AGENDA

Ordinary Meeting of Council

To be held at the

Civic Centre

511 Burwood Highway

Wantirna South

On

Monday 26 August 2019 at 7:00 pm

Order of Business

Tony Doyle

Chief Executive Officer

1 Apologies and Requests for Leave of Absence

2 Declarations of Conflict of Interest

3 Confirmation of Minutes

Confirmation of Minutes of Ordinary Meeting of Council held on Monday 22 July 2019

Confirmation of Minutes of Special Meeting of Council held on Monday 12 August 2019

4 Petitions and Memorials

5 Reports by Councillors

5.1 Committees and Delegates

5.2 Ward Issues

6 City Development Officers' Reports for consideration

6.1 Report of Planning Applications Decided Under Delegation 1 July to 31 July 2019

SUMMARY: Manager, City Planning & Building, Paul Dickie

Details of planning applications considered under delegation are referred for information. It is recommended that the items be noted.

RECOMMENDATION

That the planning applications decided under delegation reports (between 1 July to 31 July 2019) be noted

1. REPORT

Details of planning applications decided under delegation from 1 July to 31 July 2019 are attached. The applications are summarised as follows:

Application Type		**No.**
Building & Works:	Residential	7
	Other	7
Subdivision		14
Units		16
Tree Removal / Pruning		14
Single Dwelling		4
Change of Use		1
Signage		1
Liquor Licence		1
TOTAL		**65**

Report Prepared By: **Manager, City Planning & Building, Paul Dickie**

Report Authorised By: **Director, City Development, Matt Kelleher**

Attachments

Nil

Knox City Council

Planning Applications Decided by Responsible Officer

1 July 2019 - 31 July 2019

Ward	No/ Type	Address	Description	Decision
Baird	2019/7087	8 Clendon Road FERNTREE GULLY VIC 3156	Construction of three single storey dwellings	31/07/2019 Approved
Baird	2018/6410	16 Duncan Avenue BORONIA VIC 3155	Development of the land for six (6) single and two storey dwellings and associated tree removal	29/07/2019 Notice of Decision
Baird	2019/7228	1 Cardiff Street BORONIA VIC 3155	Removal of one (1) Eucalyptus botryoides Southern Mahogany Gum) and one (1) Callistemon salignus (White Bottlebrush)	29/07/2019 Approved
Baird	2019/9574	3 Gideon Close BORONIA VIC 3155	Pruning of one (1) Eucalyptus obliqua	31/07/2019 Approved
Baird	2019/6111	17 Malua Road FERNTREE GULLY VIC 3156	Double storey dwelling to the rear of the existing dwelling	18/07/2019 Notice of Decision
Baird	2019/6096	165 Dorset Road BORONIA VIC 3155	Business identification signage and alteration of access to Road Zone Category 1	4/07/2019 Approved
Baird	2019/6032	246 Boronia Road BORONIA VIC 3155	The construction of three (3) double storey dwellings on the land	4/07/2019 Approved
Baird	2019/6080	11-13 Gibbs Road FERNTREE GULLY VIC 3156	The development of the land for the construction of seven (7) double storey dwellings and two (2) single storey dwellings (total nine (9) dwellings)	4/07/2019 Refused
Baird	2019/7162	8 Stirling Street FERNTREE GULLY VIC 3156	3 lot subdivision (Approved unit development)	10/07/2019 Approved
Baird	2019/7217	1/67 Rankin Road FERNTREE GULLY VIC 3156	Two Lot Subdivision (Approved unit development)	18/07/2019 Approved
Baird	2019/7180	285 Scoresby Road BORONIA VIC 3155	Two lot subdivision (Approved unit development)	10/07/2019 Approved
Baird	2019/9556	7-9 Ramage Street BAYSWATER VIC 3153	Buildings and works to build a mezzanine and reduction in car parking	18/07/2019 Approved

Ward	No/ Type	Address	Description	Decision
Chandler	2019/7218	5 Bambil Court BORONIA VIC 3155	Removal of one (1) Chamaecyparis lawsoniana	31/07/2019 Approved
Chandler	2019/9570	24 Olive Grove BORONIA VIC 3155	Removal of one (1) Eucalyptus radiata (Narrow-leaved Peppermint)	29/07/2019 Approved
Chandler	2019/7038	71 Stewart Street BORONIA VIC 3155	The construction of a double storey dwelling to the rear of the existing dwelling and vegetation removal	5/07/2019 Approved
Chandler	2019/9559	48 Kalman Drive BORONIA VIC 3155	Proposal to install a 99m2 free standing mezzanine	1/07/2019 Approved
Chandler	2018/6679	1 Marland Road BORONIA VIC 3155	Two lot subdivision	1/07/2019 Approved
Chandler	2019/7178	20 Olive Grove BORONIA VIC 3155	The removal of one (1) Eucalyptus radiata (Narrow leaved Peppermint)	10/07/2019 Approved
Chandler	2019/9568	12 Thelma Avenue BORONIA VIC 3155	Removal of one (1) Acacia melanoxylon (Blackwood) from front garden.	23/07/2019 Approved
Chandler	2019/7210	4 Hovea Court BORONIA VIC 3155	Remove one (1) Eucalyptus ovata (Swamp Gum) from rear garden	19/07/2019 Approved
Chandler	2019/7206	23 Rome Beauty Avenue THE BASIN VIC 3154	Remove nine (9) Syagrus romanzoffiana (Queen Palm) along the property boundary.	12/07/2019 Approved
Chandler	2019/6106	10 Stewart Street & 15 Bellrise Court BORONIA VIC 3155	Buildings and works to develop the land for a dwelling, garage and shed	4/07/2019 Approved
Chandler	2019/7145	86 Daffodil Road BORONIA VIC 3155	Removal of one (1) Fraxinus oxycarpa 'Raywoodii'	1/07/2019 Approved
Chandler	2019/7188	7 Marland Road BORONIA VIC 3155	Remove dying Norfolk Pine from front of property	12/07/2019 Approved
Chandler	2019/7014	10 Weyburn Road BORONIA VIC 3155	The construction of a garage and carport	24/07/2019 Approved
Chandler	2019/9569	8 Shalimar Crescent BORONIA VIC 3155	Two Lot Subdivision (Approved unit development)	26/07/2019 Approved

Ward	No/ Type	Address	Description	Decision
Chandler	2018/6543	142 Albert Avenue BORONIA VIC 3155	The development of the land for a double storey dwelling and removal of vegetation	5/07/2019 Approved
Chandler	2019/6025	201 Ferndale Road SASSAFRAS VIC 3787	Change of use to a restaurant, associated buildings and works, and sale and consumption of liquor	19/07/2019 Notice of Decision
Chandler	2019/7078	Colchester Reserve 88 Beresford Drive BORONIA VIC 3155	Buildings and Works (Change room facility)	18/07/2019 Approved
Collier	2019/7007	493 Mountain Highway BAYSWATER VIC 3153	Development of 32 self storage units and 9 warehouses, dispensation of car parking and alteration of access to a Road Zone Category 1	31/07/2019 Approved
Collier	2019/6011	25 Clarence Road WANTIRNA VIC 3152	2 lot subdivision (Approved unit development)	30/07/2019 Approved
Dinsdale	2019/7142	1/33 Birch Street BAYSWATER VIC 3153	Verandah to existing dwelling	31/07/2019 Approved
Dinsdale	2019/7083	98 Sasses Avenue BAYSWATER VIC 3153	The construction of a double storey dwelling to the rear of the existing dwelling	26/07/2019 Approved
Dinsdale	2019/7136	181 Stud Road WANTIRNA SOUTH VIC 3152	Seven (7) lot subdivision (Approved unit development)	10/07/2019 Approved
Dinsdale	2019/9565	90 Sasses Avenue BAYSWATER VIC 3153	2 lot subdivision (Approved unit development)	19/07/2019 Approved
Dinsdale	2019/9567	11 Aisbett Avenue WANTIRNA SOUTH VIC 3152	Two lot subdivision (Approved unit development)	23/07/2019 Approved
Dinsdale	2019/7045	8 Ash Grove BAYSWATER VIC 3153	The construction of a single storey dwelling to the rear of the existing dwelling	11/07/2019 Notice of Decision
Dinsdale	2019/9562	32 Larne Avenue BAYSWATER VIC 3153	2 lot subdivision (Approved unit development)	11/07/2019 Approved
Dinsdale	2019/7161	5 Ozone Road BAYSWATER VIC 3153	Two Lot Subdivision (Approved unit development)	9/07/2019 Approved
Dinsdale	2018/6631	28 John Street BAYSWATER VIC 3153	Development of the land for four (4) double storey dwellings	24/07/2019 Refused

Ward	No/ Type	Address	Description	Decision
Dobson	2019/7132	19 Myrtle Crescent FERNTREE GULLY VIC 3156	Buildings and Works (Extension to an existing dwelling and construction of a new shed/garage with excavation of part of rear yard)	31/07/2019 Approved
Dobson	2019/9573	30 Trafalgar Street FERNTREE GULLY VIC 3156	Proposed front timber fence at 2100mm height and gate	31/07/2019 Refused
Dobson	2019/6104	3/10 Nathan Street FERNTREE GULLY VIC 3156	The construction of a single storey dwelling on the land	4/07/2019 Approved
Dobson	2019/7156	1/2 Doysal Avenue FERNTREE GULLY VIC 3156	Removal of one (1) Ulmus parvifolia	5/07/2019 Approved
Dobson	2019/7181	21 Rona Street FERNTREE GULLY VIC 3156	Construction of a skillion roofed garage	11/07/2019 Approved
Dobson	2019/6058	39 Kevin Avenue FERNTREE GULLY VIC 3156	The construction of one (1) single storey dwelling and one (1) double storey dwelling on the land	5/07/2019 Approved
Dobson	2019/7139	32 Mont Albert Road FERNTREE GULLY VIC 3156	Pruning of one (1) Eucalyptus obliqua	2/07/2019 Approved
Dobson	2019/7079	Wally Tew Reserve 6 Brenock Park Drive FERNTREE GULLY VIC 3156	Buildings and Works (Change room and public toilet facility) and vegetation removal	1/07/2019 Approved
Dobson	2019/7189	23 Barton Avenue FERNTREE GULLY VIC 3156	Removal of one (1) Cupressus lusitanica (Mexican Cypress) in rear garden.	19/07/2019 Approved
Dobson	2019/9566	52 Kia-Ora Parade FERNTREE GULLY VIC 3156	Two lot subdivision and boundary re-alignment	23/07/2019 Approved
Dobson	2019/9560	194 Forest Road BORONIA VIC 3155	Buildings and works for the construction of a garage and front fence	22/07/2019 Approved
Dobson	2019/9564	3A Nathan Street FERNTREE GULLY VIC 3156	Removal of one (1) Liquidambar styraciflua (Liquidambar) from rear yard.	23/07/2019 Approved
Dobson	2019/6103	2/10 Nathan Street FERNTREE GULLY VIC 3156	The construction of a single storey dwelling on the land	4/07/2019 Approved
Friberg	2019/7149	1781 Ferntree Gully Road FERNTREE GULLY VIC 3156	Four (4) lot subdivision (Approved unit development)	29/07/2019 Approved

Ward	No/ Type	Address	Description	Decision
Friberg	2018/6738	34 Norma Crescent South KNOXFIELD VIC 3180	The development of the land for two (2) double storey dwellings and one (1) single storey dwelling (total of 3 dwellings)	2/07/2019 Refused
Scott	2019/7057	54 Norma Crescent KNOXFIELD VIC 3180	The construction of a double storey dwelling to the rear of the existing dwelling	11/07/2019 Notice of Decision
Scott	2018/6629	2/28 Cherrytree Rise KNOXFIELD VIC 3180	Construction of a double storey dwelling to the rear of the existing dwelling and removal of vegetation	4/07/2019 Notice of Decision
Scott	2019/9558	102 Ridge Road WANTIRNA SOUTH VIC 3152	Erect a stratco skillion roof pergola	11/07/2019 Approved
Scott	2019/6021	450 Scoresby Road FERNTREE GULLY VIC 3156	The construction of two double storey dwellings to the rear of existing dwelling (total of 3 dwellings) and alteration of access to a road in a Road Zone Category 1	24/07/2019 Approved
Scott	2019/7108	1322 High Street Road WANTIRNA SOUTH VIC 3152	Liquor Licence (Restaurant and Cafe licence)	24/07/2019 Notice of Decision
Taylor	2019/9572	8 Snowgum Close ROWVILLE VIC 3178	Two lot subdivision (Approved unit development)	29/07/2019 Approved
Taylor	2018/6740	24-26 Taylors Lane ROWVILLE VIC 3178	Development of the land for 10 double storey and eight single storey dwellings (total 18 dwellings)	9/07/2019 Refused
Tirhatuan	2019/7211	842 Wellington Road ROWVILLE VIC 3178	Buildings and works (replacement of Silo 1)	19/07/2019 Approved
Tirhatuan	2019/7022	6 Barry Court SCORESBY VIC 3179	The construction of two (2) double storey dwellings	24/07/2019 Notice of Decision
Tirhatuan	2019/9557	35/1470 Ferntree Gully Road KNOXFIELD VIC 3180	Buildings and works for the construction of an internal storage mezzanine and associated car parking reduction.	4/07/2019 Approved

Total: 65

6.2 14 Corporate Avenue, Rowville

SUMMARY: Principal Planner, Nancy Neil

Development Plan for the redevelopment of the former Kingston Links Golf Course at 14 Corporate Avenue, Rowville

RECOMMENDATION

That Council approve the Development Plan and supporting documents in accordance with the Development Plan Overlay Schedule 13 (DPO13) of the Knox Planning Scheme, subject to minor changes detailed in the full recommendation in Section 10 below.

1. INTRODUCTION

Amendment C142 was gazetted into the Knox Planning Scheme on 11 October 2018 which enabled the future development of the Kingston Links Golf Course. Amendment C142 rezoned the land from the Special Use Zone to a mix of General Residential Zone Schedule 1, Mixed Use Zone, and Public Park and Recreation Zone. The Amendment also introduced the Development Plan Overlay Schedule 13 (DPO13) which is the main planning control that will guide the long-term development of the site.

A Development Plan in accordance with the DPO13 has now been submitted to Council for approval.

2. DISCUSSION

The Development Plan implements the provisions of the DPO13 and the policy statements which apply to the land.

Specifically, the Development Plan identifies land use precincts (including residential, mixed use, and public open space areas); indicative height, massing and interface treatments; proposed staging; landscape and open space themes; movement and neighbourhood street networks; stormwater and flood management initiatives; servicing and infrastructure; and management of environmental features.

The land will be developed in a number of stages over an expected 8-10 year time frame. In accordance with State and Local planning policy, the intended development will offer a diversity of lot sizes ranging from approximately 100sqm for terrace house typologies to above 600sqm for larger detached houses. Higher density dwellings are also provided for in and around a future Mixed Use Precinct.

The Development Plan is characterised by the following key features: development of approximately 800 dwellings; broad range of lot sizes; provision for social housing; vehicle access via Emmeline Row and from the existing access from Corporate Avenue; mitigating road works at Wellington Road/Corporate Avenue; construction of a Mixed Use Precinct; active and passive open space; and rehabilitation of Corhanwarrabul Creek.

A thorough assessment of the Development Plan and supporting documents is detailed in Attachment 1 with the documentation available in Attachment 2.

3. CONSULTATION

Whilst there is no formal requirement for the Development Plan to be advertised, the Development Plan was advertised by way of four (4) signs on the site and notices were sent to adjoining owners and occupiers. In total, five (5) submissions were received. It is important to note that while the Development Plan was advertised, formal third party notice and appeal rights (to the Victorian Civil and Administrative Tribunal) to not apply.

The application was referred externally to the CFA, Melbourne Water, Department of Transport and internally to Council's Traffic Engineer, Stormwater Engineer, Landscape Officer, and Senior Sustainable Development Engineer. No objections were raised with the Development Plan and supporting documentation.

4. ENVIRONMENTAL/AMENITY ISSUES

There are no significant environmental impacts or amenity issues associated with the proposed Development Plan. A thorough assessment of the Development Plan against environmental and amenity considerations can be found in the Officer's Report at Attachment 1.

5. FINANCIAL & ECONOMIC IMPLICATIONS

There are no financial or economic implications associated with the proposed Development Plan.

6. SOCIAL IMPLICATIONS

There are no significant social implications associated with the proposed Development Plan. A thorough assessment of the application against all relevant considerations of the Knox Planning Scheme can be found in the Officer's Report at Attachment 1.

7. RELEVANCE TO KNOX COMMUNITY AND COUNCIL PLAN 2017-2021

Goal 1 - We value our natural and built environment

Strategy 1.1 - Protect and enhance our natural environment

Strategy 1.2 - Create a greener city with more large trees, indigenous flora and fauna

Strategy 1.3 - Ensure the Knox local character is protected and enhanced through the design and location of urban development and infrastructure

Goal 2 - We have housing to meet our changing needs

Strategy 2.1 - Plan for a diversity of housing in appropriate locations

Strategy 2.2 - Encourage high quality sustainable design

Strategy 2.3 - Support the delivery of a range of housing that addresses housing and living affordability needs

8. CONFLICT OF INTEREST

Under section 80c of the Local Government Act 1989 officers providing advice to Council must disclose any interests, including the type of interest.

Author – Principal Planner, Nancy Neil - In providing this advice as the Author, I have no disclosable interests in this report.

Officer Responsible – Director, City Development, Matt Kelleher - In providing this advice as the Officer Responsible, I have no disclosable interests in this report.

9. CONCLUSION

The Development Plan and supporting documentation is consistent with the requirements outlines within the DPO13 and is recommended for approval.

10. RECOMMENDATION

That Council approve the Development Plan for the redevelopment of the former Kingston Links Golf Course and supporting documents in Attachment 2 in accordance with the Development Plan Overlay Schedule 13 (DPO13) of the Knox Planning Scheme, subject to the following changes:

1. **The cross-sections contained in the Integrated Transport Management Plan (dated June 2019) modified to show the following:**
    a. **The 9m wide cross-section amended to show a 1.5m wide footpath on one side of the road;**
    b. **The stormwater pit and pipe located behind the kerb and channel;**
    c. **Road assets (kerb and agriculture system) and stormwater drainage system (pits and pipes) contained entirely within the road reserve;**
    d. **A notation that all services have a minimum 650mm cover; and**
    e. **A notation that service locations and offsets are subject to authority approval.**

11. CONFIDENTIALITY

There are no items of a confidential nature in this report.

Report Prepared By: **Principal Planner, Nancy Neil**

Report Authorised By: **Director, City Development, Matt Kelleher**

Attachments

1. Attachment 1 Officer Report - 14 Corporate Avenue ROWVILLE VIC 3178 P 2019 714 [FAPD] [**6.2.1** - 15 pages]
2. Attachment 2 Plans and Reports - 14 Corporate Avenue Rowville [**6.2.2** - 194 pages]

Attachment 1

Development Plan for the redevelopment of the former Kingston Links Golf Course at 14 Corporate Avenue, 14A Corporate Avenue and 899R Wellington Road Rowville.

1. Summary:

Subject Site:	14 Corporate Avenue, 14A Corporate Avenue and 899R Wellington Road, Rowville
Proposed Development:	Development Plan in accordance with Development Plan Overlay, Schedule 13 (DPO13)
Existing Land Use:	Vacant (former golf course)
Site Area:	68 hectares
Planning Scheme Controls:	General Residential Zone – Schedule 1 and Mixed Use Zone / Development Plan Overlay – Schedule 13 (DPO13), Land Subject to Inundation Overlay (LSIO), and Environmental Significance Overlay – Schedule 2 (ESO2)
Application Received:	30 May 2019
Number of Submissions:	Five (5)
PCC Meeting:	N/A
Ward:	Tirhatuan

2. Purpose

The purpose of this report is to provide Councillors with the Council Planning Officer's assessment of the Development Plan for Kingston Links to assist in making a decision on the application. It should be read in conjunction with the other attachments.

3. Background

3.1 History

- Knox Planning Scheme Amendment C142 sought to enable the future redevelopment of the Kingston Links Golf Course (Kingston Links) for a mixture of residential, mixed use and open space. Kingston Links is identified in the Knox Housing Strategy 2015 as a 'Strategic Investigation Site'. The amendment facilitated the redevelopment of the site for residential uses with approximately 800 new dwellings, new parks and public open spaces, new wetlands and other flood mitigation works, new multi-purpose community facilities, rehabilitation of ecological corridors along the Corhanwarrabul Creek, and the potential for small-scale commercial uses as part of a mixed-use neighbourhood centre.
- The Amendment was placed on exhibition from 24 October to 27 November 2017 and received 53 submissions, mostly from residents of the abutting residential area. The issues raised in the submissions are discussed thoroughly in the Panel Report dated 30 April 2018.
- On 11 October 2018, Amendment C142 was gazetted into the Knox Planning Scheme (the Scheme). Amendment C142 included the following changes to the Scheme:

- Rezoning of the land from the Special Use Zone (SUZ1) to a mix of General Residential Zone – Schedule 1, Mixed Use Zone, and Public Park and Recreation Zone.
- The removal of the Land Subject to Inundation Overlay (LSIO) from areas that are proposed to be raised out of the floodplain.
- The introduction of the Development Plan Overlay – Schedule 13 (DPO13) which is the main planning control that will guide the long-term development of the site.

3.2 Subject Site and Surrounds

The location of the subject site and surrounds is shown in Attachment 2.

- The site address is 14 Corporate Avenue, Rowville. The application also affects 14A Corporate Avenue and 899R Wellington Road (the south-east portion of the overall site).
- Corhanwarrabul Creek forms the site's northern boundary. To the north of the creek is Caribbean Business Park.
- The 68 hectare site is irregular shaped and wraps around the established residential area to the immediate and south-east.
- The northern section of the site also immediately adjoins Council land that provides for the future road connection to Stamford Park.
- Eastlink Freeway forms the site's western boundary.
- The current road access to the site is via Corporate Avenue/Wellington Road.
- A drainage reserve and drainage line separates the site from the commercial/industrial area to the south and south-east.
- The south-west of the site is encumbered with a high voltage power easement.

3.3 The Proposal

The submitted Development Plan implements the provisions of the Development Plan Overlay – Schedule 13 (DPO13) and the policy statements which apply to the land. The submitted Development Plan and supporting documents are contained within Attachment 2.

Specifically, the Development Plan identifies:

- Land use precincts, including residential, mixed use, and public open space areas;
- Indicative height, massing, and interface treatments;
- Proposed staging;
- Noise attenuation, details on fencing and minimum setbacks adjoining the Eastlink Freeway reserve;
- Landscape and open space themes, concepts and management;
- Movement and neighbourhood street network initiatives;
- Stormwater and flood management initiatives;
- Servicing and infrastructure considerations; and
- Management of identified environmental features.

The following documents have been provided as required by the DPO13 to provide specialist inputs for this Development Plan:

- 'Stormwater Management Integrated Water Management Plan' (Water Technology, February 2019).
- 'Integrated Transport Management Plan' (Traffix Group, February 2019).
- 'Landscape Masterplan Report' (Tract Consultants, March 2019).
- 'Grassfire Management Plan' (Ecology &Heritage Partners, February 2019)

The proposal will be developed in a number of stages over an expected 8-10 year time frame. In accordance with State and Local planning policy, the intended development will offer a diversity of lot sizes ranging from approximately 100sqm for terrace house typologies to above 600sqm for larger detached houses. Higher density products are also provided for in and around a future Mixed Use Precinct.

The Development Plan is characterised by the following key features:

- Development of approximately 800 dwellings.
- Broad range of lot sizes (generally smaller than normally encountered in the surrounding established residential area).
- Provision for social housing.
- Vehicle access via Emmeline Row and from the existing access point from Corporate Avenue.
- Mitigating road works at Wellington Road/ Corporate Avenue.
- Construction of a Mixed Use Precinct, consisting of retail/higher density housing.
- Active and passive open space.
- Rehabilitation of Corhanwarrabul Creek.

4. Consultation

4.1 Advertising

Whilst there is no formal requirement for the Development Plan to be advertised, the Development Plan was advertised by way of four (4) signs on the site and notices were sent to adjoining owners and occupiers. In total, five (5) submissions were received and are summarised below.

Standard of housing not in keeping with the locality / Double storey dwellings are problematic close to the fence line / Density proposed

- *Knox Planning Scheme Amendment C142 sought to enable the future redevelopment of the Kingston Links Golf Course (Kingston Links) for a mixture of dwellings and open space. Kingston Links is identified in the Knox Housing Strategy 2015 as a 'Strategic Investigation Site' and the proposed Development Plan is consistent with the directions and requirements introduced by DPO13. All building heights proposed are consistent with the relevant zones and the DPO13.*
- *The majority of the residential area to the immediate east is separated from the proposed development by a 5-8 metre wide landscape buffer, which contains predominantly established canopy trees. Where the landscape buffer doesn't extend along the entire eastern boundary, the masterplan requires a 15 metre setback for two storey built form to the eastern boundary.*

Housing is not appropriate in this location, due to the land being floor prone and presence of high voltage power lines

- *The site is currently being filled to 100 year ARI, meaning that it is being raised out of the floodplain. Once this has been completed to the satisfaction of Melbourne Water, the land will no longer be subject to flooding. It is not anticipated that the development will affect any existing flooding issues to the existing housing estate to the east.*

- *As noted above, Amendment C142 was gazetted into the Knox Planning Scheme which re-zoned most of the site for residential purposes. Therefore the site has been declared suitable for housing.*

Insufficient car parking within the estate

- *There is nothing to suggest that insufficient car parking will be provided within the estate. The provision of on-street car parking will be assessed as part of any future subdivision application for the site.*
- *In addition, there are mechanisms in place to ensure sufficient car parking is provided for all dwellings to comply with Clause 52.06 (Car Parking) of the Knox Planning Scheme.*

Walking path along the easement

- *All of the cross-sections included in the Integrated Transport Management Plan (except the 9m wide cross-section) show the provision of a footpath on at least one side of the road. At this stage, it is unclear where the 9m wide road will be located throughout the development. Therefore it is recommended that the 9m wide cross-section contained in the Integrated Transport Management Plan is amended to show a 1.5m wide footpath to ensure adequate pedestrian mobility is provided throughout the site.*
- *The exact location of internal footpaths will be assessed as part of any future subdivision application for the site.*

The development will create additional traffic along Wellington Road and Stud Road

- *A Functional Layout Plan (FLP), attached at Appendix A of the Integrated Transport Management Plan, has been prepared to demonstrate the potential intersection layout and SIDRA Analysis of Wellington Road/Corporate Avenue/South Corporate Avenue intersection post development. This has received in-principle support from the Department of Transport.*
- *At Stud Road, the analysis indicates that with adjustments to existing signal phasing times, the full development of the precinct can be accommodated at this intersection without significant impact to through movements on Stud Road. Therefore, no mitigation works are proposed or required at the Stud Road/Emmeline Row intersection.*

Negative views towards social housing

- *The provision of social housing is directly linked to the Knox Affordable Housing Action Plan 2015-2020, where Council has forecasted that an additional 860 social housing dwellings will be needed within Knox by 2036 to meet minimum requirements. Key approaches to achieve an increased supply across the municipality include negotiations with developers for a voluntary contribution to social housing (of approximately 5%) on larger-scale development plans. In this instance, an agreement has been reached between Pask Group and Knox City Council regarding the contribution for social housing which is reflected in the Development Plan.*

The proposed walkway through Turnberry Court could be mistaken for road access

- *The proposed Masterplan only shows pedestrian access through Turnberry Court. Final designs will ensure that the pedestrian access will not be mistaken for vehicle access.*
- *Any future subdivision application will need to be in accordance with the approved Development Plan.*

Loss of existing vegetation along the eastern buffer

- *The existing landscape buffer along the eastern boundary is approximately 20m wide. The DPO13 states that a 5-8m landscape buffer is required along most of the eastern boundary, meaning some vegetation loss is to be expected and is compliant with the requirements of the DPO13.*
- *Nevertheless, the approved Landscape Masterplan will ensure sufficient landscaping is provided throughout the development.*

Fencing

- *Whilst there has been no formal agreement for the replacement of fencing adjoining the subject site, Pask Group are aware that this will require attention in the near future.*

4.2 Referrals

The application was referred to external authorities and internal departments for advice. The following is a summary of relevant advice:

CFA: CFA support the Grassfire Management Plan (June 2019) for Kingston Links which was prepared by Ecology and Heritage Partners.

Melbourne Water: Melbourne Water support the Integrated Water Management Plan (IWMP) (WaterTech, March 2019). The Development Plan also accords with previous advice provided by Melbourne Water. No additional comments are applicable.

Department of Transport: In-principle support of the Functional Layout Plan (detailing road mitigation works along Wellington Road/Corporate Avenue/South Corporate Avenue) was received by Council on 29 July 2019.

Traffic Engineer: The Integrated Transport Management Plan submitted with the Development Plan is satisfactory.
Stormwater: The Integrated Water Management Plan submitted with the Development Plan is satisfactory.

Landscape: The Landscape Masterplan Report (dated March 2019) did not satisfactorily address the Knox Open Space Plan 2012-2022 or the Knox Liveable Streets Plan 2012-2022. Tract Consultants have since submitted a revised Landscape Masterplan Report which is satisfactory.

Senior Sustainable Development Engineer: The cross-sections provided within the Integrated Transport Management Plan should be amended to show: the stormwater pit and pipe located behind the kerb and channel; Road assets (kerb and agriculture system) and stormwater drainage system (pits and pipes) contained entirely within the road reserve; a notation that all services have a minimum 650mm cover; and a notation that service locations and offsets are subject to authority approval.

5. Discussion

This section considers the proposed development in light of the provisions of the Knox Planning Scheme including State and Local Planning Policies, any other relevant policies and objectives.

5.1 Zoning and Overlays

5.1.1 Zone

The site is predominantly zoned General Residential Zone – Schedule 1, with a small component of Mixed Use Zone located centrally within the site and a component of Public Park and Recreation zone to the north, abutting the creek corridor.

General Residential Zone – Schedule 1

The purpose of the General Residential Zone – Schedule 1 is to encourage development that respects the neighbourhood character of the area; to encourage a diversity of housing types and housing growth particularly in locations offering good access to services and transport; and to allow educational, recreational, religious, community and a limited range of other non-residential uses to serve local community needs in appropriate locations.

- It is considered that the proposed development plan is consistent with the purpose of the General Residential Zone – Schedule 1.

Mixed Use Zone

The purpose of the Mixed Use Zone is to provide for a range of residential, commercial, industrial and other uses which complement the mixed-use function of the locality; to provide for housing at higher densities; to encourage development that responds to the existing or preferred neighbourhood character of the area; and to facilitate the use, development and redevelopment of land in accordance with the objectives specified in a schedule to this zone.

- It is considered that the proposed development plan is consistent with the purpose of the Mixed Use Zone.

Public Park and Recreation Zone (PPRZ)

The purpose of the Public Park and Recreation Zone is to recognise areas for public recreation and open space; to protect and conserve areas of significance where appropriate; and top provide for commercial uses where appropriate.

- It is considered that the proposed development plan is consistent with the purpose of the Public Park and Recreation Zone.

5.1.2 Overlays

The site is affected by the Development Plan Overlay – Schedule 13 (DPO13), Land Subject to Inundation Overlay (LSIO), Environmental Significance Overlay – Schedule 2 (ESO2).

Development Plan Overlay – Schedule 13 (DPO13)

Pursuant to the Knox Planning Scheme, the site is located within the Development Plan Overlay – Schedule 13 (DPO13), which relates specifically to the subject site. The Development Plan Overlay (DPO) outlines that prior to a planning permit being granted to subdivide land or construct a building or construct or carry out works, a Development Plan must be prepared to the satisfaction of the Responsible Authority. This Overlay is therefore the planning control which requires the preparation of a Development Plan to Council's satisfaction and once approved, Planning Applications which are consistent with the Development Plan are exempt from normal notification and third party VCAT appeal provisions.

A development plan must include the following requirements:

- A Masterplan that illustrates land uses (including open space), interface treatments, and an indicative road layout across the site.

- A Landscape Masterplan that shows the landscape design concept for the site, including all streetscapes and public open space (active and passive recreation areas, natural areas, other public realm).
- An Integrated Transport Management Plan that addresses access and movement within and to and from the site.
- An Integrated Water Management Plan that addresses holistic stormwater management within the site and those water-related interfaces beyond the site.
- A Grassfire Mitigation and Management Plan that addresses grassfire hazard, emergency vehicle road design, the provision of reticulated or static water supply and hard stand access for firefighting.

Masterplan

The Masterplan must include:

- The distribution of land uses throughout the site including public open space.
- Detail reflecting public open space, infrastructure and other elements consistent with any agreement entered into with the responsible authority.
- A description of the indicative siting, lot configuration and land uses within the mixed use precinct.
- A hierarchy of public open spaces.
- A description of the road network and hierarchy throughout the site, including function and cross sections.
- Transport connections and access points generally in accordance with Figure 1.
- A description of the distribution of height and massing of built form across the site, generally in accordance with Figure 1.
- Details of the treatment to residential interfaces along the irregular eastern boundary of the land, generally in accordance with Figure 1 including either:
  - Retention of a vegetated landscape buffer generally between 5 metres and 8 metres in width retaining high amenity trees where practical with a new local road; or
  - Where proposed allotments share a direct abuttal with existing residential land a maximum 2 storey building height within 15 metres of the shared boundary.
- Details of the staging of future land use and development throughout the site.
- A notation that the intensity of land uses and the number of dwellings must not exceed that adopted for the traffic generation development scenario that forms part of the approved Integrated Transport Management Plan, unless otherwise agreed in writing by the responsible authority.
- Detail on how any required noise attenuation measures will meet the noise level objectives in VicRoads Traffic Noise Reduction Policy (or any subsequent publication) and the Traffic Noise Criteria set out in the EastLink Concession Deed (which specifies performance criteria in relation to traffic noise) or as updated at the boundary of the EastLink Freeway reserve. All noise attenuation measures required to satisfy these objectives must be met by the relevant land owner/developer. Where an acoustic barrier is required, it must be provided within the EastLink Freeway reserve.
- Details on the fencing on the boundary of the EastLink Freeway reserve. Fencing to the EastLink Freeway reserve must complement the urban design treatment and landscaping of the EastLink corridor, restrict access to the EastLink Freeway, prevent unauthorised dumping of materials or rubbish blowing onto the EastLink Freeway reserve and prevent or minimise graffiti and vandalism.

- A building setback of 2 metres from the EastLink boundary to allow for the construction and maintenance of buildings on the land and a notation that access to the EastLink Freeway reserve will not be permitted to be used for construction and maintenance works.
- Details of how contaminated soil will be managed.
- Details of how the built form of the Mixed Use Zone development will interface sensitively with existing and future residential development and public open space.

Officer response:

- *A Masterplan for Kingston Links prepared by Tract Consultants (dated June, 2019) was submitted with the Development plan. The Masterplan outlines all of the requirements listed above.*

Landscape Masterplan

The Landscape Masterplan must include:

- A statement explaining how landscape design addresses the strategic directions within the Knox Open Space Plan 2012-2022 (or as amended).
- A statement explaining how landscape design addresses the strategic directions within the Knox Liveable Streets Plan 2012-2022 (or as amended).
- Details of key landscape design principles and species selected throughout road reserves, along the site's key external interfaces, and within public open space.
- A planting theme that enhances local habitat values and demonstrates compatibility with the inclusion of water sensitive urban design objectives. The planting theme on the eastern boundary must respond to the landscaping and urban design of EastLink.
- Landscaping detail for the landscape buffer at the residential interface along the irregular eastern boundary of the land.
- Details of the removal of vegetation not suitable for retention.

Officer response:

- *As noted above, a revised Landscape Masterplan Report was submitted to Council which meets all of the above requirements.*

Integrated Transport Management Plan

The Integrated Transport Management Plan must include:

- An assessment of the expected impact of traffic generated by the development on the existing and future road network and any mitigation measures required to address identified issues to the satisfaction of VicRoads and the responsible authority.
- Traffic modelling of future conditions is to be predicated on a distribution analysis of generated traffic having regard to:
  - The nature and breakup of residential trip purposes
  - The likely origin and destination of trips based on:
  - residential precincts within the site
  - connections to the arterial network
  - location of nearby services and facilities
  - journey to work data.

- A statement explaining how the integrated transport network addresses the strategic directions within the Knox Liveable Streets Plan 2012-2022 (or as amended).
- An indicative road, bicycle, and pedestrian network plan showing:
  - Vehicular access from Corporate Avenue to the proposed internal road network;
  - Vehicular access from Stamford Park to the proposed internal road network;
  - Pedestrian and bicycle access from surrounding areas, including both on-street and dedicated off-street facilities connecting to Stamford Park, Caribbean Gardens, and adjacent residential areas;
  - A street network that makes provision for a vehicular link between Kingston Links and Stamford Park, and discourages non-local through-traffic;
  - Layout of internal roads, including a hierarchy of the roads that specifies the purpose, function, cross sections, and widths of the road reserves for each road type;
  - Provision for bus movement through the site linking Wellington Road, traversing Stamford Park to access Stud Road, via Emmeline Row;
  - Provision of safe, well-lit and direct pedestrian connections from the bus capable through road to existing residential areas east of the site, Wellington Road, Caribbean Gardens, Stamford Park and Stud Road;
  - provision of emergency services and waste collection services through the site;
  - A pedestrian and cycle shared path network, both throughout the site and to the existing network at Stamford Park and the EastLink Trail, with any access to the EastLink Trail to be controlled and maintained by the council;
  - Connected footpath network both throughout the site and to the existing network on Corporate Avenue;
  - Mitigation works at the intersection of Wellington Road and Corporate Avenue to provide adequate capacity to cater for anticipated traffic generation and to retain appropriate access to the Corporate Avenue;
  - Any complementary works required to retain or improve access from South Corporate Avenue to Wellington Road;
  - Any local area traffic management works required having regard to the characteristics of Emmeline Row as a Residential Collector Street;
  - Enhancement works as required to Corporate Avenue to accommodate projected traffic movements while ensuring retention of appropriate access to existing properties;
  - Any traffic implications of staging of development as contemplated in the Masterplan, including triggers for the provision of connections to the arterial network and implementation of any mitigation works;
  - A Construction Management Plan informed by analysis of staging requirements of traffic works identified in the Integrated Transport Management Plan.

Officer response:

- *The Integrated Transport Management Plan has been reviewed by Council's Traffic Team with no objection raised.*
- *In addition, the Department of Transport (DoT) have also reviewed the revised Functional Layout Plan (FLP) (Drawing No G18520B-02 Issue A dated 24 January 2019 and G28520B-01 Issue F dated 6 June 2019). DoT have advised that the FLP has received in-principle support and can form part of the Integrated Management Plan (dated March 2019).*
- *DoT have provided a number of conditions which will be included in any future planning permit to subdivide the land, as it links the road mitigation works to Stage 9 of the development.*

<u>Integrated Water Management Plan</u>

The Integrated Water Management Plan must include:

- Detailed information on how stormwater will be managed in a holistic manner.
- An assessment of the pre-development and expected post-development stormwater conditions.
- Details of how stormwater can be efficiently filtered, infiltrated and harvested on site to limit off-site discharge and meet all relevant State Government water quality targets, including:
  - Total Suspended Solids (TSS)
  - Total Nitrogen (TN)
  - Total Phosphorus (TP)
  - Total flows.
- Details of how the proposed development will either maintain or increase overall Stormwater storage capacity of the site.
- Details of how the proposed development will limit avulsion to minimise the risk of:
  - erosion of the creek channel or floodplain;
  - transportation of sediment downstream;
  - damage to or destruction of natural habitat and stream ecology;
  - damage to or destruction of built assets; and
  - changes in the course of the Corhanwarrabul Creek.
- Details of remediation works along the riparian zone of the Corhanwarrabul Creek.
- Details of any proposed modifications to the Corhanwarrabul Creek, and how these modifications will protect and enhance stream ecology.
- Details of how the proposed development will accommodate a 1 in 100 year ARI storm event.
- Details of how the Rowville Main Drain will be modified and how modifications will maintain or enhance hydraulic performance and flood protection of the local area.
- Necessary site control measures during the construction of any drainage works.
- Details of wetlands and stormwater maintenance works, including the removal of associated sediment to be undertaken by the land owner, for a period of two years after the completion of all works including roadworks, construction of the wetlands and inground infrastructure works.
- A statement that:
  - all surface water (up to the 1 in 100 year ARI storm event) and underground drainage will be directed away from the EastLink Freeway reserve; and
  - any works and fillings on the site must have no detrimental effect on the flood levels and drainage paths in and around the EastLink Freeway reserve.
- Notation of the requirement for a Wetlands Maintenance and Operation Plan, to the satisfaction of the responsible authority, prior to hand over to the public land manager of the ownership and management of stormwater infrastructure.
- Arrangements for handover to the public land manager of the ownership and management of stormwater infrastructure subsequent to the maintenance period.

Officer response:

- *An Integrated Water Management Plan prepared by Water Technology (dated June, 2019) was submitted with the Development plan. The report outlines all of the requirements listed above.*
- *The report was referred to Melbourne Water and Council's Stormwater Team with no objection raised.*

Grassfire Mitigation and Management Plan

The Grassfire Management Plan must include:

- A description of the fire risk for the area.
- Road design that:
  - allows for a range of emergency service vehicles, including large aerial appliances;
  - incorporates road widths sufficient to accommodate the needs of emergency vehicles;
  - ensures emergency vehicle access to open space areas and the freeway reserve.
- Notation that planting, landscape and vegetation management within landscape buffers, easements and areas of open space do not increase the risk of fire, including allowing for appropriate emergency service vehicle access.
- The provision of reticulated and or static water supply and hard stand access for firefighting in strategically located areas.

Officer response:

- *A Grassfire Management Plan prepared by Ecology & Heritage Partners (dated June, 2019) was submitted with the Development Plan. The report outlines a description of the fire risk for the area, satisfactory road design for emergency vehicles, details regarding satisfactory planting, and the provision of water supply for firefighting purposes.*
- *The Grassfire Management Plan was approved by the CFA on 20 June 2019.*

Land Subject to Inundation Overlay (LSIO)

The purpose of the LSIO is to identify land in a flood storage or flood fringe area affected by the 1 in 100 year flood or any other area determined by the floodplain management authority; to ensure that development maintains the free passage and temporary storage of floodwaters, minimises flood damage, is compatible with the flood hazard and local drainage conditions and will not cause any significant rise in flood level or flow velocity; to reflect any declaration under Division 4 of Part 10 of the Water Act, 1989 where a declaration has been made; to protect water quality in accordance with the provisions of relevant State Environment Protection Policies, particularly in accordance with Clauses 33 and 35 of the State Environment Protection Policy (Waters of Victoria); to ensure that development maintains or improves river and wetland health, waterway protection and flood plain health.

- It is considered that the proposed development plan is consistent with the purpose of the Land Subject to Inundation Overlay (LSIO). Through appropriate earth working and associated remedial landscape works, the Development Plan will ensure that the free passage and temporary storage of flood waters is maintained and that water quality and creek health are not adversely affected.
- It is noted that the LSIO has been modified so it does not currently apply to the residential development pad.

Environmental Significance Overlay – Schedule 2 (ESO2)

The purpose of the ESO2 is to identify areas where the development of land may be affected by environmental constraints; and to ensure that development is compatible with identified environmental values.

- The Development Plan is consistent with the purpose of the ESO. Through a landscape design response and appropriate development buffers, the Development Plan will ensure that environmental values are protected and enhanced along the Corhanwarrabul Creek.

5.2 Cultural Heritage

The Cultural Heritage Management Plan prepared for the site states that, "no archaeological Aboriginal cultural heritage is present within the activity area and, no areas likely to contain Aboriginal cultural heritage are present within the activity area".

5.3 Policy Consideration: State and Local Planning Policy Framework

State and local policy requires Council to integrate the range of policies relevant to the issues to be determined, and balance conflicting objectives in favour of net community benefit and sustainable development. The key themes for the assessment of the application include Housing, Sustainability and Environment, Transport and Urban Design.

5.3.1 Housing

Clause 15.01: Urban environment sets out a series of design principles, including in relation to the subdivision or provision of residential areas and quality neighbourhoods.

Clause 16: Housing is of particular relevance, including through higher density development on appropriate sites (near to activity centres), housing supply increases on opportunity sites allowing urban consolidation and provision of a diversity of housing opportunity.

Clause 21.06 Housing: The Housing theme implements the Knox Housing Strategy 2015. In managing the City of Knox's current and future housing needs, Council supports a scaled approach to residential development. This scaled approach recognises that some parts of the City will need to accommodate change, due to population growth and the community's changing household needs. Development in residential areas will need to respond positively to the desired future character of the local area and take account of the particular built form and natural environmental elements that make up the neighbourhood character of Knox. The strong landscape character is the unifying element of the neighbourhood character of Knox.

- As noted above, Knox Planning Scheme Amendment C142 sought to enable the future redevelopment of the Kingston Links Golf Course (Kingston Links) for a mixture of dwellings and open space. Kingston Links is identified in the Knox Housing Strategy 2015 as a 'Strategic Investigation Site' and the proposed Development Plan is consistent with the directions and requirements introduced by DPO13.

5.3.2 Sustainability and Environment

Clause 15.02 Sustainable Development: Ensure that land use and development is consistent with the efficient use of energy and the minimisation of greenhouse gas emissions.

Clause 22.04 Environmentally Sustainable Development: This new policy introduced into Knox Planning Scheme under Amendment C150 requires applicants to address Environmentally Sustainable Development (ESD) principles including energy performance, water resources, indoor environmental quality, stormwater, waste management, transport and urban ecology, by applying these principles within the proposed development.

- The project as a whole has been prepared to align with the sustainability criteria of the UDIA's 'EnviroDevelopment' national sustainability rating tool National Technical Standards Version 2). EnviroDevelopment is a scientifically-based assessment scheme that independently reviews development projects and awards certification to those that achieve outstanding performance across four or more of the following elements: Ecosystems, Waste, Energy, Materials, Water and Community.
- In addition, the proposed Development Plan will allow for Water Sensitive Urban Design (WSUD) to be implemented throughout the development. MUSIC Modeling (Model for Urban Stormwater Improvement Conceptualisation) demonstrates that the proposed WSUD assets to treat the stormwater generated from the development exceed State Water Quality targets.

5.3.3 Transport

Clause 18 Transport: Planning should ensure an integrated and sustainable transport system that provides access to social and economic opportunities, facilities economic prosperity, contributes to environmental sustainability, coordinates reliable movements of people and goods, and is safe.

Clause 18.01-2S Transport System: To coordinate development of all transport modes to provide a comprehensive transport system.

Clause 18.01-2R Sustainable Personal Transport: Develop local cycling networks and new cycling facilities that support the development of 20-minute neighbourhoods and that link to and complement the metropolitan-wide network of bicycle routes.

- The proposed Development Plan provides an indicative road, bicycle and pedestrian network plan that allows for the provision for bus movement through the site linking Wellington Road, traversing Stamford Park to access Stud Road, via Emmeline Row. The indicative plan also allows the provision of a pedestrian and cycle shared path network through the site.

5.3.4 Urban Design (including Neighbourhood Character)

Clause 15 Built Environment and Heritage – Encourages high quality architecture and urban design outcomes that reflects the particular characteristics, aspirations and cultural identity of the community; enhances liveability, diversity, amenity and safety of the public realm; and promotes attractiveness of towns and cities within broader strategic contexts.

Clause 21.05 Built Environment and Heritage – Development should address needs of changing household structures, creating high quality, well-designed places that respect and strengthen the local context and landscape qualities of Knox. It is important to achieve environmentally sustainable development that contributes to a more liveable and sustainable Knox, including efficient use of urban water runoff and the quality of stormwater entering waterways.

- The proposed Development Plan enables the future redevelopment of the site for a mixture of dwellings and open space, in line with the DPO13.
- As noted above, the proposed Development Plan will allow for Water Sensitive Urban Design (WSUD) to be implemented throughout the development to treat the quality of stormwater entering waterways.

5.4 Particular Provisions

The following provisions will apply to a planning permit application for the subdivision of the site:

Clause 52.06 Car Parking: The purpose of Clause 52.06 is:

- To ensure that car parking is provided in accordance with the Municipal Planning Strategy and the Planning Policy Framework.
- To ensure the provision of an appropriate number of car parking spaces having regard to the demand likely to be generated, the activities on the land and the nature of the locality.
- To support sustainable transport alternatives to the motor car.
- To promote the efficient use of car parking spaces through the consolidation of car parking facilities.
- To ensure that car parking does not adversely affect the amenity of the locality.
- To ensure that the design and location of car parking is of a high standard, creates a safe environment for users and enables easy and efficient use.

- The proposed Development Plan ensures that the purposes of Clause 52.06 are satisfied by proposing lots which are generally large enough to accommodate statutory parking requirements on-site; by providing opportunity for a future bus link through the site and into the adjacent Stamford Park; and by providing good access to a pedestrian and bicycle network.

Clause 52.17 (Native Vegetation): The purpose of Clause 52.17 is:

- To ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation. This is achieved by applying the following three step approach in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (Department of Environment, Land, Water and Planning, 2017) (the Guidelines):
  - Avoid the removal, destruction or lopping of native vegetation.
  - Minimise impacts from the removal, destruction or lopping of native vegetation that cannot be avoided.
  - Provide an offset to compensate for the biodiversity impact if a permit is granted to remove, destroy or lop native vegetation.
- To manage the removal, destruction or lopping of native vegetation to minimize land and water degradation.
- The proposed Development Plan ensures that the purposes of Clause 52.17 are satisfied by generally avoiding the removal of native vegetation where possible. Any proposed removal of native vegetation would be subject to the planning permit application process.

Clause 53.01 (Public Open Space Contribution and Subdivision): Clause 53.01 requires that:

- A person who proposes to subdivide land must make a contribution to the council for public open space in an amount specified in the schedule to this clause (being a percentage of the land intended to be used for residential, industrial or commercial purposes, or a percentage of the site value of such land, or a combination of both).
- An agreement has been reached between Pask Group and Knox City Council regarding the open space contribution. The Development Plan reflects this agreement.

Clause 56 (Residential Subdivision): The purpose of Clause 56 is to:

- To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To create liveable and sustainable neighbourhoods and urban places with character and identity.
- To achieve residential subdivision outcomes that appropriately respond to the site and its context for:
  - Metropolitan Melbourne growth areas.
  - Infill sites within established residential areas.
  - Regional cities and towns.
- To ensure residential subdivision design appropriately provides for:
  - Policy implementation.
  - Livable and sustainable communities.
  - Residential lot design.

- Urban landscape.
- Access and mobility management.
- Integrated water management.
- Site management.
- Utilities.

The Development Plan ensures that the purposes of Clause 56 are satisfied by:

- Providing a framework for a liveable and sustainable neighbourhood that offers a range of residential lot sizes and housing types.
- Providing a framework for a future residential subdivision that appropriately responds to the site and its context.
- Ensuring streets and houses promote passive surveillance of public open spaces.
- Providing attractive and continuous landscaping in streets and public open spaces that contributes to the character and identity of the existing and future neighbourhood.
- Creating a unique sense of place and urban identity.
- Providing an internal road and pedestrian network that ensures a high level of permeability.

Future subdivision applications will be assessed against the relevant provisions of Clause 56.

5.5 General Decision Guidelines

Clause 65 of the Knox Planning Scheme and Section 60 of the Planning and Environment Act 1987 set out decision guidelines/matters which the responsible authority must consider when deciding any planning application.

- The decision guidelines of Clause 65 of the Knox Planning Scheme and Section 60 of the Planning and Environment Act (1987) have been appropriately considered.

6. Conclusion

That Council approve the Development Plan and supporting documents in Attachment 2 in accordance with the Development Plan Overlay Schedule 13 (DPO13) of the Knox Planning Scheme, subject to the following changes:

1. The cross-sections contained in the Integrated Transport Management Plan (dated June 2019) modified to show the following:

    a. The 9m wide cross-section amended to show a 1.5m wide footpath on one side of the road;
    b. The stormwater pit and pipe located behind the kerb and channel;
    c. Road assets (kerb and agriculture system) and stormwater drainage system (pits and pipes) contained entirely within the road reserve;
    d. A notation that all services have a minimum 650mm cover; and
    e. A notation that service locations and offsets are subject to authority approval.

Attachment 6.2.2

Knox City Council

ATTACHMENT 2

Address	14 Corporate Avenue, ROWVILLE
Application Number	P/2019/7140
Description	Proposed Development Plan for the redevelopment of the former Kingston Links Golf Course
Wardname	Tirhatuan

LEGEND:

- Title Boundary
- Road Boundaries
- City Boundary
- Bus Route
- Reserves
- Commercial Areas
- Tertiary Schools
- Primary Schools
- Secondary Schools
- P-12 School
- Bus Stops
- O Objector
- U Unit Development
- S Subject Property
- P Petition

Scale: **1:20000**

DISCLAIMER:

Roads and Title Boundaries - State of Victoria, Knox City Council
Planning Scheme Information - DPCD, Knox City Council
Aerial Photography - AAM (Flown January 2013 – unless otherwise stated)
Melbourne Water Drainage Information - Melbourne Water

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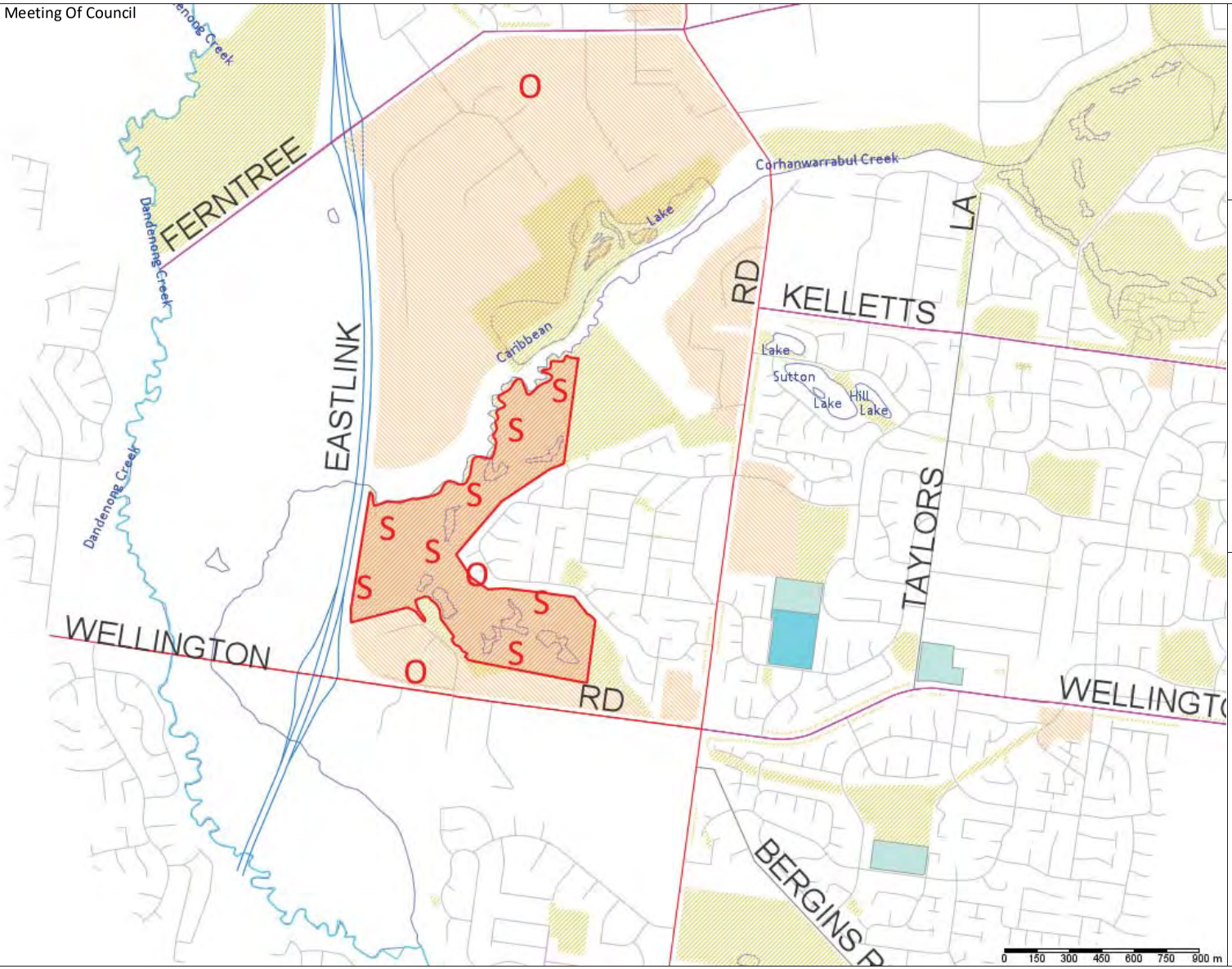
4. Drainage and flood extent information has been provided to Council on a yearly basis by Melbourne Water for indicative purposes only. Where the latest Melbourne Water drainage and flood extent mapping is critical, please contact Melbourne Water.



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PASKGROUP™

ESTABLISHED 1969

Development Plan for Kingston Links

June 2019

Tract
Town Planners
Landscape Architects
Urban Designers

CONTENTS

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1 INTRODUCTION

1.1 DEVELOPMENT PLAN OVERVIEW

The Development Plan for the Kingston Links site (the 'Development Plan') has been prepared in respect of land at 14 Corporate Avenue, Rowville and the lots to the south and southeast which contain the Rowville Main Drain (the 'Site').

The location of the Site is illustrated in **Figure 1 – Locality Plan**.

The Development Plan has been prepared in accordance with the provisions of Schedule 13 to the Development Plan Overlay which was applied to the Site as part of Knox Amendment C142.

Presenting an exciting opportunity to revitalise an important strategic redevelopment site in Melbourne's south-east, the Development Plan provides a framework for the revitalisation of approximately 65 hectares of well-serviced urban land.

Responding to the Site's features, interfaces, and unique location, the intended development will offer a vibrant and sustainable residential community which is set within a pedestrian focused environment and adorned by its generous provision of public spaces and high quality landscape.

The proposal will be developed in a number of stages over an expected 8-10 year time frame. In accordance with State and local planning policy, the intended development will offer a diversity of lot sizes ranging from approximately 100sqm for terrace house typologies to above 600sqm for larger detached houses. Higher density products are also provided for in and around a future Mixed Use Precinct.

1.2 VISION

The vision for the Site is:

- To create a vibrant and sustainable residential community with generous landscaping and open space, a central mixed use precinct, and seamless integration with the surrounding natural environment, community, and urban form.

1.3 PURPOSE OF DEVELOPMENT PLAN

The Development Plan implements the provisions of the DPO13 and the policy statements which apply to the land.

Specifically, the Development Plan identifies:

- Land use precincts including residential, mixed use, and public open space areas;
- Indicative height, massing, and interface treatments;
- Proposed staging;
- Landscape and open space themes, concepts, and management;
- Movement and neighbourhood street network initiatives;
- Stormwater and flood management initiatives;
- Servicing and infrastructure considerations; and
- Management of identified environmental features.

The details of the Development Plan are intended to be indicative only and are subject to detailed design as part of any future planning permit application.

1.4 SUPPORTING DOCUMENTS

The following documents are required by DPO13 to provide specialist inputs for this Development Plan:

- 'Stormwater Management Integrated Water Management Plan' (Water Technology, February 2019).
- 'Integrated Transport Management Plan' (Traffix Group, February 2019).
- 'Landscape Masterplan Report' (Tract Consultants, March 2019).
- 'Grassfire Management Plan' (Ecology &Heritage Partners, February 2019)

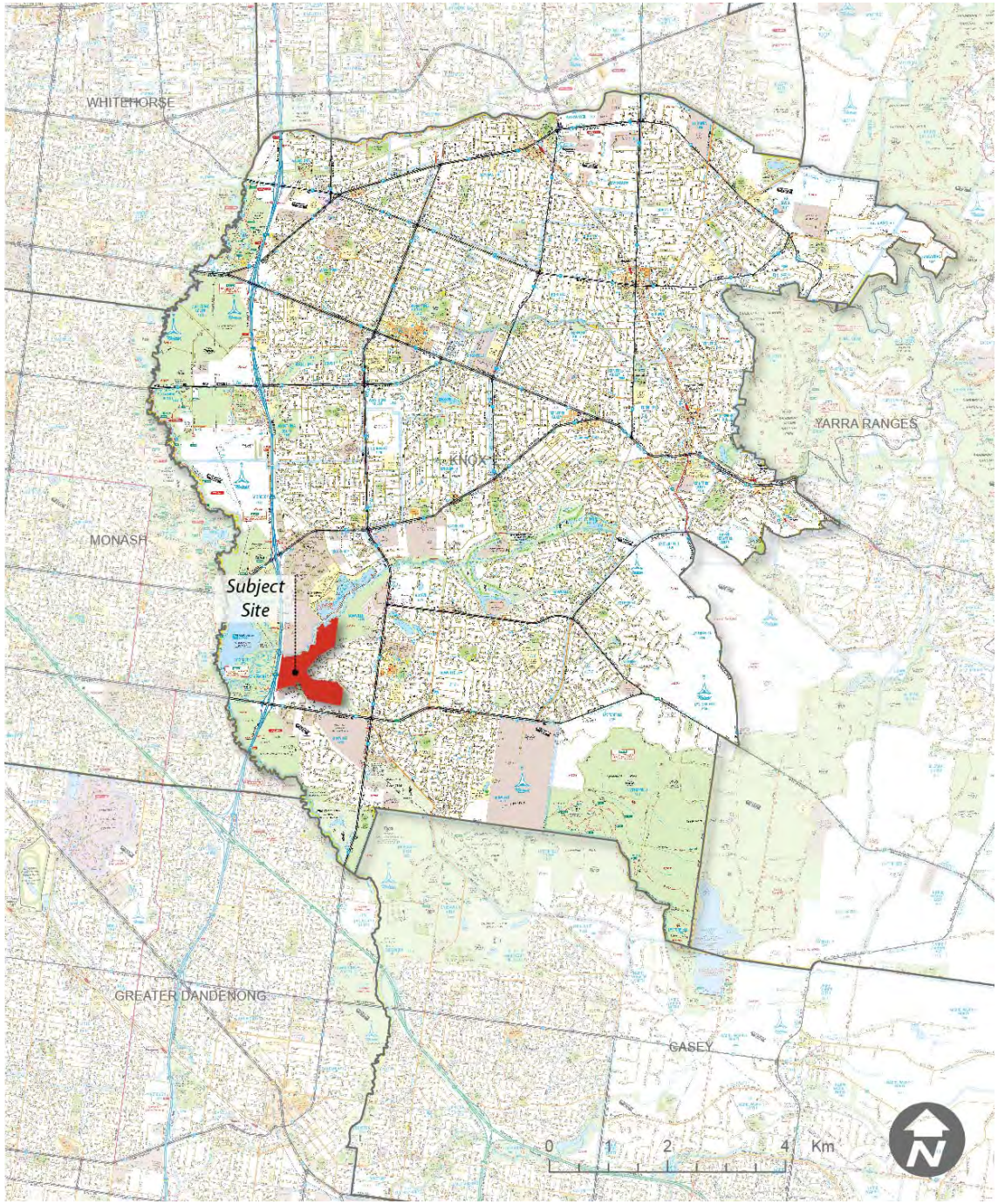

Figure 1 Locality Plan

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2 RELEVANT PLANNING PROVISIONS

2.1 AMENDMENT C142 TO THE KNOX PLANNING SCHEME

Amendment C142 to the Knox Planning Scheme (the 'Amendment') was prepared by Knox City Council at the request of Pask Group.

The Amendment rezoned the Site from the Special Use Zone – Schedule 1 to the General Residential Zone - Schedule 1, the Mixed Use Zone, and the Public Park and Recreation Zone.

The Amendment also applied the Development Plan Overlay - Schedule 13 to the Site and deleted part of its Land Subject to Inundation Overlay.

The Amendment facilitates the future development of the Site for residential purposes.

2.2 PLANNING POLICY FRAMEWORK

The Kingston Links Development Plan has been prepared in accordance with Schedule 13 to the Development Plan Overlay, having regard to the following key State and Local Planning Policies:

Planning Policy Framework

- **Clause 11 (Settlement)**

"To promote the sustainable growth and development of Victoria and deliver choice and opportunity for all Victorians through a network of settlements."

- **Clause 11.01-1R1 (Settlement – Metropolitan Melbourne)**

"Maintain a permanent urban growth boundary around Melbourne to create a more consolidated, sustainable city and protect the values of non-urban land. "

- **Clause 11.02-1S (Supply of urban land)**

"To ensure a sufficient supply of land is available for residential, commercial, retail, industrial, recreational, institutional and other community uses."

- **Clause 11.02-3S (Sequencing of development)**

"To manage the sequence of development in areas of growth so that services are available from early in the life of new communities."

- **Clause 12 (Environmental and landscape values)**

"Planning should help to protect the health of ecological systems and the biodiversity they support (including ecosystems, habitats, species and genetic diversity) and conserve areas with identified environmental and landscape values.

Planning should protect, restore and enhance sites and features of nature conservation, biodiversity, geological or landscape value."

- **Clause 12.01-1S (Protection of biodiversity)**

"To assist the protection and conservation of Victoria's biodiversity."

- **Clause 12.01-2S (Native vegetation management)**

"To ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation."

- **Clause 12.03-1S (River corridors, waterways, lakes and wetlands)**

"To protect and enhance river corridors, waterways, lakes and wetlands."

- **Clause 12.05-2S (Landscapes)**

"To protect and enhance significant landscapes and open spaces that contribute to character, identity and sustainable environments."

- **Clause 13.02-1S (Bushfire planning)**

"To strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life."

