoor recreation facility (8 courts) on a 1 hectare site. • MR Power Regional Park indoor recreation facility (4 courts).	The demand generated by the Ballarat West PSP is equivalent approximately 4 indoor multipurpose courts. Given that there are two indoor recreation facilities proposed to be established within the Ballarat West PSP supplying a total of 12 indoor courts, no further provision is recommended.	Given the demand and supply requirements generated by the Ballarat West PSP, and Council's current position on the future role and function MR Power Park as an informal regional passive open space, it is recommended that the proposed indoor recreation facility earmarked for MR Power Park be removed as a requirement of the Ballarat West PSP. Any development contributions collected as part of the Ballarat West DCP for this project is to be

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
			redirected toward the construction of the indoor recreation facility proposed for Community Hub 3 which Council still supports.
Aquatic leisure centres	The Ballarat West PSP does not include an existing or planned Council aquatic leisure centre. The nearest Council indoor aquatic leisure facility is the Ballarat Aquatic & Lifestyle Centre located approximately 6 kilometres north of the Delacombe Major Activity centre.	The demand generated by the Ballarat West PSP is equivalent approximately 205,000 Council aquatic leisure centre visits per annum and 0.3 Council aquatic leisure centre facilities.	Given its reasonable proximity to the Ballarat Aquatic & Lifestyle Centre no additional aquatic leisure centre provision is recommended for the Ballarat West PSP.
Health services			
Local GP Clinics	Although not specifically identified in the Ballarat West PSP, it can be assumed that private GP clinics will be established within proposed activity centres, especially the proposed Major Activity Centre.	Possibly 12 medical centres delivered by the private sector.	Local GP clinics will be delivered by private and or / not for profit service providers (e.g. community health). However, it is recommended that Council determine preferred locations for further medical centre provision in the Ballarat West PSP with an aspirational target of accommodating up to 12 facilities.
Acute / Sub-acute services	The Ballarat West PSP does not include an existing or planned acute / sub-acute health service site(s). Grampians Health, the main provider of public acute, sub-acute and mental health services in Ballarat, has several existing sites in the municipality including the Ballarat Base Hospital (located 7 kilometres north east of the Delacombe Town Centre) and the Queen Elizabeth Centre (located 6 kilometres north east of the Delacombe Town Centre). Other acute health facilities in Ballarat include St John of God Ballarat Hospital (a private hospital located 7 kilometres north east of the Delacombe Town Centre) and Ballarat Surgicentre (a private day hospital located 9 kilometres north east of the Delacombe Town Centre).	The demand generated by the Ballarat West PSP is equivalent approximately 140 public/private hospital beds. The Department of Health (DH) was consulted as part of the Review to confirm future acute / sub-acute health provision needs for the Ballarat West PSP and Ballarat more broadly. However, DH provided no formal response to acute / sub-acute health provision needs.	Although there are no existing or planned acute and sub-acute health services for the Ballarat West PSP, the proximity of the PSP to existing facilities (including Ballarat Base Hospital and St John of God Ballarat) indicates additional provision within the PSP is unlikely to be a high priority. However, it is recommended that Council engage with Grampians Health to confirm whether the Ballarat West PSP may be a suitable location option for a new Community Mental Health Facility in Ballarat it is currently seeking fund for from the State Government. Additional acute and sub-acute health provision may also be considered as part of the future planning of the Ballarat West Growth Area.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
	The most notable health infrastructure initiative underway is the $541.6 million Ballarat Base Hospital Redevelopment (which includes a new multilevel tower which includes a new emergency department, state-of-the-art theatre suite and an extra 100 inpatient and short-stay beds). This project commenced in 2023 and is anticipated to be implemented over a number of stages and finally completed by 2027. Grampians Health is also leading the campaign for a new Community Mental Health Facility to meet the rapidly growing demand for community-based mental health services in the Ballarat and Grampians region. The purpose-built facility will provide early intervention services in a contemporary and highly accessible setting, serving a catchment area of more than 300,000 people.		
Community health services	The Ballarat West PSP does not include an existing or planned community health service site. Ballarat Community Health, the main provider of community health services in Ballarat, has six existing sites in the municipality including its Sebastopol facility (located 3 kilometres east of the Delacombe Town Centre) its Lucas facility (located 8 kilometres north of the Delacombe Town Centre) and its main CBD facility in Victoria Street (located 8 kilometres east of the Delacombe Town Centre).	The demand generated by the Ballarat West PSP is equivalent approximately 1,100 community health service clients. The Department of Health (DH) was consulted as part of the Review to confirm future community health provision needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DH.	Future community health provision within Ballarat is likely to continue to be centred on Ballarat Community Health's existing six sites. However, the proposed development of the Ballarat West PSP can enhance access to public community health services and private primary care services by: • Including consulting rooms for outreach community health programs within the Level 2 and Level 3 multipurpose community centres proposed for the PSP; and • Facilitating the establishment at least one privately operated general practice clinic. The Department of Health has also indicated that long-term planning provision should also consider

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
			accommodating Aboriginal-led service delivery from new community spaces. At a minimum, organisations, such as Ballarat and District Aboriginal Cooperative should be offered co-location opportunities for any new infrastructure builds related to community hubs or early years hubs.
Cemeteries	The Ballarat West PSP does not include an existing or planned cemetery. The nearest existing cemeteries are the Old Ballarat Cemetery (approximately 8 kilometres north east of the Delacombe Town Centre), the New Ballarat Cemetery (approximately 13 kilometres north east of the Delacombe Town Centre) and the Buninyong General Cemetery (approximately 10 kilometres south east of the Delacombe Town Centre).	The Department of Health (DH) was consulted as part of the Review to confirm future cemetery provision needs for the Ballarat West PSP and Ballarat more broadly. However, DH provided no formal response to cemetery provision needs.	Although there are no existing or planned cemeteries for the Ballarat West PSP, the proximity of the PSP to existing facilities to the north east (Old Ballarat Cemetery and New Ballarat Cemetery) and south east (Buninyong General Cemetery) indicates additional provision within the PSP is unlikely to be a high priority. However, additional provision may be considered as part of the future planning of the Ballarat West Growth Area.
Police & Emergency services			
Police Station	The Ballarat West PSP originally included provision for an emergency services hub site on the north western boundary of the PSP, but was subsequently relocated to the north eastern boundary in Lucas which includes the Ballarat West Police Station located adjacent to the Ballarat West Fire Station. The first stage of the Ballarat West Police Station was built in 2015 and Stage 2 in 2016.	The Department of Justice and Community Safety (DJCS) and Victoria Police were consulted as part of the Review to confirm future police station provision needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DJCS.	The existing Ballarat West Police Station, located within the north east section of the Ballarat West PSP operates as a 16 hour police station. Although this existing facility is not located in, or adjacent to an activity centre (the preferred location for police stations), the need to establish a new Police Station within the PSP is not considered a high priority. However, as population in Ballarat West continues to grow it is likely that the existing 16 hour Ballarat West Police Station will need to be increased to a 24 hour operation.
Ambulance Station	There is no ambulance station located within the Ballarat West PSP. The nearest existing ambulance stations are located to the east of the PSP in Sebastopol (approximately 4 kilometres east of the Delacombe Town Centre) and Bakery Hill (approximately 8 kilometres from the Delacombe Town Centre).	The Department of Health (DH) was consulted as part of the Review to confirm future ambulance provision needs for the Ballarat West PSP and Ballarat more broadly. However, DH provided no formal response to ambulance provision needs.	Although there are no existing or planned ambulance stations for the Ballarat West PSP, the proximity of the PSP to existing facilities to the east (Sebastopol and Bakery Hill) indicates that emergency response times to the PSP will remain adequate. Additional provision may be considered as part of the future planning of the Ballarat West Growth Area.

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
Fire Services	The Ballarat West PSP originally included provision for an emergency services hub site on the north western boundary of the PSP, but was subsequently relocated to the north eastern boundary in Lucas and is co-located with the Ballarat West Police Station. The Lucas Fire Station was constructed in 2019.	The Department of Justice and Community Safety (DJCS) and the Emergency Services Infrastructure Authority (ESIA) were consulted as part of the Review to confirm future fire station needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DJCS.	The existing Ballarat West Fire Station will be sufficient to meet the future needs of the Ballarat West PSP. However, additional provision may be considered as part of the future planning of the Ballarat West Growth Area.
Victorian State Emergency Service (VICSES)	There is no VICSES facility located within the Ballarat West PSP. The nearest existing facility is located a short distance east of the PSP boundary in Alfredton (115B Gillies St, Alfredton) and operates from a leased site owned by Ballarat City Council. The Department of Justice and Community Safety (DJCS) has indicated that Ballarat City Council will not renew the lease at the existing site.	The Department of Justice and Community Safety (DJCS) and the Emergency Services Infrastructure Authority (ESIA) were consulted as part of the Review to confirm future VICSES needs for the Ballarat West PSP and Ballarat more broadly. Refer to Appendix 5 for a copy of the formal response received from DJCS.	There is a need to identify a new location for the existing Ballarat VICSES facility currently operating from leased premises owned by Ballarat City Council which it will not renew. The Ballarat West PSP, along with the future Ballarat West Growth Area, provides an opportunity to identify a new site location for VICSES. This review recommends that Council and the Department of Justice and Community Safety (DJCS) undertake a coordinated and collaborative planning exercise to identify a suitable site within the Ballarat West PSP.
Law courts	There are no law courts located within the Ballarat West PSP. The nearest existing law court facility is the Ballarat Magistrates Court located approximately 8 kilometres east of the Delacombe Town Centre (approximately 12-minute drive time).	The Department of Justice and Community Safety (DJCS) was consulted as part of the Review to confirm future law court provision needs for the Ballarat West PSP and Ballarat more broadly. However, DJCS provided no formal response to law court provision needs.	Given the scale of projected population growth and the proximity of the PSP to the existing Ballarat Magistrates Court (approximately 8 kilometres east of the Delacombe Town Centre) indicates the need for a new law court facility in the Ballarat West PSP is not justified. However, as the population of Ballarat continues to grow over the coming decades there may be a new to expand and / or redevelop the existing Ballarat Magistrates Court and increase its operational resources.
Residential aged care and other older persons services			
Residential aged	The Ballarat West PSP includes provision of a retirement village site.	This assessment supports the needs for residential aged care provision within the Ballarat West PSP (demand equivalent to approximately 430 to 450 aged care places).	Residential aged care provision will be delivered by private and or / not for profit service providers. However, it is recommended that Council determine preferred locations for further residential aged care

Community Infrastructure Category	Current Ballarat West PSP Provision	Revised Assessment of Provision Requirements	Implications for the Ballarat West PSP Review
		Although subject to market / developer interest, Council is encouraged to nominate preferred locations for future provision (potentially 3 to 4 sites).	provision in the Ballarat West PSP with an aspirational target of accommodating 3 to 4 facilities.

9 Summary of Key Findings & Recommendations

Based on the information presented and analysed in the previous sections of this report a summary of key findings and recommendations is summarised below.

9.1 Dwelling & Population Outcomes

1. It is expected that for the remaining undeveloped land, densities will be closer to 20 dwellings per hectare than 15 and therefore, Council estimates that the PSP will accommodate approximately 1,000 more dwellings than originally forecast and approximately 2,700 more residents. By full development it is estimated the PSP will accommodate approximately 15,500 dwellings and be home to approximately 42,000 residents.

9.2 Public Open Space & Recreation

Passive Open Space

2. The overall supply of proposed passive open space within the Ballarat West PSP will increase because of a number of key changes that have occurred since approval of the original PSP. Overall supply will increase from 58.15 hectares to 64.88 hectares generating a surplus of 25.88 hectares when measured against current performance targets identified in the PSP Guidelines 2.0 (note: this surplus has been offset by a large corresponding decrease in 22.06 hectares of active open space).
3. It is recommended Council identify the hierarchy of open spaces proposed for the Ballarat West PSP in line with the hierarchy outlined by the Ballarat Open Space Strategy (BOSS) to clearly distinguish between Neighbourhood, District and Regional open spaces.

Active Open Space

4. The overall supply of proposed active of open space within the Ballarat West PSP will significantly reduce because of a number of key changes that have occurred since approval of the original PSP. Overall supply will decrease from 57.61 hectares to 36.94 hectares leaving a shortfall of 22.06 hectares based on the VPA PSP benchmark of 6% of NDA (note: this shortfall has been offset by a large corresponding surplus of 25.88 hectares of passive open space).
5. In response to this reduced supply of active open space it is recommended that Council assess implementing the following measures:
    - The embellishment of MR Power Park Djila-tjarriu Park with a diverse range of informal recreation facilities.

- Where feasible, it is recommended that Council identify opportunities for informal recreation opportunities as part of the development of encumbered open spaces.
- Investigate opportunities to secure active open space land in the adjoining future Ballarat West Growth Area and / or Ballarat North West Growth Area;
- Evaluate how current projects identified in the Ballarat West DCP toward active open space developments are to be utilised in light of the changes identified by this review.

Encumbered Open Space

6. The review of the Ballarat West PSP indicates that the total supply of encumbered public open space will decrease to 102.09 (a net decline of 6.65 hectares). Although not classified as credited open space, these open spaces will provide a tangible contribution to the open space values and functions of the PSP including providing some additional opportunities for informal recreation infrastructure provision (e.g. trails and outdoor gym equipment).

Regional Open Space

7. It is recommended that the revised Ballarat West PSP identify MR Power Park as regional open space with a predominantly passive open space and informal recreation function (13.63 hectares) and a smaller active open space function (4 hectares).

Indoor Recreation

8. Given the demand and supply requirements generated by the Ballarat West PSP, and Council's current position on the future role and function MR Power Park as an informal regional passive open space, it is recommended that the proposed indoor recreation facility earmarked for MR Power Park be removed as a requirement of the Ballarat West PSP. Any development contributions collected as part of the Ballarat West DCP for this project is to be redirected toward the construction of the indoor recreation facility proposed for Community Hub 3 which Council still supports.
9. Given its reasonable proximity to the Ballarat Aquatic & Lifestyle Centre no additional aquatic leisure centre provision is recommended for the Ballarat West PSP.

9.3 Multipurpose Community Centres & Community Services

Level 1 Multipurpose Community Centres

10. For the purposes of this Review it is recommend that both the soon to be constructed Alfredton Community Hub (Community hub 4) and existing Bonshaw Early Learning Centre (Community Hub 1) be classified as Level 1 multipurpose community centres.

11. It is also recommended that the Existing Bonshaw Early Learning Centre (Community Hub 1) be classified as a Level 1 multipurpose community centre and that it be expanded to include additional kindergarten and community meeting space capacity.

Level 2 Multipurpose Community Centres

12. For the purposes of this Review it is recommend that both the proposed Community Hub 3 multipurpose community centre and early years facility be amalgamated and classified as a Level 2 multipurpose community centre and incorporate a Neighbourhood House service.

Level 3 Multipurpose Community Centres

13. For the purposes of this Review it is recommend that both the proposed Community Hub 2 (Delacombe Town Centre) library and multipurpose community centre be amalgamated and classified as a Level 3 multipurpose community centre.

Early Years Services – Long Day Child Care

14. Continue to encourage private and community based long day child care provision (potentially as many as 10 to 11 services) across the Ballarat West PSP, especially close to community infrastructure hubs.

Early Years Services – 3 & 4 Year Old Sessional Kindergarten

15. Given that one early years facility has already been constructed (Bonshaw Early Learning Centre) with 2 kindergarten rooms (proposed to be expanded to 3 rooms) and the soon to be constructed Alfredton Community Hub will include 3 kindergarten rooms, the remaining 2 facilities would need to accommodate a further 8 kindergarten rooms (4 rooms per facility) under the present kindergarten policy environment. However, under the proposed kindergarten policy initiative, this figure would increase to 15 rooms (approximately 7 to 8 rooms per facility).
16. It is recommended Council engage with DE to discuss adopting a shared approach to the delivery and funding of future kindergarten facilities within the Ballarat West PSP with a view to incorporating a minimum of 2 kindergarten rooms at every proposed government primary school (4 schools and 8 rooms).

Early Years Services – Maternal & Child Health

17. In light of the pressure to supply a far larger number of kindergarten rooms over the coming decade than originally anticipated, it is recommended Council identify only one further early years facility for MCH service provision within the Ballarat West PSP,

preferably the Community Hub 2 early years facility located within the Delacombe Town Centre.

Early Years Services – Youth

18. Future community facilities in the Ballarat West PSP will be designed for flexible use and include spaces for young people based on existing examples such as the Ballarat and Sebastopol Libraries.

Neighbourhood Houses / Adult Education

19. Review community centre provision strategy to determine the feasibility of expanding / reconfiguring one of the remaining proposed multipurpose community centres as a preferred location for one Neighbourhood House service, preferably at Community Hub 3.

Libraries

20. No change recommended. This assessment supports the need for a new library facility within the Ballarat West PSP and its proposed location (Community Hub 2 – Delacombe Town Centre) and that it includes a minimum floor area of 1,800 square metres.

Arts & Cultural Facilities

21. Review community centre provision strategy to determine the feasibility of expanding / reconfiguring one of the remaining proposed multipurpose community centres as a preferred location for arts and cultural activities, preferably at Community Hub 2 (Major Activity Centre).
22. It is also recommended that Council ensure that arts and cultural facilities are embedded in the proposed multipurpose community centre spaces and recreation facilities including:
    - Soundproofing meeting rooms to make them dual rehearsal spaces / recording spaces;
    - Provision of wet spaces (such as large kitchen environments) which can be used as wet work spaces (ceramics, mosaics, painting) with wipe clean surfaces;
    - Improved WIFI network service permitting good upload and download capacity for creative businesses; and
    - Sprung floors in large sporting areas (such as a basketball court) to make it suitable for dance rehearsal.

9.4 Education

Government Primary

23. Based on the data regarding revised dwelling yield and densities for the Ballarat West PSP, DE has confirmed that number of Government primary school sites (four) is sufficient to satisfy future demand within the Ballarat West PSP. However, DE have identified site specific location and configuration issues with all proposed Government primary school sites that it wishes to address with Council and developers to ensure consistency with the Victorian Government School Site Selection Criteria Guidance document. Refer to Appendix 5 for a copy of the formal response received from DE for more details.

24. The location and configuration of proposed Government school sites should be delivered in accordance with the Victorian Government School Site Selection Criteria – Toolbox (October 2021).

Government Secondary

25. Based on the data regarding revised dwelling yield and densities for the Ballarat West PSP, DE has confirmed that number of Government secondary school sites (one) is sufficient to satisfy future demand within the Ballarat West PSP. However, DE have identified site specific location and configuration issues with the proposed school site that it wishes to address with Council and developers to ensure consistency with the Victorian Government School Site Selection Criteria Guidance document. Refer to Appendix 5 for a copy of the formal response received from DE for more details.

Government Specialist Schools

26. DE advises that its existing school land holdings within the Ballarat Local Government Area (LGA) is expected to be sufficient to meet specialist education demand in Ballarat over the next 20 years. The Department will continue to monitor the educational needs of students with a disability in the Ballarat LGA and consider opportunities to strengthen inclusive education options as appropriate.

Non-Government Schools

27. Formal feedback received from Diocese of Ballarat Catholic Education Limited (DOBCEL) has confirmed the need for a Catholic primary school within the Ballarat West PSP. DOBCEL will now pursue the opportunity to acquire the non-Government school site identified for Community Hub 3 and wish to contribute to discussions to refine the layout and siting of a Catholic primary school in this location to ensure an optimum solution for the Hub.

Higher Education

28. Given the proximity of existing higher education facilities to the Ballarat West PSP and Federation University's focus on acquiring State / Federal Government funding to

establish an integrated University Campus in the heart of the Ballarat CBD, large scale investment in additional campus facilities within the Ballarat West PSP appears unlikely. However, it is recommended that Council continue to liaise with both Federation University and the Australian Catholic University to identify potential long term provision needs in the wider Ballarat West Growth Area.

9.5 Law Courts, Police & Emergency Services

Police

29. The existing Ballarat West Police Station, located within the north east section of the Ballarat West PSP operates as a 16 hour police station. Although this existing facility is not located in, or adjacent to an activity centre (the preferred location for police stations), the need to establish a new Police Station within the PSP is not considered a high priority. However, as population in Ballarat West continues to grow it is likely that the existing 16 hour Ballarat West Police Station will need to be increased to a 24 hour operation.

Fire Services

30. The existing Ballarat West Fire Station (located within the Ballarat West PSP) will be sufficient to meet the future needs of the Ballarat West PSP. However, additional provision may be considered as part of the future planning of the Ballarat West Growth Area.

Ambulance Services

31. Although there are no existing or planned ambulance stations for the Ballarat West PSP, the proximity of the PSP to existing facilities to the east (Sebastopol and Bakery Hill) indicates that emergency response times to the PSP will remain adequate. Additional provision may be considered as part of the future planning of the Ballarat West Growth Area.

Victorian State Emergency Services (VICSES)

32. There is a need to identify a new location for the existing Ballarat VICSES facility currently operating from leased premises owned by Ballarat City Council which it will not renew. The Ballarat West PSP, along with the future Ballarat West Growth Area, provides an opportunity to identify a new site location for VICSES. This review recommends that Council and the Department of Justice and Community Safety (DJCS) undertake a coordinated and collaborative planning exercise to identify a suitable site within the Ballarat West PSP.

Law Courts

33. Given the scale of projected population growth and the proximity of the PSP to the existing Ballarat Magistrates Court (approximately 8 kilometres east of the Delacombe

Town Centre) indicates the need for a new law court facility in the Ballarat West PSP is not justified. However, as the population of Ballarat continues to grow over the coming decades there may be a new to expand and / or redevelop the existing Ballarat Magistrates Court and increase its operational resources.

9.6 Health

Acute / Sub-Acute Health Services

34. Although there are no existing or planned acute and sub-acute health services for the Ballarat West PSP, the proximity of the PSP to existing facilities (including Ballarat Base Hospital and St John of God Ballarat) indicates additional provision within the PSP is unlikely to be a high priority. However, it is recommended that Council engage with Grampians Health to confirm whether the Ballarat West PSP may be a suitable location option for a new Community Mental Health Facility in Ballarat it is currently seeking fund for from the State Government.
35. Additional acute and sub-acute health provision may also be considered as part of the future planning of the Ballarat West Growth Area.

Community Health Services

36. Future community health provision within Ballarat is likely to continue to be centred on Ballarat Community Health's existing six sites. However, the proposed development of the Ballarat West PSP can enhance access to public community health services and private primary care services by: 1) including consulting rooms for outreach community health programs within the Level 2 and Level 3 multipurpose community centres proposed for the PSP, and 2) facilitating the establishment at least one privately operated general practice clinic.
37. The Department of Health has also indicated that long-term planning provision should also consider accommodating Aboriginal-led service delivery from new community spaces. At a minimum, organisations, such as Ballarat and District Aboriginal Cooperative should be offered co-location opportunities for any new infrastructure builds related to community hubs or early years hubs.

Cemeteries

38. Although there are no existing or planned cemeteries for the Ballarat West PSP, the proximity of the PSP to existing facilities to the north east (Old Ballarat Cemetery and New Ballarat Cemetery) and south east (Buninyong General Cemetery) indicates additional provision within the PSP is unlikely to be a high priority. However, additional provision may be considered as part of the future planning of the Ballarat West Growth Area.

9.7 Aged Care & Other Services for Older Persons

Aged Care Places

39. Residential aged care provision will be delivered by private and or / not for profit service providers. However, it is recommended that Council determine preferred locations for further residential aged care provision in the Ballarat West PSP with an aspirational target of accommodating 3 to 4 facilities.

9.8 Consistency with Statutory Policies and Other Strategic Documents

40. The recommendations outlined above a broadly in accordance with the statutory and strategic documentation reviewed by this assessment, and in particular the requirements and directions outlined in the Ballarat Planning Scheme and other City of Ballarat policies, strategies and plans.

9.9 Further Process Recommendations

41. Further discussion and engagement with Ballarat City Council and other external agencies is recommended to confirm support for the conclusions and recommendations outlined by this assessment.

9.10 Review of the Ballarat West DCP

42. The findings and recommendations of this review will have implications for the Ballarat West DCP. It is recommended that the Ballarat West DCP be reviewed to assess these implications in greater detail.

Appendices

Appendix 1 – Review of Relevant Polices, Guidelines & Strategic Documents

1.1 Precinct Structure Planning Guidelines

The Precinct Structure Planning Guidelines: New Communities in Victoria (the Guidelines) are a Victorian Government initiative to ensure the Victorian Planning Authority (VPA) and other planning authorities prepare plans for places that enable best practice, liveable new communities for Victoria.

The purpose of the Guidelines is to provide the framework for preparing PSPs that guarantees quality outcomes while also being flexible, responsive and supportive of innovation by setting aspirational goals for our future communities. The approach provides a transitionary model enabling 20-minute neighbourhoods to evolve over time and achieve the objectives as the area matures. The Guidelines are based on planning for 20-minute neighbourhoods, a principle in Plan Melbourne 2017-2050 (Plan Melbourne) that advocates for living locally to ensure accessible, safe and attractive local communities.

The Guidelines are structured in the following four parts:

- PART 1 - PURPOSE AND PLANNING CONTEXT. Provides the context for preparing a PSP, including how the Guidelines ensure a future where Victoria is socially and economically strong, environmentally resilient and engaged with the opportunities of a rapidly changing world. It outlines the United Nations Sustainable Development Goals (UN SDGs) and relevant Plan Melbourne policy and explains the 20-minute neighbourhood integrating framework and where PSPs fit in the planning hierarchy.
- PART 2 - PSP PATHWAYS AND PROCESSES (PSP 2.0). Outlines the process for co-designing a PSP with key stakeholders using the PSP 2.0 approach to develop a shared vision for the precinct and resolve key planning challenges early. It also outlines the innovation pathway, which provides new opportunities to deliver over and above expected outcomes.
- PART 3 - CONSTRUCTING A PSP. Provides specific guidance on the General Principles and Performance Targets to be adopted when preparing a PSP. The principles and targets reflect the aspirations of policies such as Plan Melbourne and UN SDGs. They also reflect broader updates to State Government policies including the Department of Transport's Movement and Place Framework and Resilient Melbourne's Living Melbourne – Our Metropolitan Urban Forest. Part 3 also provides guidance on how to demonstrate a PSP has achieved its principles and targets, and where the innovation pathway should be considered.
- PART 4 - PRACTITIONER'S TOOLBOX. Provides guidance on the more detailed aspects of planning for Victoria's new communities. The Practitioner's Toolbox is available online and kept up to date with the latest tools and practices, including updates and changes to relevant government planning policies and guidance notes.

The Guidelines have a hierarchy of elements to explain what needs to be considered and delivered in a PSP. Elements are grounded in state policy and strategy or key future directions for greenfield precincts as determined by the VPA through the preparation process.

There are a number of sections within the PSP Guidelines that specifically relevant to the preparation of a Community Infrastructure Assessment. The most relevant elements are located in Part 3 (Constructing a PSP) and include:

- **Offer High-Quality Public Realm**
  - Offer high-quality public realm and open space
  - The public realm and open space network are crucial to creating the identity of a neighbourhood, and can have a significant impact on liveability, social cohesiveness, sense of place, the community's health and wellbeing, and the urban heat island effect.

- **Services and Destinations**
  - Provide services and destinations that support local living
  - Encouraging communities to 'live locally' means ensuring facilities and services are located close to housing and that the services meet the community's daily needs.

- **Infrastructure and Coordination**
  - Smarter infrastructure investment, and an integrated approach to land-use planning, is essential to unlocking development and ensuring housing affordability PSPs identify infrastructure needs and coordinate their integration with appropriate future land uses in order to provide for future communities.
  - The Guidelines provide direction around the distribution of community facilities, open space and transport required to support compact, walkable 20-minute neighbourhoods. Coordinated and timely delivery of this infrastructure is critical to enable development in greenfield areas and therefore affordability of land. The logical and orderly development of precincts also ensures that new communities have the things they need to thrive.

Table 7 on the following page provides a summary of the key community infrastructure assessment principles, the application of these principles to the PSP process and key PSP targets.

In addition to the PSP Guidelines the VPA, Department of Education and Training and Catholic Education Melbourne has prepared a number of additional resources to assist with the community infrastructure planning process in PSP locations. These include:

- Victorian Planning Authority – Guidance Note – PSP2.0 (November 2021);
- Victorian Planning Authority – Community Infrastructure Planning in New Communities Guidance Note (November 2021);
- Victorian Planning Authority – Infrastructure Contributions Plan Guidelines (March 2021);
- Department of Education & Training - Victorian Government School Site Selection Criteria – Toolbox (October 2021);
- Victorian Planning Authority – PSP Note – Non-Government Schools; and
- Melbourne Archdiocese Catholic Schools - Catholic Schools Site Selection Criteria Guidelines (2021).

Table 5 – Key Elements of the PSP Guidelines Relevant to the Community Infrastructure Assessment Process

PSP Feature & General Principles	How to Apply to PSP	PSP / Performance Targets
Offer High-Quality Public Realm		
F 10. Local recreational spaces and facilities **Networks of open space and facilities that optimise the use of available land and provide equitable access to sport and recreation, leisure, environmental benefits, cultural benefits and visual amenity.**		
F 10.1 The open space network should include local parks that: • have a variety of sizes and proportions, generally ranging from 0.1 to 3 hectares • are located to enable access by local residents without having to cross significant barriers such as arterial roads, railways or waterways • provide a diversity of amenity experiences – both internal to the park and external interfaces that will provide an amenity context for development. Relevant VPP: Clause 56.05-2	• A Public Realm & Water Plan should be developed. The plan may demonstrate a diverse range of open space typologies that respond to place (for example, linear open space, waterway corridors, biodiversity areas and the productive use of encumbered land). The plan should show park sizes, preferred interfaces and walkable catchments (adjusted for significant barriers).	T11 The open space network should seek to meet the following minimum targets: • Within residential areas (including activity centres): - 10% of net developable area for local parks and sports field reserves - 3-5% of net developable area set aside for local parks - 5-7% of net developable area set aside for sports field reserves. • Within dedicated employment and/ or economic activity areas, 2% of the net developable area for local parks. Relevant VPP: Clause 19.02-6S, 53.01 T12 Open space and sports reserves should be located to meet the following distribution targets: • A sports reserve or open space larger than 1 hectare within an 800m safe walkable distance of each dwelling • A local park within a 400m safe walkable distance of each dwelling. Relevant VPP: Clause 56.05-2 Note: Includes sports reserves and public land that is encumbered by other uses but is capable of being utilised for open space purposes.
F 10.2 Proposed sporting reserves should be located, designed and configured to be: • targeted to forecast community needs, including design, landscaping and functionality accessible • appropriately meeting their purpose, having regard to shared use opportunities • able to take advantage of opportunities for alternative water supply (including co-location with stormwater harvesting and treatment facilities) • distinctive and responsive to local character and surrounding land use.	• A community needs analysis should be undertaken to inform the plan at preparation stage. • A Public Realm & Water Plan should show sporting reserve size, purpose and walkable catchments. • Typography should be considered when determining the appropriate location of sport reserves.	

PSP Feature & General Principles	How to Apply to PSP	PSP / Performance Targets
F 10.3 A network of diverse open space should be provided across the precinct that connects (via open space or major pedestrian/cycle links) to metropolitan or regional open space networks.	• A Public Realm & Water Plan should show linkages and connections, any barriers to connectivity, and measures to overcome barriers.	
F 10.4 The location and scale of open space should respond to and optimise integration with the existing topography, waterway features, landscape features, biodiversity conservation areas and cultural heritage values.	• A Public Realm & Water Plan should detail the features the open space network is responding to. • A PSP may include any relevant cross section/s of existing or proposed features. For example, waterway, conservation area, Water Sensitive Urban Design (WSUD) element with the surrounding urban form to clearly show expected development interface outcomes.	
F 10.5 The public realm network should be located, configured and designed to enhance and optimise the role of encumbered or restricted public land (for example, waterways, conservation, utility easements, schools) for multifunctional spaces and cater for a broad range of local users and visitors. Where possible, the provision of open space should be integrated with and/or link with waterways and Water Sensitive Urban Design (WSUD) elements. The public realm network should account for provision of multifunctional water management assets. Relevant VPP: Clause 56.05-2, 19.03-3S	• The community needs analysis should identify possible functions of each space. This could also include the potential role and function of school sports fields, waterways and/or floodways in contributing to the network. • Place-specific guidance should express expectations with regard to landscaping outcomes in open spaces and the public realm.	
Services And Destinations		
F 14. Local schools and community Infrastructure **Education and community infrastructure and facilities that are located to equitably and efficiently maximise their accessibility and shared use.**		
F 14.1 Education and community facilities (i.e. primary, secondary and specialist schools, kindergartens, community centres, health facilities and sport reserves) should: • be co-located within community hubs • have good visual and physical links to a local centre • be located on connector streets, linked by walking and cycling paths • be located in proximity to high-quality public transport where possible • be located away from potential hazards. Relevant VPP: Clause 56.03-3	• A Community Infrastructure Plan should show the preferred location of education and community facilities and identify their locational advantages. The assessment should ensure that the context of surrounding or planned development is considered to inform the role and location of education and community facilities. • Where a specialist school is required, it should wherever possible, be located adjacent to an existing or proposed government school—preferably a secondary school. • Planning to co-locate kindergartens with all new government primary schools (including within co-located community facilities) should be undertaken in consultation with Department	T18 The location of dwellings should achieve the following accessibility targets in relation to education and community facilities: • 70% of dwellings located within 800m of a government primary school • 100% of dwellings located within 3,200m of a government secondary school • 80% of dwellings located within 800m of a community facility • 80% of dwellings located within 800m of a health facility. Note: A health facility may include areas where a general practitioner would be capable of operating (for example, commercial or mixeduse zone).

PSP Feature & General Principles	How to Apply to PSP	PSP / Performance Targets
	of Education and Training (DET) to determine appropriate land take and design requirements. Note: PSPs are only capable of accommodating the provision of infrastructure. Timing of delivery is subject to the discretion of the relevant service provider.	
F 14.2 High intensity facilities such as libraries, childcare centres, justice/emergency services and community centres should be located within close proximity of an activity centre or have good visual and physical links to an activity centre and active transport routes.	• Consultation with agencies and service providers should explore spatial and locational needs of these facilities, as well as likely delivery models. • A community infrastructure needs assessment should be prepared to inform plan preparation, identifying potential local synergies available in the PSP area.	
F 14.3 Upgrades to existing infrastructure and/or the provision of new infrastructure should align with council and/or agency service plans and provide guidance to reflect the most cost-efficient approach to addressing service needs. This includes making use of any spare capacity of existing facilities within the catchment area and pursuing integrated service planning and delivery opportunities.	• A community infrastructure needs assessment should be undertaken to inform plan preparation, identifying spare capacity within the catchment and exploring integrated delivery opportunities. • Consultation with community infrastructure service providers should be undertaken to explore integrated delivery opportunities.	
F 14.4 Where feasible, education and community infrastructure should provide space for not-for-profit organisations. Opportunities should also be explored in town centres for space that not-for-profits may be able to rent	• Consultation with not-for-profit organisations and DET, Council and other community land use managers, as well as developers of town centres, should be undertaken early to identify and co-design opportunities for shared facilities.	
F 14.5 The location of emergency services should be within easy access to the arterial road network to maximise coverage and reduce response times.	• A community infrastructure needs assessment should be undertaken to inform plan preparation, identifying the location of existing or proposed emergency service facilities. • A Community Infrastructure Plan should identify the preferred location of emergency services if located within the precinct.	
F 15. Lifelong learning opportunities **Education and community infrastructure and facilities that cater for the many social needs of the community and individuals at any stage of their lives.**		

PSP Feature & General Principles	How to Apply to PSP	PSP / Performance Targets
F 15.1 The amount of land allocated for education and community facilities, and their role and function, should be determined in consultation with service providers and should respond to the local context, the broader strategic context, and the forecast service needs of the new or changing community. Relevant VPP: Clause 56.03-3	• A community infrastructure needs assessment should identify likely community needs. The assessment should ensure that the context of surrounding or planned development is considered to inform the role and location of education and community facilities. • Consultation with community infrastructure service providers should be undertaken to explore opportunities to respond to changing needs in an innovative way.	Refer to T18 Targets
F 15.2 The location and design of education and community facilities should cost-effectively maximise functional use, flexibility, safety, amenity and operational efficiency (e.g. shared use of facilities with active open space, alternative funding models, adaptable design models, community access to school grounds, etc.)	• A Community Infrastructure Plan should show any proposed agreement for shared use. • A Precinct Infrastructure Plan should identify timing, delivery responsibility, potential funding sources and commitments to shared delivery and use of facilities.	
F 15.3 Opportunities for non-government schools and tertiary education facilities should be identified through engagement with the non-government school and tertiary education sectors.	• Consultation with non-government education providers should be undertaken early in the PSP process. • A Community Infrastructure Plan should identify any nongovernment education facilities (where known).	
F 15.4 Future opportunities for higher order health and education (e.g. tertiary education) should be considered during the PSP process and land areas or 'areas of strategic interest' should be nominated where known.	• Consultation with higher order health and education providers should be undertaken early in the PSP process to explore any opportunities for these sites to be nominated and for partnerships to be forged. • A Community Infrastructure Plan should identify any facilities (where known) and identify any catalyst impacts of these facilities.	
Infrastructure Coordination		
F 17. Staging and location of development **Directing the staging and location of development within a PSP to:** • **use available capacity in existing infrastructure** • **support the orderly and economic extension or augmentation of existing infrastructure** • **match the timely provision of new infrastructure.** **This will include directing the location and timing of development and identifying trigger points for the provision of required infrastructure.**		
F 17.1 The structure and design of a PSP should accommodate the coordinated delivery of key infrastructure (basic and essential infrastructure and other infrastructure) and appropriate staging of development to provide for: • integration and shared-use opportunities	• Encourage active engagement with government departments, service providers and utility agencies to input their forward plans, identify and define essential infrastructure and to explore strategic partnerships for planning, funding and delivery.	T20 Identify all basic and essential infrastructure with spatial requirements on the future place-based structure plan (e.g. open space, schools, community centres, integrated water management, etc.)

PSP Feature & General Principles	How to Apply to PSP	PSP / Performance Targets
• timely delivery, taking into consideration likely sequencing of development, land ownership constraints and funding sources • efficient delivery, taking into consideration likely sequencing of development • development that will not be isolated from basic and essential infrastructure and services • ensuring that development does not take place unless it can be serviced in a timely manner • ensuring that development within a PSP can be staged to match the attainment of infrastructure triggers and the provision of infrastructure and services • opportunities for alternative delivery models that achieve sustainability or other community benefits.	• A Precinct Infrastructure Plan should identify all infrastructure needed to service the new neighbourhoods, indicative timing, delivery responsibility, other potential funding sources and any agreed commitments to partnerships or alternative delivery models. • The indicative locations of essential infrastructure should consider the local requirements of service providers relevant to the PSP.	
F 17.2 The staging of development within PSPs should consider: • proximity to existing or proposed development fronts or serviced land • proximity to significant public transport infrastructure or public transport services • proximity to existing or committed community infrastructure such as schools • proximity to new or existing arterial or connector road infrastructure • existing uses (for example, extractive uses) which may transition over a longer period of time • its role in facilitating delivery of this infrastructure.	• Active engagement with government departments, service providers, utility providers, landowners, developers and local government to explore the potential staging of development that aligns with potential planning, funding and delivery of infrastructure. • Spatial arrangement of land uses within a PSP and the provision of infrastructure within a Precinct Infrastructure Plan are aligned to encourage appropriate staging of development. • Direction is provided on the location and timing of development fronts within a PSP and the trigger points for required infrastructure, where relevant, in order to ensure development matches the timely provision of infrastructure. • An indicative staging plan should be prepared where appropriate.	
F 17.3 Land should be set aside and reserved to allow for all public land uses, including schools, community centres, health, emergency and justice facilities, road widening and grade separation of rail from all transport corridors (includes roads, pedestrian and bicycle paths) where a delivery agency has agreed to the commitment.	• Land required in the future should be identified in a Place Infrastructure Plan.	
F 17.4 Structure and design of a PSP should seek to maximise opportunities for development to utilise existing infrastructure or to capitalise on planned infrastructure commitments.	• An infrastructure and servicing assessment should be prepared to inform plan preparation and should identify existing capacity of infrastructure. • Consultation should be undertaken with agencies and servicing authorities to identify opportunities to leverage planned infrastructure commitments.	
F 18. Innovative and sustainable infrastructure delivery		

PSP Feature & General Principles	How to Apply to PSP	PSP / Performance Targets
Actively pursuing innovative and sustainable models for infrastructure delivery, and long-term strategic infrastructure opportunities that align with the UN SDGs and the 20-minute neighbourhood framework.		
F 18.1 Alternative and innovative infrastructure and service delivery approaches should be explored early in the PSP place-shaping and visioning stages to ensure new and innovative initiatives are embedded in the design and structure of a PSP. Implications for urban form, housing, jobs and other features of the 20-minute neighbourhood should be considered and addressed through the PSP.	• The PSP vision statement should identify any proposed infrastructure or service delivery innovations, as well as actions to support the vision.	Refer to Performance Target T18
F 18.2 Potential mechanisms to incentivise the early delivery of key infrastructure should be explored, particularly where fragmented land parcels and/or other site constraints exist that prohibit the logical delivery of infrastructure to support new job growth.	• Active engagement with key implementing stakeholders will identify opportunities and commitment to bring forward infrastructure. • All commitments should be identified in the Precinct Infrastructure Plan. • A staged approach to drainage outfall should be considered to align with incremental development of the precinct.	

1.2 City of Ballarat & Non Council Agency Strategic Documents

A number of City of Ballarat and other non-Council agency strategies, plans and polices were identified and reviewed for potential relevance to the review.

1.2.1 City of Ballarat Strategic Documents

The key Council policies, strategies and plans reviewed are listed below and summarised in the Table following this list.

- Community Vision 2021-2031
- Council Plan 2021-2025
- City of Ballarat Health and Wellbeing Plan 2021-2031
- City of Ballarat Asset Plan 2022-2032
- Municipal Early Years Plan 2022-26
- Youth Strategy 2022-2026
- Ageing Well Strategy 2022-2026
- Active Ballarat Strategy
- Active Women and Girls Strategy 2018
- Ballarat Aquatic Strategy 2014
- Ballarat Skate and Youth Facilities Framework (2019)
- Lawn Bowls Facilities Framework (2015)
- Ballarat Open Space Strategy (2008)
- Playspace Planning Framework (2014)
- Ballarat Libraries and Learning Strategy 2022-2027
- Ballarat Arts and Cultural Infrastructure Report (2021)
- Ballarat Creative City Strategy (2019)
- Ballarat Creative Precinct Master Plan (2019)
- Ballarat Event Strategy 2018-28
- Ballarat Heritage Plan 2017-30
- Social Policy Framework
- Intercultural Plan 2022-2026

Table 6 - Ballarat City Council Strategic Documents Potentially Relevant to the Assessment

Strategy Type and Name
Corporate Strategies
Community Vision 2021-2031 The Community Vision 2021-2031 was informed by a large-scale community engagement process in February and March 2021. A Community Panel, representative of the Ballarat community, further developed community input received during this first stage of engagement via a deliberative engagement process in April and May. The Panel developed the vision statement, principles for decision making and the key themes for action presented in the Vision.
Council Plan 2021-2025 The City of Ballarat Council Plan 2021-2025 was adopted by Council at the August 25 Council Meeting. The plan outlines how City of Ballarat will achieve Council's and the community's vision of Ballarat. The plan has six goals: • An environmentally sustainable future • A healthy, connected and inclusive community • A city that fosters sustainable growth • A city that conserves and enhances our natural and built assets • A strong and innovative economy and city • A council that provides leadership and advocates for its community
City of Ballarat Health and Wellbeing Plan 2021-2031 The City of Ballarat Health and Wellbeing Plan 2021-2031 sets the health priorities for the Ballarat community, outlines strategies to prevent or reduce public health issues and supports the community to achieve optimum health and wellbeing. The Health and Wellbeing Plan 2021-2031 has six priority areas: • Tackling climate and its impact on health • Preventing all forms of violence • Increasing healthy eating • Increasing active living • Improving mental wellbeing • Reducing harm from smoking, gambling, alcohol and other drugs
City of Ballarat Asset Plan 2022-2032 The Asset Plan 2022-2032 provides clear direction about how the City of Ballarat proposes to manage the portfolio of public assets it controls over the next 10 years and beyond to ensure responsible and sustainable stewardship
Education, Early Years, Youth and Older Persons
Municipal Early Years Plan 2022-26 The Municipal Early Years Plan lays out the Ballarat community's vision and priorities for its children, and for being a child friendly city for every child that lives, learns, is cared for and plays in the municipality. The Plan has six key goals: • Valued, loved and safe • Having material basics • Being healthy • Children are learning • Children are participating • Positive sense of culture and identity
Youth Strategy 2022-2026 The City of Ballarat Youth Strategy 2022 –2026 lays the foundation for our young people to access the programs and services they need to build a brighter future for our city. The visions, voices and creativity of young people will be fostered to grow through a range of exciting programs for young people aged 12 –25.
Older Persons
Ageing Well Strategy 2022-2026 This strategy has been developed to guide City of Ballarat to respond to the current, changing and emerging needs of residents aged 55 years and over and to identify its future focus and priorities for the community. Priorities include:

Strategy Type and Name
• Improving the accessibility and safety of our spaces, places, and streetscapes. • Access to a range of reliable and affordable transport and affordable housing options. • The availability of services to maintain independence at home and in the community. • Strengthening the regard and respect for people as they age and their contribution and value in community, social, political and economic life.
Open Space & Recreation
Active Ballarat Strategy One of the key objectives of the Active Ballarat Strategy is that it aligns with the State government's plan – Active Victoria – which aims to strengthen the sport and recreation sector and participation across the state. This has been at the forefront of our thinking throughout the development of this strategy. The overall objectives of this strategy are to: • Establish strategic directions for the planning, provision, development and management of a diverse range of sport and recreation facilities, services and infrastructure; • Provide recommendations and strategic outcomes that address short term (1-2 years), medium term (3-4 years) and future term (5-10 years) community needs; and • Identify critical policy direction for the City of Ballarat recreation processes and procedures.
Active Women and Girls Strategy 2018 This strategic document represents the overarching strategy to guide future initiatives aimed at increasing female participation in sport and physical activity within the municipality. The strategy has a four-year timeframe and is supported by a strategy action plan that identifies priority initiatives, and aligns with Council Plan, key recreation documents and capital programs and budgets. This strategy will identify four key focus areas that will guide Council over the next four years on projects to be delivered. The outcomes of any projects or initiatives will be communicated based on how they address four key pillars. They are: • Participation; • Culture and Environment; • Infrastructure; and • Media Action.
Ballarat Aquatic Strategy 2014 The City of Ballarat Aquatic Plan presents practical projects to be delivered across the municipality over the next five to ten years. These projects are designed to increase participation in aquatic activities by all people, regardless of gender, age or physical capabilities. One of the recommendations contained in this report states: "Given the high growth expected in Ballarat's west, specific planning must also be undertaken for aquatic play spaces and additional aquatic facilities in this part of the city."
Ballarat Skate and Youth Facilities Framework (2019) The aim of this report is to ensure that the City of Ballarat has a clear strategic plan to appropriately provide accessible, inclusive and relevant skate, scooter and BMX spaces and broader activity spaces for tweens (aged 8 to 12) and teens in line with current practice for the next ten years.
Lawn Bowls Facilities Framework (2015) The Lawn Bowls Facilities Framework assists the City of Ballarat deliver its stated health and wellbeing domains outlined in the Council Plan, notably in the areas of sustainable built and natural environments, where a key objective is improved access to and utilisation of leisure and recreational facilities. Council will support local bowls clubs and work with other relevant stakeholders, particularly the Ballarat District Bowls Division (BDBD), Bowls Victoria and Bowls Australia, to support the long-term growth and sustainability of bowls in the region.
Ballarat Open Space Strategy (2008) The Ballarat Open Space Strategy: • Provides a clear and concise policy framework for the management, use and development of the municipality's open space assets; • Determines the appropriate provision of open space to cater to Ballarat's existing and projected population; • Provides environmental management outcomes and solutions for financing the development of open space; • Provides a sustainable public landscape and planting vision aimed at responding to the impact of climate change.
Playspace Planning Framework (2014)

Strategy Type and Name
This strategy provides guidance for the provision of integrated play opportunities for people of all ages, interests and abilities throughout the municipality. It is based on ten geographic precincts that comprise the City of Ballarat and form the basis for planning and development of play spaces for all ages. Additionally, the strategy is not intended to cover all forms of physical activity (like sport and organised competition), but focuses on the informal playful and casual activities.
Libraries, Arts & Culture
Ballarat Libraries and Learning Strategy 2022-2027 Key priorities of the Strategy are: Reach out 1. Engage with the Ballarat community to increase library use and service impact. 2. Target library services to priority community cohorts with a focus on literacy, lifelong learning, digital inclusion and wellbeing. Branch out 3. Increase the size, quality and accessibility of the branch library network. 4. Explore use of alternative models that increase community access to library services. Stand out 5. Exemplify a strategic approach to delivering purposeful and mutually beneficial service partnerships. 6. Demonstrate regional and industry leadership in provision of community-focused public library services. The Strategy identifies that "planning will also be undertaken for a future library to serve the Ballarat West growth area located in the Delacombe Town Centre." (Page 17)
Ballarat Arts and Cultural Infrastructure Report (2021) This Arts and Cultural Infrastructure Report provides an analysis of the current supply and function of private and public cultural facilities in the City of Ballarat, and the anticipated sector trends that will drive infrastructure needs into the future. This Report has identified six strategic priorities to guide the City of Ballarat's investment in: • New cultural infrastructure, upgrades or redevelopment of existing arts and cultural assets • Opportunities for the inclusion of cultural use and programming in planned and future infrastructure projects • Initiatives that support the provision and or operation of cultural infrastructure including the inclusion of provision standards for arts and cultural infrastructure. These six strategic priorities include: 1. A holistic, collaborative approach to new and ongoing capital and operational investment in arts and cultural infrastructure 2. The incorporation of cultural use into the design of fit for purpose community infrastructure planning 3. Prioritised investment in arts and cultural infrastructure that supports and improves the productivity, entrepreneurship and sustainability of the sector 4. Arts and cultural infrastructure is visible and accessible to the community and visitors 5. Arts and cultural infrastructure is affordable and supports collaboration, career development and pathways 6. World class arts and cultural infrastructure to be fit for purpose to preserve cultural collections and assets, provide education and learning opportunities, and optimise tourism and visitation.
Ballarat Creative City Strategy (2019) Creative City Strategy presents a proposed long-term vision for the City, to guide policy and investment for the cultural and creative industries. The strategy is built on comprehensive research and extensive engagement with community and expert stakeholders. Collectively, and with community support, the strategy and masterplan aim to position Ballarat as one of Australia's leading creative cities. The Strategy identifies the following seven strategic goals: Goal 1: Ballarat is a creative city with entire community participation Goal 2: Ballarat is a city in which artists and creatives can sustain professional careers and prosper Goal 3: Ballarat has a strong domestic audience and consumer market for local creative product Goal 4: Ballarat's cultural economy and market is continually growing Goal 5: Ballarat is a city with strong representation of a variety of creative industries Goal 6: Ballarat is a city where strong creative capabilities are used throughout industry and the community Goal 7: Ballarat has a high quality creative precinct, which is vibrant, playful and tells the unique Ballarat story
Ballarat Creative Precinct Master Plan (2019)

Strategy Type and Name
The Precinct Master Plan will provide a framework for the development of the central business district until 2040. Its aim is to help coordinate investment in the Creative Precinct to support Ballarat as a creative city, through creating a vibrant, diverse and participatory place to live, work, study, create and visit.
Ballarat Event Strategy 2018-28 This Events Strategy (Strategy) provides a roadmap for the development of Ballarat's event program over the next eight years. It will help ensure the outcomes of the events program are fully understood, optimised and in line with broader City of Ballarat strategies and priorities. The Strategy is designed to be a practical guide to assist the direction of current events, initiation and acquisition of new events, and provide a rationale for ceasing investment in others – to that end, it is a strategic framework for event development.
Ballarat Heritage Plan 2017-30 Our People, Culture & Place: A plan to sustain Ballarat's heritage 2017 – 2030 is a whole-of-city action plan that details locally and collaboratively developed projects and programs under three key priority areas: 1. Regeneration 2. Celebrating and inspiring with Ballarat's stories 3. Managing change and safeguarding heritage.
Other
Social Policy Framework Social policy relates to people's wellbeing, particularly the welfare of those who experience disadvantage. It relates to how people work, live, and spend time, and helps determine the best ways to meet human needs such as housing, employment, education, recreation, leisure, health, safety, and the care of children. The City of Ballarat Social Policy Framework highlights the principles, considerations, roles, and responsibilities for policy development in social and wellbeing areas. Council's position statements accompany the Social Policy Framework, and consolidate our social policies, key messages, roles and responsibilities on several social issues. These include: • Access to Food • Affordable Housing • Alcohol and other Drugs • Mental Health and Wellbeing • Preventing Gambling Harm • Preventing Family Violence and • Promoting Active Living
Intercultural Plan 2022-2026 Ballarat's Intercultural City Strategic Plan promotes social inclusion and wellbeing within its multicultural and Indigenous communities, highlighting the positive contributions migrants and Indigenous Australians have made to our community.

