Bayside Council
Serving Our Community

The **Ordinary Meeting** of
**Bayside Council**
will be held in the Rockdale Town Hall, Council Chambers,
Level 1, 448 Princes Highway, Rockdale
**on Wednesday, 12 June 2019 at 7:00 pm**

# UNDER SEPARATE COVER ATTACHMENTS

## 8 REPORTS


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| Government Agency Submissions | | |
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| **Submission Maker** | **Key Points/Issues** | **Council Officer Response** |
| Sydney Airport Authority | • The height of the Obstacle Limitation Surface (OLS) over the site is 51m Australian Height Datum (AHD).<br>• Under the Airspace Regulations, any proposed development taller than 51m AHD would be subject to assessment & approval by the Federal Department of Infrastructure & Regional Development. | • Noted.<br>• On 30 January 2019, DIRDC issued a 'Controlled Activity Approval' to a maximum height of 91m AHD. As such, aeronautical issues are considered to have been resolved. |
| Department of Infrastructure, Regional Development and Cities (DIRDC) | • Recommend the proponent of this development continue to advise Sydney Airport of the planned final height of any buildings as well as any associated crane activities to ensure that any approvals that may be required under the Airports (Protection of Airspace) Regulations 1996 are obtained prior to construction commencing. | • On 30 January 2019, DIRDC issued a 'Controlled Activity Approval' to a maximum height of 91m AHD. As such, aeronautical issues are considered to have been resolved.<br>• Council will continue to liaise with Sydney Airport Authority as part of a future DA(s) on site. |
| Civil Aviation Safety Authority (CASA) | • CASA has no other issues concerning the planning proposal and no objections to the planning proposal at 91m AHD. | • Noted. |
| Department of Education | • On the basis that the development masterplan provides for approximately 2,015 new dwellings, the resultant demand for additional teaching space in government schools is likely be significant.<br>• The initial impact will be felt in local primary schools where the additional population moving into these developments has the potential to | • Noted.<br>• Noted. |

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| | expend all current spare capacity in available classroom space.<br>• Without a SIC in place, it is requested that Council, in consultation with School Infrastructure NSW (SINSW) and the Department of Planning and Environment, consider a mechanism to obtain developer contributions for public education facilities arising from this planning proposal. A mechanism to delivery infrastructure could be via satisfactory arrangement or a voluntary planning agreement (VPA). | • This matter has been addressed in the associated VPA report to Council. |
| Office of Environment and Heritage (OEH) | • The Heritage Impact Statement (HIS) does not assess in detail the impact that redevelopment of the site will have on heritage items in the vicinity of the site.<br>• The HIS does not provide justification as to why it was concluded that the planning proposal will not have any negative impacts on heritage items in the vicinity of the site.<br>• The HIS does not indicate whether the demolition of items of significance is supported on heritage grounds.<br>• Should demolition of the buildings be approved, the recommendations of the HIS to mitigate heritage impacts should be adopted. The photographic archival recording should be | • The HIS is considered adequate to assess the planning proposal at this stage. If the Planning Proposal is supported, it is anticipated that the final design scheme and future Development Application (DA) will provide detailed assessment of any impacts of the proposed development on surrounding heritage items.<br>• Noted. A future DA will be required to provide an updated HIS with adequate justification to enable proper assessment of any future development proposed for the site.<br>• These items of heritage significance are not included on the State Heritage Register or identified as items of environmental heritage in Schedule 5 (Environmental Heritage) of the Botany Bay LEP 2013. As such, there is no legal requirement for items to be retained and the proponent has been issued with a Complying Development Certificate to demolish certain buildings on site, including those identified in the HIS as being of heritage significance.<br>• The demolition of the buildings has been approved via a Complying Development Certificate. The recommendations suggested by OEH will be considered in the assessment of any future Development Application. |

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| | expanded to include all remaining infrastructure associated with the General Motors Holden manufacturing period. | |
| Joint submission: Transport for NSW (TfNSW) and Roads and Maritime Services (RMS) | • Council should implement travel demand strategies, which could include initiatives such as reduced on-site car parking provisions, to mitigate the potential impact of traffic movements to/from future developments. A contribution toward local and regional active transport connections would also help in this regard. The following suggestions should be considered for funding:<br>1. An upgrade of the on-road cycle lanes, along Banks Avenue between Heffron Road and General Bridge Crescent, to a separated cycleway.<br>2. A new shared path along Heffron Road, Page Street and Cowper Avenue, which will link to a future Green Corridor. | • This has been addressed in detail in the VPA report associated with this Planning Proposal. |
| | • The Southeast Sydney bus service network will change once the CBD & Southeast Light Rail opens in mid-2020. The definition of the network has not yet been finalised. | • As per the recommendations of the Sydney Central Planning Panel when considering the Rezoning Review for this Planning Proposal , the proponent was required to provide "*assurances from Transport for NSW that public transport will cope with the proposed population increase*", The proponent states that *"while it is acknowledged that light rail is not directly accessible from the site, additional bus services are proposed. Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site".* However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |

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| | • It is recommended that Council includes LEP controls to limit the floor space of the additional permitted use of 'retail premises' to 5,000 sqm. This has been recommended as any exceedance of the retail floor space has not been accounted for in the traffic assessment and the associated traffic may exceed the capacity of the road infrastructure and recently delivered upgrades. | • Council notes RMS's recommendation to limit the 5000sqm non-residential FSR on the site. The non-residential component is a requirement of the Gateway Determination and is deemed necessary to enable future resident's adequate access to shops and services on site. Future DA's will be required to be referred to RMS to enable further comment in this regard and the potential for further upgrades, including any DA involving commercial floor area. |
| | • The preparation of the site-specific DCP or the assessment of any Masterplan application should consider the following:<br>1. Any direct vehicular access points to Bunnerong Road from the site is unlikely to be supported by Roads and Maritime.<br>2. Any future vehicular access points to the site on Heffron Road or Banks Avenue should be located as far as practical away from any signalised intersections.<br>3. Any future child care centres should be positioned and oriented such that vehicular and pedestrian access is obtained from the local/internal road network only, on road safety grounds. | • Council will consider these recommendations when assessing any future Development Application. |
| | • Roads and Maritime has reviewed revised modelling provided by the Applicant on 2 March 2019 and noted some matters that should be addressed either prior to the making of the Plan, or at a minimum in any transport study prepared in support of the future Masterplan DA. | • Noted. |
| Randwick City Council | • The intensification of FSR and building height is considered excessive and the proposed FSR of | • Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the |

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| | 2.35:1 represents an increase in permissible gross floor area of 120,990 or an additional 135% on the current 1:1 FSR standard. | Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1). The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1 and comply with relevant provisions of SEPP 65 and the ADG. |
| | • The proposed building heights vary significantly from current heights stipulated in BBLEP 2013. The proposed 69m building height is out of character with the surrounding areas and will be dominant and overbearing when viewed from the adjoining residential properties. | • Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br>• Although the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br>• The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys), in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-east of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-eastern portion of the subject site.<br>• Building height, bulk, scale, form and design will be further refined in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. |

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| | • The Planning Proposal's justification for the development is largely reliant on the extension of new major public transport to the site such as the extension of the CBD and South East Rail Light Rail to Maroubra Junction. The Future Transport Strategy 2056 identifies that both projects are to be investigate in the next 10-20 years and are therefore not confirmed pieces of transport infrastructure that the Planning Proposal can rely on. The NSW State Government has made no commitments to light rail extensions in discussions with Randwick Council.<br>• The proposal would really solely on existing limited bus services if approved. Bus access and frequency should be reviewed. | • TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "*Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site*". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • The proposed building heights scale downwards toward the north of the site in response to the low density residential neighbourhood north of Heffron Road. A similar treatment should be considered to respond to low density residential development across Heffron Road to the east. This would reduce the bulk and dominance of the proposal on the surrounding area.<br>• Setbacks to the eastern boundary adjacent to Bunnerong Road should be consistent with the Hills Thalis scheme rather than a nil setback as proposed in the masterplan. The setbacks should be consistent with other blocks within the greater BATA site front Bunnerong Road. | • The proposed building heights along the eastern edge of the site have been reduced when compared with the original Planning Proposal. The original Planning Proposal included a proposed maximum building height of 65m along majority of the eastern boundary of the site. The current Planning Proposal includes a proposed maximum building height of 38m along the entire eastern boundary of the site. This provides an appropriate transition from a maximum height of 69m in the middle and south-western portion of the site.<br>• Setbacks to proposed buildings will be further refined and considered as part of a future Development Application on the site. |

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| | • The application of R4 High Residential zoning across the site is inappropriate given the variation in building heights from 2 storey town houses to 20 storey towers. It would be more appropriate to individually zone parts of the site depending on the proposed built form or apply an R1 General Residential zone that reflects the varying forms of residential development. | • The proposed R4 High Residential zoning is considered to be appropriate in this circumstance. Given that the proposed development and masterplan will be subject to a future Development Application, a consistent zoning across the subject site is considered to allow flexibility for future development. |
| | • The proposed development will have impacts on the usage of nearby Randwick City Council public open space such as Heffron Park and Nagle Park. It's noted that the redevelopment provides 2.02ha of public open space, it is considered appropriate to identify these areas as RE1 Public Recreation zoning as part of the LEP. | • The Voluntary Planning Agreement includes the embellishment and dedication of 2.02ha of public open space. Given that the proposed development and masterplan will be subject to a future Development Application, specifying RE1 Public Recreation zoning for public open space within the subject site may reduce flexibility for future development. Council will consider rezoning the site to RE1 Public Recreation at a later date, if appropriate. |
| | • Recommends that the Central Park open space area is enlarged to improve usability and amenity. Shadow diagrams provided with the Planning Proposal indicate that the park will have reduced winter solar access. Heights of building Block B should be revised to address this matter. | • Central Park located to the south of the site does not form part of this Planning Proposal. Development to the south of the site has been subject to numerous Development Applications. Whilst Central Park will experience overshadowing in mid-winter, solar access diagrams demonstrate that compliance with relevant ADG provisions can be achieved. |
| | • The Planning Proposal does not clearly state building uses consistently and it is difficult to understand the impacts of what is being proposed. | • Noted. This matter will be addressed as part of a future Development Application if the Planning Proposal proceeds. |
| | • Justification for the proposed reduced parking rates is heavily reliant on the extension of the CBD and South Eats Light Rail and the Sydney | • Parking has been discussed in detail in the 'response to submissions' within the report. |

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| | Metro. As these are not confirmed pieces of infrastructure, this should not be relied on. The proposed parking rates will result in a shortfall of on-site parking spaces and the deficient is likely to spill over causing an increased demand for on-street parking in the surrounding street network located within the Randwick City Council LGA. Additional onsite parking should be provided. | |
| | • The Planning Proposal will generate an additional approximate 2000 vehicles which will create further congestion of surrounding intersections. | • Traffic has been discussed in detail in the 'response to submissions' within the report. |
| | • If future residents drive and park their cars at the future Kingsford Light Rail Terminus this may increase traffic and car parking congestion on the surrounding street network as it is unlikely that future residents will walk 2km to the station. | • Noted. |
| | • Impacts of increased population on social infrastructure such as community facilities, services and open space. | • The Planning Proposal will provide a total of 20,208sqm public open space throughout the site that will be dedicated to Council. The area of public open space represents approximately 22.5% of the total site area. The public open space areas are to be located in a way that provides a green link between Jellicoe park to the north and the 'Central Park' approved as part of BATA Stage 1 development to the south. Future DA's on site will also be required to provide a minimum amount of communal open space in order to satisfy ADG requirements. |

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| | • Pedestrian access and safety.<br>• Retention of trees.<br>• Drainage. | • The amount of green space and recreational facilities for Bayside Council is currently being investigated and will inform future strategic planning for the area.<br>• Pedestrian access and safety will be further refined in a future DA in the proposal proceeds.<br>• The proposed masterplan illustrates that trees are to be retained where appropriate on the perimeter.<br>• The Due Diligence Report provided by AT&L concluded that the proposed storm water system consistent with good management practices can be provided for the proposed development and can achieve the target requirements for Council and Sydney Waters OSD and WSUD principles. This will be assessed in detail as part of a future DA. |

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| 71 | • Concern in relation to hazardous materials are transported along Bunnerong Rd and that intensification of residential uses on the land could thus significantly increase the risk to human life. | • A Planning Risk Assessment was not provided as part of the Planning Proposal as the subject site is located outside of the risk areas for the Botany Industrial Park and Denison Street – Dangerous Goods Route. Furthermore, the Department of Planning and Environment did not raise any issues or require any additional information at the time of the Gateway Determination. |
| 72 | • Anonymous online petition against development of the site | • An online petition titled *"Stop Meriton Eastgardens and the Plans to Increase an Already Bad Idea!"* was submitted by an anonymous individual. The petition was completed online 232 times, and can be found here: *https://www.change.org/p/bayside-council-stop-meriton-pagewood-get-away-with-corruption-in-our-suburb*. |

| **Community Submissions** | | |
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| **Submission Maker** | **Key Points/Issues** | **Council Officer Response** |
| 1. | • A strong objection to proposal.<br><br>• The development will have a significant impact on public infrastructure due to increased density from Floor Space Ratio (FSR) and height of buildings. | • Noted.<br><br>• The Voluntary Planning Agreement (VPA) includes contributions that will assist in upgrading public infrastructure, such as the upgrade of the Botany Aquatic Centre, the dedication of public roads and 2 hectares of open space. The VPA pertaining to the subject site will be reported separately to Council.<br><br>• The Due Diligence Report prepared by AT&L identifies that essential services such as water and sewerage can be provided to the site. The Transport Impact Assessment prepared by ARUP concluded that the surrounding road network could sustain the increased trips generated by the proposed development. Roads and Maritime Services (RMS) and Transport for NSW (TNSW) have reviewed the proposal and provide no objections. Traffic, car parking and transport are discussed in detail in the response to submissions in the report.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.) and be supported by appropriate information to allow Council to determine whether any additional infrastructure is required to support the development. |
| **2.** | • Object to proposal. | • Noted. |

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| | • Consideration and approval of the proposal should be deferred until after the upcoming state election. | • Noted, however an election is not a planning matter and therefore cannot be taken into consideration. Council has a duty to continue the assessment and progression of Planning Proposals, regardless of elections. |
| | • The proposed development is not in keeping with the existing low density residential character surrounding the site and is a 'gross over-development'. | • The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal is considered appropriate.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1). |
| | • Increased building heights will result in privacy issues, loss of solar access, overshadowing and wind tunnels. | • Whilst the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a masterplan which provides an indicative plan in relation to location of built form and typologies, among other matters.<br><br>The masterplan recommends a reduction in building height towards the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site. |

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| | | The Planning Proposal also includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept masterplan development application as per Clause 4.23 of the Environmental Planning and Assessment Act (1979)) to be prepared prior to development consent being granted. The Planning Proposal outlines specific considerations that a future DCP or concept development application are required to address including:<br>• minimising impacts on adjoining buildings while improving the public domain;<br>• environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity; and<br>• no additional overshadowing will occur to the residential buildings in the R2 zone on the eastern side of Bunnerong Road between 9am and 3pm in mid-winter.<br><br>• Whilst it is anticipated that some buildings and open space within Stage 1 of the BATA site will experience some overshadowing (being located to the south of the subject site), the Planning Proposal states that the proposal is able to comply with SEPP 65 and ADG requirements. In any case, building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide. |
| | • Increased traffic, overcrowding on public transport, lack of car parking spaces.<br><br>• Heritage clock tower should be refurbished for community use by the public | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• Whilst the clock tower was identified as an item of heritage significance in the Heritage Impact Statement (HIS) provided as part of the proposal, the clock tower (as well as other items of heritage significance on the site) is not included on the State Heritage Register or identified as items of environmental heritage in Schedule 5 (Environmental Heritage) of the Botany Bay LEP 2013. As such, |

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| | | there is no legal requirement for the item to retained and the proponent has been issued with a Complying Development Certificate to demolish certain buildings on site, including the clock tower. |
| **3.** | • The amount of affordable housing provided should be increased to comply with the 5-10% specified by the Greater Sydney Commission | • The Planning Proposal includes the provision of 50 affordable housing units. The 'Greater Sydney Region Plan' requires the preparation of 'Affordable Rental Housing Target Schemes' and recommends a target of 5-10% of residential floor space be applied to defined precincts prior to rezoning. The Plan states the Targets will not affect projects currently underway. Given that Bayside Council does not have an Affordable Rental Housing Scheme or a local provision to mandate affordable housing, it cannot be implemented. As such, the provision of affordable housing was considered to have merit and has been negotiated via a VPA. Given that Council does not have an affordable housing policy in place, the provision of 50 units as affordable housing was considered to be appropriate and consistent with 'Greater Sydney Region Plan' the Eastern City District Plan. |
| 4. | • Object to the proposal.<br><br>• The development will have negative impacts on infrastructure. | • Noted.<br><br>• The Voluntary Planning Agreement (VPA) includes contributions that will assist in upgrading public infrastructure, such as the upgrade of the Botany Aquatic Centre, the dedication of public roads and 2 hectares of open space. The VPA pertaining to the subject site will be reported separately to Council.<br><br>The Due Diligence Report prepared by AT&L identifies that essential services such as water and sewerage can be provided to the site. The Transport Impact Assessment prepared by ARUP concluded that the surrounding road network could sustain the increased trips generated by the proposed development. Roads and Maritime Services (RMS) and Transport for NSW (TNSW) have reviewed the proposal and provide no objections. Traffic, car parking and transport are discussed in detail in the response to submissions in the report.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.) and be supported by appropriate information to allow Council |

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| | • The development will have an impact on quality of life for local residents. | to determine whether any additional infrastructure is required to support the development.<br><br>• The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept development application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or concept development application are required to address issues including:<br>  • minimising impacts on adjoining buildings while improving the public domain;<br>  • environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity; and<br>  • no additional overshadowing will occur to the residential buildings in the R2 zone on the eastern side of Bunnerong Road between 9am and 3pm in mid-winter.<br><br>Any future DA for significant development on the site would also require detailed assessment of overshadowing, solar access and visual amenity, to ensure that development can respond to any relevant Council and/or State planning controls, and to assess how any impacts on adjoining landowners/ residents can be minimised. |
| 5. | • Strong objection to proposal.<br><br>• The alteration to building heights requested by the proponent is far too excessive. | • Noted.<br><br>• Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>Although the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m |

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| | | (central and south-western portion of the site), the Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site. |
| | • Comments in relation to Development Application | • The current application is a Planning Proposal that seeks to amend planning controls relating to the site. Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourage the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| 6. | • The alteration to building height would penetrate the Sydney Airport Obstacle Limitation Surface (OLS) and thus should be rejected. | • The Obstacle Limitation Surface (OLS) prescribed for the site is 51m AHD. The proposal includes a maximum height of 91 metres (RL) AHD which exceeds, by 40 metres, the prescribed OLS for the site. However, on 30 January 2019, DIRDC issued a 'Controlled Activity Approval' to a maximum height of 91m AHD. As such, aeronautical issues are considered to have been resolved. |
| | • Road upgrades to the intersection of Wentworth Ave and Page St and the Wentworth Ave and Southern Cross Drive intersection will be essential if | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |

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| | the proposal is to proceed as these intersections are at capacity during peak periods. | |
| **7.** | • Strong objection to proposal.<br><br>• LEP was only gazetted in 2013 with the precinct receiving 'massive' population increases and limited infrastructure enhancements.<br><br>• Current Meriton developments have had a highly negative effect on the area in terms of parking, road congestion and loss of amenity.<br><br>• Quality of units a concern given the proposed density. | • Noted.<br><br>• Whilst the planning controls for the site were varied in 2013 as part of the inception of the Botany Bay LEP 2013, a Planning Proposal is able to be lodged by an applicant at any time. As such, Council is obligated to continue to assess the Planning Proposal based on the proposals strategic merit and consistency with relevant state and local plans and policies.<br><br>• Since 2013, the Greater Sydney Commission has released a series of 'District Plans' to guide the planning and development of areas over the next 20 years. The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus in delivering employment and economic growth. As such, it is anticipated that land located within the strategic centre, as well as supporting infrastructure will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal is considered appropriate.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence, which will ensure that a high standard of architectural design is achieved.<br><br>Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG) which includes provisions that encourages the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes. |

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| | • Rezoning is an excessive increase to building height, and floor space ratio controls. | • Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>Although the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |

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| | • Negative impacts on surrounding residents. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept masterplan development application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or concept development application are required to address including:<br>  ◦ minimising impacts on adjoining buildings while improving the public domain;<br>  ◦ environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity; and<br>  ◦ no additional overshadowing will occur to the residential buildings in the R2 zone on the eastern side of Bunnerong Road between 9am and 3pm in mid-winter.<br><br>Any future DA for significant development on the site would also require detailed assessment of overshadowing, solar access and visual amenity, to ensure that development can respond to any relevant Council and/or State planning controls, and to assess how any impacts on adjoining landowners/ residents can be minimised. |
| | • Affordable housing raises issue of increased crime rates/safety. | • It is considered unlikely that the provision of affordable housing within the development would increase crime rates and detrimentally impact safety. In any case, Crime Prevention Through Environmental Design (CPTED) principles (such as lighting and urban design) will be considered and assessed for all buildings (including affordable housing) as part of any future DA for the site. |
| | • Planning Proposal will go ahead due to VPA money being offered. | • The Planning Proposal has been assessed based on its strategic and site specific merit. The VPA is not a matter of consideration when assessing the Planning Proposal. The VPA is being considered in a separate report to Council. |
| 8. | • Concerns raised about the scale of the development. | • The Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters. |

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| | | The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat buildings within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourage the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • Concerns raised regarding urban design of the development. | • The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence, which will ensure that a high standard of architectural design is achieved.<br><br>Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG) which includes provisions that encourages the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes. |
| | • No mass transit facility/public transport to support the development. | • TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that *"Meriton and STA have discussed bus services that will be provided directly to* |

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| | | *the site within the short term, including bus stops built within the site"*. However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • Little consideration has been shown towards active transport (concerns regarding width of footpath and cycle ways) | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept development application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted which includes the consideration of walking and cycling transport options. TfNSW recommended that active transport links should be investigated by Council and this is discussed separately in the VPA report to Council. As such, the provision of active transport options such as pedestrian pathways and cycle ways is a matter that will be considered in detail by Council either as part of the VPA or in a future DA for the site if the Planning Proposal is to proceed. |
| 9. | • Do not support the proposal.<br><br>• Existing buildings (Stage 1 BATA) are too high and a 'major eyesore'.<br><br>• The proposed building heights for the subject site are too high. | • Noted.<br><br>• The height of the apartments currently being built were subject to a separate DA process and do not directly form part of the assessment of the current planning proposal.<br><br>• Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>Although the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a proposed masterplan which provides an indicative plan in |

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| | | relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourage the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • The area should not be intensified beyond medium density, as population density is a major issue. | • The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus in delivering employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal be considered appropriate. |
| | • Traffic congestion will be a major issue. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |

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| | • Public transport does not have the capacity to service the existing population, and this will be exacerbated by the development. | • TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "*Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site*". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| 10. | • Do not support the proposal. | • Noted. |
| 11. | • Do not support the proposal.<br><br>• The building heights are out of character for the local area. | • Noted.<br><br>• Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>Although the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey |

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| | | dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat buildings within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • The infrastructure that is currently in place is inadequate to support this development. | • The Voluntary Planning Agreement (VPA) includes contributions that will assist in upgrading public infrastructure, such as the upgrade of the Botany Aquatic Centre, the dedication of public roads and 2 hectares of open space. The VPA pertaining to the subject site will be reported separately to Council.<br><br>The Due Diligence Report prepared by AT&L identifies that essential services such as water and sewerage can be provided to the site.<br><br>Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are |

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| | | awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.) and be supported by appropriate information to allow Council to determine whether any additional infrastructure is required to support the development. |
| | • The proposal should not go ahead until the impact on transport, traffic and surrounding roads is addressed. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| 12. | • Object to the proposal.<br><br>• Insufficient car parking spaces provided and parking will overflow to the surrounding street network.<br>• Traffic study is incorrect as traffic congestion is understated and the proposed development will exacerbate pressure on the surrounding street network.<br><br>• Public transport is currently overcrowded and is insufficient to support the development and the approval of the proposal should not be based on the promise of increased infrastructure. Infrastructure should be in place before the development occurs. | • Noted.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• Noted. Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. |

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| | | Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| **13.** | • Object to the planning proposal.<br><br>• The proposed R4 High Density Residential zoning is not in keeping with low density areas directly adjacent to the site (across both Heffron Road and Bunnerong Road). The area is unsuitable for high rise development.<br><br>• The proposed building heights represent overdevelopment, are unsuitable for the area and lack in variety and human scale and will dominate the skyline. | • Noted.<br><br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal is considered appropriate.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>• Although the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey |

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| | | dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat buildings within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourage the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • Increasing FSR controls will lead to overcrowding. | • The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1 and comply with relevant provisions of SEPP 65 and the ADG.<br><br>The Planning Proposal, if approved, will facilitate the delivery of 2,015 dwellings. Future residents will have access to a range of services given the site's proximity to Westfield Eastgardens shopping centre, as well as existing schools and hospitals. |
| | • The proposed development will result in wind tunnelling and block solar amenity. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept development application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or concept development application are required to address including:<br>  • environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity; and<br>  • no additional overshadowing will occur to the residential buildings in the R2 zone on the eastern side of Bunnerong Road between 9am and 3pm in mid-winter. |

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| **14.** | • The scale of the proposed development is out of character for the local area. | • The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic planning framework, the Planning Proposal is considered appropriate. |
| | • The proposed building height is too high. | • Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>Although the proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site. |
| | • The first stage of the site (BATA Stage 1) is considered inappropriate in terms of height and | • Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the |

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| | density, is out of place and has negative impacts on the surrounding areas (such as reflectivity and glare) and is serviced by inadequate public transport. The impacts of development will be exacerbated by the current proposal. | planning proposal was to proceed. Future development of any proposed residential flat buildings within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourage the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials.<br><br>The first stage of the site (BATA Stage 1) currently under construction were subject to a separate DA process and do not directly form part of the assessment of the current planning proposal.<br><br>The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept development application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or concept development application are required to address including:<br>• minimising impacts on adjoining buildings while improving the public domain; and<br>• environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| | • The reduced rate of car parking will result in parking issues, with parking overflow to surrounding streets. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • The proposal is based on 'potential' public transport upgrades. The public transport in the area is not proposed to change sufficient within the next 10 years to cater for the population increase generated by the proposal. The current bus service is infrequent and overcrowded. | • Noted. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "*Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site*". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can |

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| | | support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • Traffic congestion in the area has increased and Bunnerong Road is at capacity. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • The quality of the proposed development will be poor and it will not age well. | • The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence, which will ensure that a high standard of architectural design is achieved.<br><br>Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG), which includes provisions that encourage the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes. |
| | • The proposal will result in detrimental impacts to the quality of life and living conditions of surrounding residents. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept development application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or concept development application are required to address including:<br>  • minimising impacts on adjoining buildings while improving the public domain;<br>  • environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity; and<br>  • no additional overshadowing will occur to the residential buildings in the R2 zone on the eastern side of Bunnerong Road between 9am and 3pm in mid-winter. |

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| | • Planning Proposal will go ahead due to VPA money being offered. | • The Planning Proposal has been assessed based on its strategic and site specific merit. The VPA is not a matter of consideration when assessing the Planning Proposal. The VPA is being considered in a separate report to Council. |
| 15. | • Objection to proposal based on aesthetics. | • The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence, which will ensure that a high standard of architectural design is achieved. The proposed masterplan will continue to be refined during the DA process, if the Planning Proposal is supported.<br><br>• Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG), which includes provisions that encourage the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes. |
| | • Potential issues with aeronautical impacts. | • The Obstacle Limitation Surface (OLS) prescribed for the site is 51m AHD. The proposal includes a maximum height of 91 metres (RL) AHD which exceeds, by 40 metres, the prescribed OLS for the site. However, on 30 January 2019, DIRDC issued a 'Controlled Activity Approval' to a maximum height of 91m AHD. As such, aeronautical issues are considered to have been resolved. |
| | • The proposed density is too high and should be lowered. | • The urban design report and proposed masterplan illustrate that the site is able to accommodate the proposed FSR of 2.35:1, and comply with the relevant provisions of SEPP 65 and the ADG.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As |

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| | | such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic planning framework, the Planning Proposal be considered appropriate.<br><br>Building bulk, height, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • Road access should be improved as the area currently suffers from heavy congestion.<br>• Car parking rates should be increased (tripled). | |
| 16. | • Object to the proposal.<br><br>• Opposed to increased units, including Stage 1 BATA, given the detrimental impacts on the surrounding area. | • Noted.<br><br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic planning framework, the Planning Proposal be considered appropriate.<br><br>The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a concept development application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal |

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| | | outlines specific considerations that a future DCP or concept development application are required to address including:<br>• minimising impacts on adjoining buildings while improving the public domain; and<br>• environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| | • Insufficient car parking rates will lead to overflow and on-street parking along Banks Avenue. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • Public transport is insufficient to support the development, with a lack of buses servicing the site. | • Noted. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "*Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site*". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • The developer has a history applying for more density after approval. | • If the proponent wishes to amend the planning controls to increase FSR (density) or height, a Clause 4.6 variation would be required to be submitted with a future DA or a new Planning Proposal would be required to be lodged and assessed by Council and the Department of Planning and Environment before being approved. |
| 17. | • Support the proposal and masterplan. | • Noted. |
| 18. | • Support the proposal. | • Noted. |
| 19. | • Support the proposal and masterplan. | • Noted. |
| 20. | • Do not support the proposal. | • Noted. |
| 21. | • Do not support the proposal. | • Noted. |

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| | • The proposed heights and densities are not supported. | • The proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site). The Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the planning proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • The proposal will place stress on existing infrastructure and services. | • The Voluntary Planning Agreement (VPA) includes contributions that will assist in upgrading public infrastructure, such as the upgrade of the Botany Aquatic Centre, the dedication of public roads and 2 hectares of open space, which represents 22.5% of the site. The VPA pertaining to the subject site will be reported separately to Council. |

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| | | The Due Diligence Report prepared by AT&L identifies that essential services such as water and sewerage can be provided to the site. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "*Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site*". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.), and be supported by appropriate information to allow Council to determine whether any additional infrastructure is required to support the development. |
| | • The development is not in keeping with the existing character of the neighbourhood. | • The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal is considered to be appropriate.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1). |
| 22 | • Support proposal and masterplan | • Noted. |

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| 23 | • Do not support the planning proposal and request a 'deemed refusal'. | • Noted. The changes being sought to planning controls by the proponent are being done so via a 'Planning Proposal' not a 'Development Application'. As such, a 'deemed refusal' is not an option in these circumstances. For more information about the next steps for this Planning Proposal, please see the Planning Proposal flowchart (**Attachment 20**). |
| | • The 'Revised Planning Proposal' submitted by the applicant, erroneously identifies the location of the site on page 18. The current site is not serviced by the infrastructure shown on the map due to its location. | • Noted. Despite this anomaly within the Planning Proposal document, the site is identified as being part of the Eastgardens – Maroubra Junction strategic centre in the Eastern Centre District Plans. The studies supporting the Planning Proposal have correctly noted the location of the site and the infrastructure servicing the site and surrounds have been used in the assessment of this proposal. |
| | • Concerns in relation to urban design, quality of future buildings. | • The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence. This will ensure that a high standard of architectural design is achieved. The proposed masterplan will continue to be refined during the DA process, if the Planning Proposal is supported.<br><br>Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG) which includes provisions that encourages the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes. |
| | • The proposal should not be based on potential public transport (light rail) upgrades. Given that no infrastructure upgrades have been confirmed by Government agencies, this should not be considered as grounds to proceed with the proposal. | • It is acknowledged that light rail is not directly accessible from the site. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "*Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site*". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid- |

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| | | 2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • If a light rail extension to Maroubra Junction was to proceed in the future, the SJB Masterplan notes that it would be beyond walking distance from the site. Further, future residents would be required to access the city by 3 modes of transport which is unlikely (bus, light rail, train).<br>  • There are no certainties or guarantees about public transport infrastructure in relation to the light rail or the metro being delivered to the area. | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. As above, Council are awaiting assurances that the surrounding bus infrastructure can support the increased development. |
| | • Widening the road for traffic intersections could eliminate the opportunity for light rail lines along Bunnerong Rd. | • The current proposal does not proposed intersection upgrades. Any road widening currently planned or being undertaken has previously been considered by Council. |
| | • Traffic<br>  • A proposed extension of the light rail to Maroubra would be at the limit of walking distance for residents, and would thus be underutilized.<br>  • Relying on the bus network is unreasonable as passengers would possibly have to make multiple modal changes to reach their destination (i.e. from bus to light rail to heavy rail), which may deter residents from using public transport.<br>  • The development does not propose reduced car parking rates that is consistent with transit oriented development. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |

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| | • The Traffic Report relies on data from 2013 which is problematic given construction of developments that have occurred in the area during this time.<br><br>• The Road Safety section of the Transport Impact Assessment report is inaccurate and has not taken into account accidents that have occurred since 2013 which is misleading.<br><br>• Concerns in relation to the proposal to demolish historical/heritage structures on site. | • The proponent has provided additional commentary in relation to this issue stating "Crash data requests via Roads and Maritime are delayed for detailed crash assessment. As such, The Centre for Road Safety portal data available was investigated in the interim to determine any road safety deficiencies near the site". RMS did not raised objection to this approach.<br><br>• A number of items of heritage significance were identified in the Heritage Impact Statement (HIS) provided as part of the proposal. These items of heritage significance are not included on the State Heritage Register or identified as items of environmental heritage in Schedule 5 (Environmental Heritage) of the Botany Bay LEP 2013. As such, there is no legal requirement for items to be retained and the proponent has been issued with a Complying Development Certificate to demolish certain buildings on site, including those identified in the HIS as being of heritage significance. |
| 24 | • Object to the proposal.<br><br>• Opposed to the proposed 65m building height. | • Noted.<br><br>• Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>The proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site). The Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters. |

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| | | The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • Medium density development would be more appropriate for the site. | • The site has been the subject of an urban design and shadow analysis which demonstrates that the site is able to facilitate high density residential development, whilst also achieving compliance with relevant policies such as the Apartment Design Guide (ADG) in terms of building separation and solar access. |
| | • The surrounding roads and public transport is insufficient to be able to handle the proposed development, and this is not adequately addressed in the Planning Proposal (unless the light rail is extended fully). | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur |

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| | • The facilities and infrastructure to support the development should be put in place before the proposal proceeds. | mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br><br>• The Voluntary Planning Agreement (VPA) includes contributions that will assist in upgrading public infrastructure, such as the upgrade of the Botany Aquatic Centre, the dedication of public roads and 2 hectares of open space, which represents 22.5% of the site. The VPA pertaining to the subject site will be reported separately to Council.<br><br>The Due Diligence Report prepared by AT&L identifies that essential services such as water and sewerage can be provided to the site.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.) and be supported by appropriate information to allow Council to determine whether any additional infrastructure is required to support the development. |
| 25 | • Object to the proposal.<br><br>• FSR of 2.35:1 is excessive and will result in cramped units. | • Noted.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1 and comply with relevant provisions of SEPP 65 and the ADG.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of |

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| | | the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal is considered to be appropriate.<br><br>Building bulk, height, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any proposed residential flat buildings within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • Proposal will have negative impacts on the residents within the development and in the surrounding area. Glare and reflection is a major concern. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>  • minimising impacts on adjoining buildings while improving the public domain; and<br>  • environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |

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| | • Traffic congestion in the area is already problematic, the increased density will exacerbate this.<br>• Not enough car parking spaces have been proposed within the development. 90 car spaces on Banks Avenue can't be part of the proposal as the road is not owned by Meriton. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • Limited local infrastructure to support the increase in residents. Infrastructure concerns have not been addressed, with specific reference to public transport (not enough buses). | • The Voluntary Planning Agreement (VPA) includes contributions that will assist in upgrading public infrastructure, such as the upgrade of the Botany Aquatic Centre, the dedication of public roads and 2 hectares of open space, which represents 22.5% of the site. The VPA pertaining to the subject site will be reported separately to Council.<br><br>The Due Diligence Report prepared by AT&L identifies that essential services such as water and sewerage can be provided to the site.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.) and be supported by appropriate information to allow Council to determine whether any additional infrastructure is required to support the development.<br><br>Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to |

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| | | this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| 26 | • Support the proposal.<br>• It is a good plan for the community. | • Noted. |
| 27 | • Support the proposal.<br>• A new community centre and park is a positive.<br>• 'The industrial site is an eyesore and any change is welcome'.<br>• The developer contributions will improve the community. | • Noted. |
| 28 | • Support proposal and masterplan | • Noted. |
| 29 | • Support proposal and masterplan | • Noted. |
| 30 | • Support proposal and masterplan | • Noted. |
| 31 | • Support proposal and masterplan.<br>• Redevelopment will open up the unused industrial site to the public with access to retail shopping.<br>• This proposal will provide more housing options and is well located, within relative proximity to the CBD, airport, adjoining open space and beaches.<br>• Recommend more express bus services to the city be provided and extension to light rail.<br>• The increased population will provide jobs and support local businesses. | • Noted. |
| 32 | • Support the planning proposal with changes.<br><br>• High rise development is unnecessary, can create good residential living spaces 'without overdoing it'. | • Noted.<br><br>• The site has been the subject of an urban design and shadow analysis which demonstrates that the site is able to facilitate high density residential development whilst also achieving compliance with relevant policies such as |

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| | | the Apartment Design Guide (ADG) in terms of building separation and solar access. |
| 33 | • Support the proposal and masterplan | • Noted. |
| 34 | • Support the proposal and masterplan | • Noted. |
| 35 | • Object to the proposal.<br><br>• Object to the heights of the buildings along Banks avenue. | • Noted.<br><br>• Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>The proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site). The Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road toward Banks Avenue to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site. |

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| | | • Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any proposed residential flat buildings within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| | • Traffic congestion will be an issue.<br>• Not enough car parking spaces have been provided with the development. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • Public transport options are currently limited in the area, and this proposal will place more strain on the network. | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • Overpopulation. | • The proposed masterplan illustrates that the site is able to accommodate high density residential development and the proposed FSR of 2.35:1 and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the |