- **Clause 13.03-1S (Floodplain management)**

"To assist the protection of:

- Life, property and community infrastructure from flood hazard.
- The natural flood carrying capacity of rivers, streams and floodways.
- The flood storage function of floodplains and waterways.
- Floodplain areas of environmental significance or of importance to river health."

- **Clause 13.07-1S (Land use compatibility)**

"To safeguard community amenity while facilitating appropriate commercial, industrial or other uses with potential off-site effects."

- **Clause 14.02-1S (Catchment planning and management)**

"To assist the protection and restoration of catchments, water bodies,

groundwater, and the marine environment."

- **Clause 15 (Built environment and heritage)**

"Planning should ensure all land use and development appropriately responds to its surrounding landscape and character, valued built form and cultural context.

Planning should protect places and sites with significant heritage, architectural, aesthetic, scientific and cultural value.

Planning must support the establishment and maintenance of communities by delivering functional, accessible, safe and diverse physical and social environments, through the appropriate location of use and development and through high quality buildings and urban design.

Planning should promote development that is environmentally sustainable and should minimise detrimental impacts on the built and natural environment."

- **Clause 15.01-1S (Urban Design)**

"To create urban environments that are safe, healthy, functional and enjoyable and that contribute to a sense of place and cultural identity."

Clause 15.01-1S (Urban Design– Metropolitan Melbourne)

"To create a distinctive and liveable city with quality design and amenity."

- **Clause 15.01-3S (Subdivision design)**

"To ensure the design of subdivisions achieves attractive, safe, accessible, diverse and sustainable neighbourhoods."

- **Clause 15.01-4S (Healthy neighbourhoods)**

"To achieve neighbourhoods that foster healthy and active living and community wellbeing."

- **Clause 15.01-4R (Healthy neighbourhoods – Metropolitan Melbourne)**

"Create a city of 20 minute neighbourhoods that give people the ability to meet most of their everyday needs within a 20 minute walk, cycle or local public transport trip from their home."

- **Clause 16.01-1S (Integrated Housing)**

"To promote a housing market that meets community needs."

- **Clause 16.01-1S (Integrated Housing)**

"Provide certainty about the scale of growth by prescribing appropriate height and site coverage provisions for different areas.

Allow for a range of minimal, incremental and high change residential areas that balance the need to protect valued areas with the need to ensure choice and growth in housing."

- **Clause 16.01-2S (Location of Residential Development)**

"To locate new housing in designated locations that offer good access to jobs, services and transport."

- **Clause 16.01-2S (Housing Diversity)**

"To provide for a range of housing types to meet diverse need."

- **Clause 16.01-2R (Housing Diversity – Metropolitan Melbourne)**

"Create mixed-use neighbourhoods at varying densities that offer more choice in housing."

- **Clause 17.02-1S (Business)**

"To encourage development that meets the community's needs for retail, entertainment, office and other commercial services."

- **Clause 18 (Transport)**

"Planning should ensure an integrated and sustainable transport system that provides access to social and economic opportunities, facilitates economic prosperity, contributes to environmental sustainability, coordinates reliable movements of people and goods, and is safe."

- **Clause 18.01-2S (Transport system)**

"To coordinate development of all transport modes to provide a comprehensive transport system."

- **Clause 18.01-2S (Sustainable personal transport)**

"To promote the use of sustainable personal transport."

- **Clause 18.01-2R (Sustainable personal transport– Metropolitan Melbourne)**

"Improve local travel options for walking and cycling to support 20 minute neighbourhoods.

Develop local cycling networks and new cycling facilities that support the development of 20-minute neighbourhoods and that link to and complement the metropolitan-wide network of bicycle routes - the Principal Bicycle Network."

- **Clause 19.02-6S (Open Space)**

"To establish, manage and improve a diverse and integrated network of public open space that meets the needs of the community. "

- **Clause 19.03 (Infrastructure Design and Provision)**

"To provide timely, efficient and cost-effective development infrastructure that meets the needs of the community."

Local Planning Policy Framework

- **Clause 21.03 (Environmental and Landscape Values)**

"To protect and strengthen treed character and landscape value across all areas in Knox.

To retain and enhance native vegetation in Knox, in extent and ecological condition.

To protect and enhance the natural values of Sites of Biological Significance

To maintain the diversity and genetic integrity of indigenous flora and fauna within Knox to prevent species from becoming locally extinct.

To protect and enhance the network of habitat and creek corridors, as

key public, landscape and environmental assets."

- **Clause 21.04-1 (Bushfire)**

"To ensure that new development responds to bushfire risk to life and property.

To create an urban environment that is resilient to the impacts of climate change, in particular the urban heat island effect, heatwaves, droughts and storm events."

- **Clause 21.05 (Built Environment and Heritage)**

"To create vibrant local areas with a strong character, identity and sense of place.

To create high quality, well-designed places that respect and strengthen the local context and landscape qualities of Knox.

To create places that are accessible and adaptable to changing community needs.

To create high quality public spaces with infrastructure for recreation, social interaction and cultural expression."

- **Clause 21.06 (Housing)**

"To support a scaled approach to residential development in accordance with the Knox Housing Strategy 2015.

To support a diversity of housing choices (styles, types, forms and sizes) to cater for the Knox community's current and future needs, in appropriate locations.

To provide residential development that allows people to 'age-in-place'.

To support high quality housing design that responds to the City's 'green and leafy' character, local character and creates a strong sense of place.

To protect and enhance the landscape and environmental values of natural areas of significance within the municipality.

To support some non-residential uses in appropriate residential areas without impacting on residential amenity or creating defacto commercial precincts."

- **Clause 21.08 (Economic Development)**

"To provide a local amenity that makes it attractive to work and do business in Knox. "

- **Clause 21.08 (Community Development)**

"To provide for communities that are walkable, accessible, safe and attractive to support the health and wellbeing of the community.

To provide a safe, accessible, linked and functional open space network which meets community needs.

Facilitate community infrastructure that is accessible and meets the existing and future needs of the community"

- **Clause 21.09 (Transport and Infrastructure)**

"To provide for the transport needs of existing and future populations in an integrated and sustainable manner.

To encourage development that contributes towards an active, safe and accessible transport network.

To ensure that infrastructure is able to accommodate existing and new development and contributes positively to urban amenity.

To support the efficient and sustainable use of water by requiring development to adopt an integrated approach to water management and infrastructure provision.

To protect the ecological health of waterways and wetlands from the impact of development."

2.3 ZONES

The Site is located within three zones: the General Residential Zone, the Mixed Use Zone, and the Public Park and Recreation Zone (refer **Figure 2 - Zone Plan**).

Clause 32.08 (General Residential Zone – Schedule 1)

The purpose of the GRZ is to:

- "To implement the Municipal Planning Strategy and the Planning Policy Framework."
- To encourage development that respects the neighbourhood character of the area.
- To encourage a diversity of housing types and housing growth particularly in location offering good access to services and transport.
- To allow educational, recreational, religious, community and a limited range of other nonresidential uses to serve local community needs in appropriate locations."

The Development Plan is consistent with the purpose of the GRZ.

The Development Plan will assist in the implementation of the objectives of this zone by encouraging the consolidation of residential

development at a varying density.

Clause 32.04 (Mixed Use Zone)

The purpose of the MUZ is to:

- "To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To provide for a range of residential, commercial, industrial and other uses which complement the mixed-use function of the locality.
- To provide for housing at higher densities.
- To encourage development that responds to the existing or preferred neighbourhood character of the area.
- To facilitate the use, development and redevelopment of land in accordance with the objectives specified in a schedule to this zone."

The Development Plan is consistent with the purpose of the MUZ. The Mixed Use Precinct will comprise a mix of uses, including housing at higher densities, to cater for the existing and future residential community.

Clause 36.02 (Public Park and Recreation Zone)

The purpose of the PPRZ is to:

- "To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To recognise areas for public recreation and open space.
- To protect and conserve areas of significance where appropriate.
- To provide for commercial uses where appropriate."

The Development Plan is consistent with the purpose of the PPRZ. The Development Plan protects and conserves the Corhanwarrabul Creek through its strategic open space network.

The PPRZ recognises and protects the Corhanwarranbul Creek for enjoyment by the public, incorporating this information into the Development Plan's open space network.

2.4 OVERLAYS

The Site is affected by three overlays: the Environmental Significance Overlay ('ESO'), the Development Plan Overlay - Schedule 13 ('DPO13'), and the Land Subject to Inundation Overlay ('LSIO'). Refer **Figure 3, 4 and 5 - Overlay Plans**.

Clause 42.01 (Environmental Significance Overlay – Schedule 3)

The purpose of the ESO is to:

- "To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To identify areas where the development of land may be affected by environmental constraints.
- To ensure that development is compatible with identified environmental values."

The Development Plan is consistent with the purpose of the ESO. Through a sensitive landscape design response and appropriate development buffers, the Development Plan will ensure that environmental values are protected and enhanced along the Corhanwarrabul Creek.

Clause 43.04 (Development Plan Overlay – Schedule 13)

The purpose of the DPO is to:

- "To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To identify areas which require the form and conditions of future use and development to be shown on a development plan before a permit can be granted to use or develop the land.
- To exempt an application from notice and review if it is generally in accordance with a development plan.

The Development Plan implements the objectives and provisions of Schedule 13 to the Development Plan Overlay and the policy statements which apply to the land.

The requirements of DPO13 are listed and responded to throughout this Development Plan.

Clause 44.04 (Land Subject to Inundation Overlay)

The purpose of the LSIO is to:

- "To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To identify land in a flood storage or flood fringe area affected by the 1 in 100 year flood or any other area determined by the floodplain management authority.
- To ensure that development maintains the free passage and temporary storage of floodwaters, minimises flood damage, is compatible with the flood hazard and local drainage conditions and will not cause any significant rise in flood level or flow velocity.
- To reflect any declaration under Division 4 of Part 10 of the Water Act, 1989 where a declaration has been made.
- To protect water quality in accordance with the provisions of relevant State Environment Protection Policies, particularly in accordance with Clauses 33 and 35 of the State Environment Protection Policy (Waters of Victoria).
- To ensure that development maintains or improves river and wetland health, waterway protection and flood plain health."

The Development Plan is consistent with the purpose of the LSIO.

Through appropriate earthworking and associated remedial landscape works, the Development Plan will ensure that the free passage and

temporary storage of flood waters is maintained and that water quality and river health are not adversely affected.

2.5 PARTICULAR PROVISIONS

The following provisions will apply to a planning permit application for the subdivision of the Site:

Clause 52.06 (Car parking)

The purpose of clause 52.06 is:

- "To ensure that car parking is provided in accordance with the Municipal Planning Strategy and the Planning Policy Framework.
- To ensure the provision of an appropriate number of car parking spaces having regard to the demand likely to be generated, the activities on the land and the nature of the locality.
- To support sustainable transport alternatives to the motor car.
- To promote the efficient use of car parking spaces through the consolidation of car parking facilities.
- To ensure that car parking does not adversely affect the amenity of the locality.
- To ensure that the design and location of car parking is of a high standard, creates a safe environment for users and enables easy and efficient use."

The Development Plan ensures that the purposes of Clause 52.06 are satisfied by proposing lots which are generally large enough to accommodate statutory parking requirements on-site; by providing opportunity for a future bus link through the Site and into the adjacent Stamford Park; and by providing good access to a pedestrian and bicycle network.

Fulfillment of specific car parking requirements will be dealt with by future planning permit applications.

Clause 52.17 (Native Vegetation)

The purpose of clause 52.17 is:

- "To ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation. This is achieved by applying the following three step approach in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (Department of Environment, Land, Water and Planning, 2017) (the Guidelines):
  - Avoid the removal, destruction or lopping of native vegetation.
  - Minimise impacts from the removal, destruction or lopping of native vegetation that cannot be avoided.
  - Provide an offset to compensate for the biodiversity impact if a permit is granted to remove, destroy or lop native vegetation.
- To manage the removal, destruction or lopping of native vegetation to minimise land and water degradation. "

The Development Plan ensures that the purposes of Clause 52.17 are satisfied by generally avoiding the removal of native vegetation where possible. Any proposed removal of native vegetation would be subject to the planning permit application process.

Clause 53.01 (Public Open Space Contribution and Subdivision)

Clause 53.01 requires that, "A person who proposes to subdivide land must make a contribution to the council for public open space in an amount specified in the schedule to this clause (being a percentage of the land intended to be used for residential, industrial or commercial purposes, or a percentage of the site value of such land, or a combination of both)."

An agreement has been reached between Push Group and Knox City Council regarding the open space contribution. The Development Plan reflects this agreement.

Clause 56 (Residential Subdivision)

The purpose of clause 56 is:

- "To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To create liveable and sustainable neighbourhoods and urban places with character and identity.
- To achieve residential subdivision outcomes that appropriately respond to the site and its context for:
  - Metropolitan Melbourne growth areas.
  - Infill sites within established residential areas.
  - Regional cities and towns.
- To ensure residential subdivision design appropriately provides for:
  - Policy implementation.
  - Livable and sustainable communities.
  - Residential lot design.
  - Urban landscape.
  - Access and mobility management.
  - Integrated water management.
  - Site management.
  - Utilities."

The Development Plan ensures that the purposes of Clause 56 are satisfied by:

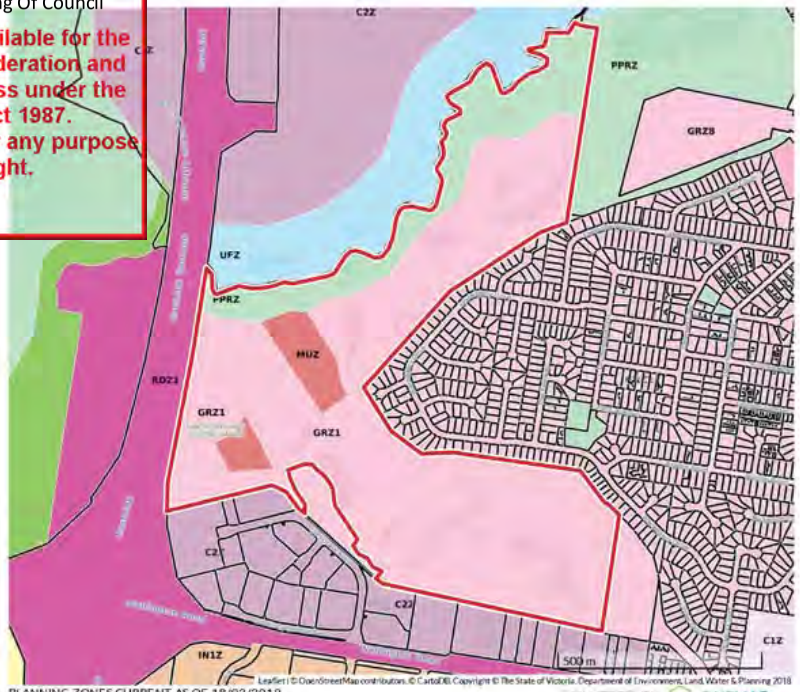
- Providing a framework for a liveable and sustainable neighbourhood that offers a range of residential lot sizes and housing types.
- Providing a framework for a future residential subdivision that appropriately responds to the site and its context.
- Ensuring streets and houses promote passive surveillance of public open spaces.
- Providing attractive and continuous landscaping in streets and public open spaces that contributes to the character and identity of the existing and future neighbourhood.
- Creating a unique sense of place and urban identity.
- Providing an internal road and pedestrian network that ensures a high level of permeability.

PLANNING ZONES

PPRZ
PUBLIC PARK AND RECREATION ZONE
PUBLIC PARK AND RECREATION ZONE SCHEDULE

MUZ
MIXED USE ZONE
MIXED USE ZONE - SCHEDULE 1

GRZ1
GENERAL RESIDENTIAL ZONE
GENERAL RESIDENTIAL ZONE - SCHEDULE 1



PLANNING ZONES CURRENT AS OF 18/02/2019.

LEGEND

RESIDENTIAL ZONES
- RGZ - RESIDENTIAL GROWTH
- R2Z - RESIDENTIAL 2
- GRZ - GENERAL RESIDENTIAL / R1Z - RESIDENTIAL 1
- NRZ - NEIGHBOURHOOD RESIDENTIAL
- R3Z - RESIDENTIAL 3
- LDRZ - LOW DENSITY RESIDENTIAL
- MUZ - MIXED USE
- TZ - TOWNSHIP

COMMERCIAL / BUSINESS ZONES
- C1Z - COMMERCIAL 1 / BUSINESS 1
- B2Z - BUSINESS 2
- C2Z - COMMERCIAL 2
- B3Z - BUSINESS 3
- B4Z - BUSINESS 4
- B5Z - BUSINESS 5

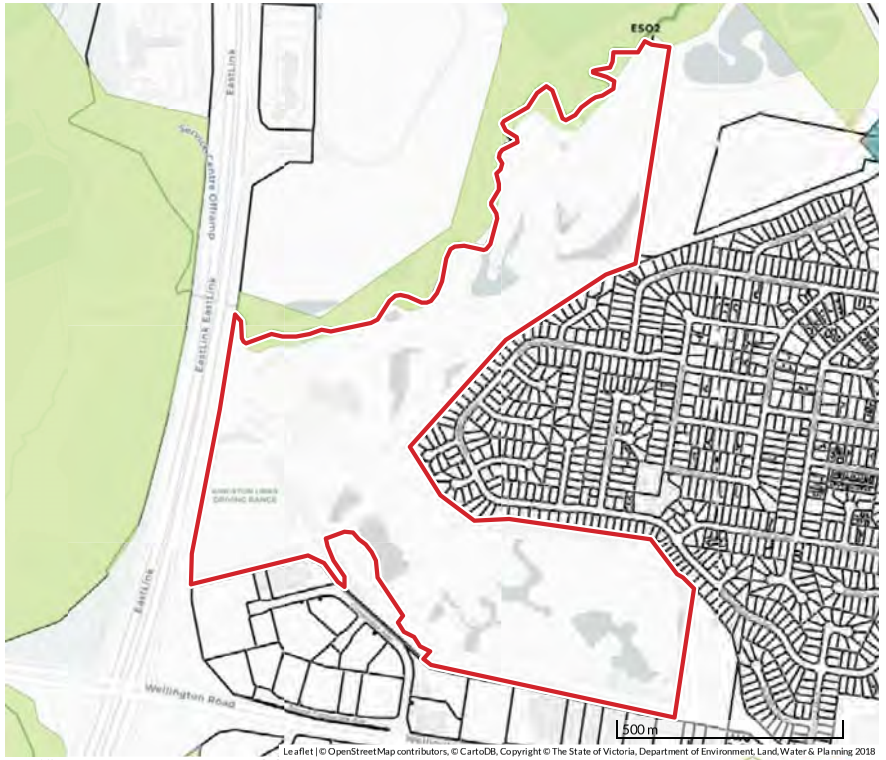
SPECIAL DEVELOPMENT ZONES
- ACZ - ACTIVITY CENTRE
- CCZ - CAPITAL CITY
- DZ - DOCKLANDS
- CDZ - COMPREHENSIVE DEVELOPMENT
- PDZ - PRIORITY DEVELOPMENT
- UGZ - URBAN GROWTH

INDUSTRIAL ZONES
- IN1Z - INDUSTRIAL 1
- IN2Z - INDUSTRIAL 2
- IN3Z - INDUSTRIAL 3

RURAL ZONES
- RLZ - RURAL LIVING
- RAZ - RURAL ACTIVITY
- FZ - FARMING / RUZ - RURAL
- GWAZ - GREEN WEDGE A
- GWZ - GREEN WEDGE
- ERZ - ENVIRONMENTAL RURAL
- RCZ - RURAL CONSERVATION

OTHER ZONES
- SUZ - SPECIAL USE
- CA - COMMONWEALTH LAND
- PZ - PORT
- RDZ1 - ROAD - CATEGORY 1
- RDZ2 - ROAD - CATEGORY 2
- UFZ - URBAN FLOODWAY
- PPRZ - PUBLIC PARK AND RECREATION
- PCRZ - PUBLIC CONSERVATION AND RESOURCE
- PUZ4 - PUBLIC USE - TRANSPORT
- PUBLIC USE - PUZ1 - SERVICE & UTILITY / PUZ2 - EDUCATION / PUZ3 - HEALTH COMMUNITY / PUZ 5 - CEMETARY / CREMATORIUM / PUZ 6 - LOCAL GOVERNMENT / PUZ7 - OTHER PUBLIC USE
- MUNICIPALITY BOUNDARIES
- URBAN GROWTH BOUNDARY

Figure 2 Zone Plan



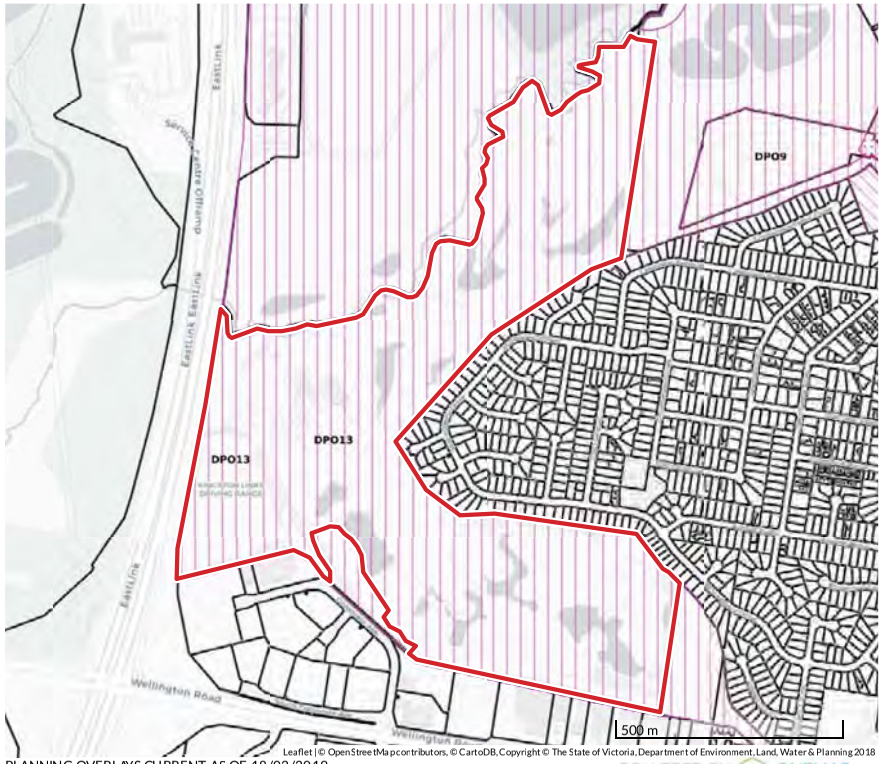
PLANNING OVERLAYS CURRENT AS OF 18/02/2019.

ENVIRONMENTAL AND LANDSCAPE OVERLAYS

ESO2
ENVIRONMENTAL SIGNIFICANCE OVERLAY
ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 2

LEGEND
- Environmental Significance (ESO)
- Vegetation Protection (VPO)
- Significant Landscape (SLO)

Figure 3 Environmental and Landscape Overlays Plan



PLANNING OVERLAYS CURRENT AS OF 18/02/2019.

POWERED BY ONEMAP

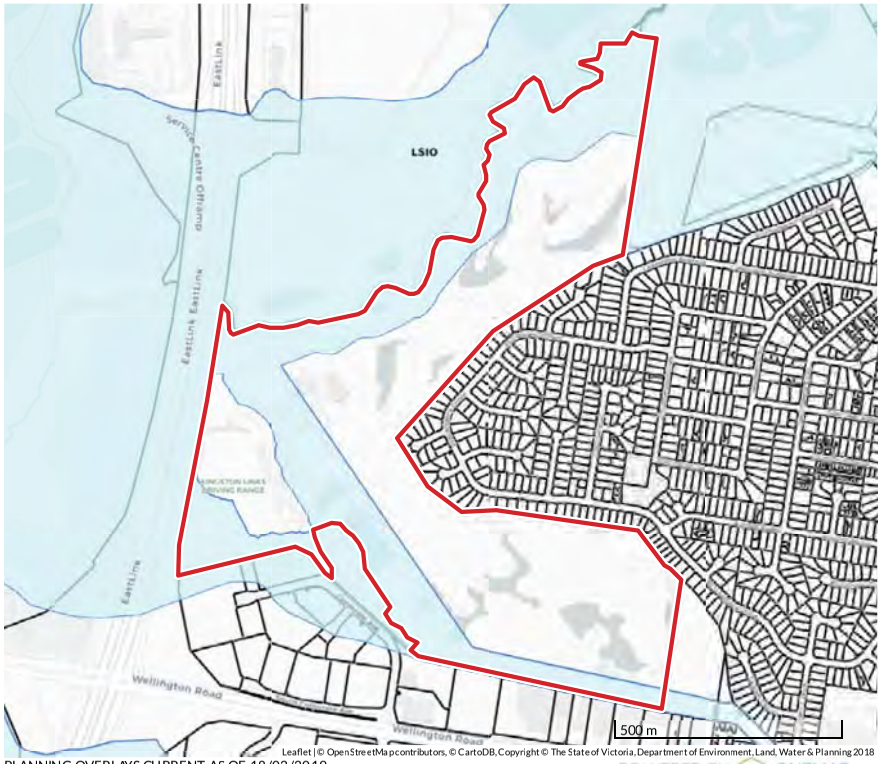
HERITAGE AND BUILT FORM OVERLAYS

DPO13
DEVELOPMENT PLAN OVERLAY

LEGEND

- **Heritage** (HO)
- **Design & Development** (DDO)
- **Neighbourhood Character** (NCO)
- **Incorporated Plan** (IPO)
- **Development Plan** (DPO)

Figure 5 Heritage and Built Form Overlays Plan



PLANNING OVERLAYS CURRENT AS OF 18/02/2019.

POWERED BY ONEMAP

LAND MANAGEMENT OVERLAYS

LSIO
LAND SUBJECT TO INUNDATION OVERLAY
LAND SUBJECT TO INUNDATION OVERLAY SCHEDULE

LEGEND

- **Erosion Management** (EMO)
- **Floodway** (FO/RFO)
- **Land Subject To Inundation** (LSIO)
- **Special Building** (SBO)
- **Salinity Management** (SMO)
- **State Resource** (SRO)
- **Bushfire Management** (BMO)

Figure 4 Land Management Overlays Plan

3 SITE CONTEXT & ANALYSIS

3.1 SITE LOCALITY

Located in the suburb of Rowville approximately 30 kilometers south-east of Melbourne's CBD, the Site is positioned within the north-east quadrant of the intersection between Wellington Road and the Eastlink Freeway (refer **Figure 1 – Locality Plan**).

To the north of the Site is the Caribbean Business Park which, when fully complete, is expected to generate 20,000 jobs (Page 20, Kingston Links Golf Course Demand Assessment, Deep End).

To the Site's north-east is the Stamford Park reserve which is owned and managed by the City of Knox. Prepared on behalf of Council, the Stamford Park Master Plan (July 2014) identifies a residential development precinct and envisions that the historic homestead will be used for community uses, café, functions, and events. Development of the residential precinct has commenced.

East of Stud Road is the Stud Park Shopping Centre. This is identified in Council documents as a Major Activity Centre which includes specialty retailing, supermarket and discount department store. A number of supporting businesses operate around the core retail centre.

Residential development to the east is generally conventional single dwelling form, with some minor infill townhouse development. A retirement village is located directly north-east of the Stud Park Shopping Centre.

Commercial land use to the south along Wellington Road generally comprises warehouse and service industrial uses. There are no known industrial uses in this area that rely on significant buffers to meet EPA requirements.

Both industrial and residential areas surrounding the Site present a 'garden suburban' feel, consistent with relevant Council policies.

Refer **Figure 6 - Site Context Plan.**

Figure 6 Site Context Plan

3.2 SITE ANALYSIS

Site Interfaces

The Site's immediate interfaces are summarised as follows:

- North: Corhanwarrabul Creek forms the Golf Course's northern boundary. While highly modified and degraded, this is an environmentally sensitive landscape protected by the Environmental Significance Overlay (Schedule 2). This interface also has an important drainage and inundation function reflected by the application of the Urban Flood Zone immediately north of the Site.
- North-east: Stamford Park forms the Site's north-eastern boundary. Accessed from Stud Road via Enterprise Drive, Stamford Park is owned and managed by the City of Knox and includes the Council owned Stamford House heritage building.
- East: The Site wraps around residential development to the east which generally comprises conventional single dwelling form with some infill townhouse development present.
- South-east: The Site's south-east corner abuts a Council-owned drainage reserve.
- South: Separating the Site from Wellington Road is a Council-owned tree reserve. South-adjacent to this tree reserve is a precinct of Commercial 2 Zone land which generally comprises lots larger than 3000sqm. This interface masks much of the view of the Site from Wellington Road.
- West: Eastlink Freeway forms the Site's western boundary.

Refer **Figure 7 – Site Features & Interfaces Plan**

3.3 CULTURAL HERITAGE

The CHMP prepared for the Site states that, "No archaeological Aboriginal cultural heritage is present within the activity area and, no areas likely to contain Aboriginal cultural heritage are present within the activity area (Page iii)."

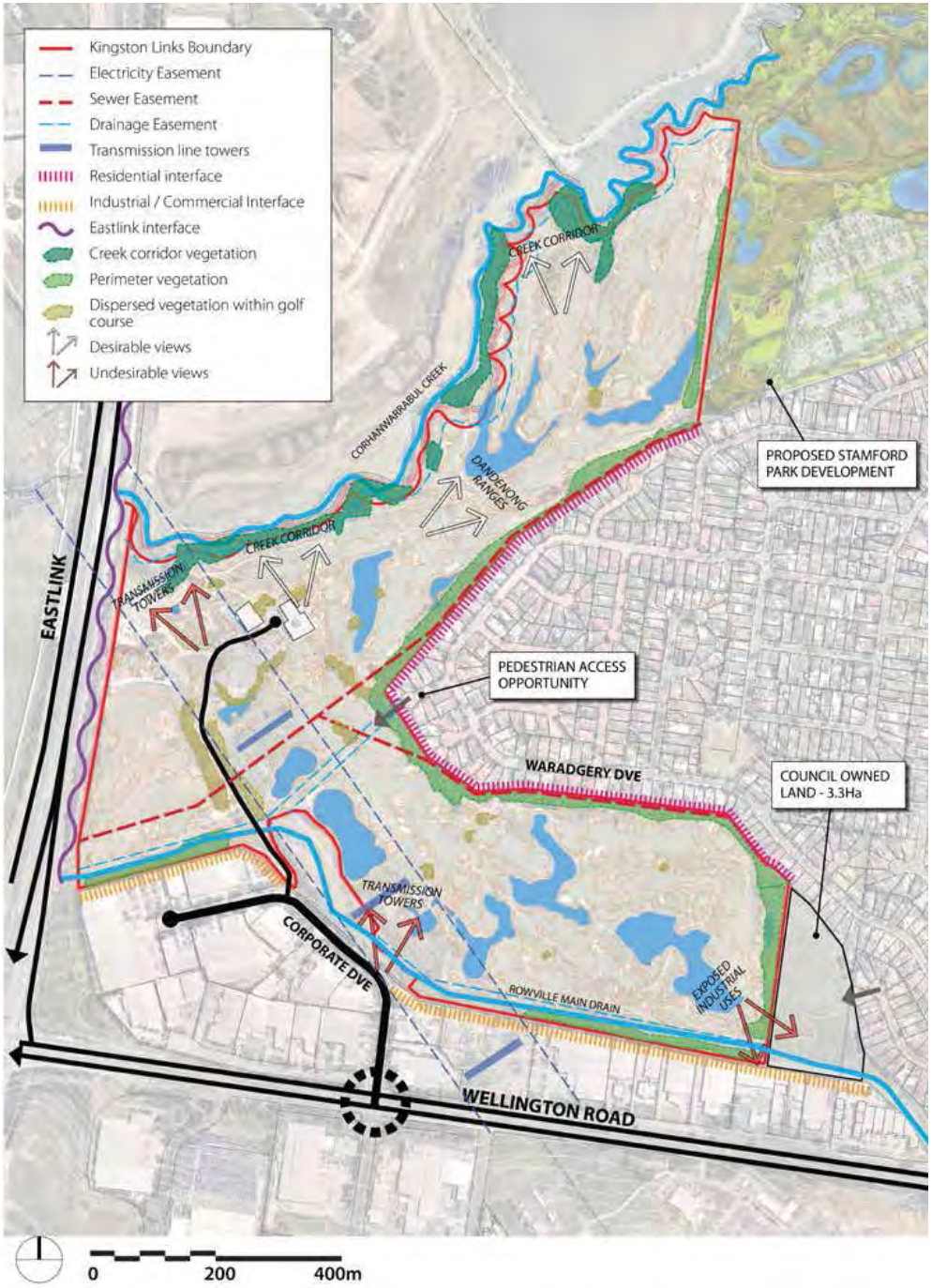


Figure 7 Site Features & Interfaces Plan

3.4 EXISTING ROAD NETWORK

Wellington Road

Wellington Road is a VicRoads declared Primary Arterial Road and is classified as a Category 1 Road Zone under the Planning Scheme. Wellington Road is aligned east-west and connects to Belgrave-Gembrook Road in the east and continues as North Road in the west. In the vicinity of the subject site, Wellington Road provides a divided dual carriageway with three lanes of through traffic in each direction.

Corporate Avenue

Corporate Avenue functions as a local street under the control of Council. It extends in a northerly direction from Wellington Road to the entrance of the Site. Corporate Avenue provides for two-way traffic and kerbside parking within a 12.5 metre carriageway.

The intersection of Corporate Avenue and Wellington Road is signalised, with Jaydee Court forming the southern leg of the intersection. A single right turn lane is provided from Wellington Road east and a shared through and left lane is provided from the west.

Stud Road

Stud Road is a VicRoads declared Primary Arterial Road in a Road Zone 1 running north-south. In the vicinity of Emmeline Row, Stud Road provides two through lanes and a dedicated bus lane in each direction.

Emmeline Row

Emmeline Row operates as a local street with a pavement width of approximately 13.0 metres accommodating a single traffic lane in each direction, separated by a central line-marked median set within a road reserve of approximately 22 metres.

Emmeline Row provides access to the Stamford Business Park to the north and will also provide access to the proposed Stamford Park residential subdivision.

The signalised intersection of Stud Road with Emmeline Row provides for double right turns from the north and a left turn slip lane from the south into Emmeline Row.

South Corporate Avenue

South Corporate Avenue functions as a local industrial access street under the control of Council providing access to the industrial and commercial land fronting Wellington Road between Corporate Avenue and Eastlink to the west.

South Corporate Avenue extends west from Corporate Avenue for approximately 320 metres parallel to Wellington Road and provides a 12.5 metre carriageway facilitating two-way traffic and kerbside parking along both sides.

The western extent of South Corporate Avenue widens to approximately 25 metres to allow for vehicle turnaround.

3.5 SITE FEATURES

Access

The current road access to the Site is provided from the south via Corporate Avenue, a sealed road which connects the Site to a signalised intersection with Wellington Road. Wellington Road is a Road Zone – Category 1, being an east-west arterial road which connects the Site to the Eastlink, the Monash Freeway, and by extension Melbourne's CBD and the broader metropolitan area. An agreement is in place between Pask Group and Knox City Council to construct a road between the Site and the residential development precinct at Stamford Park.

Topography

The Site's natural topography has been significantly altered as a result of its development into a golf course. The Site's modified topography is gently undulating and inclusive of raised tees and greens, sand bunkers, ponds, and other features typical of golf courses (including a club house and car park).

Forming the Site's northern boundary, Corhanwarrabul Creek is an important topographic feature of the Site and performs habitat, drainage, and inundation functions.

Landscape and Vegetation

The Site's natural landscape and vegetation have been significantly compromised as a result of its development into a golf course.

Much of the eastern perimeter to adjoining residential land is vegetated with a tree reserve restricting views into the Site from the residential properties. Additionally, there is also planting along a southern easement line, shielding views of industrial development to the south and south-west of the Site.

The Site benefits from the borrowed landscapes of the Corhanwarrabul Creek corridor including, in particularly, views of the Dandenong Ranges. In its current state, much of the Corhanwarrabul Creek corridor is modified and overgrown with noxious weeds.

Easements and Encumbrances

A drainage easement and drainage line separates the Site from the commercial-industrial area to the south and south west.

Significant sewer assets are located within the Site. A 1500mm diameter GRP trunk sewer runs along the Site's eastern boundary adjacent to existing residential lots and falling to the south-western corner of the Site. A second major 750mm diameter sewer runs along the southern boundary of the existing residential area and discharges to the 1500 diameter sewer

The south-west of the Site is encumbered with a high voltage power easement and power lines which dissects the land.

Refer **Figure 7 – Site Features Plan** and **Figure 8 – Site Photographs**.

Figure 8 Site Photographs

3.6 SITE FLORA & FAUNA

Flora

81 flora species (40 indigenous, 41 non-indigenous) are known to inhabit the Site, none of which are considered 'significant' species.

Vegetation on the Site does not meet the condition thresholds that define any significant ecological communities.

Having undergone intensive landscaping approximately 20 years ago, little remnant vegetation remains within the study area aside from an occasional scattered indigenous tree, with the exception being the land directly adjoining the Corhanwarrabul Creek Corridor which has not been subject to earthworks and therefore retains remnant riparian vegetation.

Swampy Woodland (EVC 937), Swampy Riparian Woodland (EVC 83), and Floodplain Reedbed (EVC 863) vegetation communities were identified along the creek line in varying states of quality.

Fauna

45 fauna species are known to inhabit the Site. These comprise 35 birds (30 native, 5 introduced), three introduced mammals, one introduced fish, and six native frog species. Of these, one species (the Blue-billed Duck) is considered State significant.

Suitable foraging habitat for additional State-listed fauna species (Powerful Owl, Barking Owl, Sooty Owl, Musk Duck, Australasian Shoveler, Hardhead, Eastern Great Egret, Little Egret, and Baillon's Crake).

It is also considered that two additional fauna species of national significance (Grey-headed Flying Fox and Swift Parrot) are likely to visit the Site.

Targeted surveys were undertaken for the Growling Grass Frog during the 2012/13 and 2015/16. Despite optimal conditions, no Growling Grass Frogs were recorded during these targeted surveys.

Targeted surveys for Dwarf Galaxias did not detect presence of this species.

There are limited records of Platypus occurring within 10km of the study area, however, no evidence of this species was detected during field investigations.

3.7 CORHANWARRABUL CREEK FLORA & FAUNA

Flora

Seventy-nine flora species (22 indigenous and 57 non-indigenous) were recorded in an approximately 1.7km section of the Corhanwarrabul Creek which abuts the Site.

Remnant vegetation in this section of the Corhanwarrabul Creek includes three patches of Swampy Woodland (EVC 937), six patches of Swampy Riparian Woodland (EVC 83), and two patches of Floodplain Reedbed (EVC 863) in varying condition.

Vegetation in this section of Corhanwarrabul Creek does not meet the condition thresholds that define any significant ecological communities under Commonwealth or State legislation.

With the exception of the canopy later which is generally in good condition, as well as small areas of Floodplain Reedbed, the entire creek corridor is highly modified, degraded, and dominated by introduced species. In-stream vegetation is also essentially absent through this section of the Corhanwarrabul Creek.

Four Weeds of National Significance were recorded in this section of Corhanwarrabul Creek (African Box-thorn, Blackberry, Willow, and Gorse) alongside four additional species listed on the 'Victorian Noxious Weed List 2014' (Angled Onion, Spear Thistle, Hawthorn, and St. Peter's Wort). 10 further identified species are listed as 'Very Serious' environmental weeds by the City of Knox.

Overall, this section of Corhanwarrabul Creek corridor is considered highly modified with poor quality understorey and a high cover of weeds throughout.

Fauna

Despite the high cover of weeds, this section of the Corhanwarrabul Creek is considered to be of high habitat value for fauna.

Thirty-one fauna species comprising 28 birds (24 native, four introduced), two introduced mammals, and one native frog species were recorded in this section of the Corhanwarrabul Creek. Of these, one species (Eastern Great Egret) is considered State significant fauna.

Suitable habitat is also present within area for additional State-listed fauna species (Powerful Owl, Barking Owl, Little Egret, and Baillon's Crake).

This section of the Corhanwarrabul Creek is therefore identified as a 'candidate' for habitat restoration works.

3.8 EXISTING SITE HYDROLOGY

Existing Drainage Conditions

The present topography of the Kingston Links Golf Club is undulating with a series of ponds and billabongs. The sequence of mounded tees and greens, connected by elevated fairways has resulted in a highly modified floodplain. Subsequently the site runoff is largely disconnected from the main waterways of Corhanwarrabul Creek and Rowville Main Drain.

A levee line runs along the creek's floodplain with a short break midway through the Site. The break in the levee was identified as an area potentially subject to frequent inundation in the ecology study.

Existing Conditions Peak Flows

Using a conservative approach to size retarding basin volumes, it is assumed that most of the existing site runoff is fed into the on-site waterbodies and only a small portion of the site discharges directly into the receiving waterways. This provides a lower target 100 year ARI - Average Recurrence Interval - flow rate for sizing the required retarding basin storage volumes and hence will provide a conservative estimate of flood storage.

Associated with the site runoff is the runoff from the adjacent residential catchments. The northern piped discharge (from Lakeview Avenue and Corhanwarrabul Close) is conservatively assumed to be captured by the golf course waterbodies and was not used to calculate the target permissible discharge flow. However, the pipe at the end of Turnberry Court discharges directly into Rowville Main Drain and has therefore been considered in calculating the peak pre-development target design flow.

The peak 100 year ARI pre-development design flows discharging into Corhanwarrabul Creek and Rowville Main Drain are shown in the table below.

LOCATION	Q100 DESIGN TOTAL (M^3/S)
Corhanwarrbul Creek	0.27
Rowville Main Drive	2.51

Figure 9 External Catchment Flows Discharging into the Site

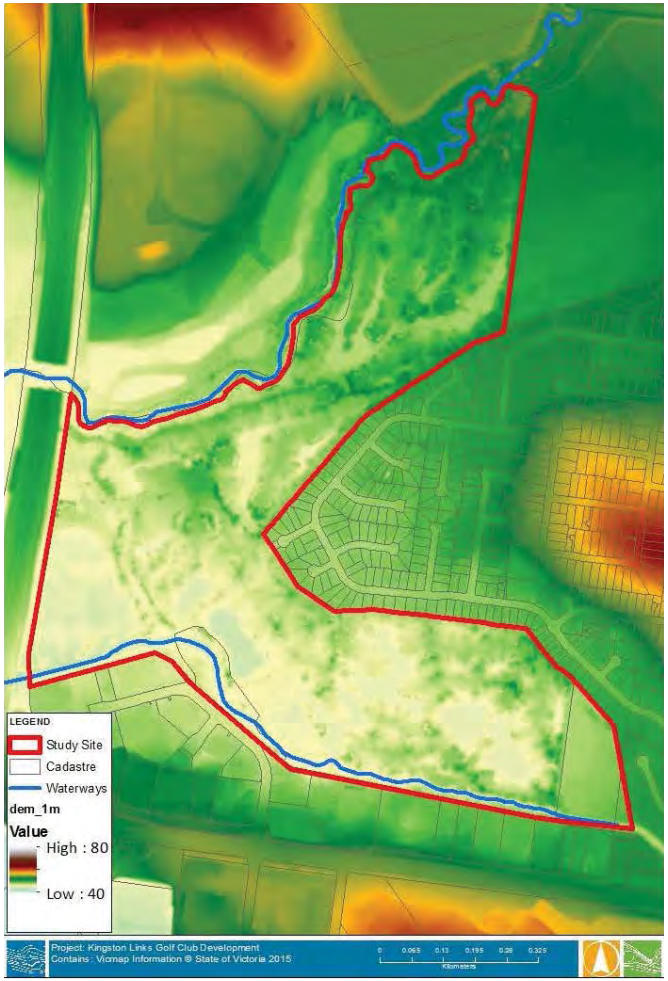


Figure 10 Existing Conditions Topography of the Study Site

4 MASTERPLAN

4.1 DEVELOPMENT PLAN REQUIREMENTS

Section 4 of DPO13 states that a development plan must include the following:

- A Masterplan that illustrates land uses (including open space), interface treatments, and an indicative road layout across the site.
- A Landscape Masterplan that shows the landscape design concept for the site, including all streetscapes and public open space (active and passive recreation areas, natural areas, other public realm).
- An Integrated Transport Management Plan that addresses access and movement within and to and from the site.
- An Integrated Water Management Plan that addresses holistic stormwater management within the site and those water-related interfaces beyond the site.
- A Grassfire Mitigation and Management Plan that addresses grassfire hazard, emergency vehicle road design, the provision of reticulated or static water supply and hard stand access for fire fighting.

This chapter addresses the requirements of the Masterplan. The balance of the matters included in the bullet points above are addressed in the subsequent chapters.

4.2 MASTERPLAN REQUIREMENTS

Section 4 of DPO13 states that the Masterplan must include:

- The distribution of land uses throughout the site including public open space, generally in accordance with Figure 1.
- Detail reflecting public open space, infrastructure and other elements consistent with any agreement entered into with the responsible authority.
- A description of the indicative siting, lot configuration and land uses within the mixed use precinct.
- A hierarchy of public open spaces.
- A description of the road network and hierarchy throughout the site, including function and cross sections.
- Transport connections and access points generally in accordance with Figure 1.
- A description of the distribution of height and massing of built form across the site, generally in accordance with Figure 1.
- Details of the treatment to residential interfaces along the irregular eastern boundary of the land generally in accordance with Figure 1 including either:
  - retention of a vegetated landscape buffer generally between 5m and 8m in width retaining high amenity trees where practical with a new local road; or
  - where proposed allotments share a direct abuttal with existing residential land a maximum 2 storey building height within 15m of the shared boundary.
- Details of the staging of future land use and development throughout the site.
- A notation that the intensity of land uses and the number of dwellings must not exceed that adopted for the traffic generation development scenario that forms part of the approved Integrated Transport Management Plan, unless otherwise agreed in writing by the responsible authority.
- Detail on how any required noise attenuation measures will meet the noise level objectives in VicRoads Traffic Noise Reduction Policy (or any subsequent publication) and the Traffic Noise Criteria set out in the EastLink Concession Deed (which specifies performance criteria in relation to traffic noise) or as updated at the boundary of the EastLink Freeway reserve. All noise attenuation measures required to satisfy these objectives must be met by the relevant land owner/developer. Where an acoustic barrier is required, it must be provided within the EastLink Freeway reserve.
- Details on the fencing on the boundary of the EastLink Freeway reserve. Fencing to the EastLink Freeway reserve must complement the urban design treatment and landscaping of the EastLink corridor, restrict access to the EastLink Freeway, prevent unauthorised dumping of materials or rubbish blowing onto the EastLink Freeway reserve and prevent or minimise graffiti and vandalism.
- A building setback of 2m from the EastLink boundary to allow for the construction and maintenance of buildings on the land and a notation that access to the EastLink Freeway reserve will not be permitted to be used for construction and maintenance works.
- Details of how contaminated soil will be managed.
- Details of how the built form of the Mixed Use Zone development will interface sensitively with existing and future residential development and public open space.

4.3 MASTERPLAN

The Masterplan focuses on creating a place where the landscape, generous open spaces, and streetscapes provide a high level of amenity for residents and the broader community.

There is a strong presence of water management assets across the Site with wetlands, the Corhanwarrabul Creek, and Rowville Main Drain not only playing vital water management and environmental roles but also providing high quality open space assets for the community. This corridor connects into the broader open space network through a shared pedestrian and cycle path.

Pedestrian connections from the existing residential community to the Site's east will be provided to ensure that existing residents have access to all of the new amenities of the development.

Capturing views to pocket parks and Corhanwarrabul Creek, and designed to control traffic flows and vehicle speeds, the primary access road provides a high quality boulevard experience as it meanders through the Site to Stamford Park. The local street network is highly permeable and provides residents with open space at the end of most streets.

Predominantly oriented north-south and east-west, the orientation of streets enables good solar access to future lots. Equally, street orientation ensures that future lots will provide passive surveillance over proposed open spaces and shared trails.

The Mixed Use Precinct provides a central focus for the future community and is connected to the shared path network. In addition to higer density housing, the mixed use precinct at Kingston Links is likely to support a small mixed business/general store similar to a 'Friendly IGA' type brand, take away food outlet, and or other retail services such as a hairdresser or similar. All proposed uses will accord with the purpose of the Mixed Use Zone.

Refer **Figure 11 – Development Concept Plan**.

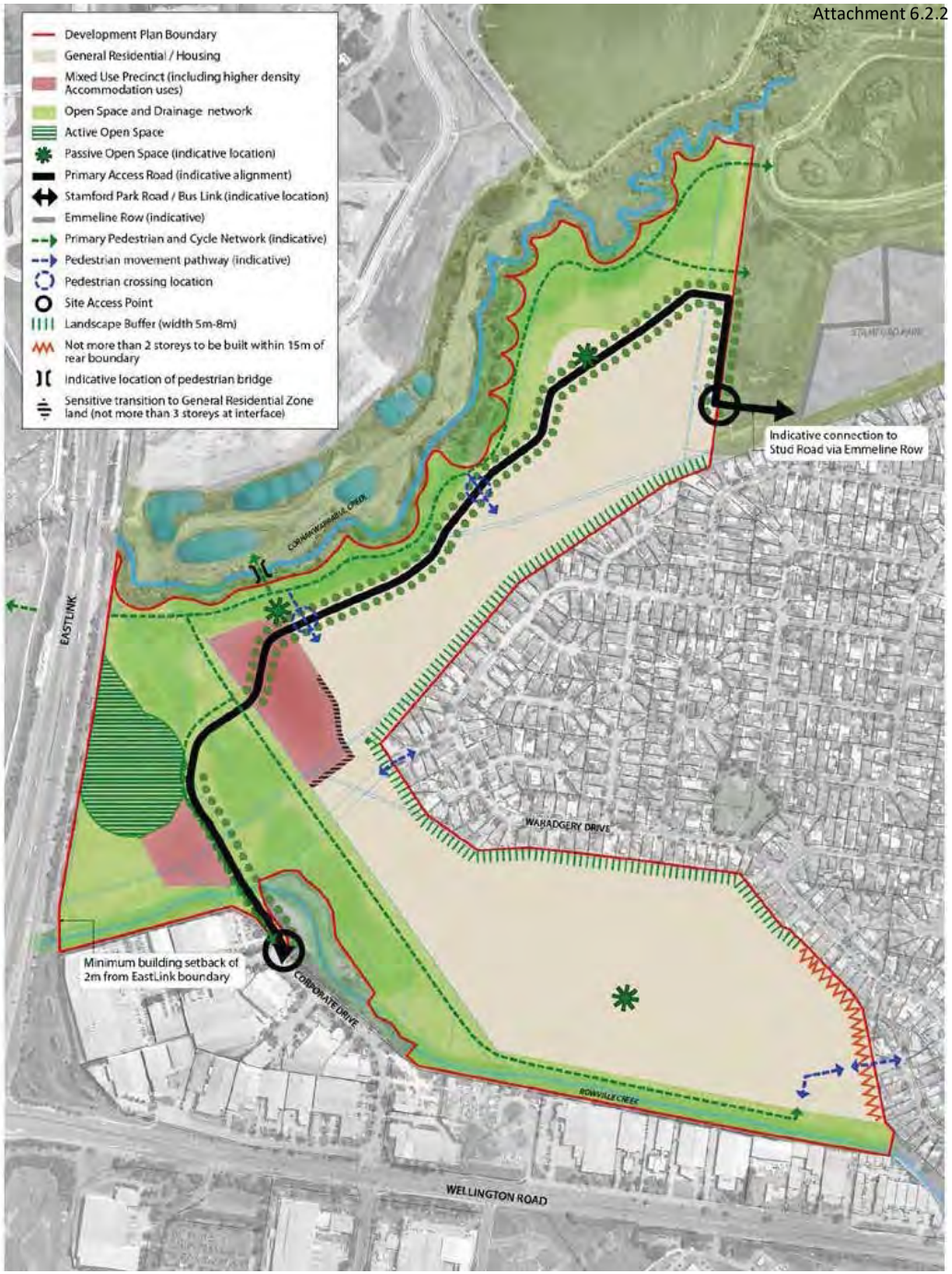


Figure 11 Development Concept Plan

4.4 DENSITY, BUILDING HEIGHT, AND MASSING

The proposal includes a range of built form typologies to encourage housing and other land use choices that meet the diverse needs and lifestyles of future residents.

The predominant housing type within the General Residential Zone area will be detached dwellings on a range of lot sizes. Though provision will also be made for medium density residential development throughout this area in appropriate locations, building heights outside of the Mixed Use Precinct will generally be of a lower scale and not exceed three storeys (consistent with the requirements of the General Residential Zone).

A landscape buffer with a contextual width in the range of 5m-8m is proposed adjacent to existing residential development along the eastern boundary of the land, retaining high amenity trees where practical. The planting of indigenous shrubs and trees, subject to Council requirements, will further enhance the green edge and screening effect between proposed and existing residential communities, as well as enrich environmental values and improve habitat potential for indigenous fauna. Where proposed allotments share a direct abuttal with existing residential land, the design introduces a sensitive interface with a maximum 2-storeys building height within 15 metres of the shared boundary.

Higher density development in the form of apartment buildings and townhouses will generally be located in and around the Mixed Use Precinct, noting that this precinct has been positioned away from existing residential development to the east. Higher density development could generally range from three to eight storeys. To ensure a sensitive height transition to existing and future residential development, the design introduces the requirement for a sensitive interface ('not more than 3 storeys') at the edge of the mixed use precincts at its interfaces with part of the General Residential Zone. With respect to interfaces with public open space, residential development will be oriented to overlook public spaces, particularly at upper levels.

The lot configuration within the Mixed Use precinct will be subject to a future planning permit application for subdivision. Depending on ultimate ownership structures, this is likely to include a mix of strata lots (or similar) where residential apartments are proposed; standard lots oriented towards streets and accessways where townhouses are proposed; and lots for commercial use configured to provide for development which provides a clear sense of address and entry.

The layout of the development and the proximity of the Mixed Use Precinct to a linked series of open spaces will allow residents to be within walking distance to a unique collection of nature-based experiences.

The intensity of land uses and number of dwellings will not exceed that adopted for the traffic generation development scenario in the approved Integrated Transport Management Plan ('ITMP'). Council may approve changes to the ITMP over the course of the project

Refer **Figure 12- Plan of Indicative Building Heights.**

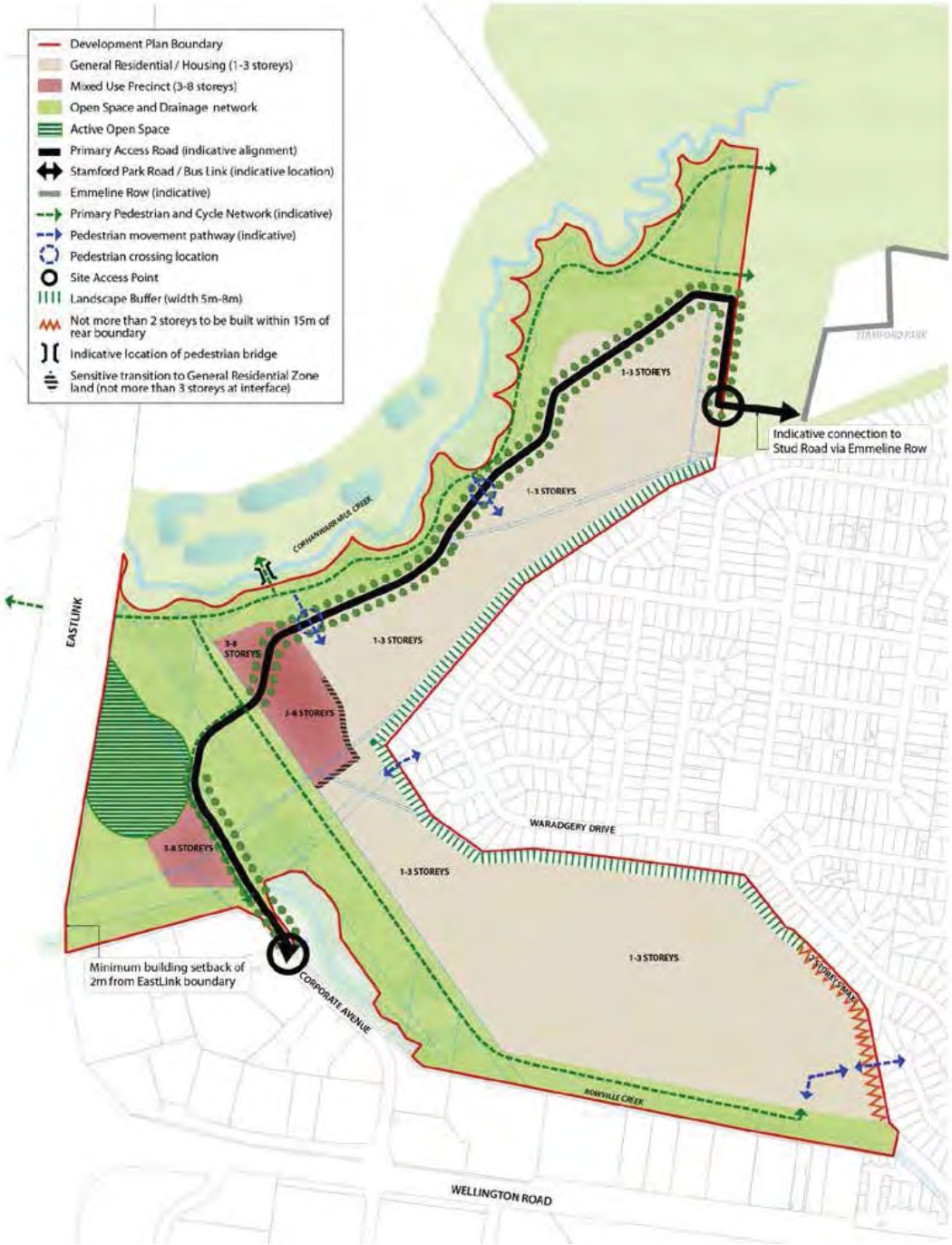


Figure 12 Plan of Indicative Building Heights

4.5 SOCIAL HOUSING REQUIREMENT

The requirement for a further Section 173 agreement between Council and Pask Group to restrict the development and use of future nominated lots for social housing is required by Clause 5.5.6 of the existing signed Section 173 agreement between Pask Group and Knox CC. The planning permit for subdivision is the appropriate vehicle for resolving this agreement.

4.7 STAGING

The development of the Site is envisaged to occur in stages. The stages and timing of development will generally be influenced by market conditions and demand. Staging may change from time to time.

The indicative staging for the Site is illustrated in **Figure 13 – Staging Plan**.

4.6 CONTAMINATION ASSESSMENT

A Soil Contamination Assessment (2017) was undertaken by GreenCap during the rezoning process. The document identifies that the proposed residential development presents low levels of soil contamination and that these are unlikely to pose an unacceptable risk to future inhabitants and surrounding ecosystems.

The Soil Contamination Report (Page ii) recommends the following:

- As a conservative precautionary measure, a soil management plan be developed for proposed soil excavation works and ongoing development of the site to provide measures to minimise risks to site workers, future site users and the environment associated with potentially contaminated soils that may be encountered during development works at the site.
- Should the maintenance facility be proposed to be redeveloped to comprise a sensitive (residential) land use, Greencap recommend that soil validation sampling be undertaken during the decommissioning of site infrastructure (e.g. chemical/fuel storage areas and triple interceptor traps); and
- Soils/wastewater/sediments required to be disposed off-site as part of the proposed development should be classified (and subsequently) managed in accordance with EPA Victoria Guidelines.

A soil management plan should be required as a condition on a future planning permit for subdivision.

No residential development is proposed on or in proximity to the maintenance facility.

Soil and sediment will be resused within the site and treatment of wastewater will be controlled through a future Environmental Management Plan (which will be required as a condition on a future planning permit for subdivision in accordance with Section 3 of DPO13).

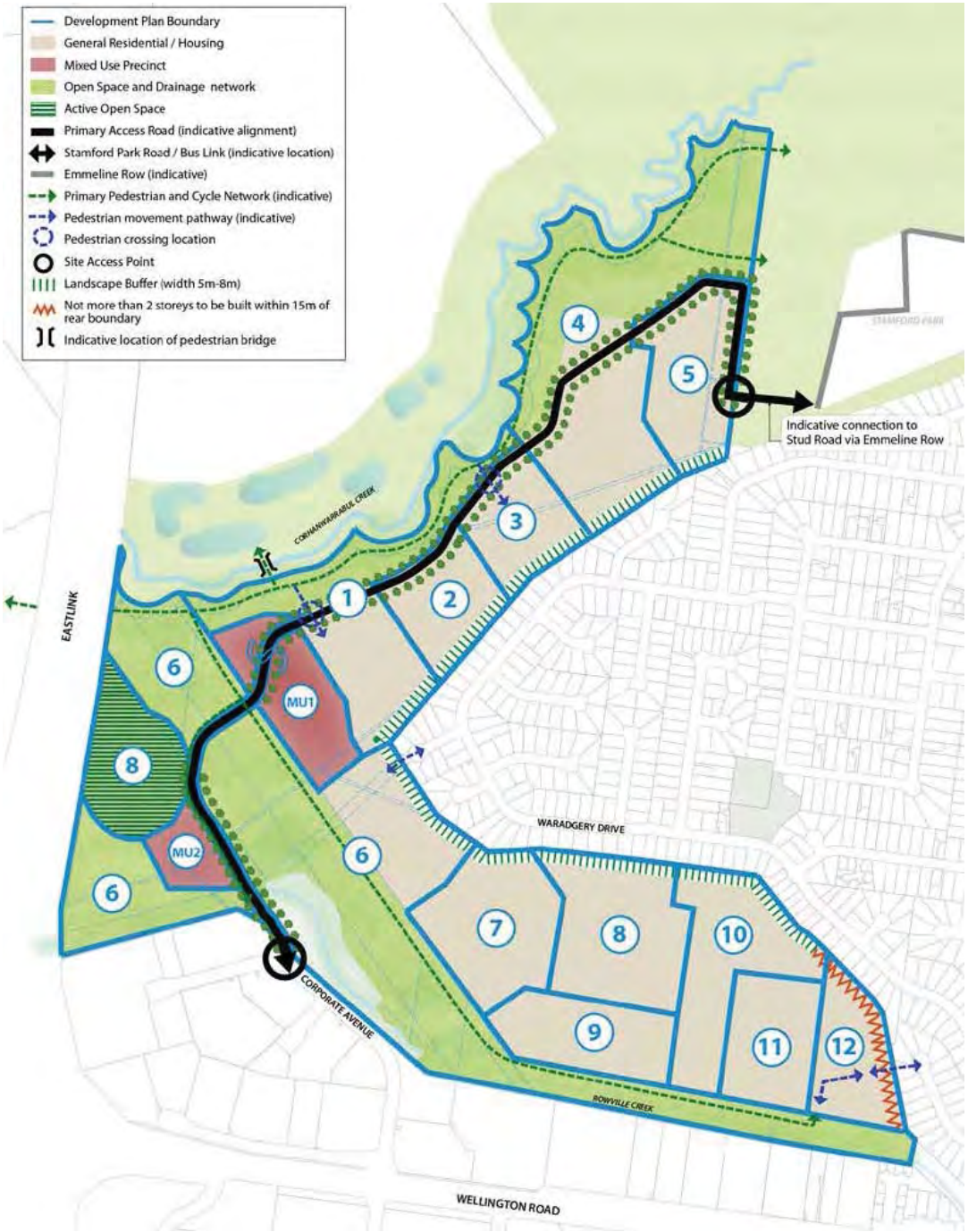


Figure 13 Staging Plan

4.7 NOISE ATTENUATION

DPO13 requires detail on how any required noise attenuation measures meets the noise level objectives in VicRoads's Traffic Noise Reduction Policy (or any subsequent publication) and the Traffic Noise Criteria, as set out in the EastLink Concession Deed or as updated at the boundary of the East-Link Freeway reserve.

The EastLink Concession Deed performance criterion for road traffic noise to residential buildings is 63 dBA L10(18hr). The performance criterion is required to be met throughout the term of the Concession Deed, which expires on 30 November 2043. Where the external criterion of 63 dBA L10(18hr) is exceeded at the façade of a future development, it is an option to design to achieve internal noise targets in some circumstances.

Based on modelling by SLR Consulting, the 63 dBA, L10(18 hour) contour line extends into the western part of the site (refer Figures 14 and 15). Though no development is currently proposed within that area, any proposed development for land within the 63 dBA, L10(18hour) contour (i.e. between the contour and EastLink) will require acoustic attenuation in accordance with the recommendations in the SLR report (Kingston Links Residential Development: Acoustic Assessment of Road Traffic Noise dated 22 May 2017).

Refer **Figure 14 and 15 - Current Noise Levels (2015) and Future Predicted Noise Levels Unmitigated (2043) (SLR Consulting, 2017)**

4.8 BOUNDARY FENCING

The Development Plan does not propose to alter the existing fencing on the boundary of the EastLink Freeway reserve. It is considered that the existing fencing adequately meets the requirements of DPO13 in complementing the urban design treatment and landscaping of the EastLink corridor, restricting access to the EastLink Freeway, preventing unauthorised dumping of materials or rubbish blowing onto the EastLink Freeway reserve and preventing or minimising graffiti and vandalism.