1.2.2 Non-Council Strategic Documents

The following important non-Council social infrastructure strategies are summarised in this section:

- Victorian State Government, Best Start, Best Life Policy (June 2022);
- Transforming lives and enhancing communities: Federation University Strategic Plan 2018 – 2022;
- Health 2040: Advancing health, access and care;
- Statewide Design, Service and Infrastructure Plan for Victoria's Health System: 2017–2037;
- Ballarat Health Services Strategic Plan 2017 – 2022;
- Victoria Police Blue Paper: A Vision for Victoria Police In 2025;
- Ambulance Victoria Strategic Plan 2017-2022;
- Court Services Victoria Strategic Asset Plan:2016-2031;
- Fire Rescue Victoria Strategic Plan 2022-2032; and
- Victorian State Emergency Services (VICSES) Service Delivery Strategy 2025.

Table 7 - Non-Council Strategies and Plans

Document Name
Victorian State Government, Best Start, Best Life Policy (June 2022) The Andrews Labor Government will expand the Best Start, Best Life program with three major new initiatives: • Making kinder free across the state • Delivering a new year of universal Pre-Prep for 4-year-olds • Establishing 50 government operated childcare centres This means from 2023, any family with a three or four-year-old will pay nothing for kinder – a saving of up to $2,500 per child every year. Three-Year-Old Kinder is already rolling out across the state, expanding universal access to 15 hours of government funded kinder every week – and from next year, it will be free. Four-Year-Old Kinder will also be free, providing much-needed relief for family budgets and giving more women a choice to return to the workforce. Over the next decade, Four-Year-Old Kinder will transition to Pre-Prep – increasing to a universal 30-hour a week program of play-based learning for every four-year-old child in Victoria. Pre-Prep will be delivered through kinders and long day care centres, creating a high-quality, universal program to give four-year-old kids the opportunity to socialise and learn through play.
Transforming lives and enhancing communities: Federation University Strategic Plan 2018 - 2022 FedUni is regional Victoria's largest education institution, with campuses in Ballarat, Berwick, Brisbane, Gippsland and the Wimmera providing easy access to study, and approximately 1,300 staff committed to teaching excellence and student support. The Berwick Campus became part of FedUni in 2017. The campus is located about 40km south east of the Melbourne CBD. It is only a five minute walk from the Berwick Station on the metropolitan Pakenham train line, and adjacent to the Princes Freeway. The multi-level complex of modern architecturally-designed buildings is surrounded by spacious grounds with landscaped gardens and internal courtyards. Purpose: To transform lives and enhance communities. Priorities • Lifelong Learning – Provide future-focused, high-quality lifelong learning opportunities for students from all backgrounds. • Global Citizens - Empower students with the necessary knowledge, skills and aptitude for further study, to participate in workplaces and to be effective global citizens. • Partnerships - Use our network of campuses and partnerships to deliver our courses and programs. • Research to Impact – Conduct research with measurable impact on the communities in which we are located and wider society. • Sustainability – Ensure long-term financial sustainability. Outcomes By 2022 FedUni will:

Document Name
1. Become a popular student destination • Reach 20,000 higher education and 8,000 TAFE student enrolments. • Attract significant numbers of international students. • Engage students from a diverse range of backgrounds. • Be highly regarded for our range of offerings. 2. Offer a high-quality student experience • Improve student retention rates and success results. • Achieve 5 Star rating by the Good Universities Guide for high-quality teaching. • Meet students' needs using the latest pedagogy and technology. • Create connected alumni who provide industry links and channel future employees. 3. Make a positive impact • Be highly rated by employers for the quality of our graduates. • Be known for research that delivers societal impact and be ranked by Times Higher Education (THE), Shanghai Academic Ranking of World Universities (Shanghai) and QS World University Rankings (QS). • Lead the sector in best practice community and industry engagement. 4. Become a university workplace of choice • Demonstrate high levels of employee satisfaction. • Be in the top quartile of Australian universities for the numbers of female staff in senior leadership roles. • Be an asset to regional communities and contribute to capacity building. • Be a preferred employer and higher education destination for Indigenous staff and students. • Build an efficient organisation
Health 2040: Advancing health, access and care The organisation's vision is for all Victorians to have: • better health – skills and support to be healthy and well • better access – fair, timely and easier access to care • better care – world-class healthcare every time. Better health • A system geared to prevention as much as treatment • Everyone understands their own health and risks • Illness is detected and managed early • Healthy neighbourhoods and communities encourage healthy lifestyles Better access • Care is always there when people need it • More access to care in the home and community • People are connected to the full range of care and support they need • There is fair access to care Better care • Target zero avoidable harm • Healthcare that focuses on outcomes • People are active partners in care • Care fits together around people's needs
Statewide Design, Service and Infrastructure Plan for Victoria's Health System: 2017–2037 This Plan focuses on five priority areas over the coming 20 years: 1. building a proactive system that promotes health and anticipates demand 2. creating a safety and quality-led system 3. integrating care across the health and social service system 4. strengthening regional and rural health services 5. investing in the future—the next generation of healthcare
Ballarat Health Services Strategic Plan 2017 – 2022 The BHS 2017 – 22 Strategic Plan:

Document Name
• Identifies important service directions, priorities and actions for the next five years. • Identifies a new set of organisational Values, and a new Vision. • Provides a foundation for the development of a more detailed Service Plan. • Has been developed through extensive consultation with patients, staff, and stakeholders.
Victoria Police Blue Paper: A Vision for Victoria Police In 2025 Based on an understanding of the role of Victoria Police, the principles of policing, and the external and internal challenges facing Victoria Police, A Vision for Victoria Police in 2025 lays out three proposed strategic directions to enhance public safety, and increase value for money for the Victorian community through its investment in Victoria Police: **1. Better matching of resources to demand by rethinking the traditional operating model** The Paper makes the following observations on this direction: *The traditional police service delivery model needs to shift from one based on an historical geographic footprint, to one that is mobile, technologically-advanced, and more responsive to changing demand. The type and location of police operations should be determined by what is required to provide the best possible service to the community. For example, larger, consolidated 'supersites' should replace many of the smaller and less operationally-effective traditional police stations. The supersite – or sites - in each Division should be the central 'hub' that supports a variety of other Victoria Police service points for local communities, such as 'shopfronts', mobile police stations, and self-service kiosks for non-urgent issues. In rural Victoria, multiple hubs might be required. Supersites should be multi-disciplinary centres where Victoria Police is co-located with other public services"".* **2. Improving capability through workforce reform and technology** The Paper makes the following observations on this direction: *"Victoria Police officers need to be far better supported by modern technology. They need to have the information and systems to do their work in a more 'virtual' environment, and to be freed from time-consuming paperwork. Technology should also support a strong culture of information security.* *Frontline officers should not need to return to their supersite during their shift: the proportion of an officer's time spent in the community (not in a police complex) should increase from 54 per cent to around 80 per cent. Each supersite should be designed to accommodate an IT system which allocates tasks and coordinates police operations. The system would integrate audio and video feeds from mobile and fixed sensor platforms, advanced analytics, and advice from partner agencies. It would also have capacity for a custody suite, operated by a private provider.* *Victorians should be able to report crime and suspicious activity through online self-service portals, and provide pictures and video to assist in offender identification. There should also be a dedicated non-emergency telephone line, where the public can talk directly to a staff member who can take their report and provide access to crime prevention information. Individuals should be able to track the progress of their reports via a secure online system. The system would, via social media, provide the community with real time alerts and requests for assistance to solve a crime or problem."* **3. Collaborating more closely through partnerships** The Paper makes the following observations on this direction: *"Different types of partnerships with the community are necessary:* • *An effective model of local policing in collaboration with residents and business owners will remain of vital importance, for maintaining and building community trust and confidence in Victoria Police.* • *Local policing partnerships should use practical and wide-reaching methods for public participation to shape local* • *priorities (such as community forums and social media platforms). A more personal approach, through greater face-to-face interaction with identified individual police officers – recognisable 'faces' – is vital.* • *Victoria Police must increase the trust that communities of identity (relating to gender, ethnicity, religion, sexuality, age, capacity or otherwise) have in its ability to serve them as well and treat them as fairly as anybody else.* • *Victoria Police needs to engage with businesses in a different way for mutual benefit, based on enduring structures and processes.* • *Police and private security firms need to work together to deter crime and maintain public order most effectively, but police should retain an involvement in the regulation of the industry and could become involved in the training of its members".*
Ambulance Victoria Strategic Plan 2017-2022 This Strategic Plan outlines how Ambulance Victoria will continue its recent operational reforms, to provide Victorians with a world-class emergency ambulance service over the next five years. The Plan focuses on achieving four key outcomes and associated priorities:

Document Name
Outcome1 - An exceptional patient experience • Providing safe, high quality, timely and expert patient care every time • Helping people to make informed decisions about their emergency health care • Connecting people with the care they need • Using research and evidence to continuously learn and improve our services **Outcome 2 - Partnerships that make a difference** • Working with communities to deliver local emergency health care solutions • Collaborating with our partners to improve health outcomes • Planning for and responding to major events and emergencies • Sharing knowledge, experience and data **Outcome 3 - A great place to work and volunteer** • Keeping our people safe, and physically and psychologically well • Providing an inclusive and flexible workplace • Developing a culture of continual learning and development • Embedding an ethical, just and respectful culture **Outcome 4 - A high performing organisation** • Embracing innovative ideas, systems and technology • Being accountable for our actions and outcomes • Improving our integrated service model • Operating in a financially and environmentally sustainable way
Court Services Victoria Strategic Asset Plan:2016-2031 The purpose of this Plan is to deliver safe, secure and sustainable court and tribunal assets via excellent and expert asset management. Court Services Victoria (CSV) aims to enable provision of accessible justice for all Victorians through a portfolio of buildings that are safe, secure and sustainable to meet the service needs of the jurisdictions, court and tribunal users and community, now and into the future. The key priority focus areas are: • Enabling specialist court infrastructure including family violence response • Ensuring safe, flexible, future proofed and fit-for-purpose environments • Delivering Melbourne CBD Legal Precinct (the Precinct) development requirements • Delivering Melbourne growth corridor development priorities • Implementing the Court Services Delineation Model across metropolitan and regional Victoria • Identifying a set of principles that will determine proper priorities and allocation of resources for new capital works and maintenance of the existing asset base both within and between the CBD, metropolitan Melbourne, and regional Victoria. The strategy responds to the defined service needs of all jurisdictions, incorporating the following components over a 15 year period: • Investment in ten new court and tribunal facilities • Expansion of five existing court and tribunal facilities • Upgrade and lifecycle management across the court portfolio - Accommodating the new Court Services Delineation Model - Replacing/upgrading critical infrastructure - Increase in recurrent maintenance funding • Divestment of up to thirteen properties • Release of up to ten leased properties.
Fire Rescue Victoria Strategic Plan 2022-2032 The FRV Strategic Plan is built on the following five pillars of focus over the next 10 years: 1. Partnering effectively for safer communities; 2. Creating a culture that connects and supports our people; 3. Modernising our organisation to provide better outcomes; 4. Helping Victorian communities build resilience through education and preparation; and 5. Delivering excellence across our fire and rescue services.

Document Name
The Strategic Plan states that FRV periodically reviews the strategic location of fire stations to look at ways to improve response to the community (page 27).
Victorian State Emergency Services (VICSES) Service Delivery Strategy 2025 VICSES is a volunteer-based organisation, providing emergency assistance to minimise the impact of emergencies and strengthen the community's capacity to plan, respond and recover, when emergencies occur. It operates under the Victoria State Emergency Act (2005) and the coordinating agency for emergency management, Emergency Management Victoria (EMV). VICSES aims to partner with communities, government, other agencies and business to provide timely and effective emergency management services, building community preparedness, disaster resilience and contributing to risk prevention.

Appendix 2 – Community Infrastructure Audit Maps

Figure 7 - Libraries, Community Centres, Cultural Facilities and Halls

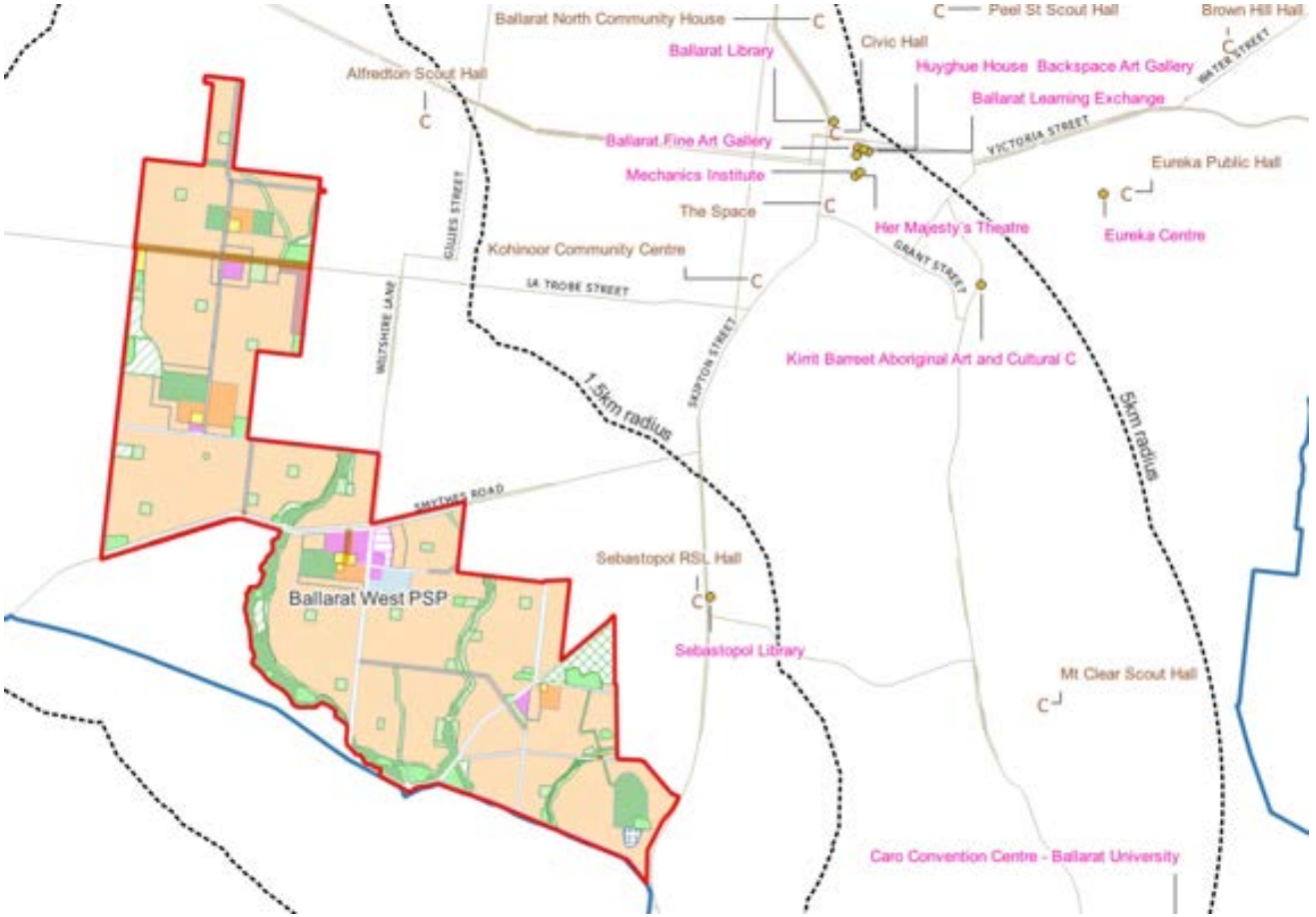


Figure 8- Early Years Facilities: Long Day Child Care (L), Sessional Kindergarten (K) and Maternal & Child Health (M)

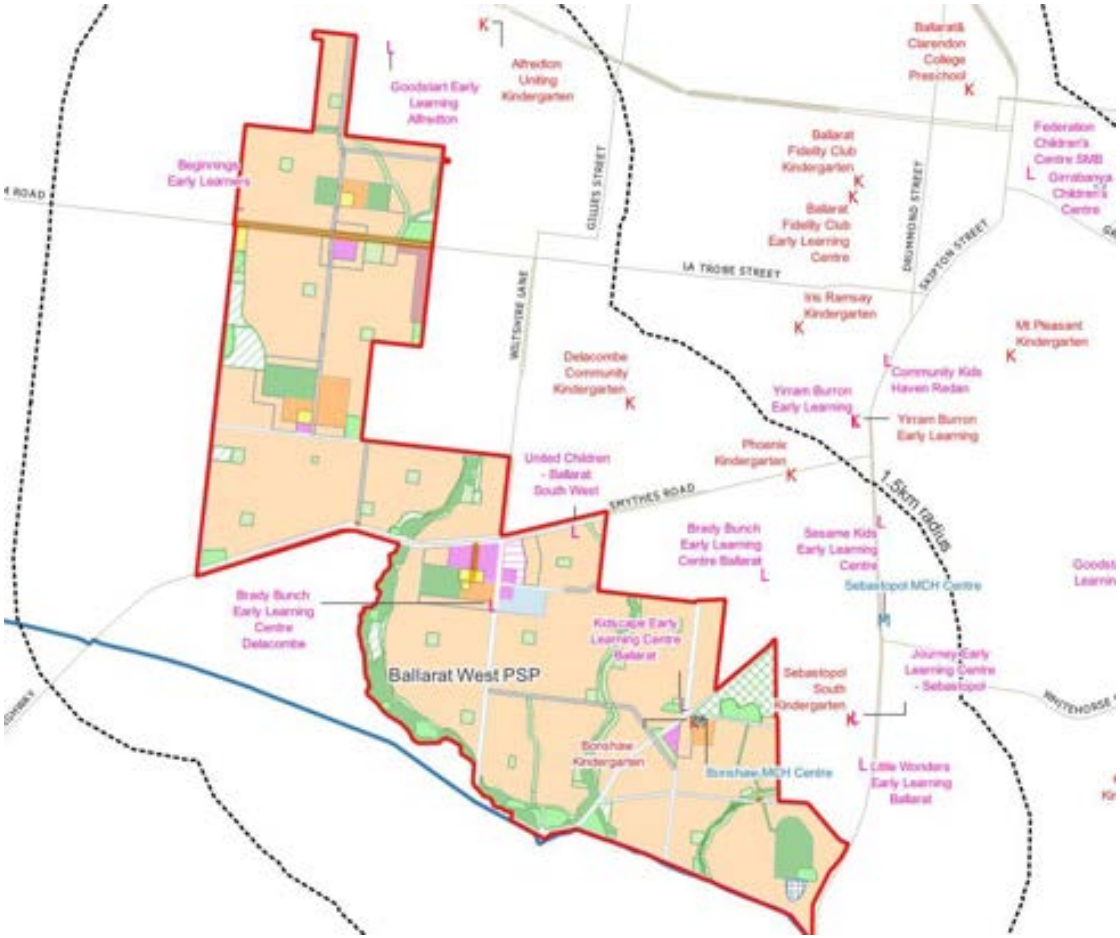


Figure 9 - Open Space and Recreation Facilities

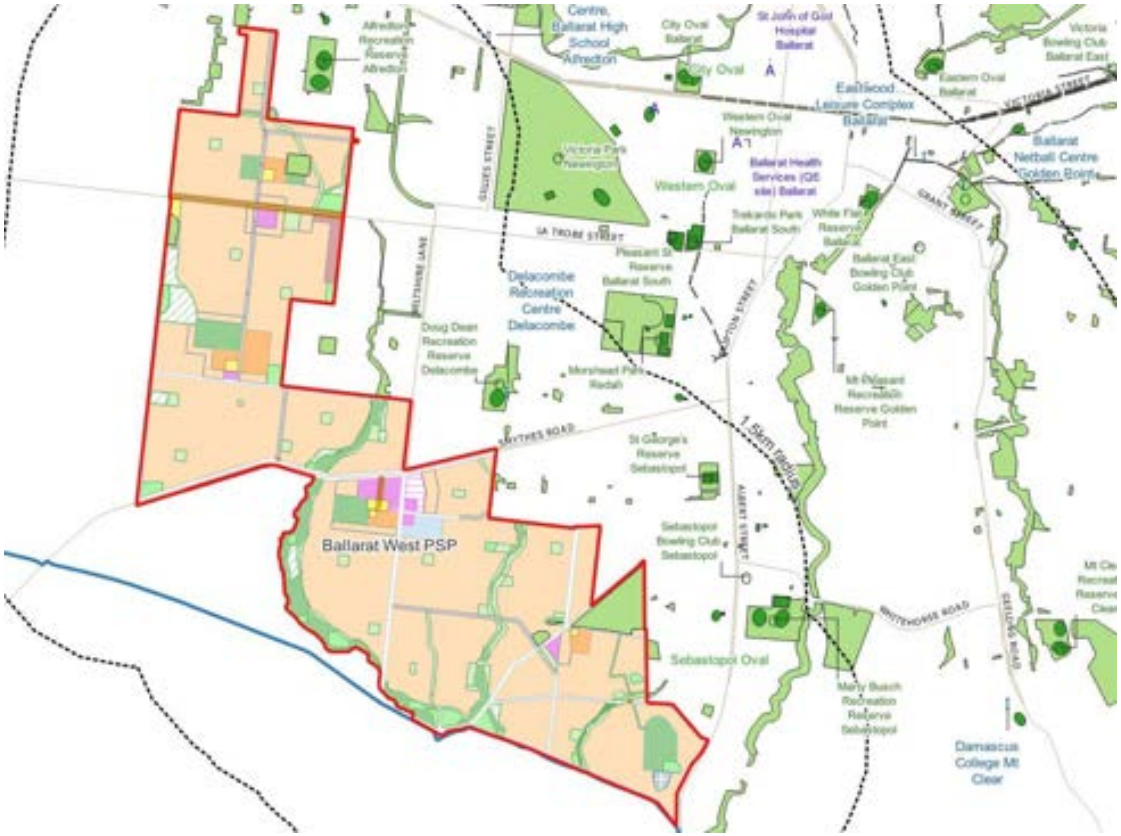


Figure 10 - Education Facilities

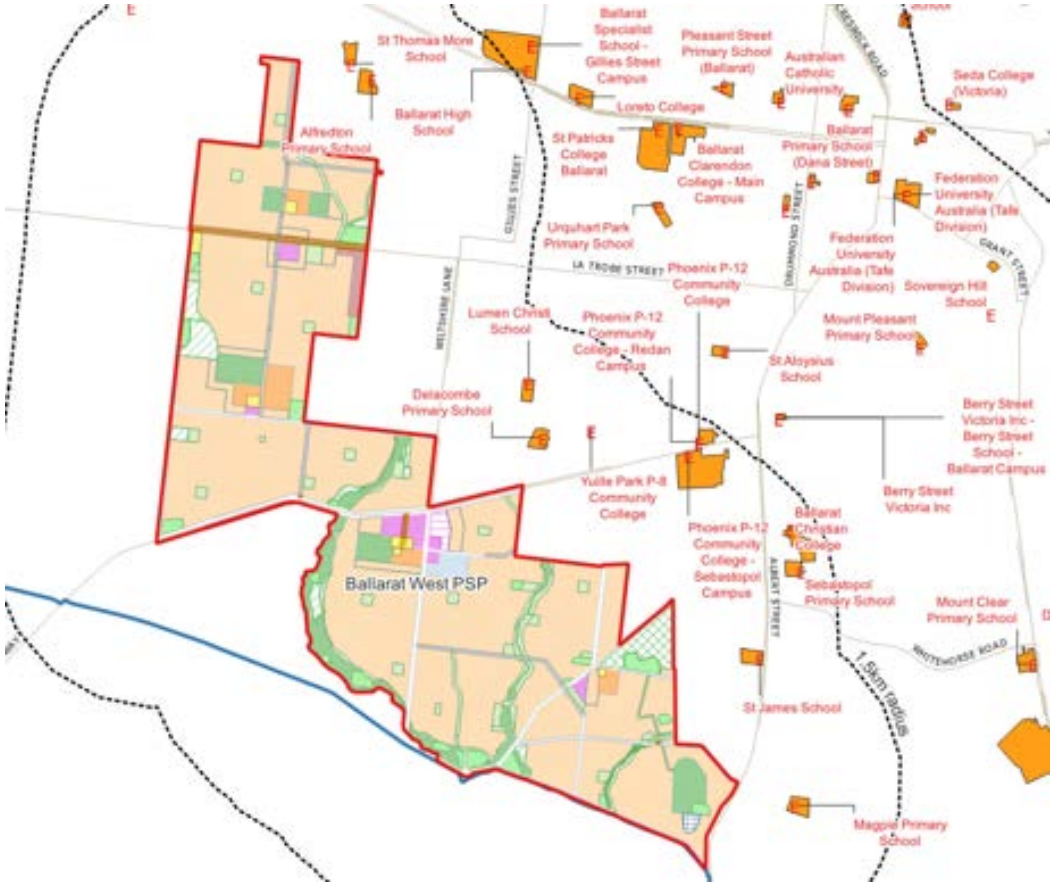


Figure 11 - Law Courts, Police and Emergency Services

Figure 12 - Acute and Community Health Services

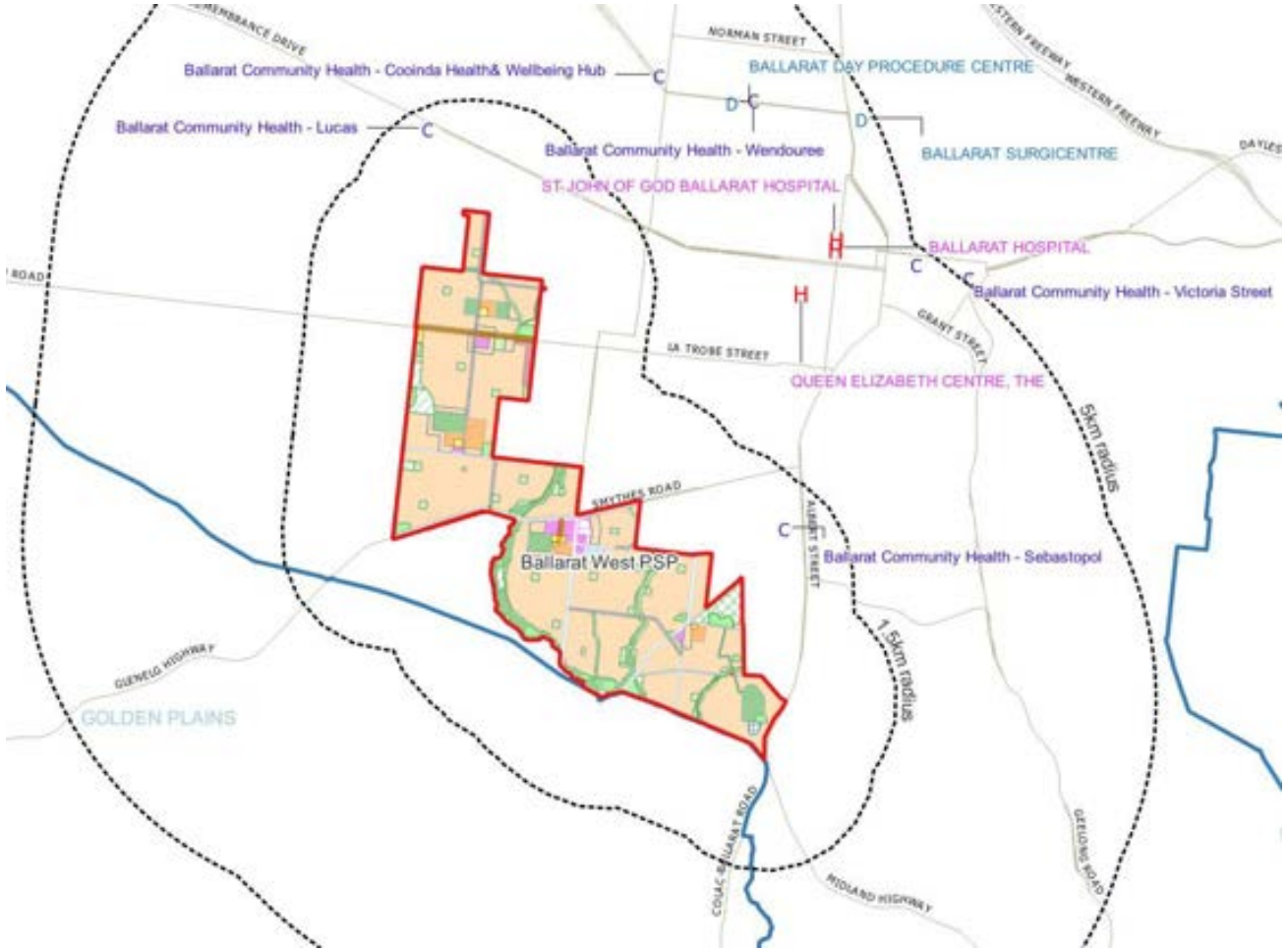


Figure 13 - Residential Aged Care (R), Supported Residential Services (S) and Planned Activity Group Venues (P)

Appendix 3 – Revised Ballarat West PSP Community Infrastructure Demand & Supply Estimates

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
Total public open space contribution (local passive + local active)	10.0%	Percentage of net developable area to be provided as unencumbered public open space	Victorian Planning Authority, Precinct Planning Guidelines (2021)	94.8	98.6
Local passive open space	4.0%	Percentage of net developable area to be provided as unencumbered public open space	Victorian Planning Authority, Precinct Planning Guidelines (2021)	37.9	39.5
Local active open space	6.0%	Percentage of net developable area to be provided as unencumbered public open space	Victorian Planning Authority, Precinct Planning Guidelines (2021)	56.9	59.2
Organised Sport Facility & Participation Estimates					
Indoor and outdoor recreation facilities					
Indoor recreation centres / courts	10,000	Total population per court	Typical standard used by some Melbourne Growth Area Councils (note: individual LGAs vary on their views about the "desired" benchmark and some have no documented working benchmark).	3.9	4.0
Council aquatic leisure centre visits per annum	5.1	Number of visits per person per annum	Victorian Department of Jobs, Precincts & Regions, Know Your Council: 2018-2019 Dataset (All Victorian LGA average)	199,242	204,830
Council aquatic / leisure centres	116,000	Approximate total population per indoor aquatic facility	ASR Research calculation based on the City of Ballarat having 1 indoor aquatic leisure facility (note: the municipality also has 4 outdoor aquatic facilities which are not included in this calculation).	0.3	0.3
Organised Sport Participation					
Participation in organisation/venue based activity: Adults (people aged 15 and over)					
Fitness/Gym	32.2%	% of people aged 15 years and over participating in organised physical activity or sport at least once per year	Australian Sports Commission, AusPlay Survey (AusPlay): January 2019 - December 2019 Victoria Data (Table 11)	9,642	9,912
Swimming	9.7%	As above	As above	2,904	2,986
Golf	4.0%	As above	As above	1,198	1,231

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
Pilates	3.9%	As above	As above	1,168	1,201
Basketball	4.1%	As above	As above	1,228	1,262
Tennis	3.1%	As above	As above	928	954
Football/soccer	3.3%	As above	As above	988	1,016
Yoga	4.2%	As above	As above	1,258	1,293
Netball	3.2%	As above	As above	958	985
Australian football	3.4%	As above	As above	1,018	1,047
Athletics, track and field (includes jogging and running)	3.9%	As above	As above	1,168	1,201
Walking (Recreational)	2.9%	As above	As above	868	893
Cycling	1.4%	As above	As above	419	431
Bowls	1.4%	As above	As above	419	431
Cricket	2.2%	As above	As above	659	677
Organised participation by activity - top 10 activities (children aged 0 to 14)					
Swimming	35.5%	% of children aged 0-14 participating in organised physical activity or sport at least once per year	Australian Sports Commission, AusPlay Survey (AusPlay): January 2019 - December 2019 Victoria Data (Table 10)	2,192	2,254
Australian football	16.8%	As above	As above	1,037	1,066
Basketball	13.7%	As above	As above	846	870
Cricket	6.4%	As above	As above	395	406
Dancing (recreational)	10.2%	As above	As above	630	648
Netball	5.8%	As above	As above	358	368
Football/soccer	10.1%	As above	As above	624	641
Tennis	6.4%	As above	As above	395	406
Gymnastics	11.8%	As above	As above	729	749
Karate	5.2%	As above	As above	321	330

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
Early Years Services					
Kindergartens					
% of 4 year olds participating in 4 year old Kindergarten	100.0%	% of all eligible children participating in 4 Year Old Subsidised Kindergarten	State Government Objective	602	619
Total number of enrolments in 4 year old sessional Kindergarten	75.5%	% of participating children (see above) enrolled at a 4 year old sessional Kindergarten service	Victorian Child and Adolescent Monitoring System (VCAMS), Department of Education & Training Based on indicator 31.4 Number of four year old kindergarten enrolments in a long day care or integrated children's services setting for Ballarat: 24.5% (2015 data).	454	467
Total number of enrolments in 3 year old sessional Kindergarten	75.5%	% of participating children (see above) enrolled at a 3 year old sessional Kindergarten service	ASR Research assumption	447	459
Total 3 & 4 year old enrolments attending sessional kindergarten				901	926
Number of sessional kindergarten rooms required under current kindergarten policy environment (15 hours per week for both three and four year old kindergarten)	*66*	*66 enrolments per room (33 licensed places per room) for both three year old kindergarten & four year old kindergarten.*	*ASR constructed calculation*	14	14
Number of sessional kindergarten rooms required under current kindergarten policy environment (15 hours per week of three year old kindergarten and 30 hours of four year old kindergarten)	*66 enrolments for three year old kindergarten & 33 enrolments for four year old kindergarten*	*66 enrolments per room (33 licensed places each) for three year old kindergarten & 33 enrolments per room (33 licensed places per room) for four year old kindergarten.*	*ASR constructed calculation*	21	21
Maternal & Child Health					
Number of MCH Full-Time Nurses	120	1 FT nurse per 120 children 0 years	ASR Research estimate	4.5	4.7
Number of MCH consulting units	1	Number of MCH consulting units required per FT nurse	Based on above	4.5	4.7
Playgroup					
Number of 2 hr playgroup sessions per week	245	Total number of children aged 0-3 years required to generate	ASR Research constructed measure using Playgroup Victoria	9.3	9.5

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
		demand for a 2 hour playgroup session per week			
Occasional Child Care					
Number of occasional child care places	124	Total number of children aged 0-6 years per licensed LDC place	Department of Education & Training, Register of Approved Children's Services in Victoria (City of Ballarat data, 86 places and 3 services) October 2022	356.2	366
Number of occasional child care centres	30	Total number of facilities required based on number of licensed places generated (see above)	ASR Research constructed measure based on a typical sized occasional child care facility.	11.9	12.2
Long Day Child Care Centres					
Number of Long Day Child Care places	3.3	Total number of children aged 0-6 years per licensed LDC place	Australian Children's Education and Care Quality Authority (ACECQA) National Register Data (City of Ballarat data, 3251 places and 33 services), October 2022	1,242	1,276
Number of Long Day Child Care centres	120	Total number of facilities required based on number of licensed places generated (see above)	ASR Research constructed measure based on a typical large sized long day child care facility.	10	11
Community Centres, Meeting spaces, Neighbourhood Houses & Libraries					
Level 1 community centre	20,000	Population per Level 1 facility for a catchment of 60,000 people	VPA / ASR Research Growth Area Community Centre Planning Guideline	1.9	2.0
Level 2 community centre	20,000	Population per Level 2 facility for a catchment of 60,000 people	VPA / ASR Research Growth Area Community Centre Planning Guideline	1.9	2.0
Level 3 community centre	60,000	Population per Level 3 facility for a catchment of 60,000 people	VPA / ASR Research Growth Area Community Centre Planning Guideline	0.6	0.7
Neighbourhood Houses					
Number of Neighbourhood House users per week	3%	Percentage of population using a Neighbourhod House in a given week	Neighbourhood Houses Victoria, Neighbourhood Houses Survey 2017	1,170	1,203
Number of Neighbourhood Houses	28,000	Approximate total population per facility in the City of Ballarat (2021)	2021 statistic based on 4 existing Neighbourhood House services and a municipal population of 113,500 (2021 estimate)	1.4	1.4
Libraries					

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
Number of library loans annum	5.4	Total loans per person	Public Libraries Victoria Network, 2018-19 PLVN Annual Statistical Survey (2019), Wyndham Libraries	210,550	216,455
Number of library visits per annum	4.4	Total visits per person	Public Libraries Victoria Network, 2018-19 PLVN Annual Statistical Survey (2019), Wyndham Libraries	171,559	176,370
Number of library facilities	38,000	Population per Library facility	2021 statistic based on 3 branch libraries within the City of Ballarat (excluding mobile library locations) and a municipal population of 113,500 (2021 estimate)	1.0	1.1
Education Enrolment & Facility Estimates					
Primary Schools					
Govt Primary Enrolment	55%	% of 5-11 year old population	Australian Bureau of Statistics, 2021 Census of Population and Housing, based on data for Ballarat LGA	2,389	2,456
Catholic Primary Enrolment	27%	% of 5-11 year old population	As above	1,175	1,208
Non Govt Primary Enrolment	12%	% of 5-11 year old population	As above	507	521
Total Primary Enrolment	94%	% of 5-11 year old population	As above	4,078	4,193
Govt Primary School	3,000	Total number of dwellings per facility	Department of Education & Training	4.8	4.9
Secondary Schools					
Govt Secondary Enrolment	40%	% of 12-17 year old population	Australian Bureau of Statistics, 2021 Census of Population and Housing, based on data for Ballarat LGA	1,422	1,462
Catholic Secondary Enrolment	28%	% of 12-17 year old population	As above	984	1,011
Non Gov Secondary Enrolment	20%	% of 12-17 year old population	As above	693	713
Total Secondary Enrolment	88%	% of 12-17 year old population	As above	3,102	3,189
Govt Secondary School	10,000	Total number of dwellings per facility	Department of Education & Training	1.4	1.5
TAFE					
TAFE Full-Time Enrolment (15 to 24)	2.5%	% of 15-24 year old population	Australian Bureau of Statistics, 2021 Census of Population and Housing, based on data for Ballarat LGA	129	132
TAFE Full-Time Enrolment (25+)	0.5%	% 25 + year old population	As above	122	126
TAFE Part-Time Enrolment (15 to 24)	4.4%	% of 15-24 year old population	As above	225	231

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
TAFE Part-Time Enrolment (25+)	1.4%	% 25 + year old population	As above	346	355
Total TAFE Enrolments				822	845
Universities					
University Full-Time Enrolment (15 to 24)	15.2%	% of 15-24 year old population	Australian Bureau of Statistics, 2021 Census of Population and Housing, based on data for Ballarat LGA	769	790
University Full-Time Enrolment (25+)	1.3%	% 25 + year old population	As above	321	330
University Part-Time Enrolment (25 to 24)	2.1%	% of 15-24 year old population	As above	108	111
University Part-Time Enrolment (25+)	1.8%	% 25 + year old population	As above	455	467
Total University Enrolments				1,652	1,699
Primary & Acute Health Services					
Number of public and private hospital beds	3.55	Number of public and private beds per 1,000 people	Australian Institute of Health & Welfare, Hospital resources 2017–18: Australian hospital statistics	138	142
Number of public hospital beds	2.34	Number of public beds per 1,000 people	Australian Institute of Health & Welfare, Hospital resources 2017–18: Australian hospital statistics	91	94
Community health clients	3%	Proportion of population that is a registered community health client	Victorian Auditor-General's report, Community Health Program (June 2018)	1,119	1,150
Allied health service sites	0.8	Number of allied health service sites per 1,000 people (City of Ballarat)	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	31	32
General practices	0.30	Number of general practice clinics per 1,000 people (City of Ballarat)	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	12	12
Dental services	0.30	Number of dental service sites per 1,000 people (City of Ballarat)	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	12	12
Pharmacies	0.20	Number of pharmacies per 1,000 people (City of Ballarat)	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	8	8

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
Projected hospital admissions	476.2	Hospital inpatient separations per 1,000 people (City of Ballarat). Note: projected to increase by 3.2 % per annum until 2026/27.	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	18,567	19,088
Emergency presentations	375	Emergency department presentations per 1,000 people (City of Ballarat). Note: projected to increase by 3% per annum until 2026/27	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	14,622	15,032
Drug & alcohol clients	5.5	Number of registered Alcohol & Drug Treatment clients per 1,000 people (City of Ballarat)	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	214	220
Mental health clients	18.5	Number of registered mental health clients per 1,000 people (City of Ballarat)	Department of Health and Human Services, City of Ballarat Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	721	742
Aged Care & HACC					
Aged Care					
Number of aged care places (residential and home care)	123	Number of aged care places per 1000 people aged 70 years +	Australian Government Planning Ratio 2019	435	447
Short Term Restorative Care Programme	2	Number of STRC places per 1000 people aged 70 years +	Australian Government Planning Ratio by 2019	7	7
Arts & Cultural Activities					
Type of arts / cultural activity participated in (people aged 15 and over)					
Performing in a drama, comedy, musical or variety act	6.2%	% of 15+ population participating in activity	Australian Bureau of Statistics, Participation in Selected Cultural Activities, Australia, 2017–18 (Catalogue Number 4921.0)	1,856	1,909
Singing or playing a musical instrument	4.3%	As above	As above	1,288	1,324
Dancing	4.8%	As above	As above	1,437	1,478
Writing	2.8%	As above	As above	838	862
Visual art activities	1.9%	As above	As above	569	585
Craft activities	1.8%	As above	As above	539	554

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Existing Ballarat West PSP	Revised Ballarat West PSP
Designing websites, computer games or interactive software	2.8%	As above	As above	838	862
Fashion, interior or graphic design	5.7%	As above	As above	1,707	1,755
Type of arts / cultural activity participated in (children aged 0 to 14)					
Drama activities	8%	% of 0-14 population participating in activity	Australian Bureau of Statistics, Participation in Selected Cultural Activities, Australia, 2017–18 (Catalogue Number 4921.0)	488	502
Singing or playing a musical instrument	23%	As above	As above	1,420	1,460
Dancing	17%	As above	As above	1,025	1,054
Art and craft activities	39%	As above	As above	2,396	2,463
Creative writing	23%	As above	As above	1,389	1,428
Creating digital content	17%	As above	As above	1,019	1,047
Screen based activities	90%	As above	As above	5,576	5,732
Reading for pleasure	79%	As above	As above	4,847	4,983

Appendix 4 – Community Infrastructure Specifications

This Appendix shows indicative community infrastructure specifications for the main DCP items typically identified in a PSP. These specifications include active open space reserves, sporting pavilions and community centres.

Table 8 - Typical PSP Active Open Space Specifications by Size

Component	Unit	5 to 6 Hectares	8 to 10 Hectares
Combination of two ovals & three soccer fields	No	1 Ovals 1 soccer	2 Ovals
Car park	Spaces	120	175
Netball / basketball court	No	2	2
Tennis Courts	No	2	
Cricket pitch and practice nets	No	1 /1	2 / 1
Goals	No	2 sets	4 sets
Internal access road	m2	1350	1980
Landscaping	m2	30430	55435
Lighting – training & site	No	6	14
Signage	No	15	24
Site boundary fencing	m	1000	1300
Driveway crossing access from street	No	1	1
Utility service connections	Item	1	1
Interchange shelters	No	5	8
Turf surface and irrigation system	m2	21340	55440
Score Board	No	2	2

Source: Review of Benchmark Infrastructure Costings: Benchmark Infrastructure Costing, Prepared for VPA by Cardno (2018)

Table 9 - Typical PSP Sport Pavilion Specifications by Number of Playing Fields

Description / Facility	Unit	Two playing areas	Three playing areas
Four changes rooms with toilets and showers	m2	120	
Six change rooms with toilets and showers	m2		240
Two umpire change rooms with toilets	m2	40	
Three umpire change rooms with toilets	m2		60
Storage	m2	80	120
Office / first aid room	m2	20	30
Canteen and kitchen	m2	20	40
Public Toilets	m2	40	60
Multipurpose community room / social room (A small (50-80m2) community meeting space, entry foyer and circulation space)	m2	100	
Multipurpose community room / social room (A small (100-125m2) community meeting space, entry foyer and circulation space)	m2		150
Total Building floor space	**m2**	**420**	**700**
Covered spectator area	m2	80	120

Source: Review of Benchmark Infrastructure Costings: Benchmark Infrastructure Costing, Prepared for VPA by Cardno (2018)

Table 10 – Typical PSP Community Centre Configurations x Hierarchy Type

Description / Facility	Unit	Level 1	Level 2	Level 3
Kindergarten Facility Two kindergarten rooms to accommodate 99 licensed places, including children's toilets and amenities, storage space, office, staff room and staff toilets and amenities display and circulation space	m2	750	750	
Extra 33-place kindergarten room / multipurpose meeting space	m2	150	150	
Maternal and child health consulting facility (two consulting rooms plus waiting space / program room	m2	100	100	
Multipurpose community spaces (A combination of small (50-80m2) and medium (100-125m2) community meeting spaces, plus public toilets and amenities, office, staff room and staff toilets and amenities, reception and circulation space)	m2	200	500	
Multipurpose and specialist community spaces (A combination of small (50-80m2), medium (100-125m2) and large (180m2+) community meeting spaces and classrooms plus public toilets and amenities, reception and circulation space)	m2			450
Library	m2			1500
Specialist community space (adult reception / neighbourhood house, arts and cultural facility, youth facility, planned activity group space etc)	m2			250
Total building floor space	**m2**	**1200**	**1500**	**2500**
Small commercial kitchen	No	1		
Medium commercial kitchen	No		1	
Large commercial kitchen	No			1
Kindergarten outdoor play spaces	m2	700	700	
Car parking spaces	Spaces	60	75	125
Playground	m2	800	800	800
Landscaping	m2	500	500	500

Source: Review of Benchmark Infrastructure Costings: Benchmark Infrastructure Costing, Prepared for VPA by Cardno (2018)

Appendix 5 – State Government & Other External Agency Responses

Department of Education

Schools and Regional Services

2 Treasury Place
East Melbourne Victoria 3002
Telephone: 03 9637 2000
DX210083

COR23121574

Natalie Robertson
Director Development and Growth
City of Ballarat
natalierobertson@ballarat.vic.gov.au

Dear Ms Robertson,

RE: Ballarat West Precinct Structure Plan Review

Thank you for your email correspondence of 10 February 2023 seeking the Department of Education's (the department) feedback on the proposed 5-year review of the Ballarat West Precinct Structure Plan (PSP) and the Development Contribution Plan (DCP), as part of the state agencies stakeholder engagement and consultation process.