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| | | Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP. |
| 36 | • Support the proposal but with changes.<br>• BDGC is supportive of affordable housing but seeks clarification over affordable housing<br>• Regarding the embellishment and dedication of a minimum of 20,000m2 of open space, BDGC would like to know what amount is above the requirement based on council instruments for the scale of the development and that it is only the additional cost that is included in the VPA.<br>• BDGC is concerned about the risk to employees crossing Heffron Road (as RMS does not allow the use of pedestrian crossings) and BDGC expects traffic along Heffron Road to increase as a result of the Planning Proposal and therefore create further risk to employees. The employees cross Heffron Road approximately 55,000 times per year<br>•<br>• BDGC contests that Bayside Council request the proponent amend the VPA to include the construction of an underpass (estimated to be approx. $3m) or, that the Bayside Council undertakes to meet the full cost of the construction of the underpass from the $23.9M monetary contribution received through the proposed VPA. | • Noted.<br>• This matter relates to the VPA and has been considered in a separate report to Council.<br><br><br><br><br><br>• The Traffic Impact Assessment submitted with the Planning Proposal outlines that the surrounding intersections will operate at an acceptable Level Of Service (LOS) in future development scenarios.<br><br>The BDGC is advised to liaise with RMS regarding safety concerns of employees crossing Heffron Road and seek to develop a Risk Management strategy to mitigate any potential impacts to employees.<br><br>• This matter relates to the VPA and has been considered in a separate report to Council. |
| 37 | • Does not support the Planning Proposal and supports the proposed masterplan but with changes. | • Noted. |

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| | • Adequate and well located off-street parking to be provided for visitors. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| 38 | • Does not support the Planning Proposal.<br><br>• Opposed to building heights of 20 storey apartment blocks along Banks Avenue. | • Noted.<br><br>• Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>• The proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site). The Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>• The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road toward Banks Avenue to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>• Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with |

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| | • Concerns over increased traffic congestion and lack of car spaces.<br><br>• Concerns in relation to public transport and the anticipated increase strain. | the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| 39 | • Concern in relation to hazardous materials are transported along Bunnerong Rd and that intensification of residential uses on the land could thus significantly increase the risk to human life. | • A Planning Risk Assessment was not provided as part of the Planning Proposal as the subject site is located outside of the risk areas for the Botany Industrial Park and Denison Street – Dangerous Goods Route. Furthermore, the Department of Planning and Environment did not raise any issues or require any additional information at the time of the Gateway Determination. |
| 40 | • Does not support he Planning Proposal.<br><br>• No transport infrastructure to support the development which is already experiencing issues. | • Noted.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |

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| | • Current upgrades to traffic management (traffic light installation on Banks Avenue, Heffron Rd and Bunnerong Rd) are inadequate to deal with the new residents of the stage 1 development.<br>• Traffic congestion is currently a severe issue along Page Street/Heffron Road, Bunnerong Road and Wentworth Avenue, this will get worse as more nearby apartment buildings are completed.<br>• Insufficient buses and no nearby train stations. The proposed light rail will not service the area.<br>• Concerns that surrounding schools in the area may not have capacity for increasing population. | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br>• The Department of Education were consulted in relation to this Planning Proposal and no objections to the Planning Proposal proceeding were raised. This is discussed in detail in the associated VPA report to Council. |
| 41 | • Object to the proposal.<br>• Concerned with the modifications to the original proposal. | • Noted.<br>• The changes being sought to planning controls by the proponent are being done so via a 'Planning Proposal' not a 'Development Application'. The current Planning Proposal is not related to BATA Stage 1 which is considered separately. |

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| | • Scale is too high, large and concentrated for the area and will place pressure on the suburb. | • Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>• The proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site), the Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road toward Banks Avenue to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide, which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |

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| | • The heights will impact neighbouring residences by obstructing views and sunlight.<br><br>• There will be an increase in traffic that will congest local streets, this will also add to noise and air pollution.<br><br>• The changes proposed are not in the best interests of the community. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>  ◦ minimising impacts on adjoining buildings while improving the public domain; and<br>  ◦ environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• Whilst the Planning Proposal represents significant changes to the current planning controls, the site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal be considered appropriate. |
| 42 | • Object to the Proposal.<br><br>• The proposed zoning is of R4 is not in keeping with the adjoining low density neighbourhoods. The adjacent suburbs of Pagewood and Maroubra are zoned R2. The proposed changes to zoning to increase both the building heights (by almost double) and the Floor Space Ratio, are not | • Noted.<br><br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for |

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| | consistent with the neighbouring suburbs development or zoning. | a 'productive city'. Given the strategic planning framework, the Planning Proposal be considered appropriate.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1). |
| | • The proposal will cause significant impacts on infrastructure and local residents. | • The Voluntary Planning Agreement (VPA) includes contributions that will assist in upgrading public infrastructure, such as the upgrade of the Botany Aquatic Centre, the dedication of public roads and 2 hectares of open space, which represents 22.5% of the site. The VPA pertaining to the subject site will be reported separately to Council.<br><br>The Due Diligence report prepared by AT&L identifies that essential services such as water and sewerage can be provided to the site.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.), and be supported by appropriate information to allow Council to determine whether any additional infrastructure is required to support the development. |
| | • Traffic congestion, and risk of road fatalities will be severely exacerbated by the development.<br>• Insufficient parking is provided by the development. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • The likelihood of the light rail being extended down to the development is very slim. Traffic generation analysis has been based on an extension of the light rail, so it is possible that the roadways cannot accommodate the projected increase in traffic. | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La |

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| | | Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • Given that Meriton is delivering 2068 dwellings of Bayside's 10,150 dwelling target, this can be considered to be an overdevelopment (i.e: a fifth of the dwellings in a single development). | • The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1 and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Strategic Centre. |
| | • Pressure will be placed on local schools, as the schools in area are near capacity. | • The Department of Education were consulted in relation to this Planning Proposal and no objections to the Planning Proposal were raised. This is discussed in detail in the associated VPA report to Council. |
| | • Insufficient green and open space is provided within the development. Further investigation of provision of green space is needed. | • The Planning Proposal will provide a total of 20,208sqm public open space throughout the site that will be dedicated to Council. The area of public open space represents approximately 22.5% of the total site area. The public open space areas are to be located in a way that provides a green link between Jellicoe park to the north and the 'Central Park' approved as part of BATA Stage 1 development to the south. Future DA's on site will also be required to provide a minimum amount of communal open space in order to satisfy ADG requirements. |

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| | | The amount of green space and recreational facilities for Bayside Council is currently being investigated and will inform future strategic planning for the area. |
| 43 | • Support the Proposal and the masterplan. | • Noted. |
| 44 | • Object to the planning proposal and the masterplan.<br><br>• Object to overdevelopment of the site.<br><br>• Existing road network can't support the development at this scale. Council commissioned Cardno to report and they found a number of deficiencies in the Arup report and Meriton submissions. New, accurate and up-to-date modelling must be carried out and independently verified before decisions are made.<br>• Proposed car parking is far under the DCP requirements. The stated reliance on RTA Guide to Traffic publication- whereby reduced cars per bedroom in apartments is noted, is appropriate to areas like St. Leonards, Chatswood etc and have some merit only because they have railway stations - heavy rail in those centres. This Meriton site does not have heavy rail anywhere near it.<br><br>• Public transport is currently overcrowded and this will be exacerbated by the development. | • Noted.<br><br>• The site has been the subject of an urban design study which demonstrates that the site is able to facilitate high density residential development, whilst also achieving compliance with relevant policies such as the Apartment Design Guide (ADG) in terms of building separation, solar access and other design criteria.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus |

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| | | services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • The demolition of the clock tower is problematic, it is one of the few significant heritage buildings in Pagewood. | • A number of items of heritage significance were identified in the Heritage Impact Statement (HIS) provided as part of the proposal. These items of heritage significance are not included on the State Heritage Register or identified as items of environmental heritage in Schedule 5 (Environmental Heritage) of the Botany Bay LEP 2013. As such, there is no legal requirement for items to be retained and the proponent has been issued with a Complying Development Certificate to demolish certain buildings on site, including those identified in the HIS as being of heritage significance. |
| | • The 2 storey townhouses on the edge of Heffron Road could be subject to an amendment, being either 3 or 4 apartment blocks 8 storey high along Heffron Rd and the supply of less car parking than required by Code. | • The concept master plan submitted with the Planning Proposal indicates that 2 storey townhouses will be located along the northern boundary adjacent to Heffron Road. A future DA may propose to deviate from the built form outlined in the proposed masterplan and propose buildings up to the maximum building height of 16.4m in this part of the site. This has the potential to equate to buildings of approximately 4 storeys.<br><br>The proposed masterplan is indicative only and may be subject to change as part of a future DA. Any changes to the proposed land uses would require detailed assessment and appropriate car parking provision. |

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| | • The lack of informed information is a problem. Having the planning proposal on a table in the Eastgardens library and nobody to answer any queries is considered to be inattentive. | • The information provided as part of the Planning Proposal complies with the Department of Planning and Environment's requirements outlined in 'A Guide to Preparing Planning Proposals', and the conditions of the Gateway determination. Over 1,000 letters were issued, including to those partially affected residents in the Randwick LGA. Council officers are available to answer queries over the phone or at Rockdale Customer Service Centre. |
| 45 | • Support the proposal.<br><br>• Development contributions from the development will provide vital funding for infrastructure upgrade and maintenance (such as Hensley and other sporting parks in the locale) which are extensively utilised by the local community and sporting clubs. Hakoah Sydney City East hence supports the Planning Proposal for the positive contribution and associated benefits that it will bring to the area. | • Noted.<br><br>• Submissions in relation to the Voluntary Planning Agreement have been considered in a separate report to Council. |
| 46 | • Object to the planning proposal.<br><br>• High and density is inappropriate, the site should be medium density. There are enough apartments in the area. | • Noted.<br><br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal be considered appropriate.<br><br>• The proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site). The Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters. |

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| | | The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road toward Banks Avenue to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any proposed residential flat buildings within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials. |
| 47 | • Object to the planning proposal.<br><br>• There are already enough apartments and the area is overcrowded. | • Noted.<br><br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic planning framework, the Planning Proposal be considered appropriate.<br><br>The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will |

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| | | deliver a variety of housing types, as well as services to support the growth of the Strategic Centre. |
| | • Lack of public transport. | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • Lack of green space. | • The Planning Proposal will provide a total of 20,208sqm public open space throughout the site that will be dedicated to Council. The area of public open space represents approximately 22.5% of the total site area. The public open space areas are to be located in a way that provides a green link between Jellicoe park to the north and the 'Central Park' approved as part of BATA Stage 1 development to the south. Future DA's on site will also be required to provide a minimum amount of communal open space in order to satisfy ADG requirements. |
| 48 | • Object to the planning proposal.<br>• Enough units and residents in the area currently. | • Noted.<br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre |

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| | • Lack of traffic infrastructure to support the development.<br><br>• Concerns regarding quality of buildings. | will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic planning framework, the Planning Proposal be considered appropriate.<br><br>The proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Strategic Centre.<br><br>• Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br><br>• The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence, which will ensure that a high standard of architectural design is achieved. The proposed masterplan will continue to be refined during the DA process, if the Planning Proposal is supported. |

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| | | Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG) which includes provisions that encourages the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes. |
| 49 | • Object to the planning proposal.<br>• The historical administration building in the north-east corner of the site is significant to the local community.<br>• Traffic congestion for the surrounding street network is currently an issue and will be exacerbated by the proposal. Recent upgrades are causing increased congestion. | • Noted.<br>• A number of items of heritage significance were identified in the Heritage Impact Statement (HIS) provided as part of the proposal. These items of heritage significance are not included on the State Heritage Register or identified as items of environmental heritage in Schedule 5 (Environmental Heritage) of the Botany Bay LEP 2013. As such, there is no legal requirement for items to be retained and the proponent has been issued with a Complying Development Certificate to demolish certain buildings on site, including those identified in the HIS as being of heritage significance.<br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| 50 | • Object to the planning proposal.<br>• The area is currently congested and there is no infrastructure to support the development. | • Noted.<br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| 51 | • Object to the planning proposal. No issue with the original plans, but with the new proposal.<br>• Concerns regarding congestion of surrounding street network, such as Bunnerong Road and Heffron Road. | • Stage 1 BATA, adjoining the site to the south, was approved via a Development Application and is currently under construction. The current Planning Proposal is separate to Stage 1 BATA DA.<br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |

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| | • Concerns in relation to building size and that the proposal will depreciate property value. | • Property devaluation is not a matter that can be considered in assessing a Planning Proposal. |
| 52 | • Object to the planning proposal.<br><br>• Opposed to high density buildings in an area that is already overcrowded. | • Noted.<br><br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic framework, the Planning Proposal be considered appropriate.<br><br>The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Strategic Centre. |
| 53 | • Object to the planning proposal.<br><br>• High rise development is out of character for a low density residential area. | • Noted.<br><br>• The site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic planning framework, the Planning Proposal be considered appropriate.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average |

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| | • Proposal will have negative impacts on current residents and access to open space. | FSR of 2.2:1).<br><br>• The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>o minimising impacts on adjoining buildings while improving the public domain; and<br>o environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity.<br><br>The Planning Proposal will provide a total of 20,208sqm public open space throughout the site that will be dedicated to Council. The area of public open space represents approximately 22.5% of the total site area. The public open space areas are to be located in a way that provides a green link between Jellicoe park to the north and the 'Central Park' approved as part of BATA Stage 1 development to the south. Future DA's on site will also be required to provide a minimum amount of communal open space in order to satisfy ADG requirements. |
| 54 | • Object to the planning proposal.<br><br>• The proposal is too dense and will result in overpopulation. | • Noted.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP. |
| 55 | • Object to the planning proposal. | • Noted. |

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| | • The proposal is an overdevelopment of the site.<br><br>• The proposal will result in increased traffic issues.<br><br>• The proposal will be an eyesore for surrounding residents.<br><br>• Impacts of the proposal on current residents. | • The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence, which will ensure that a high standard of architectural design is achieved. The proposed masterplan will continue to be refined during the DA process, if the Planning Proposal is supported.<br><br>Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG) which includes provisions that encourages the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes.<br><br>• The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>o minimising impacts on adjoining buildings while improving the public domain; and |

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| | | ○ environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| 56 | • Object to the planning proposal.<br><br>• Opposed to increase in height to 69m. | • Noted.<br><br>• The proposed Height of Building map includes a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site). The Planning Proposal is supported by a proposed masterplan which provides an indicative plan in relation to location of built form and typologies, building separation, privacy and overshadowing, among other matters.<br><br>The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road toward Banks Avenue to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant |

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| | • The development will cause issues for the surrounding areas and will be overdevelopment. | provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address issues including:<br>o minimising impacts on adjoining buildings while improving the public domain; and<br>o environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| 57 | • Object to the planning proposal.<br><br>• The developer is acting disingenuously, by applying to increase development standards beyond previous agreement.<br><br>• The proposal seeks to overdevelop the site.<br><br>• The proposal will impact traffic and public transport. The traffic modelling is inaccurate and | • Noted.<br><br>• The Planning proposal is unrelated to BATA Stage 1 DA to the south of the site. A Planning proposal can be lodged to Council to amend planning controls, which is the process currently being undertaken.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |

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| | out-of-date which will impact surrounding residents particularly Page Street.<br><br>• The proposal will negatively impact the lives of surrounding residents. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>o minimising impacts on adjoining buildings while improving the public domain; and<br>o environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| 58 | • Object to the planning proposal.<br><br>• The proposal is overdevelopment and is not needed in the area.<br><br>• Lack of infrastructure to support the development and will place pressure on power supply and increase outages. | • Noted.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• The Utilities Report prepared by Aurecon identifies that essential services such as water and sewerage can be provided to the site.<br><br>Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur |

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| | • Traffic and surrounding street network already congested and will be exacerbated by the development.<br><br>• The development is not in the best interest of the community. | mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br><br>Despite the above, any future DA(s) lodged with Council would need to provide detail on the final proposed scheme, including mix of uses (residential, commercial etc.) and be supported by appropriate information to allow Council to determine whether any additional infrastructure is required to support the development.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• Whilst the Planning Proposal represents significant changes to the current planning controls, the site has been identified as being within the Eastgardens-Maroubra Junction 'Strategic Centre' under the Eastern City District Plan, which outlines that such centres should be the focus to deliver employment and economic growth. As such, it anticipated that land located within the strategic centre will undergo significant change in the future to enable the Plan's objective for a 'productive city'. Given the strategic planning framework, the Planning Proposal be considered appropriate. |
| 59 | • Object to the planning proposal.<br><br>• Low and medium density zoning more appropriate. | • Noted.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate high density residential development and the proposed FSR of 2.35:1 and comply with relevant provisions of SEPP 65 and the ADG. |

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| | | The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP. |
| | • Lack of infrastructure and public transport to support the development. Current infrastructure already inadequate. | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • The proposal is harmful to the community. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>○ minimising impacts on adjoining buildings while improving the public domain; and<br>○ environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| 60 | • Object to the planning proposal. | • Noted. |

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| | • The proposal is an overdevelopment of the site and will be out of character with the surrounding suburbs. | • The draft masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1). |
| | • The proposal will increase traffic congestion and there is lack of public transport (heavy and light rail) servicing the site. | • Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • There is insufficient green space to service the increased population. | • The Planning Proposal will provide a total of 20,208sqm public open space throughout the site that will be dedicated to Council. The area of public open space represents approximately 22.5% of the total site area. The public open |

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| | | space areas are to be located in a way that provides a green link between Jellicoe park to the north and the 'Central Park' approved as part of BATA Stage 1 development to the south. Future DA's on site will also be required to provide a minimum amount of communal open space in order to satisfy ADG requirements. |
| 61 | • Object to the planning proposal.<br><br>• This proposal is an overdevelopment that will impact on the character of the locality and result in environmental and social issues. | • Noted.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address issues including:<br>o minimising impacts on adjoining buildings while improving the public domain; and<br>o environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| 62 | • Object to the planning proposal. | • Noted. |

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| | • The developer is acting disingenuously, by applying to increase development standards beyond previous agreement.<br><br>• The proposal is an overdevelopment of the site.<br><br>• Lack of infrastructure and additional pressure on infrastructure (roads, schools, doctors, hospitals). | • The Planning proposal is unrelated to BATA Stage 1 DA to the south of the site. A Planning proposal can be lodged to Council to amend planning controls, which is the process currently being undertaken.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br><br>Department of Education did not object to the Planning proposal. Their submission is summarised above and address in further detail in the VPA report to Council. |
| 63 | • Strongly opposed to the planning proposal. | • Noted. |