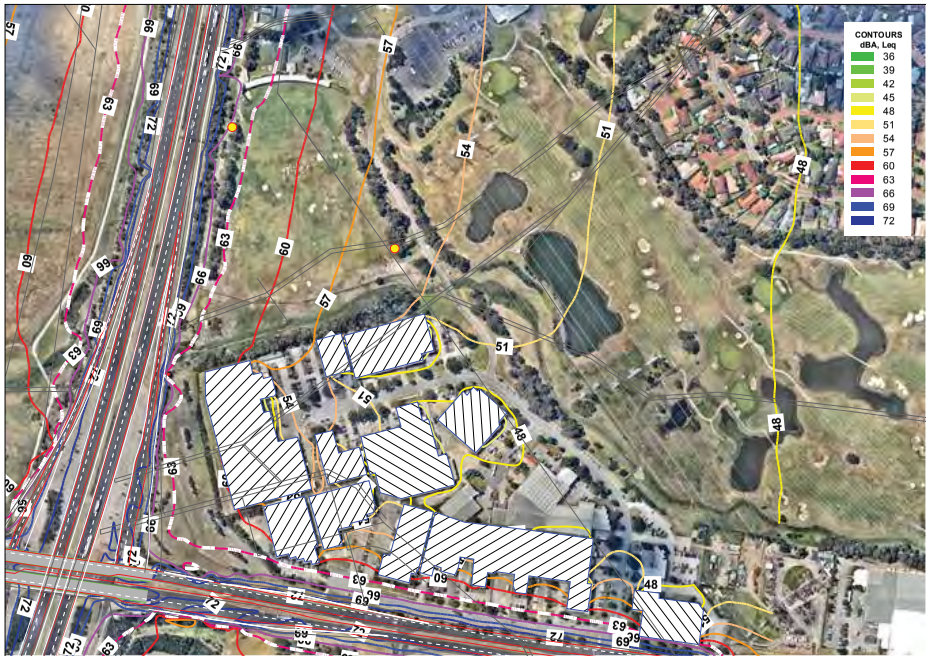


Figure 14 Existing Noise Levels (2015) (SLR Consulting, 2017)

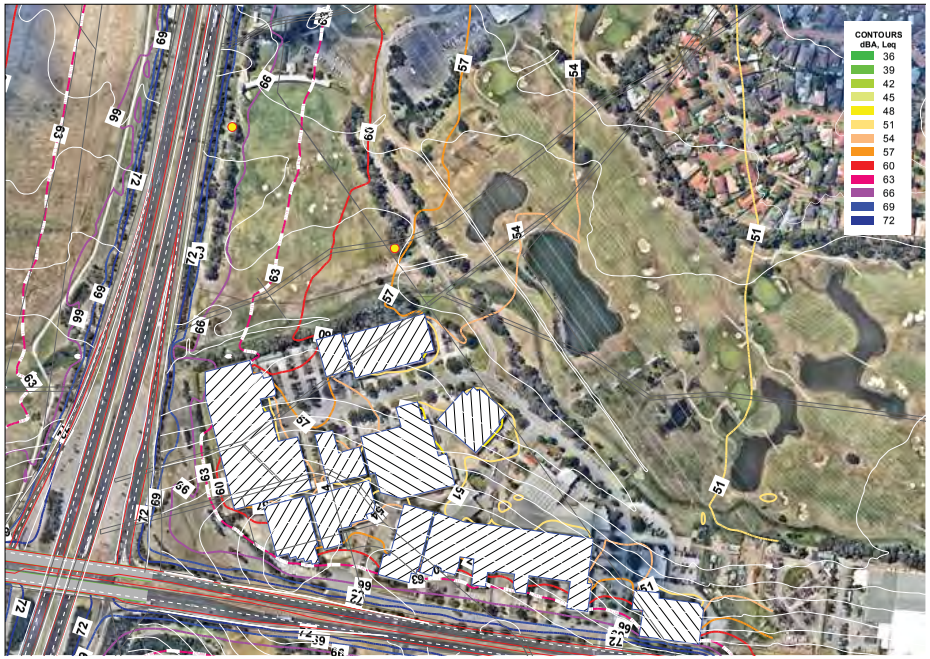


Figure 15 FuturePredictedNoiseLevels(2043)Unmitigated(SLRConsulting,2017)

5 LANDSCAPE & PUBLIC OPEN SPACE

5.1 DEVELOPMENT PLAN REQUIREMENTS

Section 4 of DPO13 states that the Landscape Masterplan must include:

- A statement explaining how landscape design addresses the strategic directions within the Knox Open Space Plan 2012-2022 (or as amended).
- A statement explaining how landscape design addresses the strategic directions within the Knox Liveable Streets Plan 2012-2022 (or as amended).
- Details of key landscape design principles and species selected throughout road reserves, along the site's key external interfaces, and within public open space.
- A planting theme that enhances local habitat values and demonstrates compatibility with the inclusion of water sensitive urban design objectives. The planting theme on the eastern [side of the western] boundary must respond to the landscaping and urban design of EastLink.
- Landscaping detail for the landscape buffer at the residential interface along the irregular eastern boundary of the land.
- Details of the removal of vegetation not suitable for retention.

These requirements have been addressed in detail in the 'Landscape Masterplan Report' (Tract Consultants, May 2018).

5.2 LANDSCAPE VISION & THEMING

Stormwater imperatives mean that water will pervade the look and feel of the Site's future residential development. Building upon this, the landscape vision is to tell the 'water story' by making the role of water in the landscape visible and allowing this to permeate design themes and functional outcomes throughout the Site.

As identified in the Knox Open Space Plan (2012-2022), the vision for open space throughout the development will provide for a diversity of leisure activities, and enable people to enjoy nature, engage with others, learn and play. The four key strategic directions identified in the Open Space Plan have helped and will continue drive the landscape design as detailed within this document.

Walking and cycling will be promoted through a streetscape design which embraces 'Livable Streets' principles as described in the Knox Liveable Street Plan 2012-2022 and through an extensive nature trail network encircling the Site.

Corhanwarrabul Creek is the 'jewel' in the Site's open space network. The landscape design response is to embrace the Creek's potential to contribute to the seemingly 'untouched' experience of nature for the benefit of both residents and the ecological communities it supports. Habitat management and maintenance will play a large role in the landscape approach for this zone. All works within this zone will be in accordance with Ecology and Heritage Partners and Melbourne Water's requirements and recommendations and will be carefully planned in respect of existing flora and fauna species. Appreciation of the Site's natural and cultural values will be key design informants for the creek corridor landscape response.

The Site's power lines are a strong element of orientation within the landscape. By converting the ground plain under the power lines into a wetland system inclusive of an integrated trail network, it is envisaged that the power lines will be recognised as synonymous with a 'wetland nature' experience whilst fulfilling water management and environmental objectives.

The reserve associated with Rowville Main Drain also forms part of the 'water story' and trail network while acting as a buffer to adjoining industrial uses. As some of the existing planted trees will need to be removed, opportunities will be explored to re-use felled trees for multiple purposes.

Refer **Figure 14 - Landscape Masterplan**.

5.3 KEY LANDSCAPE TREATMENTS

The Kingston Links Landscape Masterplan incorporates the following linked series of open spaces that will offer a unique collection of nature-based experiences, encouraging walking and cycling.

Corhanwarrabul Creek Reserve

Restoration works are planned for Corhanwarrabul Creek in accordance with Melbourne Water and Knox City Council requirements. Creek buffer zones will be respected in the landscape design response. It is anticipated that an area at the site's north will be set aside as platypus habitat, and pedestrian access discouraged.

Corhanwarrabul Floodplain

The Corhanwarrabul Creek Floodplain Reserve will act as a buffer between Corhanwarrabul Creek and the proposed new residential zone while also catering for flood events. The Reserve is intended to form a seamless extension of Corhanwarrabul Creek's tapestry of indigenous riparian and woodland vegetation interwoven with open lawn for play, picnicking and relaxing.

The opportunity to include Creek-side nodes linked with EVC based settings may be considered. These could provide the opportunity to linger and enjoy nature, and could also form potential starting points for more concentrated creek restoration efforts.

A shared path is planned for the Reserve, connecting Kingston Links' reserves with Stamford Park's path network, facilities and open space reserves.

There is an opportunity to incorporate a local park within the Floodplain Reserve near the site's mixed use precinct, offering seating, nature-based play, and picnic facilities.

Residential Interface

Along the eastern boundary of the land, a landscape buffer with a contextual width in the range of 5m-8m is proposed, retaining high amenity trees where practical. The planting of indigenous shrubs and trees, subject to Council requirements, will further enhance the green edge and screening effect between proposed and existing residential communities, as well as enrich environmental values and improve habitat potential for indigenous fauna.

Power-lines Wetland Reserve

The area under the Site's power lines is to be sculpted for water retention and treatment and forms a significant opportunity to create an expansive wetland system.

While meeting Melbourne Water's requirements will be the key priority in the design of the Reserve, the design response will also be guided by SP Ausnet's 'guide to living with transmission line easements'. The design will seek to maximise the Site's opportunity to contribute to habitat creation, and where possible will also provide recreational opportunities. Shared path and seating will be incorporated within the Reserve.

Rowville Main Drain Reserve

The proposed nature trail system will also include the Rowville Main Drain, a Melbourne Water drainage channel that will be reshaped as part of the Site's stormwater management program. During this transition, the existing channel will be widened, its profile changed, and a more natural, meandering form constructed within its low-flow alignment. The change will improve the drain from a pure engineering function to a more landscape-designed outcome.

Existing buffer planting will be strengthened where gaps exist and wetland/creek vegetation will be incorporated within the low-lying areas of the reserve. The shared path running along the Reserve's residential edge will be sheltered by proposed indigenous canopy trees. Opportunities will be explored to passively activate the space for recreational use where suitable.

Industrial Interface

Treatments to the Site's industrial interfaces will include retention of existing trees where possible and under-canopy planting to further screen and soften these interfaces.

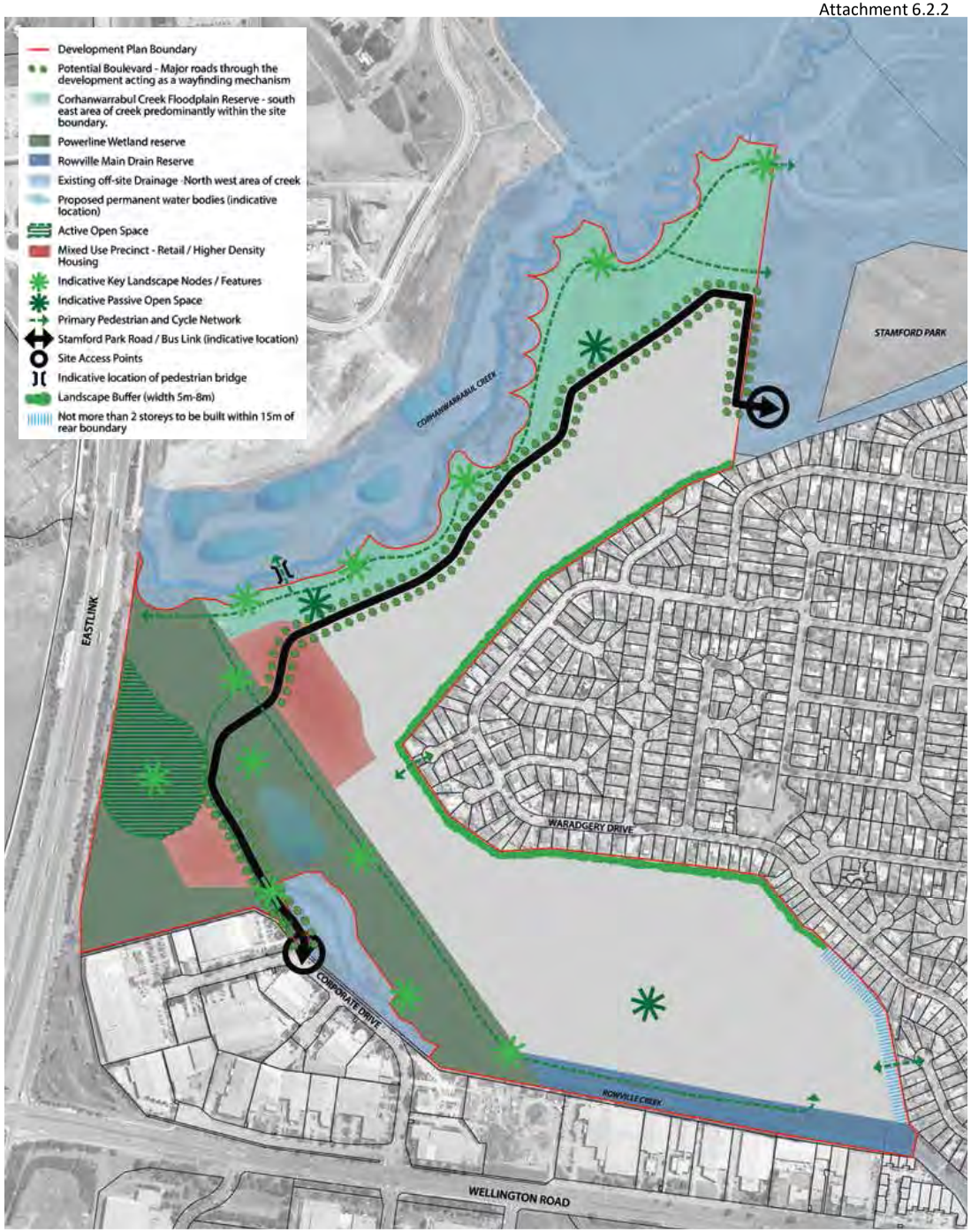


Figure 16 Landscape Masterplan

5.4 TREE PLANTING & UNDERSTORY DESIGN APPROACH

Tree planting in the City of Knox includes a range of mainly native species however exotic deciduous trees are used along boulevards, within shopping centres, and in existing residential areas including the Rowville area.

Tree planting within Kingston Links is intended to contribute to Rowville's identity as one of Knox's 'green and leafy' suburbs through the inclusion of canopy trees, particularly native and indigenous species in parks and streetscapes. This will not increase fire risk.

The landscape concept for tree planting and understory species selection will be influenced by the existing site conditions and the context established by its surrounding residential, industrial, and creek environs setting. The site has a strong native character, but with an element of exotic trees at its Corporate Avenue edge.

While most street tree planting will be drawn from a native and indigenous palette, a mix of indigenous, native and exotic are proposed for the entry boulevard and key internal roads. This is intended to create more readily recognisable entry points. The use of exotics within the site's proposed key streets will assist with orientation and way-finding.

Exotic trees may also play a role in laneway landscapes for streetscapes and as highlight planting in key locations within pocket parks. Indigenous understory and trees species will be used as background planting across the site to enhance environmental values and to improve habitat potential for indigenous fauna.

The design will be structured to respond to the different precincts and landscape settings within the development and to use planting to highlight special use areas such as the mixed use hub and pocket parks.

The understory plant species selection is anticipated to be heavily weighted towards native and indigenous species, while it is also anticipated that exotic species will play a strong role in key areas such as residential pocket parks and mixed use areas. The species list is anticipated to evolve throughout the life of the project to respond to climatic conditions, residents feedback, and the success of selected species in the early stages of development. The understory and tree species selection on the western boundary will also be informed by and designed to act harmoniously with the adjacent EastLink.

5.5 MANAGEMENT OF LANDSCAPE & OPEN SPACE

The landscape design will incorporate drought tolerant plant species and for areas of open space, warm season grasses will be recommended. Landscape Architects from Tract Consultants will work with Council's open space team to design spaces that require little ongoing water requirement while providing a balance between passive recreation and urban heat island mitigation.

The development offers the City of Knox the opportunity to inherit assets that support the governmental objectives of providing water sensitive cities that provide multiple benefits to the community and the environment.

During the detailed design phase, maintenance issues such as mulching, mowing angles, and access will be organised in consultation with Council. A landscape maintenance program will be implemented which will present the development site, as all times, as a high quality and well maintained environment.

It is expected that the site's creek and drainage reserves will be Melbourne Water assets which are maintained by Knox City Council under a maintenance agreement. WSUD elements outside these zones are expected to become Council assets and the management regime for these facilities will be similar to that for other similar facilities. Further detail can be provided in this regard when design development progresses.

5.6 INTEGRATED APPROACH TO TREES

With over 3000 trees onsite at Kingston Links, the development's approach to tree removal needs to be carefully considered to ensure a successful outcome for all stakeholders. A priority for tree retention, where suitable, will benefit the development outcome and help guide the consultancy team during the design process. Rather than bulk tree removal, a staged approach to tree removal will help limit the impact of overall tree removal on site, allowing decisions to be made when a more detailed assessment is possible rather than upfront before detailed designs are complete and all parameters are known.

At Council's request, a hierarchy of tree retention for Kingston Links has been developed taking both arboricultural value and habitat value into consideration.

Tree ranking is a key informant within the proposed tree retention and removal decision matrix flow chart (left) which illustrates the proposed approach to tree retention and removal at Kingston Links. Highly ranked trees will be given priority for retention over lesser-ranked trees. The existing trees throughout the site and their 'tree ranking' will help inform the subdivision layout. The effects of the subdivisions' detailed design and road layout will help guide decisions on tree removal and retention.

The development of Kingston Links Golf Course into residential land will have a major impact on the hydrology of the site. Although the TPZ of a particular tree may not be affected by the development, consideration of tree survival within evolving site conditions needs to be given prior to amending designs to retain any particular tree.

The hierarchy of tree retention and tree retention decision matrix will guide the planning stages of the development. Detailed tree retention and removal plans reflecting the outcome of this process will be provided on a stage by stage basis at permit stage.

6 INTEGRATED TRAFFIC MANAGEMENT

6.1 DEVELOPMENT PLAN REQUIREMENTS

Section 4 of DPO13 states that the Integrated Traffic Management Plan must include:

- An assessment of the expected impact of traffic generated by the development on the existing and future road network and any mitigation measures required to address identified issues to the satisfaction of VicRoads and the responsible authority.
- Traffic modelling of future conditions is to be predicated on a distribution analysis of generated traffic having regard to:
  - the nature and breakup of residential trip purposes
  - the likely origin/destination of trips based on:
  - residential precincts within the site
  - connections to the arterial network
  - location of nearby services and facilities
  - journey to work data.
- A statement explaining how the integrated transport network addresses the strategic directions within the Knox Liveable Streets Plan 2012-2022 (or as amended).
- An indicative road, bicycle, and pedestrian network plan showing:
  - vehicular access from Corporate Avenue to the proposed internal road network;
  - vehicular access from Stamford Park to the proposed internal road network;
  - pedestrian and bicycle access from surrounding areas, including both on-street and dedicated off-street facilities connecting to Stamford Park, Caribbean Gardens, and adjacent residential areas;
  - a street network that makes provision for a vehicular link between Kingston Links and Stamford Park, and discourages non-local through-traffic;
  - layout of internal roads, including a hierarchy of the roads that specifies the purpose, function, cross sections, and widths of the road reserves for each road type;
  - provision for bus movement through the site linking Wellington Road, traversing Stamford Park to access Stud Road, via Emmeline Row;
  - provision of safe, well-lit and direct pedestrian connections from the bus capable through road to existing residential areas east of the site, Wellington Road, Caribbean Gardens, Stamford Park and Stud Road;
  - provision of emergency services and waste collection services through the site;
  - a pedestrian and cycle shared path network both throughout the site and to the existing network at Stamford Park and the EastLink Trail with any access to the EastLink Trail to be controlled and maintained by Council;
  - connected footpath network both throughout the site and to the existing network on Corporate Avenue;
  - mitigation works at the intersection of Wellington Road and Corporate Avenue to provide adequate capacity to cater for anticipated traffic generation and to retain appropriate access to the Corporate Avenue;
  - any complementary works required to retain or improve access from South Corporate Avenue to Wellington Road;
  - any local area traffic management works required having regard to the characteristics of Emmeline Row as a Residential Collector Street;
  - enhancement works as required to Corporate Avenue to accommodate projected traffic movements while ensuring retention of appropriate access to existing properties;
  - any traffic implications of staging of development as contemplated in the Master Plan, including triggers for the provision of connections to the arterial network and implementation of any mitigation works;
  - a Construction Management Plan informed by analysis of staging requirements of traffic works identified in the Integrated Transport Management Plan.

These requirements have been addressed in detail in the 'Integrated Transport Management Plan' ('ITMP') (Traffix Group, February 2019).

6.2 SITE INGRESS & EGRESS

Access is proposed at two points: through Stamford Park via Stud Road and from the Site's existing access point to Corporate Avenue. An agreement is in place between Pask Group and Knox City Council to construct a road between the Site and the residential development precinct at Stamford Park.

6.3 TRAFFIC GENERATION & MANAGEMENT

An assessment of the expected traffic generation is provided at Section 4 of the ITMP. The total tentative yield of approximately 1,020 dwellings across both the Site and the future Stamford Park subdivision is expected to generate some 8,160 vehicle movements per day.

In order to accommodate the total contemplated yield across the two sites, the Developer will deliver mitigation works to the intersection of Corporate Avenue and Wellington Road in the form of a separate left turn lane on the Wellington Road west approach and a new right turn lane and separate left turn slip lane on the Corporate Avenue north approach (see Section 6.4 below).

Local Area Traffic Management treatments will also be employed within the Development to discourage 'rat running' traffic from utilising the subdivision to avoid the intersection of Stud Road and Wellington Road. This may include roundabouts, raised pavement intersections, slow points, kerb outstands or raised road humps.

6.4 MITIGATION WORKS

Based on discussions with VicRoads, it is considered that the proposed level of development can be accommodated and that the access strategy is appropriate, subject to the following mitigating works:

- Mitigating works are proposed at the intersection of Wellington Road and Corporate Avenue to provide a left turn deceleration lane from the west and a left turn slip lane and additional right turn lane from the north. Signalling changes would also be required to facilitate these works by split phasing the operation of the side roads.
- Mitigating works are proposed to South Corporate Avenue to provide a left turn deceleration lane and new ingress from the west and an egress access point for vehicles exiting to the east at the direction of VicRoads.

No works are required to the intersection of Stud Road as there is existing spare capacity at this intersection.

The mitigating road works will be staged as detailed in Section 6.3 of the ITMP.

6.5 ROAD LAYOUT & DESIGN

The Development Plan aims to integrate with the existing road network to the south of the Site and with the future Stamford Park residential development to the north east of the Site. It presents an integrated transport network which embraces 'Livable Streets' principles as described in the Knox Liveable Street Plan 2012-2022. Additionally, all roads will be designed to typical road pavement requirements consistent with Council standard street designs, the VPA design guidelines and Clause 56.06 of the planning scheme. Indicative road cross-sections are provided in both the Landscape Masterplan Report and the ITMP.

The primary boulevard through the Site provides access between Corporate Drive and Stamford Park. Designed in general accordance with a Standard Connector Street, the alignment of this road provides for a variety of landscape experiences capturing views to local parks, wetlands, and the Corhanwarrabul Creek. This road will provide the primary movement corridor for vehicles, bicycles, and pedestrians through the Site and will be capable of accommodating bus services if they are required into the future.

Consistent with best-practice urban design initiatives, the proposed vehicle link between the Site and Stamford Park will provide efficient, sustainable, and convenient vehicle access for future residents to the Rowville Activity Centre. Equally, the link will provide surrounding residents with access to the amenities of the proposed development, including the Corhanwarrabul Creek corridor and future active open space. A number of traffic calming measures are proposed along the primary boulevard to deter through traffic.

Local streets connect into the primary boulevard and provide direct access into the surrounding linear park network. These streets provide view axes to open space enabling passive surveillance from future housing. These internal streets will generally be provided as standard Access Street – Level 1 roads and would provide for an appropriate level of access for the number of dwellings serviced as well as allow for appropriate access for emergency and waste collection.

Connector streets have generally be oriented to maximise view axes and along parkland edges while enhancing natural surveillance and safety along the edges of the public spaces.

Refer **Figure 15 - Road Hierarchy Plan**

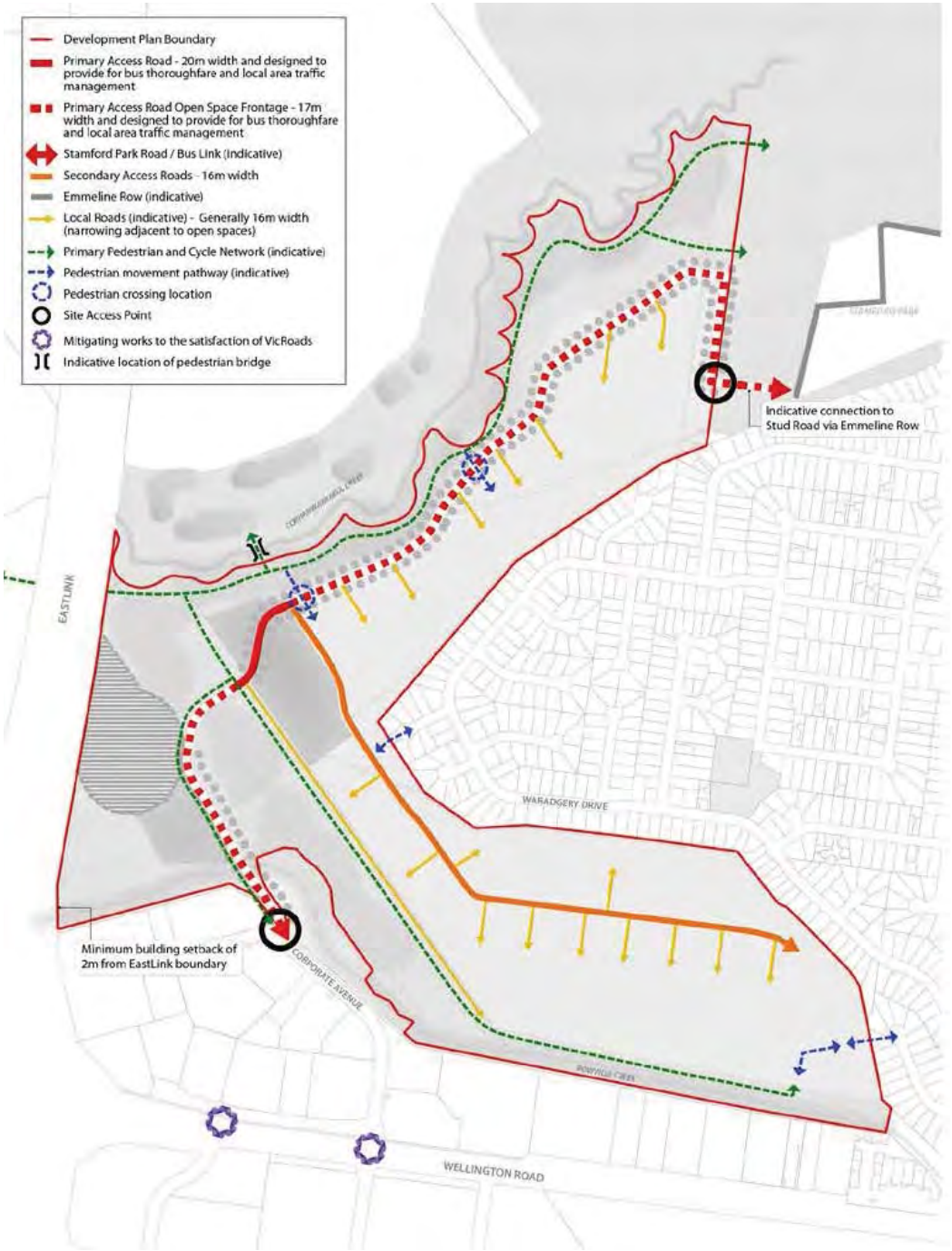


Figure 17 Road Hierarchy Network Plan

6.6 CAR PARKING

Residential Lots

Car parking for the traditional dwellings are proposed to be within enclosed garages for each respective dwelling. Design of car parking for residential lots will be provided generally in accordance with ResCode.

Mixed Use Precinct

Car parking will be provided to retail uses in accordance with provisions of clause 52.06 of the Knox Planning Scheme.

Car parking for any apartment / medium density dwellings will generally be accommodated within each respective apartment building in the form of basement, under-croft, or at-grade car parking.

The adequacy of the parking provision and adherence to relevant Australian Standards will be addressed at a later stage of the planning process.

On-street Car Parking

On-street car parking will generally be provided within suitable road reserves to accommodate visitor parking demands where appropriate.

6.7 PEDESTRIAN & BICYCLE NETWORK

Development Plan provides for a continuous shared path along the primary boulevard which will enable pedestrians and cyclists to co-travel safely. These shared paths will connect residents to key open space feature including Corhanwarrabul Creek, the Power lines Wetlands Reserve, pocket parks, Stamford Park and the existing residential subdivisions to the east.

To provide residents with safe and convenient access to the broader neighbourhood, pedestrian and cycle links will be provided throughout the Site and to the existing network at Stamford Park and the EastLink Trail, with any access to the EastLink Trail to be controlled and maintained by Council.

Pedestrian permeability and safety will be further enhanced through the integration of a pedestrian network, traffic calming mechanisms, provision of appropriate lighting and shade.

6.8 PUBLIC TRANSPORT

The Development Plan provides an opportunity for bus movement through the Site. The proposed connector road is to provide a minimum road width of 7.0 metres, allowing for 3.5 metre traffic lanes in each direction. This is consistent with PTV and VPA requirements for connector roads on bus routes.

6.9 STAGING

The development of the land will be staged and commence in the northern portion of the Site. Access via Corporate Avenue at the Site's southern boundary will be developed as part of Stage one of the development.

Additional access to the surrounding road network will be established with the subsequent subdivision of the Stamford Park precinct to the north-east of the Site.

7 INTEGRATED WATER MANAGEMENT

7.1 DEVELOPMENT PLAN REQUIREMENTS

Section 4 of DPO13 states that the Integrated Water Management Plan must include:

- Detailed information on how stormwater will be managed in an holistic manner.
- An assessment of the pre-development and expected post-development stormwater conditions.
- Details of how stormwater can be efficiently filtered, infiltrated and harvested on site to limit off-site discharge and meet all relevant State Government water quality targets , including:
  - Total Suspended Solids (TSS)
  - Total Nitrogen (TN)
  - Total Phosphorus (TP)
  - Total flows
- Details of how the proposed development will either maintain or increase overall stormwater storage capacity of the site.
- Details of how the proposed development will limit avulsion to minimise the risk of:
  - erosion of the creek channel or floodplain;
  - transportation of sediment downstream;
  - damage to or destruction of natural habitat and stream ecology;
  - damage to or destruction of built assets; and
  - changes in the course of the Corhanwarrabul Creek.
- Details of remediation works along the riparian zone of the Corhanwarrabul Creek.
- Details of any proposed modifications to the Corhanwarrabul Creek, and how these modifications will protect and enhance stream ecology.
- Details of how the proposed development will accommodate a 1 in 100 year ARI storm event.
- Details of how the Rowville Main Drain will be modified and how modifications will maintain and/or enhance hydraulic performance and flood protection of the local area.
- Necessary site control measures during the course of construction of any drainage works.
- Details of wetlands and stormwater maintenance works, including the removal of associated sediment to be undertaken by the land owner, for a period of two years after the completion of all works including roadworks, construction of the wetlands and in-ground infrastructure works.
- A statement that:
  - all surface water (up to the 1 in 100 year ARI storm event) and underground drainage will be directed away from the EastLink Freeway reserve; and
  - any works and fillings on the site must have no detrimental effect on the flood levels and drainage paths in and around the EastLink Freeway reserve.
- Notation of the requirement for a Wetlands Maintenance and Operation Plan, to the satisfaction of the Responsible Authority, prior to hand over to the public land manager of the ownership and management of stormwater infrastructure.
- Arrangements for handover to the public land manager of the ownership and management of stormwater infrastructure subsequent to the maintenance period.

These requirements have been addressed in detail in the 'Kingston Links Golf Course Development Integrated Water Management Plan' ('IWMP') (Water Technology, February 2019).

7.2 INTEGRATED APPROACH

The function of Corhanwarrabul Creek has been compromised over many years as a consequence of weed infestation and a lack of appropriate management and maintenance. The redevelopment of Kingston Links provides a major opportunity to rehabilitate the creek and return it to a more natural state where ecological diversity, habitat, open space amenity, stormwater function, and flood management and mitigation are all part of a balanced system (refer Chapter 8).

To achieve these outcomes, an integrated approach has been taken to water management at the Site, starting with ecological assessment and a detailed survey, followed by existing conditions water modeling (refer Section 3.6), geomorphological investigations, and eventual post-development modeling set out in this chapter.

With this foundation, and effective liaison with Melbourne Water, an integrated design for the creek corridor has been prepared jointly between the appointed engineer and landscape architect.

This integrated approach has ensured that the current alignment of the excavated floodway area is largely outside the mapped vegetation areas from the ecology study, with the exception of some minor encroachments at the downstream end of the creek corridor.

It also means that the right balance has been achieved between stormwater function, biodiversity, and landscape design and this leads to an outcome where the Corhanwarrabul Creek will become a key asset to the new residential community and to the broader community where passive recreation pursuits will be facilitated.

7.3 DEVELOPED CONDITIONS HYDROLOGY MODELING

A hydrological (RORB) model was created and used to analyse storm-water runoff from the proposed development and external catch-ments, and to size flood storages for peak flow retardation.

The post development peak 100 year ARI flows leaving the site is shown in the table below:

LOCATION	Q100 PRE DEVELOPMENT (M3/S)	Q100 POST DEVELOPMENT (M3/S)
Corhanwarrbul Creek	-2.7 (9 hr)	-0.5 (9 hr)
Rowville Main Drive	-8.9 (2 hr)	-8.4 (9 hr)

Storages were then sized in RORB to retard the peak 100 year ARI developed condition design flows leaving the site at Corhanwarrabul Creek and Rowville Main Drain, back to the calculated peak 100 year ARI existing conditions peak design flows. The modelling has shown that the catchment redirection (away from Corhanwarrabul Creek) will reduce local 100 year ARI flow rates entering the section of Cor-hanwarrabul Creek fronting the site, thus eliminating the need for a retarding basin upstream of Corhanwarrabul Creek.

The required flood storage volumes are presented in the table below:

FLOOD STORAGE	STORAGE VOLUME (M^3)
Retarding basin volume upstream of Corhanwarrbul Creek	n/a
Retarding basin volume upstream of Rowville Main Drive	-23,800 (9h storm)

The retarding basin required for the development can be sited within the distributed storage areas in the floodplain. The levels and foot-prints of the proposed retarding basin were determined by assessing the modified floodplain terrain to incorporate the proposed landscape and any water quality requirements.

The main retarding basin is proposed along Rowville Main Drain. The required storages are proposed to be split into separate basins within the power line easement and the areas fronting Rowville Main Drain. There is sufficient storage volume in this area to accommodate the re-quired 23,800m3 of storage, excluding the volume below the extend-ed detention depth in the centralised wetland under the power lines.

7.4 WATER SENSITIVE URBAN DESIGN

Reflecting Best Practice Environmental Management Guidelines, a treatment train consisting of a sediment pond followed by a wetland is proposed to treat the runoff generated from the development site. The concept design was developed in accordance with Melbourne Water's Deemed to Comply criteria associated with the final draft of the soon to be released (updated) Constructed Wetland Guidelines.

Sediment Ponds

Sediment ponds are detention systems which slow stormwater runoff and allow sediments to settle and deposit. These sed iments can then be removed from the system on a periodic basis.

Constructed wetlands

Typically used for large developments, constructed wetlands are large, man-made, significantly vegetated ponds that provide a natural way to reduce velocities, treat stormwater and remove sediment and contaminants before discharging stormwater downstream.

Urban Forest Related Strategies

Urban forest related strategies will be designed as part of bio-swale systems along roads adjacent areas of space.

Treatment Train Modeling

The treatment train components were modeled using the MUSIC (Model for Urban Stormwater Improvement Conceptualisation) modeling program. The predicted performance of the treatment train has been assessed against the following removal targets described in the Urban Stormwater Best Practice Guidelines (CSIRO):

- 80% of total suspended sediments;
- 45% of total nitrogen;
- 45% total phosphorous; and,
- 70% gross pollutants.

MUSIC Modeling demonstrates that the proposed WSUD assets to treat the stormwater generated from the Kingston Links development exceed State Water Quality targets. As aimed in the design stage, this sediment and wetland system also provides treatment to the external catchments, which contribute to more than 50% of the flows and pollutants entering the system.

7.5 CONCEPT STORMWATER STRATEGY

The internal drainage for the site is proposed to be serviced through a pit and pipe drainage system. The major/trunk pipe network was de-signed to convey the peak 10 year ARI design flow, with consideration of inverts at connection points to the existing drainage including the Melbourne Water network, and existing Council network. The pipes will outfall into the proposed southern outfall point along Rowville Main Drain. Surface flows exceeding the capacity of the drainage system will be directed to overland flow paths along the roadways and drainage corridors. Swales may also be incorporated into the develop-ment, mainly to convey roadside surface runoff.

It is proposed to discharge all stormwater from the development towards storage areas fronting Rowville Main Drain. This approach is proposed to help maintain the current hydrological regime of flows discharging from the site towards Corhanwarrabul Creek.

The management of stormwater for the site has been designed to improve water quality of the receiving waterways and hence the biodi-versity. A centralised 1.5 Ha wetland system is proposed to be located along Rowville Main Drive, in the power transmission line easement. This wetland system has the capacity to treat runoff from the devel-opment to best practice standards, and to also provide significant treatment benefit to the adjacent residential catchment prior to dis-charging into the receiving waterway.

7.6 HYDROLOGICAL DESIGN FEATURES

The following works have been incorporated into the proposed development to maintain floodplain storage and minimise offsite impacts post development:

- Widening the constricted section of Rowville Main Drain immediately upstream of the site, adjacent to the council reserve;
- Slightly increasing the capacity of the drain through the site;
- Existing Melbourne Water pipe to be realigned and upgraded;
- The retarding basin will be designed to retard peak stormwater flow rates back to the peak flow rate observed under pre-development conditions;
- A floodway reserve along Corhanwarrabul Creek, outside an approximate 30 m buffer from the creek;
- Lots will be filled to provide a 600 mm freeboard to the 100 year ARI flood level in Corhanwarrabul Creek and Rowville Main Drain;
- Roads and grassed swales will be designed to convey overland flows.
- Cut works within the powerline easement; and
- Cut works along the south-west part of the driving range.

7.7 STORMWATER & FLOOD MANAGEMENT

All necessary drainage works within the Site, including the hydrological design features listed below, will be undertaken by the Developer.

All necessary site control measures, such as temporary drainage diversions, scour protection, and sediment controls, will be undertaken by the Developer during the course of construction of any drainage works.

Additionally, the development will be designed to ensure that all surface water (up to the 100 year ARI event) and underground drainage will be directed away from the EastLink Freeway reserve, and that any works and fillings on the site will have no detrimental effect on the flood levels and drainage paths in and around the EastLink Freeway reserve.

It is noted that as part of the design, limited works for the floodway reserve along Corhanwarrabul Creek are proposed within the 30m buffer, namely excavation at local high spots, as agreed on with Melbourne Water. As agreed with the floodplain authority, rehabilitation works are also proposed within the 30 m buffer.

7.8 MAINTENANCE AND HANDOVER

It is noted that the maintenance of WSUD assets in the first two years after their establishment period (construction and planting phases) is key to the long-term health of the plants and success of the design.

As such, the proactive maintenance of the assets will be undertaken regularly by the land owner during the first two years. The operational and maintenance responsibilities will be transferred to the public land manager after the first two years.

A wetlands maintenance and operation plan will be developed during the detailed design phase and will be reviewed just after construction. This Plan should form a planning permit condition on a future subdivision permit. An agreement between Melbourne Water and Council will list the main Maintenance Works related to each asset and component of the asset as well as the frequency of maintenance works.

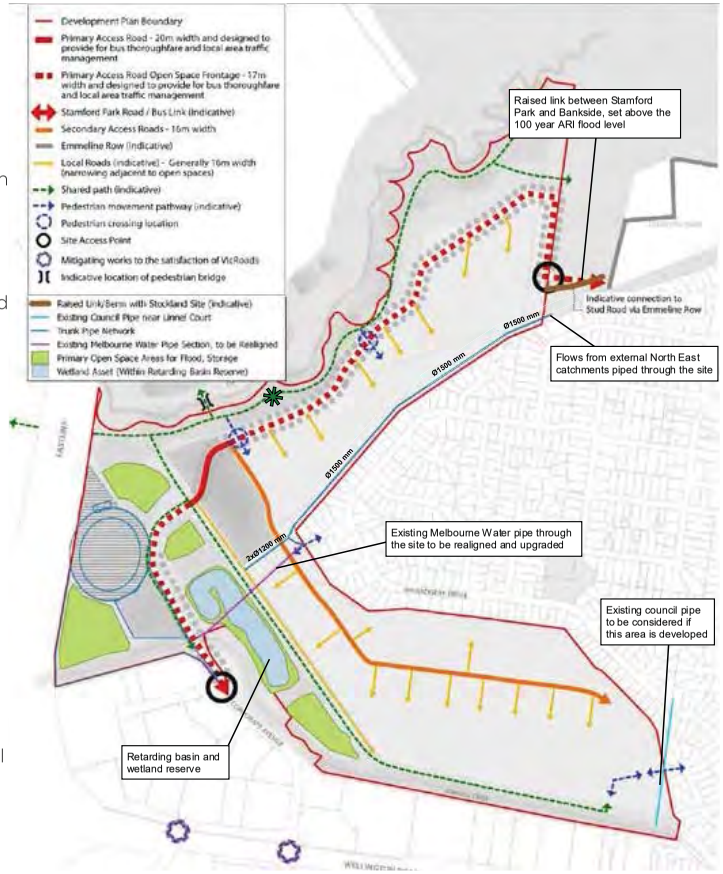


Figure 18 Stormwater Management Infrastructure - Concept Plan (WaterTech, 2019)

8 REHABILITATION OF CORHANWARRABUL CREEK

8.1 POLICY REQUIREMENTS

Section 4 of DPO13 includes the following Development Plan requirements:

- Details of remediation works along the riparian zone of the Corhanwarrabul Creek.
- Details of any proposed modifications to the Corhanwarrabul Creek, and how these modifications will protect and enhance stream ecology.

8.2 OVERVIEW OF CORHANWARRABUL CREEK REHABILITATION

The vision for Corhanwarrabul Creek is one of a restored natural system that provides areas of improved habitat, functioning ephemeral zones, and community access which include shared path trails.

Presently suffering from extensive infestation of noxious weeds, com-promised water flow, and poor quality understorey, the section of the Corhanwarrabul Creek corridor abutting the Site has been identified as a candidate for habitat restoration works including extensive weed control and revegetation.

Section 7.2 of the Integrated Water Management Plan confirms that no modification works are proposed along the creek channel. Rather the proposed modification works are located along the riparian corridor and consist of the enhancement and remediation works.

Control of noxious and high threat weed species will be prioritised to facilitate the commencement of a clean-up and rehabilitation program. Specific weed species will be targeted for eradication while controlling species of lower priority to a manageable level.

More detailed restoration activities will be focused on improved or additional fauna habitat, for example, enhancement of billabongs and discrete nodes or interest points for community engagement.

The detailed design of the wetland restoration along with the implementation aspects of the remediation works detailed below will be addressed during planning permit process for subdivision.

8.3 DETAILS OF REMEDIATION WORKS

Wetland Restoration and Creation

The southern floodplain currently contains 10 billabong/wetlands, some of which are in poor condition and in need of restoration. Two new wetlands are proposed. These wetlands are to be restored in accordance with the recommendations set out at Figure 17.

Revegetation

Revegetation will be a major component of the restoration program. The revegetation program will incorporate locally threatened flora species as identified in 'Sites of Biological Significance in Knox'.

All native vegetation will be protected and enhanced with additional planting to fill gaps in the continuity. Providing a fauna corridor will improve bank and channel stability, as well as maintaining water quality.

Shared Trail

A 1.5-1.8m wide shared trail is proposed to the south of the riparian strip (refer **Figure 14 - Landscape Masterplan**). The proposed path may provide a hard-edged buffer between the open 'non-native' lawn/future residential housing to the south and denser riparian wetland vegetation to the north.

Community Engagement Nodes

A series of nodes are proposed along the corridor to facilitate community engagement with the creek (refer Figure 17). These nodes will provide practical starting points for localised restoration efforts including indigenous landscaping.

Weed & Pest Animal Control

Weed and pest animal control activities will be strategically employed and species dependent. A broad summary of control protocols and removal strategies is included in the Restoration/Habitat Enhancement Plan and Section 7.2.1 of the IWMP.

Habitat Creation

The proposed restoration, enlargement, and creation of additional wetlands provides an opportunity to improve habitat for a range of common and threatened fauna species including the nationally listed Dwarf Galaxias and Growling Grass Frog.

Monitoring and Reporting

Regular monitoring will be undertaken for a minimum of two years in accordance with the Restoration/Habitat Enhancement Plan.

Management Zones

Three broad management zones will be utilised to separate management objectives (refer **Figure 17 - Corhanwarrabul Creek Restoration - Management Zones**).

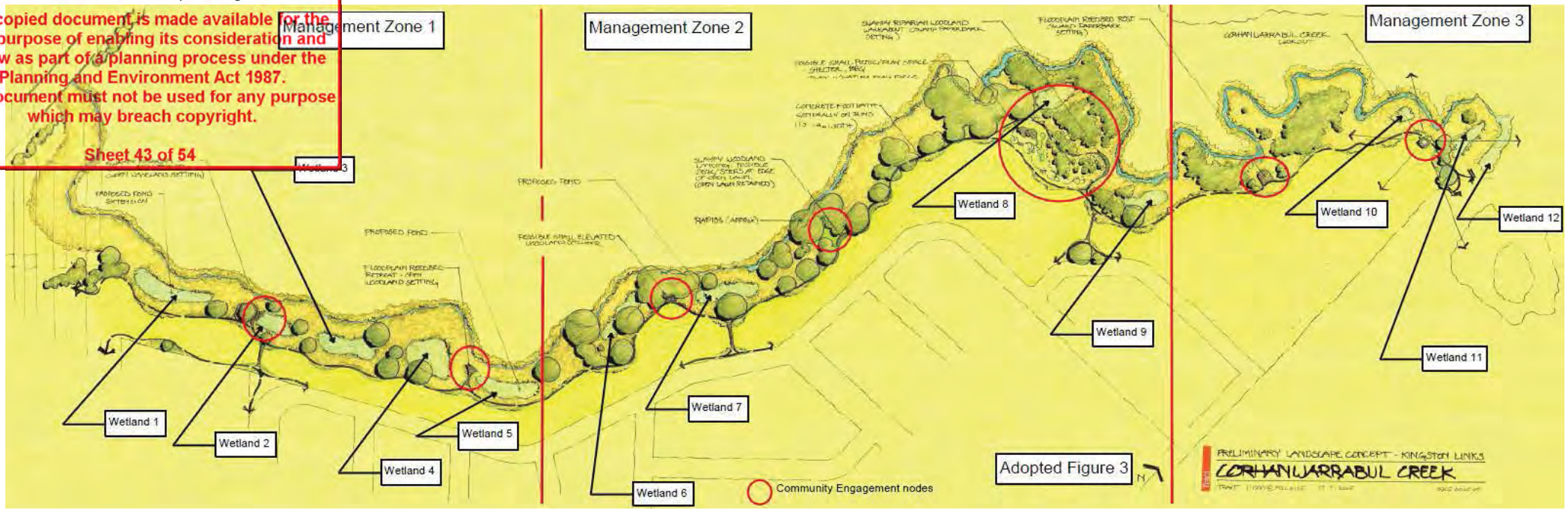


Figure 19 Corhanwarrabul Creek Restoration - Management Zones

WETLAND #	PROPOSAL	CONSIDERATIONS	THREATENED SPECIES
1	Expansion & Enhancement	May require some removal of indigenous vegetation to expand. Located within area of lowest profile, therefore logical and practical landscape position for additional fauna habitat.	Currently unshaded therefore likely to be unsuitable for Dwarf Galaxias. Potential candidate for enhancement of Growling Grass Frog habitat.
2, 3, 6 and 9	Restoration & Enhancement	**Wetlands 2 and 3** are particularly degraded, shallow, silt laden and dominated by weeds. Recommend removing silt load, re-establishing a deeper and more varied profile with a range of emergent and aquatic species to provide structurally diverse fauna habitat. Wetlands 2 and 3 may also be considered for expansion and potential connection. **Wetland 6** is in reasonable condition but requires weed control. Not recommended for expansion due to high number of surrounding trees. **Wetland 9** would benefit from more structurally diverse and complex vegetation, could possibly be enlarged to increase capacity and requires stabilisation of a nick point that will otherwise further erode.	**Wetland 2 and 3** currently unshaded therefore likely to be unsuitable for Dwarf Galaxias. Potential candidate for enhancement of Growling Grass Frog habitat. **Wetland 6** has a good cover of fringing trees, therefore parts of the waterbody are constantly under shade throughout the day. Combined with emergent and aquatic vegetation, wetland 6 may provide an ideal site for enhancement of habitat for Dwarf Galaxias. Although currently unsuitable, **Wetland 9** may provide an additional opportunity for Growling Grass Frog habitat creation
5 and 7	No Modification	Proposed locations for two created wetlands which will effectively create a chain of wetlands and improve connectivity with the creek.	Ideally, these wetlands will be specifically designed with a focus on the ecological requirements of either Growling Grass Frog or Dward Galaxias.
4, 8, 10 and 11	No Modification	These wetlands are in relatively good condition and currently support a diverse range of native fauna and flora. Wetland 4 is a good benchmark for water bird habitat as it supports dense fringing vegetation with both shallow and deep open water. Wetland 8 is a good benchmark for frog and small fish habitat as it contains limited open water and structurally complex emergent and aquatic vegetation. Wetland 10 and 11 are essentially hidden in dense Common Reed and are unlikely to be modified without substantial impacts to remnant vegetation.	Not applicable
12	No Modification	Outside of formal study area and therefore not assessed as part of the current survey	Not applicable

Figure 20 Details of Proposed Corhanwarrabul Creek Remediation Works

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9 ENVIRONMENTAL & GRASSFIRE MANAGEMENT

9.1 DEVELOPMENT PLAN REQUIREMENTS

Section 3 of DPO13 requires that a permit issued for subdivision or buildings and works must include a condition requiring an Environmental Management Plan addressing the construction activities proposed on the land must be prepared to the satisfaction of the responsible authority.

The Environmental Management Plan must include:

- Soil erosion and sediment control provisions to protect Cohanwarrabul Creek and the Stamford Park wetlands from erosion product and sediment transport by minimising erosion of lands during work.
- Hydraulics and hydrology provisions to protect and improve the floodplain, water quality, and habitat value of Corhanwarrabul Creek and the Stamford Park wetlands (measures used should include the installation of a perimeter fence to protect the waterway prior to the commencement of works).
- Protection measures to ensure that disturbance to native flora and fauna habitat is minimised and that any potential for the introduction of exotic fauna species is abated."
- Dust suppression measures to be provided during works to minimise dust impact to Eastlink.
- Measures to prevent construction fill encroaching on or being placed within the Eastlink reserve.
- A Traffic Management Plan for the site identifying the location of the proposed vehicle access point(s) and detailing the measures to ensure amenity of the adjoining areas is not impacted by the movement of vehicles (cars, trucks and construction machinery) associated with construction activities on the site.

Section 4 of DPO13 requires that the Grassfire Management Plan must include:

- A description of the fire risk for the area.
- Road design that:
  - Allows for a range of emergency service vehicles, including large aerial appliances.
  - Incorporates road widths sufficient to accommodate the needs of emergency vehicles.
  - Ensures emergency vehicle access to open space areas and the freeway reserve.
- Notation that planting, landscape and vegetation management within landscape buffers, easements and areas of open space do not increase the risk of fire, including allowing for appropriate emergency service vehicle access.
- The provision of reticulated and or static water supply and hard stand access for fire fighting in strategically located areas.

9.2 ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan will be prepared by the appointed contractor as required by a future planning permit condition.

In response to the Traffic Management Plan required under Section 3 of DPO13, access to the EastLink freeway reserve will not be permitted to be used for contruction and maintenance works.

9.3 GRASSFIRE MANAGEMENT PLAN

The requirements of DPO13 for a Grassfire Management Plan ('GMP') have been addressed in detail in the 'Grassfire Management Plan for Kingston Links Golf Course' (Ecology & Heritage Partners, July 2018).

10 SERVICING

10.1 ROADS & INTERNAL DRAINAGE

Knox City Council is the responsible authority for roads and drainage within the proposed development. All works are to be constructed to relevant Council Standards.

Internal drainage will be directed to the existing Corhanwarrabul Creek and Rowville Main Drain via a system of swales and wetlands to meet Water Quality best practice guidelines.

10.2 MAIN DRAINAGE

Melbourne Water Corporation is the responsible authority for Main Drainage within the proposed development.

Melbourne Water requires retention of current flood storage volumes and treatment of developed flows and water quality measures to best practice guidelines.

Melbourne Water requires that the developer undertakes all necessary drainage works within the site, including necessary site control measures during drainage construction.

Under Section 269A of the Melbourne and Metropolitan Board of Works Act 1958, the Developer will enter into an agreement with Melbourne Water Corporation for the provision of drainage works and the acceptance of surface and storm water from the subject land directly or indirectly into Melbourne Water's drainage system.

10.3 SEWERAGE RETICULATION

South East Water is the responsible authority for sewer provision.

Significant sewer assets are located within the Site with sufficient capacity to service future development. The Developer will be responsible for connecting residential areas to the existing sewer.

Significant sewer assets are located within the site with a 1500mm diameter GRP trunk sewer running along the eastern boundary adjacent to the existing residential lots and falling to the south western corner of the site. A second major 750mm diameter sewer runs along the southern boundary of the existing residential and discharges to the 1500 diameter sewer near the clubhouse.

South East Water has confirmed the proposed development can be connected to the 1500mm diameter branch sewer which would have sufficient capacity to service the development.

South East Water/Melbourne Water requires require 24 hour access to these major sewers and it is not possible to include this area within allotments. It is proposed to relocate the sewer into a future Council road reserve.

10.4 POTABLE WATER

South East Water is the responsible authority for water provision.

The existing mains abutting the property have capacity to service the development via a 225mm diameter water main in Wellington Road, Enterprise Boulevard, and Waradgery Drive. A length of 250m 225mm main will also need to be extended along Wellington Rd to ensure supply to the site.

The Developer will be responsible for extending water mains from the residential areas to the existing water mains.

10.5 NON-DRINKING WATER

No re-use water mains are located in the vicinity of the site.

Private rain-water tanks are recommended for each property to assist with retardation and water quality whilst also providing a sustainable source of water for toilet flushing and gardens use.

10.6 ELECTRICITY SUPPLY

United Energy is the responsible authority for electricity distribution.

Supply is available from the existing overhead electricity in Wellington Road and surrounding streets. Provision of electricity will be in accordance with United Energy's terms and conditions for residential subdivision where each lot will be supplied with an underground electrical supply at the Developer's cost.

10.7 GAS SUPPLY

Multinet Gas is the principal authority responsible for the provision of reticulated gas to this area.

Gas supply is available to the Site from mains in Wellington Road and Enterprise Boulevard. Gas shall be provided to the development in accordance with the terms and conditions of the authority.

10.8 TELECOMMUNICATIONS

NBN will be the telecommunications provider for this development. Telephone facilities are readily provided to the development in accordance with the authority's usual terms and conditions for residential developments.

Existing Telstra and Optus underground telecommunication lines run from Corporate Drive to Clubhouse and Golf Maintenance facility and these will be decommissioned prior to development.

Refer 'Kingston Links Golf Course Development: Preliminary Services Report' (Calibre Consulting, May 2017) as submitted in the documentation supporting Amendment C142.

11 SUSTAINABILITY RATING

11.1 ENVIRODEVELOPMENT

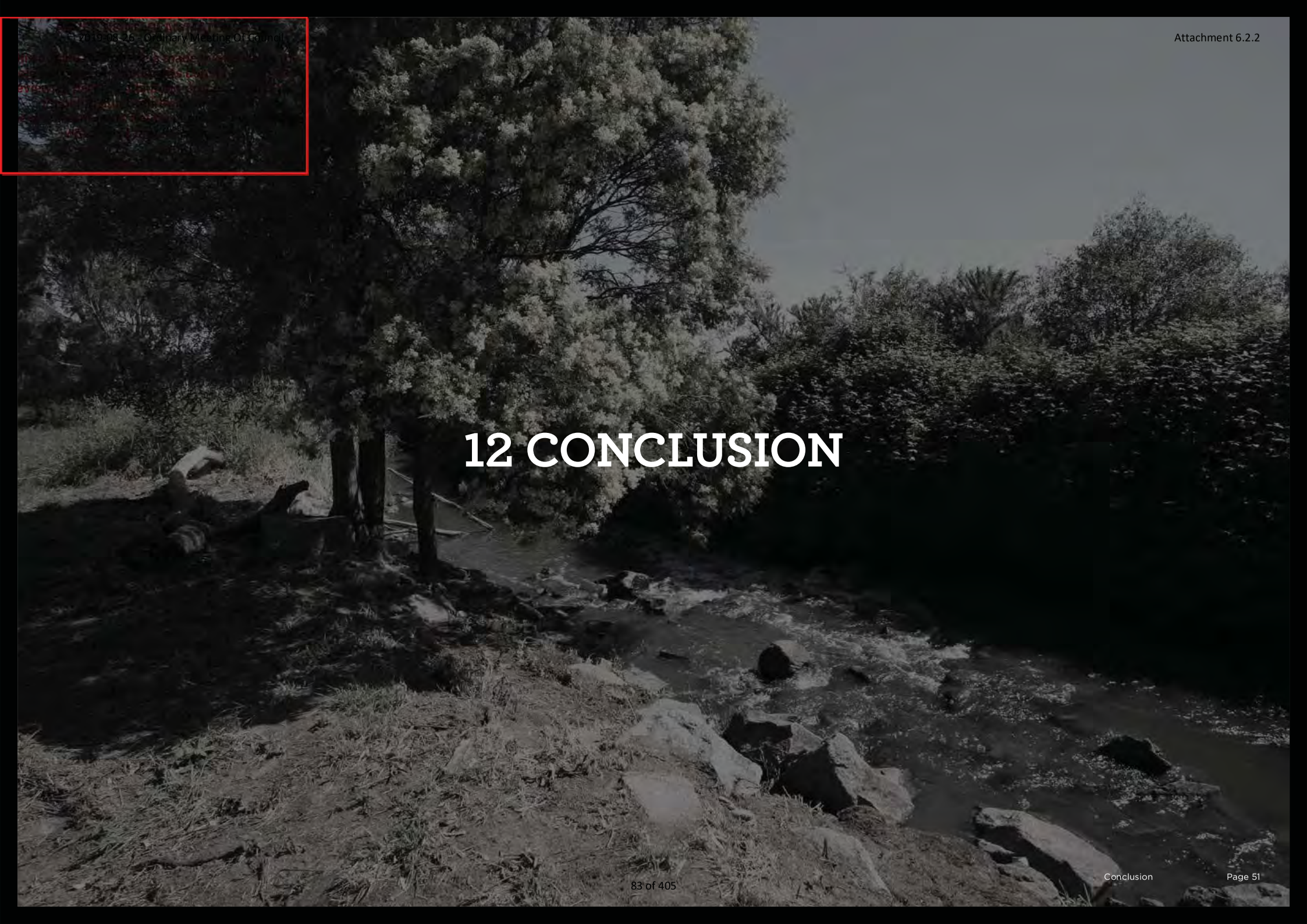
The project as a whole has been prepared to align with the sustainability criteria of the UDIA's 'EnviroDevelopment' national sustainability rating tool National Technical Standards Version 2).

EnviroDevelopment is a scientifically-based assessment scheme that independently reviews development projects and awards certification to those that achieve outstanding performance across four or more of the following elements:

- Ecosystems
- Waste
- Energy
- Materials
- Water
- Community

The Technical Standards are regularly reviewed and updated to ensure they continue to recognise sustainability achievements above government requirements and in light of new technologies and industry standards.

In 2017 the project achieved EnviroDevelopment accreditation for all sic of these possible elements. This accreditation is subject to annual recertification.



12 CONCLUSION

This Development Plan has responded to the requirements of Schedule 13 to the Development Plan Overlay as contained within the Knox Planning Scheme.

The proposed redevelopment of the Site is consistent with State and the local planning policy frameworks which support the revitalisation of strategic redevelopment sites and urban consolidation.

Offering a vibrant and sustainable residential community that will successfully integrate with the existing urban environment, the Kingston Links site will also provide community benefits in addition to residential facilities. In particular, the proposed provision of functional open space adds to the open space network of the local area and enhances pedestrian and cycle prioritisation.

The Site represents a significant opportunity for infill residential development that will provide a unique neighbourhood identity. Development in accordance with this Development Plan will ensure that the potential of the Site is realised in a manner which respects the existing character of the area whilst setting a new benchmark for infill development.

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Tract

KINGSTON LINKS, ROWVILLE

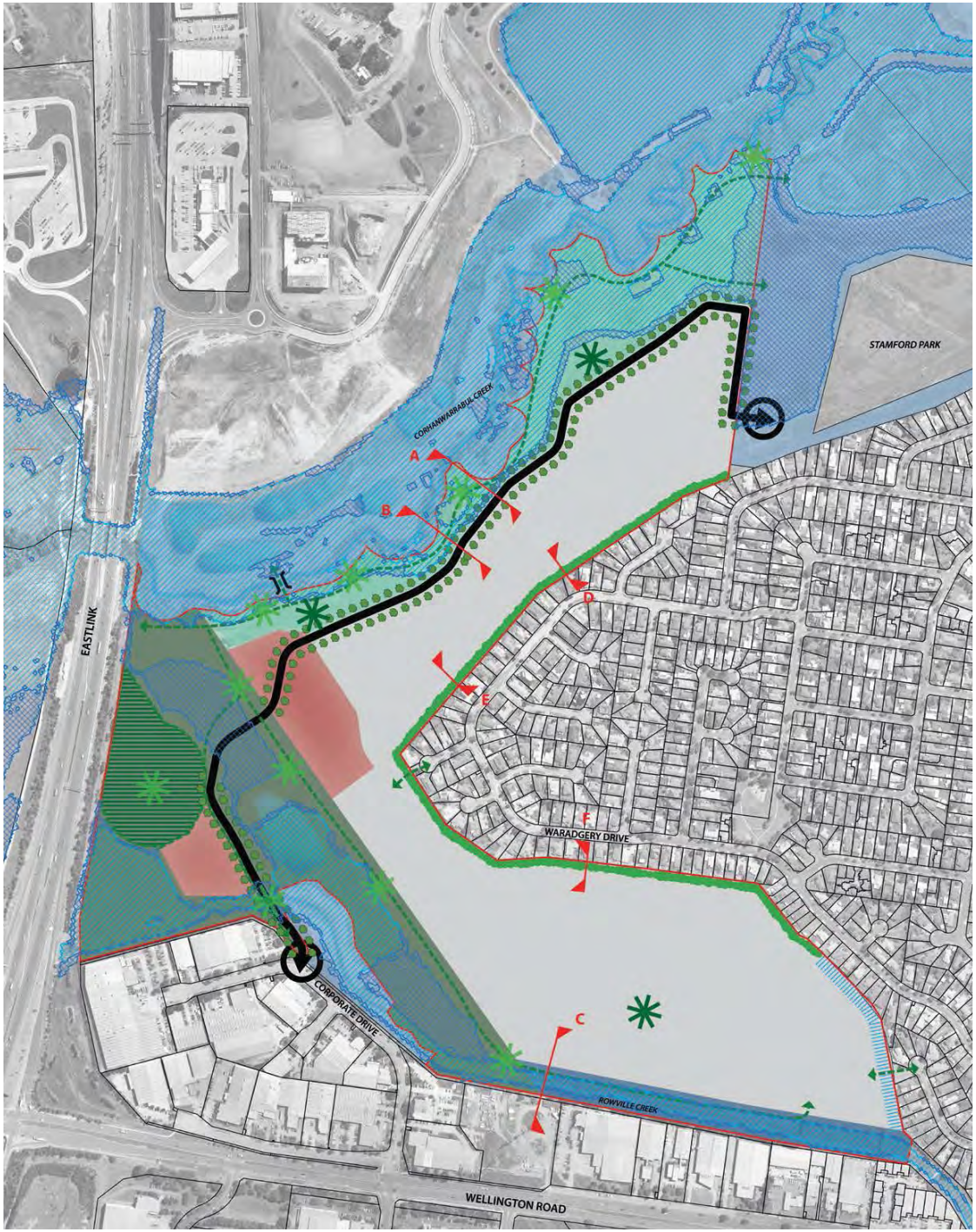
LANDSCAPE MASTERPLAN REPORT

14 Corporate Avenue, Rowville

Prepared by **Tract Consultants**
for **Pask Group**

August 2019
Rev 19

Contents



- Development Plan Boundary
- Potential Boulevard - Major roads through the development acting as a wayfinding mechanism
- Corhanwarrabul Creek Floodplain Reserve - south east area of creek predominantly within the site boundary.
- Powerline Wetland reserve
- Rowville Main Drain Reserve
- Existing off-site Drainage -North west area of creek
- Proposed permanent water bodies (indicative location)
- Active Open Space
- Mixed Use Precinct - Retail / Higher Density Housing
- Indicative Key Landscape Nodes / Features
- Indicative Passive Open Space
- Primary Pedestrian and Cycle Network
- Stamford Park Road / Bus Link (indicative location)
- Site Access Points
- Indicative location of pedestrian bridge
- Landscape Buffer (width 5m-8m)
- Not more than 2 storeys to be built within 15m of rear boundary
- Indicative Q100 - Flood Level
- Indicative Q10 - Flood Level

Note: Q10 and Q100 Flood Levels are indicative only and are subject to further detailed design by others

Policy Context

The indicative Landscape Master Plan has been prepared in accordance with the requirements of Section 3 of the Development Plan Overlay - Schedule 13 (DPO13) contained within the Knox Planning Scheme. This report outlines a vision for the residential development as part of the site's broader development plan which will provide opportunities for people to live within a sustainable green and connected local environment.