The department understands that its views will inform a Council decision regarding the proposed government school provision and site locations within the Ballarat West PSP.

The department has reviewed the information provided by Council and is pleased to provide the following comments and advice in relation to the proposed PSP review.

Government education infrastructure need for the Ballarat West PSP

It is noted that the following proposed government school sites are identified in the Ballarat West PSP, with school opening years not yet identified or publicly committed by the department.

- Alfredton West Proposed P6
- Ballarat West Proposed P6 and Ballarat West Proposed 7-12
- Cherry Flat Proposed P6
- Bonshaw Proposed P6

Annually, the department considers population forecasts and the capacity of existing schools to identify expected shortfalls in government primary, secondary and specialist school demand.

For Ballarat West PSP and the surrounding areas, the department will keep considering:

- Existing and forecast student demand,
- Access to designated government schools within reasonable travel time,

- Additional student demand triggered by Ballarat West PSP and other precincts, and
- Potential schools within Ballarat LGA and surrounds.

The information provided by Council indicates that the dwelling yield and densities in the Ballarat West PSP are similar to those forecast by Council at the commencement of the original PSP, and more than 70% of the PSP development is complete or near/under completion.

Based on the above data regarding revised dwelling yield and densities, the school provision within Ballarat West PSP remains current.

The department also notes that the existing land holdings with Ballarat Local Government Area (LGA) is expected to be sufficient to meet specialist education demand in Ballarat over the next 20 years. The department will continue to monitor the educational needs of students with disability in the Ballarat LGA and consider opportunities to strengthen inclusive education options as appropriate.

Kindergarten and Early Childhood Infrastructure

The department expects that the land allocated within the PSPs for community facilities should be located alongside new Primary School sites, in alignment with State government's commitment to ditch the double drop off. The Building Blocks Capacity Grants program is available to councils to support the delivery of community facilities.

The published Kindergarten Infrastructure and Services Plans (KISP) signed in March 2022 in response to Three-Year-Old kindergarten demand is available here. The department will engage with all local government authorities (LGAs) this year to update agreed KISP with demand for Pre-Prep.

In 2023, families in Ballarat have access to between 5 and 15 hours a week of kindergarten programs for three-year-olds. Pre-Prep rolls out in Ballarat City from 2029 with 16 to 20 Hours per week for 40 weeks of the year, with all children receiving 30 hours by 2032.

Since launching in 2020, Building Blocks grants have been laying foundations for these major reforms. They have helped local councils and other not-for-profit providers build, expand and modernise kindergartens across the state. The Building Blocks Capacity Building grants stream provides funding for projects that create additional kindergarten places for 3-year and 4-year-olds by building new, or expanding existing, infrastructure. With joint investment from the sector, the department is creating more kindergarten places. Building Blocks is also making kinder buildings, playgrounds and equipment more inclusive for children of all abilities.

Besides the grants streams, the department also offers the Building Blocks Partnerships program, and works closely with local governments and not-for-profit providers to plan and build kindergartens in the areas that need them.

The KISP planning processes will be underpinned by Building Blocks Partnerships. These are long-term, in-principle agreements between the department and LGAs or not-for-profit providers for co-investment in multi-site 'project pipelines'. Partnerships will build capacity for both Three and Four-Year-Old Kindergarten, through multiple projects over several years under agreed funding parameters. Building Blocks Partnerships will be a critical means of working with large partners, particularly LGAs to build large numbers of facilities over time.

The department and Council will continue to discuss Council's strategy and response to the Best Start Best Life reforms.

Proposed School Sites

The department considers a range of principles and requirements when selecting new school sites. Each proposed government school site brings with it a range of risks, opportunities and constraints and its suitability needs to be assessed on a case-by-case basis. The *Victorian Government School Site Selection Criteria Guidance* outlines the key factors considered by the department when assessing proposed government school site options. The *Victorian Government School Site Selection Criteria Guidance* can be found here.

In order to inform the review, all proposed school sites identified within the Ballarat West PSP have been assessed for suitability against the *Victorian Government School Site Selection Criteria.*

In reviewing the proposed school sites, it has come to light that the land use changes in the PSP have resulted in deviations from the PSP identified school sites, being not consistent with the department's site selection criteria nor the approved Ballarat West PSP.

Ballarat West Proposed P-12

The subject site is located within the Greenhalghs Road sub precinct of the PSP. The department is planning for two schools on this site including a primary and a secondary school respectively. Prior to funding, in the interim, the department refers to the proposed government schools that would be on this site as **Ballarat West Proposed P6** and **Ballarat West Proposed 7-12**.

It is understood that the subdivision permit PLP/2017/225 that has created the proposed school site has been issued, altering the location of the proposed school from that identified in the PSP.

The new school location is still within the community hub. The department officers advised Council officers on 21 April 2023 that while the location of this proposed government school site has already been established through the subdivision process is not consistent with the department's site selection criteria nor the approved Ballarat West PSP. The department would be agreeable and open to further considering the option of a proposed government school site in this sub precinct that would enable the kinder facility to be collocated with the proposed government school site. The department understands there may be opportunity to make minor alterations to the subdivision layout to address the department's concerns, such

as swapping the leisure centre and community centre locations to enable co-location of the kinder facilities with the school in line with state government policy.

Further to Council's response of 27 April 2023, the department looks forward to working collaboratively with Council to improve the suitability of the proposed school, particularly in relation to co-location with a kinder facility.

Alfredton West Proposed P6

The subject site is located within the Carngham Road sub precinct of the PSP. Prior to funding, in the interim, the department refers to the proposed government school that would be on this site as **Alfredton West Proposed P6**.

It is understood that the subdivision permits that have created the proposed school site have been issued. The school site straddles two planning permits as follows:

- Permit PLP/2013/686/C – part school site 2.86 hectare
- Permit PLP/2021/356 – part school site 0.6086 hectare
- Total school site – 3.47 hectare

An assessment of the proposed site was undertaken against the *Victorian Government School Site Selection Criteria* and in the context of the current land use arrangements in this sub precinct approved by Council via various planning permits. This indicates that although the original school site in the PSP has been relocated to a new site, it still meets the department's criteria for school site selection. The new school location is still located within the community hub co-located with a kinder facility.

Cherry Flat Proposed P6

The subject site is located within the Major Activity Centre (Delacombe Town Centre) Sub-Precinct Carngham Road sub precinct of the PSP. Prior to funding, in the interim, the department refers to the proposed government school that would be on this site as **Cherry Flat Proposed P6**.

The department has previously expressed concerns via its letter COR22103549 dated 11 July 2022 to a planning permit (PLP/2021/335) regarding the subdivision of land at 88 Cherry Flat Road that among other aspects, impacted this proposed government school site. A copy of this correspondence is attached for reference.

It is understood that the subdivision permit that have created the proposed school site has been issued and notes that this has implications for the Cherry Flat Proposed P6 site.

During a meeting held between the representatives of the department and Council on 30 August 2022, the department had reiterated that while the location and size proposed by Council is not consistent with the department's site selection criteria, the department would be agreeable and open to further consider the option of a proposed government school site

at 54 Cherry Flat Road, Smythes Creek on the proviso that the additional parcel of land 0.46 hectare (as identified in the Planning Permit PLP/2021/335) on land to the south at 88 Cherry Flat Road is identified as part of the proposed government school site in the reviewed Ballarat West PSP.

Please note that the department does have concerns that the proposed site still does not support the co-location of new government primary schools with kindergartens.

The department wishes to ensure that the kindergarten capacity created through the proposed community facility is aligned to need and is keen to work closely with Council as Council plans the community facility to understand the level of kindergarten facilities to be provided related to anticipated demand for services. It would be appreciated if Council could make contact with the department at the appropriate time to further these discussions.

Bonshaw Proposed P6

The subject site is located within the Bonshaw sub precinct of the PSP. Prior to funding, in the interim, the department refers to the proposed government school that would be on this site as **Bonshaw Proposed P6**.

The department was notified of a planning permit application PLP/2022/393 - 19 Cobden Street, Sebastopol by Council. This application among other aspects, proposes to create part proposed government school site. The department provided a response via its letter COR22104812 dated 28 August 2022. A copy of this correspondence is attached for reference.

Thank you once again for the opportunity to provide comments.

I would encourage Council to further contact the department as the review of the Ballarat West PSP progresses or if Council has any other queries regarding planning for government schools more broadly.

If you have any further queries please contact Mr Mukul Hatwal, Senior Planner, Infrastructure and Planning Branch, Department of Education on 03 7022 0608 or by email: provision.planning@education.vic.gov.au.

Yours sincerely

Jonathan Hopley
Acting Director
Infrastructure and Planning
School Provision and Establishment Division
Department of Education

22/06/2023

cc: *Chris Duckett, Manager Sustainable Growth*
chrisduckett@ballarat.vic.gov.au

Vicky Lu, Sustainable Growth Planner
vickylu@ballarat.vic.gov.au

Ethos Urban

16 March 2023

3220324

Rob Panozzo
Director
ASR Research Pty Ltd
Mezzanine Level
Suite 7, 321 Chapel Street
Prahran VIC 3181

Sent via email: rpanozzo@asrresearch.com.au

Dear Rob,

RE: Ballarat West PSP - Provision of Catholic Schools

Ethos Urban act on behalf of the Diocese of Ballarat Catholic Education Limited (DOBCEL). DOBCEL is the governing body for Catholic education within the Diocese of Ballarat and oversee the provision and operation of Catholic schools at both the primary and secondary level across the western region of Victoria, including within the regional centres of Ballarat, Warrnambool and Mildura.

Ethos Urban has assisted DOBCEL in understanding the future strategic provision and operation of Catholic schools in Ballarat. The population growth and future planning occurring in Ballarat means there is a significant benefit in undertaking a strategic approach to planning for the infrastructure that will support these growing communities. As one of the three forms of organised education, planning for Catholic schools similarly needs to be approached strategically. A strategic approach to the provision of Catholic schools includes considering the current supply of Catholic schools, as well as considering the additional need for these schools to support the future population in regional areas.

DOBCEL can confirm that the current provision of a Catholic primary school within the existing Ballarat West PSP area is required. DOBCEL have previously had discussions in relation to the acquisition of a site located within the PSP however will now pursue the opportunity provided in Community Hub 3. DOBCEL are eager to contribute to discussions to refine the layout and siting of a Catholic primary school in this location to ensure an optimum solution for the Hub.

We note that there is a substantial growth front proposed in the western and north western growth areas. As these areas are further planned DOBCEL will consider the appropriate strategic provision for Catholic schools. The strategic work undertaken by Ethos Urban suggests that a further Catholic primary and secondary school will be required to service these new areas. DOBCEL are eager to collaborate with Ballarat City Council to facilitate the necessary Catholic primary and secondary school provision as further planning occurs in these new growth areas.

Please don't hesitate to contact me if you have any questions or concerns.

Yours sincerely,

Tim Peggie
Director
+61 419 944 934
Tpeggie@ethosurban.com

Department of Justice and Community Safety

Community Safety Building Authority

Level 7
121 Exhibition St
Melbourne Victoria 3000
justice.vic.gov.au

Date: 9 March 2023

Our ref: EBC 23030702

Mr Chris Duckett
Manager Sustainable Growth
City of Ballarat
chrisduckett@ballarat.vic.gov.au

cc: Evan King CEO, City of Ballarat

Dear Mr Duckett,

Re: Ballarat West PSP Review – Community and Recreation Infrastructure Needs

Thank you for the opportunity to provide input for the review of the Ballarat West Precinct Structure Plan (PSP). The Department of Justice and Community Safety (DJCS) offers the following comments.

The current PSP, which was adopted in 2016, had 2 hectares of land allocated for emergency services infrastructure along Ballarat-Carngham Road in the north-western part of the PSP. This allocation recognised the necessary provisioning for emergency services to service the forecast population growth in the Ballarat municipality.

During the recent PSP review consultation, DJCS discovered that this land has since been used for residential development, potentially leaving the precinct and surrounding areas without adequate emergency services coverage in the future.

DJCS therefore requests the re-instatement of 2 hectares of land into the PSP to allow for emergency services facilities, in order to accommodate the following critical infrastructure:

- A Victorian State Emergency Service (VICSES) facility (Council has indicated it will not renew the lease at the existing site, leaving the municipality with no SES facility)
- An additional fire station (may be Country Fire Authority (CFA) or Fire Rescue Victoria (FRV), depending on boundary review)
- A 24 hour police station (may replace or complement the operations of the existing 16 hour police station at Ballarat West, depending on future police service delivery requirements)
- DJCS is unable to comment in relation for provisioning of Ambulance Victoria infrastructure, which is managed by the Department of Health, however the substantial increase in population would likely drive a need for an expanded ambulance presence.

The provisioning is not required as a single 2 hectare parcel of land, but could be distributed across the PSP in accordance with the following requirements:

- Pending confirmation of future service delivery requirements, Victoria Police will require a site of a minimum 5,000 sqm. This would be best located within a Major Activity Centre, both for community accessibility and the passive law enforcement impact of having a visible policing presence in the community.
- Volunteer emergency responders, such as the CFA and VICSES require a site of approximately 3,500 – 4,000 sqm and are best located on the periphery of residential areas or in industrial areas to avoid disturbing residents with training and operational activities, while preserving response times.
- All emergency services agencies require ready access to main roads to facilitate emergency response times.

DJCS is aware that there is significant development occurring in the Ballarat municipality, beyond the PSP that is the subject of this review, and that will impact the adequacy of emergency services provisioning for the municipality. This includes:

- additional greenfield development in the Northern, Western and North-western areas at 832, 1,156 and 559 hectares respectively.
- urban infill projects totalling 535 hectares in the CBD, Saleyards area, Wendouree Village and the Delacombe, Creswick Road, Scott Parade and Selkirk precincts
- the 438 hectare Ballarat West Employment Zone (BWEZ), which will see a large contingent of commercial and industrial enterprises alongside an Intermodal Freight Hub accommodated in and around the Ballarat Airport
- upgrade of the Ballarat Airport runway to accommodate larger aircraft.

Depending on the forecasting model used, these developments will see the population of Ballarat grow anywhere between 40 and 80 percent over the next 25 years, to somewhere between 160,000 and 205,000 residents living in the greater Ballarat region.

Urban infill will increase residential density, potentially heightening the risk of fire and increasing demand on existing emergency services provision within the CBD area. Residential development in the greenfield locations will expand the urban boundary of Ballarat, requiring existing services to travel further to respond to emergencies in the new communities. Without additional provisioning, this may compromise service response times, which increases the risk of unnecessary injury, and loss of life and property.

The development of the BWEZ, with its high concentration of industry and upgraded intermodal freight terminal is of significant interest to emergency services, given likely increased demand driven by the expected 9,000 people working in and around this area with the associated occupational hazards of the industry types listed in the Development Plan for the zone. These include manufacturing, construction, transportation and logistics, wholesale trade and enabling industry sectors, and explicitly limit the inclusion of lower risk enterprises such as retail, offices and warehousing.

Council appears to have recognised the impact the planned developments will have on demand for some types of community infrastructure through the generous provisioning for parks and open spaces, early years hubs, community centres, an indoor recreation facility, schools and a library.

DJCS advises that the amenity provided to residents by these facilities should be safeguarded by proportionate provisioning for the services that respond to calls for assistance and keep people safe in their homes and communities. There will be a substantial under-provisioning of emergency services infrastructure if the 2-hectare allocation is not restored in the updated PSP.

Should you wish to discuss the matter, please do not hesitate to contact Robyn Gould, Senior Business Analyst, Department of Justice and Community Safety on 0413 124 010 or by email robyn.gould@justice.vic.gov.au.

Yours Sincerely,

Sam Werner
A/CEO
Community Safety Building Authority
Department of Justice and Community Safety

Department of Health

From: Natalie Weerawardane (Health) <Natalie.Weerawardane@health.vic.gov.au>
Sent: Monday, March 20, 2023 2:37 PM
To: Robert Panozzo <rpanozzo@asrresearch.com.au>
Subject: FW: OFFICIAL: Requirements for land/ health services/facilities in Ballarat West - advice required by COB 17 March

Natalie Weerawardane (she/her)
Manager Strategy and Policy
Health Infrastructure Policy
Health Infrastructure Division
Department of Health
health.vic.gov.au
0448 103 646 **|** **Natalie.weerawardane@dhhs.vic.gov.au**

OFFICIAL

From: Elysia Delaine (Health) <Elysia.Delaine@health.vic.gov.au>
Sent: Thursday, 16 March 2023 5:11 PM
To: Natalie Weerawardane (Health) <Natalie.Weerawardane@health.vic.gov.au>
Cc: Kiewa L Lovett (Health) <kiewa.l.lovett@health.vic.gov.au>; Ann Hindell (Health) <ann.hindell@health.vic.gov.au>; Camilla Macdonell (Health) <Camilla.Macdonell@health.vic.gov.au>
Subject: RE: OFFICIAL: Requirements for land/ health services/facilities in Ballarat West - advice required by COB 17 March

Hi Nat

Thanks for the opportunity to provide input into the Ballarat West community infrastructure needs.

From an Early Parenting Centre (EPC) perspective, the Ballarat EPC currently which is under construction will be located at 10 Fawcett Rd, Lucas, in the heart of Ballarat West Growth Zone.

Regarding slide 10, we expect that the MCH service will be co-located in the new early years hubs These spaces also have the opportunity for other health services to partner operate in the space.

Long-term planning provision should also be made for Aboriginal-led service delivery from new spaces. At a minimum organisations such as Ballarat and District Aboriginal Cooperative should be offered co-location opportunities for any new infrastructure builds related to community hubs or early years hubs.

Please let me know if you would like to chat further about any of the above feedback.

Kind regards

Elysia Delaine (she/her)
Acting Manager | Early Parenting Centres Expansion Project
Community Based Health Services, Policy and Improvement
Commissioning and System Improvement Division
Department of Health
T (03) 8633 4917 | elysia.delaine@health.vic.gov.au
www.health.vic.gov.au

From: Jimmy K Chan (DJPR)
To: Robert Panozzo
Subject: OFFICIAL: RE: Ballarat West PSP Review of Community Infrastructure and Open Space
Date: Thursday, 16 March 2023 11:04:38 AM
Attachments: image001.png

OFFICIAL

Hi Robert,

Thanks for the meeting a few weeks ago and for the opportunity to provide input into the Ballarat West PSP.

We can confirm that from our perspective, there are no regional scale sport and recreation priorities within the boundaries of the PSP.

In terms of local requirements and priorities, we are confident that the Ballarat City Council are best positioned to provide information that will inform the local community sport and active recreation infrastructure requirements for this PSP. Any information/support of specific open space land allocations that we would be able to provide to inform the development of the PSP would be derived from information we receive from Ballarat City Council.

We understand that there is strong community sport support and current and emerging participation and programming (particularly for basketball and netball) to support demand for the provision of an indoor recreation facility in the area. Identifying the *Construction of Indoor Recreation Centre adjacent to the Greenleighs AOS Reserve (8 courts)* at Community Hub 3, we believe this will help meet this demand and support its continued inclusion in this PSP.

We would encourage the VPA to work with Ballarat City Council to further explore the demand and supply for indoor recreation in Ballarat West and the surrounding future growth areas, particularly with consideration of the network of facilities across the municipality and broader inter-municipal interdependencies.

Thanks again for the opportunity to provide input into this PSP.

Jimmy Chan
Principal Adviser, Precincts and Priority Projects | Community Infrastructure and Place
Sport and Recreation Victoria

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ENGENY

BALLARAT WEST PSP REVIEW

Drainage Strategy Update

Prepared on behalf of City of Ballarat

VC2031_001-REP-001-6

19 DECEMBER 2024

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Rev	Date	Description	Author	Reviewer	Project Mgr.	Approver
0	26/09/2023	Client Issue	Harry George	Glenn Ottrey	Glenn Ottrey	Paul Clemson
1	21/12/2023	Client Issue	Harry George	Glenn Ottrey	Glenn Ottrey	Paul Clemson
2	16/02/2024	Client Issue	Harry George	Glenn Ottrey	Glenn Ottrey	Paul Clemson
3	27/02/2024	Client Issue	Harry George	Glenn Ottrey	Glenn Ottrey	Paul Clemson
4	5/03/2024	Client Issue	Harry George	Glenn Ottrey	Glenn Ottrey	Paul Clemson
5	11/04/2024	Client Issue	Harry George	Glenn Ottrey	Glenn Ottrey	Paul Clemson
6	19/12/2024	Client Issue	Harry George	Glenn Ottrey	Glenn Ottrey	Paul Clemson
Signatures:						

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1. INTRODUCTION

The City of Ballarat is undertaking a review of the Ballarat West Precinct Structure Plan (PSP) and Development Contributions Plan (DCP).

As part of the PSP and DCP review Engeny was engaged by the City of Ballarat (Council) to undertake an update of the Ballarat West PSP drainage strategy, which comprises Precinct 1, Precinct 2 and Precinct 4. The drainage strategy provides inputs to the PSP in terms of the required drainage and stormwater treatment infrastructure and to the DCP with cost estimates undertaken for the proposed assets. Some changes have been made since the strategy was first developed in 2011 and to date, they were largely to accommodate construction staging and implementation of drainage works. The 2023 update focuses more on the changes that maybe required to the drainage strategy to reflect with the most recent updated guidelines and standards that have been released since 2011. The updated guidelines include Australian Rainfall and Runoff 2019 (ARR 2019), updated design guidelines, updated Urban Stormwater Management Guidelines (EPA Victoria, June 2021) and the Ballarat Integrated Water Management Plan (Feb 2018).

While some changes have been made since the original strategy was developed in 2011, the objectives and location of key infrastructure is still largely in line with the original strategy. This updated strategy will supersede all previous strategy documents and be the working strategy for the implementation of the remaining assets in the drainage strategy.

1.1 Scope of Works

The scope of works for this drainage strategy update includes the following:

1.1.1 Part A – Review of Current Status

A determination of the current status of the drainage strategy and its implementation. This involved the following:

- Review documentation including plans and report regarding changes to the drainage strategy which have occurred since the previous reviews were undertaken or the strategy was setup (as appropriate).
- Determining which assets were already constructed or committed due to the level of progression design or construction work already completed in accordance with the previous strategy.
- Determine which areas still required drainage, treatment or retardation assets to be constructed in order to service those parts of the development.
- Summarising this work in a memo to Council the details of which are included in this report.

1.1.2 Part B – Modelling Updates

- Update the RORB hydrologic model to reflect the following:
  - Current development status, including all changes made to the scheme.
  - The storage available above the extended detention depth level of the wetland where wetlands and retarding basins are co-located (in line with current MW guidance).
- Update the RORB model to be compliant with Australian Rainfall and Runoff 2019
  - Update the land use types to reflect effective impervious areas, indirectly connected areas and pervious areas.
  - Update the intensity, frequency and duration rainfall data from the Bureau of Meteorology.
  - Update the model to an initial and continuing loss model (from runoff coefficient).
  - Update the flow validation of the RORB model based on guidance from the Corangamite CMA or other regional validation methods.
  - Expand the RORB model to include the whole Winter Creek catchment.
  - Rerun the RORB model for the 20% and 1% AEP events and determine if the Retarding Basin (RB) sizing is acceptable to meet the flow targets
  - Rerun the RORB model for the 20% and 1% AEP events for climate change scenario.

- Update the MUSIC water quality model to include the following:
  - To reflect the current development status.
  - Consideration of Gross Pollutant Traps (GPTs) at the entries to wetlands.
  - To reflect the guidance provided by Melbourne Water in their Wetland Design Manual (reducing the extended detention depth to 350 mm from 500 mm and adjusting the sedimentation basin sizing to be based on a Fair and Geyer calculation).
- Consideration of implementation of rainwater tanks on lot scale and / or stormwater harvesting for the oval from the adjacent wetland/retarding basin to try to achieve the goals set out in the Urban Stormwater Best Practice Environmental Guidelines issued by the EPA. These guidelines have strong total flow volume reduction targets, which can be challenging to achieve with traditional wetlands and sedimentation basins alone.
- Consideration of staging and delivery of future assets to guide the priority of the delivery of as yet unconstructed assets
- Noting the assumptions and exclusions used in updated this strategy.

1.1.3 Part C – Final Report

- Summary of development completed within the PSP and the drainage infrastructure delivered along with any changes to the drainage strategy
- Overview of the current works completed relative to the updated guidelines
- Details of the proposed changes to make the remaining undeveloped parts of the scheme compliant with the updated guidelines, including justification for why the changes are needed

  High level cost estimates of the proposed wetland, sedimentation basin, retarding basin and pipe assets. We note that we are not quantity surveyors and are not proposing to engage quantity surveyors but will use previous construction rates we are aware of and also information provided by the City of Ballarat relating to local construction costs. The more recent local information that can be provided the better our cost estimates will be. We will also require information from the City of Ballarat to inform likely land acquisition costs based on recent previous acquisitions. Engeny has significant experience in costing drainage schemes for Melbourne Water and undertook a project on behalf of Melbourne Water to review and update the standard rates to cost drainage schemes.
- Details on the proposed staging and development of works including a table showing which infrastructure is required to support each property to develop.
- Staging plan for the next 10 years to help deliver good stormwater management outcomes in the remainder of the drainage scheme.

1.2 Previous Drainage Strategy Reports

The following previous drainage strategy reports have been used to guide this updated drainage strategy as they have materially changed the PSP stormwater management strategy direction. There are other adjustments to the delivery of on ground infrastructure which have been implemented as the designs have progressed from concept design to detailed design but are considered to be generally in accordance with the intent of the scheme design and so are not listed below:

- Ballarat West Growth Area PSP Drainage Report by SMEC Urban / Engeny Management (February 2011)

  Engeny was previously engaged in 2011 by SMEC and the City of Ballarat to inform the Ballarat West Development Contributions Plans (DCP) in relation to drainage infrastructure. Engeny undertook the hydrologic and water quality modelling, developed concept layouts for pipes and retarding basins, and prepared preliminary cost estimates for the drainage assets.
- Updated functional designs of retarding basins 11, 12 and 13 by Neil Craigie (2015)

  The location and designs of retarding basins 11, 12 and 13 were updated to help facilitate development in the north western area of Precinct 1. This included areas of the Delacombe Town Centre and adjacent residential development.
- Review of Main Drain proposals for the Power Park Catchment in Precinct 1 by Neil Craigie (August 2015)

  An update to the proposed drainage layout and layout of RB 28 which is proposed within the Power Park reserve. This review recommended the removal of RB30 and replaced it with an online sedimentation basin.
- Lot32 and 32A Tait Street IWMS by Niel Craigie (September 2015)

Proposed a staged approach to the construction of RB18 to help facilitate development

- RB26 Catchment and Outfall IWMS by Neil Craigie (July 2016)

  A variation to the original stormwater management strategy which amalgamated RB25 and RB26 into a single basin as part of the Ploughmans Arms development.

- Memorandum: Update of Engeny RORB Modelling and Adjustments to the SWMS Across the BWGA by Neil Craigie (April 2019)

- Ballarat West Growth Area PSP by Engeny (November 2021)

  Engeny was engaged by the City of Ballarat to undertake a review of the Ballarat West Precinct Structure Plan (PSP) drainage catchment design. An update was required to reflect changes to the drainage network caused by the need to build new infrastructure to support developments built "out-of-sequence". This included drainage upgrades needed for the delivery of Webb Road (East) and Ascot Gardens Drive resulting in runoff being directed west of Webb/Cherry Flat Road. This report was prepared to assist Council with:

  - Determining the development contributions needed to facilitate a timeline for implementation of drainage assets (i.e. identifying when and where the infrastructure will be needed).
  - Optimising the sequence of development to ensure timely provision of infrastructure.
  - Budget forecasting using estimated costs associated with the drainage assets.

- Ballarat West Growth Area PSP: Precinct 2 Review by Engeny (April 2022)

  This report update was required to reflect changes to the drainage network caused by the need to build new infrastructure to support developments built "out-of-sequence". This included drainage upgrades needed for the delivery of Webb Road (East) and Ascot Gardens Drive resulting in runoff being directed west of Webb/Cherry Flat Road.

- Memorandum: Ballarat RB04 and RB05 Review – Initial Drainage Review Findings by Engeny, (September 2022)

  This memo review focuses on the drainage of the southern portion of the Alluvium Estate and the drainage of the adjacent parcels of land in Precinct 2. The key updates included an updated strategy developed by Neil Craigie in 2019 and a review of the strategy in Precinct 2 in 2020 by Engeny. The Engeny review largely adopted the recommendations of the work by Neil Craigie.

2. DRAINAGE ASSETS REVIEW

Council has provided engineering drawings and related documentation for most of drainage infrastructure assets, which includes retarding basins, wetlands and biofiltration systems. Layout plans of the asset locations are shown in the following Figure 2.1 and Figure 2.2 and the drainage assets list and status are provided in Table 2.1. Appendix D displays the pipe layout plans with diameter and pipe ID visible for each precinct.

The retarding basins outside of the PSP area have been added to the hydrology model to ensure that their impact on the timing of peak flows is accounted for in the modelling.

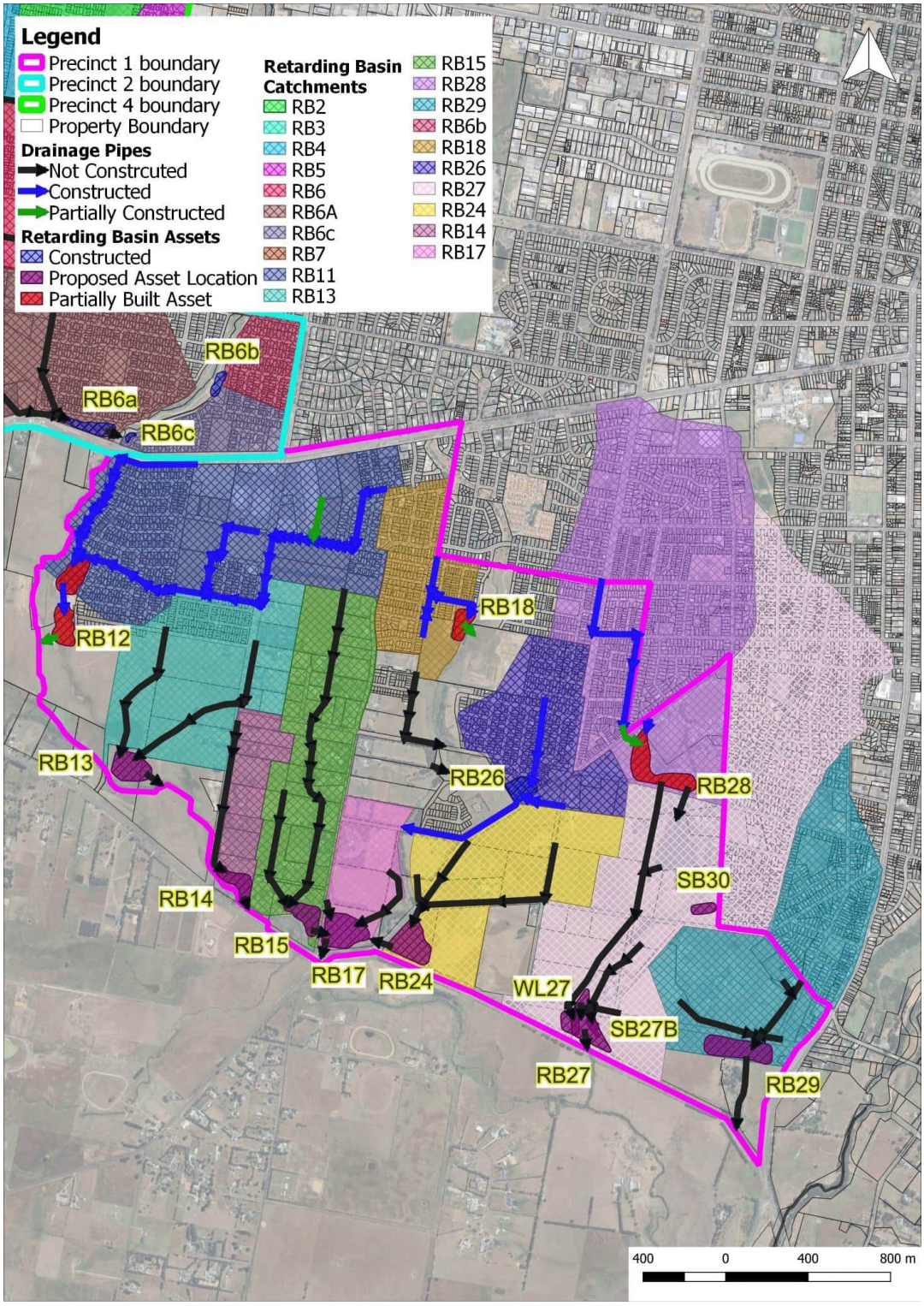

FIGURE 2.1: BALLARAT WEST PSP PRECINCT 1 LAYOUT PLAN

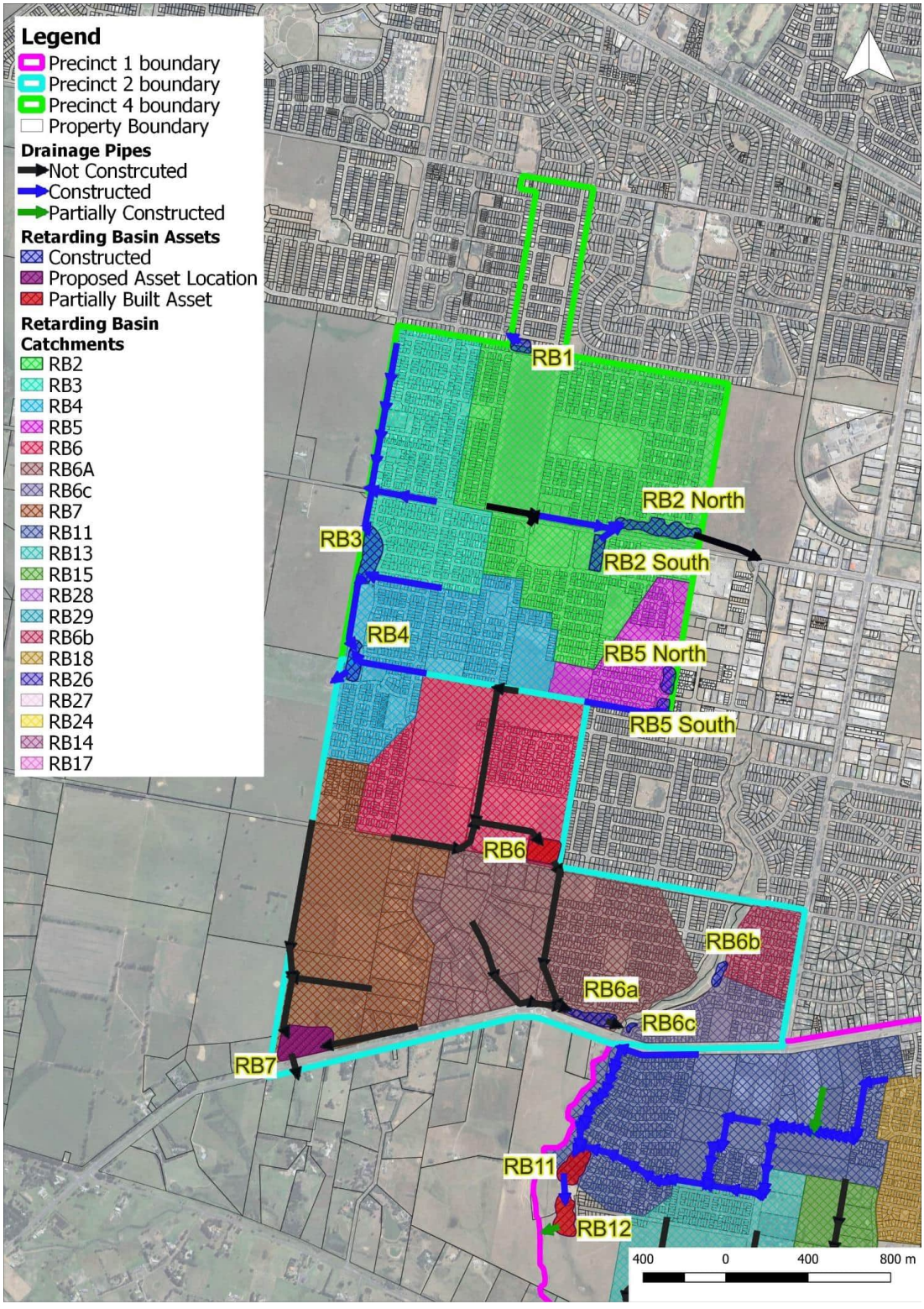

FIGURE 2.2: BALLARAT WEST PSP PRECINCT 2 AND PRECINCT 4 LAYOUT PLAN

TABLE 2.1: DRAINAGE ASSETS LIST

Drainage Asset	Residential Estate	Asset Status	Asset catchment size (km^2)	Available Data	Designer	Notes
RB DZ	The Chase	Completed		Drawings (design): in PDF	TGM	Outside of the Ballarat West PSP
RB EB	Alfredton Park	Completed		Drawings (design): in PDF	City of Ballarat	Outside of the Ballarat West PSP
RB FW	Winter Creek	Completed		Drawings (design): in PDF	City of Ballarat	Outside of the Ballarat West PSP
RB 1 (RB DY)	Winter Valley Rise Estate	Completed		Drawings (as built): in PDF and CAD Memo: Update of RB1 Catchment Main Drainage Proposal (Neil Craigie, June 2018)	Cardno TGM	-
RB 2	Alluvium Estate	Completed	1.4	Drawings (as built): in PDF and CAD	Reeds Consulting	-
RB 3	Winter Valley Rise Estate	Completed	0.6	Drawings (as built): in PDF	Cardno TGM	-
RB 4	Winter Valley Rise Estate	Partially Completed	0.6	Drawings (as built): in PDF	Cardno TGM	RB 4 has been partially completed.
RB 5	Carringum Estate	Completed	0.24	Drawings (design): in PDF and CAD Memo: RB 5 specifications	Beveridge Williams	-
RB 6	Winterfield Estate	Partially Completed	0.75	n/a	n/a	Functional layout plan endorsed and interim sedimentation basin works commenced.
RBs 6A, 6B & 6C (previously Biofilters 8, 9 & 10)	Winterfield Estate	Completed	6A - 0.87 6B - 0.12 6C - 0.16	Drawings (design): in PDF	KLM spatial	-
RB 7	n/a	Not Built/ Committed	0.7	n/a	n/a	-
RB 11	Pinnacle Estate	Partially Completed	1.02	Drawings (design): in PDF Memo: RB 11 & 12 specifications	Spiire	Design has been completed and endorsed. Minor construction of sedimentation has been undertaken to enable some development.

Drainage Asset	Residential Estate	Asset Status	Asset catchment size (km^2)	Available Data	Designer	Notes
RB 12	Pinnacle Estate	Partially Completed	1.13	Drawings (design): in PDF Memo: RB 11 & 12 specifications	Spiire	See comments for RB 11.
RB 13	n/a	Not Built	0.61	n/a	n/a	
RB 14	n/a	Not Built	0.2	n/a	n/a	
RB 15	n/a	Not Built	0.6	n/a	n/a	
RB 17	n/a	Not Built	0.22	n/a	n/a	
RB 18	n/a	Partially Completed	0.33	n/a	n/a	
RB 24	n/a	Not Built	0.53	n/a	n/a	
RB 25 (combined with 26)	Ploughmans Arms Estate	Completed	0.41	Drawings (design): in PDF	Scott Campbell Design & Drafting Pty Ltd	
RB 27	n/a	Not Built	1.68	n/a	n/a	
RB 28	n/a	Partially Completed	1.44	Drawings (design): in PDF and CAD	Axiom Consulting Engineers	Full design has been completed and outfall has been constructed.
RB 29	n/a	Not Built	0.81	n/a	n/a	
SB 30 (RB30 has been replaced with a sedimentation basin in an adjacent location)	n/a	Not Built		n/a	n/a	

3. HYDROLOGY

3.1 Hydrology Model Update

Hydrological modelling for the original 2011 drainage strategy was undertaken using RORB software and based on Australian Rainfall and Runoff (ARR) 1987. Since then, a new version of Australian Rainfall and Runoff (ARR 2019) has been released and the current RORB modelling update for the strategy has been undertaken in accordance with ARR 2019 guidelines. The updated RORB modelling for the existing condition scenario was undertaken to assess the existing peak flow at the model outlet, LK2 (confluence of Winter Creek and Yarrowee River) and Winter Creek, LT1 which is just upstream of the confluence of Winter Creek and Yarrowee River as shown in Figure 3.1.

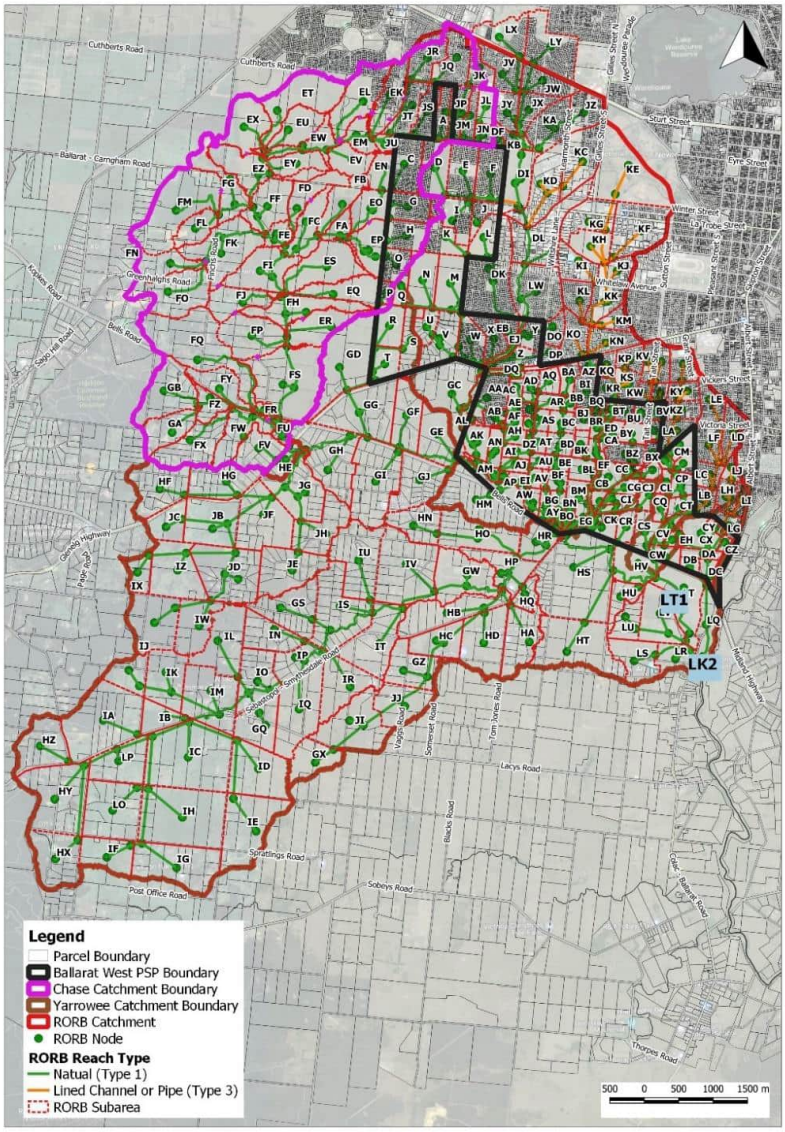

FIGURE 3.1: RORB MODELLING FOR BALLARAT WEST PSP CATCHMENT PLAN

In addition to the ARR update, the RORB modelling catchment for the existing conditions scenario has also been expanded to include the whole Winter Creek catchment area. This expanded catchment is to provide consistency that will be required at a later stage to properly understand the impact that the retarding basins may be having to the peak flows in Winter Creek for the post developed scenario.

The updated RORB model includes data from the "Chase catchment" RORB model and the existing Yarrowee River RORB model, which were previously developed for the Council on previous projects (refer to Figure 3.1 for catchments boundaries). Both Chase and Yarrowee River RORB modellings (ARR 2019) for existing conditions were previously prepared by Water Technology and were provided by Council for Engeny's use in this project. These models have also been used for calibration purposes.

To assess the existing Winter Creek catchment (80 km^2), which includes the Ballarat West PSP area and the impact on the receiving waterway (Winter Creek), the existing RORB model for "the Chase catchment" has been combined with the existing Ballarat West RORB model as shown in Figure 3.1, with additional subareas taken from Yarrowee River RORB model. The subareas from the Yarrowee River RORB model have been split to improve the resolution of the model in the area of interest, the Winter Creek catchment. The delineation of reaches and the fraction impervious in existing conditions have been updated as follows:

- For sub-catchments within the Ballarat West PSP (shown by a thick black line in Figure 3.1) have largely been classified as "Type 1 – Natural" reaches with a total fraction impervious of 0.1 in line with the existing RORB models (this impervious fraction has been modelled as indirectly connected area due to the lack of pit and pipe drainage systems in these areas).
- For sub-catchments within the existing Chase RORB modelling area (shown by a pink line in Figure 3.1 have largely been classified as "Type 1 – Natural" reaches with total fraction impervious of 0.1 in line with the existing RORB models prepared by Water Technology.
- Sub-catchments immediately to the east of Ballarat West PSP in the existing township areas of Ballarat have largely been classified as "Type 3 – Lined Channel or Pipe" reaches with some area classified as "Type 1 – Natural" reaches, with total fraction impervious ranging from 0.1 to 0.75 in line with existing conditions.
- Sub-catchment immediately to the southwest of Ballarat West PSP have largely been classified as "Type 1 – Natural" reaches with total fraction impervious of 0.1, in line with the existing RORB model of the Yarrowee River prepared by Water Technology.
- A detailed breakdown of the subareas size, impervious fraction and location can be found in Appendix A:.

The existing RORB model was run for two scenarios as follows:

- Existing / Baseline Conditions
- Existing / Baseline Conditions with climate change scenario.

3.2 Modelling Parameters and Modelling Input for Retarding Basins

The RORB model parameters adopted are as summarised as follows:

3.2.1 Intensity-Frequency-Duration (IFD) Rainfall Data

- Rainfall data was adopted based on the centroid of the updated extended Ballarat West RORB model as per Table 3.1 (-37.6037°S, 143.76647°E).
- Point rainfall temporal patterns were adopted. It is noted that point temporal patterns are generally recommended for catchment areas that do not exceed 75 km^2. The total catchment area for the extended Ballarat West RORB model is 80 km^2. Engeny has run a sensitivity analysis using the areal and point temporal patterns and found that the peak flows at the model outlet using either pattern were very similar.
- In addition, while the total catchment is 80 km^2, the sub-catchments draining from the Ballarat West PSP are around 1 km^2 in area. Hence point temporal patterns have been used for all durations, which Engeny believes is appropriate for the purposes of this assessment.

TABLE 3.1: BOM IFD TABLE FOR OVERALL SITE CATCHMENT (-37.6037°S, 143.76647°E).

	Annual Exceedance Probability (AEP)					
Duration	50 %	20 %	10 %	5 %	2 %	1 %
10 minutes	7.48	11	13.6	16.4	20.5	23.9
15 minutes	9.07	13.4	16.6	20	25	29.2
30 minutes	12	17.6	21.8	26.2	32.7	38.1
1 hour	15.2	21.9	27	32.4	40	46.3
2 hours	19.2	27.1	33	39.1	47.8	54.9
3 hours	22.2	30.9	37.3	43.9	53.2	60.8
6 hours	28.9	39.3	46.7	54.4	65.4	74.4
12 hours	37.8	50.9	60	69.5	83.1	94.2
18 hours	43.9	59.1	69.8	80.7	96.6	109
24 hours	48.5	65.5	77.6	89.8	107	121

3.2.2 Spatial Variation

- A uniform spatial distribution for rainfall was adopted.
- It is noted that per ARR 2019, it is recommended that non-uniform spatial distributions are considered for catchments exceeding 20 km^2. Engeny has assessed and compared the variation in rainfall depth across the catchment using IFD data based on the centroid of the whole catchment, and centroid of subareas KE, FM, LQ, and HX (refer to Figure 3.1), which represents sub-catchments in the northeast, northwest, southeast and southwest edges of the catchment respectively. As shown in Table 3.2, there is a marginal difference (ranging between 1% to 3%) in IFD rainfall depths of other areas in the catchment compared to the catchment centroid, thus, a uniform spatial variation was deemed appropriate for this study.