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| | • The proposed R4 zoning will enable density that is over scaled and building heights that are unsympathetic with the current surrounding low scale residential housing.<br><br>• The proposal will is out of character and will impact the streetscape, local environment and existing residences.<br><br>• Additional population will increase pressure on the surrounding road network.<br><br>• Concerns regarding low quality apartments.<br><br>• Building heights are overwhelming and will negatively affect the surrounding neighbourhood. | • The urban design report and proposed masterplan illustrates that the site is able to accommodate high density residential development and the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• Whilst the Planning Proposal represents a significant increase in height and density on the site, the proposed development is generally consistent with the Stage 1 concept masterplan consent for the land adjoining to the south of the site (which includes a maximum building height of 67.9m and an average FSR of 2.2:1).<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• The subject site is identified as a 'Key Site' under Botany Bay LEP 2013, which triggers a need for any new buildings to comply with Clause 6.16 Design Excellence, which will ensure that a high standard of architectural design is achieved. The proposed masterplan will continue to be refined during the DA process, if the Planning Proposal is supported.<br><br>Any future development will also be required to demonstrate compliance with SEPP 65 and the associated Apartment Design Guide (ADG), which includes provisions that encourages the modulation of facades to reduce perceived bulk, the use of high quality materials and minimum apartment sizes.<br><br>• Building height, bulk, scale, form and design are matters that would be assessed in association with any future Development Application (DA) for the site, if the Planning Proposal was to proceed. Future development of any |

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| | • The increased height and density will negatively affect the value of the area.<br><br>• Building heights lack of variation in proposed building heights to enable a stepped and dynamic change in building heights.<br><br>• The Transport Impact Assessment is questionable and the findings are refuted. The references to light rail use is unrealistic and misleading as it's not accessible by walking and is therefore not feasible.<br><br>• Public transport is severely inadequate, buses are the only means of public transport and are | proposed residential flat building within the site would need to comply with the SEPP 65 and the associated Apartment Design Guide which includes provisions relating to urban design that encourages the modulation of facades to reduce the perceived bulk and scale of a building, including varied building elements and changes in materials.<br><br>• Property devaluation is not a matter that can be considered in assessing a Planning Proposal.<br><br>• The proposed Height of Building map includes variety of heights across the site, including a maximum height of 16.6m (northern portion of the site), 37m (eastern portion of the site) and 69m (central and south-western portion of the site.<br><br>The proposed masterplan recommends a reduction in building height towards to the northern portion of the site (maximum three storeys) in response to the low density character of the area to the north of Heffron Road. Height and density are also proposed to be distributed away from Bunnerong Road toward Banks Avenue to minimise overshadowing to residential properties to the east, with taller buildings being distributed in a north-south orientation in the centre and south-west of the subject site. This provides a transition in height between the 1-2 storey dwellings to the north and east of the site, to the taller 4-20 storey buildings located in the central and south-western portion of the subject site.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield |

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| | currently overcrowded.<br><br>• The suggestion that there will be a need of less cars is misleading given the high car ownership rates and culture.<br><br>• The current LEP controls were based on 'expert and thorough planning assessments', they should not be increased for the sole financial benefit of a single developer at the expense of the community.<br><br>• VPA should not justify or compensate for the proposed changes to FSR and Height. | Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal.<br><br>• Traffic and car parking has been discussed in detail in the 'response to submissions' within the report.<br><br>• The Planning Proposal is considered to have demonstrated strategic and site specific merit and is informed by a variety of studies.<br><br>• The VPA is does not form part of the assessment of the Planning Proposal and has been considered in a separate report to Council. |
| 64 | • Object to the planning proposal.<br><br>• The development was never intended to be high rise and should be medium and low density and the proposal is an overdevelopment of the site. | • Noted.<br><br>• The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1, and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the |

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| | • The development will have detrimental impacts on the community. | growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>o minimising impacts on adjoining buildings while improving the public domain; and<br>o environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| 65 | • Object to the planning proposal.<br><br>• The increase in unit from 1487 to 2223 is an overdevelopment for the site and the surrounding area cannot cope with the increased unit.<br><br>• The proposal will result in an area that resembles Mascot but without a railway station. | • Noted.<br><br>• The proposed masterplan indicates that the Planning Proposal will facilitate the development of 2015 dwellings on the subject site. The urban design report and proposed masterplan illustrates that the site is able to accommodate the proposed FSR of 2.35:1 and comply with relevant provisions of SEPP 65 and the ADG. The Eastern City District Plan (ECDP) has set a dwelling target of 10,150 dwellings for the Bayside LGA. The proposal will deliver a variety of housing types, as well as services to support the growth of the Eastgardens-Maroubra Junction Strategic Centre identified in the ECDP.<br><br>• Several major bus routes (including route 301, 302, 307, 391, 392, 400, X92) currently service the site with bus stops located to the north on Heffron Road, Bunnerong Road to the north-east of the site and at the Westfield Eastgardens bus terminal, south-east of the site. Buses operate. Current bus services provide access to the city, Bondi Junction, Mascot station and La Perouse. TfNSW submission states that changes to bus services will occur mid-2020. The Traffic Impact Assessment (TIA) submitted by the proponent |

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| | | states that "Meriton and STA have discussed bus services that will be provided directly to the site within the short term, including bus stops built within the site". However, no supporting information has been provided to this effect and Council requires assurances that the bus infrastructure servicing the site can support the expected increase in demand both currently and beyond mid-2020. Council are awaiting comments from RMS and TfNSW in this regard and these matters will be resolved prior to the finalisation of the planning proposal. |
| | • The proposal will result in further traffic congestion on surrounding roads. | • Traffic and car parking has been discussed in detail in the 'response to submissions' within the report. |
| | • Concerns that the proponent will continue to make amendments to the proposal to increase density and yield. | • Any amendments to the planning controls will be subject a separate Planning Proposal. |
| | • The proposal will affect the amenity of the surrounding suburb. | • The Planning Proposal includes a clause that requires a site-specific Development Control Plan (DCP) (or a Concept Development Application as per Clause 4.23 of the Environmental Planning and Assessment Act 1979) to be prepared prior to development consent being granted, which is anticipated to minimise impacts of the proposal on nearby residents. The Planning Proposal outlines specific considerations that a future DCP or Concept Development Application are required to address including:<br>o minimising impacts on adjoining buildings while improving the public domain; and<br>o environmental impacts such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity. |
| | • Concerns that Council's office location in Rockdale may be detrimental to the assessment of the Planning Proposal. | • The Planning Proposal was exhibited in accordance with the Gateway determination and the notification and advertising requirements outlined in Botany Bay Development Control Plan 2013. Council officers are available to answer queries over the phone or at Rockdale Customer Service Centre. |

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| 66 | • Support the Planning Proposal and masterplan with amendments. The proposal will help achievement of the targets for dwelling supply and new jobs, and introduces a variety of accommodation formats and land uses that will increase the diversity and opportunities for the Eastgardens community. | • Noted. |
| | • Requests that the 'Additional Permitted Uses' clause be amended (as per red writing) as follows:<br><br>*Introduce a new clause at Schedule 1 Additional "Permitted Uses of the BBLEP 2013 to permit 'commercial premises', 'recreation facility (indoor)' and 'serviced apartment' with development consent. Non-residential uses across the site must have a minimum total floor space of 5,000sqm, and no individual retail premises tenancy may exceed 1,000sqm."* | • Planning controls should aim to promote flexibility rather than create barriers that could inhibit economic growth and competition. Section 9.1 Direction 6.3 Site Specific Provisions seeks to allow a particular development to be carried out "without imposing any development standards or requirements in addition to those already contained in the LEP". As such, it is considered that limiting the size of individual tenancies on site is inconsistent with Direction 6.3 and therefore inappropriate in these circumstances. |
| | • By permitting a large format retail tenancy there is the risk that a large portion of the proposed retail floor space is consolidated into one large tenancy which may not appropriately meet the varied convenience needs of the new residents and may pull from a trade area beyond (i.e. Westfield). | • The distribution of non-residential floor space across the site will subject to further assessment in a future DA. |
| | • Stage 2 BATA should be consistent with Part 9D of the DCP which specifies *"the new commercial/retail centre will allow up to 5,000m² of retail space to support the increased residential population. The retail area will allow for small and medium scale retail opportunities…"* | • Part 9D of BBDCP 2013 relates only to the existing R3 Medium Density Residential zoned portion of the site as well as BATA Stage 1 to the south of the site as discussed in detail in the associated report. |

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| | Small and medium scale retail would support the increased resident population, rather than be disruptive to the existing retail hierarchy. | |
| 67 | • Support the Planning Proposal and masterplan | • Noted. |
| 68 | • Do not support the Planning Proposal or the masterplan. | • Noted. |
| 69 | • Do not support the Planning Proposal or the masterplan. | • Noted. |
| 70 | • Support the Planning Proposal.<br>• It is an example of 'a highly successful renewal of a redundant industrial site.' The urban taskforce believes that the 'retain and manage' approach to industrial land by the GSC is too restrictive.<br>• The proposal provides an opportunity to replace an underutilised industrial site with high-quality urban design outcome that responds to its context and will enhance the surrounding public domain.'<br>• The mix of uses proposed will generate more jobs than the existing industrial zone, generating 342-550 direct ongoing jobs.<br>• Other benefits of the site include:<br>  ◦ short-term construction jobs,<br>  ◦ removing industrial uses from a residential area,<br>  ◦ additional housing to ease housing affordability and reach district targets,<br>  ◦ new public open space,<br>• 50 million dollars of affordable rental housing, works and contributions to support the community. | • Noted. |

**REZONING REVIEW**
**RECORD OF DECISION**
SYDNEY CENTRAL PLANNING PANEL

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| **DATE OF DECISION** | Tuesday 12 September 2017 |
| **PANEL MEMBERS** | Maria Atkinson (Chair), Sue Francis, John Roseth, Meredith Wallace, Debra Dawson |
| **APOLOGIES** | None |
| **DECLARATIONS OF INTEREST** | None |

**REZONING REVIEW**
2017SCL043 – Bayside – PGR_2017_BSIDE_001_00 at 128 and 130-150 Bunnerong Road Pagewood (AS DESCRIBED IN SCHEDULE 1)

Reason for Review:
- ☐ The council has notified the proponent that the request to prepare a planning proposal has not been supported
- ☒ The council has failed to indicate its support 90 days after the proponent submitted a request to prepare a planning proposal or took too long to submit the proposal after indicating its support

**PANEL CONSIDERATION AND DECISION**
The Panel considered: the material listed at item 4 and the matters raised and/or observed at meetings and site inspections listed at item 5 in Schedule 1.

Based on this review, the Panel determined that the proposed instrument:
- ☒ **should** be submitted for a Gateway determination because the proposal has demonstrated strategic and site specific merit
- ☐ **should not** be submitted for a Gateway determination because the proposal has
  - ☐ not demonstrated strategic merit
  - ☐ has demonstrated strategic merit but not site specific merit

The decision was 4:1 in favour, against the decision was Maria Atkinson.

**REASONS FOR THE DECISION**
The majority of the Panel (John Roseth, Sue Francis, Debra Dawson and Meredith Wallace) believe the proposal has strategic and site specific merit and support the planning proposal proceeding to Gateway.

As part of the Gateway determination, the majority recommends that a number of impacts be addressed and that the proposal be revised to respond to the following:
- No additional shadowing on existing and proposed open spaces in mid-winter between 12:00pm and 2:00pm.
- No additional shadowing on existing developments to the eastern side of Bunnerong Road.
- Five percent (5%) affordable housing to be integrated into the development without a bonus as contained in the current planning proposal. Affordable housing to be handed to a Council nominated community housing provider.
- Satisfactory arrangements with Council for the provision of appropriate community facilities, open space and social infrastructure.
- Detailed transport report(s) which include;
  - Assurance from Transport NSW that public transport will cope with the proposed population increase;
  - Impact on and conflicts with large dangerous good vehicles, eg Dennison Road; and
  - Cumulative impacts of surrounding developments eg Westfield Eastgardens Planning Proposal.

Maria Atkinson did not support the planning proposal proceeding to Gateway because Bayside local government area can achieve the 10-year housing targets of the draft Central District Plan without this rezoning. The planning proposal would result in the loss of industrial employment land and conflict with Section 117 direction 1.1 "*Business and Industrial Lands*", which aims to protect industrial lands and to encourage employment growth. Additionally, the draft Central District Plan requires a precautionary approach to the loss of industrial land.

| PANEL MEMBERS | |
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| Maria Atkinson (Chair) | John Roseth |
| Sue Francis | Meredith Wallace |
| Debra Dawson | |

| SCHEDULE 1 | | |
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| 1 | **PANEL REF – LGA – DEPARTMENT REF - ADDRESS** | 2017SCL043 – Bayside – PGR_2017_BSIDE_001_00 at 128 & 130-150 Bunnerong Road Pagewood |
| 2 | **LEP TO BE AMENDED** | Botany Local Environmental Plan 2013 |
| 3 | **PROPOSED INSTRUMENT** | The proposal seeks to rezone the subject site from part IN1 General Industrial and R3 Medium Density Residential to R4 High Density Residential and amend the FSR standard to 2.35:1 and height of building development standard to part 28m and part 65m. |
| 4 | **MATERIAL CONSIDERED BY THE PANEL** | • Rezoning review request documentation<br>• Briefing report from Department of Planning and Environment |
| 5 | **MEETINGS AND SITE INSPECTIONS BY THE PANEL** | • **Site inspection & briefing meeting with Department of Planning and Environment (DPE):** 12 September 2017 commencing at 9:30am<br>○ Panel members in attendance: Maria Atkinson (Chair), Sue Francis, John Roseth, Debra Dawson<br>○ Department of Planning and Environment (DPE) staff in attendance: Karen Armstrong, Martin Cooper, Elvie Magallanes<br>• **Briefing meeting with Council & proponent:** 12 September 2017 commencing at 11:00am<br>○ Panel members in attendance: Maria Atkinson (Chair), Sue Francis, John Roseth, Debra Dawson<br>○ Department of Planning and Environment (DPE) staff in attendance: Karen Armstrong, Martin Cooper, Elvie Magallanes<br>○ Council representatives in attendance: Michael McCabe, Clare Harvey<br>○ Proponent representatives in attendance: Harry Triguboff, Walter Gordon, Andrew Hulse, James Turner |

NSW GOVERNMENT Planning & Environment

IRF17/142

Ms Meredith Wallace
General Manager
Bayside Council
PO Box 21
ROCKDALE NSW 2216

Attention: Clare Harley

Dear Ms Wallace

**Planning Proposal PP_2017_BSIDE_007_00 to amend Botany Bay Local Environmental Plan 2013**

I am writing in response to Council's request for a Gateway determination under Section 56 of the *Environmental Planning and Assessment Act 1979* (the Act) and to additional information received on 25 October 2017 in respect of the planning proposal to rezone and amend the planning controls for land at 128 and 130-150 Bunnerong Road, Pagewood.

As delegate of the Greater Sydney Commission, I have now determined the planning proposal should proceed subject to the conditions in the attached Gateway determination.

I have also agreed, as delegate of the Secretary, that the planning proposal's inconsistency with section 117 Direction 1.1 Business and Industrial Zones is justified in accordance with the terms of the Direction. No further approval is required in relation to this Direction.

I have considered the findings at the peer review and agree that further refinement of the concept should be undertaken by investigating street connectivity, building orientation and location of open space.

However, I consider that the review did not demonstrate that a reduced FSR of 2:1 was required to deliver these outcomes and therefore the FSR of 2.35:1 has been retained for the purposes of community consultation. In addition, further consideration should be given at the Development Application stage to achieving the Panel's recommendation of no further shadowing on existing and proposed open spaces in mid-winter between 12pm and 2pm and no additional shadowing on existing development to the eastern side of Bunnerong Road.

The Draft Revised Eastern City District Plan identifies the need for the delivery of affordable housing. I have conditioned the gateway to ensure Council and the proponent undertake discussions to identify the possible delivery of affordable

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housing on the site as part of the planning proposal. Please inform the Sydney Region East team of the outcomes of these discussions by 28 February 2018.

I have considered the nature of Council's planning proposal and have decided not to issue an authorisation for Council to exercise delegation to make the plan.

The amending Local Environmental Plan (LEP) is to be finalised within 12 months of the date of the Gateway determination. Council should aim to commence the exhibition of the planning proposal as soon as possible. Council's request for the Department of Planning and Environment to draft and finalise the LEP should be made 8 weeks prior to the projected publication date.

The state government is committed to reducing the time taken to complete LEPs by tailoring the steps in the process to the complexity of the proposal, and by providing clear and publicly available justification for each plan at an early stage. In order to meet these commitments, the Greater Sydney Commission may take action under Section 54(2)(d) of the Act if the time frames outlined in this determination are not met.

Should you have any further enquiries about this matter, I have arranged for Ms Elvie Magallanes at the Department to assist you. Ms Magallanes can be contacted on 9860 1439.

Yours sincerely

12 December 2017

**Stephen Murray**
**Executive Director, Regions**
**Planning Services**

Encl: Gateway Determination

NSW GOVERNMENT | Planning & Environment

# Gateway Determination

***Planning Proposal (Department Ref: PP_2017_BSIDE_007_00)**: to rezone and amend the planning controls for land at 128 and 130-150 Bunnerong Road, Pagewood*

I, the Executive Director, Regions, at the Department of Planning and Environment, as delegate of the Greater Sydney Commission have determined under section 56(2) of the *Environmental Planning and Assessment Act 1979* (the Act) that an amendment to the Botany Bay Local Environmental Plan (LEP) 2013 to rezone and amend the planning controls for land at 128 and 130-150 Bunnerong Road, Pagewood should proceed subject to the following conditions:

1. Prior to community consultation, the planning proposal is to be updated to:

   (a) demonstrate consistency with the Draft Greater Sydney Region Plan and the Draft Revised Eastern City District Plan;
   (b) amend the explanation of provisions to include the requirement of a minimum of 5,000 square metres of commercial floor space as an additional permitted use;
   (c) update the number of jobs to reflect the provision for an additional 5,000 square metres of commercial floor space; and
   (d) investigate and discuss with the proponent suitable affordable housing outcomes for the site.

Outcomes of these discussion are to be reported to the Sydney Region East team by 28 February 2018.

2. Community consultation is required under sections 56(2)(c) and 57 of the Act as follows:

   (a) the planning proposal must be made publicly available for a minimum of **28 days**; and
   (b) the relevant planning authority must comply with the notice requirements for public exhibition of planning proposals and the specifications for material that must be made publicly available along with planning proposals as identified in section 5.5.2 of *A guide to preparing local environmental plans* (Department of Planning and Environment 2016).

3. Consultation is required with the following public authorities under section 56(2)(d) of the Act:

   - Transport for NSW;
   - Roads and Maritime Services;
   - NSW Ports;
   - Sydney Airport Authority;

- Civil Aviation Safety Authority;
- Department of Education;
- Environment Protection Authority; and
- Office of Environment and Heritage.

Each public authority is to be provided with a copy of the planning proposal and any relevant supporting material and given at least 21 days to comment on the proposal.

4. A public hearing is not required to be held into the matter by any person or body under section 56(2)(e) of the Act. This does not discharge Council from any obligation it may otherwise have to conduct a public hearing (for example, in response to a submission or if reclassifying land).

5. The time frame for completing the LEP is to be **12 months** following the date of the Gateway determination.

Dated 12th day of December 2017.