The image of Rowville as one of Knox's 'green and leafy' suburbs is recognised as a key aspect of its identity. Planting and maintenance of canopy trees, particularly native and indigenous species in parks, streetscapes, and on private properties is considered important to the community.

Promoting healthy, connected communities and advocating walking and cycling is identified as a Knox City Council priority. Liveable streets, which may include non-standard elements such as: 'pause points,' public art, gardens for wildlife and edible streetscapes, are seen as an important component of achieving this objective. Knox policy promoting walking and cycling also supports increasing the number of interesting destinations in residential streets (such as places for play, gardens of interest, and meeting places).

The protection and expansion of ecological habitats throughout Rowville's reserves, roads, and neighbourhoods is an important goal of the Rowville Plan – with Corhanwarrabul Creek specifically identified as an important ecological and community asset within the Plan. Implementing WSUD to protect sensitive ecological waterways such as Corhanwarrabul Creek is seen as a priority.

As per DPO13, the Landscape Masterplan must include:

- A statement explaining how landscape design addresses the strategic directions within the Knox Open Space Plan 2012-2022 (or as amended).
- A statement explaining how landscape design addresses the strategic directions within the Knox Liveable Streets Plan 2012-2022 (or as amended).
- Details of key landscape design principles and species selected throughout road reserves, along the site's key external interfaces, and within public open space.
- A planting theme that enhances local habitat values and demonstrates compatibility with the inclusion of water sensitive urban design objectives. The planting theme on the western boundary must respond to the landscaping and urban design of EastLink.
- Landscaping for the landscape buffer at the residential interface along the eastern boundary of the land.
- Details of the removal of vegetation not suitable for retention.

NOTE:

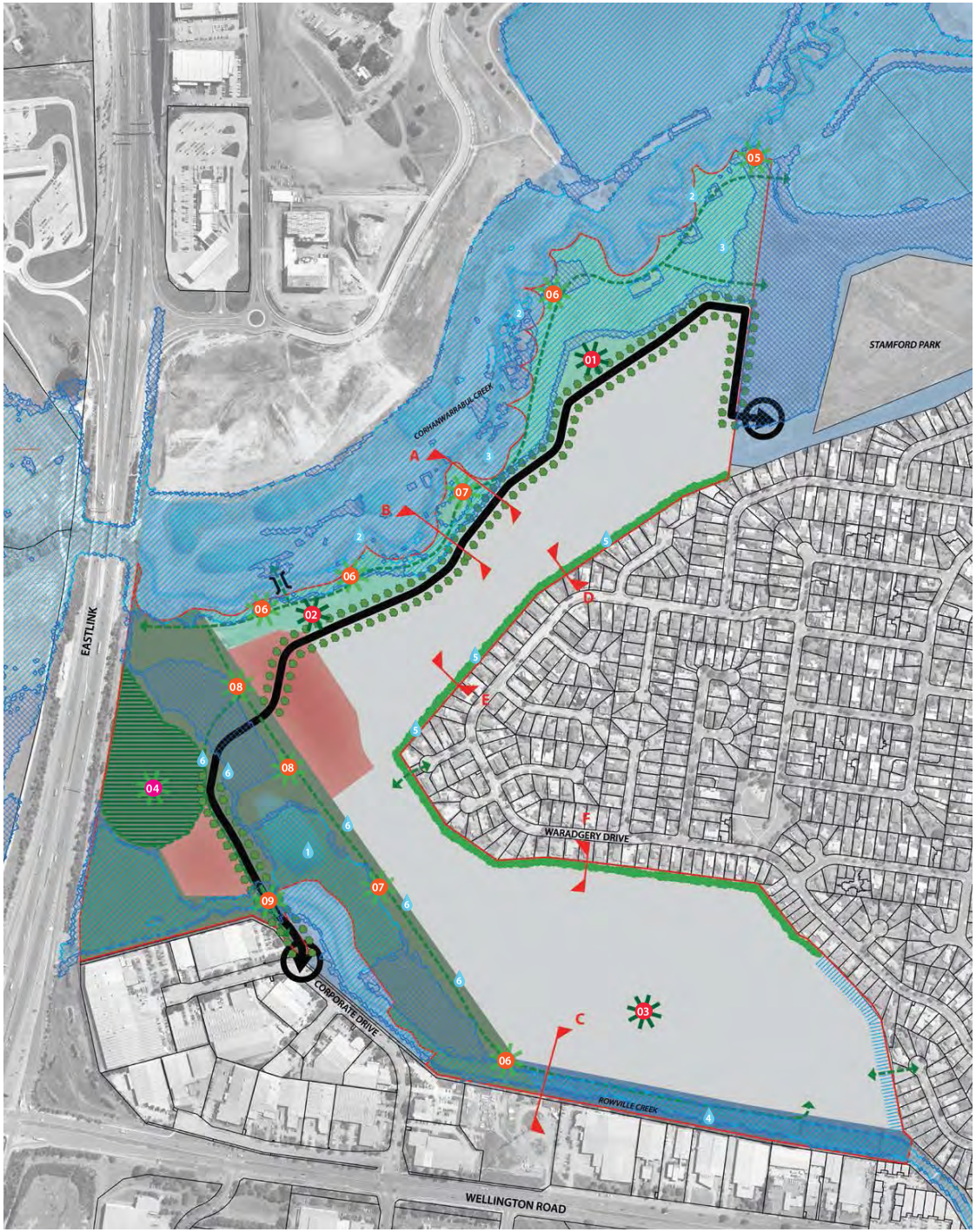
Open spaces will be developed to create a diverse network of open space activities throughout Kingston Links so as to increase usage at all times of the day. Open space network is accessible for use by people of all ages and abilities.

Community hubs to be developed to key open space areas such as open space 2, adjacent the mixed use sites and the active open space precinct.

All landscape features listed are indicative only and are subject to change upon design development and Council approval. In addition to the active open space, the following list is a list of minimum inclusions to be included at Kingston Links.

3 x Shelter & BBQ areas
1 x Adventure playground
2 x Toddler playspace
1 x Nature based playspace
3 x Fitness stations with minimum 3 pieces each
3 x Timber boardwalks / viewing platforms
2 x Grassed kick about spaces
1 x Community outdoor gathering space with 3 phase power for public events
1 x significant permanent water body / wetlands within electrical easement
1 x entrance feature bridge / culvert crossing with public artwork

As required:
- Seating nodes
- Bins
- Bike racks
- Drinking fountains



Landscape Features

Passive Open Spaces

01 Park may include possible:
- Shelter & BBQ
- Minor nature play
- Kick-about space
- Pedestrian bridge connection across the flood plain

02 Park may include possible:
- Shelter & BBQ
- Toilet facilities
- Adventure play
- Water play
- Community amphitheater, including 3 phase power
- Fitness station
- Kick-about space

03 Park may include possible:
- Shelter & BBQ
- Junior play
- Kick-about space

Active Open Spaces

04 Active sports field may include possible:
- AFL and/or soccer fields
- Pavilion
- Car parking
- Fitness stations
- Seating notes

Key Landscape Nodes / Features

05 Corhanwarrabul Creek lookout may include possible:
- Retreat and wandering
- Boardwalks
- Seating

06 Node may include possible:
- Gathering space
- Seating
- Nature Play and / or junior play
- Fitness station
- Public Art

07 Node may include possible:
- Seating
- Pedestrian flood plain / water way crossing

08 Key landscape interface with mixed use zone may include possible:
- Shelter & BBQ
- Seating
- Play
- Boardwalks
- Youth node with skate or BMX elements
- Possible community garden & orchard (if interest is shown)
- Permanent water body and/or wetlands

09 Entrance feature may include possible:
- Feature bridge with potential public art
- Water body

Indicative Locations of Green Infrastructure

1. Wetland
2. Corhanwarrabul Creek restoration
3. Floodway
4. Rowville main drain upgrade
5. Passive irrigation in home streets to nature strips
6. Proposed locations for kerbside rain gardens in lieu of street trees due to electrical easement

Existing Site Conditions - January 2015

Landscape Context

The Site has existing, predominantly native trees and large shrubs to much of its perimeter, which provide a sense of enclosure within a nature/park setting. The presence of Corhanwarrabul Creek along the site's north western boundary, scattered water features, and a gently undulating topography also contribute to this atmosphere.

The existing Kingston Links Golf Course site forms part of a floodplain and is characterised by manicured lawn interspersed with planted native and exotic species. The existing vegetation includes approximately 39 indigenous tree specimen, all located along Corhanwarrabul Creek, and a broad range of planted indigenous, native, pastoral and weed species throughout the site.

The Northwest edge of the site (near Corhanwarrabul Creek) is identified as an area of biological significance. It currently supports vegetation communities considered to be endangered within the bioregion and acts as a wildlife corridor linking other areas of higher conservation significance. Corhanwarrabul Creek offers suitable habitat for Platypus, the nationally listed Growling Grass Frog and Dwarf Galaxias as well as several state significant water birds. In addition, areas of 'archaeological potential' were identified on the Creek's southern bank.

Storm water management is a critical aspect of the Site's transition to a residential development. Cut and fill needs to be carefully balanced to accommodate large areas of on-site water retention.

High voltage power lines currently traverse the Site's south western boundary, bisecting the Site at its westernmost extent. The scale of the supporting towers gives them a strong presence in the landscape.

Access into and out of the estate is currently limited by existing houses to the east, an industrial area to the south and south west, Eastlink to the west, and Corhanwarrabul Creek to the Site's north east. The design challenge is to establish greater pedestrian connectivity beyond the Site.

A pedestrian connection into Stamford Park to the Site's immediate north and beyond is critically important, as is a connection to the Eastlink Shared Path network. There may also be opportunities to form connections with the existing neighbourhood to the east and to Carribbean Gardens. Recreation reserves and bicycle networks along the Dandenong Creek corridors are also in close proximity.

Views into the site are largely obscured by adjacent uses. There are limited views from Wellington Road into the site via the main Corporate Drive vehicle access point and there will be views into the site from the future new residential estate at Stamford Park.

From within the site there are vistas of the Dandenongs. Where not screened by the site's treed perimeter, there are existing unsightly back of industrial use views.

The City of Knox has a strong vision for Stamford Park, a Council-owned and masterplanned integrated residential and parkland future development which includes: an extensive open space system containing an array of both nature-based and recreational amenities, the historic Stamford Park homestead and gardens, and a new sustainability-focused residential development. Kingston Links has an opportunity to provide a seamless interface with Stamford Park and deliver an innovative, high quality design outcome in keeping with what is proposed for Stamford Park.


Existing Site Conditions - January 2015


Existing Site Conditions - January 2015


Existing Site Conditions - January 2015


Existing Site Conditions - January 2015

Landscape Vision & Theming

Stormwater imperatives mean that water will pervade the look and feel of the Site's future residential development. Building upon this, the landscape vision is to tell the 'water story' by making the role of water in the landscape visible and allowing this to permeate design themes and functional outcomes throughout the Site.

As identified in the **Knox Open Space Plan (2012-2022)**, the vision for open space throughout the development will provide for a diversity of leisure activities, and enable people to enjoy nature, engage with others, learn and play. The four key strategic directions identified in the Open Space Plan have helped and will continue drive the landscape design as detailed within this document.

Walking and cycling will be promoted throughout the network of reserves, the creek corridor, electrical easement and a streetscape design which embraces **Knox Liveable Streets Plan 2012-2022** principles. 'Home Streets' as identified in section 5 of Knox Liveable Streets Plan 2012-2022 will be implemented where suitable to create a shared pavement that services pedestrians, traffic and cyclists within one space.

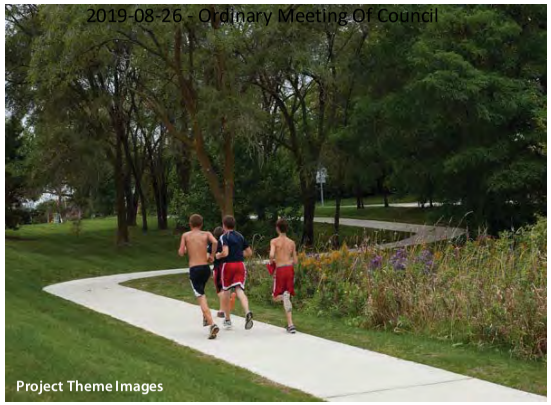
Corhanwarrabul Creek ('the Creek') is the 'jewel' in the Site's open space network. The landscape design response is to embrace the Creek's potential to contribute to the seemingly 'untouched' experience of nature for the benefit of both residents and the ecological communities it supports. Habitat management and maintenance will play a large role in the landscape approach for this zone. All works within this zone will be in accordance with Ecology and Heritage Partners and Melbourne Water's requirements and recommendations and will be carefully planned in respect of existing flora and fauna species. Appreciation of the Site's natural and cultural values will be key design informants for the creek corridor landscape response.

The Site's power lines are a strong element of orientation within the landscape. By converting the ground plain under the power lines into a wetland system inclusive of an integrated trail network, it is envisaged that the power lines will be recognised as synonymous with a 'wetland nature' experience whilst fulfilling water management and environmental objectives.

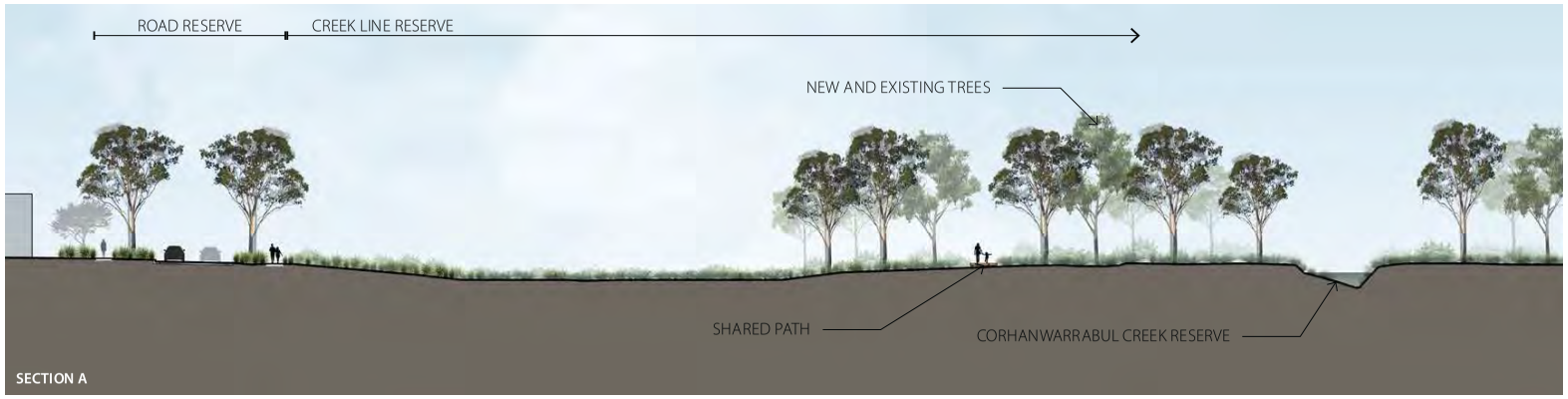
The Rowville Main Drain also forms part of the 'water story' and trail network while acting as a buffer to adjoining industrial uses. As some of the existing planted trees will need to be removed, opportunities will be explored to re-use felled trees for multiple purposes.

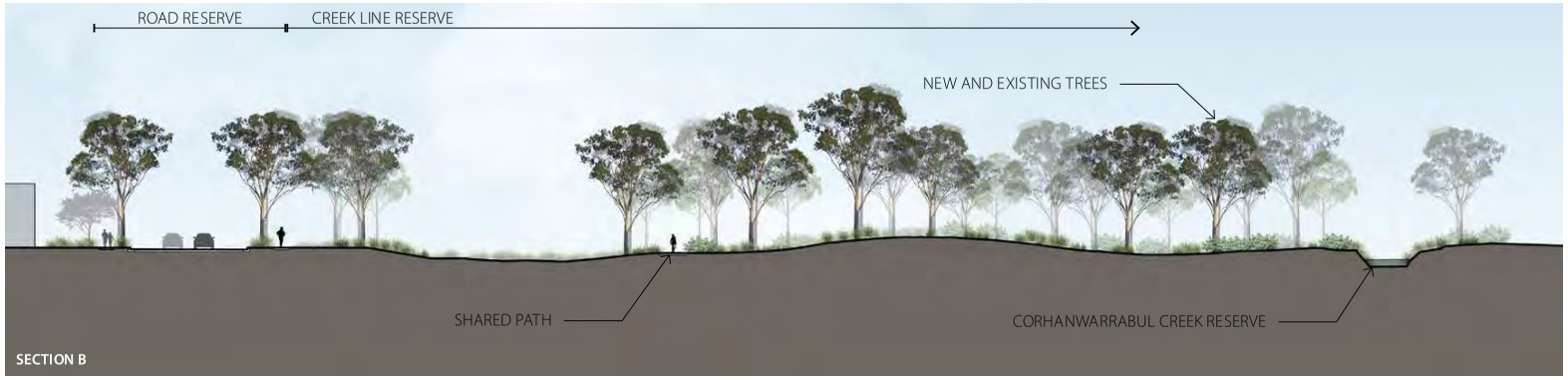
Where appropriate, streetscapes adjacent reserves can also form a chapter in the 'water story', incorporating an efficient WSUD approach to managing storm water, potentially in the form of rain gardens and bio-swales, particularly where streetscapes are adjacent to reserves.

Open space design and construction will be completed to minimise the urban heat island effect through maximising tree planting with broad canopy trees, minimising hard paving surfaces and suitably coloured materials selection for any roofed structures. Residents will be encouraged to plant native and indigenous shade trees through Pask Groups Living Design Principles issued to all purchasers.



Project Theme Images





Key Landscape Treatments

The Kingston Links masterplan incorporates a linked series of open spaces that will offer a unique collection of nature-based experiences, encouraging walking and cycling. These include: Corhanwarrabul Creek Reserve, Powerlines Wetland Reserve and, Rowville Main Drain Reserve.

Corhanwarrabul Creek Reserve

Restoration works are planned for Corhanwarrabul Creek under the guidance of Ecology and Heritage Partners' report Corhanwarrabul Creek, Kingston Links Section: Restoration / Habitat Enhancement Plan, (July 2016) and in accordance with Melbourne Water and Knox City Council requirements. Creek buffer zones will be respected in the landscape design response. It is anticipated that a small area at the site's north may be set aside as platypus habitat, and pedestrian access discouraged.

Corhanwarrabul Creek Floodplain Reserve

The Corhanwarrabul Creek Floodplain Reserve will act as a buffer between Corhanwarrabul Creek and the proposed new residential zone while also catering for flood events. The Reserve is intended to form a seamless extension of Corhanwarrabul Creek's tapestry of indigenous riparian and woodland vegetation interwoven with open lawn for play, picnicking and relaxing. Additional indigenous shade trees are to be planted throughout the creek corridor.

The opportunity to include Creek-side nodes linked with EVC-based settings may be considered. These could provide the opportunity to linger and enjoy nature, and could also form potential starting points for more concentrated creek restoration efforts. (Refer also Ecology and Heritage Partner's report (ibid).

A shared path is planned for the Reserve, connecting Kingston Links' reserves with Stamford Park's path network, facilities and open space reserves.

There is an opportunity to incorporate a local park within the Floodplain Reserve near the site's mixed use precinct, offering seating, nature-based play, and picnic facilities.

Powerline Easement - South Morang

Drainage Reserve - Manor Lakes, Wyndham Vale

Powerlines Wetland Reserve

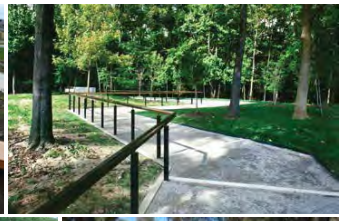
The area under the Site's power lines is to be sculpted for water retention and treatment and forms a significant opportunity to create an expansive wetland system.

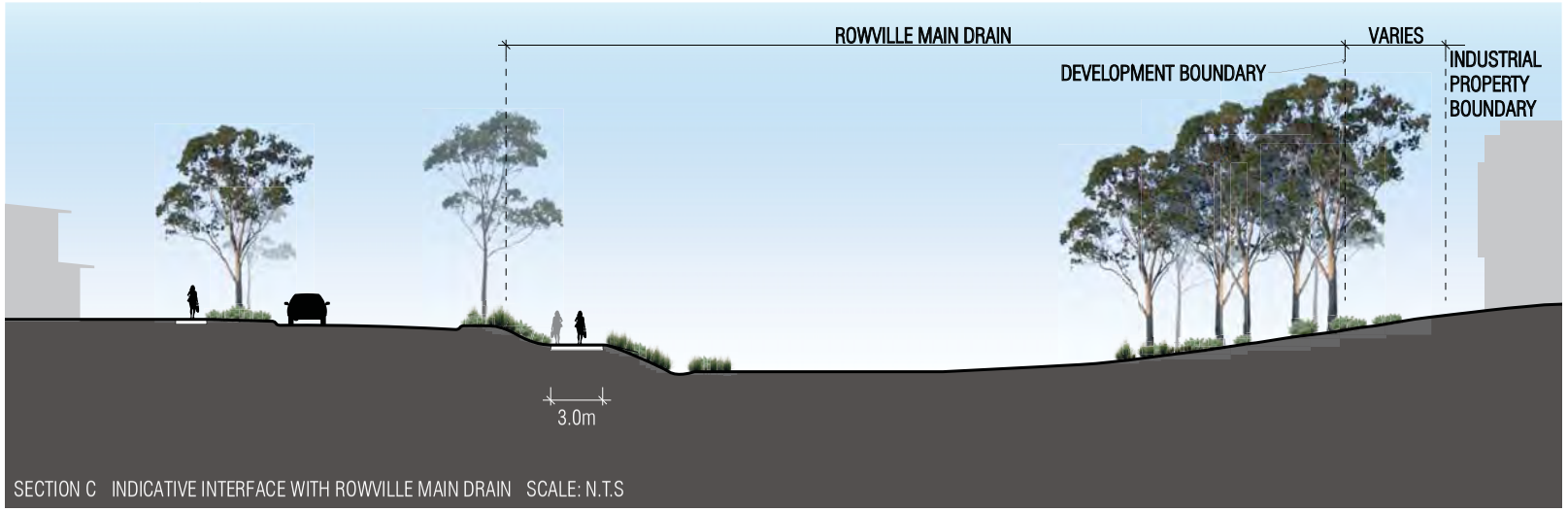
While meeting Melbourne Water's requirements will be the key priority in the design of the Reserve, the design response will also be guided by SP Ausnet's 'guide to living with transmission line easements'. The design will seek to maximise the Site's opportunity to contribute to habitat creation, and where possible will also provide recreational opportunities. Shared path and seating will be incorporated within the Reserve.

Rowville Creek Reserve

The proposed path system will also include the Rowville Main Drain, a Melbourne Water drainage channel that will be reshaped as part of the Site's stormwater management programme. During this transition, the existing channel will be widened, its profile changed, and a more natural, meandering form constructed within its low-flow alignment. The change will improve the drain from a pure engineering function to a more landscape-designed outcome.

Existing buffer planting will be strengthened where gaps exist and wetland/creek vegetation will be incorporated within the low-lying areas of the reserve. The shared path running along the Reserve's residential edge will be sheltered by proposed indigenous canopy trees. Opportunities will be explored to passively activate the space for recreational use where suitable.





SECTION C INDICATIVE INTERFACE WITH ROWVILLE MAIN DRAIN SCALE: N.T.S

Residential Buffer

The residential buffer will aim to retain high amentity trees where pratical with a new local road. The width of this buffer will range from 5m-8m depending on context and the detailed subdivision design response. Where suitable, planting of both shrubs and trees will create a green edge and screening effect for existing adjacent residents and residents of the new community.

Industrial Interface

Treatments to the Site's industrial interfaces will include retention of existing trees where possible and under-canopy planting to further screen and soften these interfaces.

Public Art Network

Up to three pieces of public art may be strategically positioned across the development. Any proposal for public art will be subject to Council review and endorsement. Contact will local artists will be sought to develop artwork. The indicative location of the potential pieces has been noted in the Landscape Features diagram on page 4.

Open Space Management

The landscape design response will incorporate drought tolerant plant species and for areas of open space, warm season grasses will be recommended. Calibre will work with Tract and Council's open space team to design spaces that require little ongoing water requirement while providing a balance between passive recreation, urban heat island mitigation, and habitat creation.

The development offers the City of Knox the opportunity to inherit assets that support the governmental objectives of providing water sensitive cities that provide multiple benefits to the community and the environment.

During the detailed design phase, maintenance issues such as mulching, mowing angles and maintenance access will be discussed in consultation with Council. A landscape maintenance program will be implemented which will present the development site, at all times, as a high quality and well maintained environment.

It is expected that the site's creek and drainage reserves will be Melbourne Water assets which are maintained by Knox City Council under a maintenance agreement. WSUD elements within these zones are expected to become Council assets and the management regime for these facilities will be similar to that for other similar facilities. Further detail can be provided in this regard when design development progresses.

Planting Design Approach

The landscape concept for tree planting and understory species selection will be influenced by the existing site conditions and the context established by its surrounding residential, industrial, and creek environs setting. The site has a strong native character, but with an element of exotic trees at its Corporate Drive edge. The design will be structured to respond to the different precincts and landscape settings within the development and to use planting to highlight special use areas such as the mixed use hub and pocket parks.

The site attributes and wider setting have led to a four zoned approach to planting:

Zone 1 runs along the interface with Corhanwarrabul Creek. It will be exclusively Indigenous planting to council requirements. Indigenous understory and trees species will be used to enhance environmental values and to improve habitat potential for indigenous fauna. This particularly applies to perimeter reserves and buffer zones. Local community and stakeholders to be involved and educated during planting works.

Zone 2 acts as a native buffer to the indigenous planting of Corhanwarrabul Creek and a native transitional zone to EastLink planting. The species selection will be informed by and designed to act harmoniously with the adjacent planting.

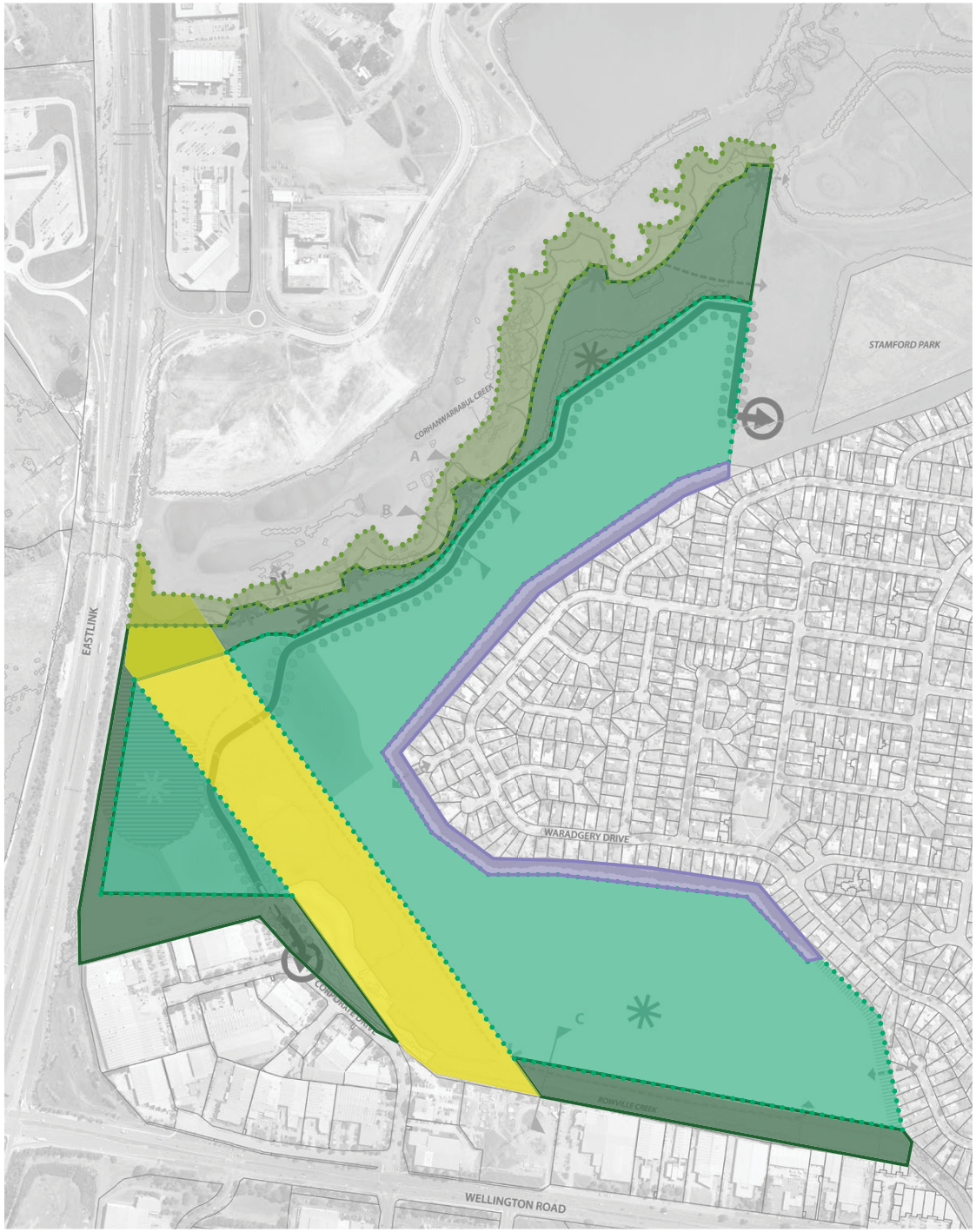
Zone 3 covers the electrical easements running north-west to south-east through the site. Species selection and attributes will be in accordance with AusNet requirements, including no trees higher than 3m.

Zone 4 is a mix of native and exotic plants appropriate to the site. It is anticipated that species selections will be heavily weighted towards native and indigenous species. Exotic species will play a strong role in key areas such as residential pocket parks, landscape nodes in reserves, laneways, some residential areas and mixed use areas. This species list is anticipated to evolve throughout the life of the project to respond to climatic conditions, residents feedback and the success of selected species in the early stages of development.

Zone 5 is the interface between proposed residential and existing residential. It will be Indigenous planting to council requirements. Indigenous understory and trees species will be used to enhance environmental values and to improve habitat potential for indigenous fauna.

Canopy cover is an important part of Knox character and key to reducing the urban heat island effect. As a result, canopy trees will play a large role in the planting approach and feature in zones 1, 2 and 4. The Kingston Links Living Design Principles (Prepared by Pask and Tract) will offer guidelines for residents and thier front gardens, all of which will feature at least two trees, one of which must be native. This will ensure private land in the development contributes to increased canopy cover and native theme.

Plant species that enhance local habitat values and are drought tolerant will be preferred during planting design.



Zone 1 - Corhanwarrabul Creek

Indigenous planting of local provenance - to council requirements

Zone 2 - Native Buffer

A buffer of native plants between the indigenous creekline and zone 4. A native buffer will also be utilised along the EastLink interface to ensure consistent planting.

Zone 3 - Electrical Easement

Planting to AusNet requirements under electrical easements, including no trees higher than 3m.

Zone 4 - General Zone

A mixture of native and exotic planting appropriate to site.

Zone 5 - Residential Buffer

Indigenous planting of local provenance - to council requirements.

BOULEVARD / NODAL TREES


Quercus coccinea
Scarlet Oak


Ulmus parvifolia
Chinese Elm

EXOTIC


Acer freemanii 'Autumn Blaze'
Freeman Maple


Koelreuteria paniculata
Golden Rain Tree


Pistacio chinensis
Chinese Pistache


Zelkova serrata
Japanese Zelkova

NATIVE & INDIGENOUS


Acacia melanoxylon
Blackwood


Angophora costata
Smooth-barked Apple


Corymbia citriodora 'Scentuous'
Dwarf Lemon Scented Gum


Eucalyptus melliodora
Yellow Gum


Eucalyptus pauciflora
Snow Gum


Eucalyptus torquata
Coral Gum


Eucalyptus scoparia
Wallangarra White Gum

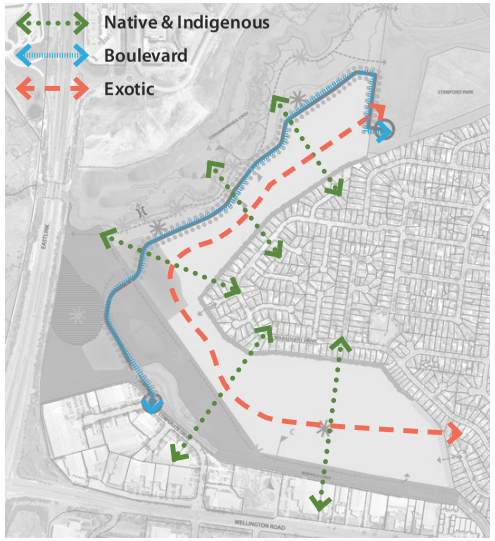

Ficus rubiginosa
Port Jackson Fig


Lophostemon confertus
Brush Box


Melia azedarach 'Elite'
White Cedar


Tristaniopsis laurina
Water Gum


Waterhousea floribunda
Weeping Lilly-Pilly



Street Tree Design Approach

Tree planting in the City of Knox includes a range of mainly native species however exotic deciduous trees have been used along boulevards, within shopping centres and existing residential areas including the Rowville area. This will be continued through Kingston Links.

Tree planting within Kingston Links is intended to contribute to Rowville's identity as one of Knox's 'green and leafy' suburbs through the inclusion of canopy trees, particularly native and indigenous species.

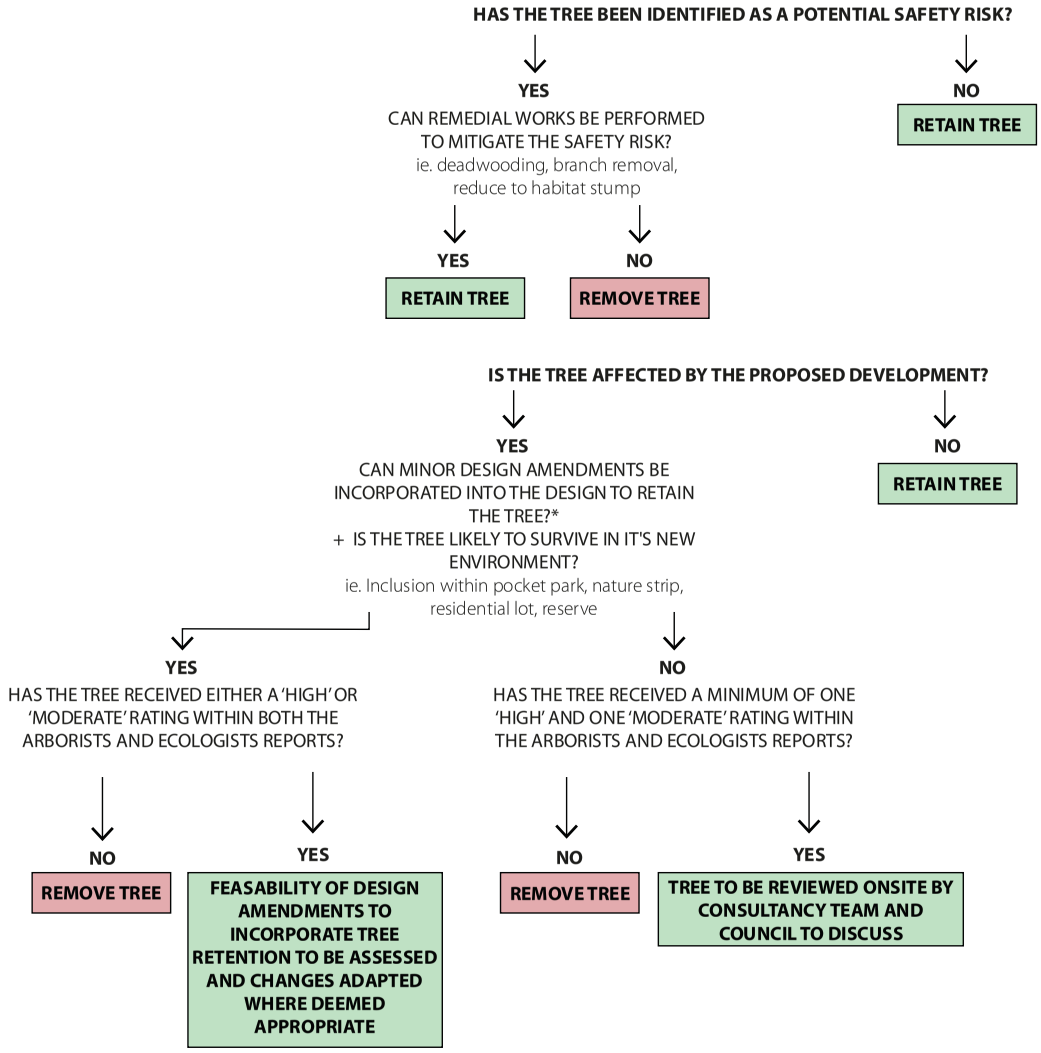
A list of indicative street tree species is represented to the left of the page which has been derived from:

- Existing trees species onsite
- Knox City Council Streetscape Policy

All roads that 'cross through' the development between existing residential and waterways will act as habitat corridors for native fauna. These key green fingers will feature native species.

While most street tree planting will be drawn from a native and indigenous palette, exotic trees are proposed for the entry boulevard and key internal roads. Use of exotics within the entry boulevard is intended to create a more readily recognisable entry point. The use of exotics within the site's proposed key streets will assist with orientation and way-finding.

The Kingston Links Living Design Principles (LDP) will require that each front garden has at least one native tree. This will contribute to the habitat value of the development and help maintain ecological corridors within the site and with the neighboring areas.



*NOTE: The effect of minor amendments must be considered on a cumulative basis.
The developer reserves the right to determine whether the impact of amendments is considered minor.

Integrated Summary of Approach to Trees

With over 3000 trees onsite at Kingston Links, the development's approach to tree removal needs to be carefully considered to ensure a successful outcome for all stakeholders. A priority for tree retention, where suitable, will benefit the development outcome and help guide the consultancy team during the design process. Rather than bulk tree removal, trees will be moved on a stage by stage basis throughout the development process. This staged tree removal will help limit the impact of overall tree removal on site, allowing decisions to be made when a more detailed assessment is possible rather than upfront before detailed designs are complete and all parameters are known.

At Council's request, a hierarchy of tree retention for Kingston Links has been developed taking both arboricultural value (as noted in TreeLogic's report: *Arboricultural Assessment, Kingston Links Golf Course, 14 Corporate Ave., Rowville, 24/6/2016)* and habitat value (as identified in Ecology and Heritage Partners' June 2016 report: *Detailed Flora and Fauna Assessment, Kingston Links Golf Course: 14 Corporate Avenue, Rowville, Victoria*) into consideration.

Tree ranking is a key informant within the proposed tree retention and removal decision matrix flow chart (left) which illustrates the proposed approach to tree retention and removal at Kingston Links. Highly ranked trees will be given priority for retention over lesser-ranked trees. The existing trees throughout the site and their 'tree ranking' will help inform the subdivision layout. The effects of the subdivisions' detailed design and road layout will help guide decisions on tree removal and retention.

The development of Kingston Links Golf Course into residential land will have a major impact on the hydrology of the site. Although the TPZ of a particular tree may not be affected by the development, consideration of tree survival within evolving site conditions needs to be given prior to amending designs to retain any particular tree.

The hierarchy of tree retention and tree retention decision matrix will guide the planning stages of the development. Detailed tree retention and removal plans reflecting the outcome of this process will be provided on a stage by stage basis at permit stage.

Sustainability Principles

The project as a whole has been prepared to align with the sustainability criteria of the UDIA's 'EnviroDevelopment' national sustainability rating tool National Technical Standards Version 2).

EnviroDevelopment is a scientifically-based assessment scheme that independently reviews development projects and awards certification to those that achieve outstanding performance across four or more of the following elements:

- Ecosystems
- Waste
- Energy
- Materials
- Water, and
- Community

In 2017 the project achieved EnviroDevelopment accreditation for all six of these possible elements. This accreditation is subject to annual recertification.

Landscape has an important role to play in achieving this recertification. In particular, this Masterplan ensures that the landscape response at Kingston Links will achieve the following EnviroDevelopment principles:

Ecosystems

- Urban heat island effect reduction
- Ecosystem rehabilitation in the degraded Corhanwarrabul Creek Corridor
- Establishing and encouraging vegetation communities within the project
- Habitat tree retention within streetscapes/open space areas where appropriate
- Ensuring ecological corridors are not severed by road networks and fauna movements across the site are considered
- Incorporating food bearing and/or cultural landscapes within the public realm

Waste

- Where waste bins are installed in the public realm, provision of separate waste receptacles for general and recyclable waste, subject to Council approval

Materials

- Use of re-used or salvaged materials and/or recycled content materials in hard landscaping
- Use of vegetative debris as mulch (minimum depth of 75mm)
- Re-use of non-contaminated soil in site soft landscape works
- Use of materials comprising reused, recycled, concrete with >30% supplementary cement, and or recycled aggregate components

Water

- Use of drought tolerant species within the public realm requiring no irrigation post-establishment
- Adopting strategies of soil amelioration and mulch application to increase the effectiveness and efficiency of irrigation /watering during establishment

Community

Public realm design which:

- Demonstrates a hierarchy of functions
- Allows multiple uses by community members of various ages and abilities with regard to safety, comfort, and security
- Encourages inclusiveness and promotes connectivity
- Creates spaces for social interaction
- Demonstrates a well-considered choice of materials
- Sites seats carefully taking microclimate into consideration
- Creates locally distinct places that connect people through place and strongly reflects the local identity of the area
- Builds flexibility into the public realm for multiple uses
- Provides an attractive, safe and walkable street environment
- Provides a number of parks, catering for a range of uses and people of varying ages and abilities
- Establishes active travel links/shared paths that are attractive, safe, direct and convenient
- Includes supporting infrastructure (eg. seats, drinking fountains, etc) in desirable locations such as where there is shade or shelter

indigenous plant installation at Kingston Links - 2016

indigenous plant installation at Kingston Links - 2017

Plant Schedule

Code	Botanical Name	Common Name	Pot Size	No. per m2	Installation Height/ Calliper	Mature Height x Width	Quantity
Tree							
AMX	*Acacia melanoxylon*	Blackwood	45L	as shown	2.2 - 2.5m / 30mm	12 - 15 x 5m	6
ANG	*Angophora costata*	Smooth Bark Apple Myrtle	45L	as shown	2.2 - 2.5m / 30mm	20 x 12m	15
CSC	*Corymbia citriodora 'Scentuous'*	Lemon Scented Gum	45L	as shown	2.2 - 2.5m / 30mm	30 X 15m	5
ELC	*Eucalyptus leucoxylon ssp. connata*	Yellow Gum	45L	as shown	2.2 - 2.5m / 30mm	12 x 10m	30
EMA	*Eucalyptus mannifera*	Brittle Gum	45L	as shown	2.2 - 2.5m / 30mm	15 x 12m	18
EME	*Eucalyptus melliodora*	Yellow Box	45L	as shown	2.2 - 2.5m / 30mm	12 x 8m	20
EPC	*Eucalyptus pulchella*	White Peppermint	45L	as shown	2.2 - 2.5m / 30mm	15 x 6m	10
EUO	*Eucalyptus ovata*	Swamp Gum	45L	as shown	2.2 - 2.5m / 30mm	20 x 10m	15
PCC	*Pyrus calleryana 'Chanticleer'*	Ornamental Pear	45L	as shown	2.0 - 2.5m / 30mm	11 x 6m	4
TTL	*Tristaniopsis laurina*	Kanooka	45L	as shown	2.0 - 2.5m / 30mm	12 - 15 x 4 - 6m	5
Shrub							
AFD	*Acacia fimbriata dwarf 'Crimson Blush'*	Dwarf Fringed Wattle	200mm	3/m2	-	-	92
CVG	*Callistemon viminalis 'Green John'*	Green John'	150mm	3/m2	-	-	69
CWA	*Callistemon citrinus 'White Anzac'*	White Anzac Bottlebrush	200mm	3/m2	-	-	126
GCV	*Grevillea rosmarinifolia 'Crimson Villea'*	Crimson Villea Grevillea	150mm	3/m2	-	-	83
HME	*Hardenbergia 'Meema'*	Hardenbergia Meema	150mm	3/m2	-	-	149
WMU	*Westringia fruticosa 'Mundi'*	Prostrate Native Rosemary	150mm	3/m2	-	-	51
WZN	*Westringia 'Zena'*	Zena Westringia	150mm	4/m2	-	-	30
Ground Cover							
BKB	*Banksia integrifolia 'Birthday Candles'*	Banksia 'Birthday Candles'	150mm	3/m2	-	-	155
EGK	*Eremophila glabra 'Kalbarrie Carpet'*	Emu Bush Cultivar	150mm	3/m2	-	-	51
GCC	*Grevillea rhyolitica x juniperina 'Cherry Cluster'*	Cherry Cluster	150mm	3/m2	-	-	144
GJG	*Grevillea juniperina 'Gold Cluster'*	Gold Cluster Grevillea	150mm	3/m2	-	-	138
Tufting							
DCB	*Dianella caerulea 'Breeze'*	Breeze Flax Lily	150mm	4/m2	-	-	416
DNT	*Dianella tasmanica*	Tasman Flax-lily	150mm	4/m2	-	-	73
LLT	*Lomandra longifolia 'Tanika'*	Fine Leaf Spiny Headed Mat Rush	150mm	4/m2	-	-	781
LML	*Lomandra longifolia*	Spiny-headed Mat-Rush	150mm	4/m2	-	-	195
LTF	*Lomandra 'Lime Tuff'*	Lime Tuff Mat Rush	150mm	4/m2	-	-	112
PES	*Poa morrisii*	Blue Tussock Grass	tubestock	5/m2	-	-	57

Plant Mixes

Planting Zone	Area (m2)	Pot Size	Density	Total Quantity
Mix A	363	Tubestock	8	2904
Mix B	601	Tubestock	4	2404
Mix C	515	Tubestock	4	2060
Mix D	148	Tubestock	4	592
Mix E	29	Tubestock	4	116

Botanical Name	Common Name	Percentage Mix	Quantity	Local Provenance
Mix A				
Carex appressa	Tall Sedge	30%	871	LP
Isolepis nodosa	Knobby club rush	40%	1162	LP
Juncus flavidus	Yellow rush	30%	871	LP
Mix B				
Dianella revoluta	Flax Lily	25%	601	LP
Enadia nutans	Nodding Saltbush	10%	240	LP
Lomandra filiformis	Wattle Mat-Rush	25%	601	LP
Lomandra longifolia	Spiny-headed Mat-rush	25%	601	LP
Poa labillardieri	Common Tussock Grass	15%	361	LP
Note: Plant *Poa labillardieri* in groups of 10-15 no.				
Mix C				
Acacia acinacea	Gold Dust Wattle	3%	62	LP
Carex appressa	Tall Sedge	15%	309	LP
Dianella revoluta	Flax Lily	17%	350	LP
Enadia nutans	Nodding Saltbush	15%	309	-
Lomandra filiformis	Wattle Mat-Rush	10%	206	LP
Lomandra longifolia	Spiny-headed Mat-rush	20%	412	LP
Poa labillardieri	Common Tussock Grass	10%	206	LP
Themeda triandra	Kangaroo Grass	10%	206	LP
Notes: 1. Plant *Acacia acinacea* in groups of 3 no. scattered througout Mix C 2. Plant *Poa labillardieri* in groups of 10-15 no.				
Mix D				
Chrysocephalum apiculatum	Yellow Buttons	15%	89	-
Dianella revoluta	Flax Lily	15%	89	LP
Lomandra filiformis	Wattle Mat-Rush	15%	89	LP
Lomandra longifolia	Spiny-headed Mat-rush	20%	118	LP
Poa labillardieri	Common Tussock Grass	15%	89	LP
Themeda triandra	Kangaroo Grass	20%	118	LP
Mix E				
Dianella revoluta	Flax Lily	30%	35	LP
Lomandra filiformis	Wattle Mat-Rush	30%	35	LP
Lomandra longifolia	Spiny-headed Mat-rush	10%	12	LP
Poa labillardieri	Common Tussock Grass	30%	35	LP

Tim Neville Arboretum Plant Schedule

Dobson Park and Tim Neville Arboretum, Ferntree Gully - Council exemplar

Tim Neville Arboretum carpark with raingardens, Ferntree Gully

Green Infrastructure

A network of green infrastructure will be an important part of Kingston Links and will be intergrated throughout the development during detailed design. The quantity and extent of these elements will be subject to Council approval.

Key elements include:

- A wetland system, outlined in the Hydrology report by Water Tech
- The rehabilitation of the Corhanwarrabul Creek Corridor
- The upgrade of Rowville Drain
- The use of rain gardens in appropriate streetscapes for WSUD pro, including kerb outstands.
- Passive irrigation to naturestrips through the use of 'home streets'. Water from the road drains directly into naturestrips without a barrier kerb.

Green Infrastructure at Kingston Links will be informed and inspired by existing examples within Knox CC such as the irrigation lake and rain gardens at the Time Neville Arboretum in Ferntree Gully and rain gardens along Sheffield Road, in the The Basin.

Knox Council's Aquatic Species Plant List will be drawn from for planting species selection for the wetlands and other WSUD water treatment assets. Bird netting will also be installed to protect certain plant species, particularly those at the Littoral Zone of the wetlands; until plants have established to protect from bird damage.

Please refer to the landscape features masterplan (page 4 of this document) for indicative locations and details on green infrastructure to be provided at Kingston Links.

ecology & heritage partners

Final Report

Grassfire Management Plan for Kingston Links Golf Course: 14 Corporate Avenue, Rowville, Victoria

Prepared for

Pask Group Pty Ltd

June 2019

Ecology and Heritage Partners Pty Ltd

DOCUMENT CONTROL

Assessment	Grassfire Management Plan for Kingston Links Golf Course: 14 Corporate Avenue, Rowville, Victoria
Address	Kingston Links Golf Course: 14 Corporate Avenue, Rowville, Victoria
Project number	11040
Project manager	Jared McGuiness (Botanist)
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Mapping	Monique Elsley (GIS Coordinator)
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Bioregion	Gippsland Plain
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Council	Knox City Council

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Draft	Report sent to client	29/06/2018
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Final v3	Report sent to client – minor changes based on CFA comments	26/02/2019
Final v4	Report sent to client – minor changes based on further CFA comments	14/06/2019

CONTENTS

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd were engaged by Pask Group Pty Ltd to prepare a Grassfire Management Plan (GMP) for the development of Kingston Links Golf Course, 14 Corporate Avenue, Rowville, Victoria (the study area).

The study area is proposed to be subdivided for residential development, including areas with mixed-use development, a sports oval and passive open space (Attachment 1).

Ecology and Heritage Partners understand that the GMP is required to address the grassfire risk as part of the greater Development Plan for the City of Knox. Specifically, this GMP has the following requirements:

- Provides a description of the fire risk for the area;
- Ensures that planting, landscape and vegetation management within landscape buffers, easements and areas of open space do not increase the risk of fire, including allowing for appropriate emergency service vehicle access;
- Provides a road design that:
    - Allows for a range of emergency service vehicles, including large aerial appliances;
    - Incorporates road widths sufficient to accommodate the needs of emergency service vehicles; and
    - Ensures emergency vehicle access to open space areas and the freeway reserve; and
- Provides a reticulated and/or static water supply system, and hard stand access for firefighting in strategically located areas.

1.2 Study Area

The study area comprises approximately 68 hectares and is located approximately 25 kilometres south-east of the Melbourne's central business district. It is bound by Corhanwarrabul Creek and Caribbean Lake to the north, residential properties to the east, industrial buildings to the south and Eastlink to the west (Attachment 1). The study area is slightly undulating, possibly due to the nature of the golf course, which has dunes and bunkers throughout. There are several scattered small lakes in the study area, with the area under the powerline easement providing conditions in which tall grasses and shrubs thrive.

According to the Department of Environment, Land, Water and Planning's (DELWP) NatureKit (DELWP 2018), the study area occurs within the Gippsland Plain bioregion. It is located within the jurisdiction of the Port Phillip and Westernport Catchment Management Authority, and the Knox City Council municipality.

2 FIRE RISK TO THE STUDY AREA

At the landscape scale, the study area is in a highly urbanised setting, with residential, commercial and industrial buildings for several kilometres (Attachment 2). Six prescribed burns have occurred within approximately 1.5 kilometres of the study area since 2015, however these have been narrow burns adjoining built assets, such as Eastlink and residential properties. The closest bushfire to occur to the study area since 1983 (i.e. Ash Wednesday) was approximately two kilometres south-east in the Dandenong Police Paddocks Reserve (Attachment 2).

The most likely directions of fire attack on days of increased fire risk in Victoria are from the north-west or south-west. At a landscape-scale, it is plausible for a fire to travel through the open area running along the western side of Eastlink if there is enough cured fuel, however it would not pose a threat to the study area given that Eastlink provides a large physical barrier (Attachment 2). There is also a high potential that the fire would be extinguished before or as it approached Eastlink given that there are several roads and tracks to slow its momentum, and firefighting crews would be on site within minutes on an average day.

Given that the study area is bound by buildings and a major freeway in three directions, the only plausible direction of grassfire approach is from the north. A local fire is possible from this direction through the grassed area (Attachment 1), however it's impact potential is likely to be low for a number of reasons, being that commercial/industrial buildings are found between 200 to 400 metres north of the study area along Lakeview Drive, a series of lakes/waterbodies occur in the space between these commercial/industrial buildings (including Caribbean Lake), Corhanwarrabul Creek borders the study area's northern boundary and the public open spaces immediately south of Corhanwarrabul Creek within the study area will be managed in a low threat state. Management of these public open spaces will be undertaken by the developer during development until the subdivision is complete, whereby management will then be handed over to the relevant authorities. All these factors restrict the available space for a fire to develop and will likely moderate a fire's momentum and behaviour if it were to approach buildings within the study area (Attachment 1).

Regardless of where a fire is in the landscape, embers have the potential to impact the study area and/or ignite a fire closer to the study area by traversing non-vegetated areas (e.g. Eastlink, waterbodies). The whole study area will be managed in a low threat state and there is therefore very little potential for an ember igniting close to buildings developing to a state that poses a risk.

3 PLANTING DESIGN AND OPEN SPACES

Vegetation within the study area will be deliberately designed and planted to mitigate the fire risk. The development provides a large ring of passive open space around its northern, southern and western boundaries. While a majority of the area is intended as drainage reserves, the highest points in elevation are marked as parks. There will, however, be no physical delineation between the drainage reserve and parks, with all passive open space becoming one large parkland with mown lawns, scattered trees, garden beds and pathways to be used by the residents. This includes the existing unmanaged area under the powerline easement that currently contains tall grasses and shrubs. Furthermore, the existing trees lining the study

area's eastern and southern boundaries will be thinned and understorey shrubs will be used to line these boundaries as screens from adjoining residential and industrial buildings amongst the remaining trees. The creation of a continuous parkland space around the northern, southern and western boundaries of the built areas will not increase the risk of fire impacting the study area, as the arrangement of scattered trees and mown lawns cannot facilitate fire spread. All parkland and other open spaces will be managed (e.g. grass regularly mown, tree branches trimmed and maintained) so there is no increased risk of fire to the surrounding development or to those that will occupy the site once developed.

Bollards are proposed along the roads next to the passive open spaces within the study area (Attachment 1). Bollards are placed along the northern-most road for public safety and to prevent public car access to the sensitive creek area, while bollards along the eastern-most road will interface a wetland area that will be created by Knox Council over the coming years. Maintenance access gates with locks that can be accessed by emergency services are also proposed to be installed at intervals of 250 metres along these bollarded strips to provide access for maintenance and emergency service vehicles into the passive open space.

The road-side south of the western-most mixed-use development area is currently fenced off with cyclone fencing and a gate due to the presence of a telecommunication tower along the study area's western boundary (Attachment 1). This area is also proposed to be bollarded with a gate (with the appropriate lock) for emergency service vehicle access.

Management of all public open spaces will be undertaken by the developer during development until the subdivision is complete, whereby management will then be handed over to the relevant authorities.

4 DEVELOPMENT STAGING AND GRASSFIRE RISK

A 60 metre buffer around each stage being developed will be managed in a low threat state (i.e. grass less than 100 millimetres) during the fire danger period. As stages are developed, the grassfire risk will therefore be managed to ensure dwellings and other buildings are not in contact with unmanaged vegetation at any point. In the event the study area boundary is less than 60 metres from the edge of a stage, vegetation will be managed in a low threat state up to the study area boundary.

5 ROAD DESIGN AND EMERGENCY SERVICE VEHICLES

Vehicles entering the development will do so from the exiting access point along Corporate Avenue (Attachment 1). The open land immediately east of the study area is in the early stages of being converted for residential use, and thus will provide a second access/egress point by the time this current development is completed.

The study area's road network will comply with the road design requirements in Standard C21 to *Clause 56.06 Access and Mobility Management*, which specify the minimum road width for each road segment depending on its expected daily traffic volume and its use as a lane, local street or connector road. CFAs emergency vehicle access requirements for fire appliances (i.e. tankers) replicate those in Standard C21 to

Clause 56.06 Access and Mobility Management, and are found in *Requirements for Water Supplies and Access for Subdivisions in Residential 1 and 2 and Township Zones* (CFA 2006a). A traffic management report will be undertaken at a later stage to ensure the development complies with public traffic and emergency vehicle access requirements.

Helipads have not been incorporated into the development's design, as large aerial appliances can use the proposed sports oval or passive open space to land if required.

Emergency service vehicles will be able to access the open space areas and the freeway reserve with ease, as explained in detail in Section 3.

6 RETICULATED WATER

The developer will ensure water is available to every lot in a subdivision for firefighting purposes in locations and amounts to enable firefighters to safely and efficiently carry out an initial attack on a grassfire or structure fire. This will be achieved through the provision of hydrants throughout the development to the specifications outlined in Standard C29 to *Clause 56.09 Utilities* and *Requirements for Water Supplies and Access for Subdivisions in Residential 1 and 2 and Township Zones* (CFA 2006a).

Fire hydrants will be:

- Located a maximum distance of 120 metres from the rear of each lot and be no more than 200 metres apart.
- Compatible with the relevant fire service equipment.
- Suitability identified so that firefighters can locate them at all hours in the form of a marker post immediately behind the hydrant (if looking from the road) and a blue reflector in the middle of the road opposite the hydrant. Exact specifications for the marker post and blue reflector are in CFA (2006a, p.5) and *Identification of Street Hydrants for Firefighting Purposes* (Fire Services Guidelines 2014).

The hydrants will be located along the road network between the roads and footpaths. This will provide ample hard standing areas for emergency service vehicles in the form of the road network, footpaths and driveways.

Corhanwarrabul Creek is a potential water source for emergency service vehicles in the unlikely event the mains water pressure fails. Signage will be located at the entrance to each maintenance access gate along the northern road that accesses the passive open space adjoining the creek to direct emergency service vehicles to this water source. Each sign will follow the marker specifications in *Preferred Requirements: Water Supplies and Access for Subdivisions in Rural Zones* (CFA 2006b).

Additional strategic water tanks/points are not considered necessary for this development, as the risk of a grassfire impacting the development is extremely low due to the highly urbanised nature of the broader landscape.

7 CONCLUSION

Kingston Links Golf Course is being converted for residential use. The grassfire risk to the study area is very low, with the only plausible direction of fire threat (once the study area is converted to low threat vegetation) approaching from the north. A local fire is possible from this direction through the grassed area, however it's impact potential is likely to be low due to the proximity of buildings, waterbodies and managed vegetation. All these factors restrict the available space for a fire to develop and will likely moderate a fire's momentum and behaviour if it were to approach buildings within the study area. Regardless of where a fire is in the landscape, embers have the potential to impact the study area and/or ignite a fire closer to the study area by traversing non-vegetated areas (e.g. Eastlink, waterbodies). The whole study area will be managed in a low threat state and there is therefore very little potential for an ember igniting close to buildings developing to a state that poses a risk.

Several measures have been incorporated into the site's development plan to address grassfire risk. These include managing all vegetation within the area marked as passive open space in a low threat state, ensuring the internal road network meets emergency service vehicle access requirements and that these vehicles can access all areas of passive open space, and providing a reticulated water system throughout the study area for firefighting purposes.

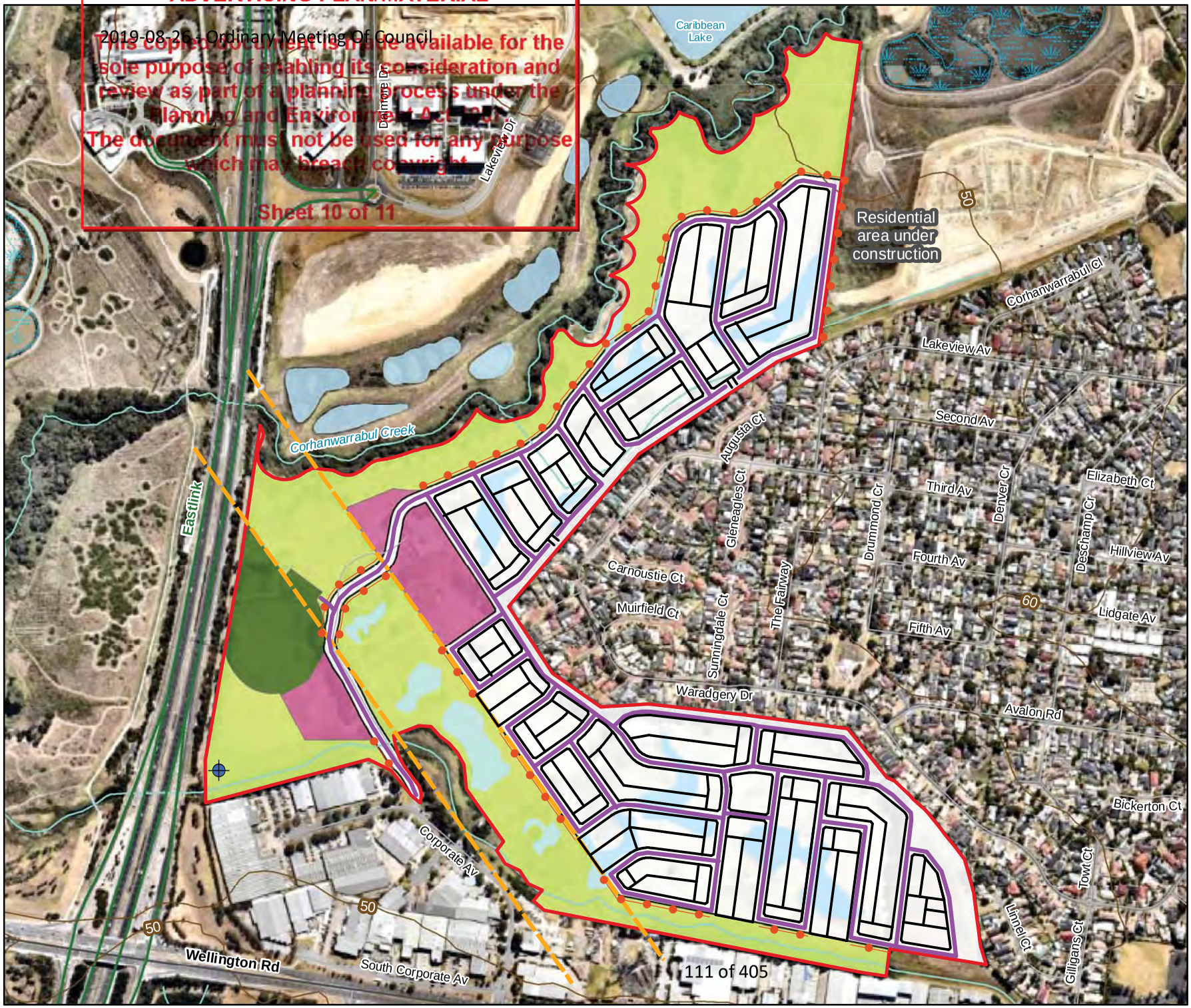
8 REFERENCES

CFA 2006a. *Requirements for Water Supplies and Access for Subdivisions in Residential 1 and 2 and Township Zones*. Country Fire Authority, Burwood East, Victoria.

CFA 2006b. *Preferred Requirements: Water Supplies and Access for Subdivisions in Rural Zones*. Country Fire Authority, Burwood East, Victoria.

Fire Services Guidelines 2014. *Identification of Street Hydrants for Firefighting Purposes*, GL-29. Metropolitan Fire Brigade, East Melbourne, Victoria.

9 ATTACHMENTS



Legend

- Study Area

Development features

- Internal roads
- Residential lots
- Mixed-use zones
- Passive open space
- Sports oval
- Bollards. Maintenance access gates proposed every 250m
- Powerline easement
- Telecommunications tower

Other features

- Permanent Waterbody
- Wetland/Swamp
- Minor Watercourse
- Contour (10m)
- Freeway
- Major Road
- Minor Road

Attachment 1

Grassfire Site Assessment

Kingston Links, Rowville

Site Size: 68.17 ha

N

0 100 200

Metres

ecology & heritage partners

Aerial source: Nearmap 2017

Legend

- Study Area
- Major and collector roads

Bushfire History

- Bushfires since 1983

Planned Burn History

- DELWP Planned Burn Area (2015-2017)

Attachment 2

Bushfire Hazard Landscape Assessment

Kingston Links, Rowville

0 400 800
Metres

ecology & heritage partners

J1040_2_Hazard_Landscape_Assessment 18/06/2018 psorensen

TraffixGroup

Traffic Engineers and Transport Planners

Integrated Transport Management Plan

Kingston Links Estate
14 Corporate Avenue, Rowville

Prepared For

Pask Group

June 2019
G18520R3K.docx

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Integrated Transport Management Plan

Kingston Links Estate
at
14 Corporate Avenue, Rowville

Document Control

Issue No.	Type	Date	Prepared	Reviewed
J	Update Following Council / TfV Queries	20/03/2019	J. Cossins	C. Morello
K	Additional Council/DoT Updates	14/06/2019	J. Cossins	C. Morello

Our Reference: G18520R3K.docx

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1 Introduction

Traffix Group has been engaged by Pask Group to prepare an Integrated Transport Management Plan for the proposed development of the Kingston Links Estate at 14 Corporate Avenue, Rowville.