TABLE 3.2: COMPARISON OF THE BOM IFD TABLE ACROSS THE RORB MODEL CATCHMENT (20% AEP)

Duration	Subarea KE	Subarea FM	Subarea LQ	Subarea HX	Catchment Centroid
10 minutes	11.2	11.0	10.9	11.2	11.0
15 minutes	13.6	13.4	13.3	13.6	13.4
30 minutes	17.8	17.6	17.4	17.9	17.6
1 hour	22.2	22	21.7	22.3	21.9
2 hours	27.3	27.2	26.6	27.4	27.1
3 hours	31.0	30.9	30.2	31.2	30.9
6 hours	39.3	39.3	38.2	39.5	39.3
12 hours	50.6	50.7	49.3	50.9	50.9
18 hours	58.7	58.8	57.4	58.9	59.1
24 hours	64.9	65	63.7	65.1	65.5

3.2.3 Pre-burst Application

- For this study, a complete storm approach has been modelled in RORB to account for pre-burst rainfall. This was achieved by appending pre-burst rainfall depths obtained from the ARR Data Hub to the BoM IFD burst rainfall. Based on the flow results calibration, median pre-bursts (rather than 75th percentile pre-bursts) were adopted.
- The recent Benchmarking ARR 2019 for Victoria study undertaken by HARC (2020) found that the 75^{th} percentile pre-burst rainfall magnitudes provided by ARR Data Hub provided a better fit across catchments in loss region 3 when compared to the median pre-burst rainfall magnitudes. The RORB model catchment falls within this loss region 3. Engeny compared the peak flows at key locations from the RORB model using the 50th and the 75^{th} percentile pre-burst rainfall and found that the flows generated from application of 50th percentile pre burst rainfall compared better to the calibrated Yarrowee River RORB Model. As such the 50th pre-burst rainfall depths have been adopted for this study.

3.2.4 Initial and Continuing Losses

- The model adopts a rural initial loss of 25 mm and a continuing loss of 2.0 mm/h. These losses were determined from the calibrated Yarrowee River and 'The Chase' RORB Models and have been adopted for the current model.
- In addition to utilising the rural initial loss and continuing losses from the ARR Data Hub, ARR 2019 also provides a methodology to calculate the initial loss and continuing loss values for other land uses. Losses in RORB were assigned based on three surface types:
  - Effective Impervious Area (EIA) – comprising areas which are impervious and are directly hydraulically connected to the drainage system (e.g., a roof connected to an underground drain by downpipes)
  - Indirectly Connected Area (ICA) – comprising impervious areas which are not directly connected to the drainage system (e.g., a paved patio or footpath) and pervious areas that interact with impervious areas which are not directly connected (e.g., nature strips and garden areas)
  - Pervious area – comprising large parklands and bushlands reserves but not small pocket parks in urban areas.

Table 3.3 summarises the loss values adopted for each surface type modelled.

TABLE 3.3: SUMMARY OF ADOPTED LOSS VALUES BY SURFACE TYPE

Surface Type	Initial Loss (IL)	Continuing Loss (CL)	Source
Pervious Area (from ARR Datahub)	25.0 mm	2.0	Yarrowee River and The Chase RORB model (calibrated)
Effective Impervious Area (EIA)	1.0 mm	0 mm/h	ARR Data Hub and ARR 2016, Book 5, Chapter 3 - Section 3.5.3.2.1
Indirectly Connected Area (ICA)	16.8 mm	2.0 mm/h	ARR Data Hub and ARR 2016, Book 5, Chapter 3 - Section 3.5.3.2.1

3.2.5 Areal Reduction Factor (ARF).

With regards to areal reduction factors (ARFs), two scenarios have been considered as follows:

- ARF for a catchment size of 360 km^2, which is the area of the Yarrowee River catchment, was adopted to allow for the comparison of flows between the existing Yarrowee River RORB model and the current RORB model at Winter Creek just upstream of the confluence with the Yarrowee Creek.
- ARF for a catchment size of 80 km^2, which is the catchment area of the current RORB model through to the confluence of Winter Creek and Yarrowee River, adopted when analysing the impact of developing the Ballarat West PSP on the receiving waterways (Winter Creek and Yarrowee River).

3.2.6 Routing Parameter

The routing parameter (k_c) was determined using the same k_c divided by Distance average (D_{av}) based on the previous Yarrowee River RORB model. The Yarrowee River RORB model has been calibrated to a flood frequency analysis at the (Mt Mercer - 233215). By utilising the same k_c divided by D_{av} ratio consistency in the flow estimates produced by the models can be achieved. Corangamite Catchment Management Authority have provided in principle support to use a k_c divided by D_{av} estimation for the k_c of the catchment within a larger calibrated RORB model (the existing Yarrowee_Gnarr RORB modelling). The m routing parameter was maintained at the recommended default of 0.8.

Table 3.4 provides a summary of the k_c, d_{av} and k_c/d_{av} ratios from the Yarrowee_River RORB modelling.

TABLE 3.4: CALCULATED K_C/D_{AV} RATIOS FOR THE RORB MODELS

Source RORB Model	k_c	d_{av}	k_c/d_{av} Ratio
Yarrowee_River RORB Model (ARR 2019 Watertech Model)	30	14.76	2.03
Ballarat West PSP RORB (ARR 2019 Engeny Model)	19.56	9.59	2.04

3.3 Modelling Results

3.3.1 Pre-Development Conditions

Engeny has compared the 1 % AEP peak outflows at at the Node LK2 on Winter Creek, just upstream of the confluence of Winter Creek and Yarrowee River (refer to Figure 3.1) to the pre-developed flows from the Yarrowee River RORB model for both existing climate conditions (based on the IFD data available from the Bureau of Meteorology) and the Year 2100 climate conditions (incorporating an 18.5 % rainfall intensity increase, in line with the guidance provided within Melbourne Water's Technical Specifications). Table 3.5 provides a summary of the resultant peak flows.

TABLE 3.5: 1% AEP EXISTING CONDITIONS PEAK FLOWS AT CONFLUENCE OF WINTER CREEK

RORB Model	Existing Condition Peak Flow (m^3/s)
Yarrowee_River RORB Model (ARR 2019 Watertech Model)	72.3
Ballarat West PSP RORB (ARR 2019 Engeny Model)	83.5*

*the Engeny model has been run with an ARF of 360 km^2 to match these flows as the Yarrowee River RORB model was also run with an ARF of 360 km^2. This value is only relevant for this validation comparison, the existing conditions flow for PSP assessment purposes is shown in Table 3.8.

As shown above, the flow result from the updated ARR 2019 RORB model for Ballarat West PSP shows a comparable result (with difference of 14%) from the Yarrowee River RORB model result. The minor difference in the flows is due to the following:

- **Reaches -** Sub-catchments immediately to the east and north of Ballarat West PSP in the existing township areas of Ballarat have largely been classified as "Type 3 – Lined Channel or Pipe" reaches and "Type 2 – Excavated but Unlined" reaches respectively in the current model. These reaches have however been modelled as "Type 1 – Natural "in the Yarrowee River RORB model and thus contribute to the differences in peak flows.
- **Losses –** The losses in the current RORB model were assigned based on three surface types (i.e., pervious Area, EIA, and ICA), while in the Yarrowee River RORB model, the losses only represented on a single value for each sub-catchment instead of assigned to different surface types. This could also account for the difference in peak flow.

In addition to the above results, peak flows results have also been compared with the previous Engeny model. Engeny's original RORB model (2011) had a total of ten discharge locations that capture all flows into the waterways and discharge points for precincts 1, 2 and 4, as shown in Figure 3.2. Engeny has compared 1% AEP peak flows between the existing conditions for the 2011 study and current model as presented in Table 3.6. The results show comparable predicted pre-development flows in most locations. The current RORB modelling update for the strategy has been undertaken in accordance with the ARR 2019 guidelines, which largely account for the differences in flows. In addition, the current model has included the Wensleydale retarding basin, which was not modelled in the 2011 study and thus also accounts for the large difference in peak flows in Location 4 (flows to the Kensington Creek at Glenelg Highway).

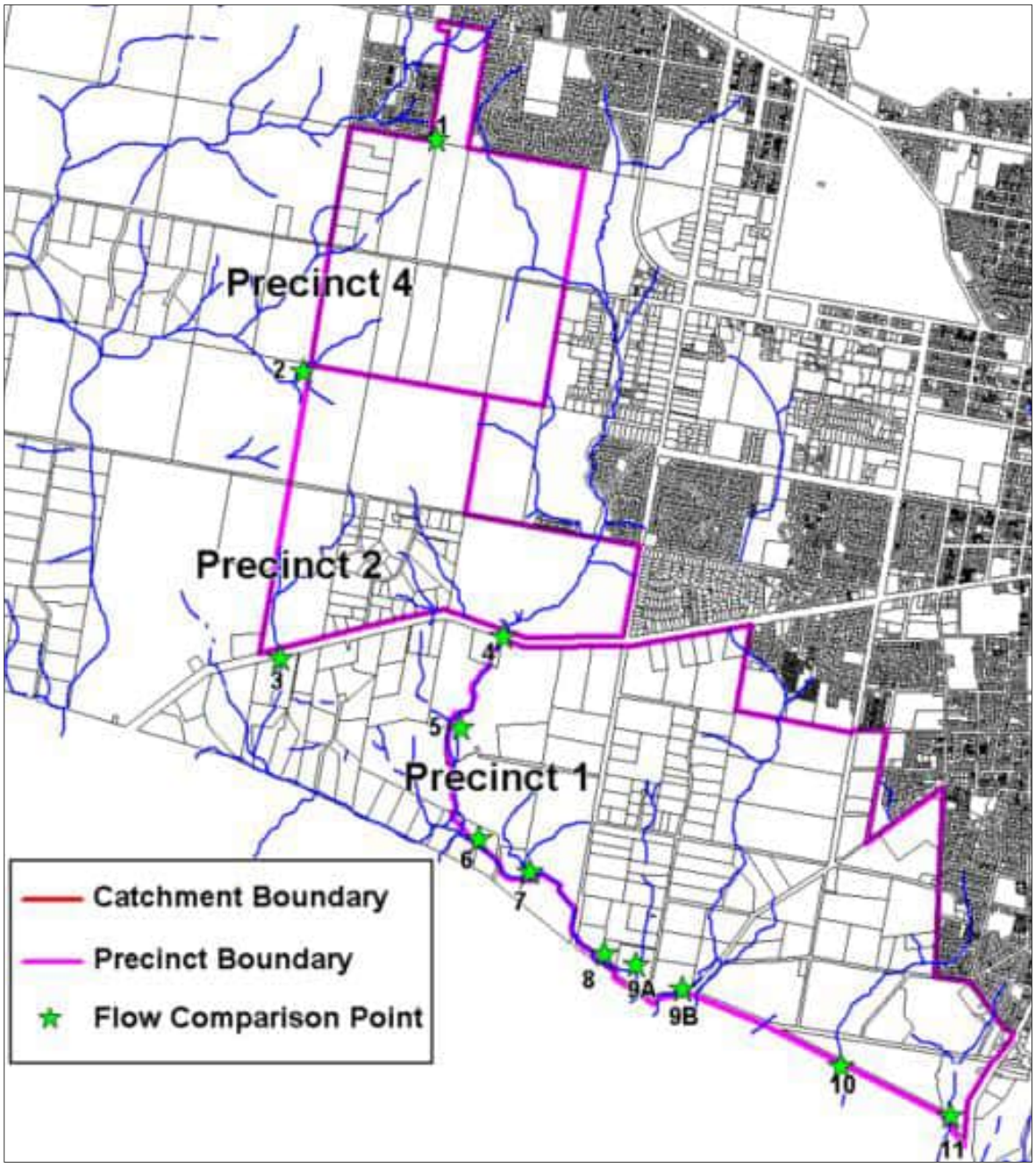

FIGURE 3.2: FLOW COMPARISON LOCATIONS

TABLE 3.6: ENGENY 1% AEP PRE-DEVELOPMENT PEAK FLOW TARGETS COMPARISON FROM BALLARAT DCP STUDY IN 2011

Comparison Locations	2011 Ballarat DCP study in 2011 (ARR 1987) (m^3/s)	Current Study (ARR 2019) (m^3/s)
Location 1	3.40	3.26
Location 2	4.10	3.78
Location 3	3.20	3.14
Location 4	32.20	28.69
Location 5	2.40	4.07
Location 6	1.10	2.18
Location 7	4.30	3.63
Location 8	1.30	1.17
Location 9a	3.40	3.00
Location 9b	23.40	23.68
Location 10	13.20	13.89
Location 11	4.80	4.60

3.3.2 Post Development Condition

Engeny has updated the developed condition RORB model to include details of the already built retarding basins and adjusted the sizing of the retarding basins which have not yet been built to try and achieve the best retardation outcomes possible. Table 3.7 shows the pre and post developed flows at the flow comparison locations where were referenced in Figure 3.2. The table shows that the pre-development flow rate is maintained or reduced at 8 of the locations but increases at 4 locations.

The increases have occurred as the original RORB modelling which informed the design of the retarding basins which have already been built was undertaken in ARR 1987 methodologies in 2011, whereas the current assessment uses ARR 2019 methodologies.

The updated modelling also accounts for an increase in development density that is reflected in the higher yields of 17-18 lots/ha which have been occurring in more recent development within the precinct. Overall, the current Ballarat West precinct average is 16 lots/ha. The modelling also accounts for an expected future increase in development density outlined in the *Precinct Structure Planning Guidelines: New Communities in Victoria, (VPA, October 2021)* that has been introduced by the VPA. These guidelines increased the proposed development density of greenfield development from 15 dwellings per hectare which was assumed for the initial drainage strategy to 20-25 dwellings per hectare under the new guidelines. The increase in density has translated to a total impervious fraction of 0.75 up from the previous assumption of 0.6. The increases to development density have not been considered retrospectively in catchments in which development and assets have already been constructed. There is not considered scope to change those assets, as they were built to the appropriate engineering standard at that time. In areas where the basins have not been constructed the basins sizes and outfalls have been adjusted to try and meet the predevelopment flows. In some parts of the catchment there is a mixture of constructed and not constructed basins. In these areas it may not have been possible to achieve predeveloped flow targets.

Table 3.7 also includes a comparison at the downstream end of Winter Creek just before it enters the Yarrowee River. The table shows that there is a 1.2 m^3/s increase in flows. This increase represents a 1.3% increase on the predevelopment flow rate. There are a few factors which are leading to this increase in flow.

(1) Change in hydrology methodology. The original drainage strategy was setup using ARR 1987 methodology while the current strategy has been reviewed using ARR 2019 methodology. The update to ARR 2019 represents a significant change in hydrologic methods which would be expected to show some difference in flows. This is support by the comparison shown in Table 3.6 which compares the developed flow targets using ARR 1987 and ARR 2019. The general trend is for lower target flows. Location 4 is a key callout as the target flow has dropped by almost 4 m^3/s.

(2) Partial completion of drainage scheme. Approximately half of the retarding basins in the drainage scheme have already been constructed or committed to construction. The sizing of those basins was based on ARR 1987 methodologies. When the performance of those basins is reassessed using ARR 2019 methodologies they are not always meeting the new current design criteria (however they did meet the design criteria which was current when they were built or approved). This is effectively applying a new design criteria to an already constructed asset. In most cases the performance is similar to what the new design criteria would propose, however it is not fully compliant (this is to be expected). Using the example of location 4 above, under the ARR 1987 methodologies the flow target was 32.2 m^3/s, under the ARR 2019 methodologies it is 28.69 m^3/s. Given that all of the basins upstream of location 4 have already been constructed or committed using ARR 1987 methodology this increase in flow under the updated hydrology design criteria is locked in.

To offset this increase in flows would require a significant oversizing of basins in the as yet undeveloped areas of the scheme. This has equity issues from a development contributions point of view as land owners who have yet to develop are effectively paying to offset the impacts of previous development. The previous development was also compliant with the appropriate standard at the time of design acceptance. Some minor (and the overall increase of 1.3% is minor) change in flow rates should be expected with such a significant change in methodology and should not undermine the integrity of the previous built assets which used the best available information at the time.

(3) Increase in development density. There has also been a gradual increase in development density as the drainage scheme has progressed. It is likely that some of the earlier developments were at or below the design density of 15 lot/ha which was used to inform the modelling. As the density has increased, if the basins have not also increased in size then they may be spilling more flow, as either an increase in peak flow or as an increase in total volume of flow. The total volume of flow can become more important when the overall impact on Winter Creek is assessed as it can impact the timing of peak flows.

As there is an increase in peak flows predicted, hydraulic modelling of Winter Creek and the downstream Yarrowee Creeks has been undertaken to determine the impact of the increased flows on flood depths and extents. This is discussed further in section 8 but the overall impacts are considered negligible in the context of the overall modelled flooding. Some areas record minor increases in peak flood depths and other areas record minor reductions.

TABLE 3.7: ENGENY 1% AEP PRE-DEVELOPMENT AND POST DEVELOPMENT FLOW COMPARISON

Comparison Locations	Predeveloped flow (m^3/s)	Post developed retarded flow (m^3/s)
Location 1	6.12	6.31
Location 2	3.59	3.55
Location 3	2.90	2.57
Location 4	23.66	20.77
Location 5	3.64	5.57
Location 6	1.26	Outfalls at location 7 under developed conditions
Location 7	4.53	3.84
Location 8	1.39	0.83
Location 9a	2.57	1.55
Location 9b	22.13	22.19
Location 10	10.94	10.86
Location 11	4.36	4.2
Winter Creek upstream of Confluence with Yarrowee Creek*	91.5	92.7

* model run with ARF set to 80 km^2 for this flow comparison point only. All others run with ARF set to 1 km^2

The developed conditions assets have been designed to current climate conditions. Consideration of climate change shows that there will be a significant increase in peak flows if there is an 18.5% increase in rainfall intensity as predicted at the year 2100. Without explicitly designing assets for the climate change event, the best approach to managing to risk of large flows as a result of climate change (and also the risk of storms rarer than a 1% AEP under current climate conditions) is to ensure that unimpeded overland flow paths are available along all flow paths and that no areas are designed with trapped low points serviced only by pipe connections. Overland flow paths typically are able to convey larger flows than they are designed for due to the allowance of freeboard (typically 300 mm) before any dwellings are flooded. Underground drainage pipes are typically only able to convey the design flow, with any additional flow above the design flow rate causing flooding or overland flow.

This should be a key consideration in the assessment of development layout plans and plans which propose trapped low points or increased pipe sizes to minimise overland flows should be subject to additional security to ensure that flows larger than the 1% AEP event will not immediately flood private properties or dwellings (i.e. minimum freeboard requirements must still be maintained).

The figures in Appendix D show where the key overland flow paths required in the development areas are. These overland flow paths need to be accounted for in the development layouts and the functional and detailed designs of the developments.

3.3.3 Climate Change

Engeny has undertaken climate change modelling to understand the likely impact of climate change in the PSP. The rainfall has been increased by 18.5% for the 2100 climate change modelling scenario, in line with the guidance from ARR 2019. The results from the modelling are shown in Table 3.8. This results in an 34% increase of flow from the existing climate conditions for Ballarat West PSP compared to the 2100 climate change conditions. The increase in flows is notably larger than the increase in rainfall intensity, which is 18.5%. Predicting a larger increase in flows than the increase in rainfall intensity is common for climate change modelling. This also demonstrates that increases in rainfall do not provide a like for like increase in total expected flows.

TABLE 3.8: CLIMATE CHANGE MODELLING RESULTS (RORB MODEL ARF 80 KM²)

Existing Condition Peak Flow (m^3/s)	Developed conditions Peak Flow (m^3/s)	Developed conditions 2100 Climate Condition Peak Flow (m^3/s)		
	1 %	1% Climate Change	2 % Climate Change	5 % Climate Change
91.5	92.7	125.0	100.4	72.1

3.4 Retarding Basins

Table 3.9 shows the key design criteria for the retarding basins that have not been constructed or designed and committed at the time this review was completed. It also shows details of the basins which were constructed with a design that is not considered in accordance with the original PSP. Basins constructed generally in accordance with the original drainage strategy and PSP are not shown. Only the outstanding retarding basins are subject to change as part of this review. The retarding basins have been designed to a detailed concept level only and so additional design work is required prior to the construction of the basins. The table shows the storage volume required in the 1% AEP event, the peak outflow in the 1% AEP event and the estimated cut volume that is needed to achieve this storage volume. It may be possible to reduce the require cut volumes with further design work however future designs must demonstrate that they are generally in accordance with the key design criteria of the basins and meet the minimum performance requirements.

TABLE 3.9: RETARDING BASIN KEY DESIGN CRITERIA

Drainage Asset	1% AEP storage volume (m^3)	Assumed outlet pipe Diameter (mm)	Peak 1% AEP outflow (m^3/s)	Estimated Cut Volume (m^3)	Notes
RB7	19,600	2 x 675	2.57 (Pipe flow)	35,800	
RB 13	17,400	2 x 825	3.84 (Pipe flow)	39,300	RB location slightly adjusted to reduce number of parcels contributing land
RB 14	9,860	525	0.83 (Pipe flow)	14,500	RB location slightly adjusted
RB15	12,000	2 x 650	2.42 (Pipe flow)	26,000	
RB 17	25,200	675	1.56 (Pipe & Spillway)	43,400	
RB 24	25,900	600	3.03 (Pipe & Spillway)	38,600	
RB 27	21,200	1 x 600 1 x 1050	10.86 (Pipe flow)	N/A	Retarding basin is proposed as an embankment across the waterway. Pipe dimensions are sized based on the RB27 design reverting flows back to the pre-development in the 1 % AEP
RB 29	17,200	2 x 750	2.86 (Pipe flow)	36,500	
SB 30 (RB30 has been replaced with a sedimentation basin in an adjacent location)	N/A	N/A	N/A	N/A	RB 30 has been removed and replaced with a sedimentation basin only. No retardation is required at this asset

TABLE 3.10:RETARDING BASIN LAND UPATKE

RB Name	Area of RB (m²)	# of Parcel 1	Area Parcel 1 (m²)	# of Parcel 2	Area Parcel 2 (m²)
RB1	8939	211	8939		
RB2 North	31803	213	31803		
RB2 South	10543	215	10543		
RB3	25020	220	25020		
RB4	15663	220	15663		
RB5 North	10050	214	10050		
RB5 South	6589	214	6589		
RB6	20000	157	20000		
RB6a	15960	158	15960		
RB6b	5697	160	5697		
RB6c	1417	159	1417		
RB7	38616	209	38616		
RB11	20267	1	20267		
RB12	19679	1	19679		
RB13	23695	12	19188	11	4507
RB14	17413	81	17016	82	397
RB15	22516	83	22516		
RB17	35631	96	35631		
RB18	12727	65	6309	67	6418
RB24	35958	101	33990	102	1968
RB26	13970	87	13970		
RB27	44818	134	11270	154	33548
RB28	62042	114	5036	116	57006
RB29	34328	154	10913	153	23415
SB30	5865	128	5865		

3.4.1 RB1

Retarding basin 1 has already been constructed. The design was adjusted to increase the overall footprint. The basin is split into two parts, a wet sediment basin section in the northern half and a "dry creekbed" section in the southern half. The retarding basin was made larger than was originally proposed in the 2011 drainage strategy.

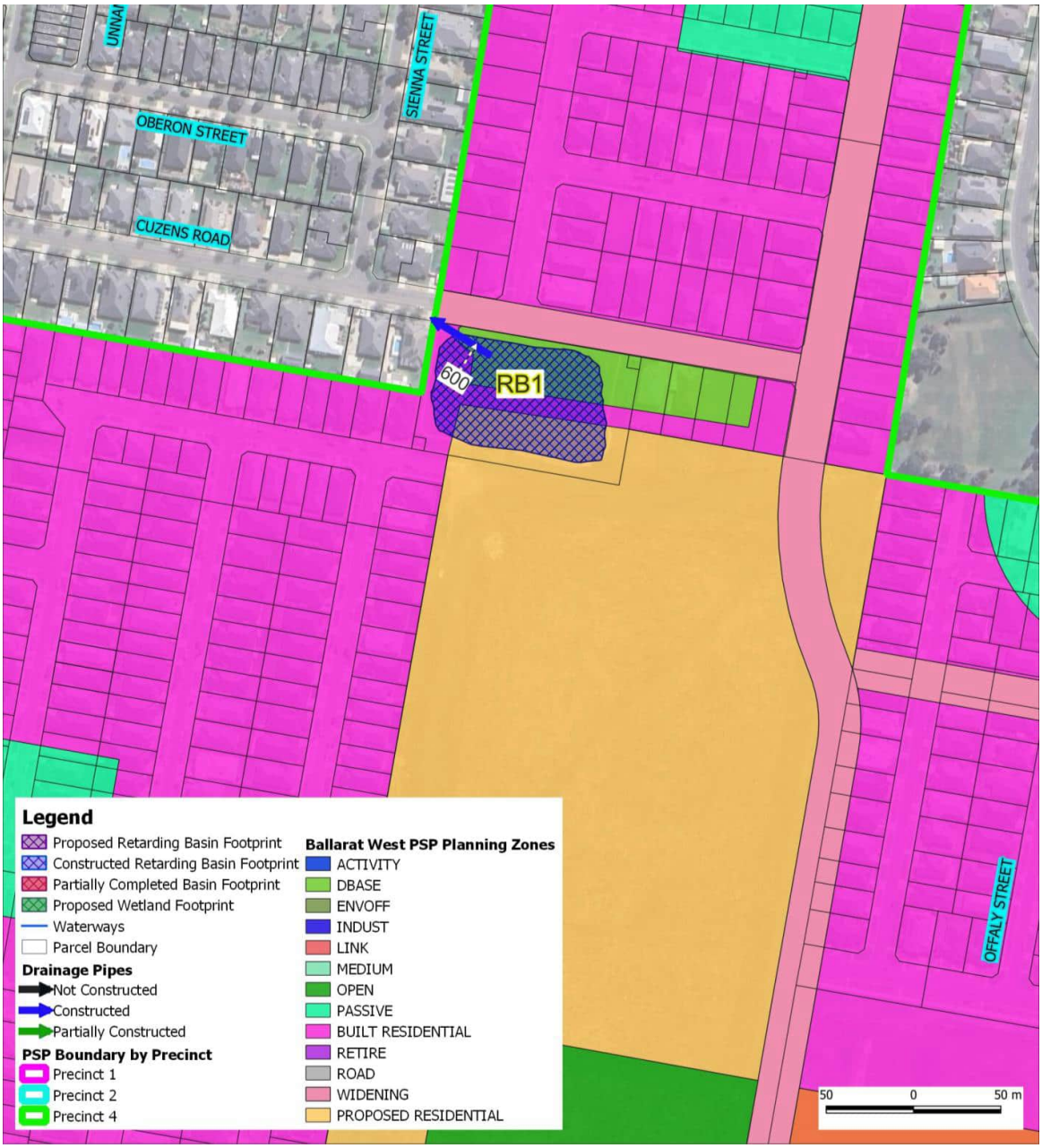

FIGURE 3.3: RETARDING BASIN 1 LAYOUT

3.4.2 RB2

Retarding basin two has already been constructed. The basin has been split into two halves. The northern half was constructed first as it was required by the earlier development stages and was the downstream section. The southern half was constructed second when the adjacent development also occurred. The key reason for the split in the basin and adjusting it to straddle both sides of Ballarat Carngham Road was to help facilitate drainage outfalls in this area. There is very little fall between RB2 south and the outfall to Kensington Creek to the East. By creating long linear wetlands an effectively flat water grade can be created. This can significantly reduce the fill required for the remaining part of the development as the pipes can discharge to a lower level further away from the creek without compromising the required hydraulic conveyance.

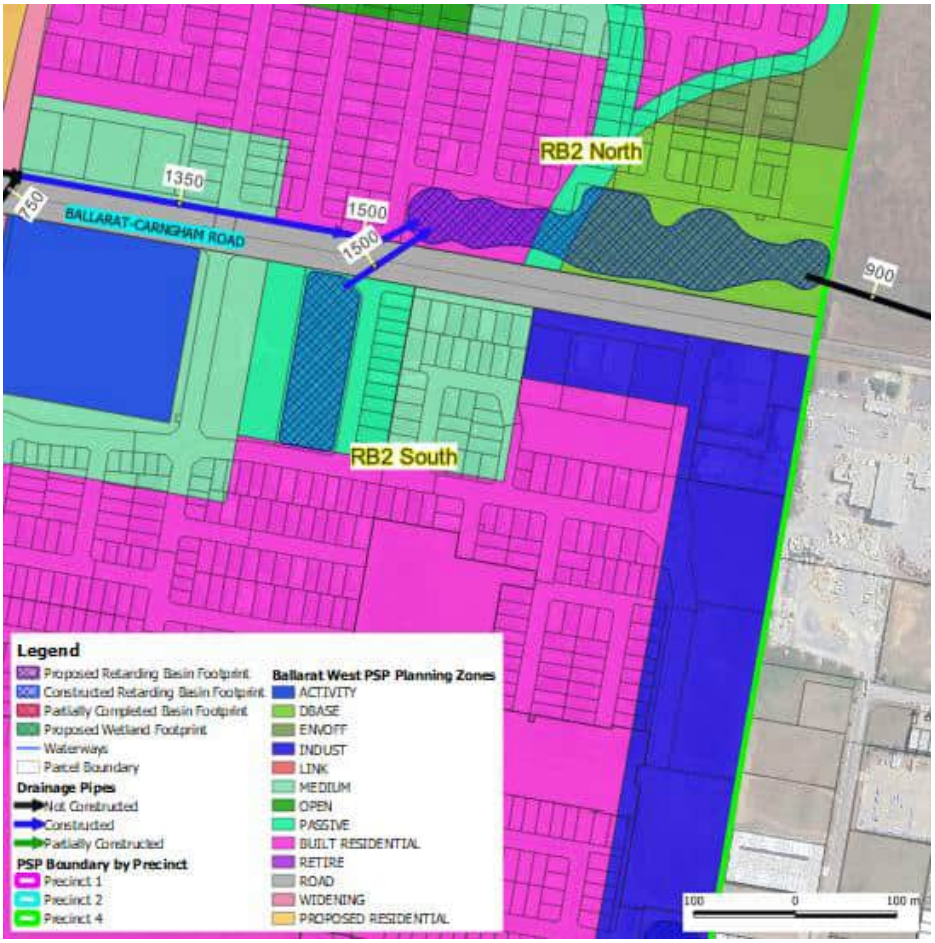

FIGURE 3.4: RETARDING BASIN 2 LAYOUT

3.4.3 RB4

Retarding basin four has been constructed. The retarding basin was moved and constructed in two parts to help facilitate development staging. The basin was moved north from its original position. The northern half, which was a sedimentation basin and retarding basin, was constructed first to facilitate the adjacent development. The southern half, which includes the wetland and additional retardation volume, was constructed a few years later when that estate reached the point at which it needed the drainage asset. Figure 3.5 shows the detailed design playout plan of retarding basin 4.

FIGURE 3.5: RETARDING BASIN 4 LAYOUT

3.4.4 RB5

Retarding basin 5 has been committed and is under construction. The asset has been split into two parts with a road running through the middle. Figure 3.6 shows the detailed design drawing of the basin. The northern part of the basin includes the sedimentation basin and part of the wetland, while the southern part includes the remainder of the wetland. The northern and southern parts combined provide the retardation function of the basin. The basin is generally in the same location as proposed in the 2011 drainage strategy, however the road through the middle has been included to provide a better development outcome, including providing better road links between adjacent estates.

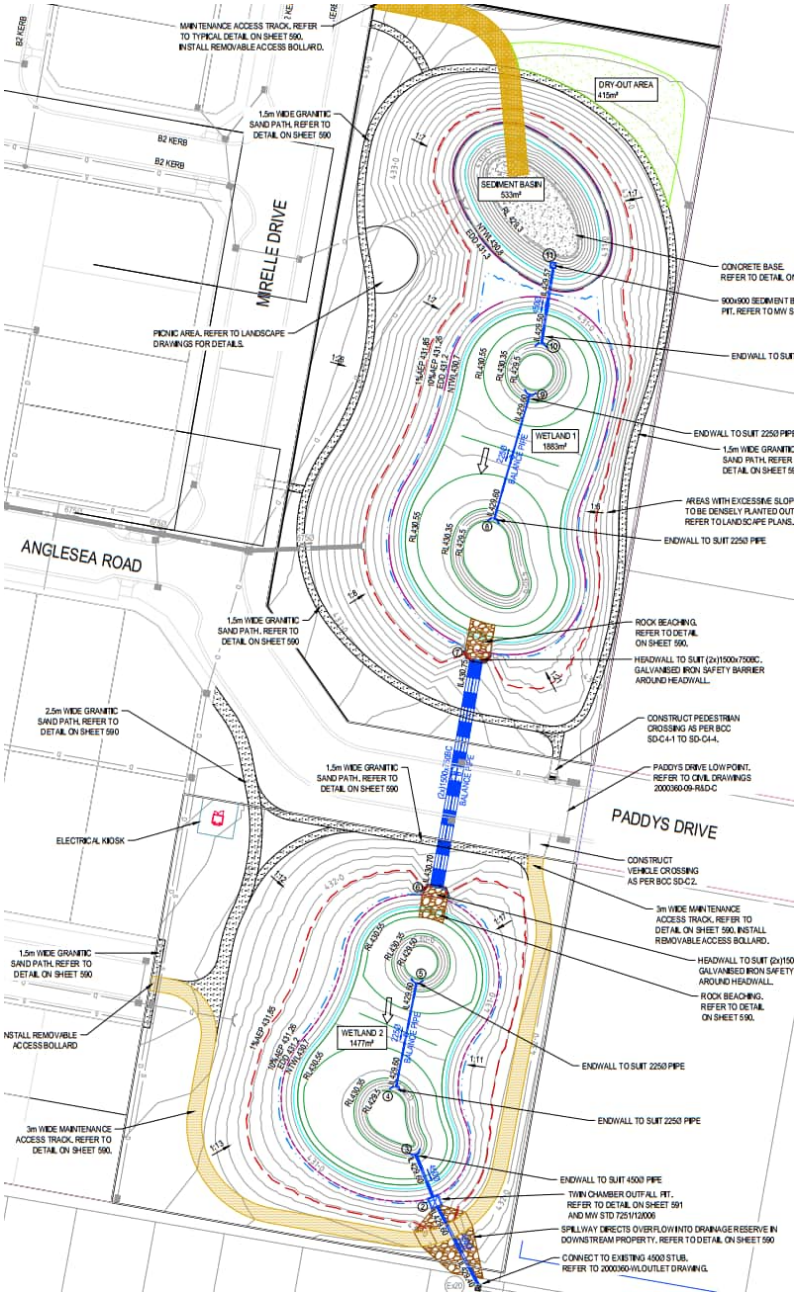

FIGURE 3.6: RETARDING BASIN 5 LAYOUT

3.4.5 RB6

Retarding Basin 6 is currently in the process of being delivered as part of the development of the land on which it is located. Figure 3.7 shows the proposed functional design layout. The asset if being delivered in a location which is broadly in accordance with what was proposed in the 2011 drainage strategy. The size of the wetland asset strategy has been reduced significantly compared to what was proposed in the 2011 drainage strategy due to the introduction of RB6A which is discussed below.

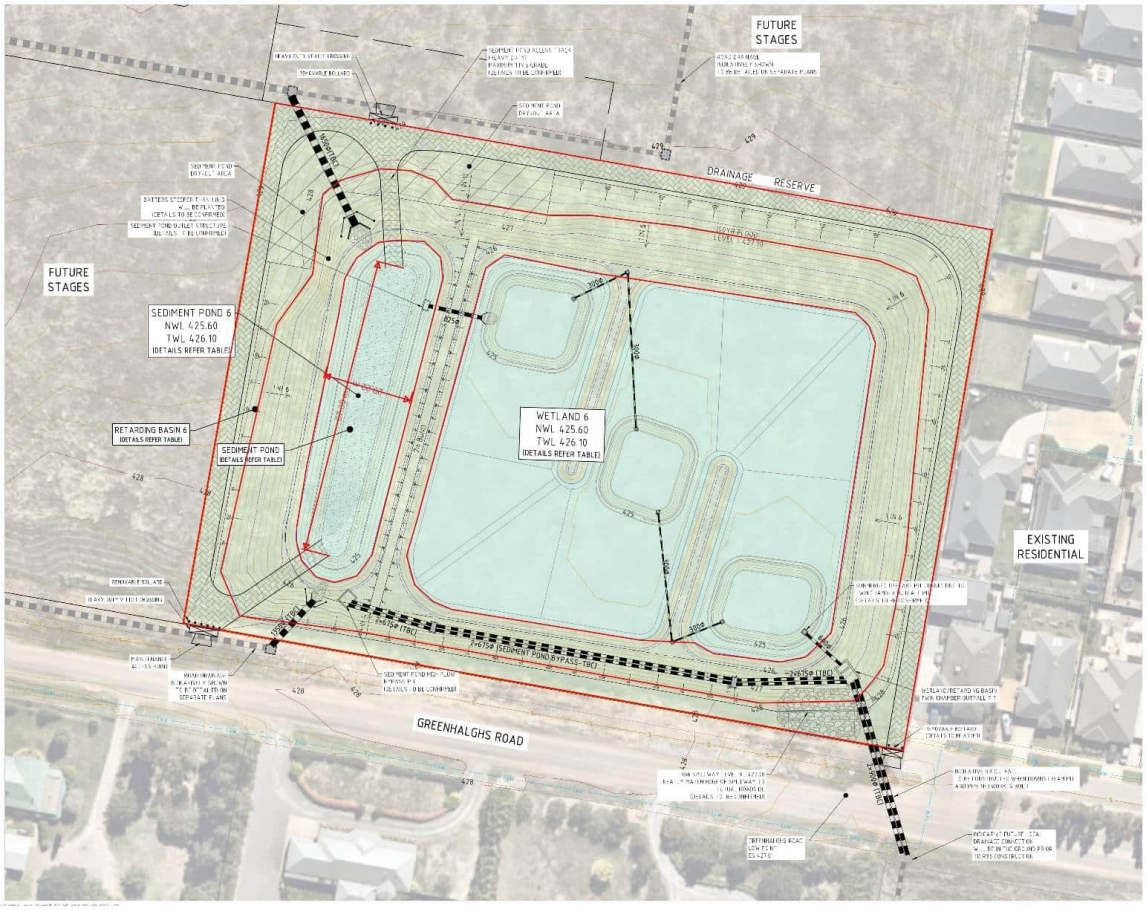

FIGURE 3.7: RETARDING BASIN 6 FUNCTIONAL DESIGN LAYOUT

There was a modification to the drainage strategy proposed by Neil Craigie (Kensington Creek Catchment – Review of drainage proposals between Greenhalghs Road and Glenelg Highway date 21 April 2016) as part of some proposed adjustments to retarding basin 6 and also the raingardens which were proposed adjacent to Kensington Creek. Basins 6A, B and C were developed based on this report and are discussed further in section 3.4.6 below. This proposal suggested that a longer narrower basin for RB6 which extended along Greenhalghs Road. The key benefit this would provide is in reducing the length of incoming pipe runs which could reduce the amount of excavation needed for the basin and wetland. This option was assessed by the developer of the site but not pursued due to commercial reasons for wanting to maximise the developable land fronting onto Greenhalghs Road.

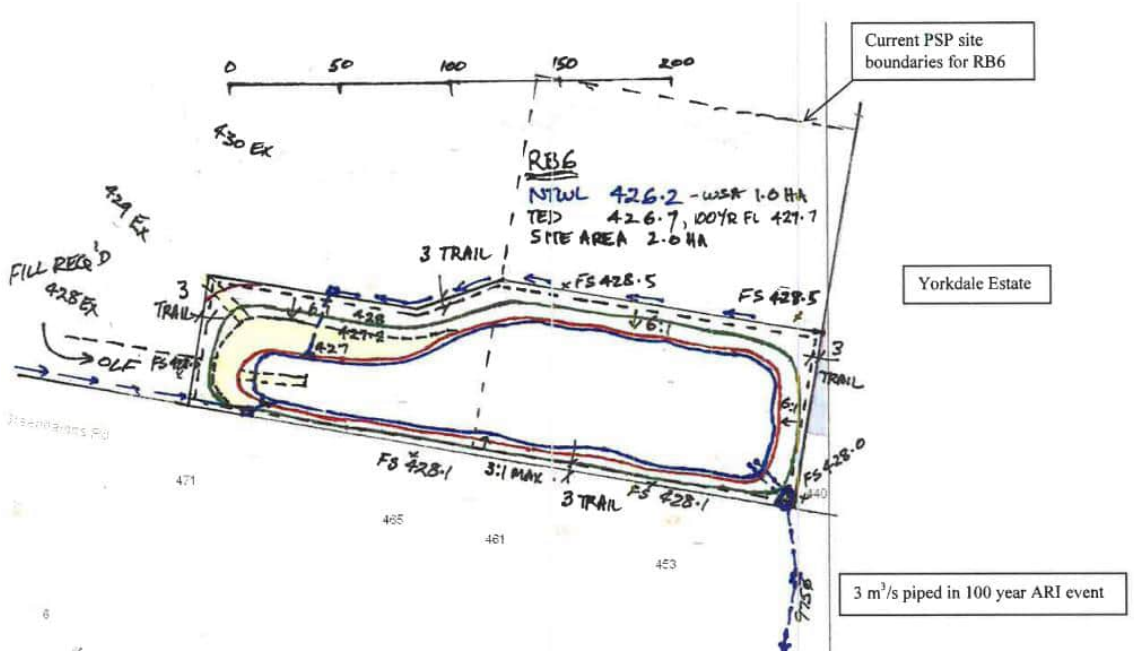

FIGURE 3.8: RETARDING BASIN 6 ALTERNATIVE DESIGN LAYOUT – NOT PURSUED

3.4.6 RB6A, B and C

The integrated sediment ponds/retarding basins RB 6A, 6B and 6C have been proposed to replace a series of biofilters as part of the stormwater treatment measures of Precinct 2. Neil Craigie completed a functional design of RB 6A which is shown in Figure 3.9. This asset has a land area of 1.85 hectares and also incorporates a 5200 m^2 sediment basin and 200 m^2 biofilter. This asset replaces Biofilter 9 that was proposed in the original drainage strategy. The combination of a sedimentation basin and biofilter will be easier for Council to maintain than a biofilter alone which would be subject to high loads of sediment and likely to have issues with surface blockage. In line with Neil Craigie's design, Engeny has also modelled the existing 1800 x 900 diameter box culvert on Glenelg Highway to carry a maximum of 3.8 m^3/s from the retarding basin to the downstream property south of Glenelg Highway, whilst the remainder of the retarding basin's outflows will be piped east to Kensington Creek. The existing box culvert discharges to a property located outside of the PSP development area.

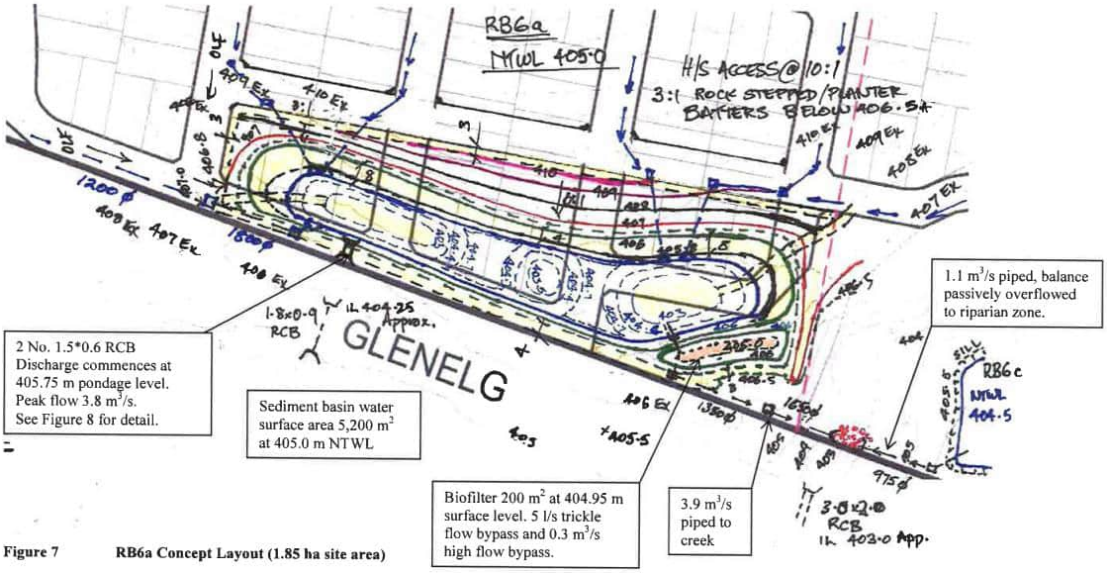

Figure 7 RB6a Concept Layout (1.85 ha site area)

FIGURE 3.9: RETARDING BASIN 6A FUNCTIONAL DESIGN LAYOUT

RB 6B and RB 6C were constructed to replace Biofilters 8 and 10 respectively. Design plans by KLM Spatial which were provided to Engeny by Council were used for used for hydrological and water quality modelling in this study. As proposed by Neil Craigie, who undertook the functional designs, RB6B and RB6C are proposed to be offline RBs, meaning that they are not situated within the main Kensington Creek waterway. Figure 3.10 shows the layout of RB6B and Figure 3.11 shows the layout of RB6C. RB6B caters for the 1 % AEP flows arising from sub-catchment Z1 in addition to a further 2 m^3/s coming from the 21.5 hectares external catchments east of Wiltshire Lane (sub-catchments DO and DP) and sub-catchment Y. As shown in Figure 3.10, it is proposed that by using a flow diversion structure, 2 m^3/s will be piped to RB 6B and the balance will overflow into Kensington Creek. As with RB6A replacing biofilters with sedimentation basins will provide for assets that are easier to maintain. While they do not achieve the same nitrogen removal rates as biofilters, including the treatment of the external catchments has boosted the pollutant removal to a level that it meets the aims of the strategy.