**Stephen Murray**
**Executive Director, Regions**
**Planning Services**
**Department of Planning and Environment**

**Delegate of the Greater Sydney Commission**

PP_2017_BSIDE_007_00

NSW GOVERNMENT Planning & Environment

# Alteration of Gateway Determination

***Planning proposal (Department Ref: PP_2017_BSIDE_007_00)***

I, the Director, Sydney Region East at the Department of Planning and Environment, as delegate of the Greater Sydney Commission, have determined under section 3.34(7) of the *Environmental Planning and Assessment Act 1979* to alter the Gateway determination dated 12 December 2017 for the proposed amendment to the Botany Bay Local Environmental Plan 2013 as follows:

1. Delete:

   "condition 1"

   and replace with:

   new condition 1: "Prior to community consultation, the planning proposal is to be updated to:

   a) include a plain English explanation requirement for a site specific Development Control Plan;

   b) demonstrate consistency with the Greater Sydney Region Plan and the Eastern City District Plan;

   c) amend the explanation of the provisions to include the requirement of a minimum of 5,000 square metres of gross floor area for commercial premises and/or other permitted non-residential land uses;

   d) update the number of potential jobs to reflect the provision for an additional 5,000 square metres of permitted non-residential land uses, including those uses outlined in subclause (e) of condition 1;

[PP_2017_BSIDE_007_00] (IRF18/5092)

e) amend the explanation of the provisions to include commercial premises, serviced apartments and recreation facilities (indoor) as additional permitted uses for the site under Schedule 1 of Botany Bay LEP 2013;

f) investigate and discuss with the proponent suitable affordable housing outcomes for the site;

g) provide an updated Heritage Impact Statement that assesses the revised proposal;

h) provide an updated Traffic Report that assesses the revised proposal and the additional permitted uses described in subclause (e) of condition 1;

i) provide shadow diagrams based on maximum building heights proposed that clearly show the extent of potential overshadowing within the site and on adjoining land and development - including the existing building facades of development located to the south and east, and the Pagewood Green park south of the proposal site;

j) identify and describe each of the proposed public open space areas to be provided and dedicated across the site; and

k) provide an updated timeline outlining the anticipated time frame for the plan-making process."

2. Delete:

"condition 5"

And replace with:

new condition 5: "The time frame for completing the LEP is to be **12 months** following the date of the Alteration to the Gateway determination."

Dated 9th day of October 2018.

**Amanda Harvey**
**Director, Sydney Region East**
**Planning Services**
**Department of Planning and Environment**

**Delegate of the Greater Sydney Commission**

[PP_2017_BSIDE_007_00] (IRF18/5092)

NSW GOVERNMENT Planning & Environment

Your Ref: S11/47-12
Our Ref: PP_2017_BSIDE_007_00

Ms Meredith Wallace
General Manager
Bayside Council
PO Box 21
ROCKDALE NSW 2216

Dear Ms Wallace

**Planning proposal PP_2017_BSIDE_007_00 – Alteration of Gateway determination**

I refer to your letter in relation to revisions to planning proposal PP_2018_RYDEC_001_00 to amend the height of building, introduce a new local provision requiring the preparation of a development control plan and specify additional permitted uses at 128 and 130-150 Bunnerong Road, Pagewood.

I have determined as the delegate of the Greater Sydney Commission, in accordance with section 3.34(7) of the *Environmental Planning and Assessment Act 1979*, to alter the Gateway determination dated 12 December 2017 for PP_2017_BSIDE_007_00. The Alteration of Gateway determination is enclosed.

The altered conditions nominate that commercial premises, serviced apartments and/or recreation facilities (indoor) are the additional permitted uses. The conditions also require amendments to the explanation of provisions to reflect the additional permitted uses and the minimum provision of 5,000m$^2$ of gross floor area for commercial premises and/or other permitted non-residential land uses. This provision is modified to allow for all non-residential uses including those currently permitted under the R4 zone and those additional uses proposed by the revised proposal. These amendments will contribute towards serving the needs of residential development on the site, provide flexibility in the further development of the site, provide an acceptable diversity of land uses, and provide the opportunity to grow local business and further investment opportunities. This is consistent with the objectives of the *Greater Sydney Region Plan – A Metropolis of Three Cities*.

In relation to the Council's concerns regarding the lack of revised documents, the Department of Planning and Environment consider that there is a need to provide several updated documents to reflect the revised planning proposal. Conditions have been inserted as part of the Gateway alteration to require that an updated Traffic Report and Heritage Impact Statement are provided that assess the revised proposal.

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Likewise, the altered conditions include the need to provide shadow diagrams which are based on the revised maximum building heights of the planning proposal. These shadows impacts are to also be illustrated onto the building façades of any existing development to the east and south of the site and include the Pagewood Green park south of the proposal site. This is considered necessary to clearly illustrate the impacts the revised maximum building heights will have on surrounding development and open space.

To better explain the provisions that the future Development Control Plan (DCP) will have to provide, a plain English explanation of these provisions is to be prepared. This will enable a clear understanding of how future development of the subject site will be guided and controlled.

Once these matters have been addressed, the planning proposal will be suitable to proceed to public exhibition and formal consultation with the relevant authorities listed in the Gateway determination.

Finally, I am not able to agree to the request that the specific LEP instrument and mapping changes be listed in the Gateway alteration. The documentation provided, which details these matters, is either sufficient or can be made sufficient prior to public exhibition and agency consultation.

If you have any questions in relation to this matter, I have arranged for Mr Alexander Galea to assist you. Mr Galea can be contacted on 8289 6793.

Yours sincerely



**9th October 2018**
**Amanda Harvey**
**Director, Sydney Region East**
**Planning Services**

Encl: Alteration of Gateway determination

# 128 AND 130-150 BUNNERONG ROAD, PAGEWOOD

## REVISED PLANNING PROPOSAL

5 SEPTEMBER 2018
SA7548
FINAL
PREPARED FOR MERITON PROPERTY SERVICES PTY LTD

URBIS

**URBIS STAFF RESPONSIBLE FOR THIS REPORT WERE:**

| | |
|---|---|
| Director | David Hoy |
| Associate Director | Danielle Blakely |
| Senior Consultant | Erin Dethridge |
| Project Code | SA7548 |
| Report Number | Final – November 2018 |

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# EXECUTIVE SUMMARY

## OVERVIEW

Rarely in Metropolitan Sydney do opportunities exist to deliver significant and positive intergenerational contributions to housing supply. The site owned by Meriton Property Services Pty Ltd (Meriton) in Pagewood is capable of doing just that. With 16.5ha in total area under its sole control, Meriton's site must be assessed not only against short-term planning considerations, but for its capacity to contribute to the 20-year planning outcomes envisaged in the *Eastern City District Plan* (the District Plan) released by the Greater Sydney Commission in March 2018. This includes transforming the Eastgardens-Maroubra Junction Corridor into a thriving Strategic Centre and achieving substantial dwelling supply targets in excess of 10,000 new houses in the Bayside Local Government Area (LGA) alone.

Meriton's site is a catalyst for this transformation, with the tone for redevelopment established by the planning approvals for the large-scale mixed use development within the southern portion of Meriton's site and the construction that has already commenced. In addition, there is the potential to deliver increased densities in time for any future public transport initiative by the NSW State Government.

This Planning Proposal received Gateway Determination on 12 December 2017 supporting the proposal and allowing it to 'proceed subject to conditions'. The Gateway Determination was issued by the Department of Planning as a delegate of the Great Sydney Commission. The Gateway Determination confirmed that proposal has site specific and strategic merit, noting it was generally consistent with strategic planning policy, including state, draft district and local planning objectives. An amended Gateway Determination was issued on 9 October 2018 which amended the gateway conditions to be satisfied prior to undertaking community consultation.

This revised Planning Proposal Report has been prepared by Urbis on behalf of Meriton (the Proponent) to initiate the preparation of an amendment to the *Botany Bay Local Environmental Plan 2013* (BBLEP 2013), and addresses the Gateway Determination conditions.

The amendment relates to land at 128 and part 130-150 Bunnerong Road, Pagewood and will result in the following:

- Amend the zoning for the site from part IN1 General Industrial and part R3 Medium Density Residential to R4 High Density Residential;
- Maximum floor space ratio (FSR) development standard of 2.35:1;
- Maximum building heights across the site of part RL 37.0, part RL 60.0 and part RL 91.0;
- Introduce a new Additional Local Provision at Clause 6.12 of the BBLEP 2013 requiring the preparation of a development control plan for the subject site;
- Introduce a new clause at Schedule 1 Additional Permitted Uses of the BBLEP 2013 to permit 'commercial premises', 'recreation facility (indoor)' and 'serviced apartment' with development consent. Non-residential uses across the site must have a minimum total floor space of 5,000sqm.

This report has been prepared to assist the Bayside Council (Council) to prepare a Planning Proposal for the LEP Amendment of the site in accordance with Section 3.33 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This report has been prepared in accordance with DPE's *A Guide to Preparing Planning Proposals*.

The Planning Proposal has been revised to address the following conditions of the Gateway Determination (Department Ref: PP_2017_BSIDE_007_00) dated 12 December 2017:

1. *Prior to community consultation, the planning proposal is to be updated to:*
   - (a) *demonstrate consistency with the Draft Greater Sydney Region Plan and the Draft Revised Eastern City District Plan* (both documents were finalised by the Greater Sydney Commission in March 2018)*;*
   - (b) *amend the explanation of provisions to include the requirement of a minimum of 5,000 square metres of commercial floor space as an additional permitted use;*

(c) *update the number of jobs to reflect the provision of an additional 5,000 square metres of commercial floor space; and*

(d) *Investigate and discuss the proponent suitable affordable housing outcomes for the site.*

## SUBJECT SITE

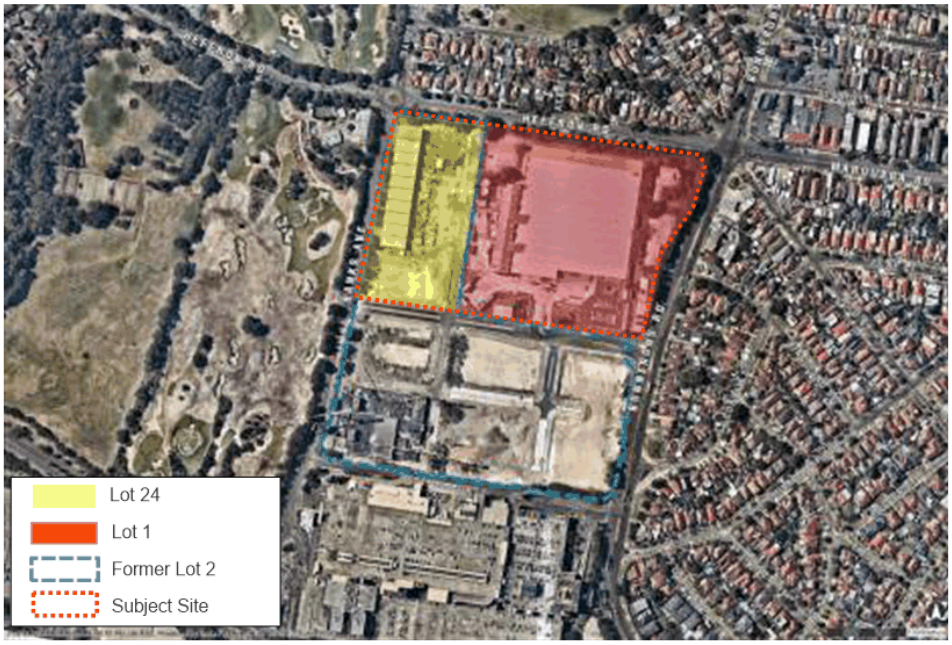
Formally known as the British American Tobacco Australasia (BATA) site, it is bounded by Bunnerong Road to the east, Heffron Road to the north, Banks Avenue to the west and Westfield Eastgardens Shopping Centre to the south.

The site is legally described as Lot 1 in DP 1187426 and Lot 24 in DP 1242288 (formerly part Lot 2 in DP 1187426). The broader BATA site covers an area of 16.5ha and represents the largest privately-owned landholding in the Central District of Sydney immediately available for development. An amendment to the BBLEP 2013 was made in June 2013 to rezone the southern part of former Lot 2 in DP 1187426 from industrial uses to residential and mixed uses and redevelopment of that land is now progressing.

The rezoning of the currently underutilised industrial portion of the BATA site is supported by the District Plan and *Botany Bay Planning Strategy 2031* (Council's 2031 Strategy) and accords with previous Department of Planning and Environment (DPE) strategic directions to locate new infill housing close to shops, centres and high frequency bus routes.

In recognition of its scale and strategic location, the site is located within the recently designated Eastgardens – Maroubra Strategic Centre. These recent changes in strategic planning context together with BATA ceasing industrial operations and vacating the site, provides an opportunity to reconsider and integrate the entire northern portion of the BATA site (north of Meriton Boulevard). The preferred option for the Planning Proposal therefore includes both Lot 1 in DP 1187426 and Lot 24 in DP 1242288 (the subject site), see **Figure 1**.

Figure 1 – Locality Plan




*Source: Nearmaps and Urbis*

## CONCEPT DESIGN

A Masterplan and Urban Design Report illustrating the type of development facilitated by the Planning Proposal has been prepared by SJB and is provided at **Appendix A.** The design has been informed by, and provides for the extension of, the approved Stage 1 Masterplan for the southern part of former Lot 2 in DP 1187426 to foster a cohesive and integrated approach to the redevelopment of the broader BATA site. The masterplan has adopted and evolved some of the elements of the Hill Thalis concept prepared on behalf of Council. An earlier concept plan prepared by Hassell accompanied the Planning Proposal Report submitted to Council in April 2017.

Key features of the masterplan include:

- **Land Use**: Provision is made for approximately 2,015 new dwellings (representing an additional 1,639 dwellings across the broader BATA site). The planned dwellings are expected to comprise a mix of unit types including one, two and three-bedroom units. The masterplan has also identified the potential to accommodate serviced apartments and seniors housing in the form of independent living units (ILUs). Allowance has been made for two x 75-place child care centres and 5,000sqm of complementary non-residential uses including commercial floor space, serviced apartments and a gymnasium.
- **Height and Built Form**: Multiple buildings are proposed across the site ranging from two storey townhouses to 20 storey towers. The built form approach has staggered taller buildings to create a more diverse skyline and reinforce the junction of proposed internal streets with the existing road network. A reduction in building heights towards the northern portion of the site (two storeys) is proposed in response to the low density residential neighbourhood north of Heffron Road and is consistent with the masterplan for Stage 1 of the BATA site. Density has also been distributed away from Bunnerong Road to minimise overshadowing to residential properties to the east.
- **FSR**: A total GFA of 210,490sqm can be accommodated across the site, which equates to an overall FSR of 2.35:1.
- **Open space**: A network of strategically located and connected open spaces with a combined area of approximately 20,208sqm will be integrated into the development. This includes a large green link between Jellicoe Park to the north and the previously approved "Central Park" adjacent to Meriton Boulevard, and a linear park along the entire northern edge of the site.
- **Access**: A legible network of streets is provided by extending the lot structure established as part of the Stage 1 Masterplan for the southern part of former Lot 2 in DP 1187426. This connects and integrates the public domain, using Meriton Boulevard as an interface between the two sites. External access to the site will utilise the approved and current road accesses to Bunnerong Road and Banks Avenue via Meriton Boulevard.
- **Community Facilities**: Community facilities will be introduced into the development to complement those within the southern portion of the BATA site, including a new civic square in the public open space.
- **Planning Agreement:** Meriton and Council are in discussions regarding a Voluntary Planning Agreement (VPA) to deliver the following public benefits:
    - 100 beds of affordable housing to provide housing for local key-workers (including teachers, nurses, policy, fireman etc) that may not otherwise be able to live in the area;
    - Monetary contribution of $23.9 million that will fund the needed upgrade of the Botany Aquatic Centre; and
    - Dedication of all public roads and over 2 hectares of new open space.

## PLANNING ASSESSMENT

The Planning Proposal has been assessed against relevant state and local planning considerations including relevant Strategic Merit Tests. The Planning Proposal offers significant benefits and opportunities for the development of the site and to the local community including:

- Subsequent actions by Council and DPE to rezone the southern part of former Lot 2 in DP 1187426 and the current proposal to rezone Lot 1 reinforce the arguments that residential intensification within the LGA is required to meet the identified dwelling target. This is consistent with Council's 2031 Strategy, which foreshadowed in 2009 a significant "gap" in the ability to provide sufficient suitable land to accommodate its forecast need for housing.
- Facilitating continued urban renewal of a strategic site that has been previously recognised to provide housing, aligned to the goals, actions and priorities of the *Greater Sydney Region Plan: A Metropolis of Three Cities* (Region Plan) (March 2018), the District Plan and Council's 2031 Strategy. As such, the proposal accords with the strategic planning framework that applies to the site and therefore warrants an appraisal of strategic planning merit.
- Providing an opportunity to make a substantial contribution and give effect to the Eastern City District's current dwelling target of 157,500 additional homes by 2036. The broader site would generate approximately 3,700 dwellings, just under 3% of the overall target for the Eastern City District. Furthermore, the current proposal (2,015 dwellings) would represent 19.8% of Bayside LGA's five-year housing target (10,150 dwellings) expressed in the District Plan.
- Creating a vibrant high-density residential community close to existing and planned public transport infrastructure that will provide economic support for the growth of the recently designated Eastgardens–Maroubra Junction Strategic Centre. This change of circumstance together with BATA ceasing operations (which had been anticipated for some time by Council) at the site ensures that there is site-specific strategic merit.
- Providing for much needed housing in a centrally located and accessible area adjacent to local services and within 30 minutes of significant employment opportunities within the Sydney Central Business District (CBD), Sydney Airport and Port Botany.
- Continuing the transformation of the land from an under-utilised and isolated industrial site to a strategically accessible and modern residential development.
- Contributing to an increase in direct and indirect employment and economic activity (Gross Value Added – GVA) including:
  - 171 direct and 531 indirect annual equivalent jobs from the construction of the proposed development concept resulting in gross value add of $102.6 million.
  - 342 direct and 196 indirect jobs from the operation of the child care and retail facilities resulting in gross value add of $57.5 million.

  It is worth noting that there will be peaks and troughs of actual jobs during construction. For instance, Meriton has advised that there are approximately 1,000 construction workers on the southern portion of the BATA site as of mid-2017.
- Delivering significant community benefits in terms of increased housing choice and diversity and improved open space opportunities.
- Council has endorsed a Voluntary Planning Agreement that will deliver 100 rooms of affordable housing and a monetary contribution of $23.9 million to fund substantial local infrastructure and community facilities.

# 1. INTRODUCTION

## 1.1. OVERVIEW

This Planning Proposal Report has been prepared by Urbis on behalf of Meriton Property Services Pty Ltd (the Proponent) to initiate the preparation of an amendment to the *Botany Bay Local Environmental Plan 2013* (BBLEP 2013) to rezone the land at 128 and part 130-150 Bunnerong Road, Pagewood.

Formally known as the British American Tobacco Australasia (BATA) site, the broader site is bounded by Bunnerong Road to the east, Heffron Road to the north, Banks Avenue to the west and Westfield Eastgardens Shopping Centre to the south.

The site is legally described as Lot 1 in DP 1187426 and Lot 24 in DP 1242288 (see **Figure 2**). An amendment to the BBLEP 2013 was made in June 2013 to rezone Lot 2 from industrial uses to residential and mixed uses (the subject site).