Amendment C142 to the Knox Planning Scheme applies to the subject site and allows the redevelopment of the existing golf course for the purposes of a residential community, including a mixed use precinct.

Schedule 13 to the Development Plan Overlay is to be introduced to the Knox Planning Scheme to facilitate the development of the land and requires the preparation of a Development Plan for the site. Amongst other things, it also requires the preparation of an Integrated Transport Management Plan addressing the following:

- *An assessment of the expected impact of traffic generated by the development on the existing and future road network and any mitigation measures required to address identified issues to the satisfaction of VicRoads.*
- *Traffic modelling of future conditions is to be predicated on a distribution analysis of generated traffic having regard to:*
  - *The nature and breakup of residential trip purposes*
  - *The likely origin/destination of trips based on:*
    - *Residential precincts within the site*
    - *Connections to the arterial network*
    - *Location of nearby services and facilities*
    - *Journey to work data.*
- *A statement explaining how the integrated transport network addresses the strategic directions within the Knox Liveable Streets Plan 2012-2022 (or as amended).*
- *An indicative road, bicycle, and pedestrian network plan showing:*
  - *vehicular access from Corporate Avenue to the proposed internal road network;*
  - *vehicular access from Stamford Park to the proposed internal road network;*
  - *pedestrian and bicycle access from surrounding areas, including both on-street and dedicated off-street facilities connecting to Stamford Park, Caribbean Gardens, and adjacent residential areas;*
  - *a street network that makes provision for a vehicular link between Kingston Links and Stamford Park, and discourages non-local through-traffic;*
  - *layout of internal roads, including a hierarchy of the roads that specifies the purpose, function, cross sections, and widths of the road reserves for each road type;*
  - *provision for bus movement through the site linking Wellington Road, traversing Stamford Park to access Stud Road, via Emmeline Road;*

- *provision of safe, well-lit and direct pedestrian connections from the bus capable through road to existing residential areas east of the site, Wellington Road, Caribbean Gardens, Stamford Park and Stud Road;*
- *provision of emergency services and waste collection services through the site;*
- *a pedestrian and cycle shared path network both throughout the site and to the existing network at Stamford Park and the EastLink Trail with any access to the EastLink Trail to be controlled and maintained by Council;*
- *connected footpath network both throughout the site and to the existing network on Corporate Avenue.*
- *mitigation works at the intersection of Wellington Road and Corporate Avenue to provide adequate capacity to cater for anticipated traffic generation and to retain appropriate access to the Corporate Avenue;*
- *any complementary works required to retain or improve access from South Corporate Avenue to Wellington Road;*
- *any local area traffic management works required having regard to the characteristics of Emmeline Row as a Residential Collector Street;*
- *enhancement works as required to Corporate Avenue to accommodate projected traffic movements while ensuring retention of appropriate access to existing properties;*
- *any traffic implications of staging of development as contemplated in the Master Plan, including triggers for the provision of connections to the arterial network and implementation of any mitigation works.*
- *A Construction Management Plan informed by analysis of staging requirements of traffic works identified in the Integrated Transport Management Plan.*

This report has been prepared to respond to the requirements of the Development Plan Overlay.

This report also supersedes previous versions of the report, responding to feedback from Department of Transport (in particular VicRoads and PTV) and also Council.

2 Background & Existing Conditions

2.1 Subject Site

The subject site is Kingston Links Golf Course and is addressed as 14 Corporate Avenue, Rowville. It is an irregular shaped parcel of land, generally spanning from Eastlink in the west to existing residential allotments in the east, and borders Caribbean Gardens in the north and Stamford Park to the north-east as shown in Figure 1.

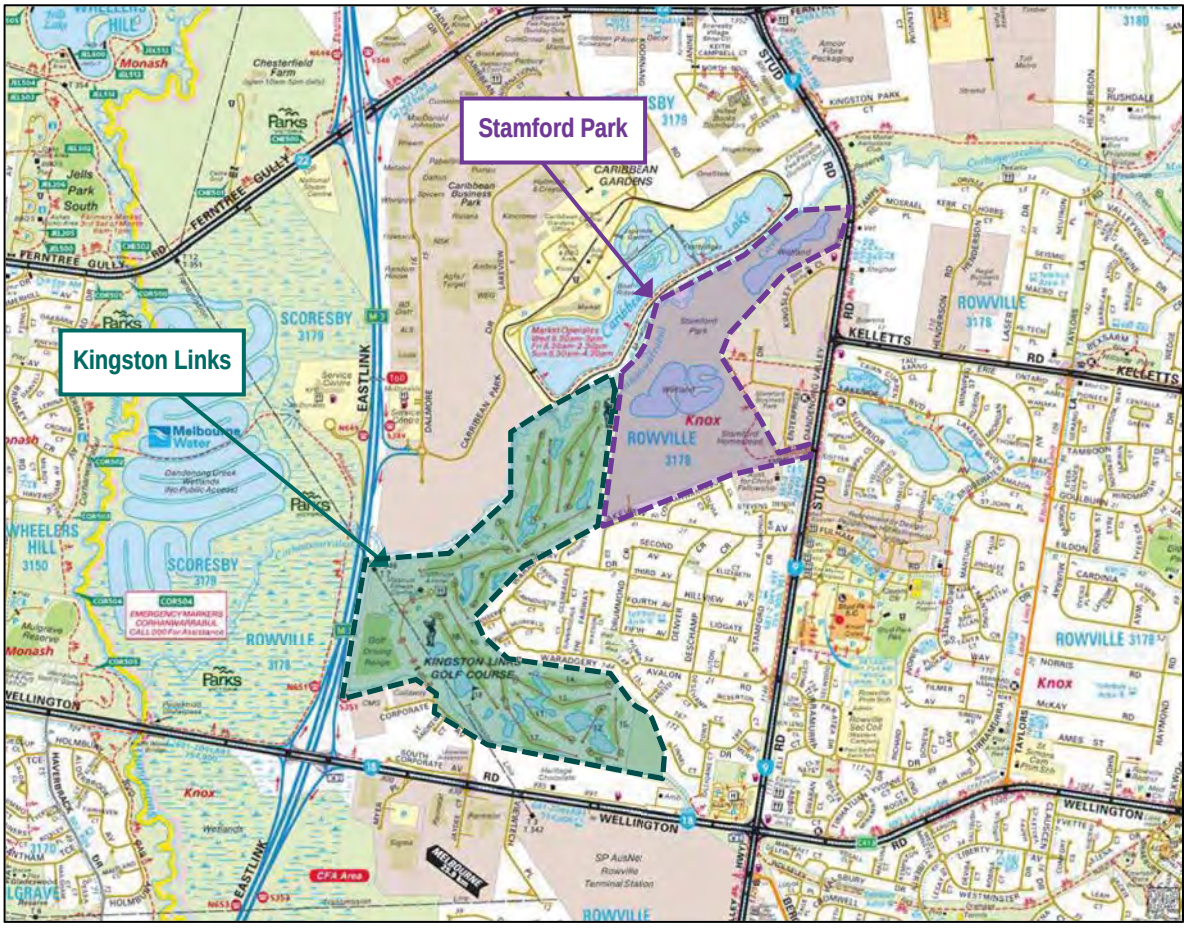


Figure 1: Locality Plan

Vehicle access to the site is currently available from Corporate Avenue via Wellington Road.

Existing land uses surrounding the subject site comprise a mixture of commercial, residential, and public use.

Amendment C93 to the Knox Planning Scheme rezoned a portion of Stamford Park to the north-east for residential development. The Development Plan for Stamford Park contemplates some 190 dwellings, with access via an extension of Emmeline Row via a residential collector street that extends to the site's western boundary to allow for access to the future residential development of Kingston Links.

2.2 Existing Sustainable Transport Accessibility

2.2.1 Public Transport

There are a number of different public transport services operating within the vicinity of the subject site. These include a number of bus services operating along Stud Road and Wellington Road. Available services are summarised in Table 1 and illustrated in Figure 1.

Table 1: Public Transport Services

Service	Route
Metropolitan Bus Services	
Route 681	Lysterfield – Know City via Wantirna, Scoresby, Rowville (clockwise)
Route 682	Lysterfield – Know City via Wantirna, Scoresby, Rowville (anti-clockwise)
Route 691	Boronia – Waverley Gardens via Ferntree Gully, Stud Park
Route 754	Rowville – Glen Waverley via Caulfield Grammar, Wheelers Hill
Route 900 (SMARTBUS)	Rowville Caulfield via Monash University, Chadstone
Route 901 (SMARTBUS)	Frankston – Melbourne Airport

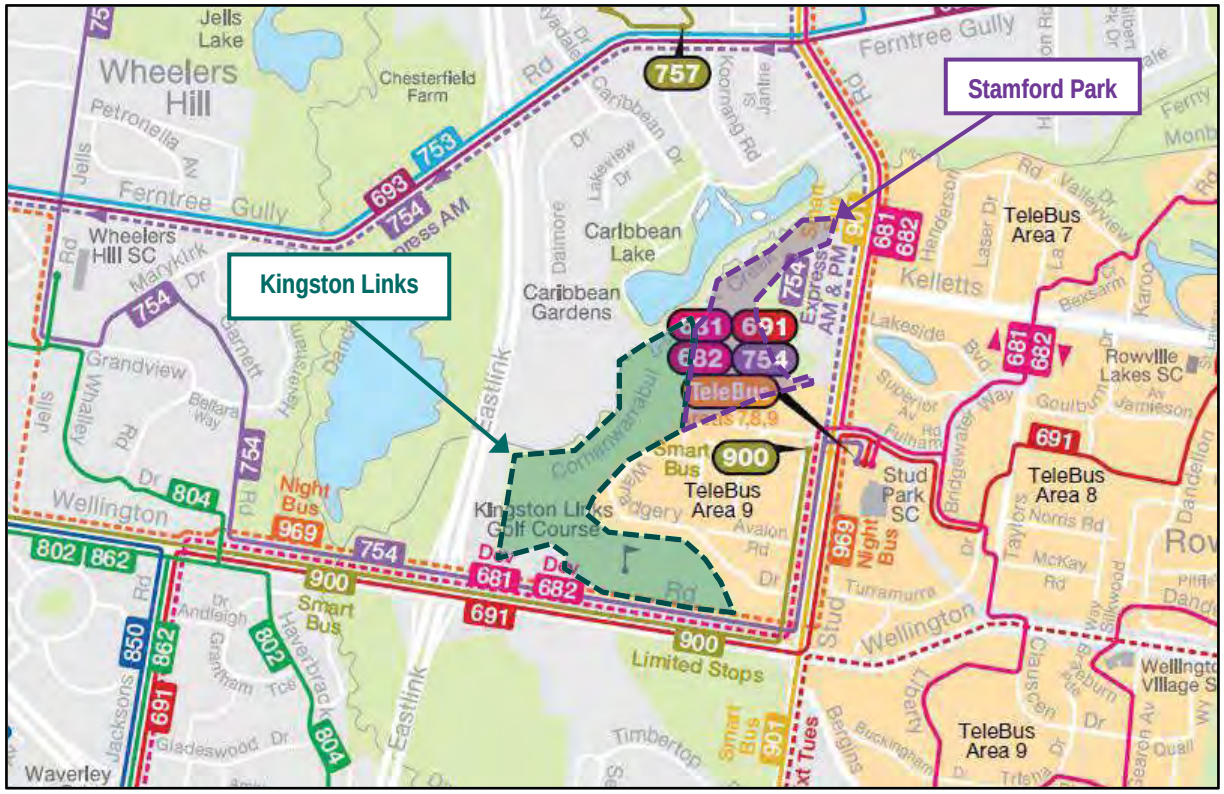


Figure 2: Knox Public Transport Map

It is noted that the Victorian Government has recently announced planning and design to begin on a tram route extension to connect Caulfield and Rowville. The Federal Government has proposed that this be a train route extension. Stage One of the link would connect Caulfield Station to Monash University's Clayton Campus via Chadstone Shopping Centre and then continue to Rowville via

Waverley Park, presumably along Wellington Road. This may provide future opportunity for train or tram access to/from the west in the long term.

2.2.2 Bicycle Network

The City of Knox is well serviced by the Principal Bicycle Network (PBN), with on-road and off-road bicycle paths directly linking the City of Knox with surrounding municipalities.

The subject site is well serviced by bicycle infrastructure with off-road bicycle lanes and on-street bicycle routes on many roads in the immediate vicinity of the subject site, including Wellington Road, and Stud Road. Figure 3 illustrates the available bicycle infrastructure in the vicinity of the subject site.

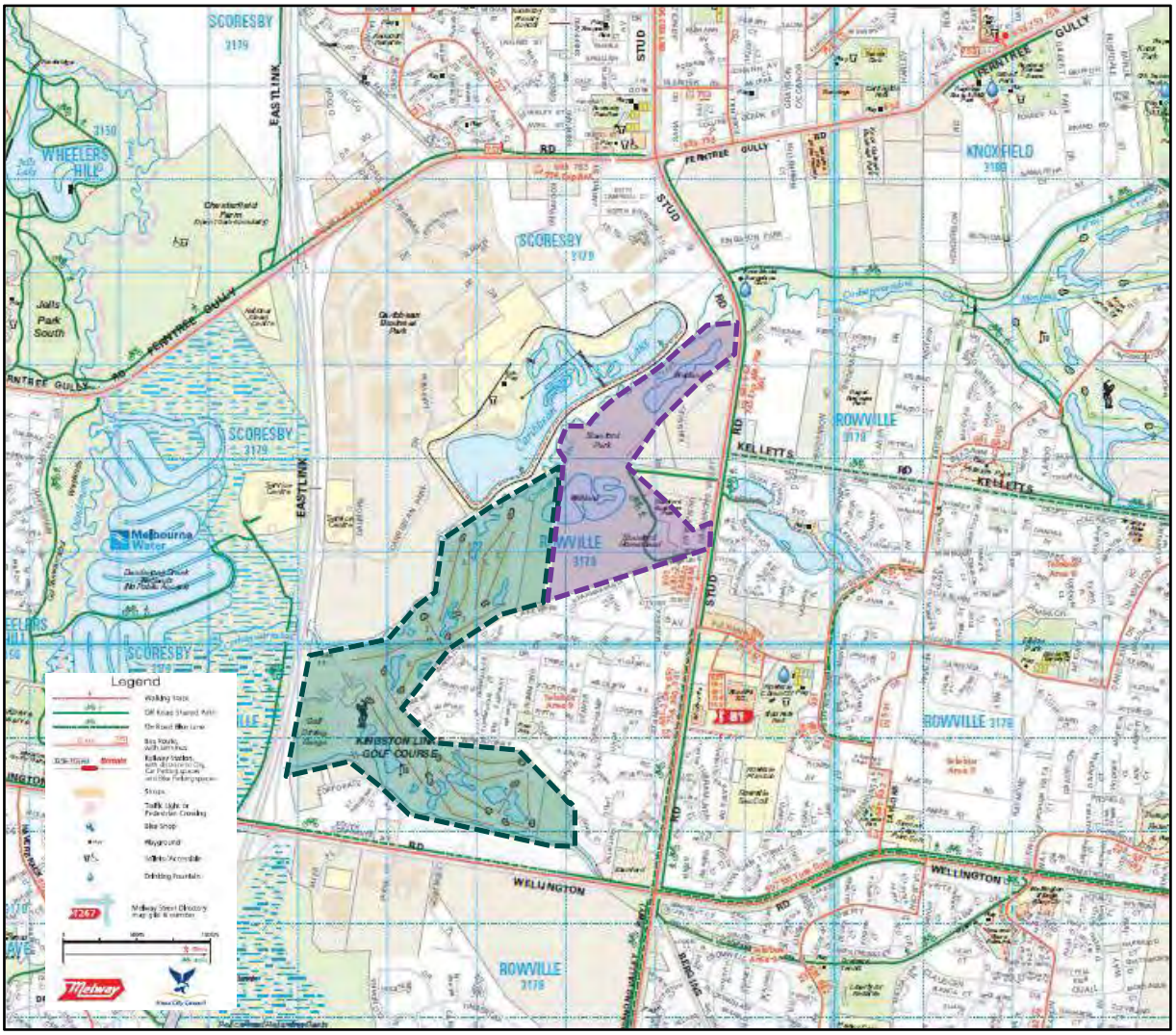


Figure 3: Explore Knox Map

Source: http://www.knox.vic.gov.au/

3 Development Plan

The Development Plan contemplates the development of the land for the purposes of dwellings, a mixed use precinct, and sporting fields with access proposed via Corporate Avenue (to Wellington Road) and through the developed Stamford Park (to connect to Emmeline Row) as shown in Figure 4.

For the purposes of the following traffic assessment, we have been instructed to allow a development yield for in the order of 830 dwellings on the Kingston Links site.

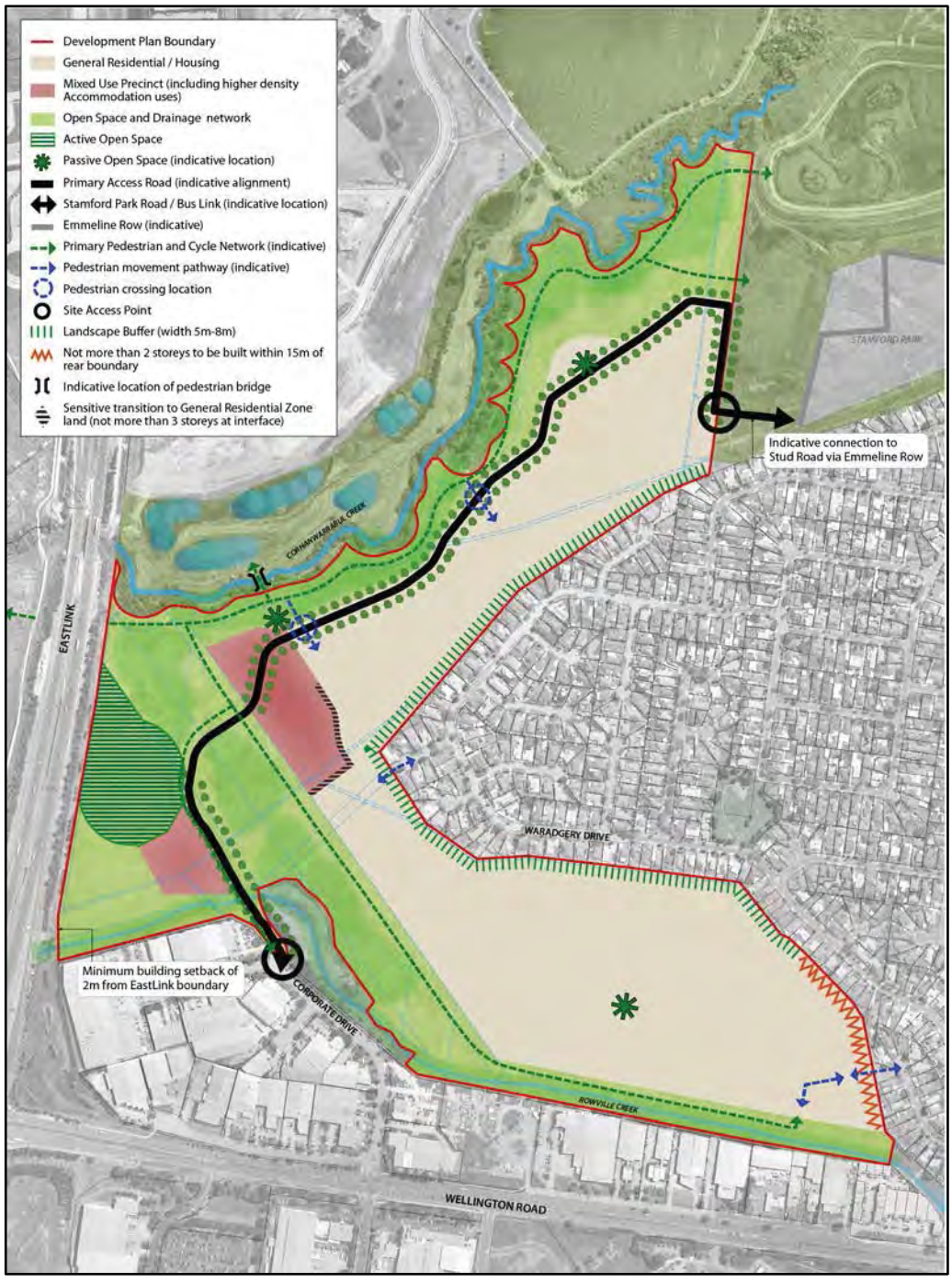


Figure 4: Proposed Kingston Links Development Plan

4 Traffic Impact

4.1 Existing Road Network

4.1.1 Stud Road

Stud Road is a VicRoads declared Primary Arterial Road in a Road Zone 1 running north-south. In the vicinity of Emmeline Row, Stud Road provides two through lanes and a dedicated bus lane in each direction.

4.1.2 Emmeline Row & Stamford Park Connector

Emmeline Row Road operates as a local street with a pavement width of approximately 13.0 metres accommodating a single traffic lane in each direction, separated by a central linemarked median set within a road reserve of approximately 22 metres.

It provides access to the Stamford Business Park to the north and will also provide access to the proposed Stamford Park residential subdivision.

The signalised intersection of Stud Road with Emmeline Row provides for double right turns from the north and a left turn slip lane from the south into Emmeline Row.

4.1.3 Proposed Stamford Park Road Network

Stamford Park is proposed to have access via a westerly extension of Emmeline Row.

The Stamford Park Development Plan identifies this road as a 20 metre residential collector street with a cross-section allowing a 7.0 metre carriageway, kerbside parking, shared path/cycle path on one side and footpath on the other. Verges of 4.5 metres are provided on both sides.

The Kingston Links Development Plan contemplates a connection to the north-east of the site into the Stamford Park subdivision via this future connector.

4.1.4 Wellington Road

Wellington Road is a VicRoads declared Primary Arterial Road in a Road Zone 1 under the Planning Scheme. Wellington Road is aligned east-west and connects to Belgrave-Gembrook Road in the east and continues as North Road in the west. In the vicinity of the subject site, Wellington Road provides a divided dual carriageway with three lanes of through traffic in each direction.

4.1.5 Corporate Avenue

Corporate Avenue functions as a local street under the control of Council. It extends in a northerly direction from Wellington Road to the entrance of the subject site. Corporate Avenue provides for two-way traffic and kerbside parking within a 12.5 metre carriageway.

The intersection of Corporate Avenue and Wellington Road is signalised, with Jaydee Court forming the southern leg of the intersection. A single right turn lane is provided from Wellington Road east and a shared through and left lane is provided from the west.

4.1.6 South Corporate Avenue

South Corporate Avenue functions as a local industrial access street under the control of Council providing access to the industrial/commercial land fronting Wellington Road, between Corporate Avenue and Eastlink to the west. South Corporate Avenue extends west from Corporate Avenue for approximately 320 metres, parallel to Wellington Road and provides a 12.5 metre carriageway facilitating two-way traffic and kerbside parking along both sides.

The western extent of South Corporate Avenue widens to approximately 25 metres to allow for vehicle turnaround.

4.2 Existing Traffic Conditions

4.2.1 External Road Network Traffic Volumes

A significant amount of data and analysis was undertaken in preparation for the Amendment C142 Panel Hearing in March 2018 and provided in previous Traffix Group Reports. It was established in those reports that the peak periods for analysis of the existing and future road network are on a weekday morning and afternoon commuter peak hours.

To understand the existing conditions at the Wellington Road / Corporate Avenue and Stud Road / Emmeline Row intersections, and utilise a consistent set of traffic volumes, Traffix Group sourced updated SCATS data and IDM data from VicRoads for each intersection on Tuesday 27th March, 2018.

Spot turning movement counts were undertaken during the morning and afternoon peak hours to verify the operating conditions highlighted by the SCATS data. Queue length observations were also included as part of the spot counts to allow for further calibration of the traffic modelling.

The morning peak hour was observed to occur from 7:45am to 8:45am and from 8am to 9am for the intersections of Wellington Road / Corporate Avenue and Stud Road / Emmeline Row respectively. The afternoon peak hours were observed to be 4:15pm to 5:15pm and 5pm to 6pm for the intersections respectively.

Typically, a road network peak would be established, however given their locations, the peak for each intersection was adopted for conservative purposes.

A review of the traffic volumes collected by GTA and Ratio as part of the Panel hearing has been undertaken to determine the validity of the updated surveys. Whilst there is some minor variation in turning volumes for each movement, the updated volumes are considered to be relatively comparable and therefore appropriate to be adopted for the following analysis.

A summary of the peak hour turning volumes are shown in Figure 5.

In addition to the SCATs data, volumes were recorded entering and exiting South Corporate Avenue during the peak hours.

The surveys identified that there is a clear bias for vehicles entering South Corporate Avenue in the morning peak hour and exiting the road in the PM peak hour, noting:

- 93 entering vehicles and 12 exiting vehicles in the AM peak hour; and
- 11 entering vehicles and 77 exiting vehicles in the PM peak hour.

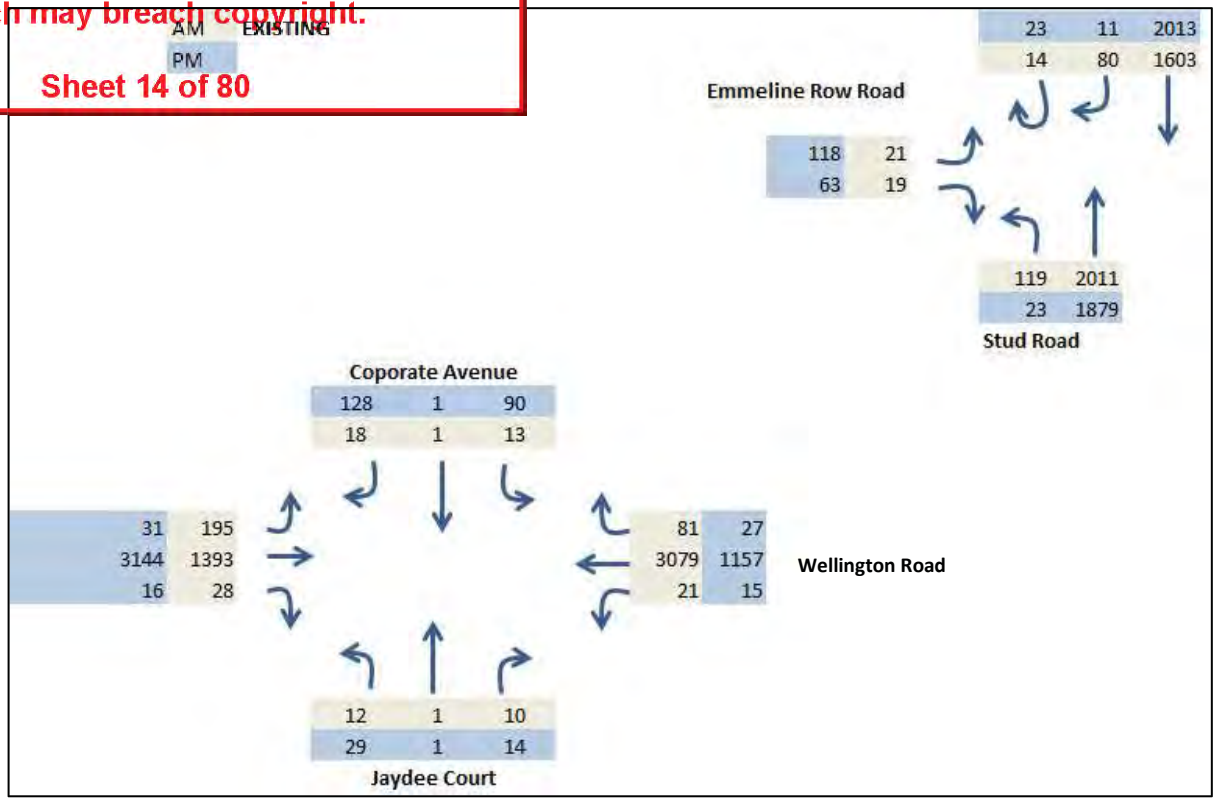


Figure 5: Existing Peak Hour Volumes (Wellington/Corporate & Stud/Emmeline Row)

4.2.2 IDM Data

IDM Data (phase and cycle time data) was collected from VicRoads for the morning and afternoon periods on 27th March, 2018. A summary of the IDM data for the relevant peak hours is shown in Table 2.

Table 2: Existing Phase and Cycle Times (IDM Data)

Intersection	Phase	Existing AM	Existing PM
Wellington Road/Corporate Avenue	A (Wellington Rd Through)	105	110
	D (Corporate Ave/Jaydee Crt)	15	25
	E1 & E2 (Wellington Rd Diamond)	19	11
	Total	**139**	**146**
Stud Road/Emmeline Row	A (Stud Road Through)	120	122
	B (Emmeline Row Rd)	8	13
	C (Bus Jump & Stud Rd Southbound)	17	10
	Total	**145**	**145**

4.2.3 Future Network Growth

Traffix Group collected SCATS data for three comparable days across 2014, 2015 and 2016 (26th February 2014, 25th February 2015, and 24th February 2016) to understand any changes to peak hour through traffic volumes along the arterial road network. These volumes were compared with the 2018

data collected by Traffix Group, 2018 to establish a growth rate for traffic volumes along Wellington Road and Stud Road.

A review of two-way through volumes along Stud Road and Wellington Road (at the subject intersections) indicates that there has been minimal change in through volumes across the past five years of data, particularly on Wellington Road.

It is noted that on Wellington Road, volumes in the afternoon peak periods have reduced slightly, whilst in the morning, a small increase in volumes is evident, albeit the increase between 2014 and 2018 is very low (<0.1%).

Table 3: Two-Way Peak Period Volumes on Stud Road and Wellington Road

Road	Period	2014	2015	2016	2017	Compounding Rate
Wellington Rd	7:30am – 9:30am	8,322	8,125	8,288	8,356	+0.10%
	3:30pm – 6:30pm	12,456	12,732	12,771	12,370	-0.17%
Stud Rd	7:30am – 9:30am	6,713	6,540	6,547	7,087	+1.4%
	3:30pm – 6:30pm	10,820	10,563	10,279	11,068	+0.57%

Having regard to the above, on balance it is considered appropriate that no growth would be applicable to Wellington Road, however for the purposes of a conservative analysis, a growth rate of 1% compounding for 10 years has been adopted for Stud Road through volumes.

Based on the preceding, the peak hour turning volumes shown in Figure 6 have been adopted as the base case.

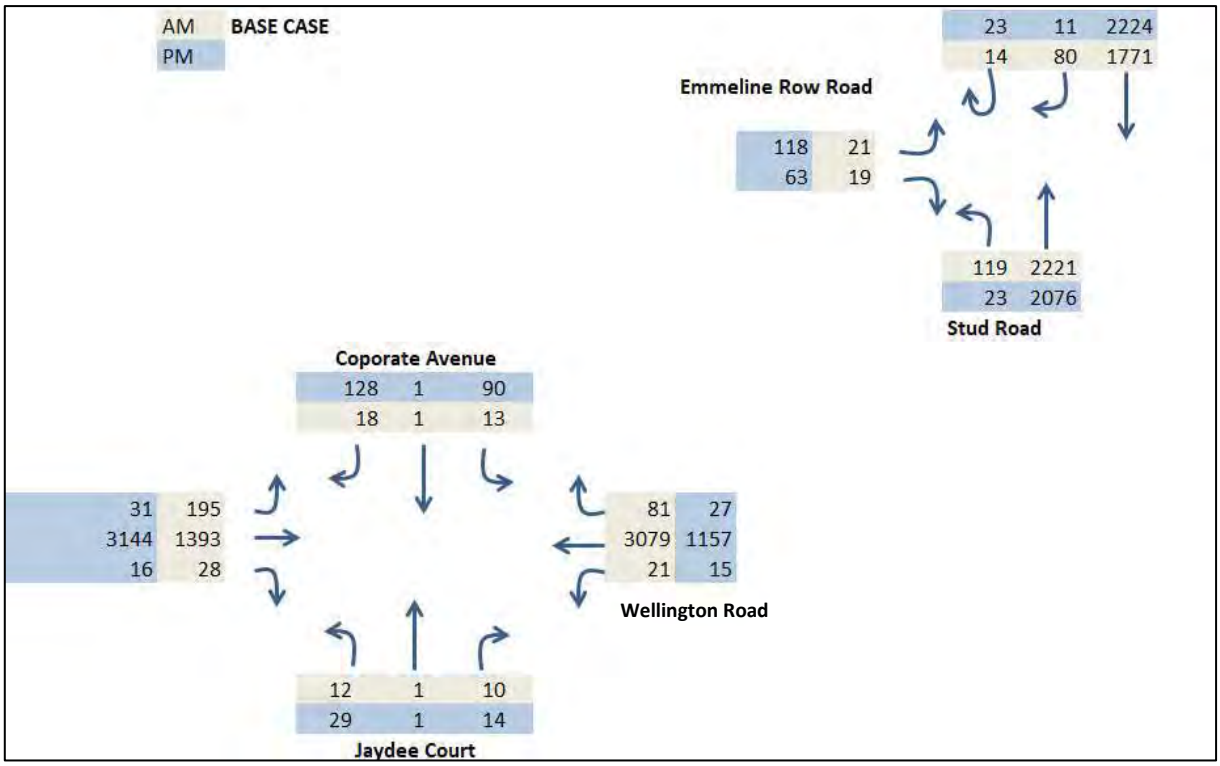


Figure 6: Base Case Peak Hour Volumes (Wellington/Corporate & Stud/Emmeline Row)

4.2.4 Existing Intersection Operating Conditions

To determine the current performance of the Wellington Road and Corporate Avenue intersection and the Stud Road and Emmeline Row intersection, analysis using SIDRA was undertaken based on existing phase timing (IDM) data provided by VicRoads and the existing traffic volumes and observation surveys.

The model was adjusted to reflect existing observed queues (relating to the existing volumes) and calibrated to reflect the observed conditions on the road network. An analysis of the base case volumes was then undertaken to identify the reference operation, particularly for Stud Road (to allow for network growth).

SIDRA is a computer program originally developed by the Australian Road Research Board, which can be used to analyse the operation of intersections. SIDRA provides information about the capacity of an intersection in terms of a range of parameters, as described below.

Degree of Saturation (D.O.S.) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown below.

Level of Service		Intersection Degree of Saturation	
		Unsignalised Intersection	Signalised Intersection
A	Excellent	≤ 0.60	≤ 0.60
B	Very Good	0.60 – 0.70	0.60 – 0.70
C	Good	0.70 – 0.80	0.70 – 0.90
D	Acceptable	0.80 – 0.90	0.90 – 0.95
E	Poor	0.90 – 1.00	0.95 – 1.00
F	Very Poor	≥ 1.0	≥ 1.0

The **95th Percentile** Queue represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour.

Average Delay (seconds) is the average delay time that can be expected for all vehicles making a particular movement in the peak hour.

The results of the base case analysis are summarised in Table 4 and Table 5.

Table 4: Base Case Conditions SIDRA Results- Wellington Road/Corporate Avenue

Leg	Movement	Existing AM Peak			Existing PM Peak		
		DoS	Av. Delay (s)	95th'ile Queue (m)	DoS	Av. Delay (s)	95th'ile Queue (m)
Jaydee Crt (S)	Left	0.03	7	1	0.05	7	2
	Through	0.10	70	6	0.08	61	7
	Right	0.10	74	6	0.08	66	7
Wellington Rd (E)	Left	0.01	5	1	0.01	5	1
	Through	0.81	3	113	0.30	8	75
	Right	0.50	74	41	0.38	85	15
Corporate Ave (N)	Left	0.04	52	5	0.24	55	40
	Through	0.18	69	10	0.75	69	69
	Right	0.18	74	10	0.75	74	69
Wellington Rd (W)	Left	0.42	11	54	0.83	11	150
	Through	0.42	2	54	0.83	3	150
	Right	0.17	71	13	0.22	84	9

Table 5: Base Case Conditions SIDRA Results- Stud Road/Emmeline Row

Leg	Movement	Existing AM Peak			Existing PM Peak		
		DoS	Av. Delay (s)	95th'ile Queue (m)	DoS	Av. Delay (s)	95th'ile Queue (m)
Stud Rd (S)	Left	0.07	6	3	0.01	6	1
	Through	0.79	1	52	0.73	4	161
Stud Rd (N)	Through	0.55	1	89	0.71	1	39
	Right	0.36	68	25	0.21	80	6
	U-Turn	0.36	55	19	0.21	14	4
Emmeline Row (W)	Left	0.06	10	3	0.41	13	26
	Right	0.13	82	5	0.29	79	17

The SIDRA results for the base case shows that the Wellington Road intersection operates under 'good' conditions in the AM peak hour, primarily associated with the Wellington Road eastern approach.

The Wellington Road intersection operates under 'good' conditions in the PM peak periods with the major demands experienced on the western approach of Wellington Road.

At Wellington Road, it is clear that there is a high peak demand for westbound through traffic associated with vehicles accessing EastLink to the west of the site in the AM peak hour. In the PM peak hour, the peak demands are in the opposite direction (eastbound movements) as vehicles exit EastLink and head east past the site.

The Stud Road intersection operates in the 'good' category during both the morning and afternoon peak hours.

At Stud Road, there are relatively low demands turning into and out of Emmeline Row as the land to the west has not been fully developed. Spare capacity remains in both the north and south directions on Stud Road.

4.3 Traffic Generation Rates

4.3.1 Existing Kingston Links Golf Course

In addition to the volumes recorded at Stud Road and Wellington Road, a survey of the existing Kingston Links Estate was undertaken on Tuesday 27th March 2018 in the morning and afternoon peak periods.

A summary of the data is provided in Table 6 below and identifies that the existing golf course generates in the order of 32-34 vehicle movements in the peak hours.

Table 6: Existing Kingston Links Peak Hour Volumes

Peak Hour	In	Out	Total
AM	31	3	34
PM	19	13	32

4.3.2 Kingston Links Future Residential

General

Traffic generation rates for residential uses vary between rates of 1 daily movement for dwellings in the CBD and inner city areas, to 10 daily movements for dwellings in rural or regional areas. Peak hour traffic generation rates of residential dwellings are typically 10% of the daily rate.

Residential Estate Case Study Data

Traffix Group has conducted traffic counts at a number of residential estates within outer metropolitan Melbourne to understand traffic generation rates, including peak hour generation rates.

An estate located in South Morang, on the eastern side of Plenty Road, was surveyed and at the time of the survey, included 614 dwellings. The surveys were undertaken on Wednesday 4th and Thursday 5th September 2013.

More recent surveys were undertaken of an existing, well established residential area in Clyde North which provided in the order of 936 dwellings. The area was primarily residential with little to no commercial or other uses (than dwellings).

The surveys were undertaken on the 7th and 8th of February, 2018.

A summary of the equivalent peak hour and daily traffic generation rates is summarised in Table 7.

Table 7: Automatic Tube Count Data Summary

Site Location	AM Peak	PM Peak	Daily
South Morang	0.66 movements/dwelling	0.72 movements/dwelling	7.9 movements/dwelling
Clyde North	0.66 movements/dwelling	0.73 movements/dwelling	7.9 movements/dwelling

The average peak hour traffic generation for all sites was recorded at 0.7 movements per dwelling.

The future Kingston Links Estate will have internal access to local convenience retail, mixed use and community uses. Accordingly, there will be a level of internal traffic generated by the future estate that would not be generated out to the external road network in the peaks.

Amendment C93 & Amendment C142 Panel Hearings

The Traffix Group report prepared for the Amendment C93 Panel Hearing assumed an average traffic generation rate of 8 vehicle movements per dwelling, inclusive of 0.8 movements per dwelling during the peak hours.

This rate was also adopted, albeit noted to be conservative, as part of the Amendment C142 Panel Hearing.

Expected Traffic Generation

Based on the preceding, and having regard to the case study data collected by Traffix Group, the previously adopted rate is considered to be overly conservative for the site as future dwellings will have access to proximate schools, work places and retail uses and there will be a range of dwelling types.

However, for the purposes of consistency, the higher rate has been adopted.

Application of the rate to the potential yield of 830 dwellings in the Kingston Links Estate equates to a traffic generation of 664 vehicle movements in the peak hours and 6,640 vehicles per day.

During the AM peak hour, it is expected that 20% of this traffic would be generated inbound with the remaining 80% outbound. During the PM peak hour, 60% will be inbound and 40% outbound.

4.3.3 Stamford Park Residential Traffic

The GTA Consultants report submitted as part of the Amendment C142 Panel Hearing on behalf of Stockland (Re V146580 dated February 2018) identifies that the Stamford Park residential development contemplates up to 190 dwellings as part of that redevelopment.

Adopting the same traffic generation rate would indicate a total of 152 peak hour trips and 1,520 daily two-way trips associated with that site.

4.3.4 Stamford Business Park

The Stamford Business Park is a development estate with access from Emmeline Row. At the time of the Stamford Park Residential Development Panel hearing, only two sites within the business estate had been developed and there was an allowance for the potential for that site to generate additional traffic. However, since that time, there has been a substantial amount of development within the business park and only one lot remains vacant (one lot adjacent to the Stud Road/Emmeline Row intersection is currently under construction).

There will be a level of traffic generation associated with the future occupation of the lot currently under construction, and the remaining vacant lot once developed. However, our observations identify that there is currently an amount of traffic being generated by construction associated with the Stamford Park residential subdivision and the business park estate. That construction traffic would cease once development of both sites has completed.

Based on the level of development remaining within the business park, we are of the view that the level of traffic likely to be generated would be comparable to that observed to be associated with construction on the site and already included within the 'base case' traffic analysis.

4.3.5 Mixed & Community Uses

With regard to the community and mixed uses proposed within the Kingston Links Estate, it is likely that these will more predominantly service the new residents within the estate, or potentially redistribute some small levels of traffic from other existing uses in the area, rather than generating new traffic movements to the network from external locations.

The traffic generated by those uses will be internal (ie not generated to the external network) or already be on the network in the vicinity of the site.

We note that the Wellington Road / Corporate Avenue intersection serves as the access for the existing Kingston Links Golf Course, which, as per the surveys undertaken at the access, generates a level of existing traffic to the road network.

In this regard, further allowances for traffic generated by the sporting fields in the peak hours is not considered to be required as there would already be a level of similar traffic on the road network that would be removed at the cessation of the golf course use.

Furthermore, by adopting a conservatively high rate for the residential subdivisions, and not discounting traffic associated with internal trips, inherently there will be an allowance for the potential for the mixed and community uses to generate traffic to/from the subject intersections.

4.4 Traffic Distribution

The distribution of traffic onto a road network where there are multiple access points and links to existing arterial routes is subject to a number of factors and considerations.

Distributions are not solely dependent on the shortest route (by distance) for a resident or worker to their chosen destination, rather it is a function of behaviour and travel times which are impacted upon by congestion and delays on the road network.

In this case, the existing intersection assessments demonstrate that there is spare capacity at the intersection of Stud Road and Emmeline Row. Whilst Wellington Road provides more proximate access to Eastlink, Stud Road provides for an alternative route to Eastlink or to the north and west, which would continue to offer drivers a similar level of service to that on Wellington Road, which is already congested.

The previous Traffix Group assessments assumed that the capacity constraints at the Wellington Road intersection would dictate a driver preference to utilise the Stud Road intersection. Combined with the analyses of Journey to Work ABS Data for City of Knox and the subject site, there would be a preference for vehicles to utilise the Stud Road/Emmeline Row Road intersection to access the external network.

The Ratio Consultants Panel Report identified a future traffic distribution irrespective of capacity constraints and identified a general distribution of 60% / 40% skewed toward the Stud Road/Emmeline Row intersection.

In contemplating the future operation of the subject intersections and the mitigating works which may be required, we have adopted the following distributions, having regard to the location of trip generators such as nearby employment and retail areas (to the east) and access to EastLink (immediately west via Wellington Road or north-west via Stud Road):

40% of traffic to/from Corporate Avenue / Wellington Road signals and then of that traffic:

- 40% of traffic is generated to and from the east; and
- 60% of traffic is generated to and from the west.

60% of traffic to/from Stud Road / Emmeline Row signals and then of that traffic:

- 60% of traffic is generated to and from the north; and
- 40% of traffic is generated to and from the south.

Importantly, it is noted that VicRoads has agreed that these distributions are appropriate for the purposes of the following analysis.

4.5 Expected Peak Hour Traffic Volumes

Based on the preceding and assuming a yield of 1,020 dwellings (inclusive of both Kingston Links and Stamford Park residential subdivisions), Figure 7 and Figure 8 have been prepared to show the expected peak hour traffic generation of the precinct and Stamford Business Park, and the future traffic volumes on the road network.

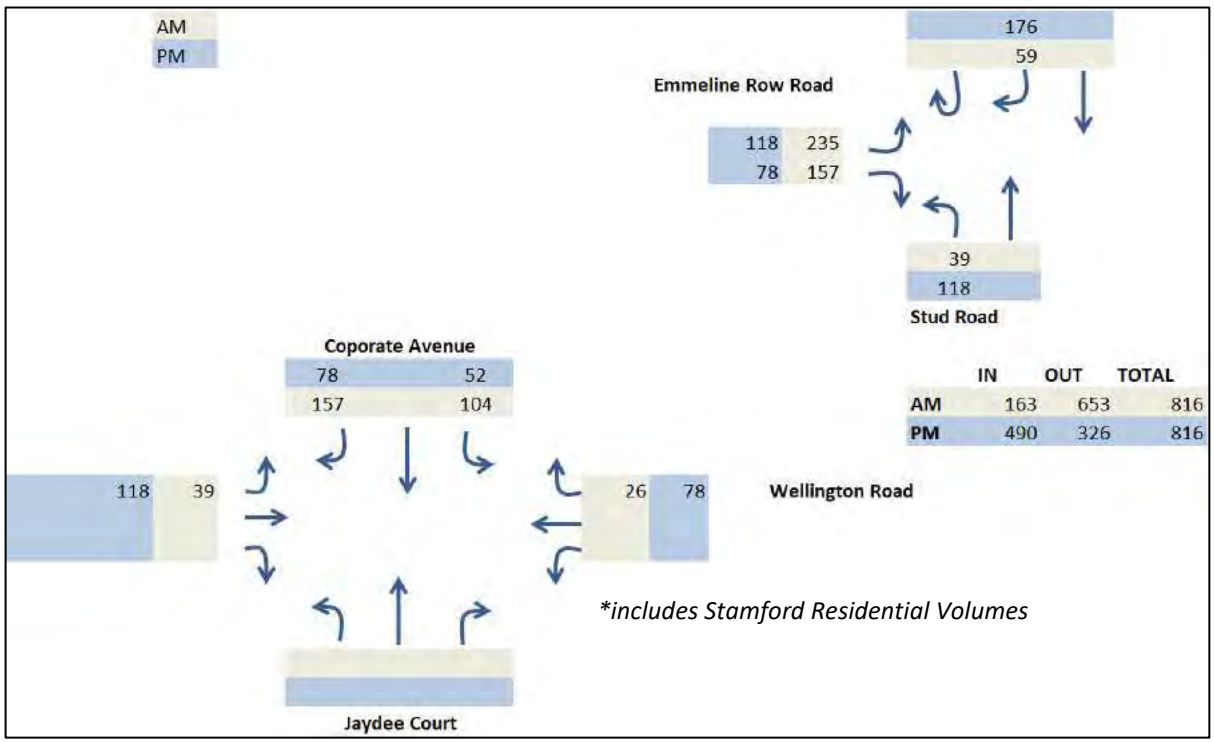


Figure 7: Total Precinct Generated Volumes (1,020 dwelling yield)

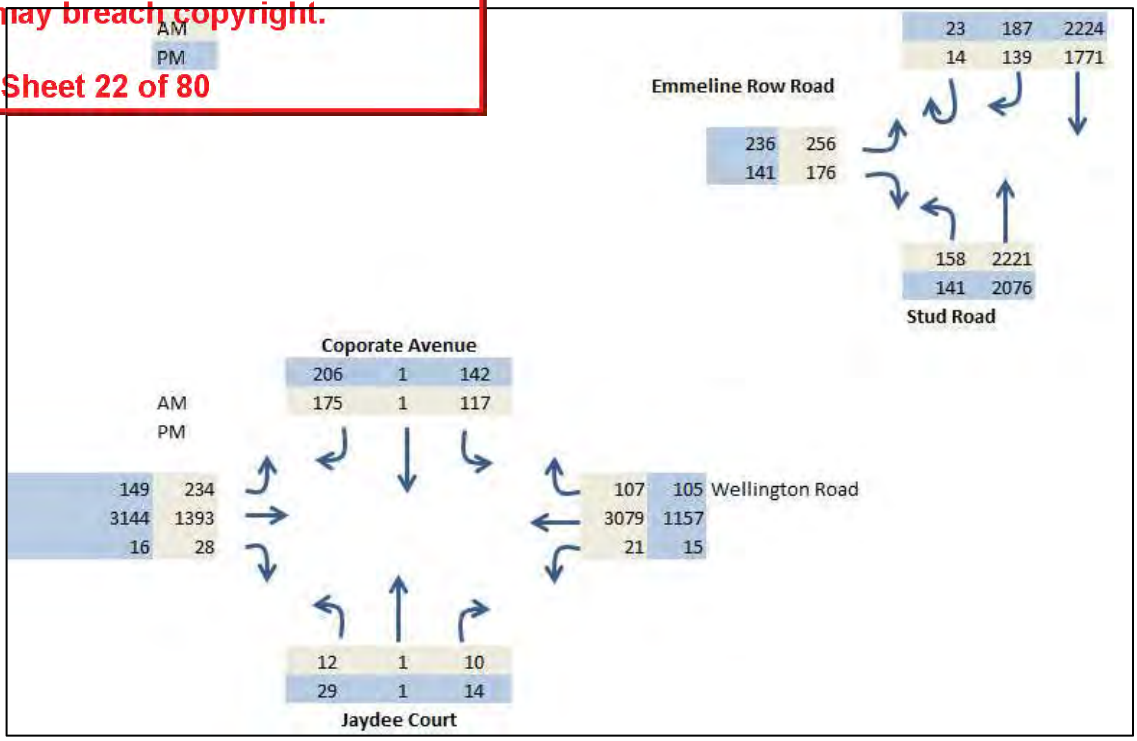


Figure 8: Future Traffic Volumes

4.6 Proposed Intersection Operating Conditions

4.6.1 Wellington Road/Corporate Avenue

Analysis of the preceding post development traffic volumes has been undertaken using SIDRA Intersection for both intersections during the AM and PM peak hours.

The existing phasing and intersection arrangements at Wellington Road and Corporate Avenue constrain the potential for mitigating works at this intersection without impacting on through capacity on Wellington Road.

The traffic evidence provided at the Panel Hearing for the rezoning discussed the potential for providing an additional right turn lane on the northern approach, in addition to the previously proposed left turn lane from the west and left turn slip lane on the north approach. However, the provision of a second right turn lane from the north would require splitting the side road phases operating the northern and southern legs of the intersection.

A Functional Layout Plan, attached at Appendix A, has been prepared to demonstrate the potential intersection layout and SIDRA Analysis has been undertaken to demonstrate the expected operation of the intersection post works. Detailed SIDRA summaries are provided for the base case and future intersection operating conditions at Appendix B.

Adopting this intersection layout and allowing for a small reallocation of phase time from the Wellington Road through movements will allow for the future network volumes to be accommodated at the intersection.

Table 8 summarises the post development peak hour operation, and it can be seen that Wellington Road continues to operate with comparable conditions to existing.

Whilst there are increases in the degrees of saturation for the Corporate Avenue exit movements in the AM peak hour from the existing conditions, this is primarily due to a utilisation of existing spare capacity for the exit from this leg. This exit from Corporate Avenue is expected to operate with a degree of saturation of 0.88 in the AM, which corresponds to 'good' conditions.

Whilst there is an increase in the degree of saturation for the Wellington Road right turn from the east in the PM, it will continue to operate within 'good' operation and queues will be maintained within existing turn lanes.

A slight increase to the degree of saturation for the west leg of Wellington Road is also expected, albeit it will continue to operate under 'good' conditions.

We note that in the AM peak, the Wellington Road eastern approach (westbound movements) shows an improvement in operation and reduction in queues. This is as a result of the potential for improved efficiency of the turn phase operations by running a leading right turn from the east. The analysis assumes that on average, due to very low turning demands from the west, that right turn would operate in approximately every second signal cycle.

With regard to the side road legs, the analysis also assumes that due to the low volumes exiting Jaydee Court, it would only operate on average approximately every second cycle.

A comparison of the existing and proposed phasing for this intersection is provided at Table 9 to demonstrate that there are no significant changes to through green times.

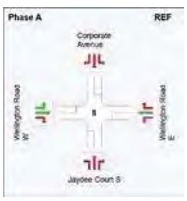
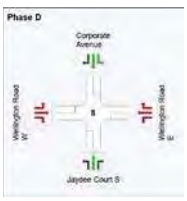
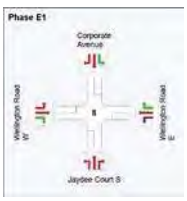
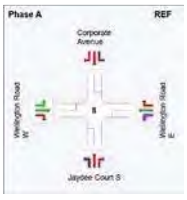
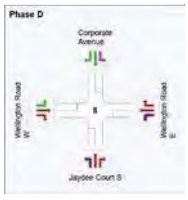
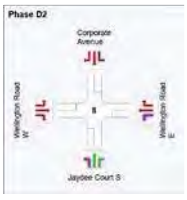
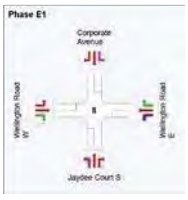
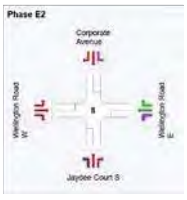
This change in phase times is not considered to have a significant affect to existing signal operations, particularly given the level of mitigating works proposed at this intersection.

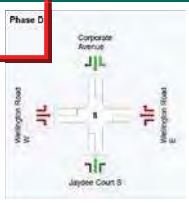
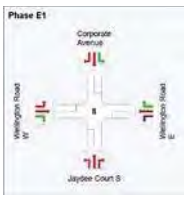
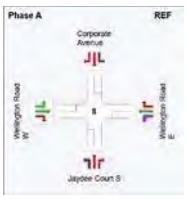
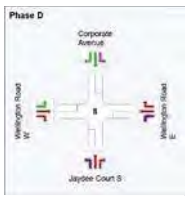
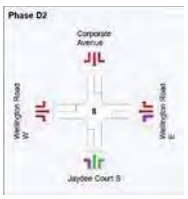
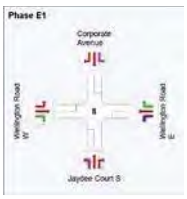
Table 8: Comparison of SIDRA Results- Wellington Road/Corporate Avenue

Leg	*Movement*	*Existing*			*Post Development*		
		DoS	*Av. Delay (s)*	*95th'ile Queue (m)*	*DoS*	*Av. Delay (s)*	*95th'ile Queue (m)*
AM Peak							
Jaydee Crt (S)	Left	0.03	7	1	0.02	5	0
	Through	0.10	70	6	0.29	81	6
	Right	0.10	74	6	0.29	86	6
Wellington Rd (E)	Left	0.01	5	1	0.01	5	3
	Through	0.81	3	113	0.75	1	39
	Right	0.50	74	41	0.38	76	24
Corporate Av (N)	Left	0.04	52	5	0.18	5	5
	Through	0.18	69	10	0.88	82	50
	Right	0.18	74	10	0.88	86	50
Wellington Rd (W)	Left	0.42	11	54	0.17	10	27
	Through	0.42	2	54	0.37	2	25
	Right	0.17	71	13	0.56	86	16

Leg	Movement	Existing			Post Development		
		DoS	Av. Delay (s)	95th'ile Queue (m)	DoS	Av. Delay (s)	95th'ile Queue (m)
PM Peak							
Jaydee Crt (S)	Left	0.05	7	2	0.03	7	3
	Through	0.08	61	7	0.42	86	9
	Right	0.08	66	7	0.42	90	9
Wellington Rd (E)	Left	0.01	5	1	0.01	5	1
	Through	0.30	8	75	0.31	9	79
	Right	0.38	85	15	0.88	91	62
Corporate Av (N)	Left	0.24	55	40	0.34	12	29
	Through	0.75	69	69	0.86	83	61
	Right	0.75	74	69	0.86	87	61
Wellington Rd (W)	Left	0.83	11	150	0.11	10	16
	Through	0.83	3	150	0.86	4	203
	Right	0.22	84	9	0.13	78	8

Table 9: Comparison of Existing and Proposed Peak Hour Phasing

AM Peak					
Existing (139 seconds)					
	105 s	15 s		19	
Proposed (139 seconds)					
	103 s	14 s	6 s	7 s	9 s

	PM Peak		
Existing (145 seconds)			
	109 s	25 s	11 s
Proposed (145 seconds)		 	
	107 s	16 s	6 s	16 s

South Corporate Avenue

We note that Council, VicRoads and the Panel raised concerns with the potential for additional impacts for vehicles entering and exiting South Corporate Avenue as a result of the additional traffic generated to/from the Development Plan.

Through discussions with VicRoads, further mitigating works have been identified to effectively allow South Corporate Avenue to operate as a Service Road to/from Wellington Road. These mitigating works include the provision of a new left turn ingress and deceleration lane from Wellington Road at the western extent of South Corporate Avenue and, subject to the determination of levels and an appropriate design, a new egress only to Wellington Road, west of the Corporate Avenue signals. These works are shown on the plans at Appendix A.

The provision of the new ingress will remove vehicles arriving from the west from the existing signals.

Vehicles arriving from the east will continue to be able to utilise the signals at Corporate Avenue/Wellington Road.

For vehicles wishing to depart the site to the east, the intention (subject to detailed design) is that the works would facilitate direct access to the eastbound carriageway of Wellington Road. This is intended to resolve potential impacts as a result of any additional queues on Corporate Avenue. Depending on the ultimate location of the cut-through, there may also opportunity for some vehicles to exit to Wellington Road and then undertake a u-turn (as appropriate) to depart to the west.

The ability to turn right from South Corporate Avenue onto Corporate Avenue to utilise the signals will remain, however the mitigating works are expected to alleviate the concerns raised by Council and VicRoads with regard to the egress from South Corporate Avenue as far as practicable.

Accordingly, these additional works are considered appropriate.

Corporate Avenue

Post development, Corporate Avenue could be expected to cater for some 6,000 vehicles per day.

The cross-section of Corporate Avenue provides for a 12.5 metre carriageway which accommodates a single lane of traffic and kerbside parallel parking in each direction with verge and footpath on both sides. On the northern/eastern side it provides for additional landscaping.

This road cross-section is generally consistent with a connector type street which would have an indicative environmental capacity of some 3,000-7,000 vehicles per day, two way.

In this regard, post development, it is considered that Corporate Avenue will continue to operate within the expected daily traffic volume range, and the proposed development is not expected to adversely impact on traffic access for the existing uses along Corporate Avenue.

With the mitigating works proposed at Wellington Street/Corporate Avenue, appropriate access to/from Corporate Avenue will be provided post development.

4.6.2 Stud Road/Emmeline Row

At Stud Road, the analysis indicates that with adjustments to existing signal phasing times, the full development of the precinct can be accommodated at this intersection without significant impact to through movements on Stud Road. It is noted that the change to phase times is primarily associated with the provision of additional phase time for right turns into Emmeline Row Road in the peak hours, of which the approved Stamford Park residential subdivision would already be contributing to a change in the phase times from the base case. The analysis suggests that a reallocation of in the order of six seconds from the A phase is required.

Capacity continues to remain on Stud Road even allowing for growth to through volumes on the network and therefore the change to phase times is considered appropriate.

A summary of the intersection results for post development volumes at Stud Road / Emmeline Row are summarised in Table 10.

Whilst there would be a reallocation of time from through movements on Stud Road to allow for vehicles to exit Emmeline Row, this is not considered unreasonable as through movements on Stud Road would continue to operate under 'good' conditions in the AM peak hour with a degree of saturation of 0.83 in the AM peak and 0.88 in the PM peak.

The degrees of saturation for the Emmeline Row AM post conditions analysis suggests that with the additional volumes of the proposed rezoning, this leg would continue to operate under 'good' conditions' at 0.73. During the PM peak hour, it will operate within capacity and under 'very good' conditions with a degree of saturation of 0.65.

Whilst there is an increase in the degree of saturation for the Stud Road right turn from the north in both the AM and PM peaks, it will continue to operate within an appropriate degree of separation (0.57 in the AM and 0.88 in the PM) for an arterial intersection. Furthermore, the 95th percentile queue in both peaks will be contained within the existing right turn lanes and therefore will not impact on through movements on Stud Road.

No works would be required to this intersection given the level of capacity which remains in these signals, particularly the existing double right turn lanes from the northern approach and two-lane right turn exit from Emmeline Row.

Table 10: Comparison of SIDRA Results – Stud Road/Emmeline Row

Leg	Movement	Base Case			Post Development		
		DoS	Av. Delay (s)	95th'ile Queue (m)	DoS	Av. Delay (s)	95th'ile Queue (m)
AM Peak							
Stud Road (S)	Left	0.07	6	3	0.10	6	6
	Through	0.79	1	52	0.83	1	66
Stud Road (N)	Through	0.55	1	89	0.57	3	121
	Right	0.36	68	25	0.57	76	41
	U-Turn	0.36	55	19	0.57	73	38
Emmeline Row (W)	Left	0.06	10	3	0.63	13	70
	Right	0.13	82	5	0.73	82	49
PM Peak							
Stud Road (S)	Left	0.01	6	1	0.09	6	7
	Through	0.73	4	161	0.80	5	207
Stud Road (N)	Through	0.71	1	39	0.71	1	39
	Right	0.21	80	6	0.88	92	63
	U-Turn	0.21	14	4	0.88	95	62
Emmeline Row (W)	Left	0.41	13	26	0.54	18	66
	Right	0.29	79	17	0.65	82	39

4.6.3 Expected Queue Lengths

Based on the analysis provided in Table 8 and Table 10, Figure 9 and Figure 10 have been prepared to demonstrate the extent of 95th percentile queue projected for the existing and proposed AM and PM peak hours.

The diagrams and the results in the tables identify the following:

At the intersection of Wellington Road/Corporate Avenue:

- The westbound direction is more critical in the AM peak hour and the analysis expects a reduction of the existing queue on the eastern approach of 113 metres to 39 metres due to improvements in the signal phasing arrangement.
- The eastbound direction is more critical in the PM peak hour and the analysis expects an extension of the existing 95th percentile queue on this approach from 150 metres to 203 metres.
- The separation between the EastLink southbound off ramp is approximately 530 metres, and therefore the queue would not extend into this intersection.

We note that the analysis for Wellington Road/Corporate Avenue does not contemplate the potential redistribution of traffic to/from South Corporate Avenue as a result of the additional mitigating works (ie the Service Road type access). However, given the relatively small proportion of vehicles entering and exiting South Corporate Avenue in the peak hours, there is likely to be limited impact on the queue lengths.

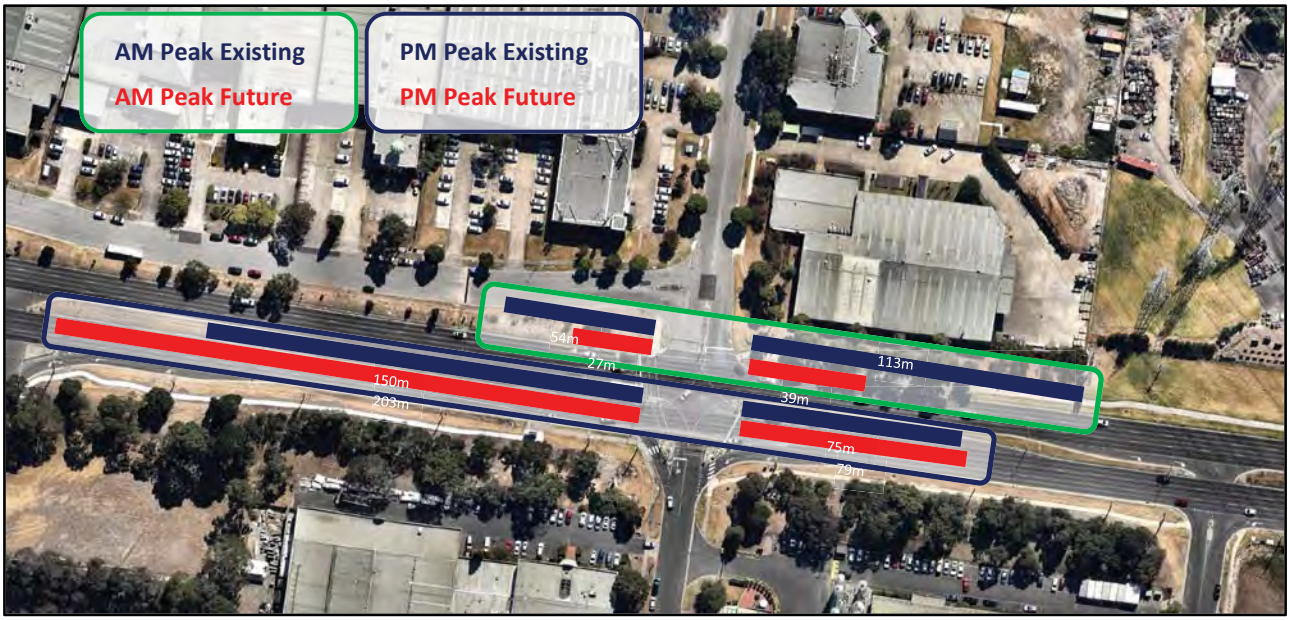


Figure 9: SIDRA Analysis Comparison of Queue Lengths - Wellington Road / Corporate Avenue

At the intersection of Stud Road / Emmeline Row:

- The separation to nearby intersections is lower, compared to at Wellington Road / Corporate Avenue with Kellets Road (signals) approximately 420 metres to the north and Fulham Road (signals) approximately 300 metres to the south.
- In the AM peak hour, the queue on the southern approach is expected to increase from 52 metres to 66 metres.
- The queue on the northern approach in the AM is expected to extend from 89 metres to 121 metres. Lakeside Boulevard is approximately 200 metres north of the intersection, and therefore access would not be impacted by queues.
- In the PM peak hour, the queue on the southern approach is expected to extend from 161 metres to approximately 207metres. This will not extend past the Lakeview Avenue/Fulham Road intersection.
- The queue on the northern approach in the PM is expected to extend to 63 metres. Again, Lakeside Boulevard is approximately 200 metres north of the intersection, and therefore access would not be impacted by queues.