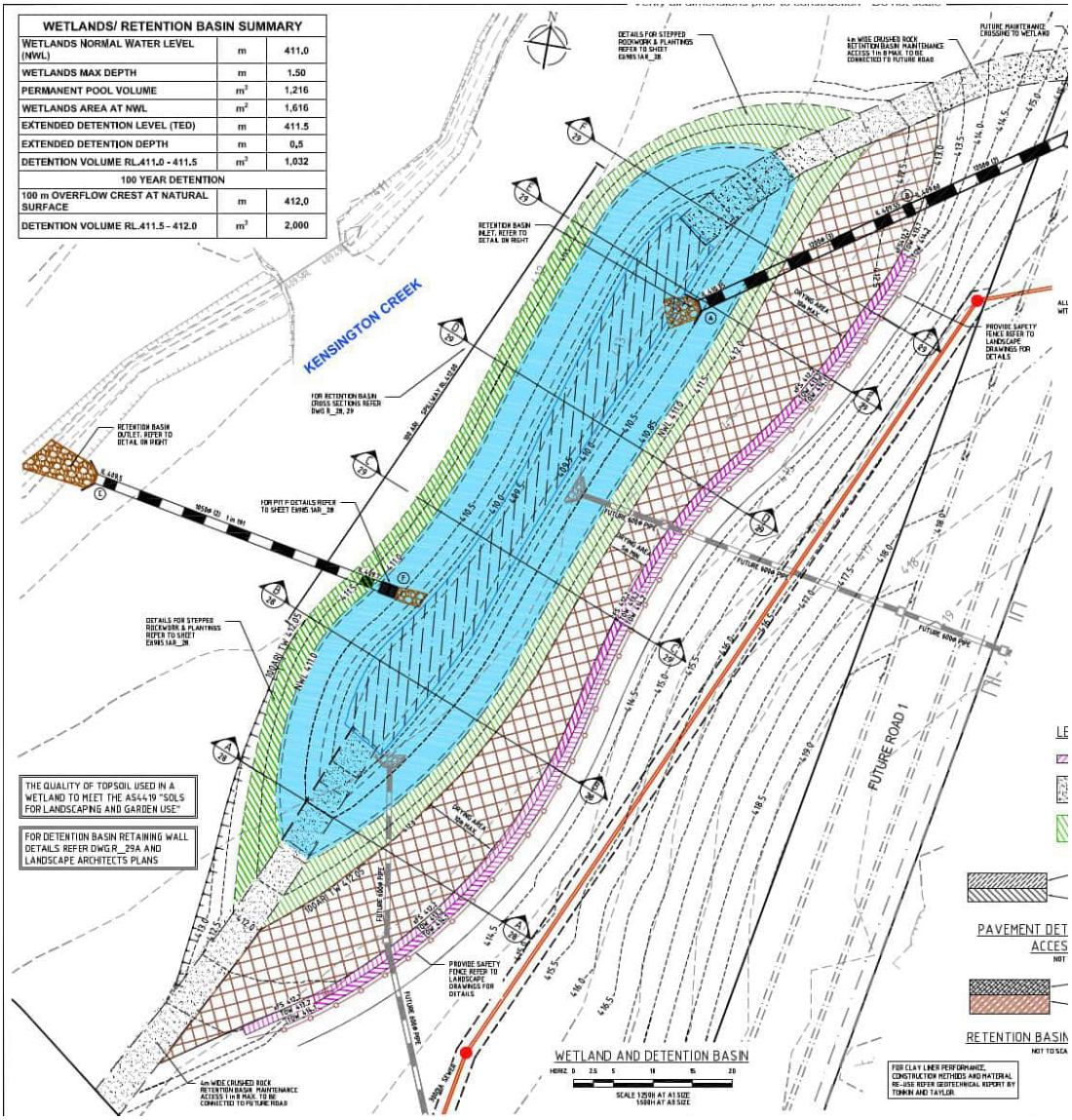

FIGURE 3.10: RETARDING BASIN 6B FUNCTIONAL DESIGN LAYOUT

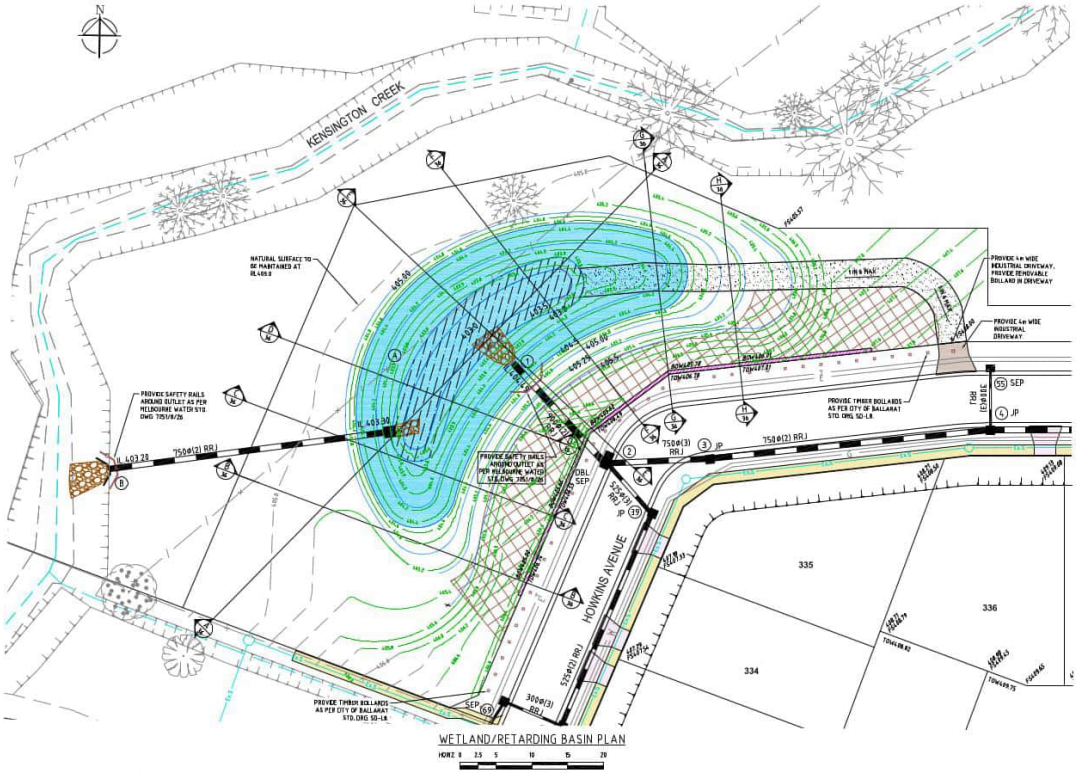

FIGURE 3.11: RETARDING BASIN 6C FUNCTIONAL DESIGN LAYOUT

3.4.7 RB7

Figure 3.12 shows the updated layout of RB7. The wetland and retarding basin are in the same general location as in the previous strategy, however the footprint has been expanded to account for the changes in wetland design standards (such as a reduction in extended detention depth from 0.5 m to 0.35 m, larger, dedicated areas for sedimentation drying, etc) and changes in the hydrology design from ARR 1987 to ARR 2019. Table 3.9 and Table 4.1 contain the key design criteria for the basin and wetland.

FIGURE 3.12: RETARDING BASIN 7 CONCEPT LAYOUT

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3.4.8 RB11 and RB12

Retarding basins 11 and 12 have been moved and resized to help facilitate the staging of development. the catchments draining to RB11, RB12 and RB13 have also been adjusted. The original drainage strategy proposed that runoff from properties along Webb Road be piped south following the pre development fall of the land to Retarding basins 12 and 13 adjacent to Winter Creek. Pipe upgrades along Webb Road captured runoff from subcatchments north of Webb Road and divert piped flows to RB11 via the Cherry Flat Road Outfall Drain. These pipe diversions have been constructed because the areas to the south, where the 2011 strategy directed the pipe drainage, were not yet developing and therefore constructing pipes through these areas would be disruptive and expensive with the infrastructure not required in the short to medium term. The pipe diversions increase the flow to RB11 and RB12, and reduce the flow to RB13.

Figure 3.13 and Figure 3.14 shows the adopted layouts of RB11 and RB12. These figures have been sourced from the "Review of main drainage proposals for the precinct 1 MAC and Abiwood Lands – Version 3" by Neil Craigie dated 22/082016

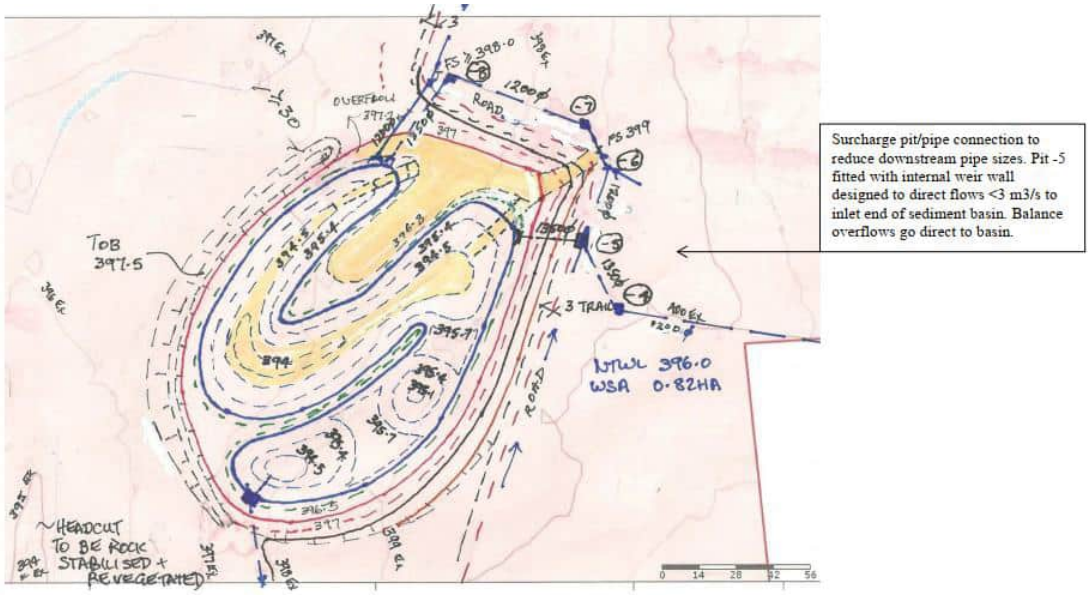

FIGURE 3.13: RETARDING BASIN 11 LAYOUT

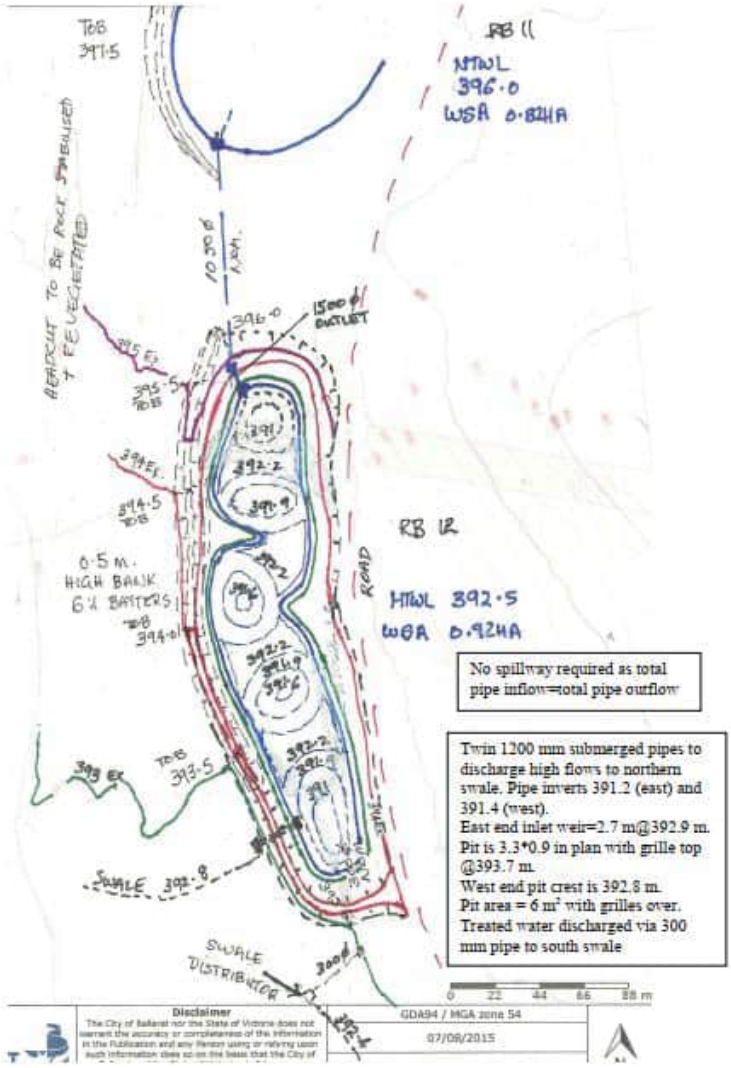

FIGURE 3.14: RETARDING BASIN 12 LAYOUT

3.4.9 RB13

As discussed in section 3.4.8 RB 13 has been resized to help accommodate staging of earlier development in north of the catchment around Webb Road. The catchment flowing to RB 13 has been reduced while the catchment flowing to RBs 11 and 12 was increased. The RB13 design has also been updated to account for the changes in the wetland design guidelines and the updated hydrological modelling. Figure 3.15 shows the updated layout of RB13. Table 3.9 and Table 4.1 contain the key design criteria for the basin and wetland.

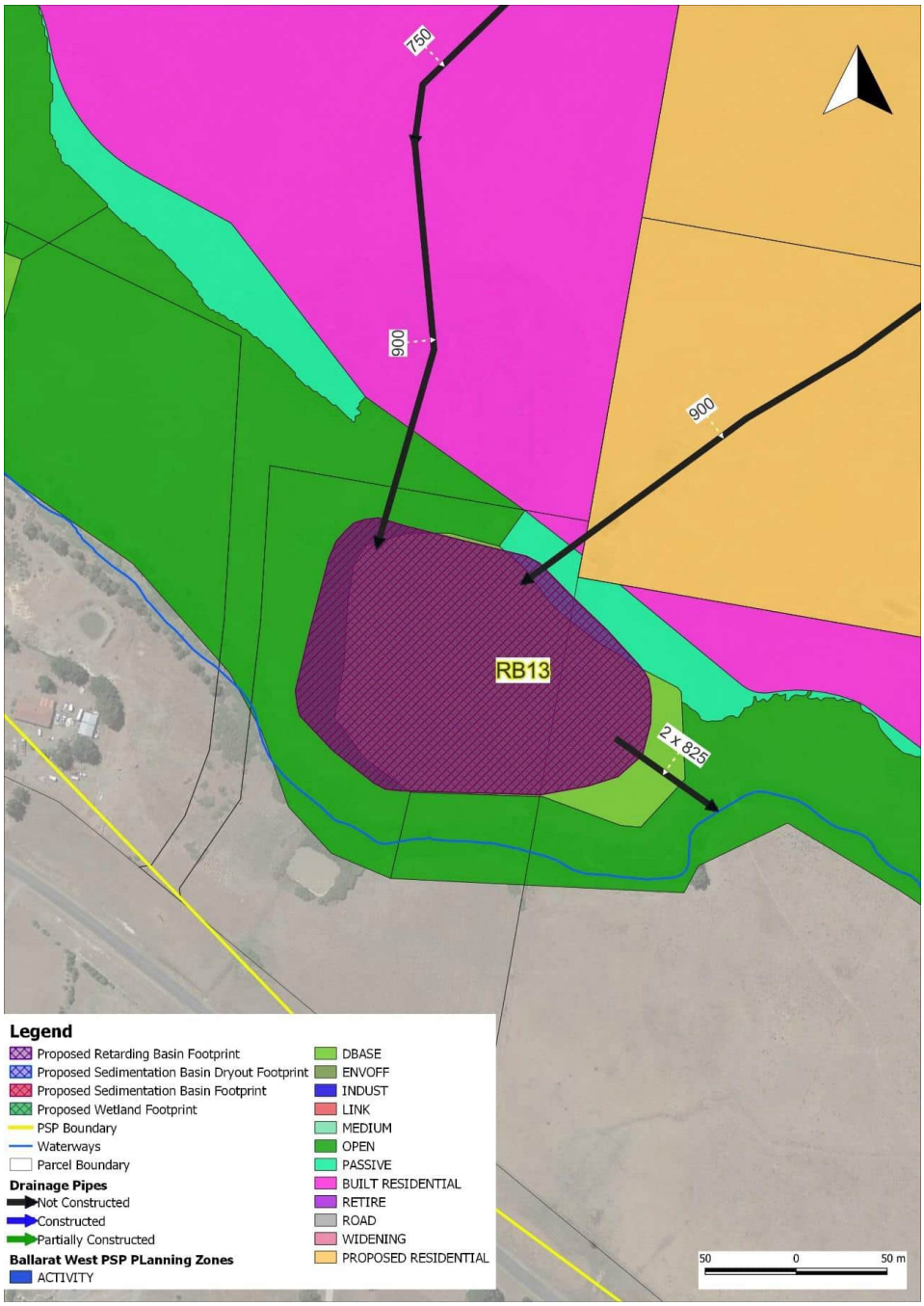

FIGURE 3.15: RETARDING BASIN 13 CONCEPT LAYOUT

3.4.10 RB14

Figure 3.16 shows the updated layout of RB14. RB 14 has been moved further west and is now proposed to be located within a single parcel. This move should assist with the development staging in the area and should help to simply the construction by reducing the need for multiple land owners to be involved. The basin is still located within open space adjacent to Winter Creek so there is no loss of developable area. The RB14 design has also been updated to account for the changes in the wetland design guidelines and the updated hydrological modelling. Table 3.9 and Table 4.1 contain the key design criteria for the basin and wetland.

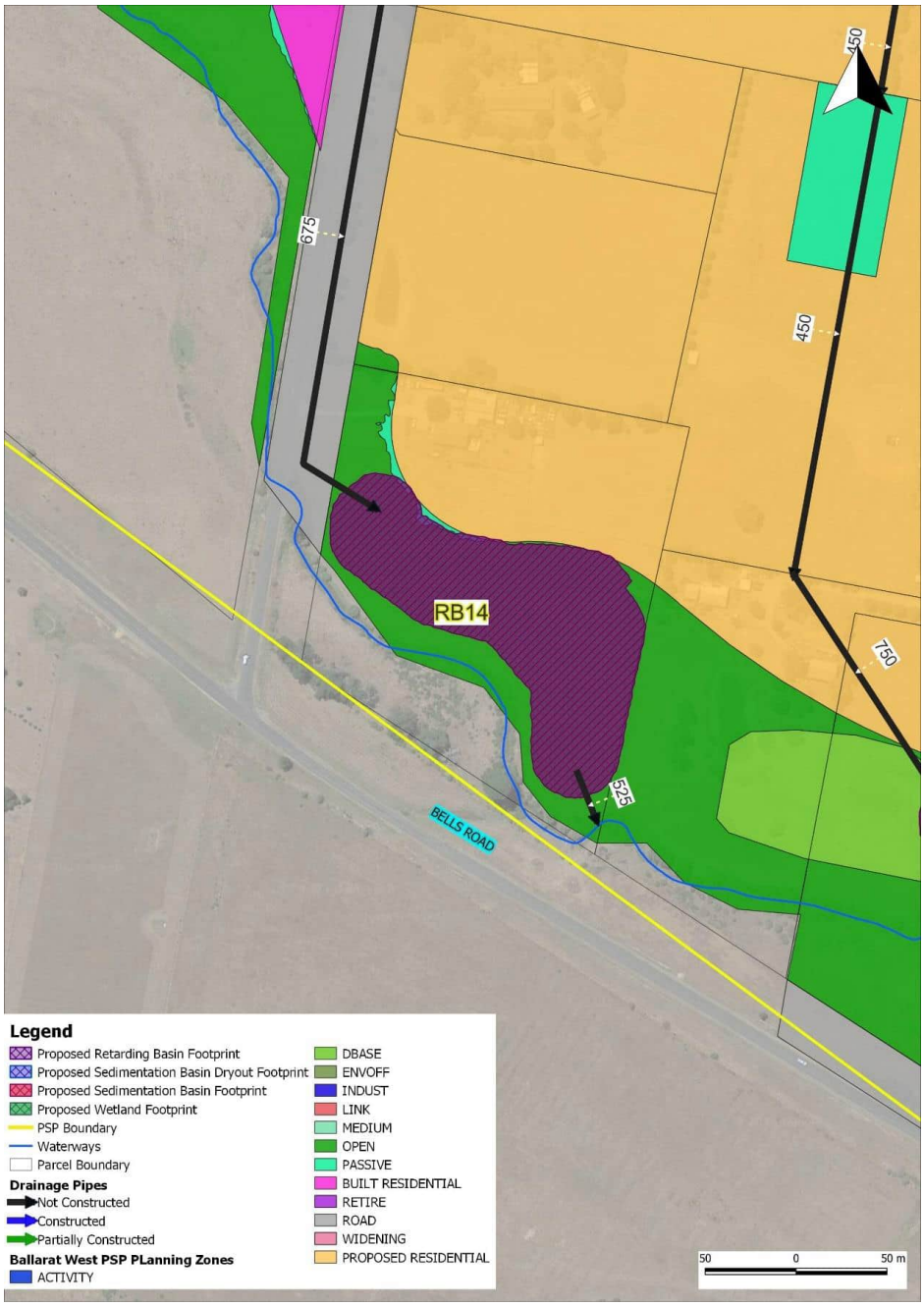

FIGURE 3.16: RETARDING BASIN 14 CONCEPT LAYOUT

3.4.11 RB15 and RB17

Figure 3.17 shows the updated layout of RB 15 and RB17. The proposed location and size of RB15 and RB 17 is very similar to the previous 2011 drainage strategy. The main change is that the footprint has been enlarged to respond to the updated design criteria in particular the lower extended detention depth in the wetland. Offsets from Winter Creek have also been further considered which has also adjusted the shapes slightly. Table 3.9 and Table 4.1 contain the key design criteria for the basin and wetland.

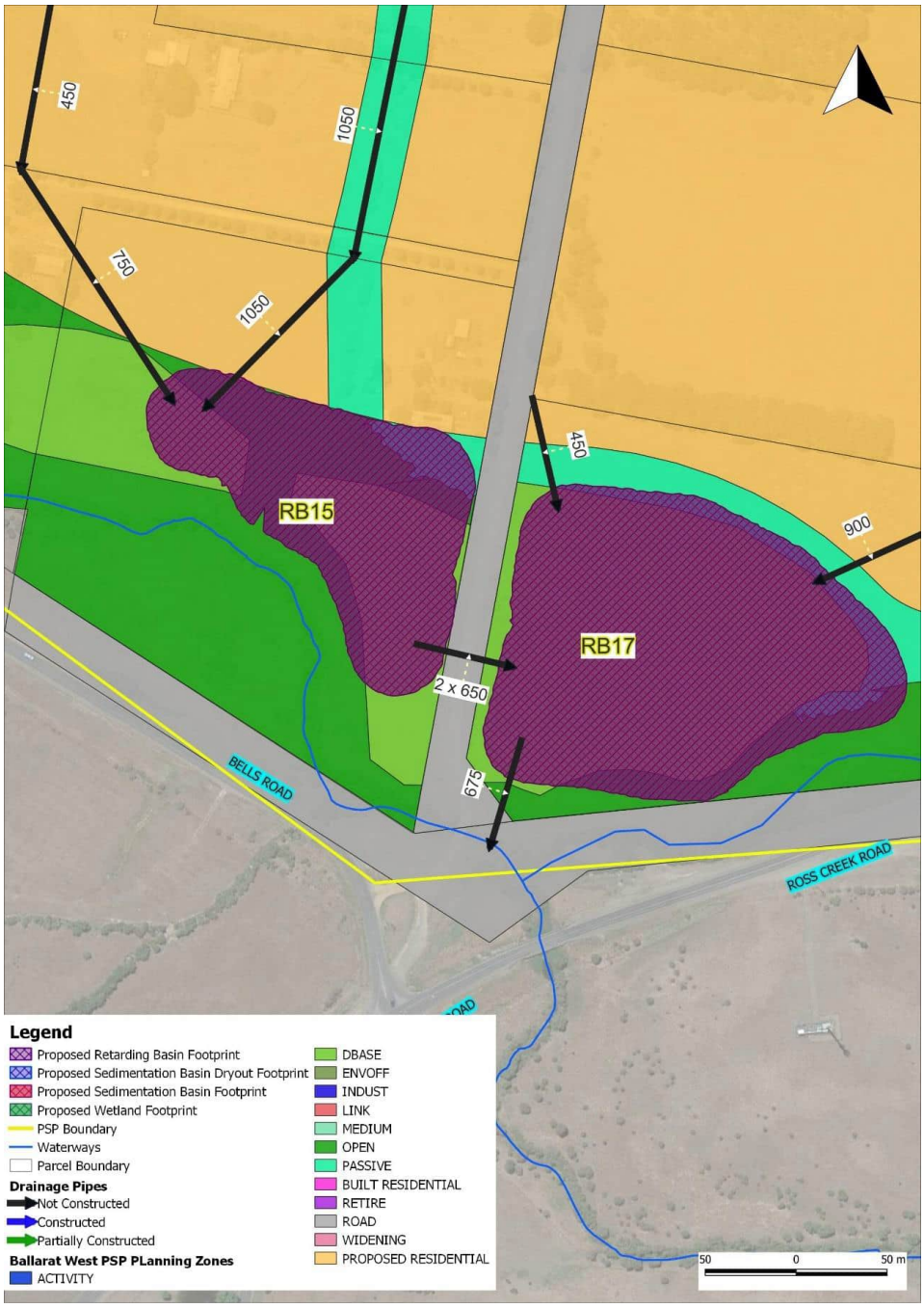

FIGURE 3.17: RETARDING BASIN 17 CONCEPT LAYOUT

3.4.12 RB18

Retarding basin 18 has been moved closer to Bonshaw Creek, enlarged and extended over two parcels. RB18 was moved to increase the catchment which can drain to it, allowing for better flow control and stormwater quality treatment. It's updated location also provides better connectivity between the wetland habitat and the creek habitat and corridor. It also helps to limit the number of drainage outfalls required into Bonshaw Creek and reduces the velocity of the flows discharging to Bonshaw Creek. The asset is currently partially constructed, with the northern section already built. The southern section will be built when the parcel on which it sits is developed. Figure 3.18 shows the layout of the retarding basin.

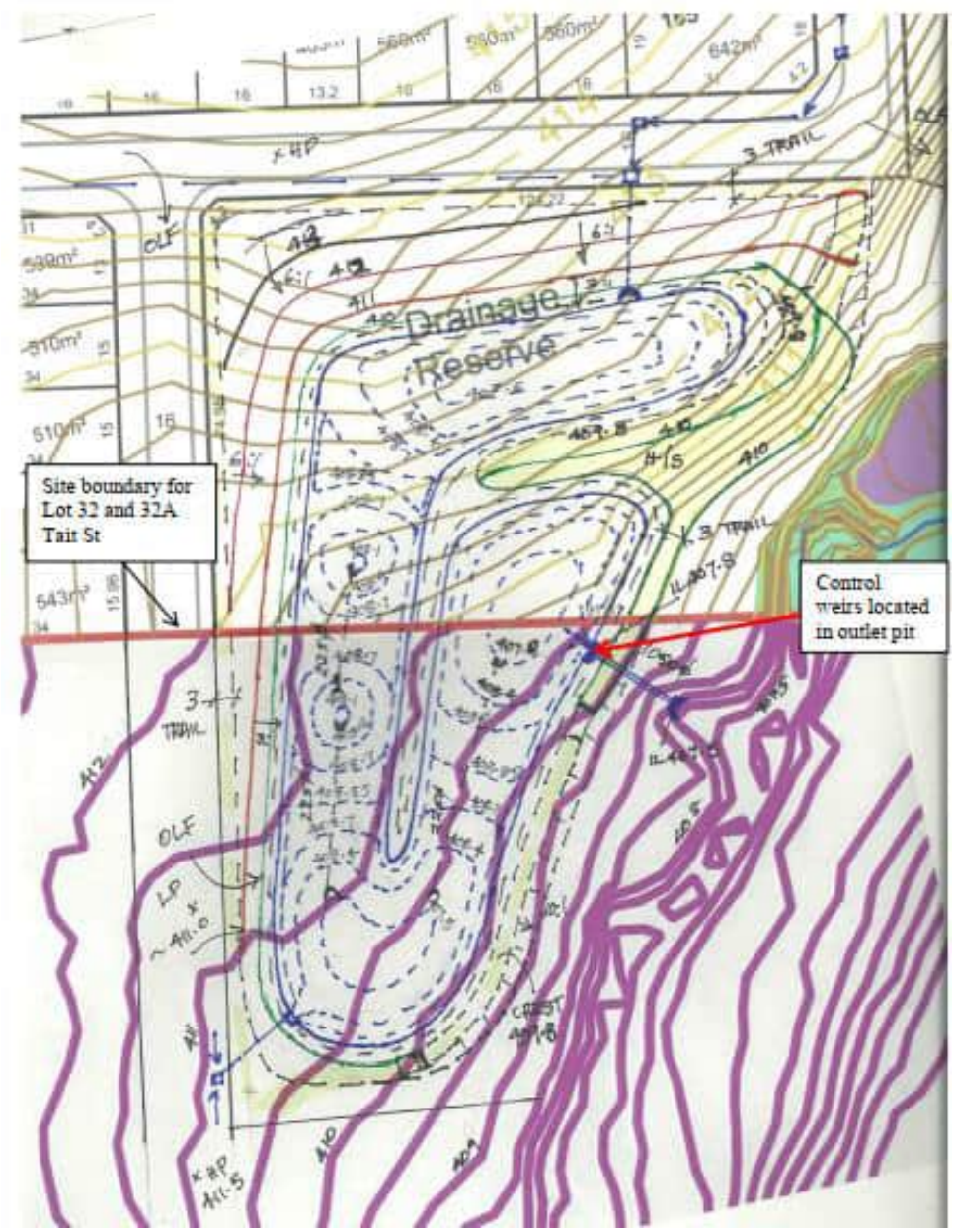

FIGURE 3.18: RETARDING BASIN 18 LAYOUT

Source: Lot 32 and 32A Tait Street, Bonshaw IWMS, Niel Craigie, 29/09/2015

3.4.13 RB24

Figure 3.19 shows the updated layout of RB24. The proposed location and size of RB 24 is very similar to the previous drainage strategy. The main change is that the footprint has been enlarged to respond to the updated design criteria with the key point being the lower extended detention depth in the wetland. Table 3.9 and Table 4.1 contain the key design criteria for the basin and wetland.

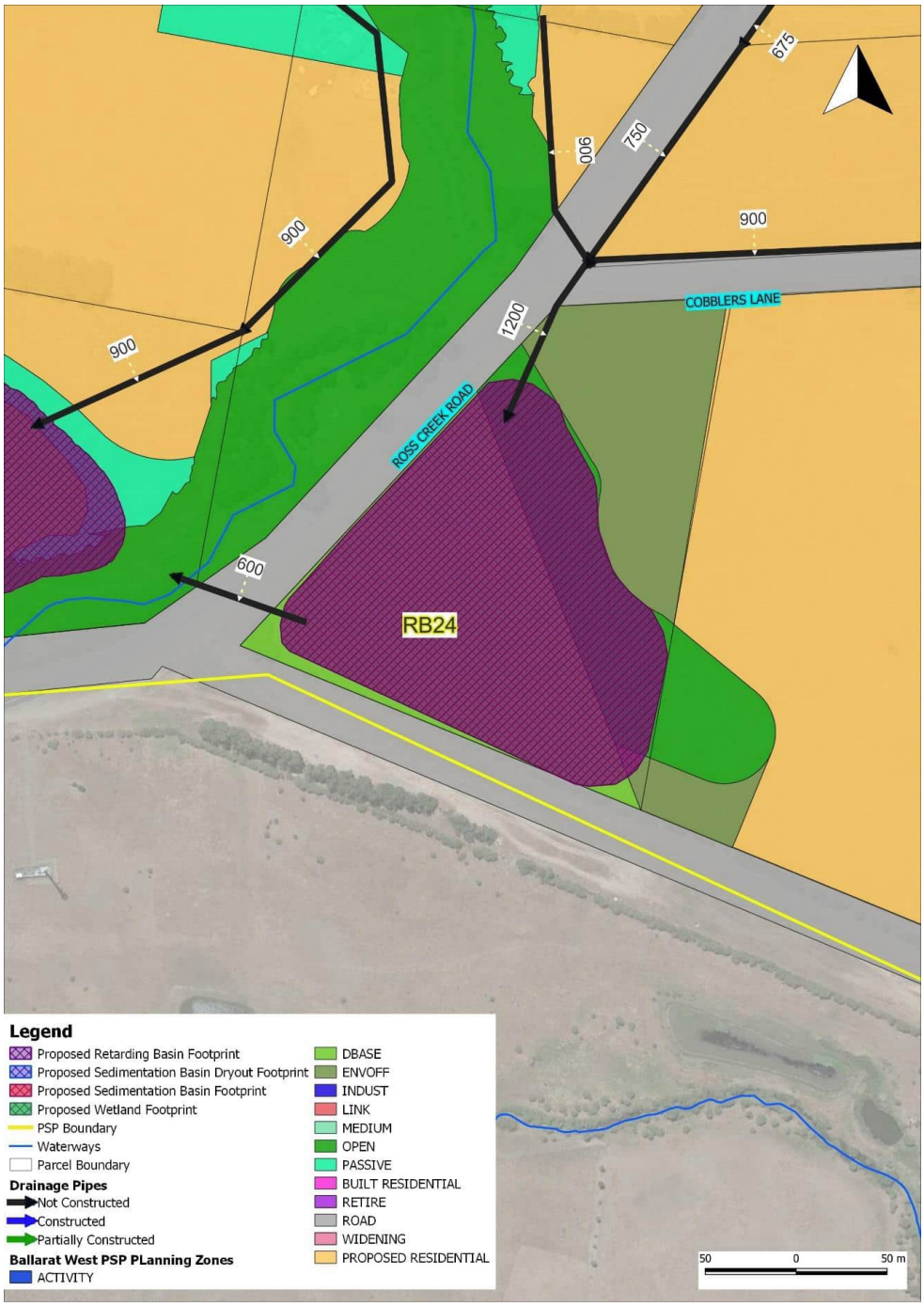

FIGURE 3.19: RETARDING BASIN 24 CONCEPT LAYOUT

3.4.14 RB25 and RB26

Retarding basins 25 and 26 have been consolidated into a single basin at the location where RB26 was proposed in the 2011 strategy. RB26 is larger than was proposed in the 2011 strategy. This change has been undertaken to allow for a reduction in the number of assets that Council will need to maintain and to improve the development layout of the estate in which the two proposed basins were situated. The two basins were relatively close together so this is a fairly minor change from what was proposed in the 2011 drainage strategy. Figure 3.20 shows the location of RB26. RB 26 has already been constructed.

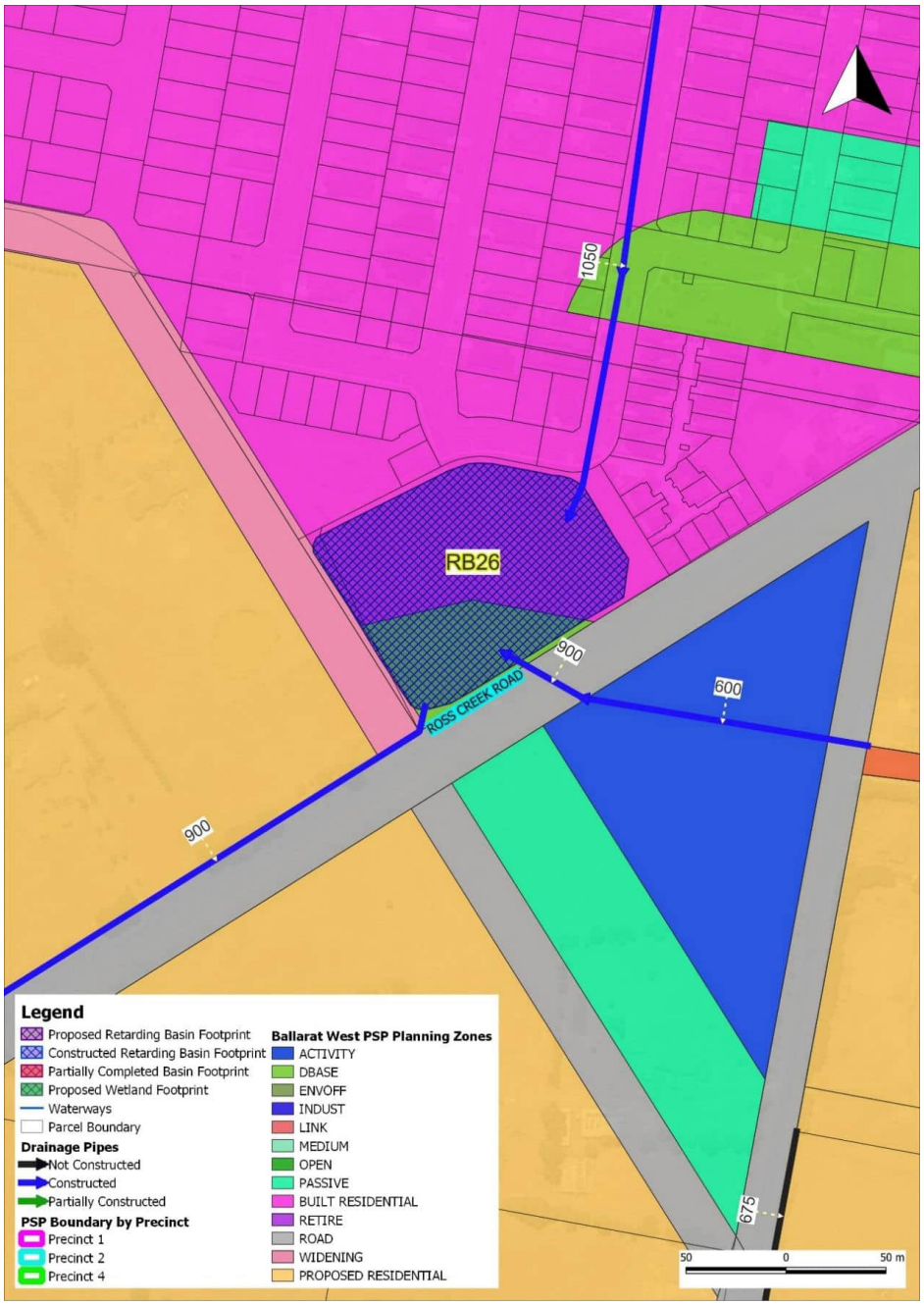

FIGURE 3.20: RETARDING BASIN 26 LAYOUT

3.4.15 RB27

Retarding basin 27 has been significantly reconfigured as part of this review. The wetland associated with the basin will remain as an offline asset on the western side of the waterway. Low flows only from the upstream catchment will need to be directed into the wetland for treatment. A sedimentation basin is also proposed on the eastern side of the waterway to provide primary treatment to the runoff from the catchments on the eastern side of the waterway. Only low flows (up to the 1 exceedance per year) would need to be conveyed to the sedimentation basin. Figure 3.21 shows the updated layout of RB7.

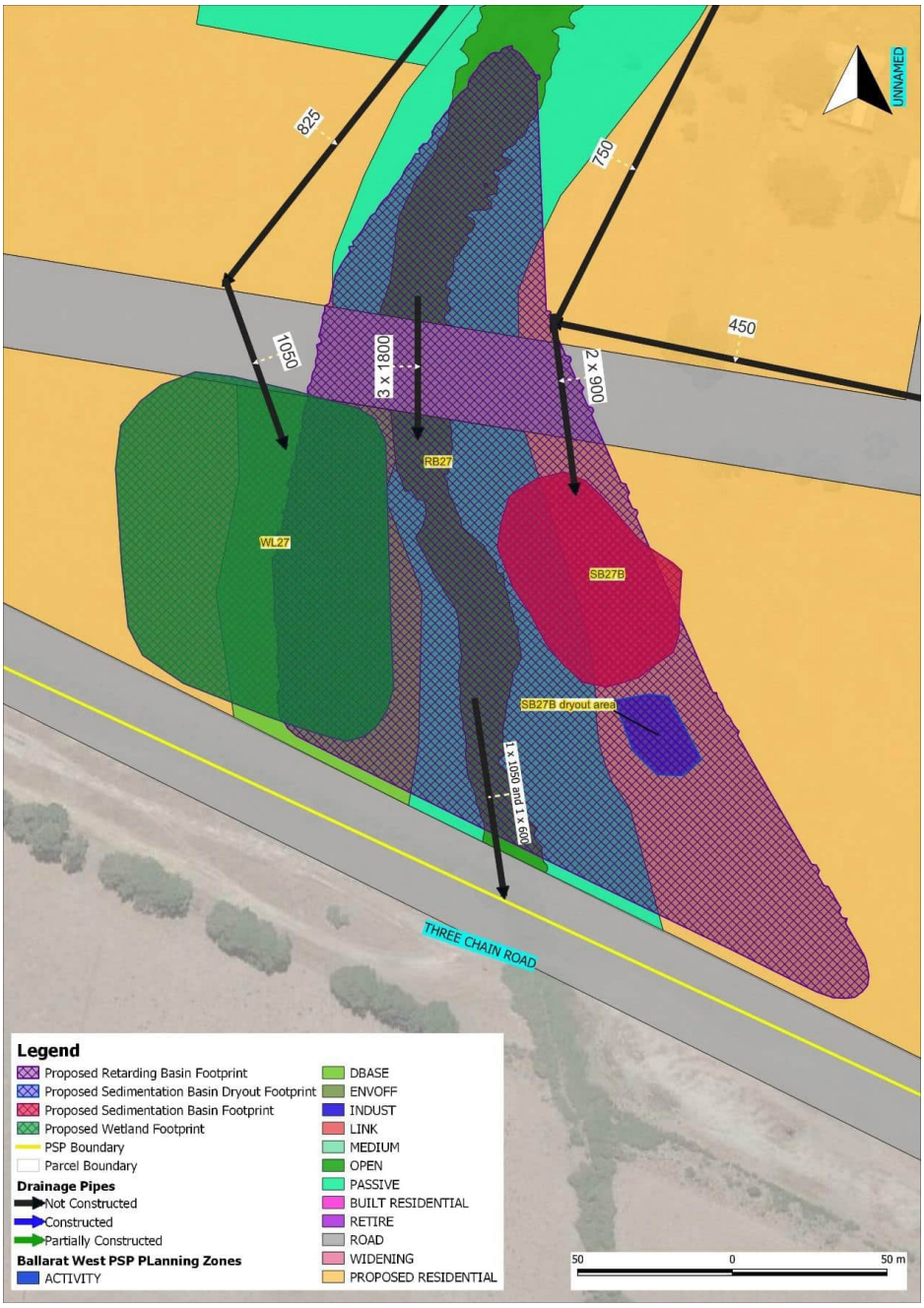

FIGURE 3.21: RETARDING BASIN 27 CONCEPT LAYOUT

For retardation an embankment across of the valley floor is proposed with culverts under the embankment providing the flow rate control. The embankment would need to extend to 388.1 m AHD. The 1% AEP flood level within the basin would extend to 387.8 m AHD. The embankment would be in the order of 5 m tall in the centre. No additional excavation is required behind the embankment wall to achieve the require storage. It has also been assumed that there is no storage available within the future road reserve which is north of Three Chain Road. It is expected that an embankment and culvert (sized to pass the unretarded 1% AEP flow) would be built within this road reserve, reducing the available storage. The retarding basin would also flood the wetland on the western side of the waterway and the proposed sedimentation basin on the eastern side of the waterway. The assets should be protected from flooding in up to a 10% AEP as part of the detailed design.

An embankment of this size creates an elevated level of risk associated with embankment failure (as compared to there being no embankment on the waterway). The land downstream of the embankment is within the Golden Plains Shire and is currently not zoned for urban development. Engeny understand that there is a proposal to undertake urban development in this area. If urban development proceeds in this area it will change the risk profile for the embankment compared with the current land use.

The retarding basin is able to achieve the required flow reduction to redeveloped flows so that there is no increase on the downstream section of waterway. This point is also the boundary between the City of Ballarat and Golden Plains Shire. The waterway flows for a few hundred metres before joining Winter Creek. Further hydrological analysis has revealed that there is no change in the peak flow on Winter Creek either with or without the retarding basin. The critical duration storm on Winter Creek is the 12 hour storm, while the critical duration for the catchment to RB 27 is the 1 hour storm. The peak flow from the local catchment is less than the retarded outflow peak flow rate from the 1 hour storm. This means that the retarding basin is meeting the drainage strategy requirement to not increase flows downstream. If the land directly downstream of the retarding basin is developed to urban housing then the proposed embankment does not represent an ideal outcome from a risk management point of view. It would be a better financial and engineering outcome if the waterway between Three Chain Road and Winter Creek could be protected or modified to convey the unretarded flow directly into Winter Creek. The hydrologic outcome to Winter Creek would be the same. It is recommended that the City of Ballarat explore this option with the proposed developer of the land, Corangamite CMA and Golden Plains Shire to establish if it would be an acceptable outcome to have an increase in flows between Three Chain Road and Winter Creek to avoid the need to construct the expensive embankment associated with Retarding Bains 27. The wetlands and sedimentation basin should be constructed regardless of if the embankment which forms the retarding function is completed or not.

Table 3.9 and Table 4.1 contain the key design criteria for the basin and wetland.

3.4.16 RB28

Retarding basin 28 has been constructed. the design of the basin has evolved from what was proposed in the original concept in the 2011 drainage strategy. Additional consideration has been given to the inverts of the incoming drains from Crown Street and the outgoing culverts and piped outfalls south under Morgan Street. The existing lake at the WorldMark Resort is to be retained (this was uncertain at the time that the 2011 drainage strategy was developed). Retaining this lake means that runoff must be directed to it to provide for suitable turnover to prevent water quality issues. The low flows from the wetland are being directed to the lake so that it received treated runoff to help maintain the water quality in the lake. Higher flows are being bypassed around the lake to help protect the structural integrity of the lake. The updated design of RB 28 also helps to minimise cut volumes and minimise disturbance in the area which contains historical tailings from mining operations. Figure 3.22 shows the location of RB 28.

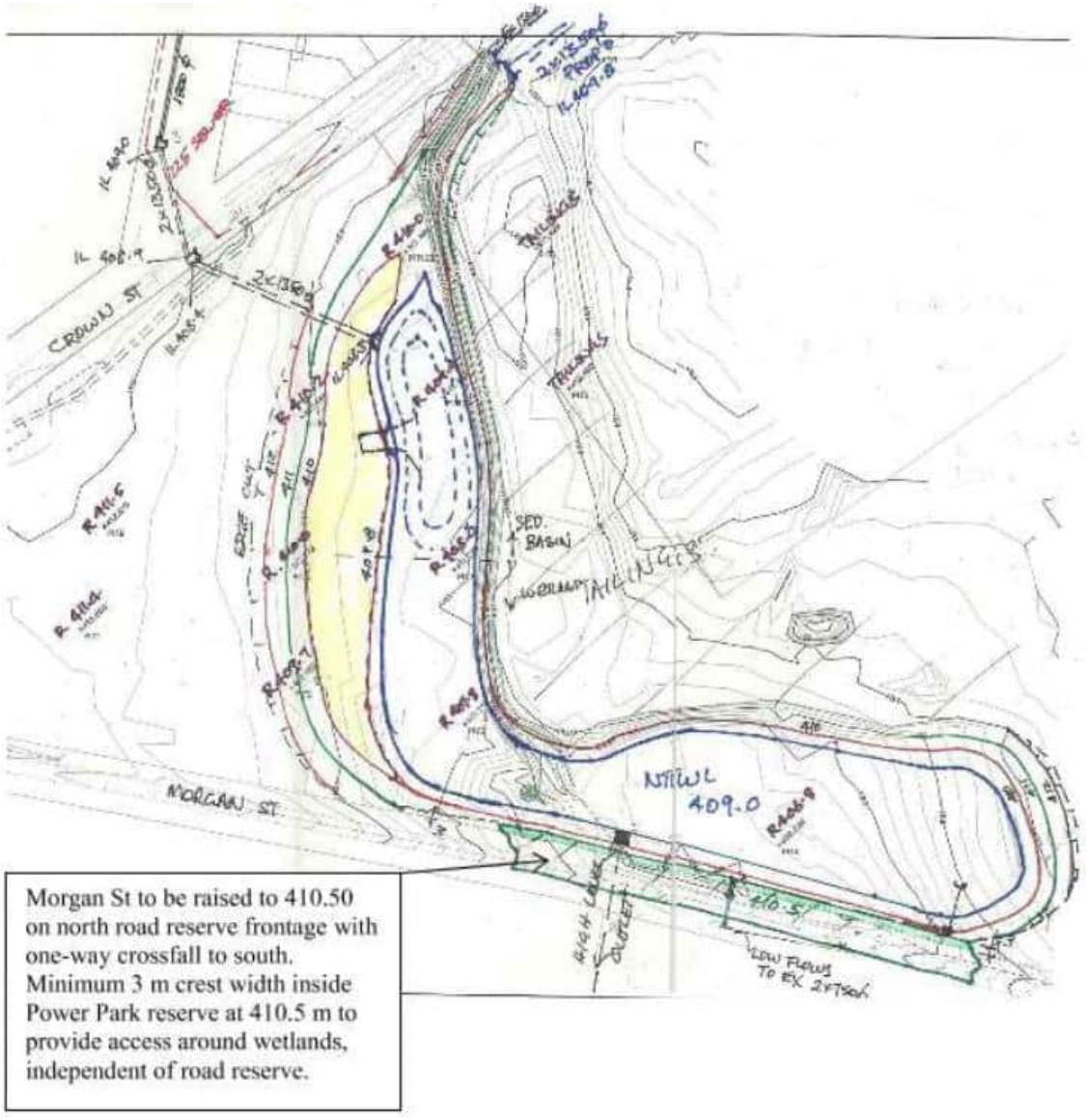

FIGURE 3.22: RETARDING BASIN 28 CONCEPT LAYOUT

Source: Review of Main Drainage Proposals for the Power Park catchment in Precinct 1, Neil Craigie, 25/08/2015

3.4.17 RB29

Figure 3.23 shows the updated layout of RB29. The retarding basin and wetland have been extended west to allow space for the maintenance paths sedimentation drying and the lower extended detention depth. Table 3.9 and Table 4.1 contain the key design criteria for the basin and wetland. RB 29 is larger than was proposed in the 2011 strategy and is taking land which was previous proposed as open space. It is also worth highlighting that since the 2011 strategy was completed this area has been identified as having heritage values (understood to be associated with historical mining) and also has the potential for ground contamination. The current costs estimate does not include an allowance to address these potential issues as they will need to be further investigated to understand the magnitude of the impacts.