Figure 2 – Meriton's Pagewood Site




*Source: Nearmaps and Urbis*

The broader site covers an area of 16.5ha and represents the largest privately-owned landholding in the Central District of Sydney immediately available for development. Furthermore, the renewal of this broader site is supported the *Eastern City Central District Plan* (the District Plan) (finalised in March 2018 and *Botany Bay Planning Strategy 2031* (Council's 2031 Strategy) and accords with previous Department of Planning and Environment (DPE) strategic directions to locate new infill housing close to shops, centres and high frequency bus routes.

The subject site is currently zoned part IN1 General Industrial and part R3 Medium Density Residential. The maximum building heights permitted vary from 11m to 32m and the maximum floor space ratio (FSR) permitted is 1:1.

This report has been prepared to assist Council in preparing a Planning Proposal to rezone the site and amend the height and FSR development standards, under the BBLEB 2013, in accordance with Section 3.33

of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The intended outcome of this planning proposal is to amend the BBLEP 2013 as follows:

- Rezone the subject site from part IN1 General Industrial and part R3 Medium Density Residential to R4 High Density Residential;
- Amend the maximum FSR development standard to 2.35:1;
- Amend the maximum height of buildings development standard to part RL 37.0, part RL 60.0 and part RL 91.0;
- Introduce a new Additional Local Provision at Clause 6.12 of the BBLEP 2013 requiring the preparation of a development control plan for the subject site;
- Introduce a new clause at Schedule 1 Additional Permitted Uses of the BBLEP 2013 to permit 'commercial premises', 'recreation facility (indoor)' and 'serviced apartments' with development consent. Non-residential uses across the site must have a minimum total floor space of 5,000sqm.

These amendments will introduce a new high-density residential development that complements the urban renewal occurring within the southern portion of the BATA site, as illustrated in the masterplan prepared by SJB and provided at **Appendix A**.

In summary, the Planning Proposal is considered appropriate in a State and regional planning context as it:

- Reflects the long-standing recognition that the broader site has been earmarked and planned for residential uses once BATA had vacated the land. The Planning Proposal therefore represents the process necessary to realise this planned change.
- Facilitates urban renewal of a strategic site that has been recognised to provide housing, aligned to the goals, actions and priorities of *Greater Sydney Region Plan: A Metropolis of Three Cities* (Region Plan) (March 2018) and the Eastern City District.
- Creates a vibrant and sustainable residential community close to existing and planned public transport infrastructure and provides a catalyst for the revitalisation of the Eastgardens–Maroubra Junction corridor.
- Provides an opportunity to make a substantial contribution to the Eastern City District's current dwelling target of 157,500 additional homes needed over the next 20 years. The broader BATA site would generate approximately 3,700 dwellings, just under 3% of the overall target for the Eastern City District. In addition, the current proposal would represent 20% of Bayside LGA's five-year housing target expressed in the District Plan.
- Provides for much needed housing in a centrally located and accessible area adjacent to local services and within 30 minutes of significant employment opportunities within the Sydney Central Business District (CBD), Sydney Airport and Port Botany.
- Facilitates the redevelopment of an underutilised and isolated industrial site to allow for a commercially viable high density residential use of the site.
- Removes the land use conflict between the existing industrial operations and residential and mixed use development approved and under construction within the southern portion of the BATA site.

It is considered that the proposed amendment to the BBLEP 2013 is the best, most efficient and time effective approach to delivering the intended outcome of the proposal.

## 1.2. REPORT STRUCTURE

This Planning Proposal has been prepared having regard to the DPE's *'A Guide to Preparing Planning Proposals'* and *'A Guide to Preparing Local Environmental Plans'*. Furthermore, this Planning Proposal builds on the planning history of the site including a previous Council-lead planning proposal and subsequent development applications that has resulted in development now being commenced. These prior actions confirm that a Planning Proposal is the most effective means to deliver the intended outcomes.

As required by Section 3.33 of the EP&A Act, this Planning Proposal request includes the following:

- Description of the subject site and context.
- Description of the proposed amendments to the BBLEP 2013 supported by sufficient detail to indicate the effect of the amendments.
- Statement of the objectives and intended outcomes of the proposal.
- Explanation of the provisions of the proposal that are to be included in the LEP.
- Summary of the justification of the proposal, including an environmental assessment.
- Description of the community consultation process that would be expected to be undertaken before consideration is given to making of the planning instrument.
- Indicative project timelines.

The Planning Proposal request is supported by the following documentation:

- **Appendix A** –Masterplan and Urban Design Report (SJB)
- **Appendix B** – Economic Impact Assessment (Urbis)
- **Appendix C** – Services, Drainage and Flooding Due Diligence Report (AT&L)
- **Appendix D** – Transport Impact Assessment (Arup)
- **Appendix E** – Summary of Geotechnical Conditions (Douglas Partners)
- **Appendix F** – Summary of Contamination Investigations (Douglas Partners)
- **Appendix G** – Preliminary Tree Assessment Report (Jacksons Nature Works)
- **Appendix H** – Survey Plan (JBW Surveyors)
- **Appendix I** – Aeronautical Impact Assessment (Landrum & Brown)
- **Appendix J** - Proposed LEP Mapping
- **Appendix K** – Complying Development Certificate for Building Demolition
- **Appendix L** – Heritage Impact Statement

The supporting documentation demonstrates the suitability of the site for the proposed land use zone and revised development controls, and provides the basis for more detailed design investigations as part of any future development applications (DAs).

## 1.3. CONSULTATION

### 1.3.1. Development Concept Plan

This Planning Proposal builds on a long-standing recognition and dialogue that has existed between Meriton and Council since Meriton's initial acquisition of the former Lot 2 in DP 1187426 in 2013 and subsequent acquisition of Lot 1 in DP 1187426 in April 2015 from BATA. It also reflects the earlier Council / BATA initiated work that commenced some years ago, which envisaged the broader site as residential and subsequently led to the rezoning of the southern part of former Lot 2 in DP 1187426.

In November 2016, Bayside Council provided feedback on the initial concept plan prepared by Hassell and also engaged Hill Thalis to review the concept plan and provide an alternative, independent scheme. This scheme introduced a large open space in the centre of the site running along a north-south axis. An alternative scheme was also prepared by Hill Thalis on the basis that the metro or light rail was extended along Bunnerong Road or Heffron Road, thereby justifying increased densities across the site to 20 storeys.

Meriton and SJB (and previously Hassell) have adopted and evolved some of the elements of the Hill Thalis scheme at Council's request. A comparison of the SJB and Hill Thalis concept schemes is provided at **Section 6.8**.

### 1.3.2. Light Rail Extension / Transport

Meriton, in liaison with the former Botany Bay Council and Randwick Council, has approached the NSW State Government to consider extending the current CBD and South East Light Rail to Maroubra Junction and on to the subject site. This would service the suburbs of Maroubra, Pagewood, Matraville, Eastgardens and the broader South-East Sydney area. There would also be further opportunities to expand this service beyond the site to the south and west, expanding the potential for cross district transport connections. This light rail extension was contemplated in the *Botany Bay Development Control Plan 2013* (DCP) as it relates to the southern part of former Lot 2 in DP 1187426 of the BATA site and is discussed in more detail in **Section 2.2**. Meriton's discussions with State Government regarding a possible light rail extension are ongoing.

Notwithstanding the Transport Strategy 2056 shows a future extension of the Sydney Metro West Project that will include a stop at Maroubra Junction and Malabar/ Long Bay Correctional Complex. The proponent has made representations that it may be more beneficial to adjust the rail alignment to Pagewood/ Eastgardens due to the planned density and land ownership issues. In the interim, the Proponent is currently working with Transport for NSW to expand existing bus services, and create new bus services that will directly service the Pagewood Green development. Based on current discussions, these services will be in place as early as this year.

# 2. PLANNING HISTORY

## 2.1. REZONING PROPOSAL

On 21 June 2013, an amendment to the BBLEP 2013 was made to rezone the former Lot 2 in DP 1187426 of the BATA site, an 'L-shaped' parcel of land measuring 10.35ha, from industrial uses to residential and mixed use and to apply development standards for building height and FSR. The document entitled 'Strategic Justification for the BATA site' prepared by Botany Bay Council in support of this earlier rezoning is applicable to the current Planning Proposal and stated:

- *"The proposed zoning is in accordance with the specific directions and actions in the Botany Bay Planning Strategy 2031 which envisage a mixed use centre at Eastgardens, after BATA vacate the land.*
- *The urban context of the site makes it suitable for the development of a mixed residential, retail and commercial precinct with a medium to high density development.*
- *The proposal will contribute to achieving important objectives and directions in NSW State Government planning strategies including contributing to achieving housing and employment targets in suitable locations. The proposal has the potential to contribute 1,200 to 1,500 new dwellings to the supply of residential dwellings in the Botany Bay LGA and provide a mix of dwelling choices.*
- *The proposed new zoning allows a wider range of employment generating land uses with higher employment densities up to around 1,550 jobs compared to 900 jobs under an industrial zoning.*
- *The BATA site is not strategically significant industrial zone land and the proposed rezoning will not have a significant impact on the viability of the industrial land supply within the Botany Bay LGA. The Draft BBLEP 2012 results in a net increase of pure industrial zoned land.*
- *The proposed rezoning of the BATA site will not create a precedent for other landowners in the locality to rezone industrial land, particularly given the unique circumstances of the land, being isolated and clearly separated from the remainder of the industrial zone at Banksmeadow, and located adjacent to an existing retail centre, strategic bus corridor and residential zone.*
- *Road access to the site is excellent with direct access to the local main roads.*
- *The BATA site has good public transport links as it adjoins a strategic bus corridor and is adjacent to a bus interchange with numerous bus service connections to and from surrounding parts of Sydney.*
- *The pedestrian and cycling network in the locality will be enhanced by connections through the site in future development.*
- *The full range of utility services – electricity, telecommunications, gas, water, sewer and stormwater drainage – are available on and adjacent to the site.*
- *There is no environmentally sensitive land or land with significant biodiversity value on or around the BATA site; and no environmental constraints or hazards of such significance as to preclude the rezoning. The environmental planning issues associated with the rezoning are addressed in the various studies prepared by BATA's specialist consultant team.*
- *Various design measures have been integrated into the design to manage the interface and mitigate potential impacts between the BATA factory remaining in the industrial zone and the future mix of residential and commercial development proposed on the remaining surplus land (our emphasis).*

## 2.2. DEVELOPMENT CONTROL PLAN

A site-specific DCP *Part 9: 130-150 Bunnerong Road, Eastgardens* was prepared to support the rezoning of Lot 2 and *'contains the overall vision for the new residential and business centre guiding its future form and function.'*

Whilst the DCP relates specifically to the former Lot 2 in DP 1187426, it clearly notes on page 6 that *'Council will consider alternative development schemes under the Masterplan DA required in Part 9D.1.5 – Specific DA Requirements for the Site…'* This comment recognises that planning needs to be flexible in response to

the evolving nature of large sites in strategic locations, as is the case for the subject site and its location within the recently designated Maroubra Junction-Eastgardens District Centre.

The Vision Statement for the redevelopment of the former Lot 2 in DP 1187426 also recognised the potential to extend the proposed CBD and South East Light Rail corridor to the site. In particular, the DCP states:

*"The redevelopment of the Site also provides a unique opportunity for the extension of the Light Rail Project into the suburb of Eastgardens. The Light Rail project has a current terminus at Kingsford. Extending the line another 2.4km to the Site will benefit both the Light Rail Project and the existing and future residents of Botany Bay LGA. Terminating the light rail at the Site would provide the opportunity to build a high quality transport oriented development at the site…Council wants to work with the purchaser of the Site and the State Government to take advantage of this opportunity."*

The Planning Proposal realises this opportunity for a high-density transport-oriented development and the concept plan makes an allowance for light rail along the Heffron Road frontage. The Proposal is also supported by enhanced public transport planning under the 2056 Transport Strategy.

In addition, this Planning Proposal seeks to introduce a new Additional Local Provision at Clause 6.12 of the BBLEP 2013 requiring the preparation of a development control plan for the subject site. This enables the preparation of a site-specific development control plan or a Stage 1 Masterplan. The proposed provision is detailed in Section 7.3 of this report below.

## 2.3. DEVELOPMENT APPLICATIONS

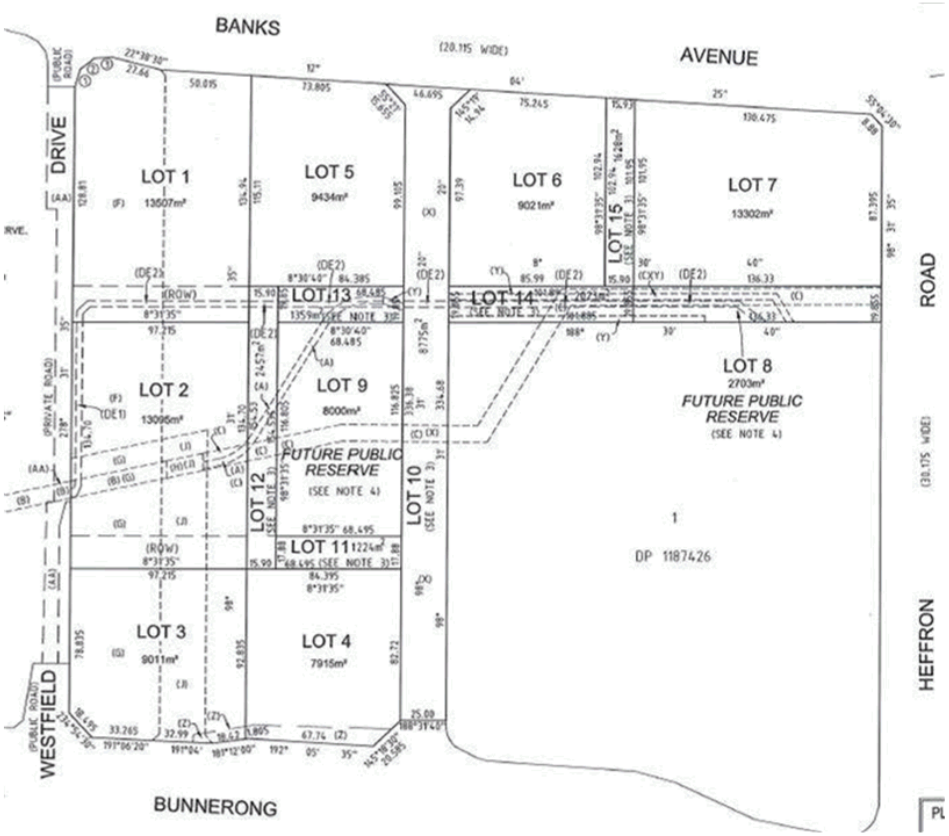
Development Application 10730/2014 for a Stage 1 Masterplan Concept (Stage 1 Consent) was approved by the Land and Environment Court on 7 August 2015. The Stage 1 Consent relates to the southern part of former Lot 2 in DP 1187426 and details of the approval are summarised below.

Land Subdivision

In summary, the Stage 1 Consent allowed the following (see **Figure 3**):

- Subdivision into seven lots, referred to as "Urban Blocks";
- Subdivision of lots for open space being a Central Park (Open Space lot 1) and Linear Park (Open Space lot 2); and
- Subdivision into lots for public roads being Road lot 1 (East West Boulevard), Road lot 2 (North South Street 2), Road lot 3 (Civic Boulevard), Road lot 4, Road lot 5, (North South Street 1) and Local Street Road lot 6.

Figure 3 – Approved Subdivision Layout

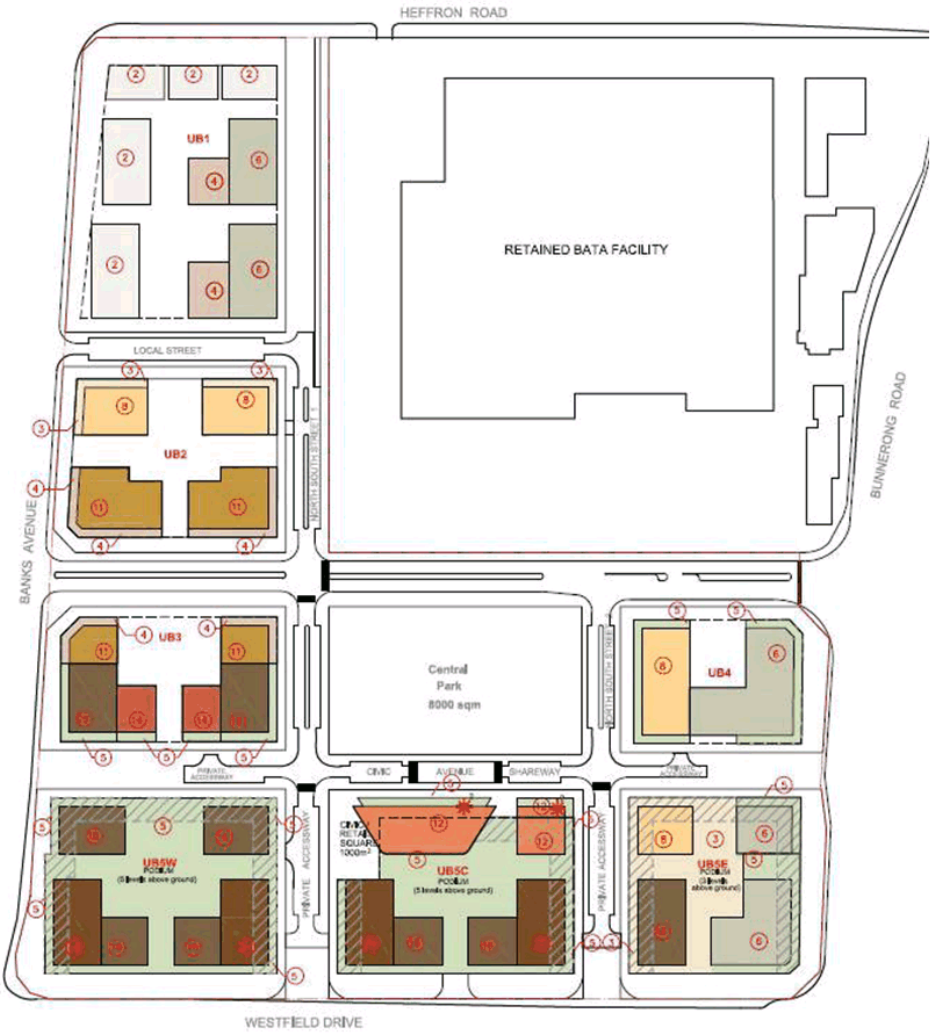



Land Uses, Yield and Building Envelopes

The Stage 1 Consent allows for an indicative maximum of 2,223 residential apartments, up to 5,000sqm retail floor space, four child care centres and a maximum Gross Floor Area (GFA) across the entire development of 227,287sqm.

The approved building envelopes are illustrated in **Figure 4**.

Figure 4 – Approved Stage 1 Masterplan Concept




Meriton has secured a number of Stage 2 development consents that are consistent with the Stage 1 Master Plan. This includes approval for all of the civil / road works, subdivision and the mixed use development of Urban Block 5 West (UB5W), Urban Block 5 East (UB5E) and Urban Block 4 (UB4). Construction of these civil works and developments have commenced, which will accommodate the first 1,000 dwellings within the southern portion of the former Lot 2 in DP 1187426 (see **Figure 2** and **Figure 4**).