Based on the preceding, the development traffic volumes are expected to be able to be accommodated at the subject intersections. Whilst there will be some extension to existing queues in the peak hours, queues would not extend past existing signalised intersections.

Figure 10: SIDRA Analysis Comparison of Queue Lengths – Stud Road/Emmeline Row

4.6.4 Broader Network Considerations

VicRoads' general guidelines for the assessment of traffic impacts for new developments, and the need to undertake detailed intersection analyses, relates to the level of additional traffic generated to a nearby intersection. If a proposal generates an increase of 10% of existing vehicle movements to any one movement, then consideration should be given to undertaking a detailed analysis of that intersection.

Any potential mitigating works which may be required as a result of those analyses must be commensurate with the level of additional traffic and / or the impact of that additional traffic on the intersection. That is, the VicRoads guidelines acknowledge that it is not the responsibility of a new development to rectify existing traffic issues at a neighbouring intersection if it does not significantly contribute to making those conditions worse.

The Rowville Transport Study, prepared by SKM undertaken in 2013, provides an assessment of the transport network in the surrounding Rowville area and identified a number of hot spots and potential future operations and considerations for the network.

It highlights that whilst Stud Road / Wellington Road and Stud Road / Kellets Road are 'hot spots' now and into the future, the delays on the road network are generally focussed around the *"major signalised intersections in the study area, rather than the minor signalised intersections along the corridor routes"*.

This is consistent with the analyses undertaken in this report, identifying that the proposed site access intersections can accommodate the level of development proposed within Kingston Links and Stamford Park.

Ultimately, the Stamford Park residential and business developments have existing permits which approved the traffic generated by those uses and the Kingston Links redevelopment is expected to generate in the order of 664 vehicle movements to the road network during the peak hours.

Wellington Road currently carries in the order of 4,000 vehicle movements two-way in the peak hours and the Kingston Links redevelopment is projected to contribute less than 200 additional vehicle movements to either of the intersections to the east and west. This represents less than 5% of the existing through volumes to the intersections to the east or west of the site.

Stud Road, north and south of Emmeline Row, currently carries in the order of 3,700 vehicle movements two-way, with a slight bias in the morning for northbound movements, and in the afternoon for southbound movements. The Kingston Links redevelopment is projected to contribute in the order of 294 vehicle movements to and from the north and 196 vehicle movements to and from the south. This would be further split to inbound and outbound movements from the site as well as individual turning movements once those vehicles arrive at those intersections. The increase to any one of the intersections to the south or north will therefore be lower than 8%.

In both cases, analyses of intersections along the broader network is not considered to be warranted.

Having regard to the preceding analyses, we are of the view that with the mitigating works proposed at Wellington Road / Corporate Avenue, and the existing intersection of Stud Road / Emmeline Row can accommodate the level of development proposed by the Kingston Links rezoning.

4.7 Agreed Mitigating Works

The Integrated Transport Management Plan is required to include:

- *An assessment of the expected impact of traffic generated by the development on the existing and future road network and any mitigation measures required to address identified issues to the satisfaction of VicRoads and the responsible authority.*

Based on the preceding, and following discussions with VicRoads, it is considered that the proposed level of development can be accommodated and that the access strategy is appropriate, subject to the following agreed mitigating works:

- Mitigating works are proposed at the intersection of Wellington Road / Corporate Avenue to provide a left turn deceleration lane from the west and a left turn slip lane and additional right turn lane from the north. The pedestrian crossing has also been relocated to the eastern side of the intersection at VicRoads' request to reflect the high demand for right turn movements out of Corporate Avenue. Signalling changes would also be required to facilitate these works by split phasing the operation of the side roads.
- At the direction of VicRoads, mitigating works are proposed to South Corporate Avenue to provide a left turn deceleration lane and new ingress from the west and, subject to detailed design being able to demonstrate appropriate grades and access to Wellington Road, there is potential for an egress access point for vehicles exiting to the east on Wellington Road.
- No works are required to the intersection of Stud Road as there is existing spare capacity at this intersection.
- Some changes to the allocation of phase times at the intersection of Stud Road is expected, however in the context of the existing operation and proposed analysis, this is considered acceptable.

5 Internal Traffic Considerations

5.1 Indicative Internal Road Network

Tract Consultants has prepared an indicative road network plan, shown at Figure 11, which is intended to respond to the requirements of the Development Plan Overlay.

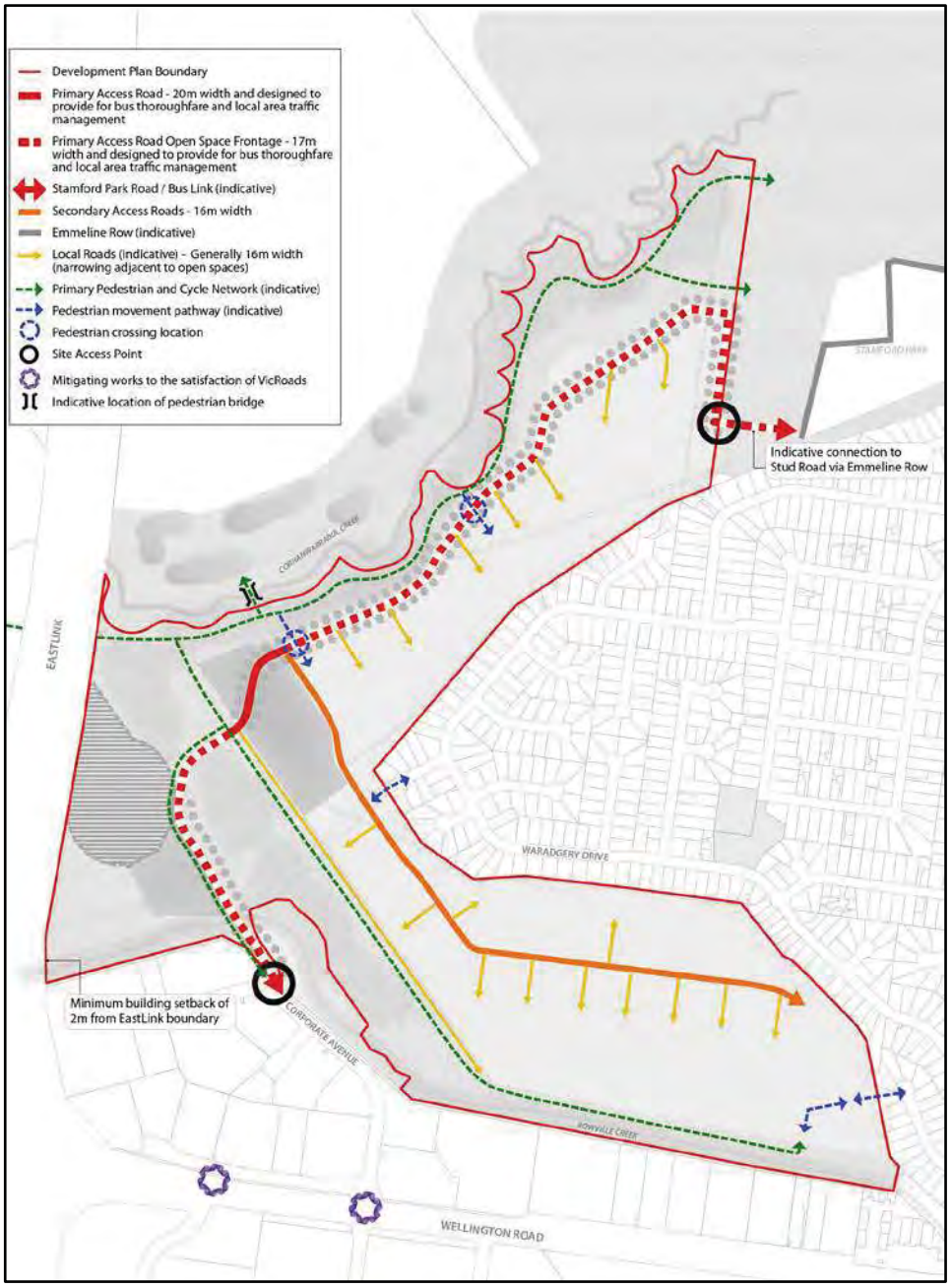


Figure 11: Proposed Internal Road Network Hierarchy

The Landscape Plan, which has been prepared in conjunction with the indicative road network plan by Tract Consultants identifies that:

"the development will provide for a diversity of leisure activities, and enable people to enjoy nature, engage with others, learn and play."

And that

"Walking and cycling will be promoted throughout the network of reserves, the creek corridor, electrical easement and a streetscape design which embraces Knox Liveable Streets Plan 2012-2022 principles. 'Home Streets' as identified in section 5 of Knox Liveable Streets Plan 2012-2022 will be implemented where suitable to create a shared pavement that services pedestrians, traffic and cyclists within one space."

Importantly, the alignment includes provision of a through road link with an alignment that finds a balance between allowing for the potential for a future bus route, but also has an alignment that manages the potential for non-local through traffic (ie rat running traffic).

A discussion of each of the key design components of the roads is provided as follows.

5.2 Primary Access Road (Connector Road)

The plan proposes a linking road which is to run from Corporate Avenue through the subdivision and connect to the Stamford Park subdivision to the north.

This link is provided with a 20.0 metre cross-section to be consistent with the approved Stamford Park Connector Road where both sides of the road are developed (as per Figure 12). The standard 20 metre cross-section provides for a 7.0 metre wide two-way traffic carriageway, indented parking on both sides, and a 4.2 metre urban verge (pedestrian footpath) on both sides.

This cross section will reduce to 17.0 metres where the road abuts open space on one side, by allowing the footpath or shared path (and some verge) on one side to be accommodated within the open space as shown in Figure 13.

The urban verge will offer the opportunity for a shared path to be provided on one side (where there is not one provided within the landscaping or park reserve).

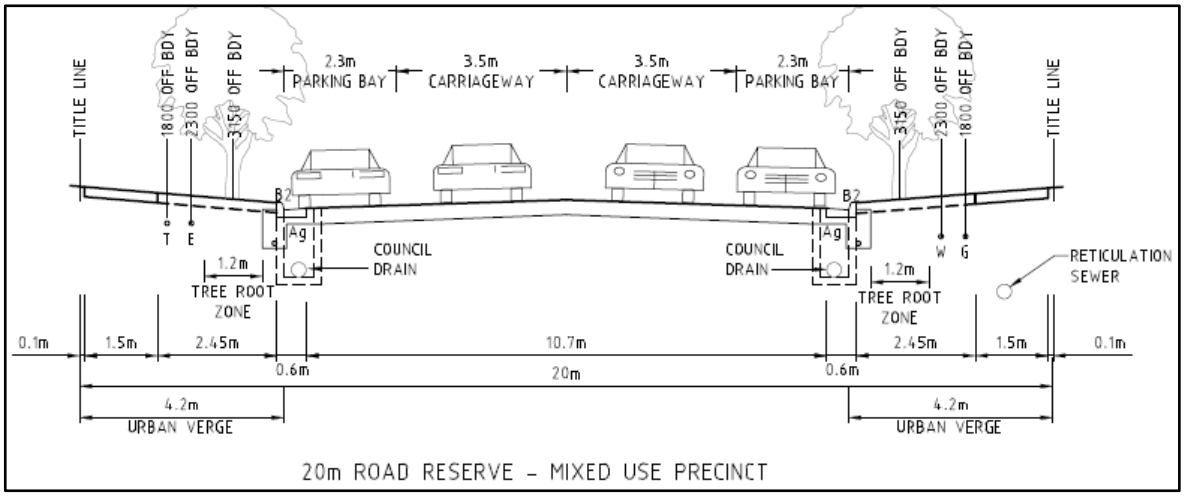


Figure 12: Primary Access Road (20 metre Collector Street)

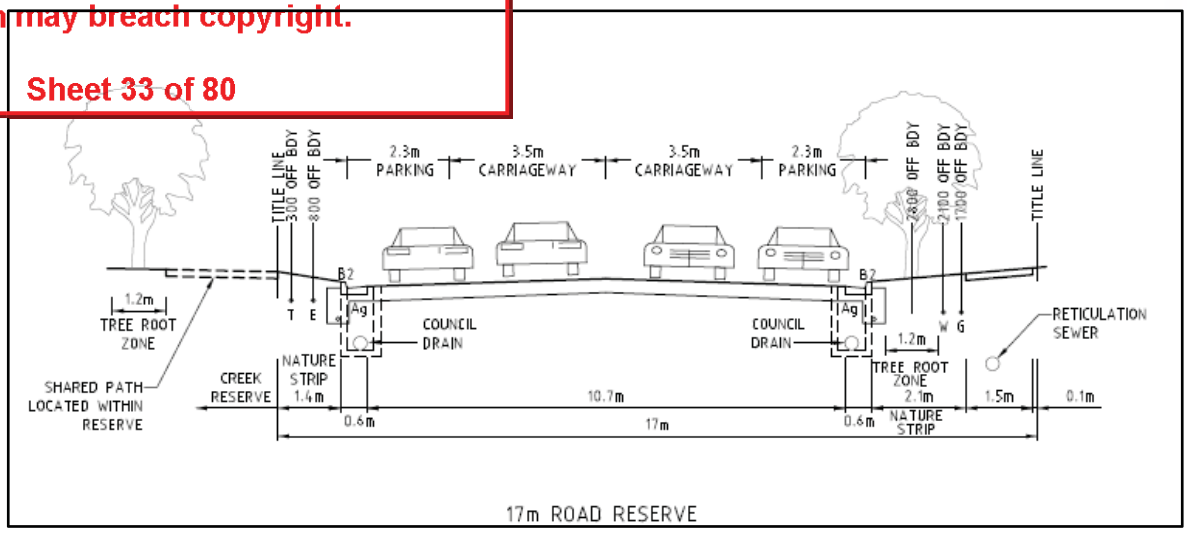


Figure 13: Entry Road Cross-Section (17 metre Collector Street Adjacent Open Space Reserve)

The upper yield of the residential precinct, inclusive of both the Stamford Park and Kingston Links sites, is expected to generate some 8,160 vehicle movements per day two-way. However, with two access points proposed to the external road network, this traffic would be distributed and no one section of road would experience this level of daily traffic.

Based on the adopted distributions, the Stamford Park connecting road could be expected to carry up to 4,500-5,000 vehicles per day two-way.

At the north-eastern connection to the existing road network, the Emmeline Row reserve width of 22 metres and the Stamford Park Connector reserve width of 20 metres will accommodate a comparable trafficable cross-section to that of a Connector Street Level 2 and with some reduction to the footpath and/or verge widths.

It is noted that Connector Streets under Clause 56 of the Planning Scheme have an environmental capacity of around 3,000-7,000 vehicles per day two-way, with the main distinction between the lower end and higher end of the range being the verge widths. That is, a larger verge provides typically for a higher perceived environmental capacity.

Notably, the new connector road through Stamford Park abuts a new residential park, open space, village green and recreation lake for the majority of its length with residential development occurring only on one side.

This is similar to the route which is proposed through Kingston Links, where a significant proportion of the road abuts open space or park reserve. In this regard, a wider verge would effectively be achieved on one side for a significant proportion of the road's length, albeit not necessarily within the allocated road reserve itself.

We note that the Stamford Park connector road was always intended to provide a through link between Kingston Links and Stud Road.

We are of the view that this would be able to function with a similar capacity to that of a higher order connector and also potentially allow for a bus route to operate through the site. Furthermore, whilst the new road will ultimately provide a link between Wellington Road and Stud Road, the proposed design is intended to discourage non-local through traffic.

In this regard, the level of traffic expected on the connector is considered acceptable given that all traffic will be local traffic, there will be limited rat running traffic, and the road has been designed to encourage a low speed environment.

5.3 Local Access Streets (including Secondary Access Road)

Local Access Roads, including the Secondary Access Road which runs south-east from the main connector, are provided with an effective 16 metre road reserve as shown in Figure 14.

The standard 16.0 metre reserve provides for a minimum carriageway width of 7.3 metres (and in most cases 7.5 metres) which is consistent with the minimum typical requirements of the VPA Guidelines for new residential developments and also Clause 56.06.

This cross-section will permit kerbside parking and a pedestrian path on either side of the road.

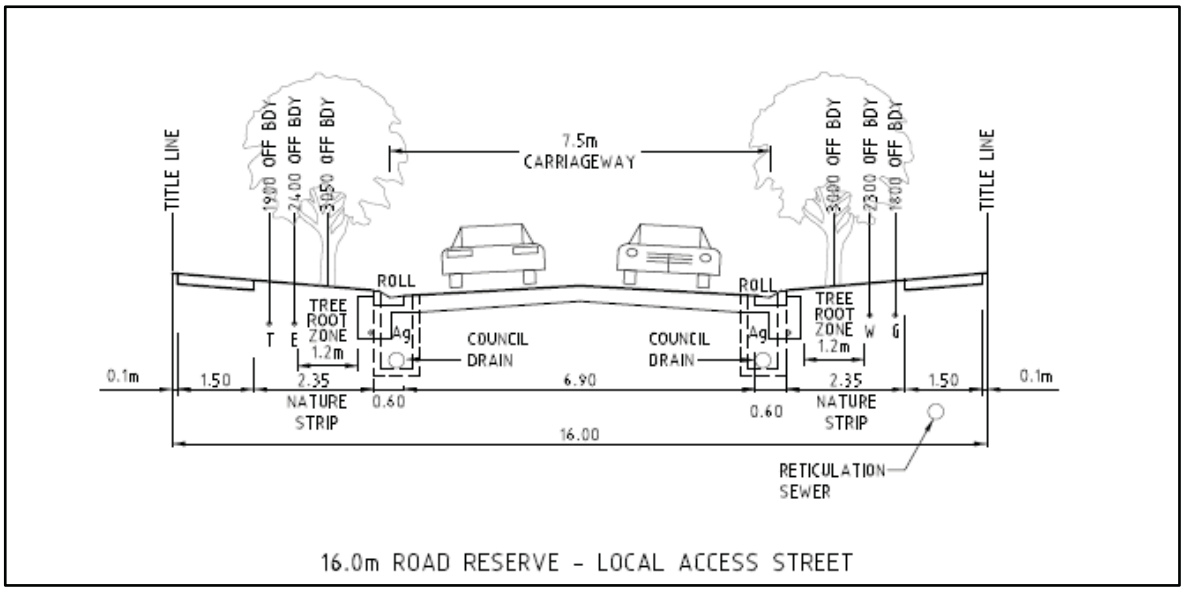


Figure 14: Local Access Road Cross Section (16.0 metre)

5.4 One-Sided Secondary Access Road & Local Streets

It is noted that the secondary access road reduces in width where it runs adjacent to a landscaping buffers/linear reserves.

In this case, a cross-section of typically 11.5 metres is provided. A carriageway width of minimum 7.3 metres will be maintained throughout these sections, allowing for consistency along this secondary access road. As there is development on one side only, footpaths are only necessary on the development side.

The transition between the 7.3 metre and 7.5 metre carriageway will be materially indiscernible for the general motorist and will not impact on accessibility throughout this part of the proposal.

We are of the view that these arrangements are acceptable and will continue to provide a generally consistent road environment through this part of the development. A nominal cross-section of the 11.5 metre road is provided in Figure 15.

This road cross-section has been also utilised for the local access roads which run adjacent to the existing residential land to the north and east of the site. Again, as development is proposed on one side only, and there is additional width provided by the adjacent linear reserve, this cross-section is considered acceptable.

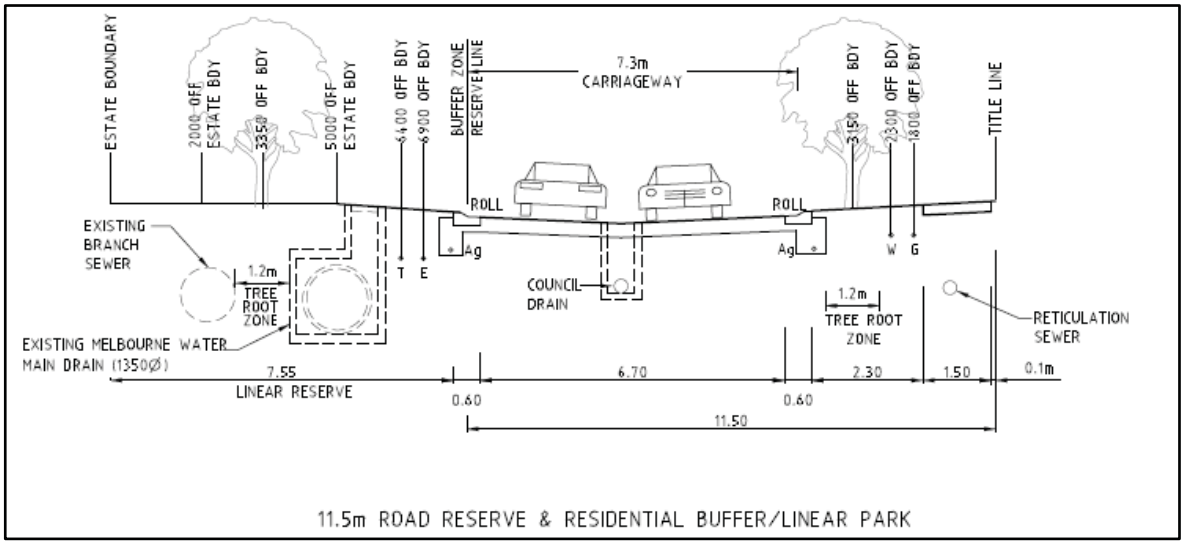


Figure 15: Local Access Road Cross Section Adjacent Linear Park (11.5 metre)

5.5 13.0 metre, 12.5 metre and 9.0 metre Buffer Roads

Similar to the reduced reserve widths accommodated by the 11.5 metre local access streets, there is a small section of local access road, serving a number of medium density townhouses that provides a 13.0 metre road reserve to the north-east of the Mixed Use precinct. It also takes advantage of single sided development and the additional space provided by the landscape buffer to the east.

The short section of the 13.0 metre road reserve allows for variations in the verge widths to be accommodated, without substantially changing the condition for drivers. That is, as the road turns the corner, or intersects with the adjacent local access street, the verge widths will adjust, but the carriageway width will be maintained.

A cross-section of this 13.0 metre road is provided at Figure 16, demonstrating appropriate footpath and carriageway provisions.

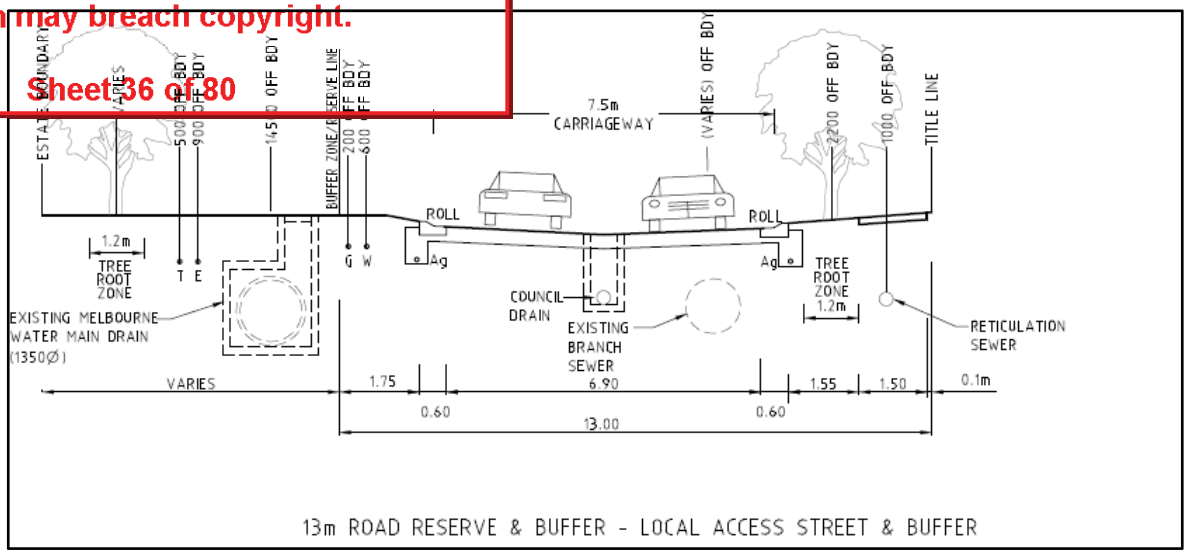


Figure 16: Local Access Road Cross Section Adjacent Drainage Reserve (13.0 metre)

The southern boundary is lined by a 12.5 metre local access road, which also intends to take advantage of the Drainage Reserve of the southern side.

A cross-section of this 12.5 metre road is shown below, demonstrating appropriate footpath and carriageway provisions.

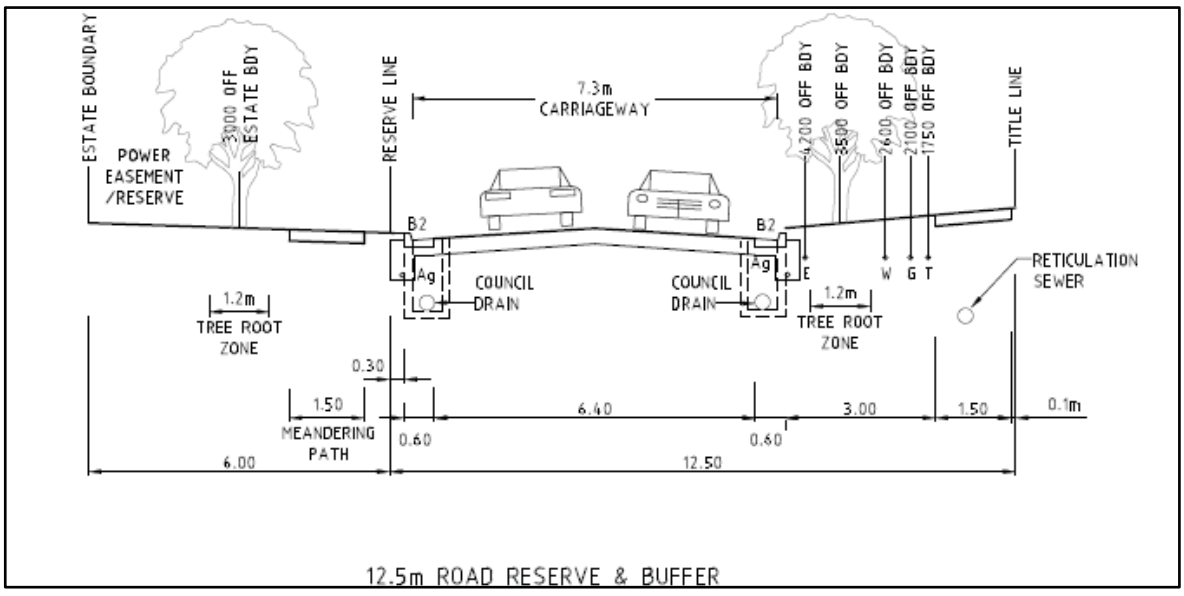


Figure 17: Local Access Road Cross Section Adjacent Drainage Reserve (12.5 metre)

In the northern portion of the site, along the eastern boundary, there are some shorter sections of 9.0 metre wide road reserves which provide very local access to what is expected to be a slightly higher density of development and do not provide any meaningful through linkages for the surrounding subdivision.

These will more likely operate as Access Places, providing limited access to predominantly those dwellings abutting the road.

Due to the limited access provided by these roads, the reduced 9.0 metre reserve, with only a 5.5 metre carriageway is considered acceptable. This 5.5 metre carriageway remains in accordance with Clause 56.06 and the minimum requirements for CFA and emergency vehicle access.

The proposed cross-section is shown at Figure 18.

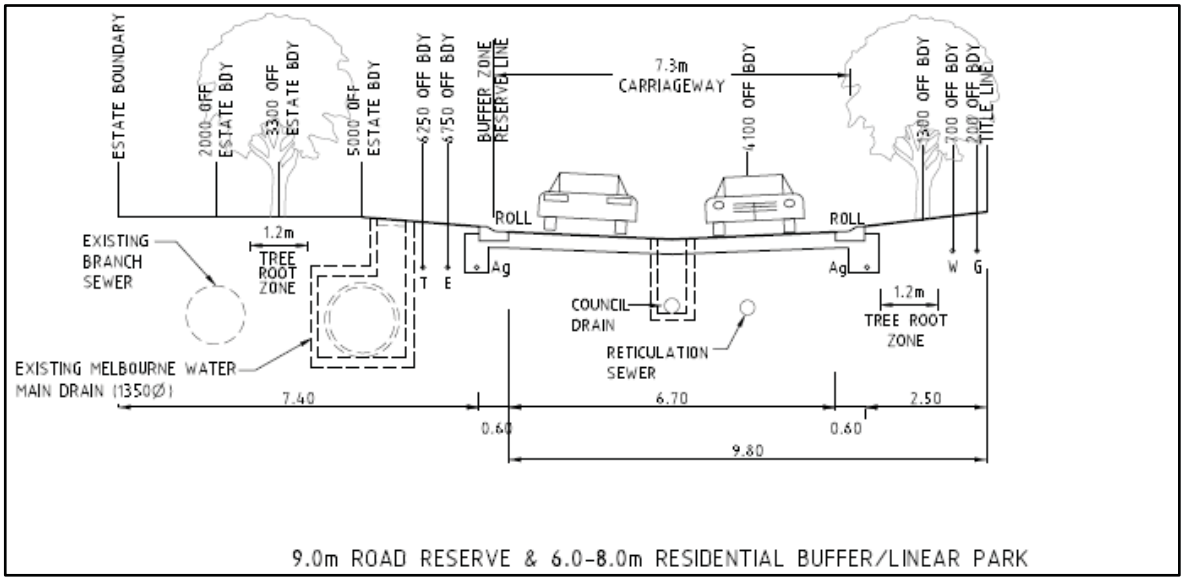


Figure 18: Local Access Places (9.0 metre)

5.6 Shared Path and Pedestrian Accessibility

The Primary Access Road is intended to provide for a continuous shared path linking Corporate Avenue with Stamford Park as noted within Figure 11.

It is noted that the plan also identifies shared path connections to the existing residential subdivisions to the east as well as along the creek reserve to the north-west of the site.

This is consistent with the themes of the Knox Liveable Streets Plan 2012 that encourages pedestrian and cycle paths throughout residential areas.

5.7 Emergency and Waste Vehicle Accessibility

The internal road network has been designed in accordance with the typical road pavement requirements consistent with Council standard street designs, the VPA design guidelines and Clause 56.06 of the Planning Scheme.

Reference has also been made to the CFA 'Requirements for water supplies and access for subdivisions in residential 1 and 2 and township zones' dated October 2006. The CFA requires a minimum carriageway width of 5.5 metres with parking provided along one side and a carriageway width of 7.3-7.5 metres for parking on both sides of the carriageway.

The internal road network has been designed with a minimum carriageway width of 5.5 metres where parking is on one-side and 7.6 metres where parking is both sides, meeting minimum CFA requirements.

All roads will ultimately be handed to Council and will be subject to detailed design to ensure appropriate access is provided for vehicles, pedestrians, bicycles, emergency vehicles, public transport and waste collection as required.

5.8 Bus Route Capability

The proposed connector is to provide a minimum road width of 7.0 metres, allowing for 3.5 metre traffic lanes in each direction. This is consistent with the PTV and VPA requirements for connector roads on bus routes. Detailed design of slow treatments and LATM will be such that the potential for a bus route can be maintained.

Whilst the route of the connector deviates through the site, and does not provide an immediately direct link through the development, this is provided in response to requirements under the Development Plan Overlay to discourage non-local through traffic.

5.9 Rat Running and Local Area Traffic Management

5.9.1 Existing and Proposed Links

DPO13 requires (among other things) a street network that discourages through-traffic. This requirement seeks to deter 'rat-running' traffic from utilising the proposed through link between Wellington Road and Stud Road via Corporate Avenue and Emmeline RoW to avoid the intersection of Stud Road / Wellington Road.

In order to discourage rat running traffic, Local Area Traffic Management (LATM) treatments will be provided along the internal linking road. These may include, road humps, (with or without kerb outstands), slow points, modified T-intersections, raised pavement intersection treatments and speed zone reductions. These treatments will be sited at approximately 200 metre intervals.

The design of these treatments will ultimately be subject to Council approval and will consider the potential provision of a bus route through the subdivision.

Traffix Group commissioned GPS travel time surveys on Thursday 30th April, 2015 during the morning and afternoon peak hours to understand existing travel times between the intersections of Wellington Road / Corporate Avenue and Stud Road / Emmeline Row in the peak directions. This route has a travel distance of approximately 2.6 kilometres.

We estimate that based on the most recent development plan, the proposed connector road through Kingston Links will have a total travel distance of approximately 2.9 kilometres between the Wellington Road / Corporate Avenue and Stud Road / Emmeline Row intersections.

This is approximately an additional 300 metres travel distance to the route via the arterial network.

The connector road will have a default speed limit of 50 km/h, however the Development Plan will target an average speed of around 35 km/h through the estate given that:

- Local Area Traffic Management (LATM) devices will be installed along the connector road (these devices generally have a reduced advisory speed limit of 20 km/h); and
- The connector road will provide access to and from adjacent streets and driveways to individual lots and in this regard, drivers would typically be subject to lower speeds due to delays from turning vehicles.

Local area traffic management devices may include:

- Roundabouts.
- Raised pavement intersections.
- Slow points, kerb outstands, or raised road humps.

Figure 19 shows a comparison of the Arterial and the Kingston Links (approximate) routes and potential (indicative) locations of LATM.

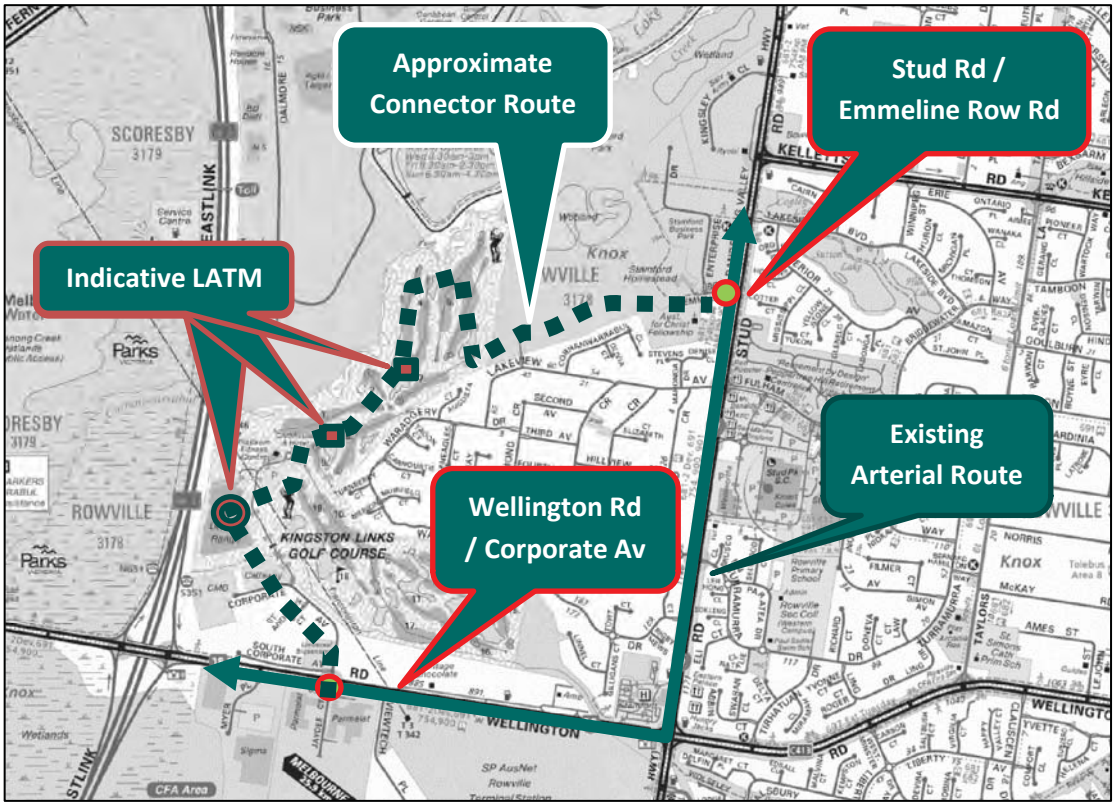


Figure 19: Comparison of Travel Routes & Indicative LATM Locations

5.9.2 Existing Arterial Travel Times

The AM traffic peak hour was found to occur 7:45am-8:45am and at this time the peak traffic direction is southbound on Stud Road and then westbound on Wellington Road (to access Eastlink).

Morning travel time surveys were undertaken across a two-hour period between 7:15am and 9:15am with a total of 17 travel runs recorded, seven (7) of these in the peak hour itself. The following travel times were observed during the AM traffic peak hour:

- A minimum travel time of four (4) minutes 37 seconds.
- An average travel time of five (5) minutes 29 seconds; and
- A maximum travel time of seven (7) minutes four (4) seconds.

The PM traffic peak hour was found to occur 4:45pm-5:45pm, when the peak traffic direction is eastbound on Wellington Road and then northbound on Stud Road (away from Eastlink).

The travel time surveys were undertaken across the 2-hour period between 4:15pm and 6:15pm with a total of 16 travel runs recorded, six (6) of these in the peak hour itself. The following travel times were observed during the PM traffic peak hour:

- A minimum travel time of four (4) minutes 19 seconds,
- An average travel time of five (5) minutes 11 seconds, and
- A maximum travel time of six (6) minutes 16 seconds.

5.9.3 Proposed Link Travel Times

Based on the anticipated average speed, a total travel time of approximately four (4) minutes 58 seconds is expected in both directions.

In the peak direction in the AM peak hour (south-to-west), if vehicles chose to use the connector route, they would be required to turn right into Emmeline Row from Stud Road to access Kingston Links, circulate through the site, and then undertake another right turn at Corporate Avenue onto Wellington Road in order to access Eastlink. The SIDRA Intersection analysis suggests that these vehicles would be subject to the following additional average delays compared to the existing arterial route:

- One (1) minute 18 seconds at the right turn into Emmeline Row.
- One (1) minute 26 seconds at the right turn from Corporate Avenue into Wellington Road.

In the peak direction in the PM peak hour, the left turn from Wellington Road in to Corporate Avenue will experience a geometric delay of some nine (9) seconds and the left turn from Emmeline Row into Stud Road northbound would attract an additional average delay of 52 seconds due to the need to give way to through traffic volumes on Stud Road.

It is therefore projected that the average travel time for the route through Kingston Links would be:

AM Peak – 7 minutes 42 seconds.

PM Peak – 5 minutes 59 seconds.

5.9.4 Comparison of Travel Times

Table 11 provides a comparison of the travel times during the AM and PM peak hours for the respective peak directions based on the preceding assumptions.

Table 11: Comparison of Travel Routes and Times

Description		Arterial Route	Kingston Links
AM Peak Hour (Stud Road/Emmeline Row to Wellington Road/Corporate Avenue)			
Travel Distance		2.6km	2.9km
Average Travel Time		5min 29sec	4min 58sec
Additional Control Delay	**Stud Rd/Emmeline RoW**	-	+ 1min 18sec
	Wellington Rd / Corporate Av	-	+ 1min 26sec
	Sub-Total	-	+ 2min 44sec
Effective Travel Time		**5min 29sec**	**7min 42sec**
PM Peak Hour (Wellington Road/Corporate Avenue to Stud Road/Emmeline Row)			
Travel Distance		2.6km	2.9km
Travel Time		5min 11sec	4min 58sec
Additional Control Delay	**Stud Rd/Emmeline RoW**	-	+ 0 min 9sec
	Wellington Rd / Corporate Av	-	+ 0 min 52sec
	Sub-Total	-	+ 1min 01sec
Effective Travel Time		**5min 11 sec**	**5min 59sec**

In summary, the AM peak hour trip toward Eastlink via Kingston Links would attract an additional two (2) minutes and 13 seconds of travel time when compared to the average trip time using the arterial route under existing conditions. The average time through Kingston Links is approximately 30 seconds greater than the maximum travel time recorded on the arterial route.

In this regard, there is no benefit to travel through the site and the arterial route provides the more timely route.

In the PM peak hour, heading east from Eastlink, the route through Kingston Links is projected to be 48 seconds slower than the arterial route. Accordingly, we believe motorists will not use Kingston Links as a 'rat run'.

Furthermore, the current travel times on the arterial road network are not considered excessive, with average travel speeds of around 35-45km/h experienced in the peak directions and with a trip time of only five (5) to seven (7) minutes.

5.9.5 Conclusions

Based on the above, we are of the opinion that the current travel times on the arterial network are not excessive and therefore drivers are unlikely to seek an alternative 'rat-run' route through the site. We expect that appropriate design will further deter external drivers from using the connector road through Kingston Links as there will be:

- An increase in the overall travel distance and average travel times.
- An increase in delays at the intersections of Wellington Road / Corporate Avenue and Stud Road / Emmeline Row for turning movements; and
- A reduction in through-driver comfort along the connector road due to lower average travel speeds and LATM devices comparative to the arterial network.

6 Construction Management Plan

6.1 General

The Development Plan Overlay requires that the Integrated Transport Management Plan also include:

> *"A Construction Management Plan informed by analysis of staging requirements of traffic works identified in the Integrated Transport Management Plan."*

Typically, the Construction Management Plan would be required prior to the commencement of works and address items such as:

- A detailed schedule of works and timing;
- A traffic management plan specifically relating to vehicle access for construction and demolition;
- Management of loading and unloading points, waste collection and disposal, dust dirt and mud containment;
- Protection of existing infrastructure and a method of remediation.

In this regard, the preparation of a detailed Construction Management Plan would typically be prepared once more detailed plans are prepared and as part of subsequent phases of the development.

However, for the purposes of this report and to guide the preparation of the Development Plan and inform the staging of works, the applicant has provided a proposed Staging Plan, included at Appendix C to this report.

It proposes that development of the site would commence from the existing access to Corporate Avenue in a generally north-east direction toward the Stamford Park boundary before then infilling the south-eastern portion of the land.

A summary of the number of lots proposed in each of the stages is provided at Table 12, noting that this does not include the development of the Mixed Use Precincts, the detail of which is likely to be resolved in later detailed stages of the development.

Table 12: Concept Staging Plan - Lots

Stage	No. Lots
1	51
2	52
3	59
4	29
5	53
6	54
7	60
8	55
9	53
10	55
11	61
12	62

6.2 Vehicle Accessibility

With regard to the initial staging of the development, it is expected that all access will be via Corporate Avenue and ultimately Wellington Road.

All construction and demolition works associated with the on-site development are expected to be undertaken on-site without impact to the existing road network.

With regard to heavy vehicle accessibility, Corporate Avenue currently caters for articulated vehicles, and accordingly access for construction and demolition vehicles is expected to be able to be accommodated without significant impact on the existing operation of Corporate Avenue.

6.3 Staging of Mitigating Works

The mitigating road works will be required to be staged, and can be tied to the relevant stage of residential development.

The analysis provided in Section 4.2.4 identifies that there is some capacity at the signals of Wellington Road / Corporate Avenue to accommodate a number of stages of development on the site.

Furthermore, the surveys of the existing golf course, summarised in Section 4.3.1, identifies that there is an existing level of development already generated to/from the intersection by the existing use.

At the commencement of the residential development, the golf course would no longer be generating traffic to the road network, and in a staged scenario, this traffic could be discounted from the existing analysis.

The existing golf course was observed to generate a peak of 32 vehicle movements per hour to the network. Based on the traffic generation rate adopted for the residential uses, this is equivalent to some 40 residential lots.

Furthermore, a link will be provided through to Stud Road via Stamford Park at Stage 5, with the remainder of the development occurring in the south-east corner of the Development Plan. Notably, the analysis for the ultimately Development Plan contemplates that 60% of all traffic would utilise the Stud Road signals, without works required to those signals.

A sensitivity analysis has been undertaken to identify the staging of the mitigating works. The results of the analysis identified that:

Phase 1 – No Works (Stages 1 – 3)

- The development of Stages 1, 2 and 3 could be completed, allowing the construction of some 162 lots on the site, without the need for works at Wellington Road / Corporate Avenue. This contemplates the existing capacity at the signals, and also substitutes traffic generated by the golf course.
- The critical period for analysis is the PM peak hour due to the higher demands for vehicles exiting Corporate Avenue onto Wellington Road and allowing for the development of 162 lots on the site, intersection would be expected to operate under 'acceptable' conditions (a degree of saturation of 0.948 in the PM peak).
- Subject to the approval of VicRoads, a reallocation of 1-2 seconds from Wellington Road could be contemplated to assist in managing queues and delays on Corporate Avenue until such time that the mitigating works are undertaken.

Phase 2 – Stamford Park Link (Stage 4 – 7)

- During development of Stage 4 and 5, the connection through to Stamford Park and Emmeline Row to the north will be constructed allowing additional capacity to cater for the development of the site.
- It is suggested that this link be provided at Stage 4 to allow for the next phase of development to utilise the Stud Road signals.
- Based on the analysis for the ultimate Development Plan, those signals could cater for up to 60% of the overall traffic generated by the two developments. This equates to some 422 lots in the Kingston Links DP.
- In this regard, the Stamford Park Link could cater for the construction of lots up to Stage 8.

Phase 3 – Corporate Avenue Works (Stages 8 +)

- The remaining stages of development Stages 9-12 and the Mixed Use Precinct are located in the southern portions of the site, and it would be of benefit to have further access be taken from the Wellington Road / Corporate Avenue signals.
- Mitigating works at Corporate Avenue and South Corporate Avenue are suggested to be undertaken prior to the opening of Stage 9 to accommodate the requirements of later stages of the development.

7 Response to Development Plan Overlay

A response to each of the specific requirements of the Development Plan Overlay Is provided in the table below

Table 13: Response to Development Plan Overlay ITMP Requirements

Condition	Response / Relevant Section
An assessment of the expected impact of traffic generated by the development on the existing and future road network and any mitigation measures required to address identified issues to the satisfaction of VicRoads and the responsible authority.	An assessment of the expected traffic generated by the development on the surrounding network and the required mitigated works has been prepared in Section 4. Detail of the proposed mitigating works, as discussed and generally agreed with VicRoads is provided at Section 4.7 and in Appendix A.
Traffic modelling of future conditions is to be predicated on a distribution analysis of generated traffic having regard to: • **The nature and breakup of residential trip purposes** • **The likely origin/destination of trips based on:** o **Residential precincts within the site** o **Connections to the arterial network** o **Location of nearby services and facilities** o **Journey to work data.**	Section 4.4 provides an assessment of the expected distributions of traffic, and these distributions as agreed with VicRoads.
A statement explaining how the integrated transport network addresses the strategic directions within the Knox Liveable Streets Plan 2012-2022 (or as amended).	The integrated transport network has been designed with the Knox Liveable Streets Plan 2012-2022 in consideration.
An indicative road, bicycle, and pedestrian network plan showing:	Section 5 provides a discussion of the indicative road, bicycle and pedestrian network.
• **vehicular access from Corporate Avenue to the proposed internal road network;**	Section 3 details the Development Plan proposal, whilst Section 4.7 includes discussion on ultimate access arrangements and mitigating works and Section 5 details in the internal road provisions.
• **vehicular access from Stamford Park to the proposed internal road network;**	As above.
• **pedestrian and bicycle access from surrounding areas, including both on-street and dedicated off-street facilities connecting to Stamford Park, Caribbean Gardens, and adjacent residential areas;**	As above.
• **a street network that makes provision for a vehicular link between Kingston Links and Stamford Park, and discourages non-local through-traffic;**	Section 3 details the Development Plan proposal, whilst Section 5 details in the internal road provisions, including a discussion of potential for rat running mitigation and local area traffic management at Section 5.9.

Condition	Response / Relevant Section
• layout of internal roads, including a hierarchy of the roads that specifies the purpose, function, cross sections, and widths of the road reserves for each road type;	Section 5 details in the internal road provisions. It is noted that all streets internal to the site have been designed with the VPA guidelines, the Knox Liveable Street Plan 2012 and Clause 56.06 of the Planning Scheme in mind.
• provision for bus movement through the site linking Wellington Road, traversing Stamford Park to access Stud Road, via Emmeline Road;	As above.
• provision of safe, well-lit and direct pedestrian connections from the bus capable through road to existing residential areas east of the site, Wellington Road, Caribbean Gardens, Stamford Park and Stud Road	As above.
• provision of emergency services and waste collection services through the site;	All roads will ultimately be handed to Council and will be subject to detailed design to ensure appropriate access is provided for vehicles, pedestrians, bicycles, emergency vehicles, public transport and waste collection as required.
• a pedestrian and cycle shared path network both throughout the site and to the existing network at Stamford Park and the EastLink Trail with any access to the EastLink Trail to be controlled and maintained by Council;	As above.
• connected footpath network both throughout the site and to the existing network on Corporate Avenue.	As above.
• mitigation works at the intersection of Wellington Road and Corporate Avenue to provide adequate capacity to cater for anticipated traffic generation and to retain appropriate access to the Corporate Avenue;	Mitigating works are proposed to Corporate Avenue and South Corporate Avenue in order to facilitate the level of traffic generated by the proposal. Proposed mitigated works are discussed within Section 4.7.
• any complementary works required to retain or improve access from South Corporate Avenue to Wellington Road;	As above.
• any local area traffic management works required having regard to the characteristics of Emmeline Row as a Residential Collector Street;	Discussion of potential for rat running mitigation and local area traffic management is provided at Section 5.9.
• enhancement works as required to Corporate Avenue to accommodate projected traffic movements while ensuring retention of appropriate access to existing properties;	Proposed mitigated works are discussed within Section 4.7.
• any traffic implications of staging of development as contemplated in the Master Plan, including triggers for the provision of connections to the arterial network and implementation of any mitigation works.	Section 6 provides a discussion of staging and potential Construction Management Plan from a road works perspective.

Condition	Response / Relevant Section
• A Construction Management Plan informed by analysis of staging requirements of traffic works identified in the Integrated Transport Management Plan.	As above.

9 Conclusions

Having undertaken a detailed traffic engineering assessment of the proposed Development Plan for the Kingston Links Estate, we conclude that:

a) The total upper yield of 1,020 dwellings across both the Kingston Links and Stamford Park subdivision sites is expected to generate some 8,160 vehicle movements per day, however with two access points proposed to the external road network, no one section of road will carry this level of traffic.

b) During the peak hours, and based on this upper yield, a total traffic generation of 816 vehicle movements is expected to be distributed to signals at Corporate Avenue / Wellington Road and Emmeline Row / Stud Road.

c) The Kingston Links redevelopment would generate some 664 vehicle movements new to the network given that the Stamford Business Park and Stamford Park Residential Redevelopment have existing approvals.

d) In order to accommodate the total contemplated yield across the two sites, mitigating works are required in the form of:

   i) the intersection of Corporate Avenue / Wellington Road in the form of a separate left turn lane on the Wellington Road west approach and a new right turn lane and separate left turn slip lane on the Corporate Avenue north approach.

   ii) New ingress and egress points to South Corporate Avenue at Wellington Road (subject to detailed design).

   iii) Signal phasing works changes the intersections of Corporate Avenue/Wellington Road and Stud Road/Emmeline Row.

e) The development of the precinct (including the remaining development of the Stamford Business Park) can be accommodated without significant impact to through volumes on Wellington Road or Stud Road.

f) Once traffic is distributed to intersections further abroad on the existing network, the impact of the additional volumes on any one movement will not be significant.

g) The internal road network has been appropriately designed to cater for the expected volumes and transport functions through the residential subdivision and its delivery will be premised on the Knox Liveable Streets Plan.

h) Expected travel times along the arterial route and proposed internal connection would preference drivers remaining on the arterial road network and Local Area Traffic Management treatments will be employed along the linking road to discourage rat running traffic from utilising the subdivision to avoid the intersection of Stud Road / Wellington Road. The linking road will provide for future public transport accessibility through the site.

i) A detailed Construction Management Plan would be required as part of further detailed design, following the approval of the Development Plan, however mitigating works and the Development Plan can be appropriately staged.

Appendix A
Wellington Road / Corporate Avenue / South Corporate Avenue Mitigating Works

ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	FUNCTIONAL LAYOUT PLAN	24 JAN 2019

GENERAL NOTES
1 BASE INFORMATION FROM AERIAL PHOTOGRAPH (SOURCE NEARMAP APR 2018)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 MAIN ROAD - WELLINGTON ROAD (SPEED ZONE 80km/h)
LOCAL ROAD - CORPORATE AVENUE (SPEED ZONE 50km/h)
4 ALL PROPOSED FOOTPATHS AND PRAM CROSSINGS ARE TO BE CONSTRUCTED WITH TACTILE GROUND SURFACE INDICATORS TO DDA COMPLIANCE GUIDELINES REFER TO AS 1428.4.2009

DESIGNED R CARBARNS 24 JAN 2019
CHECKED/APPROVED C MORELLO 24 JAN 2019
FILE NAME G18520B-00.dgn

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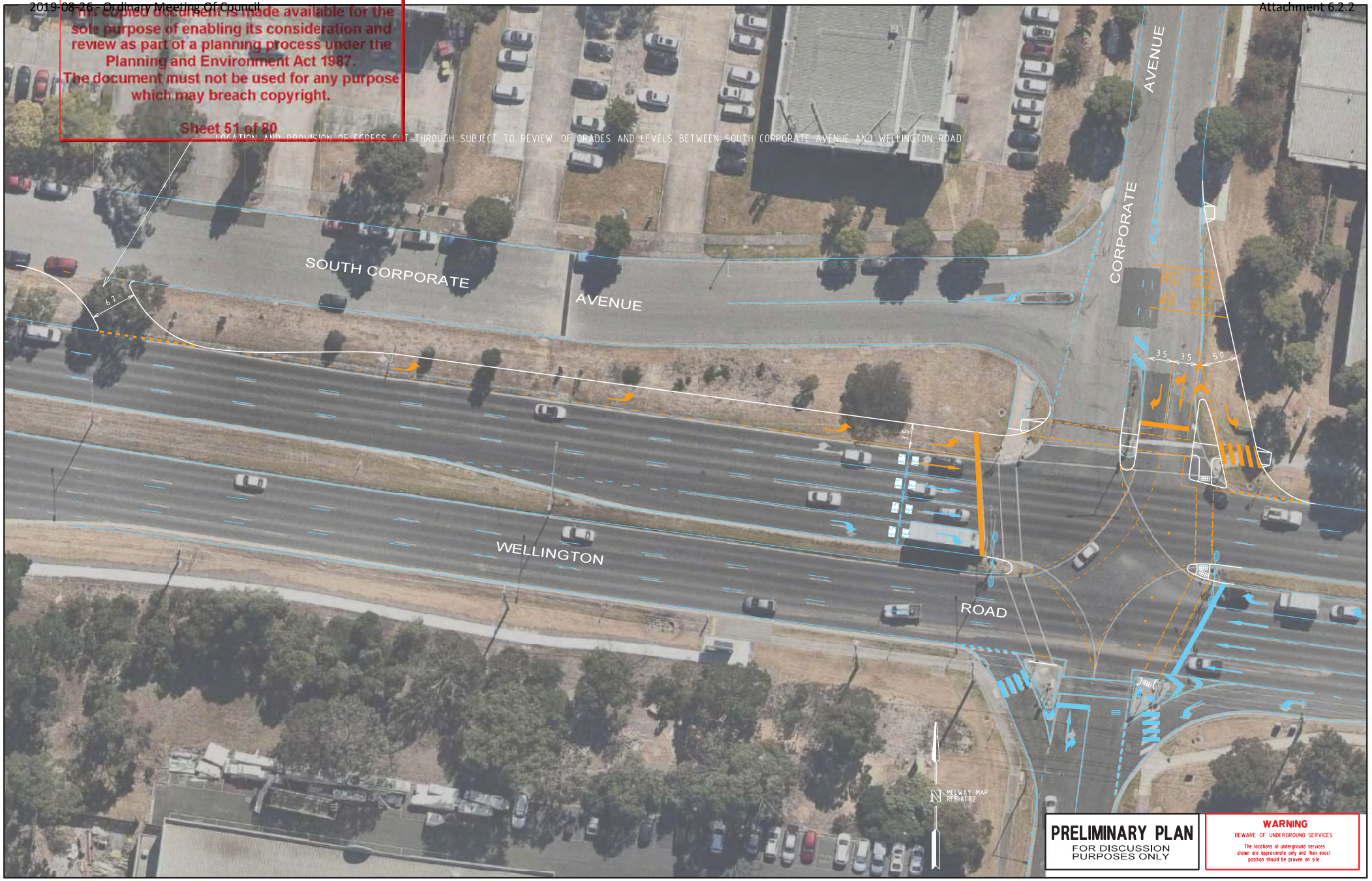
WELLINGTON ROAD - ROWVILLE
SOUTH CORPORATE AVENUE
KNOX CITY
FUNCTIONAL LAYOUT PLAN

SCALE 1:500 (A3) 0 2.5 5 7.5 10
SHEET No.
DWG No. G18520B-02



ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	FUNCTIONAL LAYOUT PLAN	24 APR 2018
B	UPDATED FUNCTIONAL LAYOUT PLAN	15 MAY 2018
C	SERVICE ROAD EGRESS ADDED	24 JAN 2019
D	SERVICE ROAD NOTATION ADDED PLAN RE-ISSUED	20 MAR 2019
E	PEDESTRIAN CROSSING RELOCATED TO EASTERN SIDE OF CORPORATE DRIVE	06 JUNE 2019

GENERAL NOTES
1 BASE INFORMATION FROM AERIAL PHOTOGRAPH (SOURCE NEARMAP APR 2018)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 MAIN ROAD - WELLINGTON ROAD (SPEED ZONE 80km/h)
LOCAL ROAD - CORPORATE AVENUE (SPEED ZONE 50km/h)
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DESIGNED S O'KEEFE 24 APR 2018
CHECKED/APPROVED C MORELLO 24 APR 2018
FILE NAME G18520B-00.dgn

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WELLINGTON ROAD / CORPORATE DRIVE
ROWVILLE
KNOX CITY COUNCIL
FUNCTIONAL LAYOUT PLAN

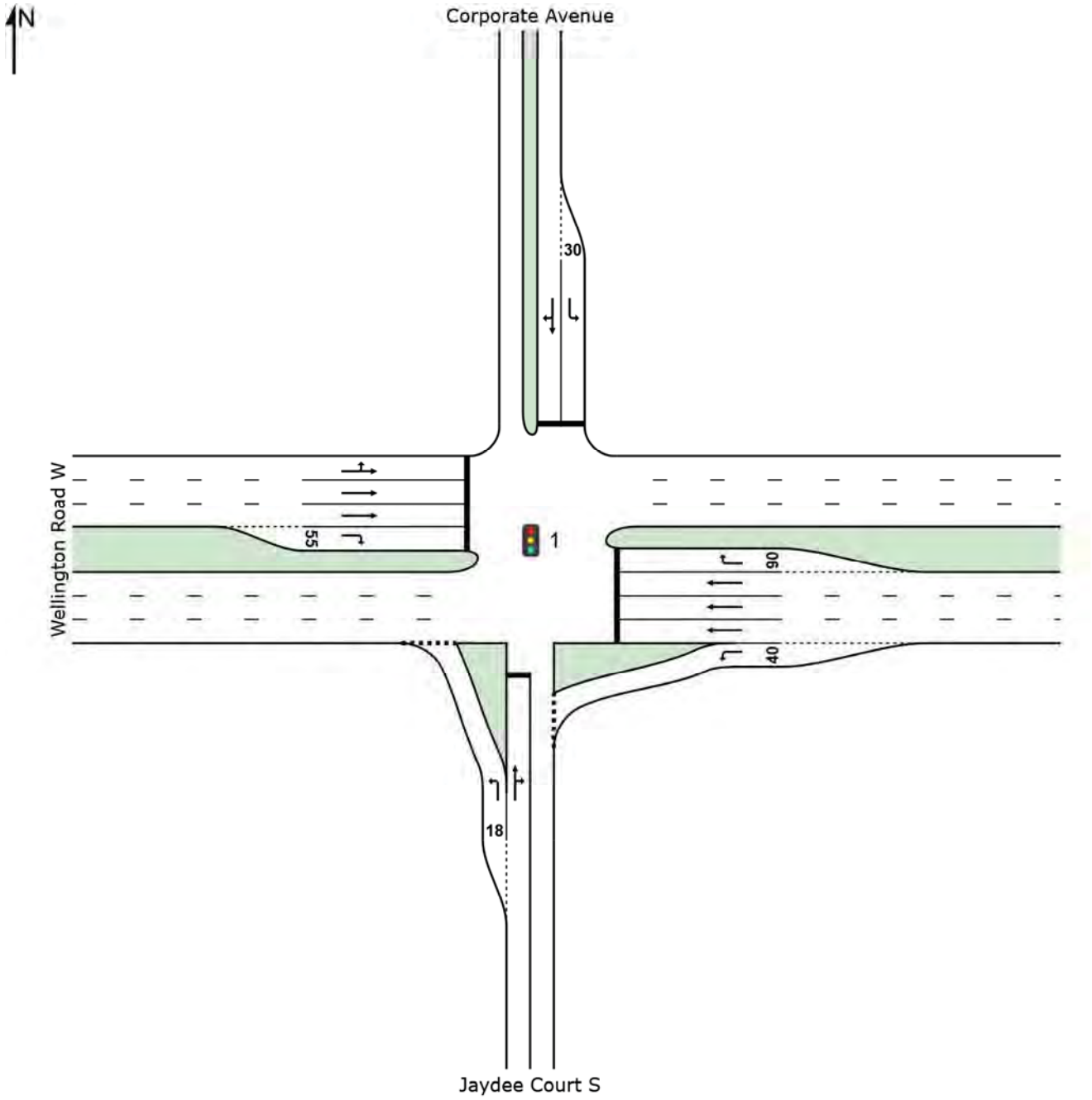
SCALE 0 2.5 5 7.5 10 | SHEET No. | DWG No. G18520B-01

Appendix B
Detailed SIDRA Analysis

SITE LAYOUT

Site: 1 [Wellington/Corporate AM - existing]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated



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Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

MOVEMENT SUMMARY

Site: 1 [Wellington/Corporate AM - existing]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 139 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Jaydee Court S											
1	L2	13	2.0	0.033	7.2	LOS A	0.2	1.2	0.25	0.56	48.5
2	T1	1	2.0	0.102	69.5	LOS E	0.8	5.5	0.97	0.68	26.1
3	R2	11	2.0	0.102	73.8	LOS E	0.8	5.5	0.97	0.68	27.0
Approach		24	2.0	0.102	38.9	LOS D	0.8	5.5	0.59	0.62	35.1
East: Wellington Road E											
4	L2	22	2.0	0.014	4.9	LOS A	0.1	0.6	0.11	0.52	46.9
5	T1	3241	5.0	0.805	2.9	LOS A	15.4	112.7	0.23	0.22	75.3
6	R2	85	2.0	0.498	73.9	LOS E	5.7	40.5	0.99	0.78	27.4
Approach		3348	4.9	0.805	4.7	LOS A	15.4	112.7	0.25	0.24	71.8
North: Corporate Avenue											
7	L2	14	2.0	0.037	52.1	LOS D	0.7	5.3	0.83	0.68	30.2
8	T1	1	2.0	0.176	69.0	LOS E	1.3	9.5	0.98	0.70	25.0
9	R2	19	2.0	0.176	73.5	LOS E	1.3	9.5	0.98	0.70	25.8
Approach		34	2.0	0.176	64.7	LOS E	1.3	9.5	0.92	0.69	27.4
West: Wellington Road W											
10	L2	205	2.0	0.416	11.3	LOS B	7.5	54.0	0.22	0.39	54.6
11	T1	1466	5.0	0.416	2.3	LOS A	7.5	54.0	0.12	0.15	75.1
12	R2	29	2.0	0.172	71.1	LOS E	1.9	13.4	0.96	0.72	28.0
Approach		1701	4.6	0.416	4.6	LOS A	7.5	54.0	0.15	0.19	69.9
All Vehicles		5107	4.8	0.805	5.2	LOS A	15.4	112.7	0.22	0.23	70.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Tuesday, 3 July 2018 2:07:02 PM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Wellington/Corporate AM - existing]