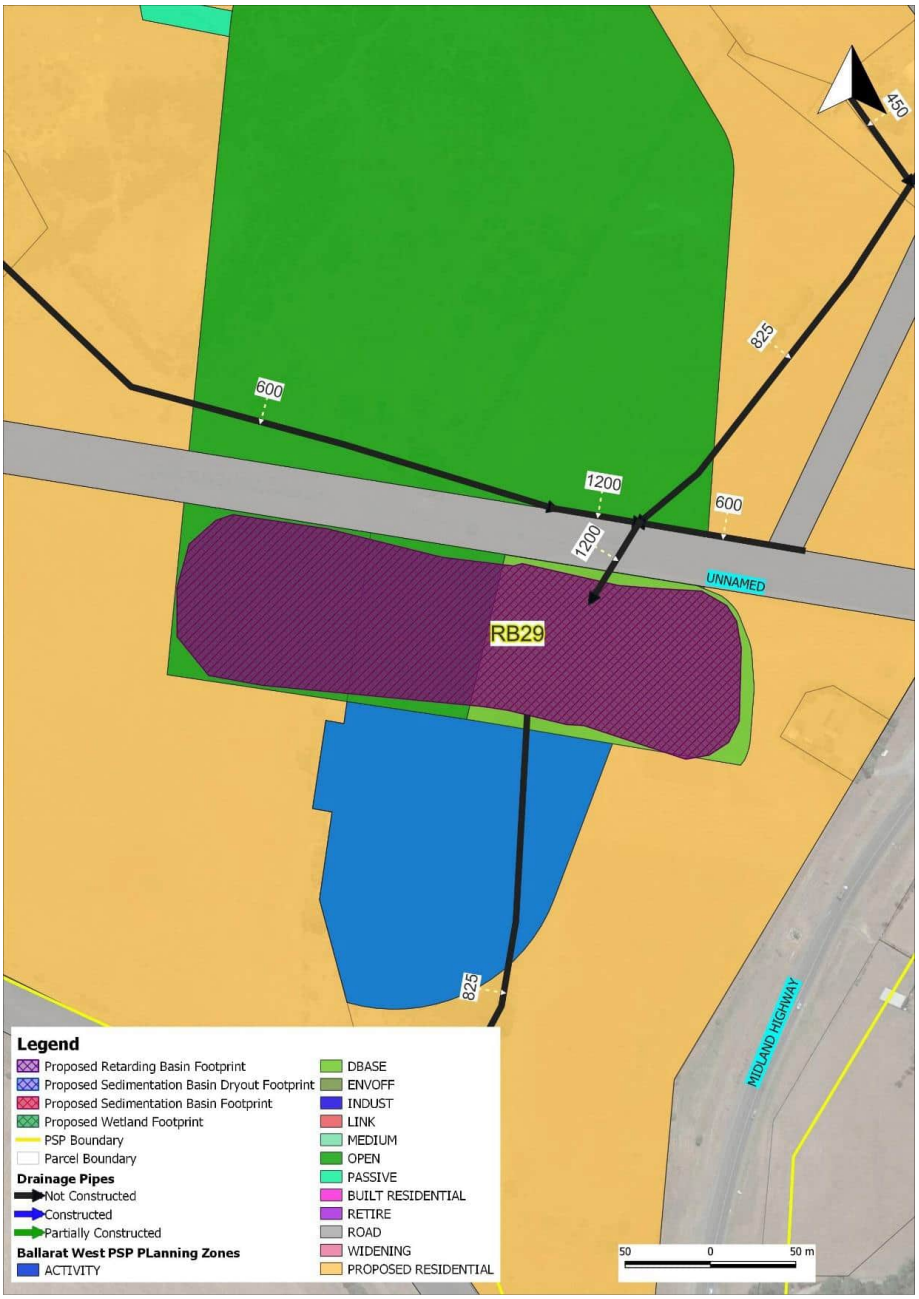

FIGURE 3.23: RETARDING BASIN 29 CONCEPT LAYOUT

3.4.18 RB30

Retarding Basin 30 is proposed to be removed and replaced with a sedimentation basin (SB30) nearby and online to the existing unnamed tributary of Winter Creek. This concept was first proposed in work undertaken by Neil Craige in 2015 as part further design work completed on RB 28 in the MR Power Park Reserve. The lake at the WorldMark Resort is proposed to be retained. At the time when the 2011 drainage strategy was developed it was unclear what would happen to this lake. The lake has a large surface area, and while it is not designed specifically to retard flows it does have an attenuating effect on them. Given that it is now being retained and with the reconfiguration of retarding basin 28, the retarding function associated with RB 30 is no longer required. There is still a need for some stormwater treatment as no treatment is being claimed by the lake as it is an existing asset. SB30 treat a large catchment which is external to the development area and has little to no stormwater treatment at the moment. The credits gained from treating this runoff is used to offset pollutants generated within the development area. The net effect is the same or better on the receiving waterways as less untreated runoff is entering Winter Creek. Figure 3.24 shows the proposed layout of sedimentation basin 30. The basin is contained to the waterway reserve.

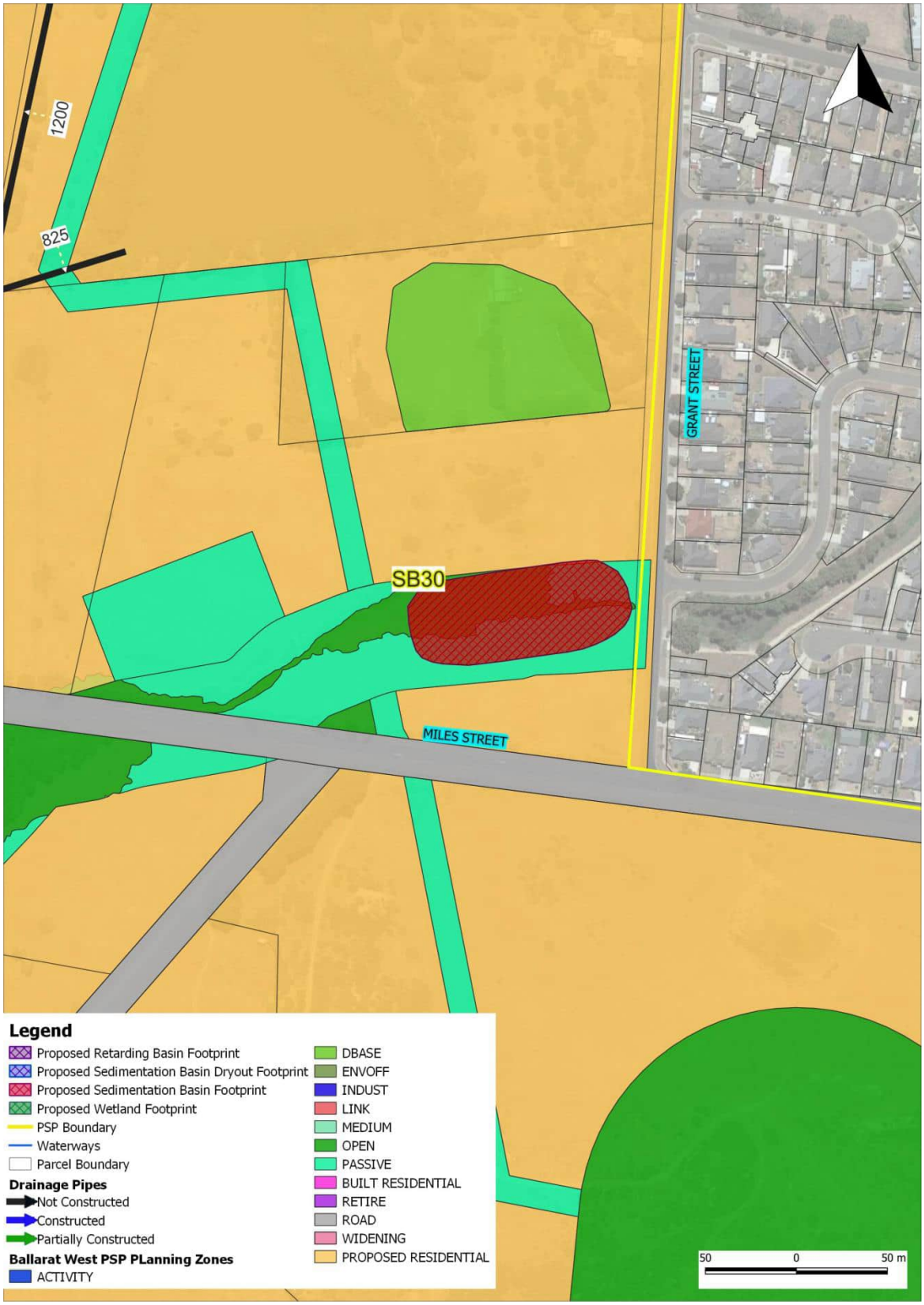

FIGURE 3.24: SEDIMENT BASIN 30 CONCEPT LAYOUT

ENGENY

3.4.19 Constructed or Committed Retarding Basins

Table 3.11 shows the details of the retarding basins which have already been constructed or committed within the PSP area.

TABLE 3.11: CONFIRMED RETARDING BASINS

Asset ID	1% AEP Storage Volume (m^3)	Outlet Configuration Weir (m AHD) or Pipe Diameter (mm)	Peak 1 % AEP Outflow (m^3/s)
RB1	4,680	Weir Outlet Weir 1. (Elevation – 440 Length – 0.3 m) Weir 2. (Elevation 440.5 Length – 1.2 m) Weir 3. (Elevation – 441.55 Length – 10.0 m) Pipe outlet – 1 x 600	6.30 (spillway)
RB2	38,100	Weir Outlet Elevation – 1.5 Length – 100.0 m	6.28 (spillway)
RB3	19,600	Weir Outlet Weir 1. (Elevation – 428.4 Length 0.3 m) Weir 2. (Elevation – 428.9 Length – 0.8 m) Weir 3. (Elevation - 430.3 Length – 50.0 m)	1.92 (spillway flow)
RB4	15,100	3 x 750	3.54 (pipe flow)
RB5	6,950	Weir Outlet Wear 1. (Elevation – 431.85 Length 10 m) 450	6.10 (pipe & spillway)
RB6	20,000	2 x 900	3.18 (pipe flow)
RB6A	7,830	1650	7.71 (pipe flow)
RB6B	1,260	1050	2.74 (pipe flow)
RB6C	184	750	1.31 (pipe flow)
RB7	19,600	2 x 675	2.57 (pipe flow)
RB11	17,900	Weir Outlet Weir 1. Elevation – 396.0 Length – 0.3 m) Weir 2. (Elevation – 396.5 Length – 2.8 m) Weir 3. (Elevation – 397.0 Length – 20.0 m)	5.57 (spillway flow)

Asset ID	1% AEP Storage Volume (m^3)	Outlet Configuration Weir (m AHD) or Pipe Diameter (mm)	Peak 1 % AEP Outflow (m^3/s)
RB12	23,500	Weir Outlet Weir 1. (Elevation - 392.5 Length – 0.2 m) Weir 2. (Elevation – 392.9 Length – 0.8 m) Weir 3. (Elevation - 394.45 Length – 60.0 m)	3.22 (spillway flow)
RB18	6,930	Weir Outlet Weir 1. (Elevation – 409.8 Length – 10.0 m) Pipe Outlet 1 x 600	3.5 (pipe & spillway flow)
RB26	7,190	1 x 900	2.63 (pipe flow)
RB28	26,300	1 x 1500 2 x 750	6.23 (pipe flow)

4. STORMWATER QUALITY

The Clause 56 of the planning scheme and Corangamite CMA requires the water discharged into existing waterways from urban areas is treated to the Best Practice Environmental Guideline Target for Stormwater Treatment. This requires that 80% of suspended solids, 45% of total phosphorus, 45% of total nitrogen be removed and 70% of gross pollutants be removed. To achieve these targets a range a water sensitive urban design (WSUD) techniques can be used, by incorporating a combination of Wetlands, Sediment Basins and Gross Pollutant Traps (GPTs).

The Ballarat West PSP drainage strategy includes a total of twenty wetlands and two stand-alone sediment basins (SB30 and a secondary basin within RB27) to achieve BPEMP objectives. Thirteen of these wetlands have been constructed or committed to construction and so the designs have not been updated as part of this project however Engeny has confirmed their makeup and contribution to the strategy. All treatment assets have been proposed to be located within the precinct boundary. Consideration has been undertaken to the consolidation of treatment assets by conveying flows to centralised locations, which also facilitates minimising piped outfalls into the waterways.

Inlet ponds for each wetland and the stand-alone sediment basins have been sized using the Fair and Geyer Equation. Typically, a 4 exceedances per year (EY) (3 month ARI) design flow is adopted in these calculations. A copy of the sedimentation basin sizing calculation sheets is included in Appendix B.

It has generally been assumed that each wetland will be constructed in cut. This makes achieving outlets from upstream drainage easier and is a conservative approach in terms of costing. The normal water level has been identified by Engeny based on both upstream and downstream level constraints and considering that at approximately one metre of storage depth is required above the extended detention depth of the treatment assets in order to provide some retardation of flows (peak flow control is discussed in Section3.4).

Engeny has sized the inlet pond area, sediment drying area and wetland treatment area for each asset. The sediment drying area has been estimated based on a sediment stockpile height of 0.5 metres in line with Melbourne Water's Wetland Design Manual. High level 12d modelling has been undertaken of the batter slopes (assumed to be 1 in5) and includes the allowance for a maintenance access track (4 m wide) around the wetlands. Further details such as wetland bathymetry, final wetland shape layout, sedimentation basin access path, high flow bypasses and landscaping have not been considered as part of this work. The total treatment footprint of the asset includes a buffer of an additional 20% of the wetland, sedimentation basin and sedimentation dry out area to allow for details discussed above but not explicitly modelled. It would be expected that the modelled wetland performance will improve when custom stage storages and outfall are added to the model at the functional design phase and that the additional space allowance should be suitable to incorporate the remaining design elements.

Table 4.1 summarises the key parameters for each treatment asset. It also provides a summary of the total footprint area for each asset at normal water level (NWL).

4.1 Wetlands

Table 4.1 shows the key design criteria of the remaining wetlands which have not yet been constructed or committed under the previous strategy work. Each of the wetlands serves a dual treatment and retardation purpose, with RB27 (discussed further in section 0) being the only asset proposing a significant embankment. All of the other assets have been assumed to be constructed in cut. Changes to the footprints may be required through detailed design, however it would be expected that where possible designs are generally in accordance with the concept designs or can be demonstrated to achieve equal or improved treatment performance outcomes. The column titled "Asset footprint (inc. battering and maintenance track)" is estimated total land take required for the asset.

TABLE 4.1: BALLARAT WEST PSP SEDIMENT BASIN AND WETLAND KEY DETAILS

Wetland	Total Catchment (ha)	4EY design flow (m^3/s)	Sed basin permanent volume (m^3)	Sed Basin Area (m^2)	Sed basin drying area (m^2)	Wetland Treatment area (m^2)	Asset footprint (inc battering and maintenance track)	Assumed NWL (m AHD)
RB7	75	0.75	600	800	702	12570	35800	405.2
RB 13	122	0.54	2000	2000	2429	8760	22400	387.5
RB 14	31	0.27	500	700	604	3830	13800	384.5
RB 15	65	0.34	1000	1200	1285	4010	16600	383.9
RB 17	22	0.32	400	600	437	12910	29500	383.9
RB 24	53	0.43	700	900	832	11530	28000	385.9
RB 27	32	0.43	500	700	506	2290	8100	386
SB27b	25	0.56	290	600	386	N/A	3300	385.5
RB 29	79	0.65	1000	1200	1244	9910	29400	390.8
SB 30 (RB30 has been replaced with a sedimentation basin in an adjacent location	100	1.00	1330	1500	1561	N/A	7300	401.0

4.2 Design Standards

It is recommended that as much as is practical, the wetlands and sedimentation basins are designed in accordance with the Melbourne Water Wetland Design Guidelines. If variations from these standards are required they should be considered by Council to determine if they improve the overall social and environmental outcomes of the wetland asset. Gross pollutant traps should be included upstream of all sedimentation basins and wetlands to help reduce the load of litter entering the systems. Council should be consulted as to which units they are able to maintain prior to detailed design of the units being completed.

4.3 Stormwater Quality Modelling Results

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) computer software was used to model the proposed WSUD features. The model was setup using 6 minute rainfall data from the Ballarat Aerodrome Berea of Meterology station. The average annual rainfall of this station is 694 mm. The MUSIC model was run using 10 years of data between 1980 and 1989.

Engeny has updated the previous MUSIC modelling of precincts 1 and 2 to include the details of the revised concept design terrain modelling. This has resulted in some increases and some decreases in wetlands sizes, however overall there is a similar area of wetland treatment provided.

Table 4.2 shows the stormwater treatment targets which are required by the planning scheme and the EPA general environmental duty.

TABLE 4.2: STORMWATER QUALITY TREATMENT TARGETS

Pollutant	Pollutant Load Reduction Target
Total Suspended Solids	80%
Total Phosphorus	45%
Total Nitrogen	45%
Gross Pollutants	70%

Table 4.3 shows the stormwater quality treatment results for Precinct 1. Table 4.4 shows the results for Precinct 2, while Table 4.5 shows the combined results for Precincts 1 and 2. There are external and non developing sub-catchments which have been included in the Precinct 1 and 2 MUSIC models. There is no requirement for the PSP to treat runoff from those areas to best practice, however runoff from some of those areas does flow through PSP assets. The requirement is for the PSP to remove the amount of pollutants equal to the targets shown in Table 4.2 from the developing areas only. If pollutants are removed from the external developed catchments which have no stormwater treatment then this can be used to offset lower percentage removal from the PSP development area. As such the percentage reduction rate shown in the tables below is in reference to the entire model. The "percentage removed from development area" column in Table 4.3 and Table 4.4 contains the outcomes for the treatment achieved within the development areas in the PSP.

TABLE 4.3: PRECINCT 1 MUSIC RESULTS

	Source	Residual Load	Percentage Reduction Rate	Total from development area	Amount removed	Percentage removed from development area
Mean Annual Flow (ML/yr)	2522	2370	6.02	1896	152	8.0%
Total Suspended Solids (kg/yr)	511873	194000	62.1	385223	317873	82.5%
Total Phosphorus (kg/yr)	1041	503	51.7	784	538	68.7%
Total Nitrogen (kg/yr)	7260	4770	34.3	5459	2490	45.6%
Gross Pollutants (kg/yr)	115663	19200	83.4	86709	96463	111.2%

The following subareas from the precinct 1 model have been considered as external or non developing: KV, KT, KW, KU, KX, KY, KZ, LA, LE, LD, LF, LC, LB, LJ, LH, LI, LG. The pollutants generated from these subareas have been removed from the source totals when determining the percental removal from the development area.

TABLE 4.4: PRECINCT 2 MUSIC RESULTS

	Source	Residual Load	% Reduction Rate	Total from development area	Amount removed	% removed from development area
Mean Annual Flow (ML/yr)	185	175	5.39	132	10	7.6%
Total Suspended Solids (kg/yr)	34189	9060	73.5	23573	25129	106.6%
Total Phosphorus (kg/yr)	62	26	57.4	40	35	88.4%
Total Nitrogen (kg/yr)	429	275	35.9	276	154	55.8%
Gross Pollutants (kg/yr)	18871	1170	93.8	16426	17701	107.8%

The following subarea from the precinct 2 model have been considered as external or non developing subareas for the purposes of this modelling: DP, DO, EJ

TABLE 4.5:COMBINED PRECINCT 1 AND 2 RESULTS

	Source	Residual Load	% Reduction Rate	Total from development area	Amount removed	% removed from development area
Mean Annual Flow (ML/yr)	2707	2545	6.0%	2707	162	8.0%
Total Suspended Solids (kg/yr)	546062	203060	62.8%	546062	343002	83.9%
Total Phosphorus (kg/yr)	1103	529	52.0%	1103	574	69.6%
Total Nitrogen (kg/yr)	7689	5045	34.4%	7689	2644	46.1%
Gross Pollutants (kg/yr)	134534	20370	84.9%	134534	114164	110.7%

A summary of the performance of each individual wetland is included in Appendix C:.

4.4 Ballarat City Integrated Water Management Plan

Council and Central Highlands Water have developed an Integrated Water Management Plan in 2018. This plan commits to the following targets and goals in relation to planning for growth:

- *incorporate the Ballarat City IWM Plan as a reference document within the Ballarat Planning Scheme*
- *utilise preferred IWM strategies (such as stormwater harvesting, recycled water and actively used rainwater tanks) to drive water-wise development in designated areas*
- *consider design stormwater drainage to water street trees in development areas to utilise runoff as passive irrigation*
- *harvest stormwater for open space irrigation*
- *restore and plan to protect creeks in new development areas*
- *investigate partnerships for water-wise developments.*

Figure 4.1 shows the preferred IWM strategies for growth areas within Ballarat. The BWUGZ is the area covered by this drainage strategy. The key action identified in the legend is titled "stormwater to Winter Creek to Lal Lal" which refers to the concept of harvesting excess stormwater runoff from Winter Creek and directing it to the Lal Lal reservoir to be treated and mixed with natural runoff from the catchment. Lal Lal reservoir supplies water to Central Highlands Water and Barwon Water as part of Ballarat and Geelong's potable water systems.

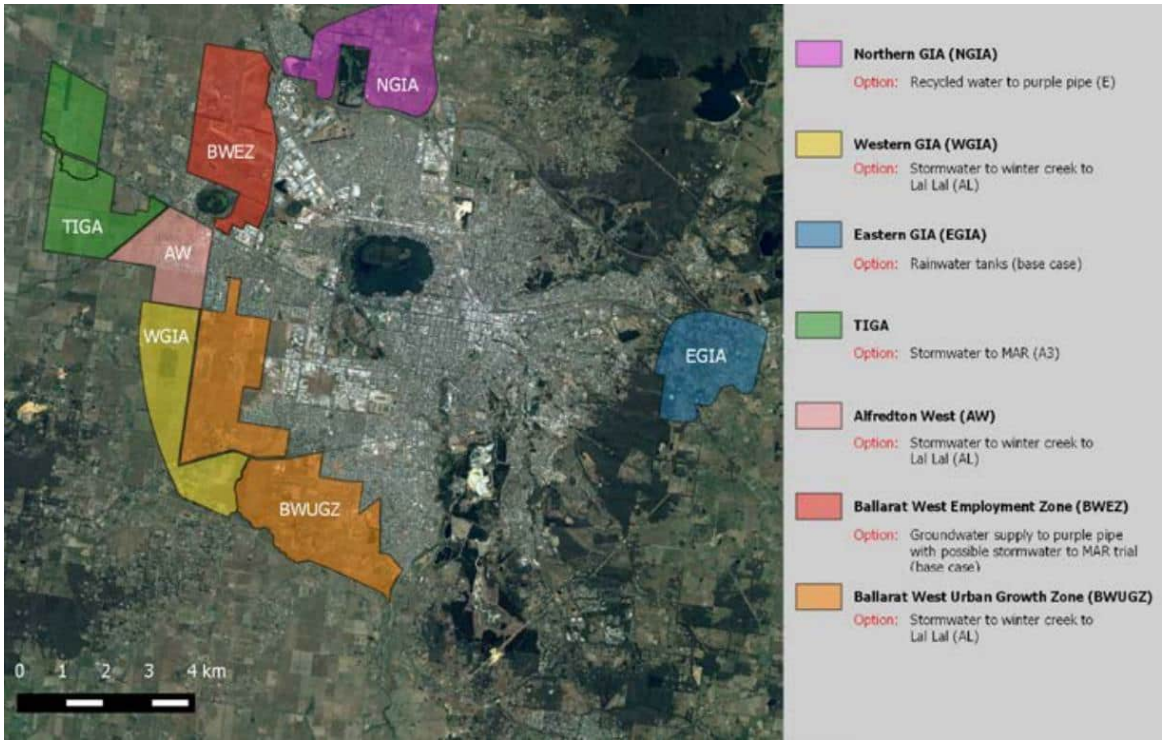

FIGURE 4.1: PREFERRED IWM STRATEGIES FOR GROWTH AREAS (SOURCE: BALLARAT IWMP)

The IWMP key goals that relate to this strategy are use of actively used rainwater tanks and stormwater harvesting for open space irrigation or other uses. Rainwater tanks are discussed further in Section 5 and represent one of the best options for reducing total runoff volume from the Ballarat West Growth area.

Stormwater harvesting is also a potential option that could be explored further within the Ballarat West Growth area. The ideal setup for large scale stormwater harvesting is to have pretreatment in a water sensitive urban design asset such as a wetland or raingarden and then a separate storage pond which can be sized to meet anticipated current or future demand. Having a standalone harvesting pond allows for complete draw down on the pond to empty (or as near to empty as is practically possible given pumping setups). This means that the maximum amount of water can be provided at the driest times of the year when it is most required. While this approach provides the ideal scenario there are significant capital expenditure and potential additional land take costs associated with this setup.

A secondary method for harvesting which can still be effective but may reduce the yield total yield of stormwater is to harvest directly from a wetland. The limitation with this approach is that the effective storage area is typically limited to a few hundred millimetres of depth in the wetland before there is risk of damaging or killing wetland plants by removing too much water. The deep pools in the wetland are usually connected by sub-surface pipe meaning the deep pools stay at same water depth. Drawing from 1 pond equally draws from all of the deep sections. To improve yield this might require a larger tank storage capacity at the sports precinct than typical so that water can be harvested when available (i.e. in wetter months) to avoid detrimental draw down.

Another option that is possible is to install a vertically adjustable weir in addition to the typical penstock slider to allow for variation in the normal water level or extended detention depth of the wetland depending on the demand for stormwater harvesting. An emerging space is the application of Smart Cities technology to achieve “Process Automation” and potentially water quality monitoring to minimise risk and enhance operational ease – the ingredients for proactive use. This might be applied to multiple wetlands in series to improve yield. For example – Wetland A holds back 5 cm of water above NTWL for harvesting purposes. When that is depleted the upstream Wetland B releases it’s held 5 cm down to Wetland A for harvesting purposes. This is an applied example of the “linked storage concept” in the IWM Plan 2018.

Planting species should be very carefully considered if this approach is taken, with a preference given to taller emergent macrophytes which can survive long periods of deeper inundation than the base design case for the wetland. It is also worth considering discussing with a Wetland Ecologist the need for a greater mix of species that recruit from rhizome, rather than reproducing from seed only to improve vegetation resilience. This may limit the plant species available for use in the wetland, however the potential trade off in terms of available water for harvesting could be significant. More attention to ecological monitoring and evaluation will also be required to ensure no negative impacts from unseasonal inundation.

Within the Ballarat West PSP the following wetlands present the best opportunity for stormwater harvesting due to the proposed land uses adjacent to the wetlands:

- RB 29 is directly adjacent to two proposed sporting ovals. This is an ideal situation for stormwater harvesting and this location should be prioritised as it has the source and demand centres for reusing water right next to each other minimising distribution costs.
- RB 4 which is currently under construction, close to completion, is also relatively close to proposed sporting fields which presents an opportunity for stormwater harvesting.
- Wetlands 15, 17 and 24 are all quite close together and are served by a large total catchment. There are no ovals or likely areas to irrigate directly adjacent to these assets, however given they are close together it could be possible to collect water from all of these wetlands and provide a single rising main to a demand source at one or multiple locations where sporting fields are proposed. It may be possible to gravity drain the low flows from wetlands 15 and 17 to Wetland 24 (or nearby to wetland 24) and then pump from a single location. This could be tied into the option of harvesting stormwater and pumping to Lal Lal reservoir should that proceed.
- An alternative option which Council could consider would be the use of floating wetlands, which can provide a higher level of stormwater treatment per square metre than a traditional wetland. This would free up land from a traditional wetland to allow for a harvesting pond. Floating wetlands also have higher maintenance costs and maintenance risks compared to a traditional wetland due to a need to undertake more activities near deeper water. By using a floating wetland the remaining land within the footprint of a proposed wetland could be converted to a harvesting storage pond. This could be especially effective in the area near wetlands 15, 17 and 24 as three large wetlands are proposed in close proximity and it may be possible to divert low flows from more than one wetland into a harvesting pond adjacent to a floating wetland. There is no open space directly adjacent to these assets which means that water would likely need to be pumped to a reuse location.

There is also a role in the PSP more broadly around the protection and enhancement of existing waterways. Wherever possible Council should look to work with the developers of properties adjacent waterways to ensure that:

- Appropriate setbacks to waterways are maintained to allow for a riparian habitat zone to be established and protected.
- Development that is “fronted on” to a waterway has a road between proposed dwellings and the waterway. This significantly improves access to and passive surveillance of the waterway, reducing the likely of illegal dumping and promoting community interaction and ownership of the waterway. This also creates the opportunity for shared use paths along side the waterway corridors to help improve opportunities for passive recreation, liveability and connectivity between public assets like schools and social services.
- Planting or revegetation of the riparian habitat is undertaken as part of the development, or that existing riparian habitat is protected. This vegetation provides crucial links for wildlife and can also help protect the waterway from erosion, reducing the future maintenance burden to Council.

ENGENY

5. GENERAL ENVIRONMENTAL DUTY

In 2017 the Victoria Environmental Protection Act was updated. A key part of the change to the Act was the introduction of the General Environmental Duty (GED). Under the GED all businesses have a responsibility to reduce the risk that they will cause harm to people or the environment. For the context of this report the key focus under the GED is how stormwater runoff is managed. This includes at all stages of development, including construction and post construction when the development work has been completed and greenfield areas become a functioning residential or commercial area. This report only focuses on the post construction goals, however compliance with the GED during construction is also very important.

Victorian Environmental Protection Agency (EPA) publication 1739.1 "Urban Stormwater Management Guidelines" provides advice on how to manage the risk of pollution from stormwater runoff. Table 1 of the document also sets out the quantitative performance objectives for urban stormwater. A reproduction of the table and notes is included below in Figure 5.1

Indicator	Performance objective
Suspended solids	80% reduction in mean annual load (Note:1)
Total phosphorus	45% reduction in mean annual load (Note:1)
Total nitrogen	45% reduction in mean annual load (Note:1)
Litter	70% reduction of mean annual load

Flow (water volume)

	Priority areas (Notes 2, 4, 5, 6)		Other areas (Notes 3, 4, 5, 6)	
rainfall band (ml)	Harvest/evapotranspire (% mean annual impervious run-off)	Infiltrate/filter (% mean annual impervious run-off)	Harvest/evapotranspire (% mean annual impervious run-off)	Infiltrate/filter (% mean annual impervious run-off)
200	93	0	37	0
300	88	0	35	0
400	83	0	33	0
500	77	5	31	4
600	72	9	29	7
700	68	11	27	9
800	64	14	26	11
900	60	16	24	13
1000	56	18	22	14
1100	53	19	21	15
1200	50	21	20	17
1300	48	22	19	18
1400	46	23	18	18
1500	44	25	18	20
1600	42	26	17	21
1700	40	27	16	22
1800	38	28	15	22

FIGURE 5.1: QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER (VIC EPA 1739.1)

Notes to Figure 5.1 (source Vic EPA 1739.1):

(1) *'Reduction in mean annual load' refers to the reduction in load discharged from the development with management. This is compared to the load that would be discharged without management. Load (or pollutant load) means the mass per unit time of an indicator/pollutant.*

(2) *These areas are priority areas for enhanced stormwater management. They have high ecological value waterways. The Melbourne Water Healthy Waterways Strategy identifies these areas. A map of them can be found here: https://data-melbournewater.opendata.arcgis.com/datasets/hws2018-stormwater-priorityareas. Note the map needs to be downloaded to distinguish the urban areas.*

A transparent process is required to identify priority areas for enhanced stormwater management outside the greater Melbourne area. Urban stormwater management guidance 9

(3) *These objectives are to help arrest further degradation in these areas. To restore a waterway to pre-urban conditions, in an already degraded environment (highly modified waterway), it is likely that the priority objective or better would need to be applied.*

(4) *Mean annual impervious run-off volume refers to the percentage of run-off from the impervious surface.*

(5) *Note, council or other authorities may have specific requirements that will apply, for example, on-site detention requirements.*

The infiltration performance objective may be inapplicable if the site is subject to requirements in an EPA permission directing that stormwater infiltration be minimised or is subject to an environmental audit statement that restricts stormwater infiltration. Victoria's planning framework includes requirements to identify potentially contaminated land at the planning scheme preparation/amendment stage and to manage any potential risks, including via EPA's environmental audit system. More information is available on DELWP and EPA websites.

(6) *For further understanding about how to model objectives, see Healthy Waterways Strategy Stormwater Targets: Practitioners Note (https://www.melbournewater.com.au/building-and-works/developer-guidesand-resources/guidelines-drawings-and-checklists/guidelines)*

The table includes the same pollutant reduction targets that have existed in the Victorian Planning Scheme for many years, with the focus being on the reduction of suspended solids, nitrogen and phosphorus from runoff before it enters the receiving waterway. The new addition to these targets is the flow (volume) reduction targets. The mean annual rainfall in Ballarat is 687 mm per year (Ballarat aerodrome station number 089002). It is understood that there are currently no priority waterways set within the Corangamite Catchment Management Authority's (CCMA) catchments, which includes the Winter Creek catchment which Ballarat West development area drains to. This means that the flow reduction targets for the Ballarat West PSP area are a 29% reduction via harvesting or evapotranspiration and 7% infiltration for a total of 36% reduction in flows discharged to the waterway from the developed catchment.

The Ballarat West PSP area has already been developed for many years prior to this review. This means that a large amount of the infrastructure has already been constructed. In these areas it is not seen as reasonable or practical to try and achieve the new targets. Equally some catchments are currently partially developed, which also makes the achievement of these targets unlikely.

Engeny's understanding is that the requirement is to achieve the flow reduction targets under a framework considering what is reasonably practicable. This means that there may be cases where the targets are not achieved and the GED is considered to be being met, however it would need to be demonstrated that everything reasonably practicable has been done to achieve the targets.

Engeny also notes that current engineering practice is still being updated with guidance on how to construct stormwater treatment assets which focus on flow reduction rather than just on stormwater treatment, however many existing practices are available and should be used to demonstrate compliance with the GED. In the context of this PSP, there are also limitations around previously proposed asset sizes and a desire to avoid significant changes to the PSP at this late stage in its development.

The Urban Stormwater Management Guidelines (Vic EPA, 2021) highlights that a range of measures will be required to meet the flow reduction targets set under the GED. This means that in addition to the works proposed under the drainage strategy, additional measures are likely to be required at a lot level scale in order to mee the GED. The simplest additional measure to implement is including rainwater tanks on each dwelling which are plumbed to flush toilets and potentially also possibly to some laundry uses, in addition to garden watering.

5.1 Rainwater Tank Modelling

Engeny has modelled 4 different rainwater tank size and reuse combinations to provide some guidance on the likely reduction in flow volumes that can be achieved by using rainwater tanks.

The scenarios modelled were:

- 2 kilolitre tank plumbed to toilet flushing only
- 2 kilolitre tank plumbed to toilet, laundry and used for irrigation
- 4 kilolitre tank plumbed to toilet only
- 4 kilolitre tank plumbed to toilet, laundry and used for irrigation

The following assumptions were made in the modelling. Adjustments to these assumptions would change the effectiveness of the harvesting.

- 20 houses per hectare
- 100 m² of roof area for each property connected to each individual rainwater tank
- Total impervious fraction of the development 75%
- Toilet flushing uses 20 litres per person per day
- Laundry usage is 15 litres per person per day
- Irrigation use is a fixed 60 litres per day
- 2.7 people are assumed to live in each house

Using these assumptions, the reductions in total runoff volume shown in Table 5.1 can be achieved from 1 hectare of urban development.

The goal for new development in Ballarat is to achieve a 29% reduction by harvesting or evapotranspiration and a 7% reduction by infiltration. Table 4.5 shows that the precinct scale infrastructure is able to achieve an 8% reduction in volume (Mean Annual Flow), largely via evapotranspiration from the proposed wetlands. Additional reductions would be possible if stormwater harvesting projects are implemented using the wetlands as a source of water. The exact reduction achieved will depend on the scale and setup of the harvesting project and could be determined as part of the design process. If the proposed infrastructure (without any stormwater harvesting) is combined with the removal rates from using rainwater tanks a total reduction in flows of up to 38% may be possible. Table 5.1 shows the reductions in mean annual flow that can be achieved in areas which are not yet developed if rainwater tanks are plumbed to internal reuse demands. It is not proposed that rainwater tank harvesting be applied retroactively to the areas of the PSP that have already developed in the same way that it is not proposed to increase or adjust the size of retarding basin and wetland assets which have already been constructed as it was not a requirement at the time that the dwellings or assets where constructed. Meeting these targets should be considered and address in areas which have not yet been developed.

The GED applies to all Victorians, including developers and the City of Ballarat. It is not up to Council on its own to demonstrate that these targets can be met (or why they cannot be met) the requirement also falls to the developers who are undertaking the change, which will have the impact, to demonstrate how they can meet the GED or why it cannot be reasonably met.

TABLE 5.1: RAINWATER TANK FLOW REDUCTIONS TABLE

Rainwater tanks	Percentage reduction in flows	Percentage of reuse demand met
Only Toilets 2 kL tank	10.9	98.6
Only Toilets 4 kL tank	11.1	100.0
Toilets, Laundry and Irrigation 2 kL tank	26.8	83.9
Toilets, Laundry and Irrigation 4 kL tank	29.8	93.5

6. COST ESTIMATES

Engeny has updated the designs of the wetlands, retarding basin and pipe assets which have not yet been constructed or committed in the Ballarat West PSP. The costs of the associated assets have also been updated to reflect any changes in asset footprints or length / size. Costs have been based on original base costing rates and methodology. Costs have been increased by 37.4% in line with the change in the road and bridge construction price index published by the Australian Bureau of Statistics. This increase is to March 2023.

In addition to increasing the base costs by the road and bridge CPI additional cost factors have been included to cover the delivery items shown in Table 6.1. The rates used have been taken from the VPA Benchmark Infrastructure Costing Report and are the applicable rates for culverts (the only drainage item listed in the VPA Benchmark cost report).

TABLE 6.1:DELIVERY ITEMS COSTS (% OF BASE COST)

Delivery item	Percentage of base cost
Council Fees	3.25
Authority Fees	1
Traffic Management	5
Environmental Management	0.5
Surveying and Design	5
Supervision and Project Management	9
Site Establishment	2.5
Contingency	15
Total of Delivery items	**41.25**

The 2011 drainage strategy applied delivery fees which totalled 38.25% (3.25% Council fees, 15% Design/consultancy fees, 20% contingency) to wetland and retarding basins and fees of 28.25% (3.25% Council fees, 15% Design/consultancy fees, 10% contingency) to the drainage pipes The updated delivery fees are a similar overall percentage and are now aligned to the fees in the VPA Benchmark Infrastructure Costing Report.

Table 6.2 shows the pipe costs and that status for each drainage pipe within the PSP. Each asset is given one of the following the statuses.

Altered – asset size has been altered from the 2011 strategy.

No change – asset size has been maintained from the 2011 strategy.

Built – asset has been built in line with the 2011 strategy.

Review Pipe Built – asset built although altered from 2011 strategy.

Removed – asset has been removed from strategy.

Table 6.3 shows the wetland/retarding basin costs. The plans in Appendix D: show the location of each of the assets.

TABLE 6.2: PIPE COSTS

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_1			Removed				
Pipe_2			Removed				
Pipe_3	525	205.14	Altered	$54,772.4	$70,245.6	$75,257.3	$106,300.9
Pipe_4	1050	120.95	Altered	$87,205.0	$111,840.3	$119,819.6	$169,245.2
Pipe_5	1050	219.08	Altered	$157,956.7	$202,579.4	$217,032.5	$306,558.4
Pipe_6	1050	111.79	Altered	$80,600.6	$103,370.3	$110,745.2	$156,427.6
Pipe_7	1050	133.89	Altered	$96,534.7	$123,805.7	$132,638.7	$187,352.1
Pipe_8	1050	96.19	Altered	$69,353.0	$88,945.2	$95,291.0	$134,598.5
Pipe_9	1050	85.01	Altered	$61,292.2	$78,607.3	$84,215.5	$118,954.4
Pipe_10	1050	99.4	Altered	$71,667.4	$91,913.4	$98,471.0	$139,090.3
Pipe_11	1050	151.05	Altered	$108,907.1	$139,673.3	$149,638.3	$211,364.1
Pipe_12	1050	282.06	Altered	$203,365.3	$260,815.9	$279,423.9	$394,686.2
Pipe_13	1050	115.68	Altered	$83,405.3	$106,967.3	$114,598.9	$161,870.9
Pipe_14	2 x 675	53.18	Altered	$37,651.4	$48,288.0	$51,733.1	$73,073.0
Pipe_15	900	247.44	No Change	$141,535.7	$181,519.5	$194,470.0	$274,688.9
Pipe_16	900	124.68	Altered	$71,317.0	$91,464.0	$97,989.5	$138,410.2
Pipe_17	675	60.31	Altered	$21,349.7	$27,381.0	$29,334.5	$41,435.0
Pipe_18	450	60.98	Altered	$14,086.4	$18,065.8	$19,354.7	$27,338.5
Pipe_19	900	163.72	Review Pipe Built	$93,647.8	$120,103.4	$128,672.1	$181,749.4
Pipe_20	600	102.53	Review Pipe Built	$31,681.8	$40,631.9	$43,530.8	$61,487.2
Pipe_21	825	84.38	Review Pipe Built	$42,021.2	$53,892.2	$57,737.2	$81,553.8
Pipe_22	675	108.85	No Change	$38,532.9	$49,418.4	$52,944.2	$74,783.7
Pipe_23	750	101.79	No Change	$41,428.5	$53,132.1	$56,922.8	$80,403.5
Pipe_24	825	101.36	No Change	$50,477.3	$64,737.1	$69,355.8	$97,965.0
Pipe_25	825	176.02	Altered	$87,658.0	$112,421.3	$120,442.0	$170,124.4
Pipe_26	600	58.3	Altered	$18,014.7	$23,103.9	$24,752.2	$34,962.5
Pipe_27	1050	278.05	Review Pipe Built	$200,474.1	$257,108.0	$275,451.3	$389,075.0

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_28	600	144.35	Built	$44,604.2	$57,204.8	$61,286.1	$86,566.6
Pipe_29	900	45.36	Built	$25,945.9	$33,275.6	$35,649.7	$50,355.2
Pipe_30	1050	200.14	Review Pipe Built	$144,300.9	$185,066.0	$198,269.5	$280,055.7
Pipe_31	900	594.36	Built	$339,973.9	$436,016.6	$467,124.2	$659,812.9
Pipe_32	675	223.41	Altered	$79,087.1	$101,429.3	$108,665.7	$153,490.3
Pipe_33	750	145.29	Altered	$59,133.0	$75,838.1	$81,248.8	$114,763.9
Pipe_34	1200	97.82	Altered	$89,407.5	$114,665.1	$122,845.9	$173,519.8
Pipe_35	675	263.82	Altered	$93,392.3	$119,775.6	$128,321.0	$181,253.4
Pipe_36	750	222.17	Altered	$90,423.2	$115,967.7	$124,241.5	$175,491.1
Pipe_37	900	374.28	Altered	$214,088.2	$274,568.1	$294,157.1	$415,496.9
Pipe_38	900	147.5	Altered	$84,370.0	$108,204.5	$115,924.4	$163,743.2
Pipe_39	600	74.8	Altered	$23,113.2	$29,642.7	$31,757.5	$44,857.5
Pipe_40	900	222.62	Review Pipe Built	$127,338.6	$163,311.8	$174,963.3	$247,135.6
Pipe_41	1200	154.2	Review Pipe Built	$140,938.8	$180,754.0	$193,649.9	$273,530.5
Pipe_42	900	251.94	Review Pipe Built	$144,109.7	$184,820.7	$198,006.7	$279,684.5
Pipe_43	1800	305.24	Review Pipe Built	$622,689.6	$798,599.4	$855,575.5	$1,208,500.4
Pipe_44	2 x 1350	113.02	Altered	$255,877.3	$328,162.6	$351,575.4	$496,600.2
Pipe_45	2 x 1350	36.09	Review Pipe Built	$81,707.8	$104,790.2	$112,266.5	$158,576.4
Pipe_46	2 x 1350	135	Altered	$305,640.0	$391,983.3	$419,949.4	$593,178.5
Pipe_47			Removed				
Pipe_48	450	136.39	Altered	$31,506.1	$40,406.6	$43,289.4	$61,146.2
Pipe_49	825	541.63	Altered	$269,731.7	$345,931.0	$370,611.4	$523,488.6
Pipe_50	1050	55.75	No Change	$40,195.8	$51,551.0	$55,229.0	$78,010.9
Pipe_51	1 x 600 and 1 x 1050	62.78	Altered	$64,663.4	$82,930.8	$88,847.5	$125,497.1
Pipe_52			Removed				
Pipe_53			Removed				
Pipe_54			Removed				

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_55			Removed				
Pipe_56			Removed				
Pipe_57			Removed				
Pipe_58			removed				
Pipe_59	900	286.03	Altered	$163,609.2	$209,828.7	$224,799.0	$317,528.6
Pipe_60	900	42.31	Altered	$24,201.3	$31,038.2	$33,252.6	$46,969.3
Pipe_61	900	258.21	Altered	$147,696.1	$189,420.3	$202,934.5	$286,644.9
Pipe_62	900	297.21	Altered	$170,004.1	$218,030.3	$233,585.7	$329,939.7
Pipe_63			Removed				
Pipe_64	525	221.28	Altered	$59,081.8	$75,772.4	$81,178.3	$114,664.4
Pipe_65	750	231.53	No Change	$94,232.7	$120,853.5	$129,475.7	$182,884.5
Pipe_66	900	225.84	Altered	$129,180.5	$165,674.0	$177,494.0	$250,710.2
Pipe_67	2 x 825	64.52	Altered	$64,261.9	$82,415.9	$88,295.9	$124,717.9
Pipe_68	600	288.34	No Change	$89,097.1	$114,267.0	$122,419.4	$172,917.3
Pipe_69	525	72.54	No Change	$19,368.2	$24,839.7	$26,611.9	$37,589.3
Pipe_70	600	72.51	No Change	$22,405.6	$28,735.2	$30,785.3	$43,484.2
Pipe_71	675	305.84	Altered	$108,267.4	$138,852.9	$148,759.4	$210,122.6
Pipe_72	525	27.94	Altered	$7,460.0	$9,567.4	$10,250.0	$14,478.1
Pipe_73			Removed				
Pipe_74	450	145.01	No Change	$33,497.3	$42,960.3	$46,025.3	$65,010.7
Pipe_75	450	269.26	No Change	$62,199.1	$79,770.3	$85,461.5	$120,714.4
Pipe_76	750	151.93	Altered	$61,835.5	$79,304.0	$84,962.0	$120,008.8
Pipe_77	600	374.33	No Change	$115,668.0	$148,344.2	$158,927.8	$224,485.5
Pipe_78	825	319.75	Altered	$159,235.5	$204,219.5	$218,789.6	$309,040.3
Pipe_79	600	97.04	Altered	$29,985.4	$38,456.2	$41,199.9	$58,194.8
Pipe_80	2 x 750	323.8	Altered	$263,573.2	$338,032.6	$362,149.6	$511,536.3
Pipe_81	1200	50.86	Altered	$46,486.0	$59,618.3	$63,871.8	$90,218.9
Pipe_82	1200	52.82	Altered	$48,277.5	$61,915.9	$66,333.3	$93,695.7

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_83	2 x 1200	60	Altered	$109,680.0	$140,664.6	$150,700.3	$212,864.2
Pipe_84	450	366.95	Built	$84,765.5	$108,711.7	$116,467.7	$164,510.7
Pipe_85			Removed				
Pipe_86			Removed				
Pipe_87			Removed				
Pipe_88	1200	268.32	Review Pipe Built	$245,244.5	$314,526.0	$336,965.9	$475,964.4
Pipe_89	525	180.14	Altered	$48,097.4	$61,684.9	$66,085.8	$93,346.2
Pipe_90	525	97.63	Built	$26,067.2	$33,431.2	$35,816.3	$50,590.6
Pipe_91	525	252.35	Built	$67,377.5	$86,411.6	$92,576.6	$130,764.5
Pipe_92			Removed				
Pipe_93			Removed				
Pipe_94	825	77.5	Altered	$38,595.0	$49,498.1	$53,029.5	$74,904.2
Pipe_95	1200	647.14	Altered	$591,486.0	$758,580.7	$812,701.7	$1,147,941.2
Pipe_96	450	71.91	No Change	$16,611.2	$21,303.9	$22,823.8	$32,238.6
Pipe_97	1050	320	Altered	$230,720.0	$295,898.4	$317,009.3	$447,775.6
Pipe_98	1200	165	Altered	$150,810.0	$193,413.8	$207,212.9	$292,688.3
Pipe_99	2 x 900	45	No Change	$51,480.0	$66,023.1	$70,733.5	$99,911.1
Pipe_100	1350	38	Altered	$43,016.0	$55,168.0	$59,104.0	$83,484.4
Pipe_101	825	279.34	No Change	$139,111.3	$178,410.3	$191,139.0	$269,983.8
Pipe_102	1350	250.85	No Change	$283,962.2	$364,181.5	$390,164.1	$551,106.7
Pipe_103	1200	118	No Change	$107,852.0	$138,320.2	$148,188.6	$209,316.5
Pipe_104	600	616.99	No Change	$190,649.9	$244,508.5	$261,953.0	$370,008.6
Pipe_105	825	373.27	Altered	$185,888.5	$238,401.9	$255,410.7	$360,767.7
Pipe_106	1200	141.47	Altered	$129,303.6	$165,831.8	$177,663.1	$250,949.2
Pipe_107	1350	276	Altered	$312,432.0	$400,694.0	$429,281.6	$606,360.2
Pipe_108	2 x 675	87.36	Altered	$61,850.9	$79,323.8	$84,983.1	$120,038.6
Pipe_109	525	438	Altered	$116,946.0	$149,983.2	$160,683.8	$226,965.9
Pipe_110	750	460	Altered	$187,220.0	$240,109.7	$257,240.3	$363,351.9