## 2.4. GATEWAY DETERMINATION

On 12 December 2017, a Gateway Determination was issued allowing the Planning Proposal to proceed subject to conditions. An amended Gateway Determination was issued on 9 October 2018, including that prior to community consultation it be updated to:

(a) *Include a plain English explanation requirement for a site-specific Development Control Plan;*

(b) *demonstrate consistency with the Greater Sydney Region Plan and the Eastern City District;*

(c) *amend the explanation of provisions to include the requirement of a minimum of 5,000 square metres of gross floor area for commercial floor space and/or other permitted non-residential land uses;*

(d) *update the number of jobs to reflect the provision of an additional 5,000 square metres of non-residential land uses, including those uses outlined in subclause (e) of condition 1;*

(e) *Amend the explanation of the provisions to include commercial premises, serviced apartments and recreation facilities (indoor) as additional permitted uses for the site under Schedule 1 of Botany Bay LEP 2013;*

(f) *Investigate and discuss the proponent suitable affordable housing outcomes for the site;*

(g) *Provide an updated Heritage Impact Statement that assesses the revised proposal;*

(h) *Provide an updated Traffic Report that assesses the revised proposal and the additional permitted uses described in subclause (e) of condition 1;*

(i) *Provide shadow diagrams based on maximum building heights proposed that clearly show the extent of potential overshadowing within the site and on adjoining land and development – including the existing building facades of development located to the south and east, and the Pagewood Green park south of the proposal site;*

(j) *Identify and describe each of the proposed public open space areas to be provided and dedicated across the site; and*

(k) *Provide an updated timeline outlining the anticipated time frame for the plan-making process.*

The Planning Proposal has been amended to address the above conditions of the Gateway Determination.

The Gateway Determination identified a maximum LEP making timeframe of 12 months, community consultation for a minimum of 28 days and requirements for consultation with agencies.

## 2.5. CURRENT REZONING PROPOSAL

This Planning Proposal was lodged with Bayside Council in May 2017. However, after not receiving Council support within the prescribed period, a Rezoning Review was made to the Department of Planning and Environment in October 2017. In December 2017, a Gateway Determination was issued which supported the proposal proceeding. The Gateway Determination confirmed the proposal has site specific and strategic planning merit that aligns with key state, district and local strategic planning policies.

The Proponent and Bayside Council have subsequently agreed on a VPA that delivers substantial public benefits which go beyond the requirements of the Gateway Determination or policy.

The Planning Proposal has now addressed all matters of the Gateway Determination have been addressed, and following public consultation, the proposed rezoning should be finalised and gazetted.

# 3. SITE CONTEXT

## 3.1. SITE DESCRIPTION

The subject site has an area of 8.95ha and is located within a broader site that comprises a rectangular parcel of land known as 128 and 130-150 Bunnerong Road, Pagewood. The site is within the Bayside LGA and is legally described as Lot 1 in DP 1187426 and Lot 24 in DP 1242288.

The site is formerly known as the BATA site and was previously occupied by industrial uses associated with the manufacturing operations of BATA. Lot 1 was excised from the larger site, remaining for reduced industrial uses while the remaining portion of the site was rezoned in June 2013 to support mixed use development, including high-density residential uses.

The site has frontages to an internal road (Meriton Boulevard) to the south, Bunnerong Road to the east, Banks Avenue to the west and Heffron Road to the north (see **Figure 5**).

Figure 5 – Location Plan




*Source: Urbis*

## 3.2. EXISTING USES

### 3.2.1. Lot 1

The site is occupied by a warehouse building and several unoccupied buildings. The buildings, modified over the years are the result of the staged exit from the site by BATA, having scaled down to the existing building and Lot 1 in 2013 and permanently vacating the site in 2015.

### 3.2.2. Lot 24

This site formerly comprised the northern part of Lot 2 in DP 1187426. Until recently, the site was occupied by expansive areas of surface car parking. It has been cleared of former industrial buildings with the exception of a warehouse in the north-west corner of the site (demolition consent was granted under DA11/272/6 for the removal of all buildings and structures).

An aerial photo detailing existing buildings within the subject site is provided at **Figure 6** and photographs of the site are provided at **Figure 7**

Figure 6 – Aerial Photo of Subject Site




*Source: Nearmap and Urbis*

Figure 7 – Photographs of Subject Site



Picture 1 – Southern Boundary of Lot 1



Picture 2 – Existing Administration Building



Picture 3 – Former BATA Facilities within Lot 1



Picture 4 – Bunnerong Road Frontage



Picture 5 – Existing Clocktower Building



Picture 6 – Southern Portion of Site under Construction

## 3.3. SURROUNDING CONTEXT

The surrounding land uses in the vicinity of the site comprise (see **Figure 8**):

- **North:** Low density residential uses. Pagewood shops are located to the north-east.
- **East:** Low density residential uses.
- **South:** Redevelopment of the southern portion of the former BATA site and Westfield Eastgardens Shopping Centre. The servicing area of the shopping centre borders the broader site's southern boundary. Commercial and industrial uses are located further to the south-west.
- **West:** Bonnie Doon Golf Course and associated club house.

The site is located in Sydney's eastern suburbs, between Port Botany and the Sydney CBD in what is known as the Economic Arc. The site is located:

- 2.5km north from Port Botany;
- 5km north from La Perouse headland;
- 3km west from Maroubra Beach;
- 4km north from Sydney Airport;
- 3km south from UNSW, Prince of Wales and Sydney Children's Hospitals and Randwick Racecourse;
- 5km south from Centennial Parklands and Moore Park Entertainment Precinct;
- 7km south from the Sydney CBD;
- 3.5km east from Mascot Train Station; and
- 4.5km south-east from Green Square Town Centre.

Adjoining Westfield Eastgardens, the site is located adjacent to the second largest retail precinct in the eastern suburbs after Bondi Junction.

The site is well suited to new residential development in accordance with the provisions of the Region Plan, and the priorities for the Eastern City District as the Westfield site and Maroubra Junction will continue to supply the employment and retail services within the Eastgardens-Maroubra Junction Strategic Centre. It is within walking and cycling distance of well-established retail and recreational uses and public transport infrastructure, making it ideally suited to accommodate more intensive development and to stimulate demand for the new facilities envisaged for the area.

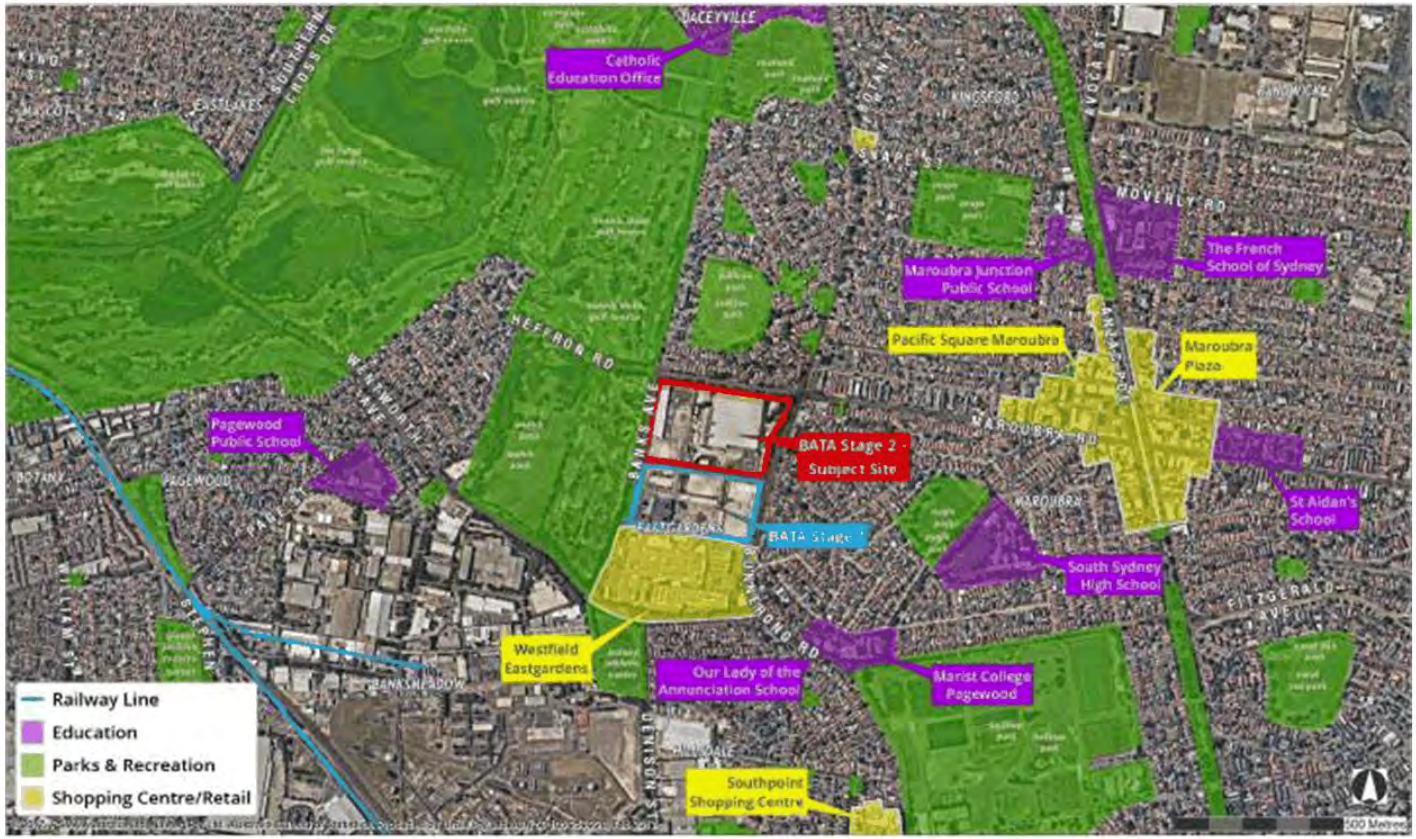
## 3.4. EXISTING OPEN SPACE

The site is currently serviced by an extensive open space network which includes a diverse range of parks, passive recreation areas and active sports facilities located within a short distance (1km) from the site. This includes, but is not limited to:

- Mutch Park, covering approximately 12ha and providing six tennis courts, including four artificial grass and two hard courts, and four squash courts;
- Jellicoe Park, covering approximately 5ha and providing 2 full sized soccer fields and a further 26 training pitches and practice fields for youth soccer;
- Nagle Park, covering 4ha and providing a full sized rugby field; and
- 44ha of open space on Fitzgerald Avenue, which accommodates significant active sports facilities including Randwick Netball Association, Matraville Sports Centre, and the Des Renford Leisure Centre.

It is anticipated that these existing facilities will significantly contribute to meeting the recreation and open space needs of the proposed community due to their proximity and the range of facilities and services provided, including active sports.

Figure 8 – Local Context Map




*Source: Urbis*

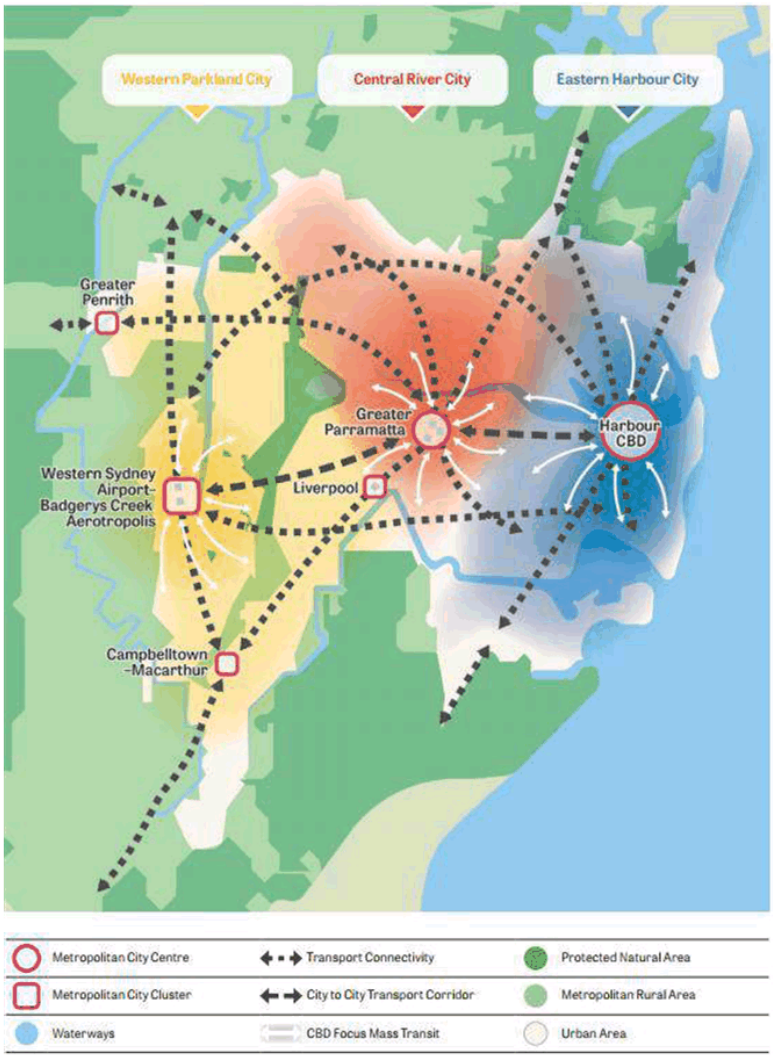
# 4. STRATEGIC PLANNING CONTEXT

## 4.1. A METROPOLIS OF THREE CITIES – THE GREATER SYDNEY REGION PLAN

Released in March 2018, the final version of the Region Plan ensures land use and transport opportunities develop more equitably across Greater Sydney.

The Region Plan conceptualises Greater Sydney as a metropolis of three '30-minute' cities, and is presented with the District Plans to reflect the most contemporary thinking about Greater Sydney's future. The site is located within the broader 'Eastern Harbour City', as shown in **Figure 9**.

Figure 9 – Greater Sydney as Three Cities




*Source: Greater Sydney Commission*

The Region Plan is underpinned by four key pillars which outline specific objectives to be achieved. The four pillars include:

- Infrastructure and Collaboration
- Liveability
- Productivity
- Sustainability

An assessment of the Planning Proposal against the relevant objectives of the Region Plan is provided in **Table 3** at **Section 8.2.1**.

## 4.2. EASTERN CITY DISTRICT PLAN

Released in March 2018, the final version of the (the District Plan is a 20-year vision that provides strategic guidance on the economic, social and environmental growth in the Eastern City District of Greater Sydney. The District Plans have been prepared to align the Region Plan and the detailed planning controls for local areas.

The District Plan sets out priorities and actions for the development of the Eastern City District, which includes the LGAs of Bayside, Burwood, Canada Bay, Inner West, Randwick, Strathfield, the City of Sydney, Waverley and Woollahra, as shown in **Figure 10.** This figure indicates that the site is proposed to be within the Eastgardens-Maroubra Junction Strategic Centre.

The priorities for this Eastern City District include:

- Providing housing supply, choice and affordability, with access to jobs and services;
- Creating and renewing great places and local centres, and respecting the District's heritage;
- Growing a stronger and more competitive Harbour City;
- Delivering integrated land use and transport planning and a 30-minute city; and
- Protecting and enhancing scenic and cultural landscapes.

As required by the EP&A Act, the District Plan:

- Provides the basis for strategic planning in the District, having regard to economic, social and environmental matters;
- Establishes planning priorities that are consistent with the objectives, strategies and actions of the Region Plan; and
- Identifies actions required to achieve the planning priorities.

The District Plan sets a strategic housing target of 157,500 for the Eastern City District by 2036, equating to an average annual supply of 7,875 dwellings. At a local level, Bayside Council's housing target requires an additional 10,150 dwellings by 2021 based on the target suggested in the Plan.

The District Plan recognises that there are opportunities within the Eastern City District to deliver beyond the minimum dwellings needed in the short term. It acknowledges the importance of addressing the pent-up demand that has resulted from past undersupply. It also draws attention to the importance of addressing housing choice and affordability to provide supply for the talented workforce needed to contribute to the Eastern City District's global city aspirations and needs.

An assessment of the Planning Proposal against the relevant planning priorities of the District Plan is provided in **Table 4** at **Section 8.2.1**.

Figure 10 – Eastern City District Structure Plan 2036




Note: The site's approximate location is shown with a red star.

*Source: Greater Sydney Commission*

# 5. STATUTORY PLANNING CONTEXT

## 5.1. BOTANY BAY LOCAL ENVIRONMENTAL PLAN 2013

The principle statutory planning instrument applying to the site is the BBLEP 2013.

### 5.1.1. Zoning and Permissibility

The subject site is currently zoned part R3 Medium Density Residential and part IN1 General Industrial under the BBLEP 2013. As demonstrated in **Figure 11**, the surrounding area is zoned for a variety of land uses including residential, commercial, public recreation and special activities (golf course). It is noted that the land to the east of Bunnerong Road falls within the Randwick LGA and zones shown below are taken from the *Randwick Local Environmental Plan 2012* (RLEP 2012).

Figure 11 – BBLEP 2013 Zoning Map Extract




*Source: BBLEP 2013 and RLEP 2012*

The existing zoning controls of the site are summarised in **Table 1**.

Table 1 – Summary of Existing Zoning Controls

| Control | R3 Medium Density Residential | IN1 General Industrial |
|---|---|---|
| Zone Objectives | • *"To provide for the housing needs of the community within a medium density residential environment.*<br>• *To provide a variety of housing types within a medium density residential environment.*<br>• *To enable other land uses that provide facilities or services to meet the day to day needs of residents.*<br>• *To encourage development that promotes walking and cycling."* | • *"To provide a wide range of industrial and warehouse land uses.*<br>• *To encourage employment opportunities.*<br>• *To minimise any adverse effect of industry on other land uses.*<br>• *To support and protect industrial land for industrial uses."* |
| Permissible Development | *Attached dwellings; Bed and breakfast accommodation; Boarding houses; Child care centres; Community facilities; Dwelling houses; Group homes; Multi dwelling housing; Neighbourhood shops; Office premises; Places of public worship; Residential flat buildings; Respite day care centres; Roads; Semi-detached dwellings; Seniors housing; Any other development not specified as development without consent or as prohibited.* | *Depots; Freight transport facilities; Garden centres; General industries; Hardware and building supplies; Industrial training facilities; Light industries; Neighbourhood shops; Places of public worship; Restaurants or cafes; Roads; Take away food and drink premises; Timber yards; Warehouse or distribution centres; Any other development not specified as development without consent or as prohibited.* |
| Prohibited Development | *Advertising structures; Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Car parks; Caravan parks; Cemeteries; Charter and tourism boating facilities; **Commercial premises**; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Emergency services facilities; Entertainment facilities; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Function centres; Heavy industrial storage establishments; Helipads; Highway service centres; Home businesses; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Information and education facilities; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Passenger transport facilities; Port facilities; Public* | *Advertising structures; Agriculture; Air transport facilities; Airstrips; Amusement centres; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; **Centre-based child care facilities**; Charter and tourism boating facilities; **Commercial premises**; Community facilities; Correctional centres; Crematoria; Eco-tourist facilities; Educational establishments; Entertainment facilities; Environmental facilities; Environmental protection works; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Function centres; Health services facilities; Heavy industrial storage establishments; Heavy industries; Helipads; Highway service centres; Home-based child care; Home businesses; Home occupations; Home occupations (sex services); Information and education facilities; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Passenger transport facilities; Port facilities; Public administration buildings; **Recreation facilities (indoor)**; Recreation* |

| Control | R3 Medium Density Residential | IN1 General Industrial |
|---|---|---|
| | *administration buildings; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Research stations; Residential accommodation; Restricted premises; Rural industries; Service stations; Sewage treatment plants; Sex services premises; Storage premises;* ***Tourist and visitor accommodation****; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Warehouse or distribution centres; Waste or resource management facilities; Water recreation structures; Water recycling facilities; Water supply systems; Wharf or boating facilities; Wholesale supplies.* | *facilities (major); Recreation facilities (outdoor); Registered clubs;* ***Residential accommodation****; Respite day care centres; Restricted premises; Rural industries;* ***Tourist and visitor accommodation****; Veterinary hospitals; Water recreation structures; Water supply systems; Wharf or boating facilities* |

As can be seen from the above table, the existing IN1 Zoning that applies to the site prohibits residential accommodation, commercial premises, child care centres, tourist and visitor accommodation, and recreation facilities (indoor). It is therefore necessary to rezone the land to allow the redevelopment of the site for high density, mixed use development. It is noted that *'serviced apartment'* falls within the group definition of *'tourist and visitor accommodation'* which is an expressly prohibited in both the R3 and IN1 zone.