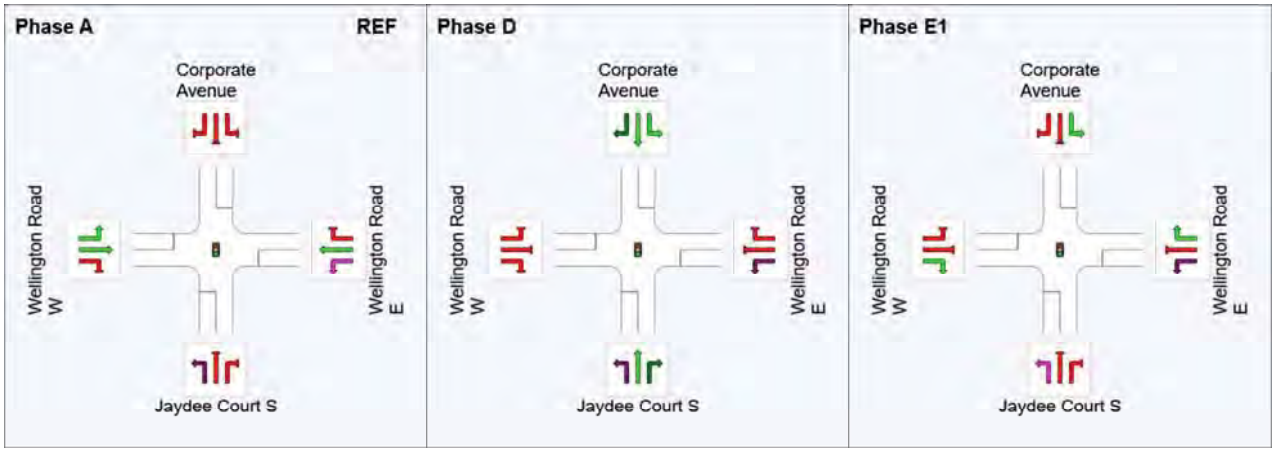
Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 139 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Four Phase
Reference Phase: Phase A
Input Phase Sequence: A, D, E1
Output Phase Sequence: A, D, E1

Phase Timing Results

Phase	A	D	E1
Phase Change Time (sec)	0	105	120
Green Time (sec)	99	9	13
Phase Time (sec)	105	15	19
Phase Split	76%	11%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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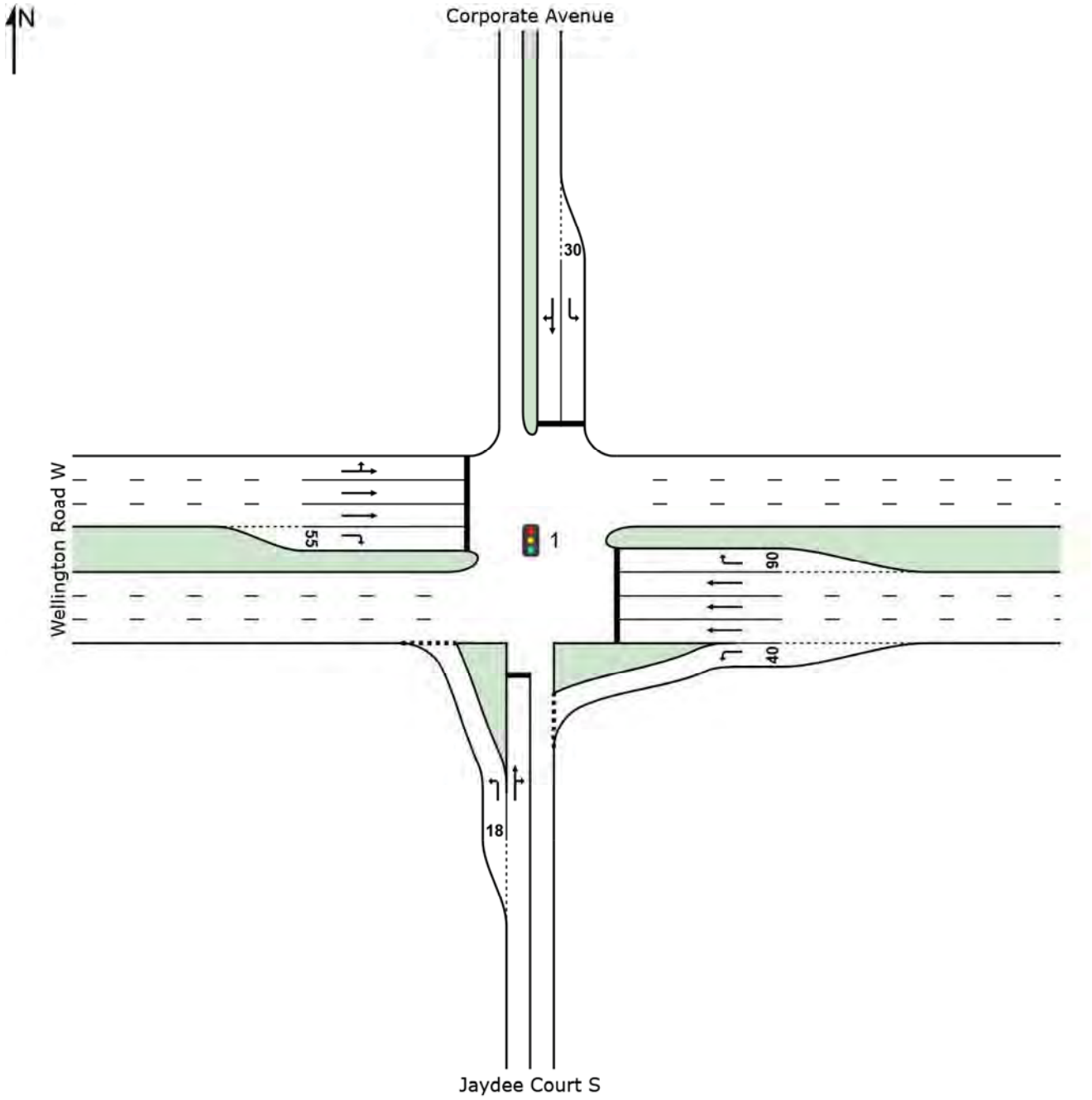
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

SITE LAYOUT

Site: 1 [Wellington/Corporate PM - existing]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated



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MOVEMENT SUMMARY

Site: 1 [Wellington/Corporate PM - existing]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Jaydee Court S											
1	L2	31	2.0	0.053	6.6	LOS A	0.3	1.9	0.25	0.56	49.0
2	T1	1	2.0	0.077	61.4	LOS E	1.0	7.1	0.91	0.70	27.7
3	R2	15	2.0	0.077	65.7	LOS E	1.0	7.1	0.91	0.70	28.8
Approach		46	2.0	0.077	26.7	LOS C	1.0	7.1	0.47	0.61	39.5
East: Wellington Road E											
4	L2	16	2.0	0.010	4.8	LOS A	0.1	0.4	0.09	0.51	47.0
5	T1	1218	5.0	0.303	8.1	LOS A	10.3	75.3	0.40	0.35	67.9
6	R2	28	2.0	0.375	85.0	LOS F	2.1	14.9	1.00	0.72	25.3
Approach		1262	4.9	0.375	9.8	LOS A	10.3	75.3	0.41	0.36	65.1
North: Corporate Avenue											
7	L2	95	2.0	0.242	55.4	LOS E	5.5	39.5	0.87	0.76	29.4
8	T1	1	2.0	0.750	69.4	LOS E	9.7	69.4	1.00	0.88	24.9
9	R2	135	2.0	0.750	74.0	LOS E	9.7	69.4	1.00	0.88	25.7
Approach		231	2.0	0.750	66.3	LOS E	9.7	69.4	0.95	0.83	27.1
West: Wellington Road W											
10	L2	33	2.0	0.834	10.7	LOS B	20.6	150.2	0.29	0.29	57.2
11	T1	3309	5.0	0.834	3.4	LOS A	20.6	150.2	0.28	0.27	74.3
12	R2	17	2.0	0.222	84.0	LOS F	1.2	8.7	1.00	0.69	25.5
Approach		3359	5.0	0.834	3.9	LOS A	20.6	150.2	0.28	0.27	73.4
All Vehicles		4898	4.8	0.834	8.6	LOS A	20.6	150.2	0.35	0.32	65.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Tuesday, 3 July 2018 3:35:32 PM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Wellington/Corporate PM - existing]

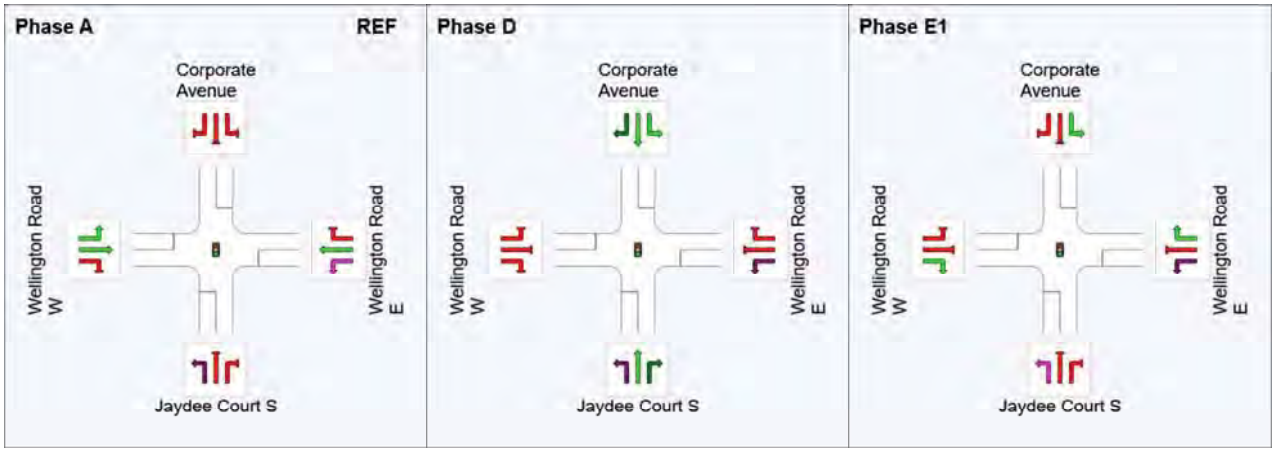
Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Four Phase
Reference Phase: Phase A
Input Phase Sequence: A, D, E1
Output Phase Sequence: A, D, E1

Phase Timing Results

Phase	A	D	E1
Phase Change Time (sec)	0	108	133
Green Time (sec)	103	19	6
Phase Time (sec)	109	25	11
Phase Split	75%	17%	8%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

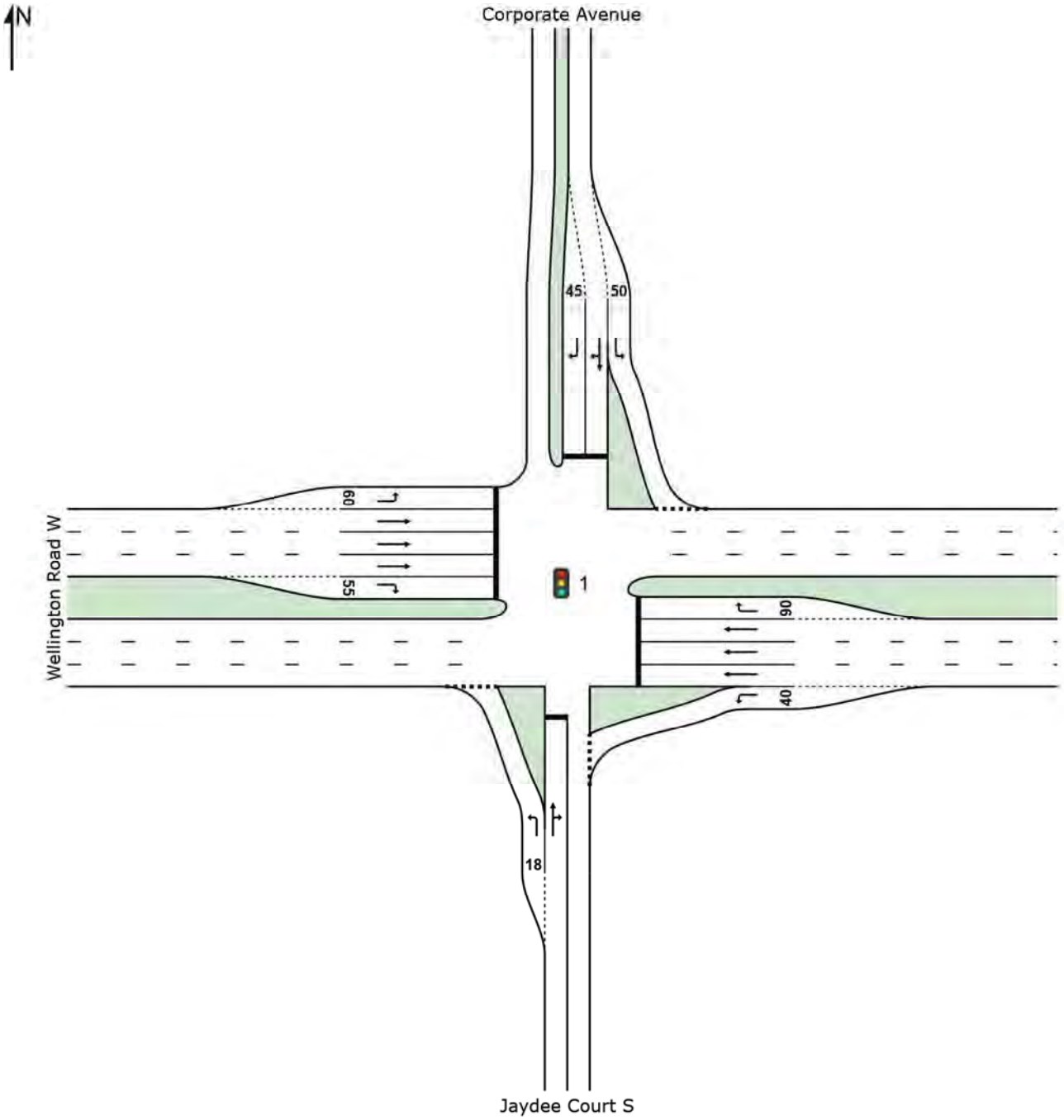
Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: TRAFFIX GROUP PTY LTD | Processed: Tuesday, 3 July 2018 3:35:32 PM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

SITE LAYOUT

Site: 1 [Wellington/Corporate AM - proposed split phase]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated



MOVEMENT SUMMARY

Site: 1 [Wellington/Corporate AM - proposed split phase]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 139 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Jaydee Court S											
1	L2	13	2.0	0.023	5.0	LOS A	0.1	0.4	0.11	0.52	50.0
2	T1	1	2.0	0.292	81.2	LOS F	0.9	6.1	1.00	0.67	24.1
3	R2	11	2.0	0.292	85.5	LOS F	0.9	6.1	1.00	0.67	24.9
Approach		24	2.0	0.292	43.3	LOS D	0.9	6.1	0.54	0.59	33.7
East: Wellington Road E											
4	L2	22	2.0	0.013	4.8	LOS A	0.1	0.6	0.08	0.51	47.0
5	T1	3241	5.0	0.750	0.9	LOS A	5.4	39.4	0.08	0.08	78.4
6	R2	113	2.0	0.855	85.8	LOS F	8.4	60.0	1.00	0.91	25.3
Approach		3376	4.9	0.855	3.8	LOS A	8.4	60.0	0.11	0.11	72.9
North: Corporate Avenue											
7	L2	123	2.0	0.175	5.1	LOS A	0.6	4.6	0.13	0.54	50.0
8	T1	1	2.0	0.879	81.9	LOS F	7.1	50.4	1.00	0.98	23.0
9	R2	184	2.0	0.879	86.4	LOS F	7.1	50.4	1.00	0.98	23.8
Approach		308	2.0	0.879	53.9	LOS D	7.1	50.4	0.65	0.80	30.0
West: Wellington Road W											
10	L2	246	2.0	0.168	10.4	LOS B	3.8	26.8	0.25	0.69	52.0
11	T1	1466	5.0	0.371	2.4	LOS A	3.4	25.1	0.11	0.10	76.0
12	R2	29	2.0	0.559	86.3	LOS F	2.2	15.5	1.00	0.73	25.1
Approach		1742	4.5	0.559	4.9	LOS A	3.8	26.8	0.15	0.20	69.1
All Vehicles		5451	4.6	0.879	7.2	LOS A	8.4	60.0	0.16	0.18	66.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Friday, 22 June 2018 8:23:22 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Wellington/Corporate AM - proposed split phase]

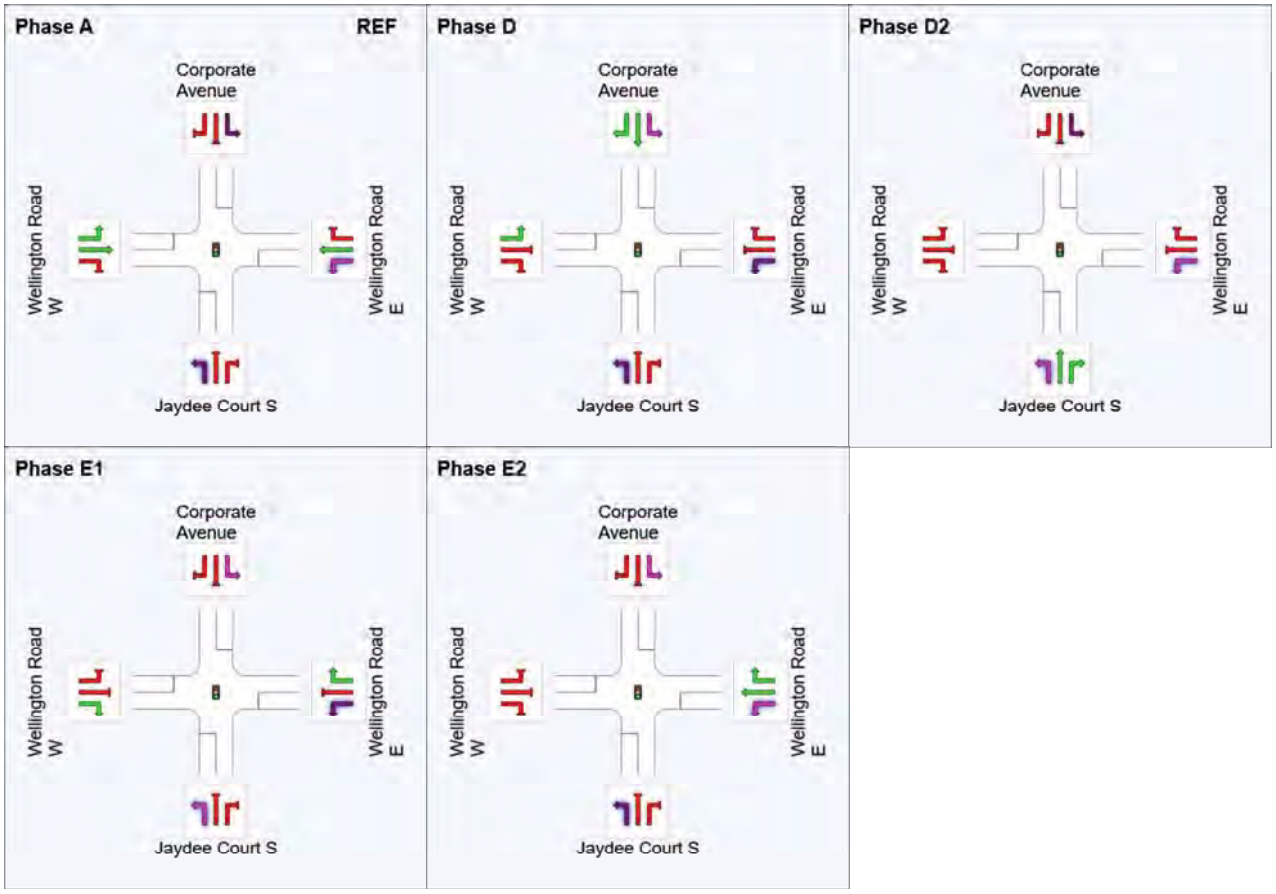
Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 139 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Four Phase
Reference Phase: Phase A
Input Phase Sequence: A, D, D2, E1, E2
Output Phase Sequence: A, D, D2, E1, E2

Phase Timing Results

Phase	A	D	D2	E1	E2
Phase Change Time (sec)	0	103	117	126	133
Green Time (sec)	97	8	3	4	3
Phase Time (sec)	103	14	6	7	9
Phase Split	74%	10%	4%	5%	6%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

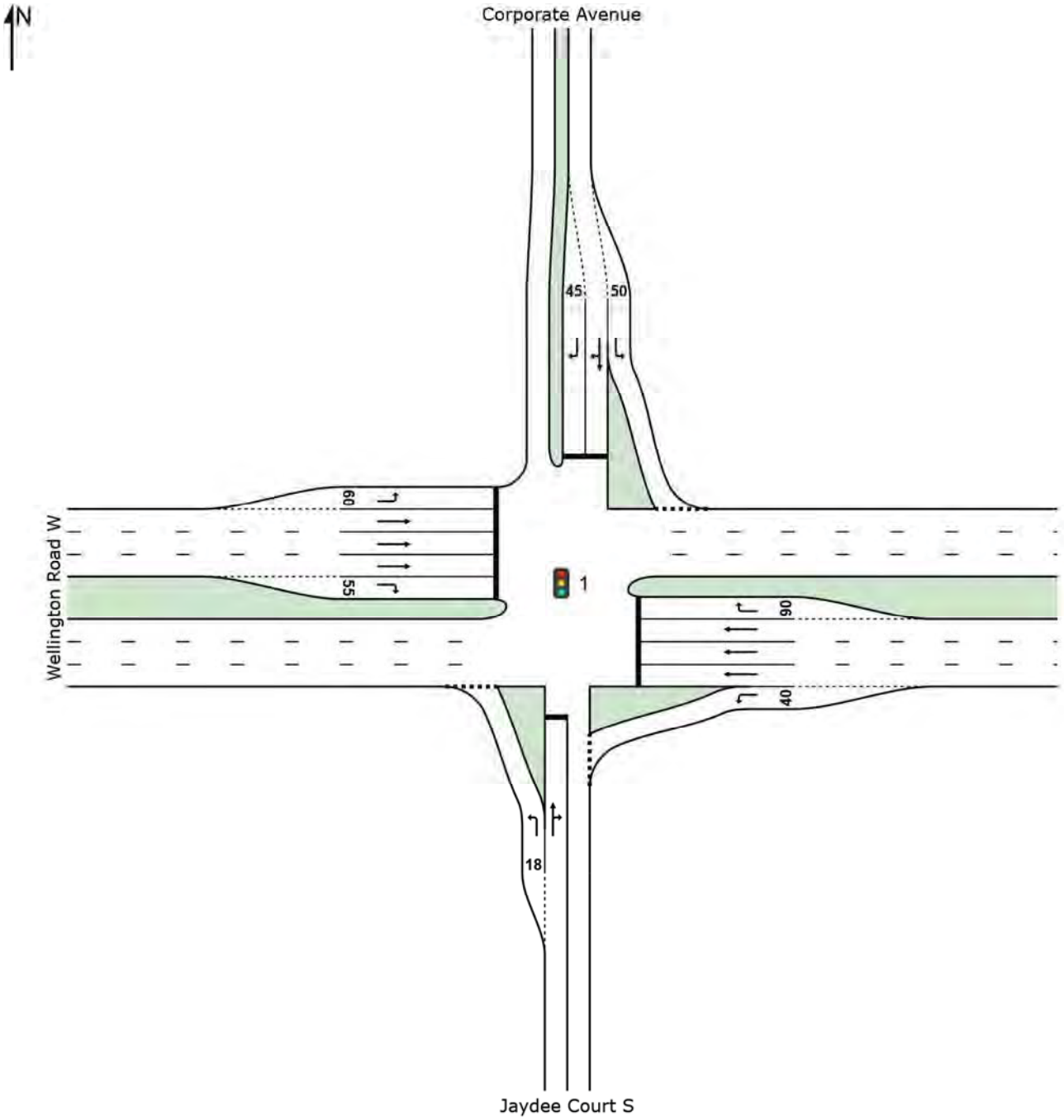
Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: TRAFFIX GROUP PTY LTD | Processed: Friday, 22 June 2018 8:23:22 AM
Project: F:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

SITE LAYOUT

Site: 1 [Wellington/Corporate - PM - proposed split phase]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated



MOVEMENT SUMMARY

Site: 1 [Wellington/Corporate - PM - proposed split phase]

Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Jaydee Court S											
1	L2	31	2.0	0.032	7.2	LOS A	0.4	2.8	0.24	0.56	48.6
2	T1	1	2.0	0.415	85.5	LOS F	1.2	8.8	1.00	0.68	23.4
3	R2	15	2.0	0.415	89.8	LOS F	1.2	8.8	1.00	0.68	24.2
Approach		46	2.0	0.415	35.2	LOS D	1.2	8.8	0.50	0.60	36.1
East: Wellington Road E											
4	L2	16	2.0	0.010	4.8	LOS A	0.1	0.4	0.09	0.52	47.0
5	T1	1218	5.0	0.309	8.9	LOS A	10.8	79.0	0.42	0.37	67.0
6	R2	111	2.0	0.875	90.8	LOS F	8.7	62.1	1.00	0.92	24.4
Approach		1344	4.7	0.875	15.6	LOS B	10.8	79.0	0.46	0.42	58.3
North: Corporate Avenue											
7	L2	149	2.0	0.335	12.4	LOS B	4.0	28.5	0.44	0.66	45.4
8	T1	1	2.0	0.863	82.5	LOS F	8.5	60.7	1.00	0.97	22.9
9	R2	217	2.0	0.863	87.0	LOS F	8.5	60.7	1.00	0.97	23.7
Approach		367	2.0	0.863	56.6	LOS E	8.5	60.7	0.77	0.84	29.4
West: Wellington Road W											
10	L2	157	2.0	0.106	10.1	LOS B	2.3	16.1	0.22	0.68	52.2
11	T1	3309	5.0	0.860	4.6	LOS A	27.8	202.9	0.36	0.34	72.7
12	R2	17	2.0	0.133	77.6	LOS E	1.2	8.2	0.97	0.70	26.7
Approach		3483	4.9	0.860	5.2	LOS A	27.8	202.9	0.35	0.35	70.9
All Vehicles		5241	4.6	0.875	11.7	LOS B	27.8	202.9	0.41	0.41	60.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Tuesday, 3 July 2018 3:27:39 PM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Wellington/Corporate - PM - proposed split phase]

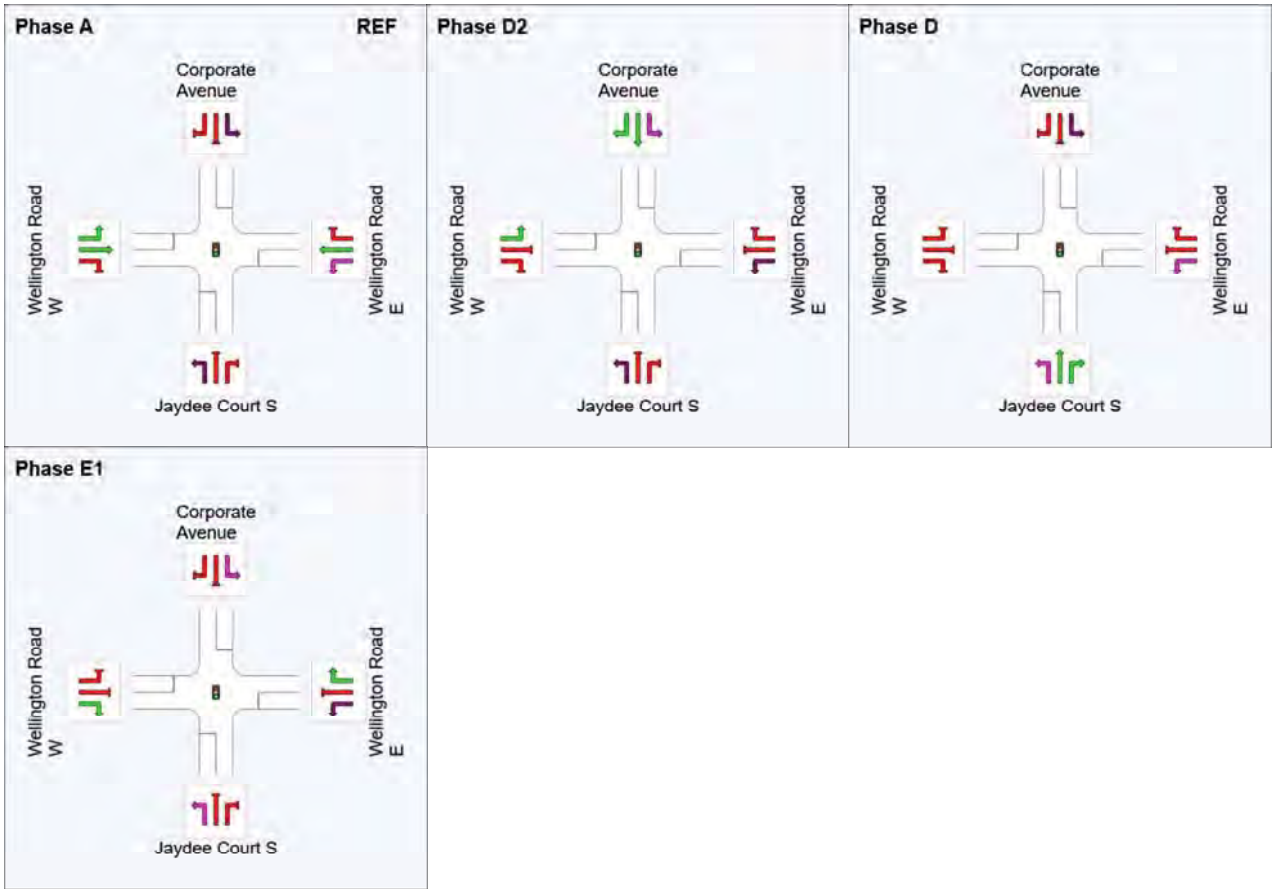
Wellington Road/Corporate Avenue
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Four Phase
Reference Phase: Phase A
Input Phase Sequence: A, D2, D, E1
Output Phase Sequence: A, D2, D, E1

Phase Timing Results

Phase	A	D2	D	E1
Phase Change Time (sec)	0	107	123	132
Green Time (sec)	101	10	3	10
Phase Time (sec)	107	16	6	16
Phase Split	74%	11%	4%	11%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

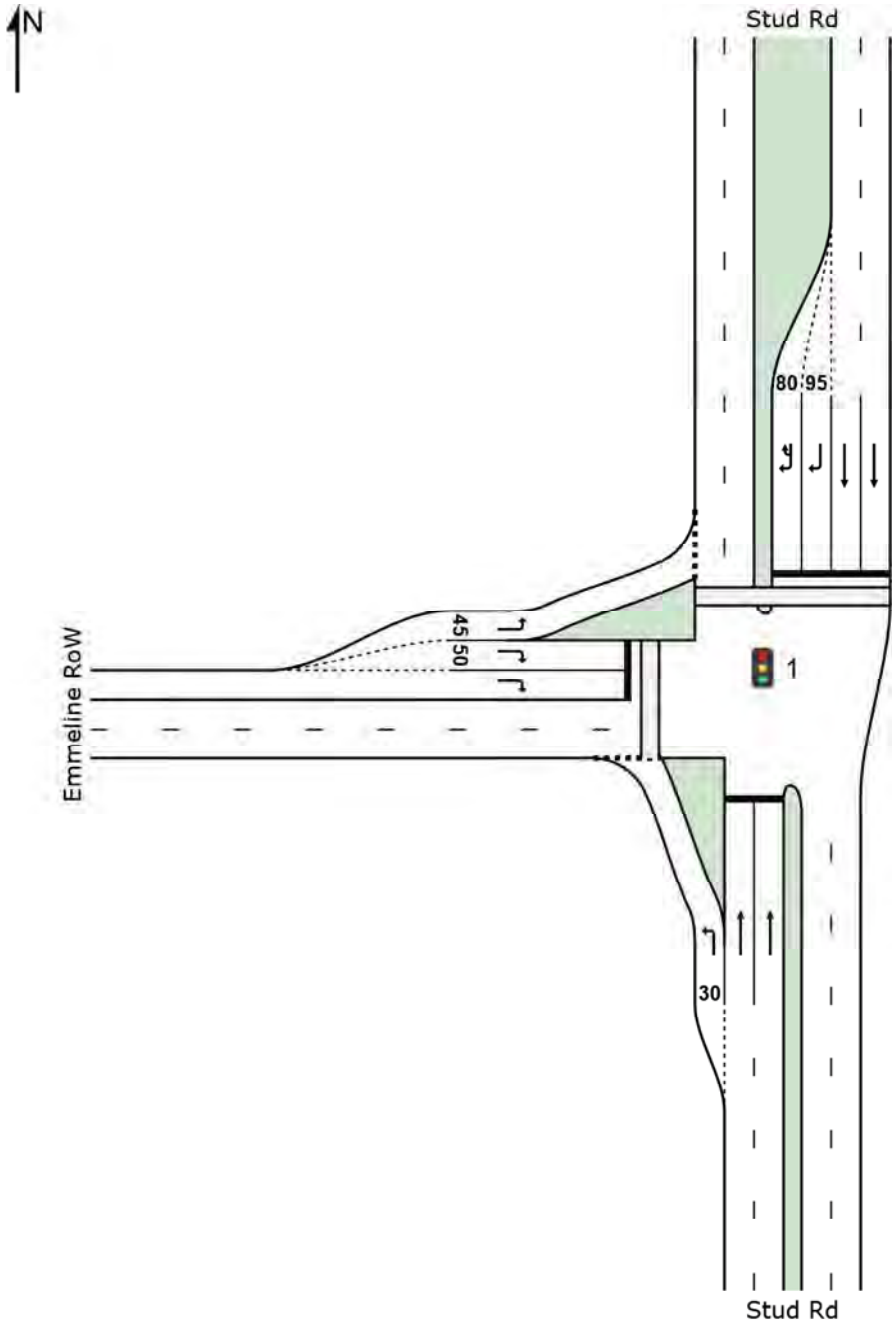
Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: TRAFFIX GROUP PTY LTD | Processed: Tuesday, 3 July 2018 3:27:39 PM
Project: P:\Sydney\Projects\GR\18\GR18520\Analysis\SIDRA\GR18520SIDRA5-2018.sip7

SITE LAYOUT

Site: 1 [Stud Rd / Emmeline AM PEAK - base case]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated



MOVEMENT SUMMARY

Site: 1 [Stud Rd / Emmeline AM PEAK - base case]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stud Rd											
1	L2	125	2.0	0.073	5.9	LOS A	0.4	2.7	0.09	0.57	53.9
2	T1	2338	5.0	0.787	1.0	LOS A	7.1	51.6	0.10	0.09	59.1
Approach		2463	4.8	0.787	1.2	LOS A	7.1	51.6	0.10	0.12	58.8
North: Stud Rd											
8	T1	1864	5.0	0.546	1.4	LOS A	12.2	89.1	0.21	0.20	58.7
9	R2	84	2.0	0.360	67.6	LOS E	3.5	24.9	0.99	0.76	28.1
9u	U	15	2.0	0.360	55.3	LOS E	2.7	19.4	0.99	0.79	31.1
Approach		1963	4.8	0.546	4.6	LOS A	12.2	89.1	0.25	0.22	55.7
West: Emmeline RoW											
10	L2	22	2.0	0.060	10.1	LOS B	0.4	2.7	0.30	0.62	50.9
12	R2	20	2.0	0.132	81.7	LOS F	0.7	5.1	0.99	0.67	25.4
Approach		42	2.0	0.132	44.1	LOS D	0.7	5.1	0.63	0.64	34.5
All Vehicles		4468	4.8	0.787	3.1	LOS A	12.2	89.1	0.17	0.17	57.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	66.8	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	53	5.8	LOS A	0.1	0.1	0.28	0.28
All Pedestrians		105	36.3	LOS D			0.62	0.62

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Monday, 18 June 2018 11:01:04 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Stud Rd / Emmeline AM PEAK - base case]

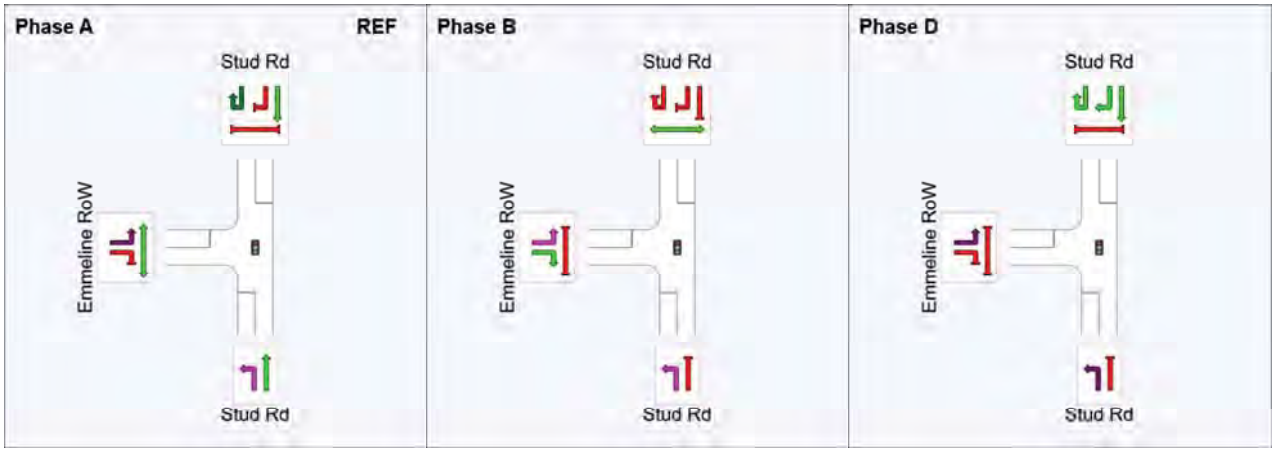
Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Two Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, D
Output Phase Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Phase Change Time (sec)	0	120	132
Green Time (sec)	114	6	11
Phase Time (sec)	120	8	17
Phase Split	83%	6%	12%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

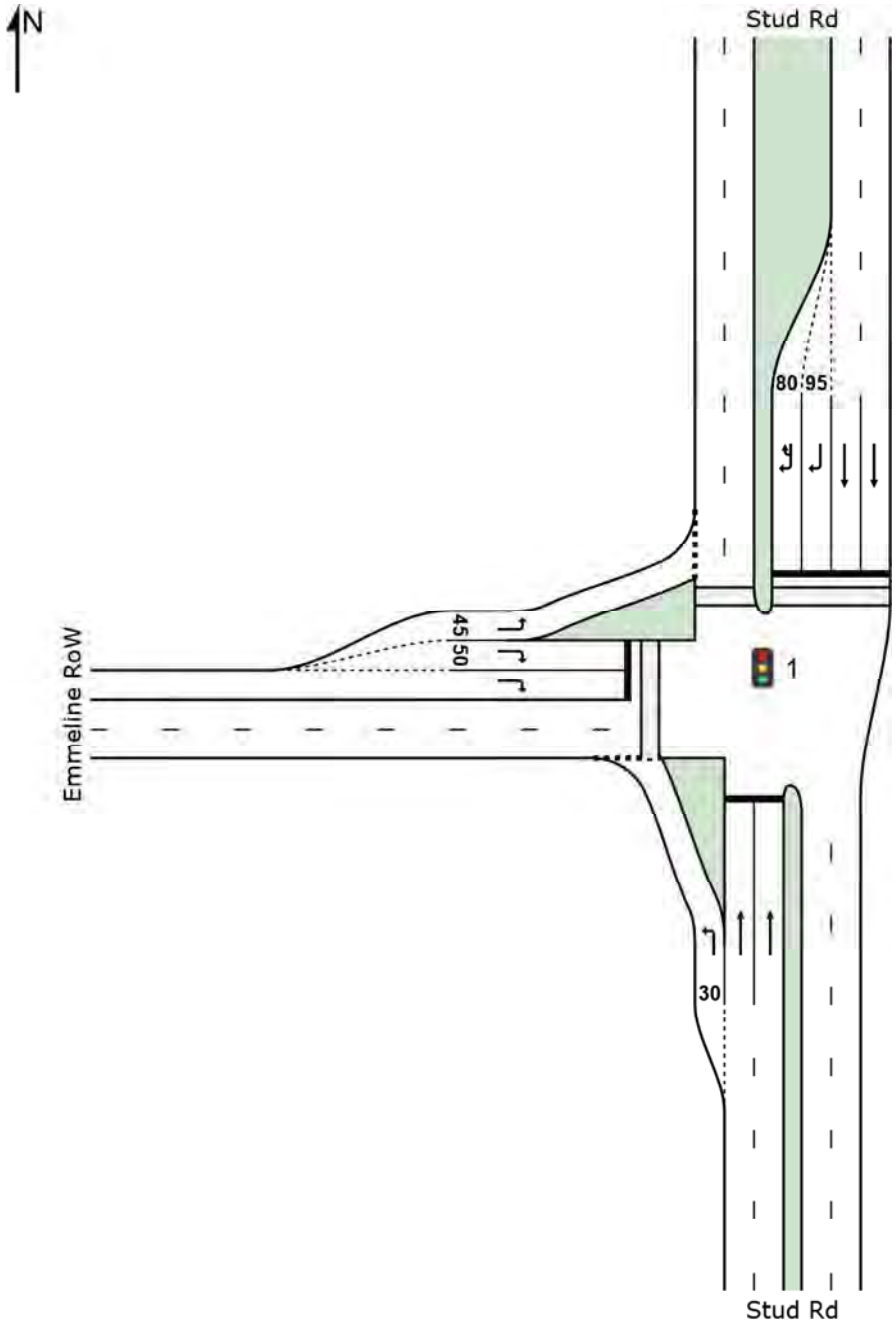
Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: TRAFFIX GROUP PTY LTD | Processed: Monday, 18 June 2018 11:01:04 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

SITE LAYOUT

Site: 1 [Stud Rd / Emmeline PM PEAK - base case]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated



MOVEMENT SUMMARY

Site: 1 [Stud Rd / Emmeline PM PEAK - base case]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stud Rd											
1	L2	24	2.0	0.014	5.8	LOS A	0.1	0.5	0.07	0.56	54.0
2	T1	2185	5.0	0.729	4.1	LOS A	22.1	161.0	0.31	0.30	56.2
Approach		2209	5.0	0.729	4.2	LOS A	22.1	161.0	0.31	0.30	56.2
North: Stud Rd											
8	T1	2341	5.0	0.713	0.6	LOS A	5.4	39.1	0.07	0.07	59.4
9	R2	12	2.0	0.211	80.3	LOS F	0.8	5.7	0.96	0.67	25.6
9u	U	24	2.0	0.211	13.9	LOS B	0.5	3.5	0.45	0.72	47.4
Approach		2377	5.0	0.713	1.1	LOS A	5.4	39.1	0.08	0.08	58.9
West: Emmeline RoW											
10	L2	124	2.0	0.413	13.0	LOS B	3.7	26.4	0.48	0.71	48.8
12	R2	66	2.0	0.292	78.7	LOS E	2.3	16.7	0.99	0.73	26.0
Approach		191	2.0	0.413	35.9	LOS D	3.7	26.4	0.65	0.71	37.4
All Vehicles		4777	4.8	0.729	3.9	LOS A	22.1	161.0	0.21	0.21	56.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P31	North Stage 1	53	66.8	LOS F	0.2	0.2	0.96	0.96
P32	North Stage 2	53	66.8	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	53	5.3	LOS A	0.1	0.1	0.27	0.27
All Pedestrians		158	46.3	LOS E			0.73	0.73

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Monday, 18 June 2018 11:05:03 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Stud Rd / Emmeline PM PEAK - base case]

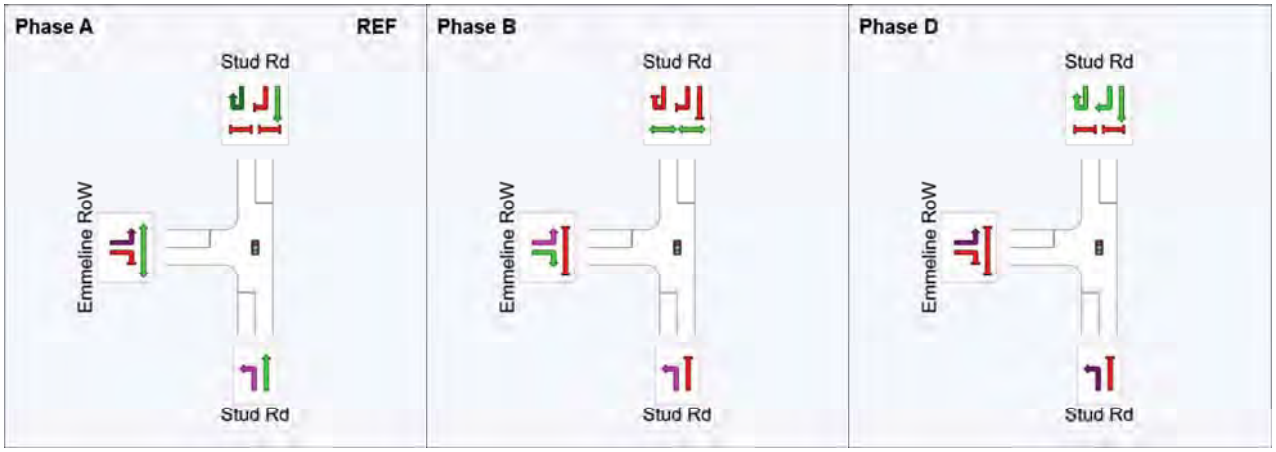
Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Two Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, D
Output Phase Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Phase Change Time (sec)	0	122	137
Green Time (sec)	116	9	4
Phase Time (sec)	122	13	10
Phase Split	84%	9%	7%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

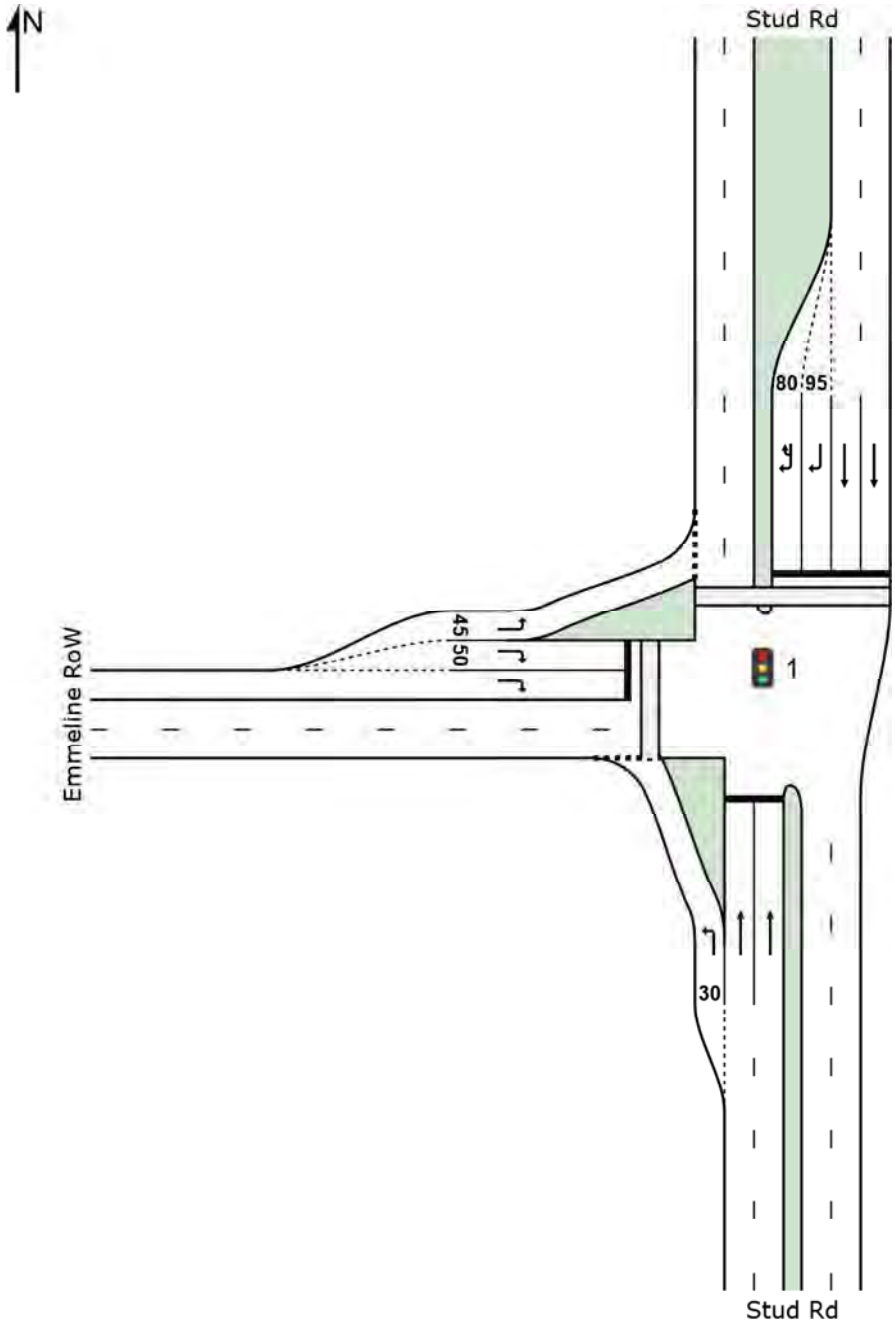
Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: TRAFFIX GROUP PTY LTD | Processed: Monday, 18 June 2018 11:05:03 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

SITE LAYOUT

Site: 1 [Stud Rd / Emmeline AM PEAK - proposed adj phase]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated



MOVEMENT SUMMARY

Site: 1 [Stud Rd / Emmeline AM PEAK - proposed adj phase]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stud Rd											
1	L2	166	2.0	0.099	6.1	LOS A	0.8	5.9	0.12	0.58	53.8
2	T1	2338	5.0	0.834	1.1	LOS A	9.0	65.5	0.11	0.11	58.9
Approach		2504	4.8	0.834	1.5	LOS A	9.0	65.5	0.11	0.14	58.5
North: Stud Rd											
8	T1	1864	5.0	0.568	2.6	LOS A	16.6	121.0	0.28	0.27	57.6
9	R2	146	2.0	0.586	75.7	LOS E	5.8	41.4	1.00	0.79	26.5
9u	U	15	2.0	0.586	73.3	LOS E	5.3	38.0	1.00	0.80	27.0
Approach		2025	4.8	0.586	8.4	LOS A	16.6	121.0	0.34	0.31	52.7
West: Emmeline RoW											
10	L2	269	2.0	0.628	13.3	LOS B	9.8	69.7	0.59	0.76	48.7
12	R2	185	2.0	0.734	82.3	LOS F	6.9	49.0	1.00	0.84	25.3
Approach		455	2.0	0.734	41.4	LOS D	9.8	69.7	0.76	0.79	35.4
All Vehicles		4984	4.5	0.834	7.9	LOS A	16.6	121.0	0.26	0.27	53.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	66.8	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	53	7.3	LOS A	0.1	0.1	0.32	0.32
All Pedestrians		105	37.0	LOS D			0.64	0.64

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Friday, 22 June 2018 8:24:33 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Stud Rd / Emmeline AM PEAK - proposed adj phase]

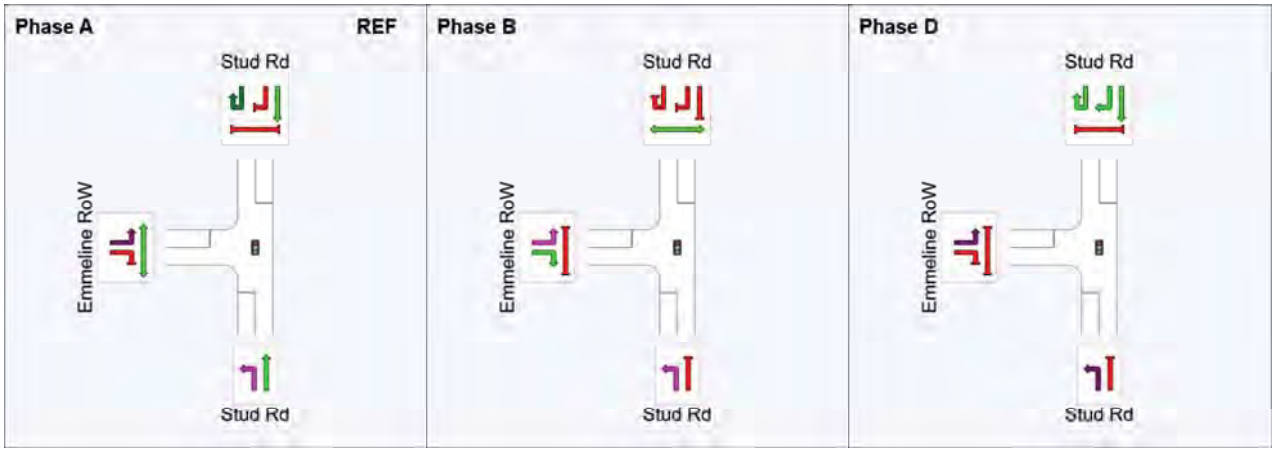
Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Two Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, D
Output Phase Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Phase Change Time (sec)	0	115	131
Green Time (sec)	109	10	11
Phase Time (sec)	115	13	17
Phase Split	79%	9%	12%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

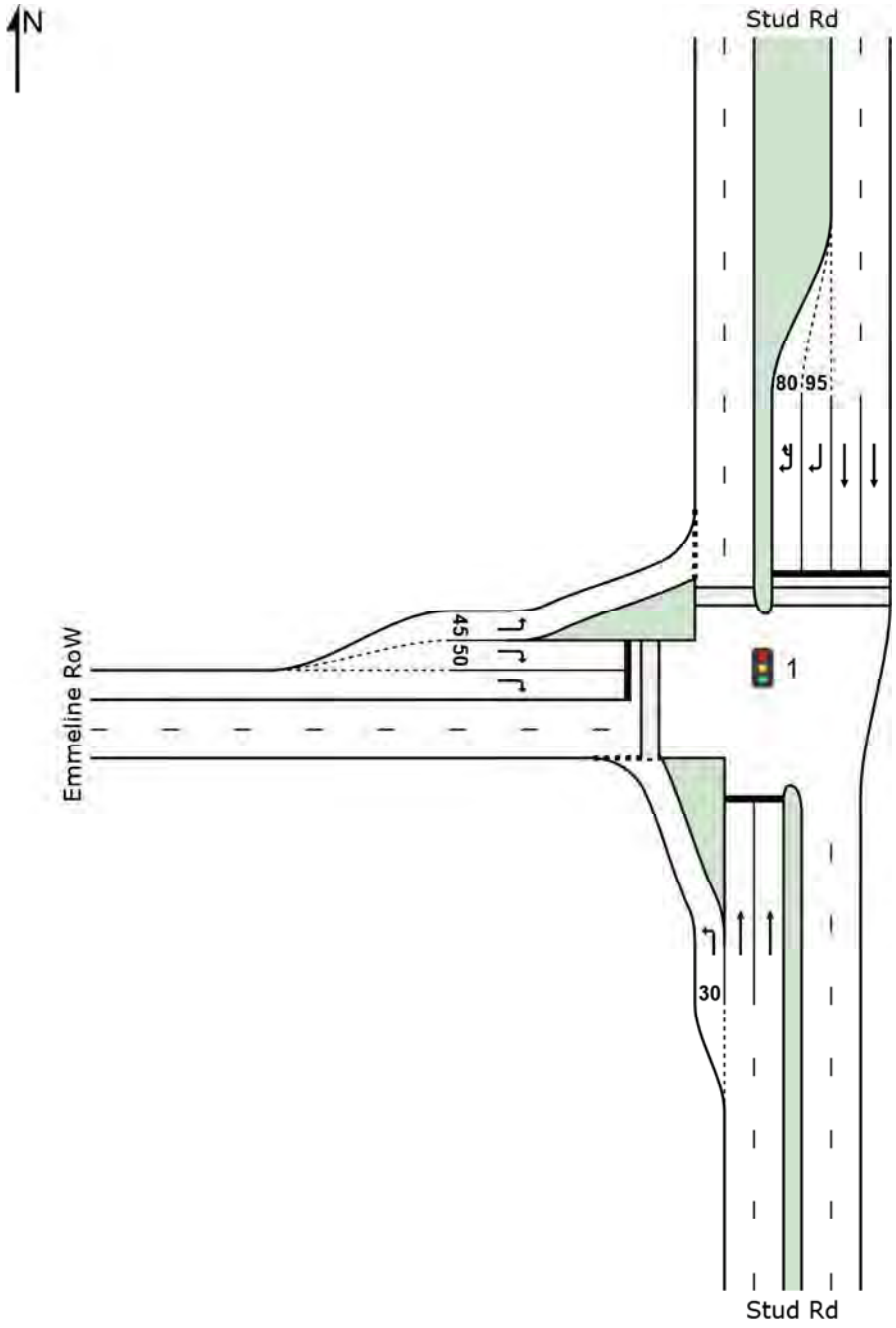
Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: TRAFFIX GROUP PTY LTD | Processed: Friday, 22 June 2018 8:24:33 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

SITE LAYOUT

Site: 1 [Stud Rd / Emmeline PM PEAK - proposed adj phase]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated



MOVEMENT SUMMARY

Site: 1 [Stud Rd / Emmeline PM PEAK - proposed adj phase]

Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stud Rd											
1	L2	148	2.0	0.090	6.4	LOS A	1.0	7.0	0.14	0.58	53.6
2	T1	2185	5.0	0.801	5.1	LOS A	28.4	207.4	0.36	0.34	55.4
Approach		2334	4.8	0.801	5.1	LOS A	28.4	207.4	0.34	0.35	55.3
North: Stud Rd											
8	T1	2341	5.0	0.713	0.6	LOS A	5.4	39.1	0.07	0.07	59.4
9	R2	197	2.0	0.881	91.7	LOS F	8.8	62.8	1.00	0.97	23.7
9u	U	24	2.0	0.881	95.3	LOS F	8.7	61.8	1.00	0.99	23.2
Approach		2562	4.7	0.881	8.5	LOS A	8.8	62.8	0.15	0.15	52.6
West: Emmeline RoW											
10	L2	248	2.0	0.543	17.7	LOS B	9.2	65.9	0.61	0.76	46.0
12	R2	148	2.0	0.653	81.8	LOS F	5.5	38.9	1.00	0.80	25.4
Approach		397	2.0	0.653	41.7	LOS D	9.2	65.9	0.75	0.77	35.3
All Vehicles		5293	4.6	0.881	9.5	LOS A	28.4	207.4	0.28	0.28	51.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P31	North Stage 1	53	66.8	LOS F	0.2	0.2	0.96	0.96
P32	North Stage 2	53	66.8	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	53	7.0	LOS A	0.1	0.1	0.31	0.31
All Pedestrians		158	46.8	LOS E			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: TRAFFIX GROUP PTY LTD | Processed: Friday, 22 June 2018 8:27:00 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

PHASING SUMMARY

Site: 1 [Stud Rd / Emmeline PM PEAK - proposed adj phase]

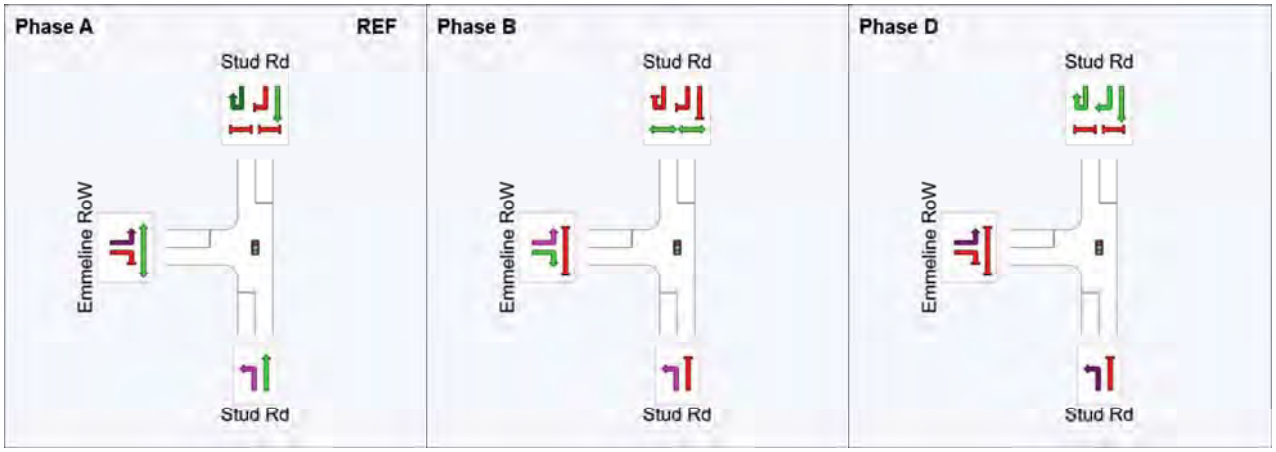
Stud Rd / Emmeline
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Two Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, D
Output Phase Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Phase Change Time (sec)	0	116	131
Green Time (sec)	110	9	10
Phase Time (sec)	116	13	16
Phase Split	80%	9%	11%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

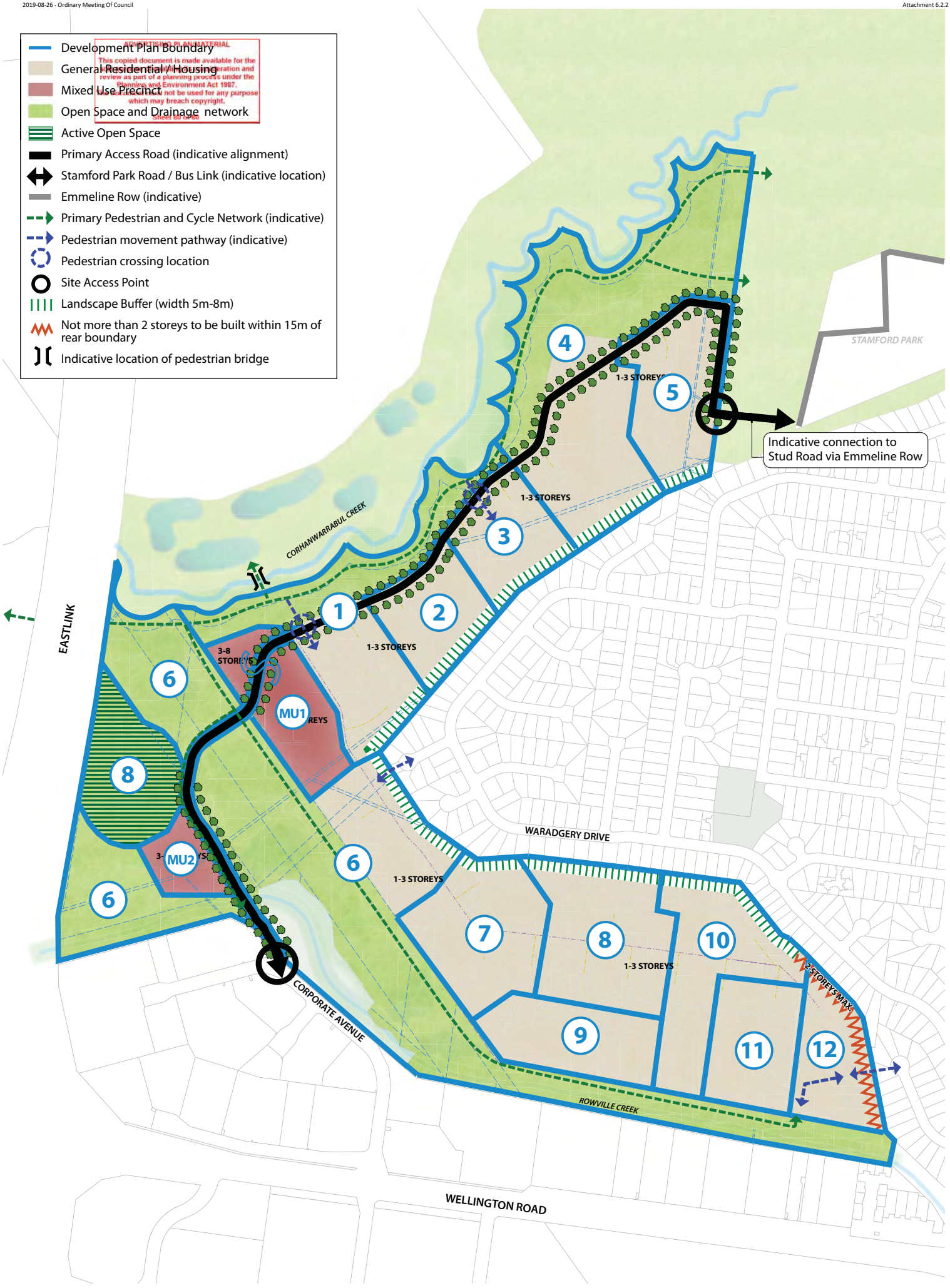


REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: TRAFFIX GROUP PTY LTD | Processed: Friday, 22 June 2018 8:27:00 AM
Project: P:\Synergy\Projects\GRP1\GRP18520\Analysis\SIDRA\G18520SIDRA5-2018.sip7

Appendix C
Concept Staging Plan



WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

Final Report

Bankside Development - Integrated Water Management Plan

PASK Group

June 2019

Document Status

Version	Doc type	Reviewed by	Approved by	Date issued
01	Draft Report	Aaron Vendargon	Aaron Vendargon	15/09/2017
02	Final Report	Aaron Vendargon	Aaron Vendargon	09/10/2017
03	Final Report	Aaron Vendargon	Aaron Vendargon	11/04/2018
04	Final Report	Aaron Vendargon	Aaron Vendargon	04/07/2018
05	Final Report	Niels Unger	Niels Unger	03/09/2018
06	Final Report	Bertrand Salmi	Bertrand Salmi	22/02/2019
07	Final Report	Niels Unger	Niels Unger	14/06/2019

Project Details

Project Name	Bankside Development - Integrated Water Management Plan
Client	PASK Group
Client Project Manager	Tim Pepper
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1 INTRODUCTION

Pask Group is proposing to develop the Kingston Links Golf Course site in Rowville, as the Bankside project. This report has been prepared to provide information on the Integrated Water Management Strategy for the proposed development of the site. It specifically addresses the request for information outlined in the draft DPO13, in relation to Integrated Water Management matters. This report builds on and supersedes certain sections of the detailed Stormwater Management Plan and Flooding Assessment prepared for the site (Water Technology, August 2017).