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_111	750	211	Altered	$85,877.0	$110,137.3	$117,995.0	$166,667.9
Pipe_112	1350	228.86	No Change	$259,069.5	$332,256.7	$355,961.5	$502,795.6
Pipe_113	1350	323.5	Review Pipe Built	$366,202.0	$469,654.1	$503,161.5	$710,715.7
Pipe_114	1500	77.2	Review Pipe Built	$107,385.2	$137,721.5	$147,547.3	$208,410.5
Pipe_115	1500	90.52	Review Pipe Built	$125,913.3	$161,483.8	$173,004.9	$244,369.4
Pipe_116	750	43.71	No Change	$17,790.0	$22,815.6	$24,443.4	$34,526.3
Pipe_117	900	300.14	No Change	$171,680.1	$220,179.7	$235,888.4	$333,192.4
Pipe_119	1200	311.87	Built	$285,049.2	$365,575.6	$391,657.6	$553,216.3
Pipe_120	900	90.72	Built	$51,891.8	$66,551.3	$71,299.4	$100,710.4
Pipe_121	1200	238.36	Built	$217,861.0	$279,406.8	$299,341.1	$422,819.3
Pipe_122	675	167.39	Built	$59,256.1	$75,995.9	$81,417.8	$115,002.7
Pipe_123	675	140.21	Built	$49,634.3	$63,656.0	$68,197.6	$96,329.1
Pipe_124	750	139.38	Built	$56,727.7	$72,753.2	$77,943.8	$110,095.6
Pipe_125	1050	122.25	Built	$88,142.3	$113,042.4	$121,107.5	$171,064.3
Pipe_126	1050	140.76	Built	$101,488.0	$130,158.3	$139,444.5	$196,965.3
Pipe_127	675	154.15	Built	$54,569.1	$69,984.9	$74,977.9	$105,906.3
Pipe_128	825	149.23	Built	$74,316.5	$95,311.0	$102,110.9	$144,231.7
Pipe_129	2 x 900	50.87	Built	$58,195.3	$74,635.4	$79,960.3	$112,943.9
Pipe_130	825	447.64	Built	$222,924.7	$285,901.0	$306,298.6	$432,646.7
Pipe_131	750	392.13	Built	$159,596.9	$204,683.0	$219,286.2	$309,741.7
Pipe_132	600	35.39	Built	$10,935.5	$14,024.8	$15,025.4	$21,223.4
Pipe_133	1200	447.38	Built	$408,905.3	$524,421.1	$561,835.9	$793,593.2
Pipe_134	3 x 750	45.06	Built	$55,018.3	$70,560.9	$75,595.1	$106,778.1
Pipe_201	1050	114.67	Review Pipe Built	$82,677.1	$106,033.3	$113,598.3	$160,457.6
Pipe_202	1050	105.07	Review Pipe Built	$75,755.5	$97,156.4	$104,088.0	$147,024.3
Pipe_204	1800	30.92	Review Pipe Built	$63,076.8	$80,896.0	$86,667.5	$122,417.9
Pipe_205	1800	174.8	Review Pipe Built	$356,592.0	$457,329.2	$489,957.4	$692,064.8
Pipe_206	1650	129.95	Review Pipe Built	$221,174.9	$283,656.8	$303,894.3	$429,250.7

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_207	1350	114.96	Review Pipe Built	$130,134.7	$166,897.8	$178,805.1	$252,562.2
Pipe_208	1350	37.13	Review Pipe Built	$42,031.2	$53,905.0	$57,750.8	$81,573.0
Pipe_209	1200	24.08	Review Pipe Built	$22,009.1	$28,226.7	$30,240.5	$42,714.7
Pipe_210	1200	90.53	Review Pipe Built	$82,744.4	$106,119.7	$113,690.8	$160,588.3
Pipe_211	1200	43.22	Review Pipe Built	$39,503.1	$50,662.7	$54,277.2	$76,666.6
Pipe_212	1200	19.09	Review Pipe Built	$17,448.3	$22,377.4	$23,973.9	$33,863.1
Pipe_213	1200	69.99	Review Pipe Built	$63,970.9	$82,042.6	$87,896.0	$124,153.0
Pipe_214	1350	79.97	Review Pipe Built	$90,526.0	$116,099.6	$124,382.8	$175,690.7
Pipe_215	1350	23.24	Review Pipe Built	$26,307.7	$33,739.6	$36,146.8	$51,057.3
Pipe_216	1350	2.95	Review Pipe Built	$3,339.4	$4,282.8	$4,588.3	$6,481.0
Pipe_217	1200	6.52	Review Pipe Built	$5,959.3	$7,642.8	$8,188.1	$11,565.6
Pipe_218	1050	5.83	Review Pipe Built	$4,203.4	$5,390.9	$5,775.5	$8,157.9
Pipe_219	1050	21.71	Review Pipe Built	$15,652.9	$20,074.9	$21,507.1	$30,378.8
Pipe_220	1050	37.98	Review Pipe Built	$27,383.6	$35,119.4	$37,625.0	$53,145.4
Pipe_221	1050	39.03	Review Pipe Built	$28,140.6	$36,090.4	$38,665.2	$54,614.6
Pipe_222	1050	43.69	Review Pipe Built	$31,500.5	$40,399.4	$43,281.7	$61,135.4
Pipe_223	1050	43.69	Review Pipe Built	$31,500.5	$40,399.4	$43,281.7	$61,135.4
Pipe_224	525	16.49	Review Pipe Built	$4,402.8	$5,646.6	$6,049.5	$8,544.9
Pipe_225	525	5.34	Review Pipe Built	$1,425.8	$1,828.6	$1,959.0	$2,767.1
Pipe_226	900	33.58	Review Pipe Built	$19,207.8	$24,634.0	$26,391.5	$37,277.9
Pipe_227	900	33.58	Review Pipe Built	$19,207.8	$24,634.0	$26,391.5	$37,277.9
Pipe_228	900	33.59	Review Pipe Built	$19,213.5	$24,641.3	$26,399.3	$37,289.0
Pipe_229	900	33.59	Review Pipe Built	$19,213.5	$24,641.3	$26,399.3	$37,289.0
Pipe_230	900	33.59	Review Pipe Built	$19,213.5	$24,641.3	$26,399.3	$37,289.0
Pipe_231	900	33.59	Review Pipe Built	$19,213.5	$24,641.3	$26,399.3	$37,289.0
Pipe_232	525	16.34	Review Pipe Built	$4,362.8	$5,595.3	$5,994.5	$8,467.2
Pipe_233	525	5.33	Review Pipe Built	$1,423.1	$1,825.1	$1,955.4	$2,761.9
Pipe_234	1350	51.69	Review Pipe Built	$58,513.1	$75,043.0	$80,397.0	$113,560.7

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_235	1350	51.44	Review Pipe Built	$58,230.1	$74,680.1	$80,008.1	$113,011.5
Pipe_236	1350	85.08	Review Pipe Built	$96,310.6	$123,518.3	$132,330.7	$186,917.1
Pipe_237	1350	112.61	Review Pipe Built	$127,474.5	$163,486.1	$175,150.0	$247,399.4
Pipe_238	1350	89.74	Review Pipe Built	$101,585.7	$130,283.6	$139,578.7	$197,154.9
Pipe_239	1350	67.08	Review Pipe Built	$75,934.6	$97,386.1	$104,334.1	$147,371.9
Pipe_240	1050	113.1	Review Pipe Built	$81,545.1	$104,581.6	$112,043.0	$158,260.7
Pipe_242	1050	44.27	Review Pipe Built	$31,918.7	$40,935.7	$43,856.3	$61,947.0
Pipe_245	1200	147.51	Review Pipe Built	$134,824.1	$172,912.0	$185,248.4	$261,663.3
Pipe_246	1200	147.63	Review Pipe Built	$134,933.8	$173,052.6	$185,399.1	$261,876.2
Pipe_301	750	36.45	Altered	$14,835.2	$19,026.1	$20,383.5	$28,791.7
Pipe_302	750	38.6	Altered	$15,710.2	$20,148.3	$21,585.8	$30,490.0
Pipe_303	750	94.76	Altered	$38,567.3	$49,462.6	$52,991.5	$74,850.5
Pipe_304	750	22.39	Altered	$9,112.7	$11,687.1	$12,520.9	$17,685.8
Pipe_305	750	53.32	Altered	$21,701.2	$27,831.8	$29,817.5	$42,117.2
Pipe_306	750	43.94	Altered	$17,883.6	$22,935.7	$24,572.0	$34,708.0
Pipe_307	900	42.91	Altered	$24,544.5	$31,478.3	$33,724.2	$47,635.4
Pipe_308	900	40.8	Altered	$23,337.6	$29,930.5	$32,065.9	$45,293.0
Pipe_309	900	66.34	Altered	$37,946.5	$48,666.4	$52,138.5	$73,645.6
Pipe_310	1050	41.93	Altered	$30,231.5	$38,771.9	$41,538.1	$58,672.6
Pipe_311	1050	36.75	Altered	$26,496.8	$33,982.1	$36,406.5	$51,424.2
Pipe_312	1050	81.87	Altered	$59,028.3	$75,703.8	$81,104.8	$114,560.6
Pipe_313	1350	33.55	Altered	$37,978.6	$48,707.6	$52,182.6	$73,707.9
Pipe_314	1650	45	Altered	$76,590.0	$98,226.7	$105,234.7	$148,644.0
Pipe_315	750	111	Altered	$45,177.0	$57,939.5	$62,073.2	$87,678.4
Pipe_316	750	94	Altered	$38,258.0	$49,065.9	$52,566.5	$74,250.2
Pipe_317	750	192	Altered	$78,144.0	$100,219.7	$107,369.9	$151,659.9
Pipe_318	2 x 900	56	Altered	$64,064.0	$82,162.1	$88,023.9	$124,333.8
Pipe_319	1050	657	Altered	$473,697.0	$607,516.4	$650,859.7	$919,339.3

Asset ID	Diameter (mm)	Length (m)	Status	Cost in 2011 dollars	Cost in 2011 delivery costs (+28.25%)	Cost in 2023 dollars (2011 cost + CPI of 37.4%)	Cost in 2023 dollars inc delivery costs (2011 cost +CPI of 37.4% + delivery costs of 41.25%)
Pipe_320	1500	336	Altered	$467,376.0	$599,409.7	$642,174.6	$907,071.7
Pipe_321	600	87	Altered	$26,883.0	$34,477.4	$36,937.2	$52,173.9
Pipe_322	1200	32.98	Built - Altered	$30,143.7	$38,659.3	$41,417.5	$58,502.2
Culvert_1	2 x 1800	44	Altered	$179,520.0	$230,234.4	$246,660.5	$348,407.9
Pipe_118			Removed				
Total				$18,091,405.5	$23,202,227.5	$24,857,591.1	$35,111,347.5

Table 6.3 shows the updated wetland cost estimates for the wetlands which were updated as part of this 2023 strategy update. Costs are shown in 2011 and 2023 prices to allow for comparison between original PSP DCP cost estimates and the updated PSP cost estimates. The 2011 costs shown are based on the updated concept designs and not the original concept designs. An allowance has also been added to the cost estimates for the supply of a gross pollutant trap to be installed upstream of each sediment basin and wetland. The cost estimates range from $80,000 to $155,000 in 2023 dollars for each GPT (depending on estimated treatment flow). The costs for the GPTs are based on information provided by propriety systems providers and are an estimate only.

The exception to the above is for retarding basin 27. This basin is proposed as an embankment across the waterway to retard flow. There are more unknowns and risk in this design and so a 50% contingency is proposed for the cost estimate instead of the standard 15% used for the remaining assets. This should be narrowed down following the completion of a functional design and ANCOLD risk of failure assessment. To provide a cost estimate at this stage it has been assumed that the ANCOLD risk ranking of the embankment would be a High C (on the basis that there will be a future arterial road directly downstream of the embankment and that residential development is also possible downstream of the embankment) and that this would require rock armouring of the entire downstream face of the embankment which would also act as the spillway in rare events. It has been assumed that a d_{50} of 500 mm (d_{50} meaning 50% of the rock placed has a diameter equal to 500 mm) would be suitable and would be required at a depth of 1 m, it is assumed to cost $150/m³ to import and place. The quality and type of the material to be excavated as part of the WL27 works is not known and so it has been assumed that all material for the embankment will need to be imported. A rate of $100 per m³ has been assumed as an average rate, noting that a sand filter is likely, with rates for filter material being up to $200 per m³ to import and place, however rates for the clay core and bulk backfill are likely to be significantly less. Further design work is recommended to improve the accuracy of the cost rating.

TABLE 6.3: WETLAND COSTS

Asset ID	Cost in 2011 dollars	Cost in 2011 dollars inc delivery fees	Cost in 2023 dollars	Cost in 2023 dollars inc delivery fees	Comments
RB7	$4,137,492	$5,720,083	$5,684,914	$8,029,942	
RB12	$1,984,173	$2,743,119	$2,726,254	$3,850,834	
RB13	$2,576,596	$3,562,144	$3,540,243	$5,000,593	
RB14	$1,632,855	$2,257,422	$2,243,543	$3,169,005	
RB15	$1,969,234	$2,722,466	$2,705,727	$3,821,840	
RB17	$3,324,885	$4,596,654	$4,568,392	$6,452,854	
RB18	$1,458,723	$2,016,685	$2,004,286	$2,831,053	
RB24	$3,198,484	$4,421,904	$4,394,717	$6,207,537	
WL27	$1,080,279	$1,493,486	$1,484,304	$2,096,579	This cost is only for the offline wetland asset on the western side of the waterway. A wetland was proposed at this location in the 2011 strategy
RB27	$1,873,900	$2,590,667	$2,574,739	$4,537,977	Costs are largely associated with the embankment and costing methodology is described above, includes a 50% contingency. A RB was proposed at this general location in the 2011 strategy
SB27B	$422,178 (New Asset)	$583,661 (New Asset)	$580,073	$819,353	New asset added to PSP as part of review on the eastern side of the waterway
RB29	$3,402,006	$4,703,274	$4,674,357	$6,602,529	
SB30	$810,249 (New Asset)	$1,120,170 (New Asset)	$1,113,283	$1,572,512	Asset changed form a retarding basin/wetland to a sedimentation basin
Total	**$27,871,056**	**$38,531,734**	**$38,294,831**	**$54,992,607**	

It is understood that stand alone wetlands and sedimentation basins were not included in the original DCP, however combined retarding basin wetlands were. It is not the intention of this strategy to decide what assets are included in the DCP, however the costs are provided so that if particular asset types are included the information is available.

Table 6.4 shows the costs of the previously constructed or committed wetland retarding basins. Please note that the 2011 report applied total contingency, council fees and consulting costs of 41.9% on top of the base fee estimate, whereas the updated costs apply a 30% contingency on top of the base fee estimate. Where there have been significant design changes the updated design has been re-costed at the 2011 rates. This means for RBs 6, 6a, 6b, 6c, 11, 12, 18 the 2011 costs will not match the 2011 report costs and the updated design has been costed and noted as the 2011 cost.

TABLE 6.4: CONSTRUCTED OR COMMITTED WETLAND COSTS

Asset ID	Cost in 2011 dollars	Cost in 2011 dollars inc delivery fees	Cost in 2023 dollars	Cost in 2023 dollars inc delivery fees	Comments
RB1	$567,840	$805,765	$780,212	$1,014,276	
RB2	$4,025,400	$5,712,043	$5,530,900	$7,190,169	
RB3	$1,564,860	$2,220,536	$2,150,118	$2,795,153	
RB4	$1,438,224	$2,040,840	$1,976,120	$2,568,956	
RB5	$1,713,810	$2,431,896	$2,354,775	$3,061,207	
RB6	$2,312,580	$3,281,551	$3,177,485	$4,130,731	Updated design costed
RB6A	$2,551,941	$3,621,205	$3,506,367	$4,558,277	New asset not in 2011 strategy
RB6B	$629,922	$893,860	$865,513	$1,125,167	New asset not in 2011 strategy
RB6C	$492,957	$699,506	$677,323	$880,520	New asset not in 2011 strategy
RB11	$2,092,329	$2,969,015	$2,874,860	$3,737,319	Updated design costed
RB25 and 26	$1,465,797	$2,079,966	$2,014,005	$2,618,207	RB 25 and 26 have been consolidated into one asset
RB28	$3,673,380	$5,212,526	$5,047,224	$6,561,391	
Total	**$22,529,041**	**$31,968,710**	**$30,954,903**	**$40,241,374**	

A number of bioretention or rain garden assets were proposed in the 2011 strategy. All of those assets have been removed from the strategy, with the original IDs and costs (2011 dollars) shown in Table 6.5. the bioretention basins have been removed as they can be challenging assets to maintain and without pretreatment of stormwater are prone to surface clogging from sediments. The role that they were playing in the stormwater treatment has been replaced by the sedimentation basins and wetlands. This results in fewer overall assets for Council to maintain and also provides better community assets as wetlands typically provide better overall amenity.

TABLE 6.5: BIORENTION AREAS

Asset ID	Filter Area (m^2)	Cost Estimate	Status
AZ	50	$16,260	Removed
BT	50	$16,260	Removed
BR	50	$16,260	Removed
CA	50	$16,260	Removed
BL	50	$16,260	Removed
CB	50	$16,260	Removed
CT	50	$16,260	Removed
CU	50	$16,260	Removed
CV	50	$16,260	Removed

Asset ID	Filter Area (m^2)	Cost Estimate	Status
DB	50	$16,260	Removed
DC	50	$16,260	Removed
CR	50	$16,260	Removed
CW	50	$16,260	Removed
Y	300	$97,557	Removed
EB	150	$48,778	Removed
W & X	2000	$773,725	Removed
Z	400	$130,075	Removed
RB1	500	$162,594	Removed

7. STAGING

Council has provided a plan showing the current status of development applications within the Ballarat West PSP area. Areas where development applications have been received and approved now make up a significant portion of the total area. A challenge that Council faces for managing stormwater is that most of the remaining wetlands and retarding basins are along the southern boundary of the development area adjacent to Winter Creek. This is the most downstream location in the catchments and so allows for most of the upstream catchment areas to be captured, maximising the treatment and retardation potential of the assets. As the development is generally being undertaken from north (existing areas of Delacombe) to south it means that the wetlands are potentially located on properties likely to be the last to develop. There are also some properties where the wetlands cover a significant portion of the property, reducing the remaining land available for development and the potential interest or viability of development on those properties. In some of these areas Council may need to take a proactive role in acquiring some land and potentially building some trunk drainage infrastructure to facilitate upstream development.

Engeny has assessed the remaining retarding basin and pipe infrastructure as being required in either the short, medium or long term. Short term requirements for infrastructure have been assigned to assets which will be required to service properties either currently under construction or with issued planning permits. (as per Figure 7.1) Properties which have infrastructure requirements downstream and are expected to lodge planning permits soon has been assessed as medium priority. The remaining areas where there are no lodged permits and none or only a single property likely to lodge soon has been assessed and long term priority. The definitions for short medium and long term and not intended to link to a particular time frame as even developments with issues planning permits can years to commence construction. Instead, they are intended to guide the focus of the general order in which assets will need to be delivered across the precinct. It is worth noting that most of the remaining retarding basins and wetlands are identified as short or medium term needs. The plans in Appendix E show the proposed staging term for each of the remaining assets.

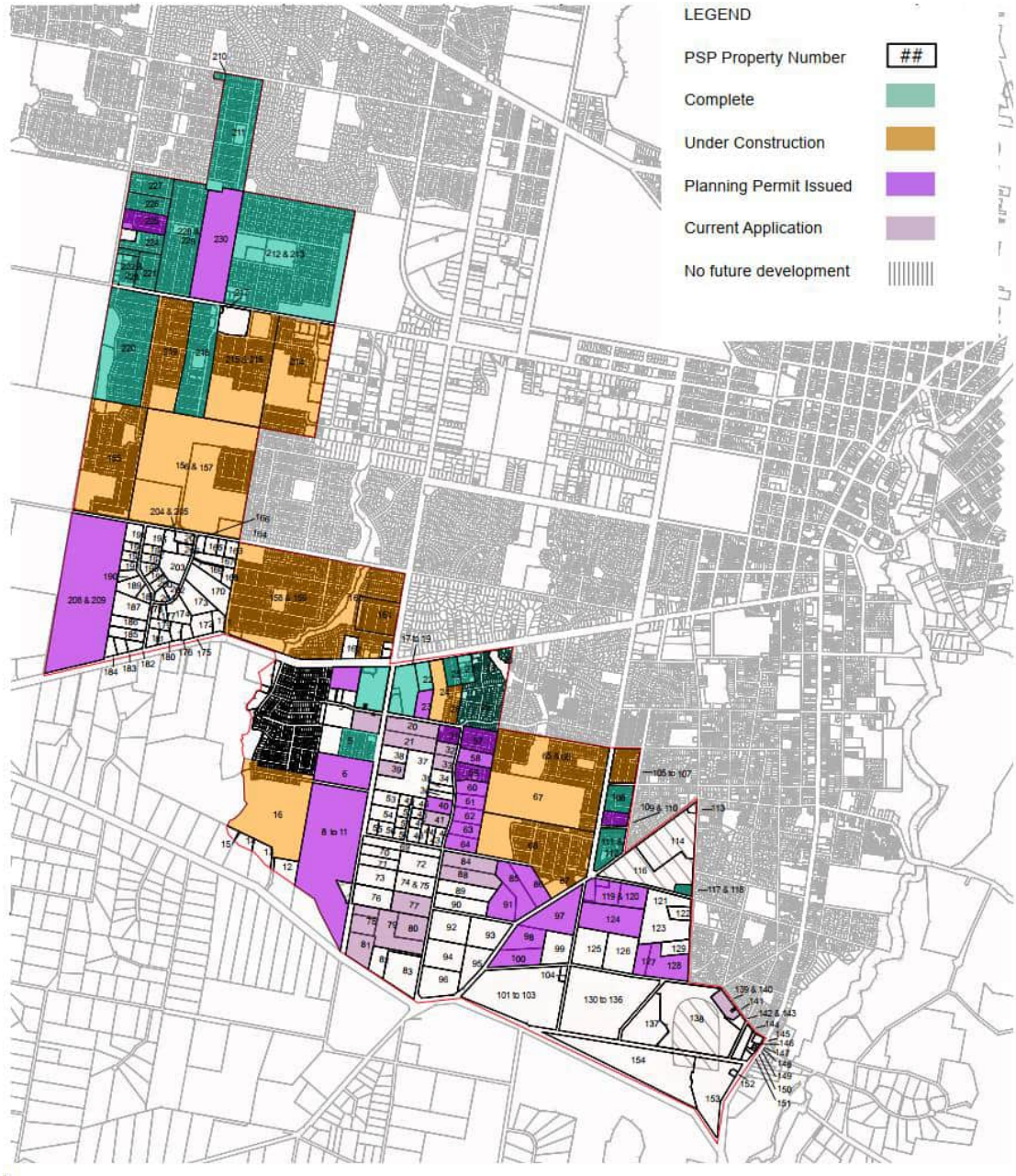

FIGURE 7.1: CURRENT PERMIT STATUS AND PROPERTY IDS

7.1 Highest Priority (short term)

The highest priority for Council should be to consider areas where construction is already underway on the property or where permits have already been lodged and where the ultimate drainage infrastructure is not yet built and will not be built as part of the development. Temporary solutions may be required by some developers, however where possible these should be minimised.

Current examples of where some Council intervention may be necessary includes property 12. The read of this property has almost no saleable development potential with nearly the entire part of property within the PSP boundary proposed for either open space or a wetland and retarding basin asset (RB13). Council should consider purchasing this property and either managing the construction of the wetland and retarding basin asset itself or engaging with the developer of property 16 to deliver this asset. The development of property 16 will be limited or require temporary assets without the construction of WLRB 13 which is located in property 11 and 12. Figure 7.2 shows the property IDs and the locations of the basins discussed above.

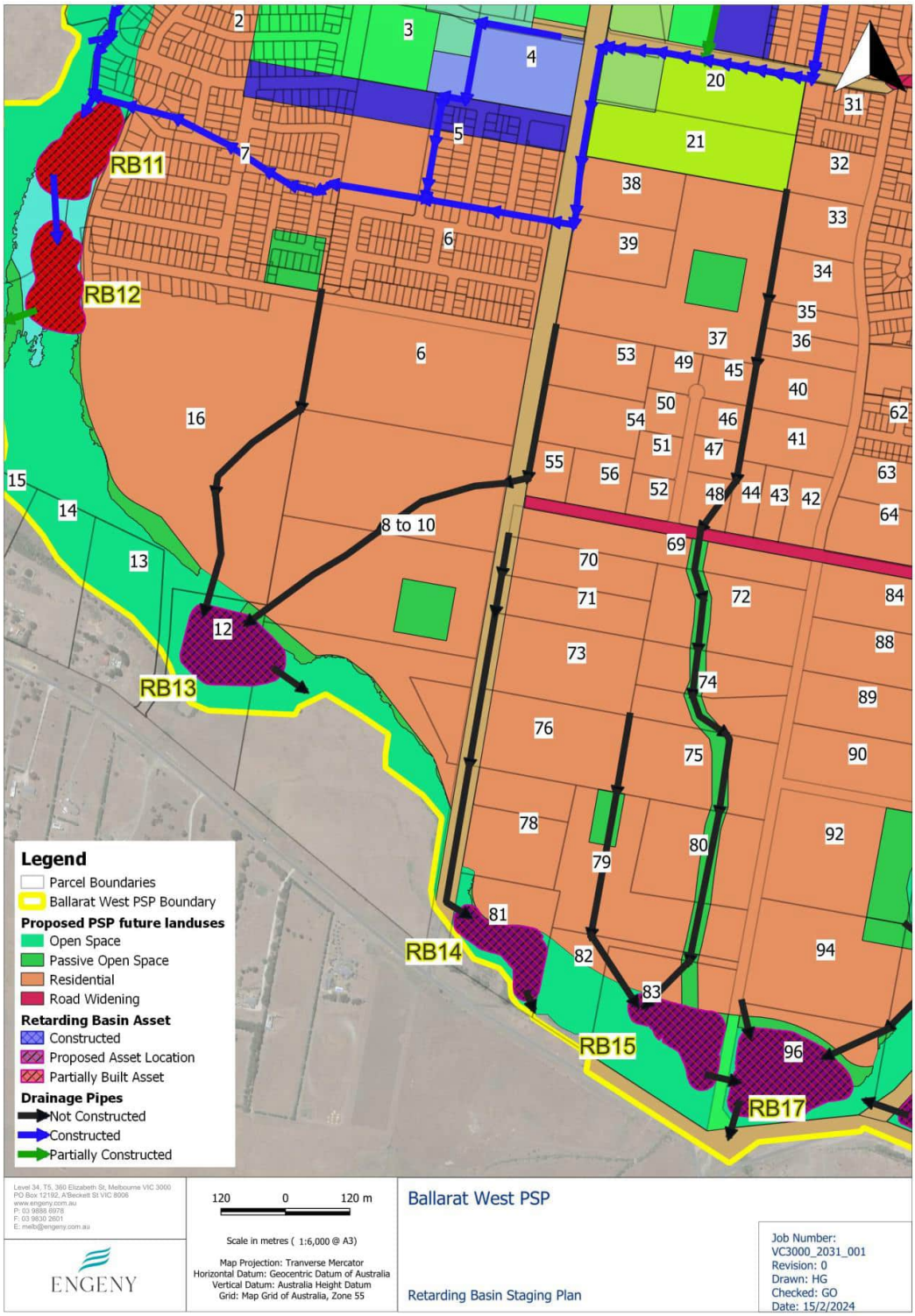

FIGURE 7.2: RETARDING BASINS AND PROPERTY NUMBERS

7.2 Secondary Priority (short-medium term)

The next highest priority for Council should be to consider which properties are close to lodging development applications and consider undertaking strategic projects to help facilitate the orderly development of these properties.

Facilitating the delivery of RB7 on property 209 will provide the final retarding basin and wetland asset in precinct 2. This should help to facilitate the remaining development within the precinct as all end of line treatment assets will be constructed.

The area shown in Figure 7.3 which is bounded by Schreenans Road / Webb Road and Cherry Flat Road and also includes Olivemay Court poses potential challenges. The development of properties 78, 79, 80, 81, 82, and 83 should be encouraged and facilitated where possible as this has the potential to deliver WLRB 14 and 15, which will help facilitate the upstream development. Properties 33, 34, 35, 36, 37, 38 and 39 (northern cluster) are somewhat stranded from a drainage point of view. The existing natural waterways or overland flow paths flow from the north to the south and pass through the smaller existing smaller properties which front Olivemay Court, Schreenans Road or Webb Road (40-52) (Olivemay cluster). The development incentive for these properties may be less than for the larger properties upstream and downstream due to their smaller size. To help facilitate the development of the northern cluster of property Council could consider undertaking or assisting in the implementation of one of the following options. The options are shown below in Figure 7.3.

- Constructing the underground drainage through the Olivemay Court cluster to Schreenans Road or through to property 80, to connect to the drain which the developer of that cluster of properties should be able to deliver in the near term. If the underground drain is only constructed to Schreenans Road it may be possible connect it to some of the dams which are online to the waterway downstream of Schreenans Road. Some interim retardation may be required to ensure that flows through these properties are not increased to a point that it has an unacceptable impact on those properties.
- Option 1 is an alternative to using the existing easements requires the creation of a new easement along the rear of properties 40 and 41 and down the western side of property 44. An easement along the western side of property 44 may be challenging as the existing dwelling is situated fairly close to the property boundary.
- Option 2 would be to utilise the existing easement through the western side of property 45 and then construct the rest of the pipeline along Olivemay Court within the existing road reserve. This option involves the least disruption to private property, however is also further away from the low point and so while facilitating the drainage of the northern cluster it does not assist with the development of the eastern properties in the Olivemay Court cluster which will occur at some point in the future. Properties 40 to 44 could not connect to this asset and properties 46 to 48 may also be unable to drain the entire property to this drain. If the main drain was constructed along this alignment then a secondary drain would likely be needed along the currently proposed alignment, however it could be smaller than is currently proposed as it is only draining the properties 40-44 and 46-48. If this option was to be pursued Engeny would recommend that the cost of the new smaller pipeline be determined and this amount reserved from the reimbursement available for the construction of pipes 5 and 6. The balance of funds could be provided to fund the main drain through property 45 and along Olivemay Court with the developer/s of the northern cluster picking up the shortfall as the works are being adjusted to facilitate quicker development and reduce the costs of onsite detention.
- Option 3: It is understood that there is an existing drainage easement at the rear of PSP properties 45-48 in the Olivemay Court Cluster. It is understood that there are a number of large trees in or adjacent to this easement which would need to be removed if this easement was used for the construction of this drain. It is understood that Council legally has the power to undertake the tree removal if they are in Council's drainage easement, however this may not to be well received by existing land owners. This option does provide drainage outfalls to properties 40 and 41, however they would be connecting to a pipe within an easement on an adjoining property.
- An overland flow path, likely in the form of a road, will be required along a similar alignment to option 1 in the future to allow for the conveyance of gap flow from the upstream development to the future drainage reserve south of Schreenans Road regardless of which option is pursued.

Engeny recommends engagement with all of the property owners in the Olivemay Court cluster to determine what the most practical solution to providing a drainage outfall for the upstream northern cluster is. From a purely engineering perspective the best alignment for the pipe is option 1. It provides outlets to properties 40 and 41 which meets the strategy's intended aim. As these properties are the ones to benefit by being provided with an outfall, the pipe also located on their land.

Construction of the main outfall drain along Cherry Flat Road or Schreenans Road (the north south running section), is not considered viable due to the height above the valley floor and low points which require drainage.

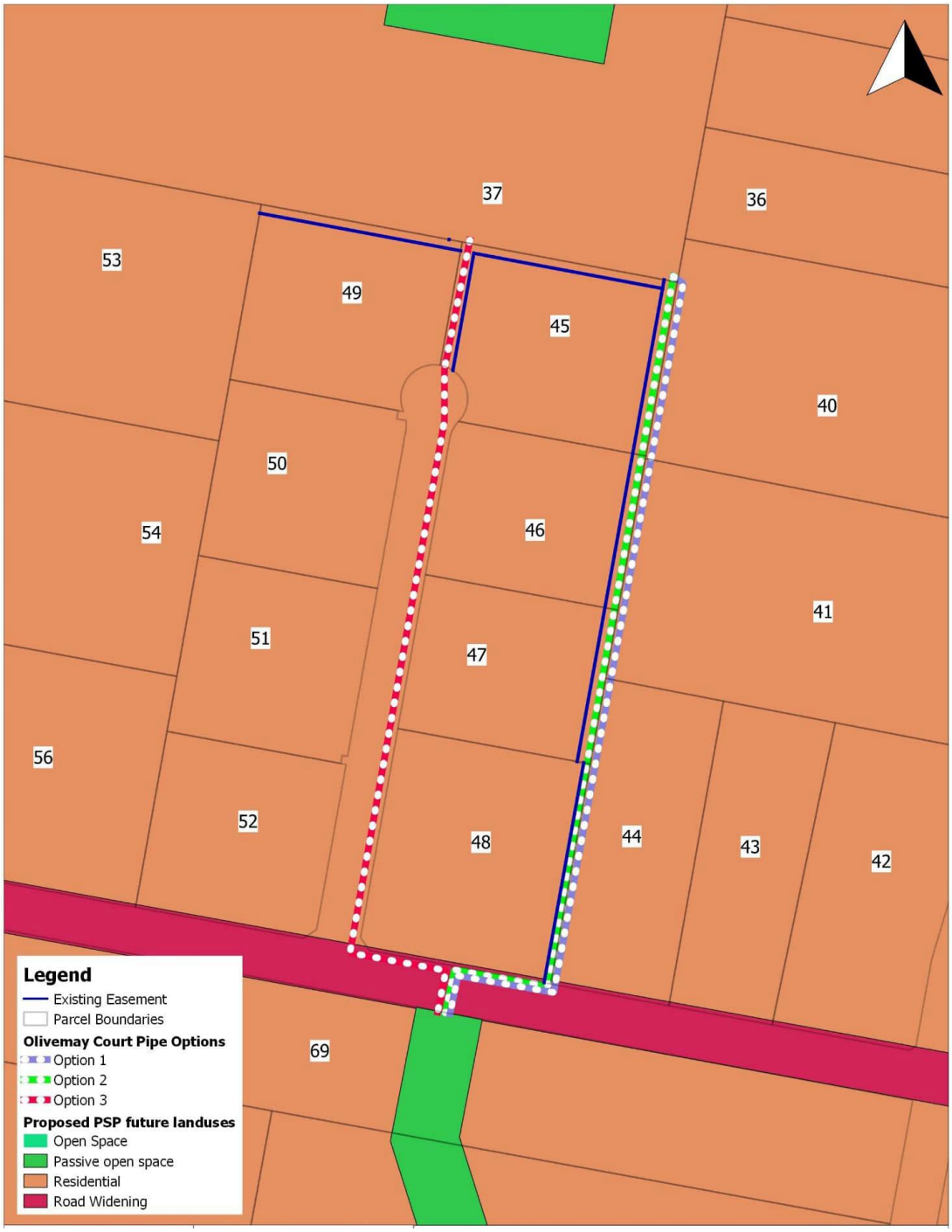

FIGURE 7.3: SCHREENANS ROAD PRECINCT

8. HYDRUALIC MODELLING

8.1 Purpose

Hydraulic TUFLOW modelling has been undertaken to help quantify the impact of the proposed development within the Ballarat West PSP on flooding downstream. In a meeting to discuss the development precinct the Corangamite CMA have stated that that up to 20 mm of flooding increase may be an acceptable level of increase.

8.2 Approach

A combined 1D/2D dynamic hydraulic modelling of the study area was undertaken using TUFLOW to estimate flood water levels, extents, flows and other hydraulic variables for the 1 % Annual Exceedance Probability (AEP) Storm Event. The model was run using the latest version of TUFLOW HPC with Subgrid Sampling (2023-03-AA) at the commencement of the modelling.

8.2.1 Methodology Overview

The following steps outline the tasks undertaken to develop the TUFLOW model for the study catchment and to obtain the results and outputs which were used for flood mapping.

- Generate a digital elevation model (DEM) based on latest available LiDAR, obtained from the Elvis portal maintained by Geoscience Australia. Simulate RORB hydrology models and compile hydrographs to determine critical storms for the study area. Refer to section 8.2.3 for details on ARF and critical duration.
- Apply rainfall excess hydrographs to flood model. Where appropriate 2D_streamlines have been utilised to improve model simulation runs times and reduce the impact of artificial depressions storage (compared to 2D_sa_all approach). Flows that had been routed in the hydrology RORB model has been applied through 2d_bc lines or sa_all polygons within waterways.
- Develop a Manning's surface roughness (materials layer)
- Input, review and verify drainage asset data (provided by Watertech).
- Represent the 3 major bridge crossings structures (Colac-Ballarat Road, Sebastopol-Smythesdale Rd, Bells Rd) (provided by Watertech)
- Apply z-shapes break lines to the road crest to ensure overland flow does not artificially travel through model cells due to the SGS modelling approach.
- Set 1D and 2D boundary conditions.
- Run the model in TUFLOW HPC with a 3-metre grid with sub-grid sampling at 0.75 metres.
- Produce and prepare flood mapping outputs.

8.2.2 Development Scenarios

As discussed in section 3.4.6 the proposed design of RB27 is able to achieve the required flow reduction to redeveloped flows so there is limited increase on the downstream section of the waterway. This proposed design will require an embankment 5 meters tall in the centre. An embankment of this size will create an elevated risk associated with possible embankment failure. Opportunities to limit the associated risk have been identified and trialled. Three variations of RB 27 were modelled to assess the downstream impacts, these include the following.

Scenario 1 (SO1) - RB27 sized to restrict flows back to pre-development within the 1 % AEP (current proposed design)

Scenario 1 aims to assess the performance of the proposed RB27 when designed to restrict flows back to predevelopment within the 1 % AEP event. Key considerations for scenario 1 include:

- Peak flow discharge from RB27 is 11.03 m^3/s (slightly higher than pre-development conditions)
- Embankment height would extend to 388.1 m AHD

Scenario 2 (SO2) - RB27 sized to restrict flows back to pre-development within the 10 % AEP

Scenario 2 aims to assess the performance of the proposed RB27 when designed the restrict flows back to predevelopment within the 10 % AEP.

Key considerations for scenario 2 include:

- Peak flow discharge from RB27 is 15.3 m^3/s
- Embankment height would extend to 387.43 m AHD

Scenario 3 (SO3) - No RB27

Scenario 3 aims to assess the downstream impacts of having no flow retardation on the waterway at the proposed location for RB27. The wetlands would still be required for stormwater treatment.

Key considerations for scenario 3 include:

- Peak flow discharge from RB27 is 19.6 m^3/s
- No embankment required

8.2.3 Areal Reduction Factors and Critical Storms

The IFD data provided by the BoM is applicable for rainfall in small catchments. As catchment size increases the chance of that average intensity of rainfall occurring over the entire catchment decreases. To address this issue an Areal Reduction Factor (ARF) can be applied to the IFD data to account for the larger catchment area. The critical storms have been identified through compiling and analysing outputs from the hydrology RORB model. Figure 8.1 identifies the key locations to determine the significant critical storm duration and temporal pattern for the 1 % AEP event.

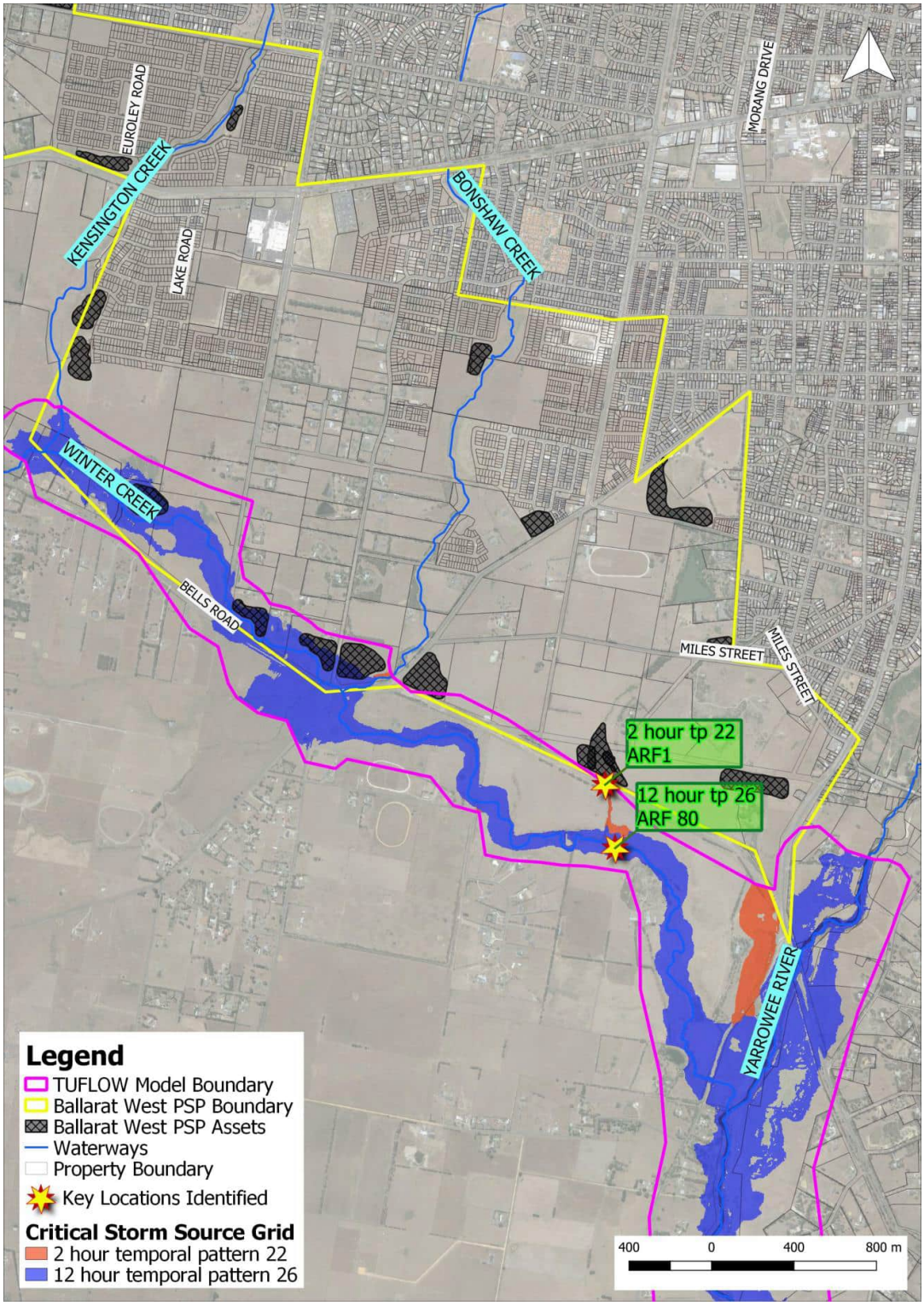

FIGURE 8.1: KEY LOCATION IDENTIFIED FOR CRITICAL DURATION AND TEMPORAL PATTERNS FOR THE 1 % AEP EVENT

8.3 Results

Appendix F shows the flood depth and flood level difference plots for the 1 % AEP event for all four scenarios including the existing conditions results.

Appendix G focuses in on the ~200 m waterway stretch between the outlet of RB27 and Winter Creek (purple box in Figure 8.2) and provides the depths and flood level difference plots for the 1 % AEP event for all four scenarios including the existing conditions results.

Figure 8.2 shows the flood level difference for scenario 3 which has no flow constraints on the waterway at the location of the proposed RB27, this scenario provides the highest peak flow discharge out of the PSP. It should be noted that flood level increase for all scenarios when compared to existing conditions outside of the ~200 m waterway stretch between the outlet of RB27 and Winter Creek (purple box in Figure 8.2) is less than 20 mm.

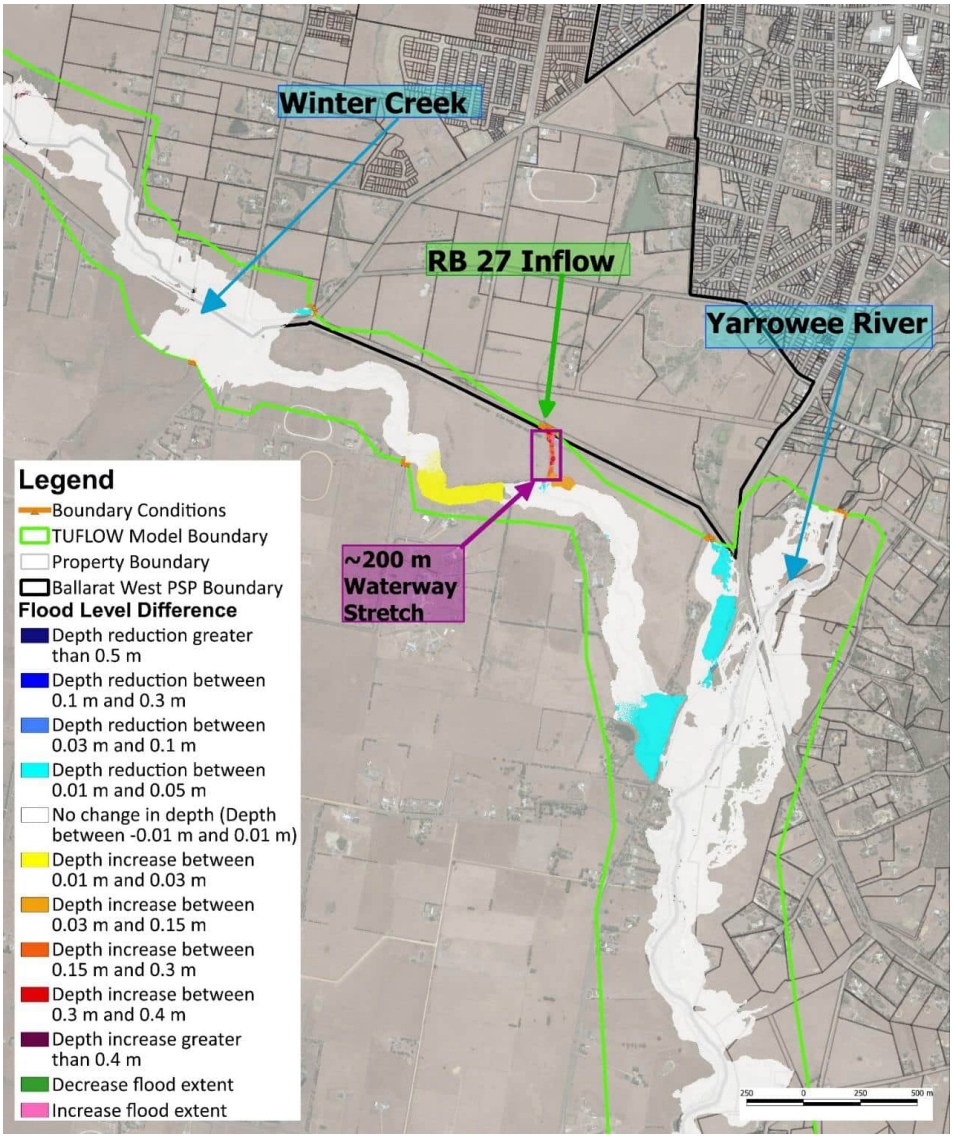

FIGURE 8.2: 1 % AEP FLOOD LEVEL DIFFERENCE FOR SCENARIO 3

Figure 8.3 is zoomed into the purple box seen in Figure 8.2. It highlights that the significant flood level increases are mainly contained to within 30 metres of the waterway centreline. The current land use in this area appears to be rural farming. The additional increase in flood depth in the 1% AEP event would have a minimal impact on the current land use. Should the area be developed in the future (noting that the property is within Golden Plains Shire Council and not currently zoned for development the waterway corridor setback requirement for each side of the waterway set by the Victorian Government under clause 14.02-1S in the Victorian Planning Scheme is 30 m and so there would not be a significant impact on the properties development potential.

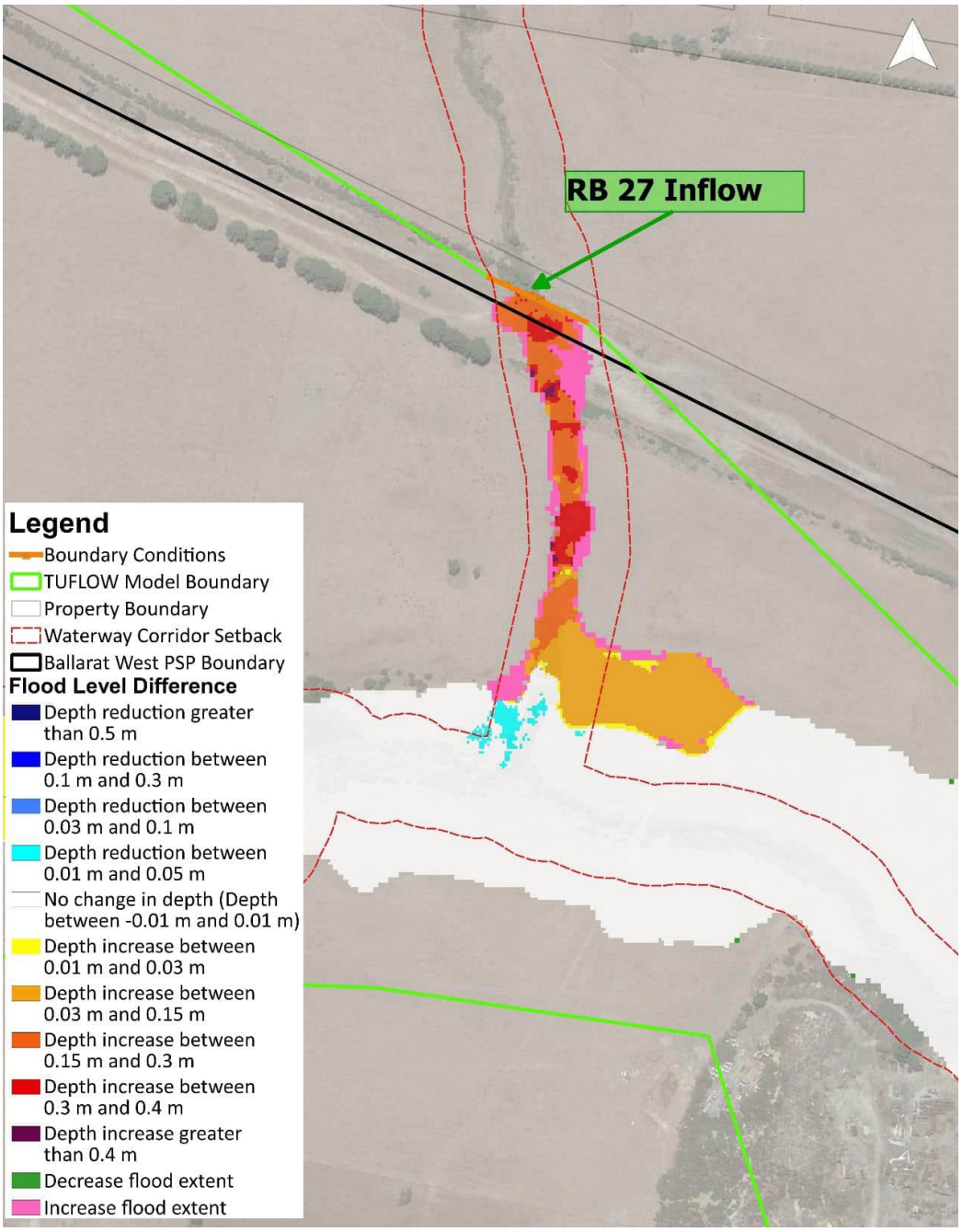

FIGURE 8.3: 1 % AEP FLOOD LEVEL DIFFERENCE FOR SCENARIO 3 ZOOMED TO ~200 M WATERWAY STRETCH

Table 8.1 summarises the peak flows and peak flood level differences for each of the scenario immediately downstream of RB27 proposed locations.

TABLE 8.1: SUMMARY OF RESULTS FOR WATERWAY STRETCH BETWEEN OUTLET OF RB27 AND WINTER CREEK

Scenario	Peak 1% AEP event flows (m^3/s)	Peak flood level difference (m)(Compared to existing conditions)
Existing conditions	10.46	-
Scenario 1	11.03	0.037
Scenario 2	15.21	0.326
Scenario 3	19.51	0.44

8.4 Discussion

Table 8.2 provides a summary of the positives and negatives for each of the design scenario modelled.

TABLE 8.2: SUMMARY OF POSITIVES AND NEGATIVES FOR THE DIFFERENT SCENARIOS

Scenario	Positives	Negatives
Scenario 1 (1% AEP RB)	• Very minor increase in flood level in private property downstream of the PSP, likely will meet the CMA flood level increase regulations. • Small decrease in flood levels (10 mm to 50 mm) downstream at Colac-Ballarat Road	• Building an embankment will increase the risk to future downstream development and will need to meet ANCOLD consequence of failure guidelines • The ANCOLD consequence of failure guidelines will likely require ongoing monitoring of the proposed retarding basin embankment. Changes to downstream land uses, including within the Three Chain Road reserve or the downstream farmland could significantly increase the risk category of the retarding basin and should be considered during design. • Expensive option that will require extensive design and complexing construction
Scenario 2 (Smaller RB)	• Flows discharging from RB27 are returned to pre-development in the 10 % AEP, protecting the waterways and the downstream properties in the more frequent events • Downstream flood increases are mostly contained to within 30 m of the waterway centreline	• Scenario 2 RB27 design will also require an embankment and therefore will increase the risk to future downstream development and will need to meet ACOLD guidelines • Expensive options that will require extensive design and complexing construction • Causing an increase in flood levels (10 mm – 30 mm) at Colac-Ballarat Road (the other two options are resulting in a decrease at this location)
Scenario (No RB)	• Increases in flood levels on waterway between Three Chain Road and Winter Creek • Downstream flood increases are mostly contained to the waterway corridor setback zone • Small decrease in flood levels (10 mm to 50 mm) downstream at Colac-Ballarat Road	• Waterway erosion protection works would be beneficial to protect the waterway from erosion .

9. CONCLUSION

The Ballarat West PSP Drainage Strategy has been updated to consider:

- The past 12 years of development within the precinct which has resulted in the completion of more than half of the proposed stormwater treatment and retardation assets
- Updated technical guidelines, including Australian Rainfall and Runoff 2019, Melbourne Water's Constructed Wetland Design Guidelines and update Environmental Protection Agency guidance on urban stormwater management and the general environmental duty
- Updated stormwater quality modelling in MUSIC and updated stormwater flow management in RORB compliant with the new guidelines.
- Changes to the drainage scheme to respond to the staging of development.

A result of these updates is that the asset sizing and costing has been updated. Generally the proposed footprints for wetland assets has increased, pipe sizes have typically stayed similar or slightly decreased and retarding basin volumes have increased, with the key drivers being the updated ARR 2019 methodologies and the increase in development density.

The plans in Appendix D: show the updated infrastructure layout.

The cost estimates have also been revised but costed using the original methodology. Costs have been increased by 37.4% in line with the change in the road and bridge construction price index (Victoria) from the original stormwater management strategy and this report as published by the Australian Bureau of Statistics.

This strategy document should be used to inform all drainage strategy implementation decisions moving forward. It is also acknowledged that while this update has considered the information available at the time, design considerations have only been undertaken to a concept level. There may be good practical reasons why the designs proposed may need to be adjusted as the design process progresses. This should be considered as an opportunity to improve the proposed designs and ensure that at a minimum the same levels of treatment and retardation are achieved by drainage strategy assets.

10. QUALIFICATIONS

(a) In preparing this document, including all relevant calculation and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

(c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

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(g) This Report does not provide legal advice.

APPENDIX A: RORB MODEL DETAILS

Table A.1 shows the RORB catchment areas and the breakdown of the directly connected (or effectively connected area (EIA)), indirectly connected (ICA)and rural pervious areas.

TABLE A.1: RORB CATCHMENT AREA AND BREAKDOWN

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
A	0.138	0.39	0.61	0.00
C	0.326	0.43	0.57	0.00
D	0.328	0.43	0.57	0.00
E	0.329	0.38	0.62	0.00
F	0.326	0.32	0.68	0.00
G	0.244	0.41	0.59	0.00
I	0.289	0.39	0.61	0.00
J	0.126	0.47	0.53	0.00
M	0.332	0.39	0.61	0.00
N	0.328	0.31	0.69	0.00
O	0.171	0.22	0.78	0.00
P	0.071	0.43	0.57	0.00
Q	0.087	0.38	0.62	0.00
R	0.249	0.47	0.53	0.00
S	0.229	0.52	0.48	0.00
T	0.196	0.45	0.55	0.00
U	0.133	0.52	0.48	0.00
V	0.307	0.52	0.48	0.00
W	0.232	0.41	0.59	0.00
X	0.194	0.37	0.63	0.00
Y	0.125	0.32	0.69	0.00
Z2	0.076	0.39	0.62	0.00
AA	0.317	0.27	0.73	0.00
AB	0.075	0.40	0.60	0.00
AC	0.066	0.31	0.69	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
AD	0.103	0.45	0.55	0.00
AE	0.046	0.42	0.58	0.00
AF	0.051	0.53	0.48	0.00
AG	0.007	0.00	0.19	0.81
AH	0.072	0.52	0.48	0.00
AI	0.083	0.52	0.48	0.00
AJ	0.083	0.47	0.53	0.00
AK13	0.114	0.27	0.73	0.00
AL	0.049	0.00	0.18	0.82
AM	0.037	0.00	0.10	0.90
AN	0.123	0.39	0.61	0.00
AO	0.033	0.00	0.11	0.90
AP	0.021	0.00	0.18	0.82
AQ	0.112	0.52	0.48	0.00
AR	0.091	0.51	0.49	0.00
AS	0.069	0.52	0.48	0.00
AT	0.067	0.52	0.48	0.00
AU	0.059	0.52	0.48	0.00
AV	0.057	0.52	0.48	0.00
AW	0.079	0.40	0.60	0.00
AX	0.026	0.53	0.48	0.00
AY	0.084	0.37	0.63	0.00
AZ	0.055	0.38	0.62	0.00
BA	0.112	0.41	0.59	0.00
BB	0.044	0.52	0.48	0.00
BC	0.119	0.48	0.52	0.00
BD	0.130	0.52	0.48	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
BE	0.072	0.48	0.52	0.00
BF	0.085	0.47	0.53	0.00
BG	0.085	0.38	0.62	0.00
BH	0.031	0.24	0.76	0.00
BI	0.143	0.44	0.56	0.00
BJ	0.075	0.49	0.51	0.00
BK	0.085	0.53	0.48	0.00
BL	0.123	0.51	0.49	0.00
BM	0.140	0.43	0.57	0.00
BN	0.031	0.52	0.48	0.00
BO	0.022	0.00	0.25	0.75
BP	0.029	0.00	0.27	0.73
BQ	0.036	0.34	0.66	0.00
BR	0.049	0.38	0.62	0.00
BS	0.026	0.31	0.69	0.00
BT	0.080	0.40	0.60	0.00
BU	0.061	0.36	0.64	0.00
BV	0.062	0.43	0.57	0.00
BW	0.070	0.46	0.54	0.00
BX1	0.026	0.43	0.57	0.00
BY	0.109	0.42	0.58	0.00
BZ	0.163	0.39	0.61	0.00
CA	0.090	0.37	0.63	0.00
CB	0.121	0.49	0.51	0.00
CC	0.051	0.40	0.60	0.00
CD	0.051	0.42	0.58	0.00
CE	0.071	0.39	0.62	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
CF	0.015	0.45	0.55	0.00
CG	0.081	0.43	0.57	0.00
CH	0.044	0.52	0.48	0.00
CI	0.090	0.52	0.48	0.00
CJ	0.117	0.52	0.48	0.00
CK	0.144	0.37	0.63	0.00
CL	0.051	0.48	0.52	0.00
CM	0.103	0.00	0.10	0.90
CN	0.047	0.00	0.13	0.87
CO	0.073	0.00	0.22	0.78
CP	0.117	0.50	0.50	0.00
CQ	0.085	0.52	0.48	0.00
CR	0.125	0.52	0.48	0.00
CS	0.186	0.47	0.53	0.00
CT	0.096	0.37	0.63	0.00
CU	0.035	0.53	0.48	0.00
CV	0.100	0.39	0.61	0.00
CW	0.114	0.47	0.53	0.00
CX	0.224	0.31	0.69	0.00
CY	0.027	0.53	0.48	0.00
CZ	0.036	0.52	0.48	0.00
DA	0.081	0.33	0.67	0.00
DB	0.066	0.52	0.48	0.00
DC	0.091	0.41	0.59	0.00
DF	0.044	0.42	0.58	0.00
DI	0.364	0.14	0.86	0.00
DK	0.713	0.41	0.59	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
DL	0.579	0.25	0.75	0.00
DO	0.124	0.42	0.58	0.00
DP	0.078	0.31	0.69	0.00
DQ	0.062	0.49	0.51	0.00
DX	0.038	0.43	0.57	0.00
DY	0.032	0.52	0.48	0.00
DZ	0.021	0.52	0.48	0.00
EA	0.021	0.42	0.58	0.00
EB	0.082	0.41	0.59	0.00
EC	0.042	0.19	0.81	0.00
ED	0.020	0.08	0.92	0.00
EE	0.063	0.00	0.32	0.68
EF	0.033	0.00	0.30	0.70
EG	0.057	0.00	0.29	0.71
EH	0.036	0.53	0.48	0.00
EI	0.057	0.00	0.43	0.57
EJ	0.062	0.00	0.13	0.87
EK	0.341	0.51	0.49	0.00
EL	0.486	0.51	0.49	0.00
EM	0.175	0.29	0.71	0.00
EN	0.183	0.00	0.11	0.89
EO	0.258	0.00	0.03	0.97
EP	0.299	0.00	0.05	0.95
EQ	0.342	0.00	0.02	0.98
ER	0.376	0.00	0.02	0.98
ES	0.533	0.00	0.02	0.98
ET	0.581	0.28	0.72	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
EU	0.309	0.00	0.01	0.99
EV	0.228	0.00	0.04	0.96
EW	0.231	0.00	0.04	0.96
EX	0.423	0.00	0.02	0.98
EY	0.228	0.00	0.02	0.98
EZ	0.447	0.00	0.03	0.97
FA	0.143	0.00	0.06	0.94
FB	0.258	0.00	0.05	0.95
FC	0.327	0.00	0.04	0.96
FD	0.282	0.00	0.03	0.97
FE	0.119	0.00	0.16	0.84
FF	0.384	0.00	0.02	0.98
FG	0.361	0.00	0.08	0.92
FH	0.421	0.00	0.02	0.98
FI	0.453	0.00	0.04	0.96
FJ	0.311	0.00	0.05	0.95
FK	0.626	0.00	0.04	0.96
FL	0.222	0.00	0.01	0.99
FM	0.877	0.00	0.03	0.97
FN	0.277	0.00	0.00	1.00
FO	0.564	0.00	0.00	1.00
FP	0.485	0.00	0.02	0.98
FQ	0.962	0.00	0.01	0.99
FR	0.047	0.00	0.17	0.83
FS	0.924	0.00	0.01	0.99
FT	0.032	0.00	0.15	0.85
FU	0.065	0.00	0.00	1.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
FV	0.314	0.00	0.00	1.00
FW	0.341	0.00	0.09	0.91
FX	0.478	0.00	0.05	0.95
FY	0.276	0.00	0.04	0.96
FZ	0.167	0.00	0.07	0.93
GA	0.314	0.00	0.11	0.89
GB	0.530	0.00	0.06	0.94
GC	0.684	0.00	0.05	0.95
GD	0.770	0.00	0.03	0.97
GE	0.383	0.00	0.03	0.97
GF	0.379	0.00	0.04	0.96
GG	0.712	0.00	0.02	0.98
GH	0.712	0.00	0.01	0.99
GI	0.755	0.00	0.02	0.98
GJ	0.477	0.00	0.03	0.97
GQ	0.378	0.00	0.04	0.96
GS	0.497	0.00	0.02	0.98
GW	0.538	0.00	0.03	0.97
GX	0.327	0.00	0.01	0.99
GZ	0.397	0.00	0.01	0.99
HA	0.444	0.00	0.03	0.97
HB	0.533	0.00	0.06	0.94
HC	0.308	0.00	0.03	0.97
HD	0.553	0.00	0.03	0.97
HE	0.130	0.00	0.08	0.92
HF	0.517	0.00	0.01	0.99
HG	0.436	0.00	0.02	0.98

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
HM	0.862	0.00	0.04	0.96
HN	0.330	0.00	0.07	0.93
HO	0.519	0.00	0.01	0.99
HP	0.350	0.00	0.03	0.97
HQ	0.125	0.00	0.12	0.88
HR	0.245	0.00	0.10	0.90
HS	1.248	0.00	0.01	0.99
HT	0.794	0.00	0.04	0.96
HU	0.180	0.00	0.04	0.96
HV	0.295	0.00	0.11	0.89
HX	0.518	0.00	0.04	0.96
HY	0.806	0.00	0.03	0.97
HZ	0.476	0.00	0.02	0.98
IA	0.955	0.00	0.02	0.98
IB	0.209	0.00	0.15	0.85
IC	1.108	0.00	0.01	0.99
ID	0.609	0.00	0.03	0.97
IE	0.701	0.00	0.01	0.99
IF	0.353	0.00	0.05	0.95
IG	0.705	0.00	0.02	0.98
IH	1.020	0.00	0.01	0.99
IJ	0.258	0.00	0.03	0.97
IK	0.441	0.00	0.05	0.95
IL	0.540	0.00	0.03	0.97
IM	0.628	0.00	0.03	0.97
IN	0.344	0.00	0.05	0.95
IO	0.409	0.00	0.05	0.95

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
IP	0.267	0.00	0.09	0.91
IQ	0.670	0.00	0.00	1.00
IR	0.467	0.00	0.01	0.99
IS	0.710	0.00	0.05	0.95
IT	0.592	0.00	0.02	0.98
IU	0.629	0.00	0.03	0.97
IV	0.809	0.00	0.02	0.98
IW	0.395	0.00	0.07	0.93
IX	0.542	0.00	0.03	0.97
IZ	0.552	0.00	0.05	0.95
JA	0.177	0.00	0.09	0.91
JB	0.524	0.00	0.02	0.98
JC	0.256	0.00	0.07	0.93
JD	0.703	0.00	0.02	0.98
JE	0.521	0.00	0.02	0.98
JF	0.626	0.00	0.00	1.00
JG	0.510	0.00	0.06	0.94
JH	0.429	0.00	0.05	0.95
JI	0.631	0.00	0.02	0.98
JJ	0.399	0.00	0.03	0.97
JK	0.173	0.41	0.59	0.00
JL	0.132	0.07	0.93	0.00
JM	0.131	0.42	0.58	0.00
JN	0.078	0.42	0.58	0.00
JO	0.067	0.43	0.57	0.00
JP	0.129	0.42	0.58	0.00
JQ	0.337	0.42	0.58	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
JR	0.287	0.42	0.58	0.00
JS	0.222	0.43	0.57	0.00
JT	0.242	0.46	0.54	0.00
JU	0.075	0.00	0.14	0.86
JV	0.283	0.41	0.59	0.00
JW	0.263	0.42	0.58	0.00
JX	0.200	0.38	0.62	0.00
JY	0.177	0.42	0.58	0.00
JZ	0.279	0.40	0.60	0.00
KA	0.327	0.39	0.61	0.00
KB	0.098	0.26	0.74	0.00
KC	0.443	0.17	0.83	0.00
KD	0.498	0.23	0.77	0.00
KE	0.806	0.00	0.02	0.98
KF	0.552	0.22	0.78	0.00
KG	0.333	0.20	0.80	0.00
KH	0.238	0.00	0.04	0.96
KI	0.235	0.19	0.81	0.00
KJ	0.183	0.22	0.78	0.00
KK	0.232	0.28	0.72	0.00
KL	0.201	0.42	0.58	0.00
KM	0.122	0.40	0.60	0.00
KN	0.234	0.42	0.58	0.00
KO	0.255	0.42	0.58	0.00
KP	0.136	0.42	0.58	0.00
KQ	0.096	0.42	0.58	0.00
KR	0.097	0.42	0.58	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
KS	0.138	0.48	0.52	0.00
KT	0.123	0.46	0.54	0.00
KU	0.064	0.52	0.48	0.00
KV	0.104	0.42	0.58	0.00
KW	0.067	0.51	0.49	0.00
KX	0.184	0.35	0.65	0.00
KY	0.129	0.41	0.59	0.00
KZ	0.139	0.42	0.58	0.00
LA	0.144	0.42	0.58	0.00
LB	0.127	0.42	0.58	0.00
LC	0.143	0.40	0.60	0.00
LD	0.198	0.42	0.58	0.00
LE	0.206	0.40	0.60	0.00
LF	0.224	0.38	0.62	0.00
LG	0.107	0.42	0.58	0.00
LH	0.131	0.34	0.66	0.00
LI	0.077	0.42	0.58	0.00
LJ	0.071	0.42	0.58	0.00
LO	0.667	0.00	0.01	0.99
LP	0.430	0.00	0.03	0.97
LQ	0.265	0.00	0.00	1.00
LR	0.202	0.00	0.04	0.96
LS	0.350	0.00	0.02	0.98
LT	0.465	0.00	0.13	0.87
LU	0.203	0.00	0.08	0.92
LV	0.413	0.00	0.00	1.00
LW	0.570	0.39	0.61	0.00

Subarea	Area (km²)	Fraction Directly Connected	Fraction indirectly Connected	Fraction Rural pervious Area
LX	0.327	0.33	0.67	0.00
LY	0.501	0.44	0.56	0.00
Z1	0.079	0.41	0.59	0.00
AK12	0.056	0.22	0.78	0.00
Le	0.206	0.40	0.60	0.00
LLa	0.118	0.50	0.50	0.00
LLb	0.030	0.42	0.58	0.00
KKe	0.012	0.42	0.58	0.00
LLc	0.026	0.41	0.59	0.00
LLd	0.012	0.41	0.59	0.00
KKf	0.019	0.24	0.76	0.00
HHa	0.145	0.31	0.69	0.00
HHe	0.017	0.31	0.69	0.00
HHd	0.015	0.42	0.58	0.00
HHb	0.067	0.42	0.58	0.00
HHc	0.007	0.42	0.58	0.00
KKc	0.017	0.42	0.58	0.00
KKa	0.073	0.38	0.62	0.00
KKb	0.062	0.42	0.58	0.00
KKd	0.035	0.42	0.58	0.00
BX2	0.039	0.44	0.56	0.00

Figure A.1 shows the layout of the existing conditions RORB model. The figure also shows the PSP boundary in black and the location of a previous model for “The Chase” development which was used in the development of the existing conditions RORB model

Figure A.2 shows the impervious fractions assumed in the developed RORB model. The values in the figure match the values in Table A.1.

Figure A.3 and Figure A.4 show the developed RORB model layout in Precincts 1 and 2.

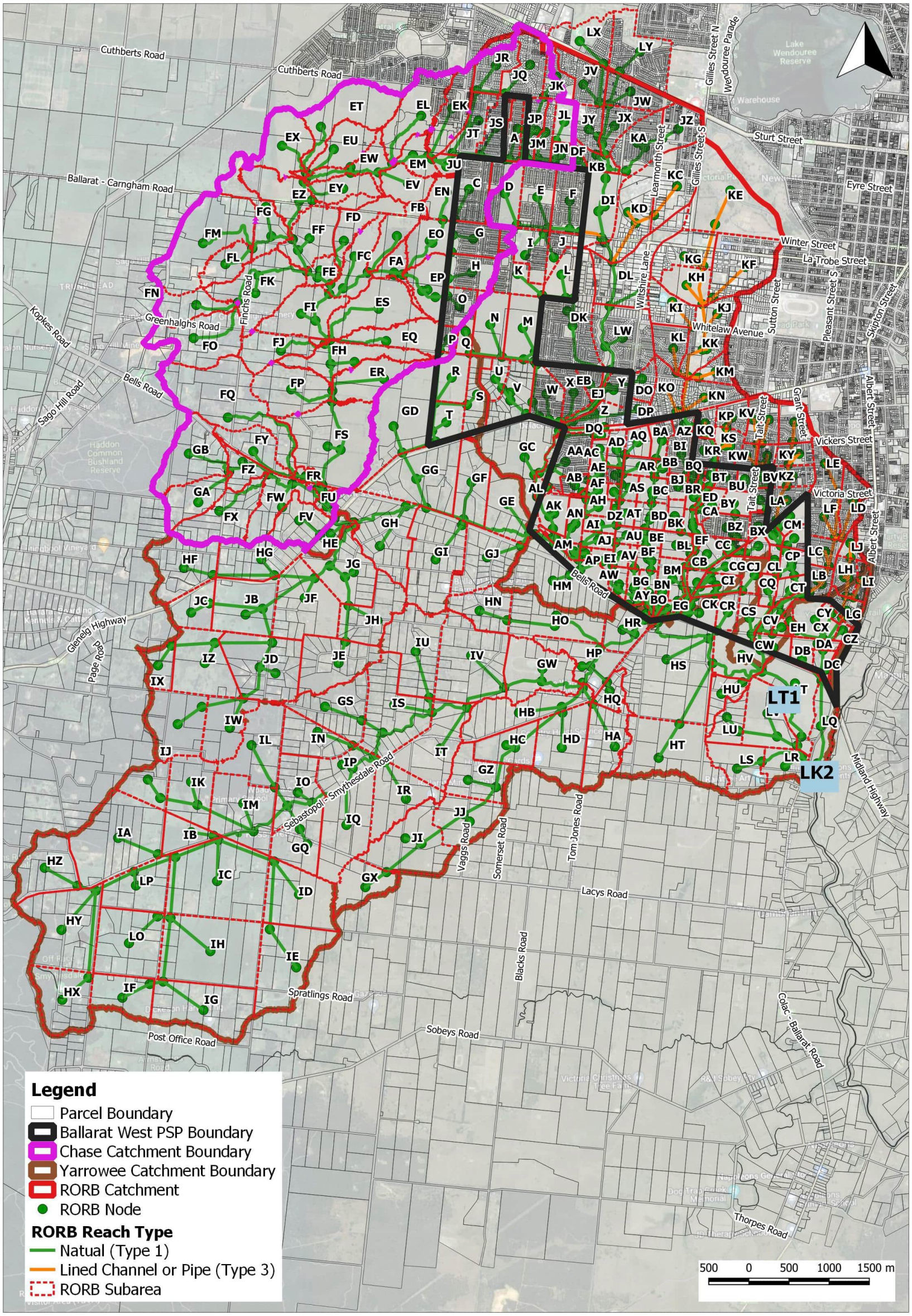

FIGURE A.1: EXISTING CONDITIONS RORB MODEL

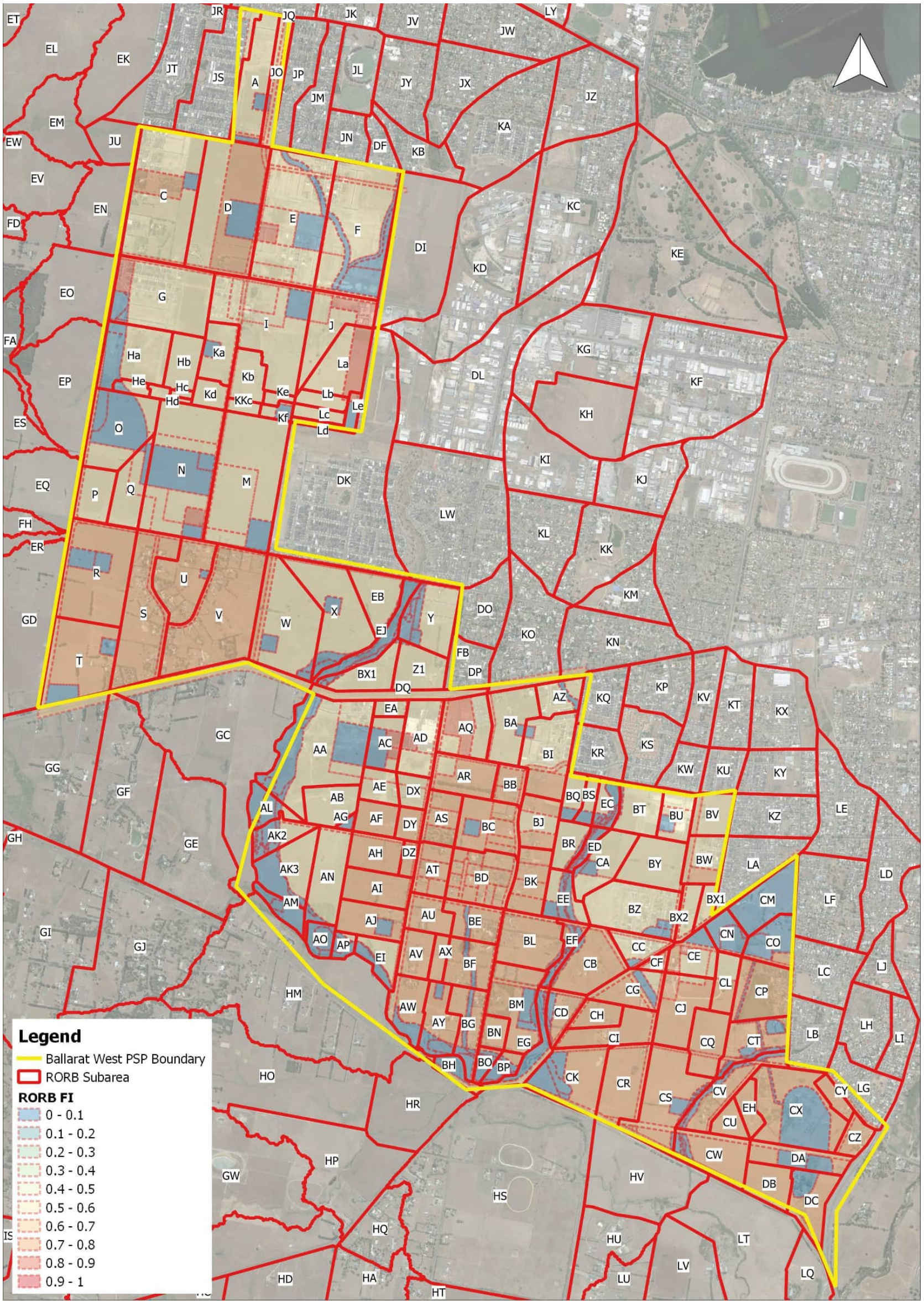

FIGURE A.2: RORB IMPERVIOUS FRACTIONS

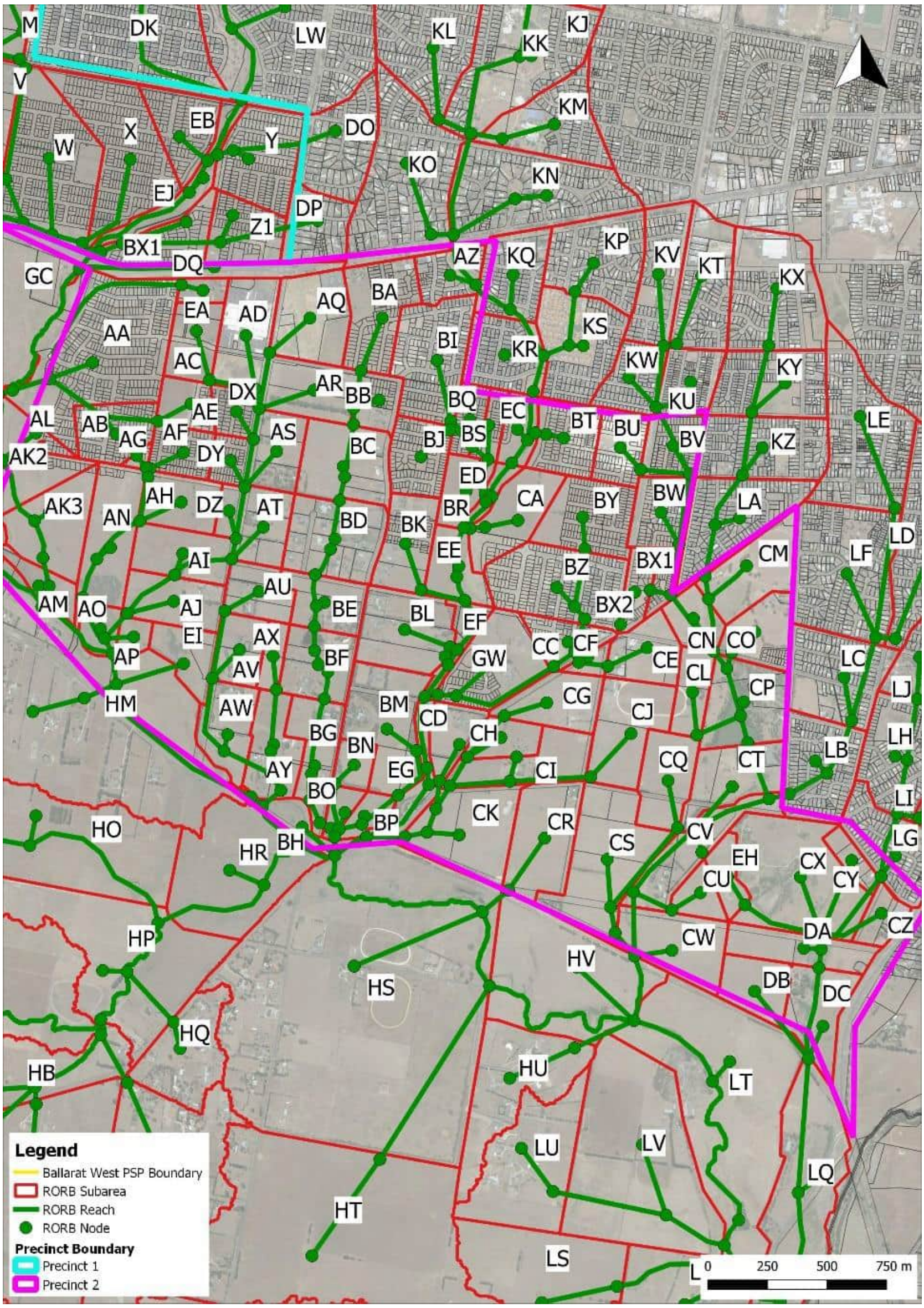

FIGURE A.3: DEVELOPED CONDITIONS PRECINCT 1 RORB LAYOUT

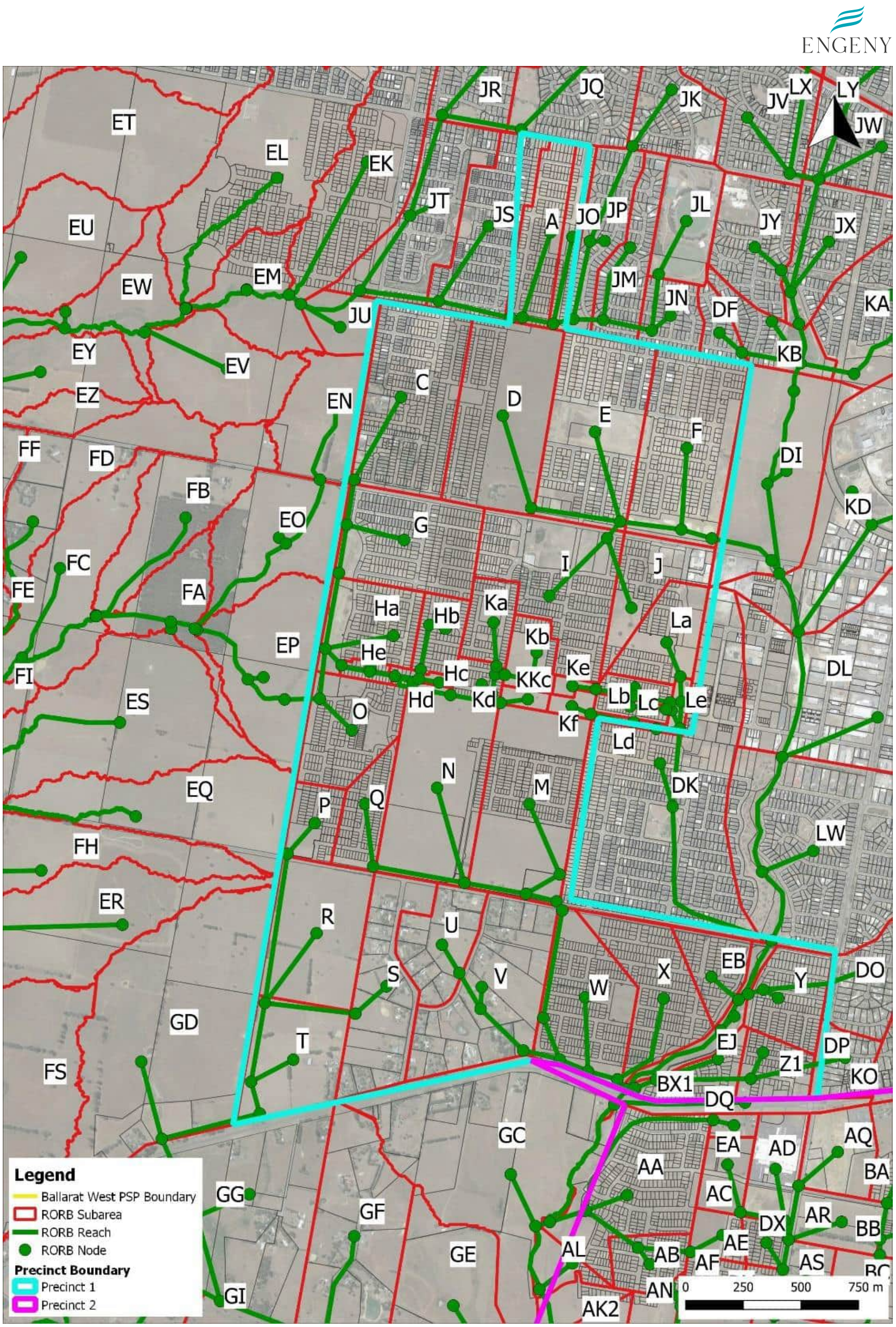

FIGURE A.4: DEVELOPED CONDITIONS PRECINCT 2 RORB LAYOUT

APPENDIX B: SEDIMENTATION BASIN CALCULATIONS

Ballarat West PSP Sediment Basin 7

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.98	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	1400	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.75	use 4EY flow
Required volume:		
S	587	
C (ha)	75	catchment Area
R	0.98	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	1.6	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	880	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	1218	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 13

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.99	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	2000	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.54	use 4EY flow
Required volume:		
S	1214	
C (ha)	122.2	catchment Area
R	0.99	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	2	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	1821	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	1926	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 14

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.99	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	700	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.27	use 1EY flow
Required volume:		
S	302	
C (ha)	30.5	catchment Area
R	0.99	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	2	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	453	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	457	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 15

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.99	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	1200	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.34	use 1EY flow
Required volume:		
S	643	
C (ha)	64.7	catchment Area
R	0.99	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	2	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	964	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	991	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 17

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.98	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	600	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.32	use 1EY flow
Required volume:		
S	219	
C (ha)	22.2	catchment Area
R	0.98	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	2	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	328	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	358	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 24

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.99	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	900	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.43	use 4EY flow
Required volume:		
S	416	
C (ha)	53	catchment Area
R	0.99	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	1.6	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	624	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	663	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 27

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.98	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	700	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.43	use 4EY flow
Required volume:		
S	253	
C (ha)	32	catchment Area
R	0.98	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	1.6	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	379	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	457	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 27B

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.97	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	600	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.56	use 4EY flow
Required volume:		
S	193	
C (ha)	25	catchment Area
R	0.97	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	1.6	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	290	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	358	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 29

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.98	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	1200	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	0.65	use 4EY flow
Required volume:		
S	622	
C (ha)	79	catchment Area
R	0.98	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	1.6	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	933	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	991	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

Ballarat West PSP Sediment Basin 30

Surface Area:	calculated using Equation 4.3 of WSUD Engineering Procedures	
R (removal fraction)	0.98	change A below to achieve 0.95
hydraulic efficiency	0.26	see Fig 4.3 of WSUD Engineering Procedures, design objective is this value should be 0.5 or higher where possible
n (number of CSTRs)	1.4	calculated using Equation 4.2 of WSUD Engineering Procedures
v_s (m/s)	0.011	settling velocity for 125 micrometre particle size, otherwise see Tabl 4.1 of WSUD Engineering Procedures
d_e (m)	0.35	extended detention depth
d_p (m)	1.5	depth of the permanent pool volume
d* (m)	1.0	sediment can accummulate up to 0.5m below normal water level
A (m^2)	1500	SA of the sediment pond
Side lenth:width ratio 1:	3	
Q (m^3/s)	1.00	use 4EY flow
Required volume:		
S	780	
C (ha)	100	catchment Area
R	0.98	capture efficiency from above equation (not less than 0.95)
L (m^3/ha)	1.6	sediment loading rate (1.6m3/ha is typical loading rate for developed catchments)
Fr (years)	5	desired clean out frequency, should be 3 years or greater
Permanent Pool Volume (PPV)		
PPV Req:	1171	accumulated sediment not to exceed 2/3 of available storage volume within 5 years (MW Constructed Wetlands Guidelines)
Estimated minimum PPV	1334	Assumes rectanglular shape with ratio specified above and saefty bench specified in dam capacity calcs
	OK	

APPENDIX C: MUSIC MODEL SETUP AND INDIVIDUAL ASSET RESULTS

Table C.1 to Table C.10 shows the treatment performance of each individual wetland and sedimentation basin asset in the drainage strategy which is not yet constructed or committed. The Precinct 1 MUSIC model contains a number of low flow diversions so the results presented are node balances and not total treatment train effectiveness (which includes all upstream assets as well). Adjustments to the low flow diversions may impact on the pollutant removal achieved by each asset and so care should be taken when adjusting low flow diversions to consider the impact on the treatment achieved in all assets.

TABLE C.1: WLRB7

	Inflow	Outflow	Reduction
Flow (ML/yr)	243	225	7.3
Total Suspended Solids (kg/yr)	49900	15100	69.8
Total Phosphorus (kg/yr)	101	39.9	60.5
Total Nitrogen (kg/yr)	700	404	42.4
Gross Pollutants (kg/yr)	10800	1400	87.1

TABLE C.2: WLRB13

	Inflow	Outflow	Reduction
Flow (ML/yr)	229	216	5.7
Total Suspended Solids (kg/yr)	46500	15900	65.8
Total Phosphorus (kg/yr)	94.2	41.3	56.1
Total Nitrogen (kg/yr)	657	409	37.8
Gross Pollutants (kg/yr)	10200	1850	81.7

TABLE C.3: WLRB14

	Inflow	Outflow	Reduction
Flow (ML/yr)	92.4	86.7	6.2
Total Suspended Solids (kg/yr)	19000	6610	65.2
Total Phosphorus (kg/yr)	38.3	17	55.7
Total Nitrogen (kg/yr)	266	163	38.5
Gross Pollutants (kg/yr)	4190	586	86

TABLE C.4: WLRB15

	Inflow	Outflow	Reduction
Flow (ML/yr)	158	152	3.8
Total Suspended Solids (kg/yr)	32200	14000	56.6
Total Phosphorus (kg/yr)	65.2	34.7	46.8
Total Nitrogen (kg/yr)	456	322	29.3
Gross Pollutants (kg/yr)	7060	1410	80.1

TABLE C.5: WLRB17

	Inflow	Outflow	Reduction
Flow (ML/yr)	158	152	3.8
Total Suspended Solids (kg/yr)	32200	14000	56.6
Total Phosphorus (kg/yr)	65.2	34.7	46.8
Total Nitrogen (kg/yr)	456	322	29.3
Gross Pollutants (kg/yr)	7060	1410	80.1

TABLE C.6: WLRB24

	Inflow	Outflow	Reduction
Flow (ML/yr)	300	283	5.8
Total Suspended Solids (kg/yr)	47000	19900	57.8
Total Phosphorus (kg/yr)	99.3	51.7	48
Total Nitrogen (kg/yr)	746	503	32.6
Gross Pollutants (kg/yr)	9240	2030	78

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TABLE C.7: WLRB27

	Inflow	Outflow	Reduction
Flow (ML/yr)	458	454	0.8
Total Suspended Solids (kg/yr)	50800	40100	21.1
Total Phosphorus (kg/yr)	115	104	9.6
Total Nitrogen (kg/yr)	971	928	4.4
Gross Pollutants (kg/yr)	6460	1190	81.6

TABLE C.8: SB27B

	Inflow	Outflow	Reduction
Flow (ML/yr)	74.8	74.3	0.7
Total Suspended Solids (kg/yr)	15300	5710	62.6
Total Phosphorus (kg/yr)	31.2	17	45.5
Total Nitrogen (kg/yr)	215	174	19.1
Gross Pollutants (kg/yr)	3400	0	100

TABLE C.9: WLRB29

	Inflow	Outflow	Reduction
Flow (ML/yr)	205	190	7.3
Total Suspended Solids (kg/yr)	41100	12400	69.8
Total Phosphorus (kg/yr)	84.2	33.5	60.2
Total Nitrogen (kg/yr)	591	340	42.4
Gross Pollutants (kg/yr)	9550	1240	87

TABLE C.10: SB30

	Inflow	Outflow	Reduction
Flow (ML/yr)	205	190	7.3
Total Suspended Solids (kg/yr)	41100	12400	69.8
Total Phosphorus (kg/yr)	84.2	33.5	60.2
Total Nitrogen (kg/yr)	591	340	42.4
Gross Pollutants (kg/yr)	9550	1240	87

Figure C.2 and Figure C.1 show the MUSIC model layouts.

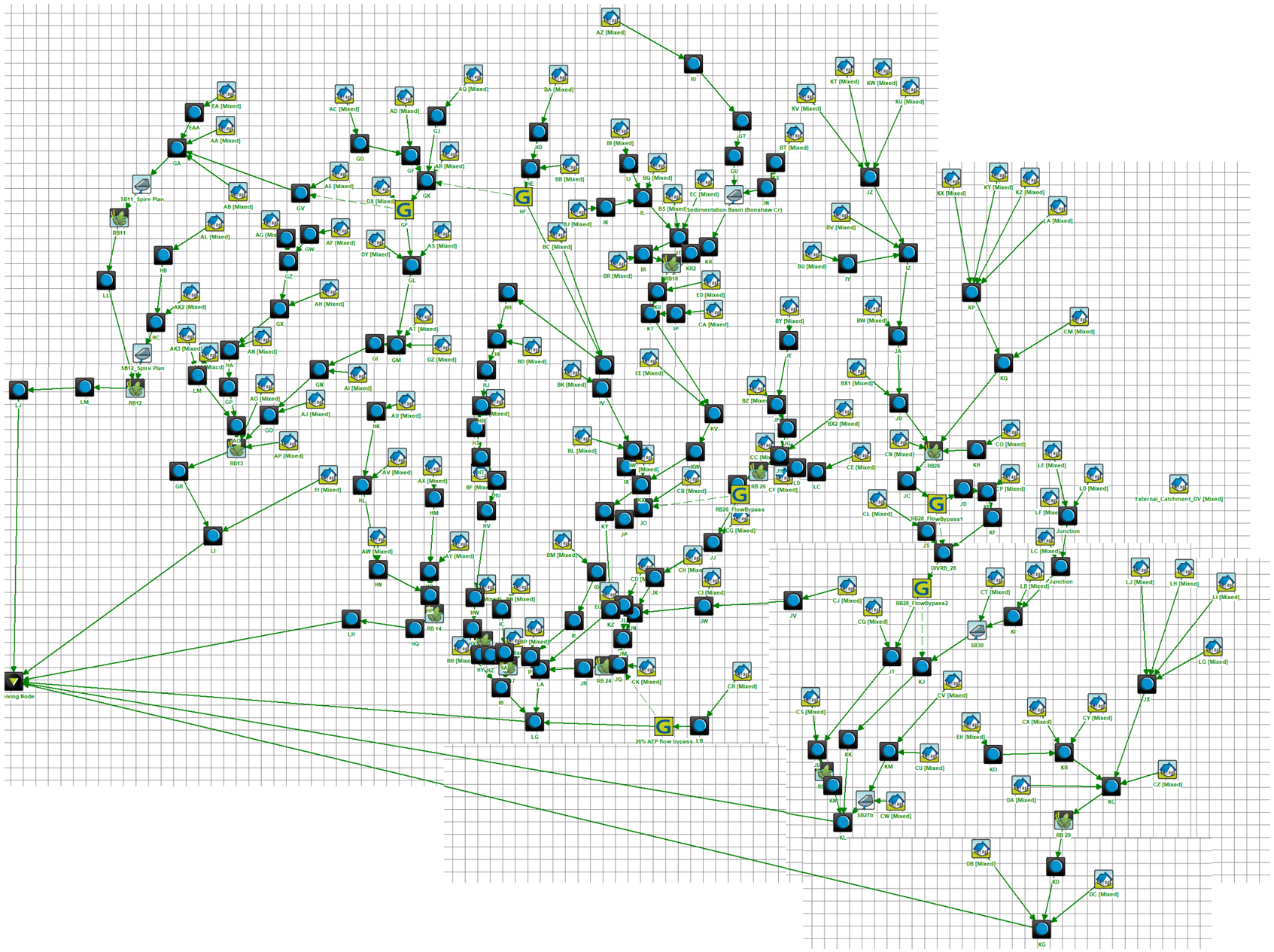

FIGURE C.1: PRECINCT 1 MUSIC MODEL LAYOUT

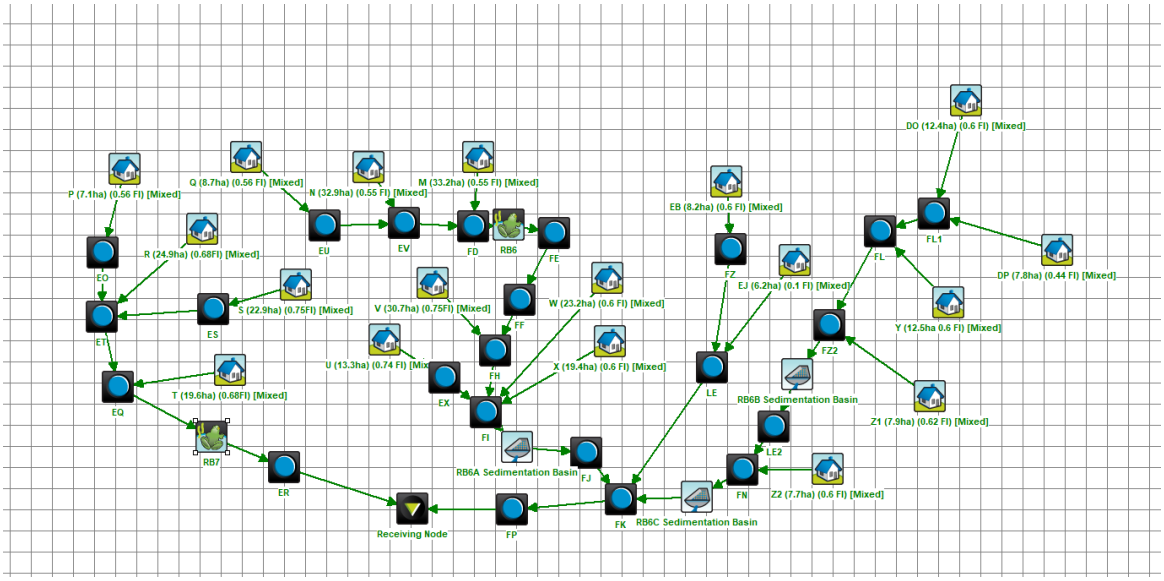

FIGURE C.2: PRECINCT 2 MUSIC MODEL LAYOUT