This report has been continually updated, in line with the key revisions to the development masterplan and corresponding updates to the flood modelling (for the floodplain component) and the hydrological and water quality modelling (for the stormwater component).

The latest version of this report (version 7) corresponds to the latest Road and Access Plan (rev 11a) and provides further detail in response to additional feedback and comments provided by Council (primarily from Council's Stormwater department), dated 29 May 2019. Melbourne Water are supportive of the Masterplan and no further information was sought by Melbourne Water in relation to the referral (Melbourne Water reference: MWA - 1098912).

1.1 Site Location

The golf course consists of approximately 70 Ha of irregularly shaped land to the east of Eastlink and to the north of Wellington Road in Rowville (Figure 1-1). The site is bounded by Corhanwarrabul Creek to the north, existing residential development to the east, Eastlink to the west and Rowville Main Drain to the south. The future proposed Stamford Park development is located adjacent to the north-east boundary of the site.

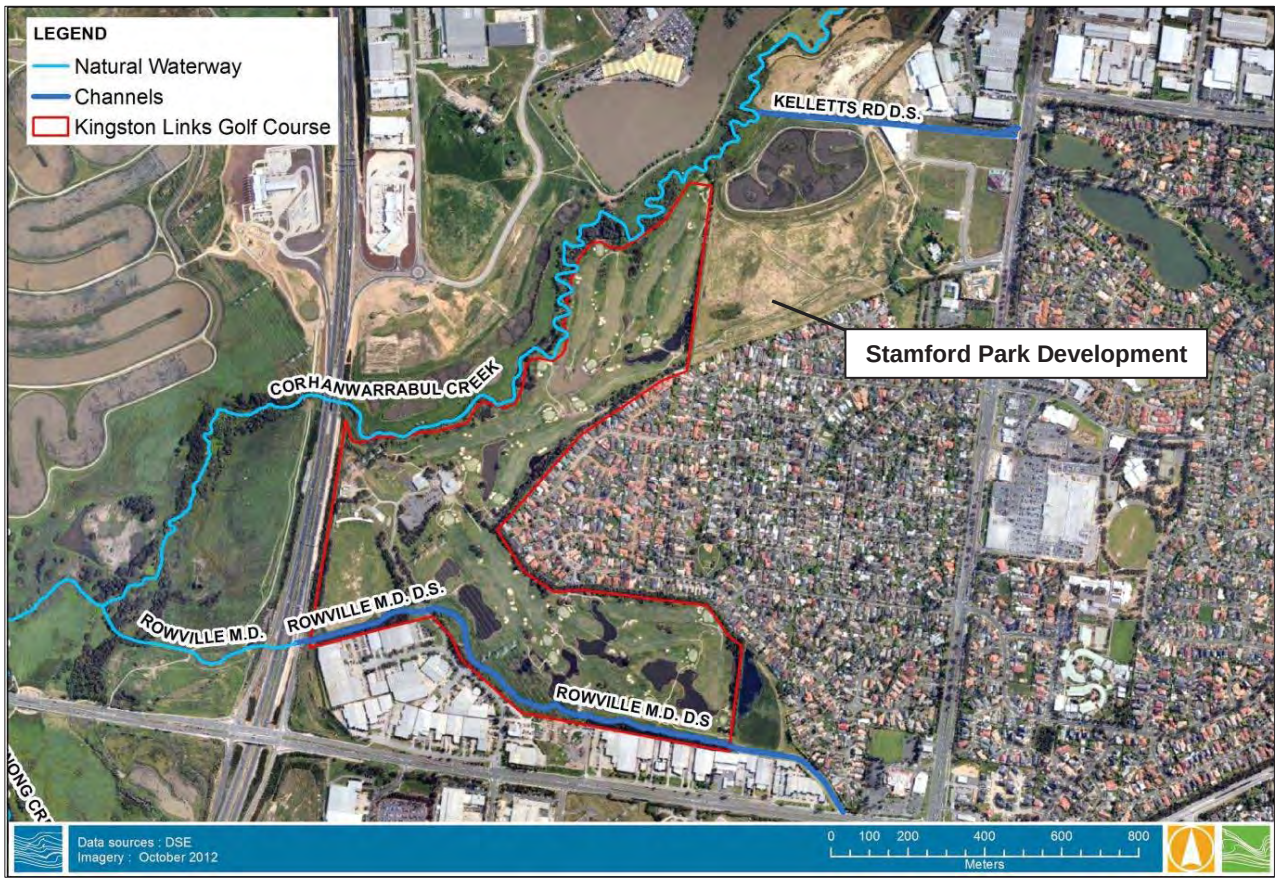

Figure 1-1 Study Area

2 STORMATER MANAGEMENT

The proposal to manage stormwater for the development has been prepared using an integrated approach, jointly considering the management of water quality, water harvesting, drainage, flooding, waterway health, and amenity, across the site and the surrounding areas. The stormwater management concept plan is shown in Figure 2-1 and highlights the key elements of the design.

The site's stormwater drainage strategy has considered the integration between the site and drainage from the existing residential areas, adjacent Stamford Park development and future parkland precinct area to the east. The key internal drainage infrastructure was sized and main overland flow paths checked to ensure feasibility of the drainage system to cope with stormwater runoff from the site and external catchments. At present, it is understood that stormwater outfalls for Stamford Park and surrounding parkland precinct area are proposed to drain directly to the creek.

The internal drainage for the site is proposed to be serviced through a pit and pipe drainage system. The major/trunk pipe network was designed to convey the peak 10 year ARI design flow, with consideration of inverts at connection points to the existing drainage including the Melbourne Water network, and existing Council network. The pipes will outfall into the proposed southern outfall point along Rowville Main Drain. Surface flows exceeding the capacity of the drainage system will be directed to overland flow paths along the roadways and drainage corridors. Swales may also be incorporated into the development, mainly to convey roadside surface runoff.

It is proposed to discharge all stormwater from the development towards storage areas fronting Rowville Main Drain, and to only direct a relatively small linear open space area towards Corhanwarrabul Creek. This approach is proposed to help maintain the current hydrological regime of flows that discharge from the site towards Corhanwarrabul Creek.

The management of stormwater for the site has been designed to improve water quality of the receiving waterways and hence the biodiversity. A centralised ~1.5 Ha wetland system is proposed to be located along Rowville Main Drive, in the power transmission line easement. This wetland system has the capacity to treat runoff from the development to best practice standards, and to also provide significant treatment benefit to the adjacent residential catchment prior to discharging into the receiving waterway.

The following opportunities and constraints to address the existing flooding issues in the adjacent subdivision have been identified in relation to the development:

- A buffer between the development and existing residential areas is proposed to reduce ponding, minimise flood risks, and to help retain existing trees.
- The existing residential area to the west of the Stamford Park development can benefit from additional flood protection from Corhanwarrabul Creek. The raised linked pathway/roadway proposed between Stamford Park and Bankside will provide increased flood protection for adjacent residential properties.
- The area of potential flooding at Turnberry Court can be offered additional protection through an upgrade of the pipe and pit network leading to Rowville Main Drain. This will likely have minimal impact on the size of the drainage assets through the development, given the proximity to the outfall point.

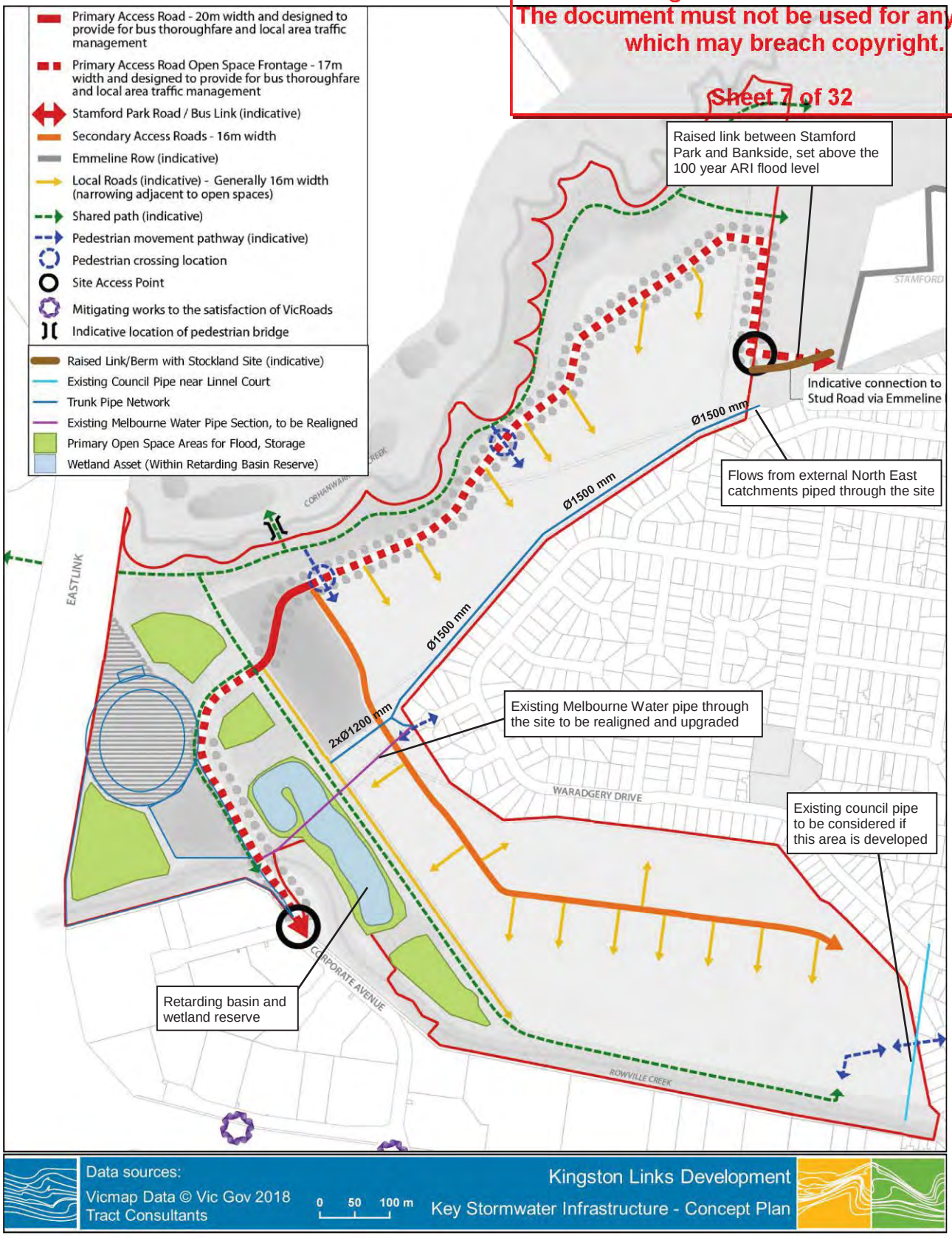

Figure 2-1 Stormwater Management Infrastructure - Concept Plan

3 PRE-DEVELOPMENT AND EXPECTED POST-DEVELOPMENT RUNOFF

Discharges to the downstream waterways are from site runoff, and runoff from the adjacent residential catchments which flow through the site. Under future developed conditions, stormwater from the development and external catchments will be directed into storage areas upstream of the receiving waterway.

Hydrological modelling, using RORB (a hydrological runoff-routing program), was undertaken and used to analyse stormwater runoff (from the proposed development and external catchments) and size flood storages for peak flow retardation. The modelling uses the AR&R1987 methodology and datasets, as the project precedes the adoption of AR&R2019. Key details on the RORB model setup and parameters are outlined below:

- The model's subarea delineation was based on LiDAR data, existing property boundaries, existing stormwater pipes, and the proposed development layout. Subareas and reaches were broken up as needed; to represent key flow splits, allow flows to be extracted at locations of interest, and to model the development staging.
- For the existing conditions model, the existing golf course waterbodies are modelled as full.
- A diversion has been included to represent the main pipe and overland flow split from the external catchments in the North East corner.
- Fraction impervious (FI) values were set to reflect current Melbourne Water recommendations for the development site. FI values set to 0.1 for the waterways and undeveloped areas and 0.6 for the external residential catchments. Future development areas in the site are assigned a higher FI value of 0.75.
- The k_c value for the 'existing conditions' model was set to 2.04, based on regional k_c relationship developed by Melbourne Water for the south east region of Melbourne: $k_c = 1.53A^{0.55}$. For the 'developed conditions' models (including key development stages), the k_c value will be adjusted to keep the same k_c to d_{av} ratio as the 'existing conditions' model. The RORB model input and run parameters shown in Table 3-1.

Table 3-1 RORB Model Parameters

Model Parameters	Values
k_c	2.04 (for existing conditions)
m	0.8
Initial Loss	15 mm
1% AEP Pervious Area Runoff Coefficient	0.6
IFD Location	Catchment centroid
Temporal Pattern Details	Filtered patterns
Areal Pattern Details	Uniform
Areal Reduction Factor	Not Applied

The storage areas have been sized to reduce the post-development 100 year ARI flows leaving the site, to below the pre-development 100 year ARI peak flow rate. It should be noted that the site's RORB model for the concept design is being continuously updated to reflect any changes, as the development layouts are revised.

The calculated peak pre-development and expected post-development (mitigated) 100 year ARI design flows discharging into Corhanwarrabul Creek and Rowville Main Drain, and corresponding critical storm durations, are shown in Table 3-2 below.

Table 3-2 Peak Pre-Development and Expected Post-Development Peak MUSIC Design Flows Leaving the Site

Location	Q_{100} Pre-Development (m^3/s)	Q_{100} Post-Development (m^3/s)
Corhanwarrabul Creek	~2.7 (9 hr)	~8.5 (9 hr)
Rowville Main Drain	~8.9 (2 hr)	~8.4 (9 hr)

4 WATER SENSITIVE URBAN DESIGN

4.1 Introduction

This section provides information on the details of how stormwater will be effectively treated on site to limit off-site discharge and meet the relevant state government water quality targets.

A treatment train, consisting of a sediment pond followed by a wetland, is proposed to treat the runoff generated by the development while providing significant treatment benefit to the adjacent residential catchment prior to discharging into the receiving waterway. Constructed wetlands are large, man-made, highly vegetated water bodies that provide a natural way to reduce runoff velocities, treat stormwater and remove sediment and contaminants before discharging stormwater downstream. Council's Aquatic Species Plant List will be reviewed and incorporated where relevant in the plant species selection for the wetland system.

The treatment train components were assessed to ensure they were technically feasible for the site and met Victorian best practice pollutant removal targets[1]:

- 80% of total suspended sediments (TSS).
- 45% of total nitrogen (TN).
- 45% total phosphorous (TP).
- 70% gross pollutants.

A combination of a sediment pond and wetland was the preferred option for this strategy, due to its performance in achieving the pollutant removal targets, but also for providing a range of other benefits including:

- Flow attenuation.
- Habitat and biodiversity enhancement.
- Microclimate enhancement.
- Amenity values.

Nonetheless urban forest related strategies are becoming popular in urban environments and have been suggested in similar development sites. In order to be part of the stormwater treatment strategy, the urban forest (tree-pits) should be designed as part of bio-swale and/or raingarden systems along the main roads and other areas within the public realm. While these systems were not the preferred systems in this plan, green street corridors are recommended for the Bankside development due to their many benefits, such as providing amenity and mitigating the urban heat-island effect. Water quality benefits from such street treatments would be over and above that specified in this strategy.

Stormwater harvesting for toilet flushing purpose has been investigated and the results indicate a potential reduction in the mean annual runoff volume of approximately 15 ML/year, which can also represent considerable savings in potable water.

4.2 Proposed strategy

A centralised sediment and wetland treatment train is proposed within the retarding basin along Rowville Main Drain, located in the power transmission line easement. This has the capacity to treat runoff from the development area to best practice standards and to also provide treatment benefit to the adjacent residential catchment prior to discharging into the receiving waterway.

[1] CSIRO (1999). Best Practice Environmental Management Guidelines.

The treatment train components were modelled using the MUSIC (Model for Urban Stormwater Improvement Conceptualisation) modelling program. The model has been setup with local rainfall data and in accordance with current best practice guidelines[2].

Table 4-1 Key Characteristics of the Proposed WSUD Features

Details	Sedimentation Basin	Wetland
Surface Area at the NWL	2,000 m^2	14,730 m^2
Extended Detention Depth	0.35 m	0.35 m
Permanent Pool Volume	1,200 m^3	5,900 m^3

4.2.1 Treatment Performance

The proposed WSUD assets treat the stormwater generated from the Bankside development to best practice targets. As aimed in the design stage, this sediment and wetland system also provides treatment for the external local catchments, which contribute around 50% of the flows and pollutants entering the system.

Table 4-2 presents the modelled treatment performance results, showing that the proposed WSUD assets will exceed best practice water quality requirements for the development site.

4.3 Stormwater Harvesting Opportunities

The adoption of rainwater tanks to store runoff from roofs for toilet flushing re-use was investigated. An average of 2.5 people per household and an average daily demand for toilet flushing of 22 L/person/day were assumed. A simple water balance model was setup with MUSIC to investigate stormwater harvesting opportunities within the development. Under the modelled assumptions, the proposed rainwater tanks provided 98% of the required volumetric demand, which means approximately 15 ML/year of potable water substitution by rain water and the same volume reduction in excess runoff volume reaching the creek.

[2] Melbourne Water (2016). MUSIC Guidelines: recommended input parameters and modelling approaches for MUSIC users. Final version released in 2017.

Melbourne Water (2015). Melbourne Water, Design, Construction and Establishment of Constructed Wetlands: Final version released in 2017.

Table 4-2 MUSIC Model Results

	Sources from External Catchments	Sources from Bankside Development	Total Sources	Residual Load (After the WSUD Treatment)	Load Removed (Total Sources – Residual Load)	% Reduction of the Developments Source Loads	Best Practice Pollutant Removal Objectives
Total Suspended Solids (kg/yr)	42,500	37,380	79,880	23,300	56,580	151%[3]	80%
Total Phosphorus (kg/yr)	80	82	161	76	85	104%[3]	45%
Total Nitrogen (kg/yr)	604	672	1,276	941	335	50%	45%
Gross Pollutants (kg/yr)	10,700	11,151	21,851	1,620	20,231	181%[3]	70%

[3] Percentage reduction of the developments source loads is greater than 100% as it accounts for the treatment of flows from the external catchment.

5 STORMWATER AND FLOODPLAIN STORAGE

5.1 Stormwater Storage

Flood storages are proposed to retard peak stormwater flows leaving the site back to existing conditions, prior to stormwater discharging into Rowville Main Drain and Corhanwarrabul Creek. A RORB model covering the site and external local catchments was used to assess the stormwater storage requirements. The contributing sub-catchments are shown in the RORB layout plan in Figure 5-1.

Under the site's stormwater strategy, parts of the catchment which currently discharge to Corhanwarrabul Creek will be directed to outfall to Rowville Main Drain. Site catchments L, M & N and the North East external catchments D, E1, E2, F, G, K1 & K2 (refer catchment ID's in Figure 5-1) are those catchments to be redirected into the proposed storage areas along Rowville Main Drain.

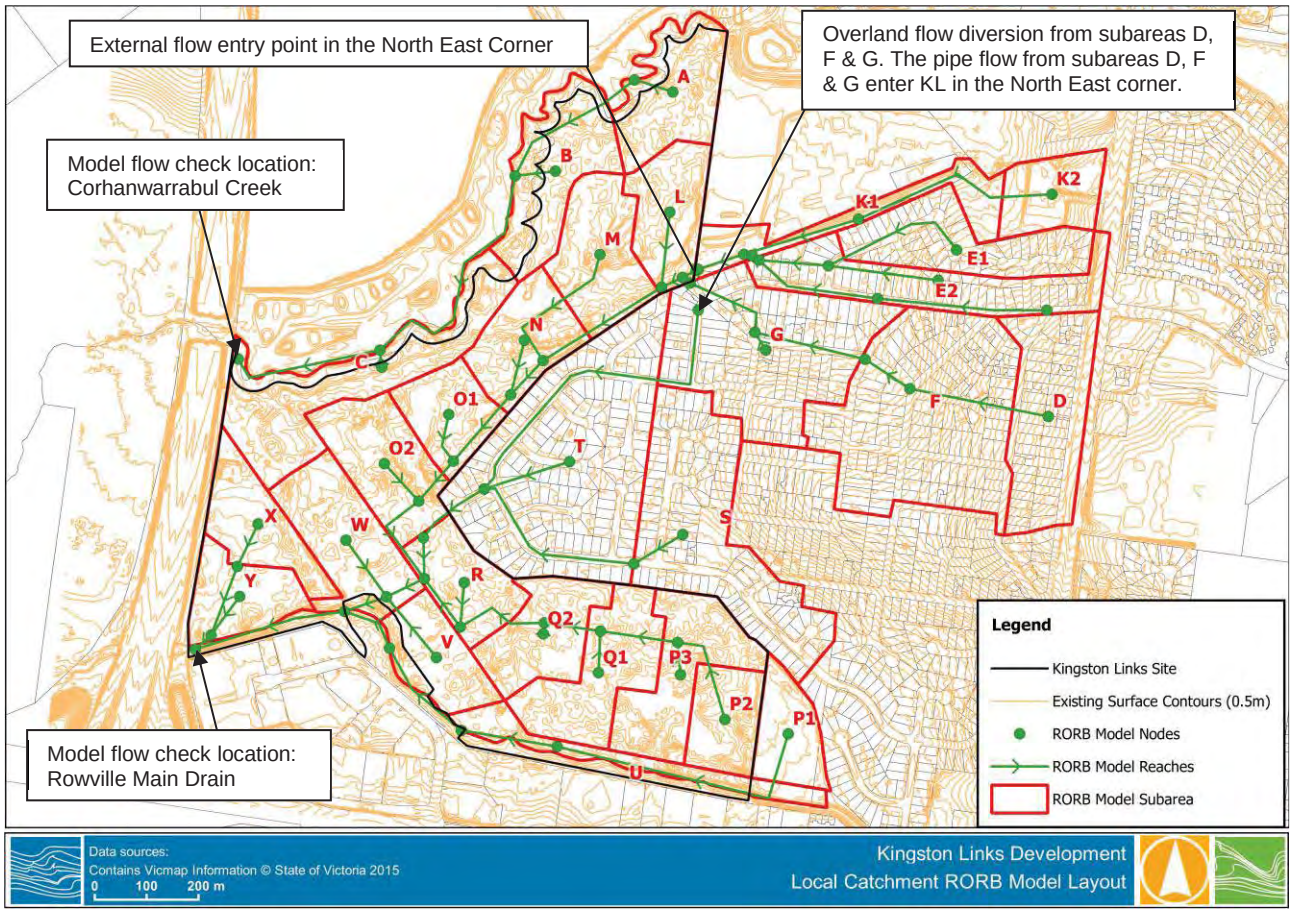

Figure 5-1 Local Catchment RORB Model Layout

The stormwater storage areas were sized to retard the 100 year ARI developed conditions (unmitigated) design flows at Corhanwarrabul Creek and Rowville Main Drain, back to the calculated peak 100 year ARI existing conditions peak design flows. The resulting required flood storage volumes and corresponding critical storm durations are presented in Table 5-1. The modelling has shown that the catchment redirection (away from Corhanwarrabul Creek) will reduce local 100 year ARI flow rates entering the section of Corhanwarrabul Creek fronting the site, thus eliminating the need for a retarding basin upstream of Corhanwarrabul Creek

Table 5-1 Stormwater Flood Storage Sizing

Flood Storages	Storage Volume (m^3)
Retarding basin controlling discharges into Corhanwarrabul Creek	n/a
Retarding basin controlling discharges into Rowville Main Drain	~23,800 (9hr storm)

It should be noted that the peak flows in the receiving waterways will be dominated by flows from the much larger external waterway catchments.

As outlined in Section 3, the site's RORB model is being continuously updated to reflect changes, as the development layouts are revised. The ultimate stormwater storage volumes (values in Table 5-1) will be finalised during the functional design phase, and the stormwater detention volumes will also be assessed for the key development stages.

The concept levels and footprints of the proposed retarding basins were determined by assessing the downstream channel levels and the surrounding proposed terrain levels. The main retarding basin(s) are proposed to be split into separate basins within the powerline easement, airspace volume above the extended detention depth in the proposed wetland and the areas fronting Rowville Main Drain, depending on the finalised overland flow path/road layout for the development.

5.2 Floodplain Storage

The golf course forms a significant part of the floodplain in the 100 year ARI event as breakout flows from Corhanwarrabul Creek and Rowville Main Drain flow through the golf course. As such, the golf course provides floodplain storage in the 100 year ARI event for both the Corhanwarrabul Creek and Rowville Main Drain systems.

To maintain floodplain storage and minimise offsite impacts post development, the following works have been designed:

- A floodway reserve along Corhanwarrabul Creek, outside an approximate 30 m buffer from the creek.
  - The 30 m buffer relates to Melbourne Waters nominated (30 m) setback from the Creek where no significant earthworks are to occur. As part of the design however, limited works for the floodway reserve along the creek are proposed within the 30 m buffer, namely excavation at local high spots, as agreed on with Melbourne Water.
  - It should also be noted that rehabilitation works are proposed within the 30 m buffer and these have been agreed with the floodplain authority.
- Widening of a section of Rowville Main Drain.
- Cut works within the powerline easement.
- Cut works along the south-west part of the driving range.

A flood (TUFLOW linked 1D-2D) model was setup and used for the development's floodplain assessment. This model is used to assess existing and proposed developed conditions, across a range of development scenarios and design flood events. Key details on the flood model setup and parameters are outlined below:

- The model's terrain was created using a wide range of survey (including LiDAR) and design terrain datasets.
- To date a 2D grid size of 4 x 4 m has been utilised for the modelling, to ensure adequate detail of the waterways and floodplain features while maintaining reasonable model run times. Where required breaklines (created using 2d zsh layers) were applied to accurately define key floodplain features.
- For 'existing conditions', it is assumed that all other planned developments (Caribbean Gardens and the Stamford Park residential development) will have occurred before any work has commenced on Bankside.
- Two upstream/inflow boundaries were applied at Corhanwarrabul Creek and Rowville Main Drain. Hydrological (RORB) models, provided by Melbourne Water and run using the AR&R1987 methodology

and datasets, were used to determine the inflow hydrographs for the two inflow (Corhanwarrabul Creek and Rowville Main Drain) inflow boundaries. The key input and run parameters for the floodplain RORB models are outlined in Table 5-2.

- A stage-discharge (HQ) slope boundary, downstream of Eastlink, was used as the model's downstream boundary.
- Key structures in the floodplain were included in the model as either 1D or 2D structures; this includes the Corhanwarrabul Creek bridge and Rowville Main Drain culverts under Eastlink, Stud Road crossings at Corhanwarrabul Creek and the waterway north of Corhanwarrabul Creek, the existing Kingston Links golf course entrance bridge, and high flow structures in the vicinity of the existing Kelletts Road wetland and adjacent swale.
- Roughness (Manning's 'n') values were attributed to different land used or surface types across the floodplain.

The flood modelling for 'existing conditions', the proposed 'ultimate developed conditions' concept design, and the 'Phase 1 bulk earthworks' stage have been reviewed and approved by Melbourne Water. The flood model will be continuously updated to reflect the development updates, as required, as the development layouts/designs are revised and/or the concept designs progress.

Table 5-2 Key Floodplain RORB Model Parameters

Key Parameters	Corhanwarrabul Creek RORB Model	Rowville Main Drain RORB Model
Kc	15.45	4.39
m	0.8	0.8
Initial loss	15 mm	15 mm
Pervious Area Runoff Coefficients (ROC)	5 year ARI (0.25) 10 year ARI (0.35) 100 year ARI (0.6)	5 year ARI (0.25) 10 year ARI (0.35) 100 year ARI (0.6)
IFD Location	Catchment Centroid	Catchment Centroid
Temporal pattern details	Filtered patterns	Filtered patterns
Areal pattern Details	Uniform	Uniform
Areal reduction factor details	AR&R 1987 method	AR&R 1987 method

The 100 year ARI flood storage calculations for existing and the (concept design) developed conditions, across the full floodplain, is shown in Table 5-3. The breakup of the total floodplain storage was calculated over the site (golf course) and areas outside the site where earthworks are proposed. The detention depth airspace over the proposed wetland was excluded from the floodplain storage volume calculation.

The flood modelling has demonstrated that the loss in floodplain storage as a result of the development, is balanced by the proposed floodplain earthworks (there is a minor increase in flood storage) in the 100 year ARI event.

Table 5-3 100 year ARI Floodplain Storage Calculation across the Entire Floodplain

Existing Floodplain Storage (m^3)	Developed Floodplain Storage (m^3)	Net Difference
156,100	158,600	+2,500 (+1.6%)

6 CONSIDERATION OF AVULSION RISKS

The design of the proposed floodway reserve along Corhanwarrabul Creek was reviewed and refined in detail to reduce the likelihood of channel avulsion. The erosion of boundary material along the banks and within the floodway reserve, can result in the transportation of sediment downstream and increased risk of channel avulsion or large-scale failure of the reserve.

Detailed flood modelling was undertaken to assess velocities and shear stresses, which were used to gauge the potential for floodplain erosion and avulsion. The floodway reserve design was focused on keeping the 100 year ARI shear stresses to largely below 50 N/m^2 along the floodway reserve and at flow transfer locations between the creek and reserve. Numerous design iterations of the channel form for the proposed reserve were trialled, to ensure that the following risks were minimised:

- Erosion of the creek channel and the floodplain.
- Transportation of sediment downstream.
- Damage to or destruction of the natural habitat and stream ecology.
- Damage to or destruction of built assets in and around the floodplain.
- Flood risks to the community.
- Changes in the course of Corhanwarrabul Creek.

To minimise the risk of avulsion and erosion, the following design changes were incorporated into proposed floodway reserve and the development line:

- The development line was offset further away from Corhanwarrabul Creek; the line was moved back substantially along the northern section of the site (by approximately 45 m) where the highest erosion risks were present. Moving the development line back in the northern section of the site resulted in a minimum distance of ~100 m between Corhanwarrabul Creek and the development line, in the northern section of the site.
- The remnant areas of fill associated with the golf course that were forming a hydraulic barrier were removed. This was done to better equalise flood levels across the floodplain, between the creek and the floodway, to provide a more stable transition of flows between the creek and floodway.
- The longitudinal grade of the floodway reserve was flattened.
- The bed of the floodway reserve was raised to minimise risks of seepage from the creek to the reserve.

7 WORKS ALONG CORHANWARRABUL CREEK

7.1 Remediation Works along the Creek

The riparian zone of Corhanwarrabul Creek presently suffers from extensive infestation of noxious weeds, compromised water flow and poor-quality understory. The section of Corhanwarrabul Creek abutting the site has been identified by the design team as a candidate for habitat restoration works including extensive weed control and revegetation.

Control of noxious and high threat weed species will be prioritised to facilitate the commencement of a clean-up and rehabilitation program. Specific weed species will be targeted for eradication while controlling species of lower priority to a manageable level.

More detailed restoration activities will be focused on improved or additional fauna habitat, for example, enhancement of billabongs and discrete nodes or interest points for community engagement (refer Appendix A); The detail design of these remediation works will be addressed during the planning permit process for subdivision.

7.2 Proposed Modifications Works

No modification works are proposed along the creek channel. The proposed modification works are located along the riparian corridor and consist of the enhancement and remediation works. These works are outlined in Appendix A, including the creation of two new proposed billabongs/wetlands, proposed landscape nodes, creation of a shared trail and establishment of vegetation cover in specific areas.

7.2.1 Protection of Channel Stability

The remediation and enhancement works will need to be managed to protect (maintain or improve) the stability of the creek channel.

All native vegetation will be protected and enhanced with additional planting to fill gaps in the continuity. Fully continuous woody vegetation is desirable to maintain or improve bank and channel stability, help maintain water quality and provide a fauna corridor.

The weed management process should be carefully managed to ensure that removal does not initiate channel instabilities (particularly bed deepening). Willow control will require a considered approach, and potential placement of bed and bank stabilisation methods (e.g. the addition of rock chutes) to prevent erosion post removal, where Willow roots are contributing to channel stability. The use of heavy machinery to remove live Willows should be avoided.

The existing rock chutes within the creek are extremely important to the long term stability of Corhanwarrabul Creek within and upstream of the project area. A longitudinal survey of the existing stream bed and assessment of the existing rock chutes through the project area is recommended, to identify any threats to channel stability, identify maintenance requirements for the existing rock chutes and to establish a baseline for future monitoring.

Any future works, such as crossings, will need to be managed to avoid initiating stream bed incision/deepening through:

- Generally ensuring that any future works in the bed of the creek are designed not to lower the existing invert (level) of the stream bed.
- Generally ensuring that future infrastructure is not placed within ten metres of the top of bank or immediately adjacent to outside bends of the creek.
- Minimise disturbance to the stream bed and banks during construction activities.

- Placing appropriate rock protection within the stream bed both upstream and downstream of any crossing or outfall for scour protection.

8 FLOOD MANAGEMENT IN A 100 YEAR ARI EVENT

The flood management of the site in a 100 year ARI event under future developed conditions is outlined below.

8.1 Local Flooding

Minor drainage for the site is proposed to be serviced through a pit and pipe drainage system. Surface flows exceeding the capacity of the drainage system will be catered for along the roadways and drainage corridors. The major overland flow paths within the site were checked to ensure that overland flows can be safely conveyed along a 16.5 m wide road reserve. Runoff from the development site will outfall to the storage areas along Rowville Main Drain.

The development's stormwater assets have been sized to cater for flows from the existing residential subdivision and external catchments as follows:

- **Northern Corner (between Stamford Park and Bankside)**

  A number of council pipes discharge at this location, with the runoff making its way through the golf course. The proposal is to cater for these flows through the development site, by piping the flows along the site's southern boundary, towards the proposed Rowville Main Drain retarding basin/wetland.

- **Downstream end of Turnberry Court**

  An overland flow path and the drainage network through the site will be used to safely convey the peak external 100 year ARI flow from Turnberry Court.

A buffer is proposed along the boundary between the development and the existing subdivision to prevent water from ponding against any filled areas and affecting the existing properties.

8.2 Flooding from Corhanwarrabul Creek and Rowville Main Drain

The proposed development areas of the site will be filled (where required depending on current levels) to protect the site from flooding from Corhanwarrabul Creek and Rowville Main Drain. Floor levels will be set to provide appropriate freeboard above the 100 year ARI flood levels. Freeboard levels of 600 mm for properties adjacent to the floodplains was agreed on in discussions with Melbourne Water. Future flood conditions (depths/extents) in a 100 year ARI event across the floodplain are shown in Figure 8-1.

The latest 'ultimate developed conditions' 100 year ARI flood levels contours (from floodplain flows/flooding) across the site is shown in Figure 8-1. It should be noted that the ultimate flood levels are yet been finalised – the flood levels will be re-assessed at the key future stages of the development and floodplain works (which includes the entry road, flood storage earthworks and landscape works). At each assessment stage, the developments design 100 year ARI flood results will be checked against the approved 'overall development' floodplain strategy to ensure compliance.

The freeboard for lots outside the floodplain influence is expected to be 300 mm above flood levels in overland flow paths, or subject to Council's requirements.

Safe access for the development can be provided via the proposed main entry road, currently proposed at the existing bridge crossing over Rowville Main Drain. The deck of this existing bridge crossing sits just at the 100 year ARI flood level. In addition, safe access can also be provided via a proposed road link to Stamford Park. The road link to Stamford Park should be set above the 100 year ARI flood level plus 600 mm freeboard, to tie into the proposed design pad levels at both sites.

The Land Subject to Inundation Overlay (LSIO) has already been updated for the site, in line with the proposed development areas and the flood modelling work undertaken. The LSIO revisions were prepared as part of the planning scheme amendment and applied as a blanket in areas along the powerline reserve. Two sections of

the proposed road network for the site lie within the LSIO, the north south road fronting the powerline easement, and the entry road section which runs across the powerline reserve. These two road sections will not be redirecting or obstructing the main flow path in the 100 year ARI floodplain, as demonstrated by the flood modelling. The entry road section which is inundated by floodplain flows will be designed to be subject to safe depths and velocities in the 100 year ARI flood event. It should also be noted that at this stage the road designs have not been finalised.

The proposed features and areas within the designated floodplain parts of the site (e.g. paths, open space and playground area in the floodway reserve) will be designed with consideration of appropriate levels for flood protection and signage as needed.

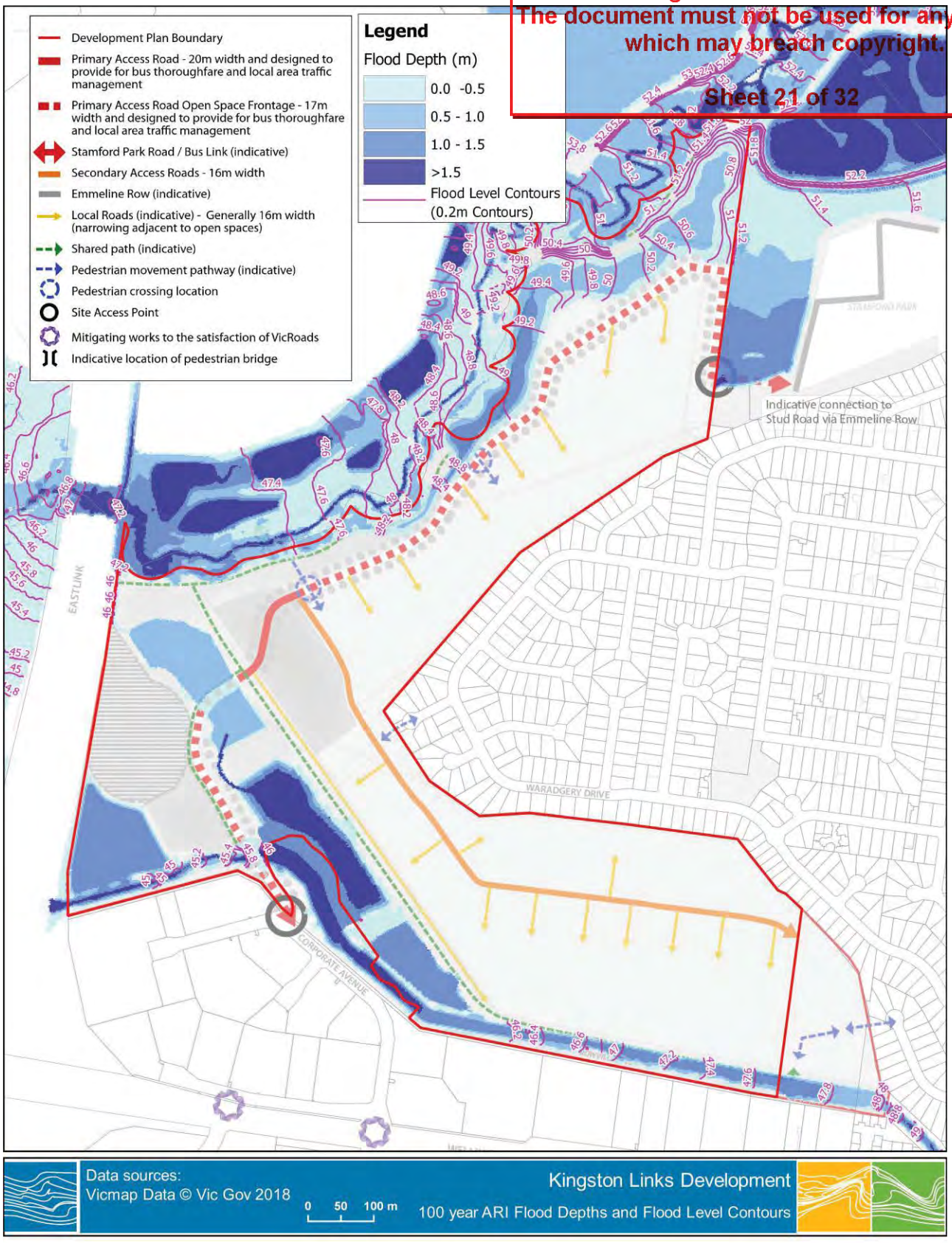

Figure 8-1 Developed Conditions 100 Year ARI Flood Depths and Flood Level Contours

9 ROWVILLE MAIN DRAIN MODIFICATIONS

The existing 100 year ARI hydraulic width for the section of Rowville Main Drain along the site varies from 20 to 30 m. It is proposed to widen the section of Rowville Main Drain between the open space reserve near Linnel Court' to the 'current golf course entry road'. The modifications are proposed to increase the capacity of the waterway, improve its amenity and provide floodplain storage.

The total waterway corridor width for Rowville Main Drain has been widened to 45 m. The 45 m width applies from the boundary of the existing industrial properties to the development line boundary. The proposed 100 year ARI hydraulic width for the widened section of Rowville Main Drain varies from 30 to 35 m. The design width of the modified drain is varied to enable most of the existing trees to be retained.

The waterway modifications can be broken into two main sections:

- Widening the constricted section of Rowville Main Drain immediately upstream of the site, adjacent to the council reserve. (refer cross section in Figure 9-1).
- Slightly increasing the capacity of the drain through the site (refer cross-section in Figure 9-2 below).

Widening Rowville Main drain will help reduce flood levels abutting the existing industrial properties by an average of 250 mm, and also help lower flood levels upstream of the site.

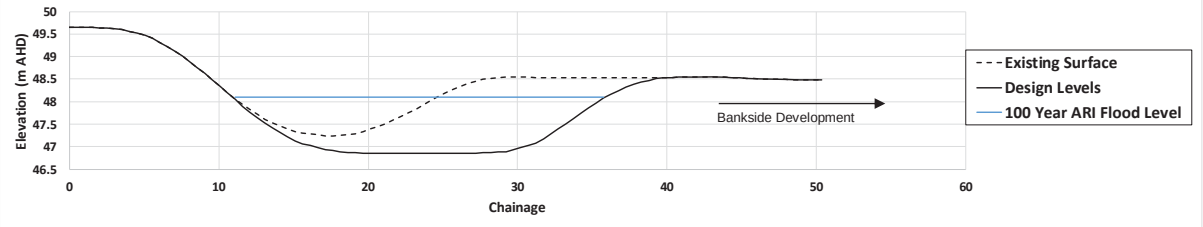

Figure 9-1 Rowville Main Drain Cross-section - Along Reserve Upstream of Golf Course

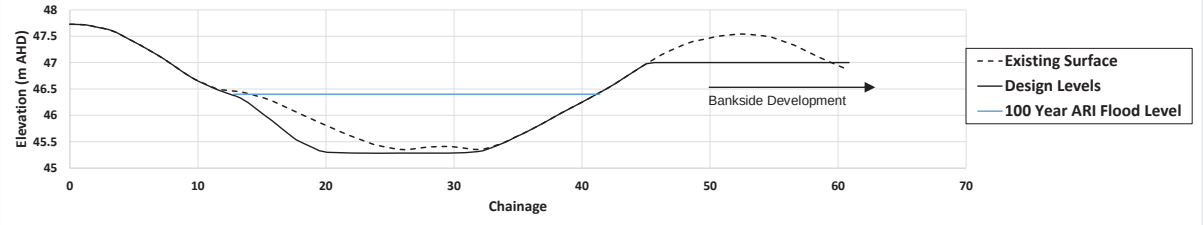

Figure 9-2 Rowville Main Drain Cross-section - Along Golf Course

10 NECESSARY SITE CONTROL MEASURES DURING CONSTRUCTION OF ANY DRAINAGE WORKS

Prior to the granting of a permit for subdivision, an Environmental Management Plan (EMP) will be prepared by the appointed contractor to establish what the contractor needs to do in order to manage itself so as to meet its environmental, economic and social goals. The EMP outlines the contractor's approach to environmental management throughout the construction phases with the primary aim of reducing any adverse impacts from construction on receiving waters, infrastructure and nearby residences.

An Environmental Risk Assessment will be undertaken when developing the EMP. The risk assessment identifies all aspects of construction that could have an environmental impact and assesses the potential risk and impact of that activity on the environment. The assessment would address the potential impacts created during the temporary construction period (e.g. construction dust, sediment and noise) and any permanent impacts (e.g. disturbance to vegetation) that are influenced by construction methods. Water management will be one of the specific environmental issues that would be addressed in the EMP and strategic details on how these would be controlled across the project would be provided.

Drainage control measures will need to be implemented on the construction site to manage stormwater runoff to primarily:

- Minimise the risk of rill and gully erosion;
- Minimise the risk of hydraulic damage to the adopted erosion and sediment control measures;
- Control the velocity, volume and location of water flow through the site; and
- Appropriately manage the movement of 'clean' and 'dirty' water through the site.

The development is proposed to be staged, and stormwater drainage requirements will need to be appropriately incorporated into all stages of construction. This would usually involve the establishment of temporary drainage control measures, separate to the site's permanent drainage system. To date, site control measures have been established for the 'Phase 1 Bulk Earthworks construction', and further control measures will be progressively prepared for future stages of construction. The following works are incorporated into the Phase 1 Bulk Earthworks, to safely convey site and external stormwater runoff during the Phase 1 Bulk Earthworks (key works shown in Figure 10-1 below):

- An interim swale located along the southern boundary of Stages 1 to 5, and an interim sediment pond/retarding basin.
- An interim catch drain provided along the southern boundary of the Stage 12 fill area, that drains to an existing artificial golf course waterbody.
- A table drain along the western boundary of the site, to prevent runoff from the fill areas discharging to the Eastlink Reserve, as per the arrangement with Connect East.

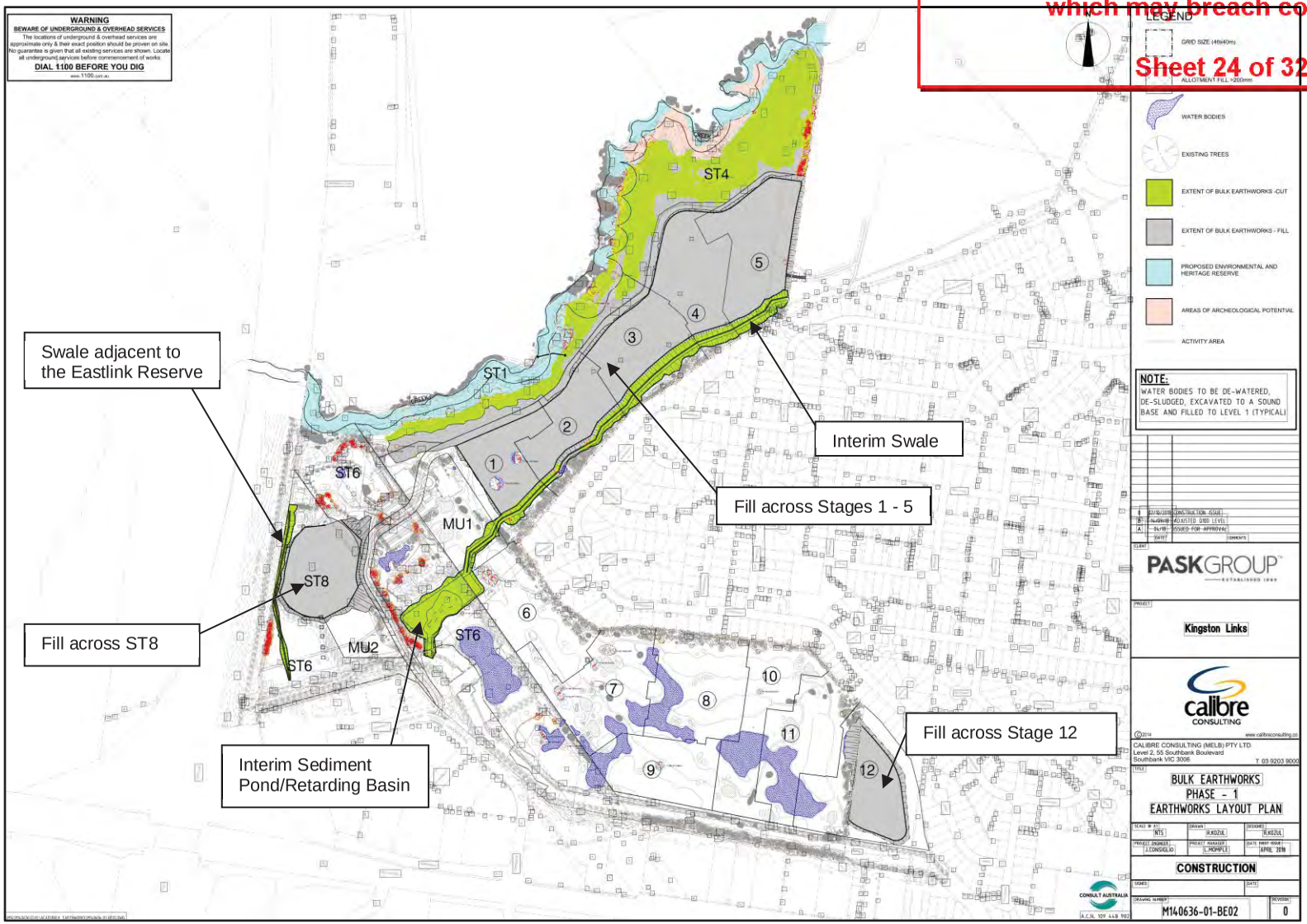

Figure 10-1 Phase 1 Bulk Earthworks Design Plan (Calibre Consulting, 2018)

11 EASTLINK FREEWAY RESERVE

Eastlink and its reserve area lie to the west of the site. The development will be designed to ensure that all surface water (up to the 100 year ARI event) and underground drainage will be directed away from the EastLink Freeway reserve, and that any works and fillings on the site will have no detrimental effect on the flood levels and drainage paths in and around the EastLink Freeway reserve.

Table drains will be created along the western boundary of the site, to ensure that no runoff from the site enters the Eastlink reserve. Two table drains are proposed, to drain the areas that slope to the north and south respectively. The details of the table drains are shown in Figure 11-1 below. The table drains have been sized to convey the peak 100 year ARI runoff from the future fill areas (sports precinct) and undeveloped areas of the site that slope towards the Eastlink reserve.

A low-level bund is currently envisaged to the north of the driving range, to separate the Rowville Main Drain and Corhanwarrabul Creek floodplains in a 100 year ARI flood event.

- The proposed bund alignment has been set to tie into existing high ground in the Eastlink Reserve, allowing the bund to be constructed without the need for any fill in the Eastlink Reserve.
- This bund formed part of the concept strategy. Its purpose was to maximise storage in the Corhanwarrabul Creek floodplain without flooding residential properties before spilling onto the Rowville floodplain. It will also act as spillway between the Corhanwarrabul Creek and Rowville floodplain in very rare events, i.e. events in excess of the 100 year ARI event. The design for this part of the site is constantly evolving; and as the floodway design has progressed further, the 100 year ARI flood levels along this section of the creek's floodplain have dropped, so we currently revaluating the need and effectiveness of the proposed bund.

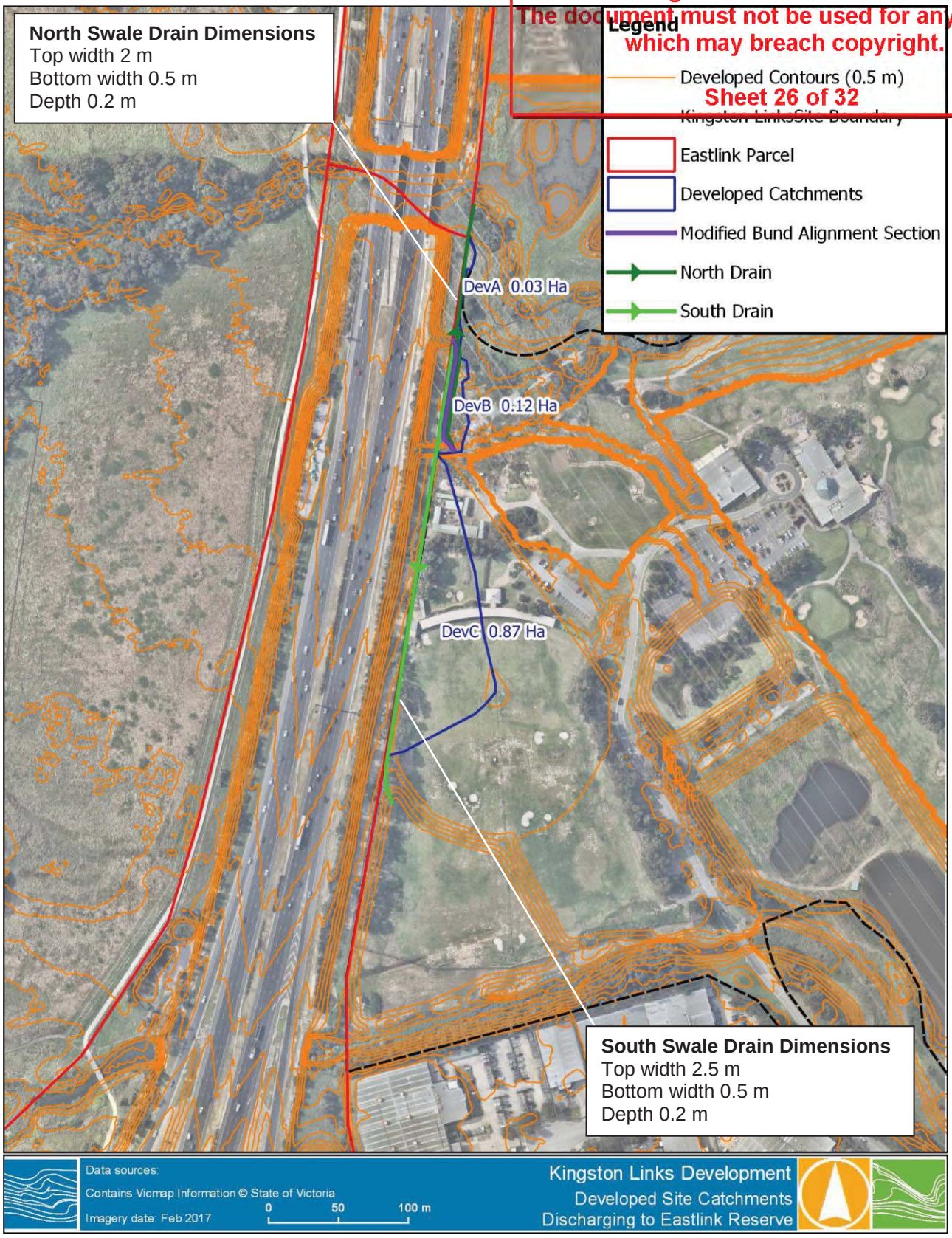

Figure 11-1 Developed Conditions Site Catchments Discharging to Eastlink and Proposed Adjacent Drains

12 MAINTENANCE AND HANDOVER

12.1 Introduction

Maintenance works of vegetated WSUD assets during the **first two years** is the foundation to the healthy establishment of the plants. In fact, proactive maintenance in the first two years after the establishment period (construction and planting phases) are the most intensive and important to the long-term success of the treatment asset. In addition to the regular inspections, vegetated assets should be visually inspected during or immediately after a significant rainfall event. This is important to confirm that the treatment system is functioning correctly under wet conditions. The recommended asset inspection frequency is presented in Table 12-1.

Desilting sedimentation ponds during its early stages (i.e. after the completion of works including roadworks, construction of the wetlands and inground infrastructure works) is also critical as it is likely that a large amount of sediments will have entered the pond during the last stages of construction.

As such, the maintenance works during the first two years should be undertaken regularly by the land owner. The ownership and operational and maintenance responsibilities of the assets will be transferred to the public land manager after the first two years. As such, keeping records of the system condition over this time is as important as undertaking the works. It is recommended that the formal inspections should involve completing a maintenance checklist and documenting any proactive or reactive maintenance activities undertaken.

Table 12-1 Recommended Asset Inspection Frequency

Lifecycle Period	Owner	Formal Inspection	Visual Inspection
Establishment (first 2 years)	Melbourne Water & Council	Every 3 months	• Every 3 months; and, • During or Following a significant rainfall event
	Developer/Land Owner	As per the Infrastructure Design Manual (at key construction points)	• During or following a significant rainfall event
Post Establishment (post first 2 years)	Melbourne Water & Council	Every year	• Every 3 months; and, • During or following a significant rainfall event

Following the initial 2 year period, the formal inspection frequency can potentially be reduced to once a year, however the vegetated asset should be visually inspected every 3 months.

12.2 Asset Handover

A wetland Maintenance and Operation Plan will be developed during the detailed design and reviewed just after construction. This Plan should form a planning permit condition on a future subdivision permit. The public land manager and the land owner should agree on terms in the Plan and have it as a condition to be fulfilled for the asset handover. The items listed below should be checked and covered in detail in the Plan:

- System appears to be working as designed visually.
- No obvious signs of under-performance.
- Inspection and maintenance undertaken as per maintenance plan (forms provided).
- Asset inspected for defects.
- Providing a list of the required documentation.

The asset handover should occur at the completion of the Defects Liability Period (DLP) and the following process is recommended:

- Preliminary acceptance when the asset has been constructed and is in a state deemed to be functional. A site visit by technically qualified staff/professional should be conducted to confirm this is the case.
- The DLP commences after the asset has attained the preliminary acceptance sign off. In most cases the public land manager takes ownership of the asset while the developer/land owner continues to maintain the asset.
- Before the asset is handed over to the public land manager, a Certificate of Completion should be carried out. If any component does not meet the requirements it is essential that the developer fixes any issues to the satisfaction of the public land manager.

12.3 Maintenance Delineation and Agreement

After handover, Melbourne Water will take ownership and maintenance responsibilities over the assets, and Council is likely to take responsibility the maintenance of the landscaping features around the assets. While a complete maintenance delineation and responsibility agreement for the different public land managers is to be provided as part of landscape design plan in consultations with Melbourne Water and Council, probable maintenance responsibilities are shown below in Table 12-2.

Table 12-2 Proposed Maintenance Responsibility

Works	Maintenance Responsibility
Sediment Basin (including inlet and outlet, piping and rock beaching)	Melbourne Water
Wetland (including edge and ephemeral planting, planting areas within and below the top water level, edge treatment, macrophyte and aquatic plants, pipeline, grilles, concrete structures, porous rock wall/ rock weirs, rock work around pit inlet/outlets).	Melbourne Water
Waterway	Melbourne Water
Drainage Structures within the Reserve	Melbourne Water
Planted Area Terrestrial, Riparian Planting, Garden Beds and Grass and Trees	Council
Bridge & Viewing Structures	Council
Signs	Council

12.4 Undertaking Ongoing Maintenance

The maintenance delineation and responsibility agreement between Melbourne Water and Council will list the main Maintenance Works related to each asset and component of the asset as well as the frequency of maintenance works.

For more information on the operational aspects and mains aspects and what to look for when undertaking maintenance, please refer to the Kingston Links Golf Course Development Stormwater Management Plan and Flooding Assessment (August 2017).

13 SUMMARY

The proposal to manage surface water for the development has been prepared using an integrated approach, jointly considering the management of water quality, water harvesting, drainage, flooding, waterway health, and amenity, across the site and the surrounding areas.

The development site and external catchments were assessed to prepare the strategy, taking into account the development layout while aiming to enhance and protect the site values along the waterway corridors. The concept design includes a combined wetland and retarding basin system to manage stormwater discharging to Rowville Main Drain, and floodplain earthworks to maintain floodplain storage and minimise offsite flood impacts. The key internal drainage has been sized and the main overland flow paths checked to ensure feasibility of the drainage infrastructure to cope with stormwater runoff from the site and external catchments.

Earthworks are proposed within the Rowville Main Drain and Corhanwarrabul Creek floodplain to facilitate development of the site whilst meeting waterway health requirements, maintaining floodplain storage and conveyance, preventing offsite impacts on flood levels and velocities, and minimising changes in flows/velocities downstream of the site.

APPENDIX A
CORHANWARRABUL CREEK RESTORATION PLAN AND SUMMARY OF WETLAND RECOMMENDATIONS (DEVELOPMENT PLAN REPORT CHAPTER 8.2)

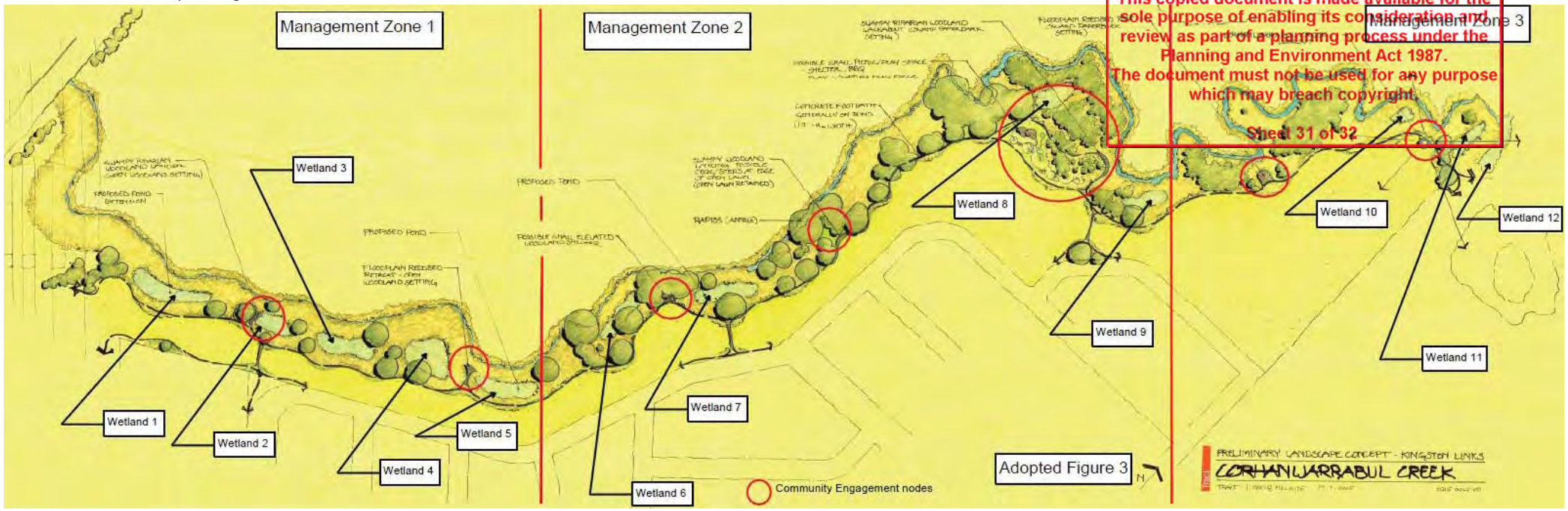

Figure 17 Corhanwarrabul Creek Restoration - Management Zones

WETLAND #	PROPOSAL	CONSIDERATIONS	THREATENED SPECIES
1	Expansion & Enhancement	May require some removal of indigenous vegetation to expand. Located within area of lowest profile, therefore logical and practical landscape position for additional fauna habitat.	Currently unshaded therefore likely to be unsuitable for Dwarf Galaxias. Potential candidate for enhancement of Growling Grass Frog habitat.
2, 3, 6 and 9	Restoration & Enhancement	**Wetlands 2 and 3** are particularly degraded, shallow, silt laden and dominated by weeds. Recommend removing silt load, re-establishing a deeper and more varied profile with a range of emergent and aquatic species to provide structurally diverse fauna habitat. Wetlands 2 and 3 may also be considered for expansion and potential connection. **Wetland 6** is in reasonable condition but requires weed control. Not recommended for expansion due to high number of surrounding trees. **Wetland 9** would benefit from more structurally diverse and complex vegetation, could possibly be enlarged to increase capacity and requires stabilisation of a nick point that will otherwise further erode.	**Wetland 2 and 3** currently unshaded therefore likely to be unsuitable for Dwarf Galaxias. Potential candidate for enhancement of Growling Grass Frog habitat. **Wetland 6** has a good cover of fringing trees, therefore parts of the waterbody are constantly under shade throughout the day. Combined with emergent and aquatic vegetation, wetland 6 may provide an ideal site for enhancement of habitat for Dwarf Galaxias. Although currently unsuitable, **Wetland 9** may provide an additional opportunity for Growling Grass Frog habitat creation
5 and 7	No Modification	Proposed locations for two created wetlands which will effectively create a chain of wetlands and improve connectivity with the creek.	Ideally, these wetlands will be specifically designed with a focus on the ecological requirements of either Growling Grass Frog or Dward Galaxias.
4, 8, 10 and 11	No Modification	These wetlands are in relatively good condition and currently support a diverse range of native fauna and flora. Wetland 4 is a good benchmark for water bird habitat as it supports dense fringing vegetation with both shallow and deep open water. Wetland 8 is a good benchmark for frog and small fish habitat as it contains limited open water and structurally complex emergent and aquatic vegetation. Wetland 10 and 11 are essentially hidden in dense Common Reed and are unlikely to be modified without substantial impacts to remnant vegetation.	Not applicable
12	No Modification	Outside of formal study area and therefore not assessed as part of the current survey	Not applicable

Figure 18 Summary of Wetland Recommendations

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