### 5.1.2. Floor Space Ratio

Under the BBLEP 2013, the subject site has a maximum FSR of 1:1 (see **Figure 12**).

Figure 12 – BBLEP 2013 FSR Map Extract




*Source: BBLEP 2013*

The Planning Proposal intends to amend the FSR development standard to 2.35:1 based on the yield illustrated in the supporting concept plan.

### 5.1.3. Height of Buildings

Under the BBLEP 2013, there are currently five different maximum building heights applicable to the subject site (see **Figure 13**).

The part zoned IN1 General Industrial has a maximum height limit of 21m. The part zoned R3 Medium Density Residential is zoned part 11m, part 17m, part 28m and part 32m. It should be noted that the Stage 1 Consent that currently applies to the Lot 24 portion of the subject site includes approved heights that exceed these controls in many instances.

Figure 13 – BBLEP 2013 Height of Buildings Map Extract




*Source: BBLEP 2013*

The Planning Proposal intends to amend the building height development standard to RL 37.0, part RL 60.0 and part RL 91.0. Whilst it is expected that buildings up to RL 91.0 will only be constructed within discreet areas of the site, to ensure flexibility at the later concept DA stage and avoid the existing 'patchwork' of height controls across the former Lot 2 portion of the site, the number of height controls across the site has been limited. It should also be noted that the maximum height proposed as part of this Planning Proposal is consistent with the maximum building heights approved as part of the Stage 1 Consent and under construction within the southern portion of the BATA site.

### 5.1.4. Heritage

The subject site is not a listed heritage item under the BBLEP 2013, nor is it located within a heritage conservation area. The site is located in the general vicinity of Jellicoe Park (Item 155) and Harris Reserve (Item 66).

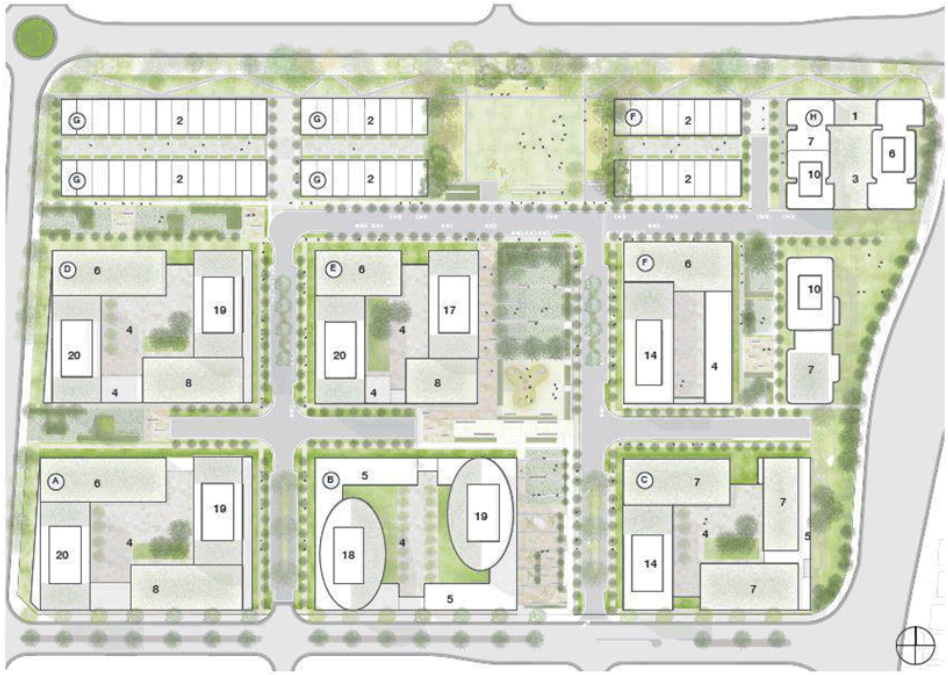
In response to the Condition 1(g) of the Revised Gateway Determination, a Heritage Impact Statement has been prepared and is attached at **Appendix L**.

# 6. DEVELOPMENT MASTERPLAN

## 6.1. DEVELOPMENT OVERVIEW

A Masterplan and Urban Design Report illustrating the type of development facilitated by the Planning Proposal has been prepared by SJB and is provided at **Appendix A**. The preferred masterplan for the site is provided at **Figure 14**. The design has been informed by, and provides for the extension of, the approved Stage 1 Master Plan for the former Lot 2 to foster a cohesive and integrated approach to the redevelopment of the entire BATA site.

Figure 14 – Preferred Masterplan



*Source: SJB*

## 6.2. DESIGN PRINCIPLES

The concept plans have been developed based on of the following design principles:

- Neighbourhood Structure: Create a walkable neighbourhood structure that provides opportunities for a connected community, with local retail convenience needs and public transport within walking distance.
- Trees: Trees will be retained wherever possible to maintain the existing landscape character and new tree planting throughout the proposed open space and along street frontages.
- Open Space: Provide a range of formal and informal recreation spaces within walking distance of proposed dwellings.
- Solar access: Ensure that built form does not unreasonably impact on solar access within the site and to surrounding residential properties.
- Ecologically Sustainable Development: Achieve best practice in sustainable design.

- Accessibility: Provide a highly permeable and legible movement network that integrates with adjacent streets and disperses traffic among the street network.
- Heritage: Provide recognition of the site's social history by interpreting historical elements.
- Community Benefit: Provide direct benefits for the existing community and future residents of the site and the broader community by:
  - Introduction of a high level of permeability and increase public accessibility to the site.
  - Provision of dedicated open space that will be accessible and useable by the community.
  - Integration of the open space network with adjoining open space areas to enhance pedestrian and cycling opportunities as part of a wider green grid.
  - Locating new housing adjacent to retail and services thereby providing opportunity to reduce the need to drive to essential and commercial services.

These design principles broadly align with those established by Hill Thalis in their work for Council. Key features of the masterplan include:

- **Land Use**: Redevelopment will provide approximately 2,015 new dwellings and accommodate a mix of unit types including one, two and three-bedroom units. Allowance has been made for two x 75-place child care centres and 5,000sqm of complementary non-residential uses including commercial floor space, serviced apartments and a gymnasium. Car parking will largely be accommodated within the podium levels of the proposed buildings and will be appropriately 'sleeved' by apartments to conceal views. This design approach is consistent with that previously approved for the areas of the broader site now under construction, reinforcing a distinct and integrated design theme.
- **Height and Built Form**: As discussed in more detail at **Section 6.4**, multiple buildings are proposed across the site ranging from two storey townhouses to 20 storey towers.
- **FSR**: A total GFA of 210,490sqm can be accommodated across the site, which equates to an overall FSR of 2.35:1 and is commensurable with other existing densities of this size.
- **Open space**: A network of strategically located and connected open spaces with a combined area of approximately 20,208sqm will be integrated into the development, see **Section 6.7**.
- **Access**: A legible network of streets is provided by extending the lot structure established as part of the Stage 1 Master Plan for Lot 2. This connects and integrates the public domain, using Meriton Boulevard as an interface between the two sites. The internal road network will provide separation and access to the car parking areas for each urban block and the proposed open spaces.

  External access to the site will utilise the approved and current road accesses to Bunnerong Road and Banks Avenue via Meriton Boulevard.
- **Community Facilities**: Community facilities will be introduced into the development to complement those within the southern portion of the BATA site, including a new civic square in public open space.

## 6.3. LAND USE

### 6.3.1. Seniors Housing and Serviced Apartments

Whilst the masterplan prepared by SJB has been prepared on the basis of a largely residential scheme comprising a mix of one, two and three-bedroom apartments, the concept identifies the potential to establish seniors housing in Lot H and serviced apartments in Lot B. The apartment sizes and seniors housing will diversify housing choice across the site and wider area, and cater to a wide range of households, including members of the community looking to downsize and 'age in place'. In addition, the serviced apartments will provide visitor accommodation within the precinct, however in a form that is complementary to the residential accommodation and consistent with the R4 zone objectives.

Seniors housing is a type of residential accommodation, which is prohibited in the R4 Zone under the LEP. Notwithstanding this, Clause 15 of the *State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004* (Seniors SEPP) states:

> *This Chapter allows the following development despite the provisions of any other environmental planning instrument if the development is carried out in accordance with this Policy:*
>
> *(a) development on land zoned primarily for urban purposes for the purpose of any form of seniors housing, and*
>
> *(b) development on land that adjoins land zoned primarily for urban purposes for the purpose of any form of seniors housing consisting of a hostel, a residential care facility or serviced self-care housing.*

The Seniors SEPP applies to land zoned primarily for urban purposes but only if development for the purposes of any of the following is permitted on the land:

(i) dwelling-houses,

(ii) residential flat buildings,

(iii) hospitals,

(iv) development of a kind identified in respect of land zoned as special uses, including (but not limited to) churches, convents, educational establishments, schools and seminaries, or

On the basis that dwelling houses and RFBs are permitted on land in the R4 Zone, seniors housing is permissible with consent on the site under the provisions of the Seniors SEPP.

The potential inclusion of a serviced apartments in Lot B will further contribute to the mix of land uses provided within the site and is a response to the site's strategic centre location and the requirements of the Gateway Determination. The proposed yield and feasibility of serviced apartments would be determined as part of a future DA, however given this use would generate a similar number of traffic movements to a residential development (see **Appendix D**), it is appropriate to make an allowance for this land use at this early concept stage through the inclusion of *''serviced apartment'* as an additional permitted use in Schedule 1 of the BLEP.

### 6.3.2. Commercial Premises

In accordance with the Gateway Determination, it is proposed to allow *'commercial premises'* as an additional permitted use on the land at Schedule 1 of the BBLEP 2013. Commercial premises include the following land uses under the definitions of the BBLEP 2013:

1. business premises

   *(a) an occupation, profession or trade (other than an industry) is carried on for the provision of services directly to members of the public on a regular basis, or*
   *(b) a service is provided directly to members of the public on a regular basis,*

   *and includes a funeral home and, without limitation, premises such as banks, post offices, hairdressers, dry cleaners, travel agencies, internet access facilities, betting agencies and the like, but does not include an entertainment facility, home business, home occupation, home occupation (sex services), medical centre, restricted premises, sex services premises or veterinary hospital.*

2. office premises

*a building or place used for the purpose of administrative, clerical, technical, professional or similar activities that do not include dealing with members of the public at the building or place on a direct and regular basis, except where such dealing is a minor activity (by appointment) that is ancillary to the main purpose for which the building or place is used.*

3. retail premises

*a building or place used for the purpose of selling items by retail, or hiring or displaying items for the purpose of selling them or hiring them out, whether the items are goods or materials (or whether also sold by wholesale), and includes any of the following:*

*(a) bulky goods premises,*
*(b) cellar door premises,*
*(c) food and drink premises,*
*(d) garden centres,*
*(e) hardware and building supplies,*
*(f) kiosks,*
*(g) landscaping material supplies,*
*(h) markets,*
*(i) plant nurseries,*
*(j) roadside stalls,*
*(k) rural supplies,*
*(l) shops,*
*(m) timber yards,*
*(n) vehicle sales or hire premises,*

*but does not include highway service centres, service stations, industrial retail outlets or restricted premises.*

The inclusion of commercial premises within the development will enhance economic activity associated with the proposed Eastgardens–Maroubra Junction Strategic Centre and increase employment opportunities within the site.

A further review of uses that may complement the mixed-use development has identified the potential for a gymnasium to be introduced within the site, providing further recreation opportunities for future residents and the surrounding community. It is therefore proposed to also include 'recreation centre (indoor)' as a permitted use on the land at Schedule 1 of the BBLEP 2013.

Whilst the intention of including commercial premises as a permitted use is to facilitate employment opportunities, it should also be acknowledged that other employment opportunities will be provided by the inclusion of two child care centres and potential serviced apartments and gymnasium as part of a local retail centre as required by the Gateway Determination.

## 6.4. HEIGHT AND BUILT FORM

The building envelopes approved as part of the Stage 1 Consent were developed through a comprehensive site analysis and had regard to the following:

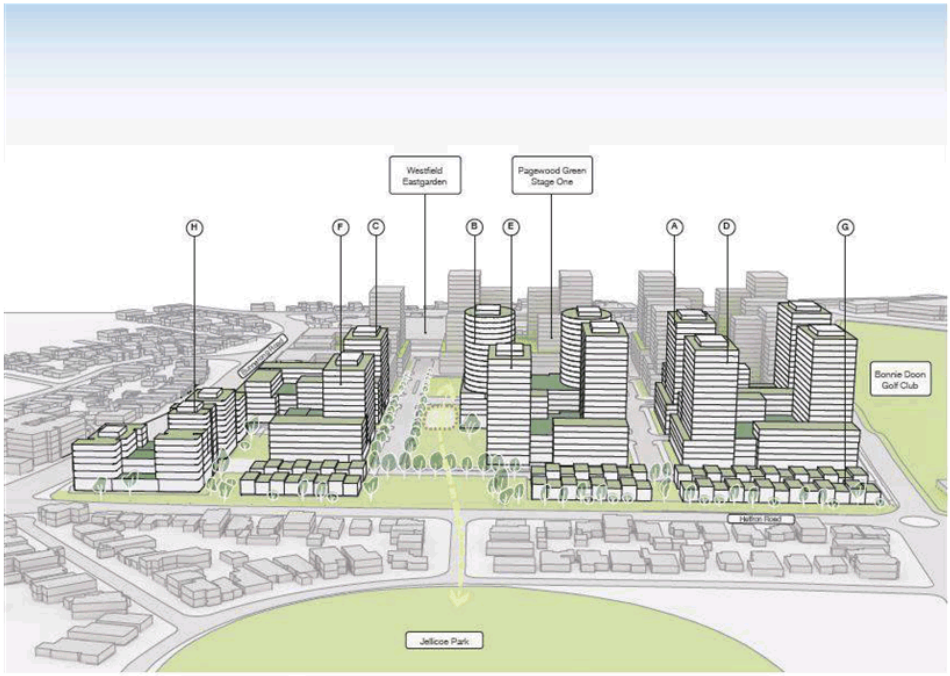
- Higher densities at the southern end of the site away from sensitive land uses and to accommodate above ground car parking within podium levels. The southern portion of the former BATA site is situated opposite the loading and servicing facilities of Westfield Eastgardens and therefore this part of the site is undesirable for low level apartment buildings given the potential land use conflicts.
- Reduced density at the northern end of the site (within Urban Blocks 1 and 2) in recognition of the one and two storey dwellings along the opposite side of Heffron Road, creating a comfortable transition of building heights and minimising visual bulk impacts.
- The existing controls being implemented at a time when there was an on-going presence by BATA on the site. Accordingly, built form controls reflected in both the LEP and DCP controls where heavily geared towards managing a residential and industrial interface and the associated compatibility issues of such.
- Aeronautical height restrictions of 91AHD.

The subsequent change in circumstances affecting the site, including BATA ceasing operations and the new role of the site within a strategic centre (together with its significance in overall site area), has provided an opportunity to revisit the zoning and proposed densities within Lot 24. The preferred option for the Planning Proposal therefore includes Urban Blocks 1 and 2 to enable an integrated and cohesive urban design outcome for the northern precinct of the former BATA site.

The proposed built form approach has been informed by the following (see **Figure 15**):

- The Stage 1 Consent, which approved an average FSR across the former Lot 2 in DP 1187426 of 2.2:1 and sets the tone and scale of development within the subject site. It is noted that a higher FSR of 3:1 applies to the B3 zoned portion of former Lot 2 and a lower FSR of 1:1 applies to the balance of former Lot 2. The lower FSR was applied in recognition of the site's interface to the ongoing BATA operations (at the time) and the relationship to the existing low-scale residential neighbourhood to the north of the site.
- Providing two storey townhouses within the northern portion of the site in response to the interface with the existing low density residential neighbourhood on the northern side of Heffron Road.
- Staggering taller buildings to create a more diverse skyline and to mitigate overshadowing to approved buildings and open space under the Stage 1 Consent.
- Distributing density away from Bunnerong Road to minimise overshadowing to existing residential properties to the east.
- Reinforcing the junction of the proposed internal streets with the existing road network and new street corners, with taller built form elements.
- Comprehensive testing to ensure compliance with the required building separation, dwelling sizes, solar access and ventilation requirements outlined in *State Environmental Planning Policy 65 – Design Quality of Residential Apartment Development* (SEPP 65) and the associated *Apartment Design Guide* (ADG).
- Minimising basement excavation in response to the constraints around soil conditions and groundwater, as outlined in the supporting Geotechnical and Contamination Investigations (see **Appendix E** and **Appendix F**), by accommodating the majority of car parking within the podiums of the proposed buildings.

Figure 15 – 3D Perspective




*Source: SJB*

## 6.5. SEPP 65

The concept plan illustrates a layout and building arrangement that can be designed to comply with the relevant provisions of SEPP 65 and the associated ADG. As outlined in the concept plans prepared by SJB, key considerations are as follows:

- Building separations meet the minimum requirements set out in the ADG (Objectives 2F and 3F) to assist in achieving high levels of visual and acoustic privacy, outlook, natural ventilation and daylight access. All building facades will feature habitable rooms, with a minimum 24m separation provided between buildings for maximum solar access.
- Building depths will support a range of apartment layouts and comply with the ADG requirements (Objective 2E).
- The orientation of buildings maximises solar access for future residents, whilst minimising the potential for unreasonable overshadowing to neighbouring properties, the public domain and open space.
- The solar access analysis undertaken by SJB (see **Figure 16**) indicates that 82.7% of the proposed apartments are capable of receiving a minimum of two hours of direct sunlight based on the massing and separation of buildings in accordance with the ADG (Objective 4A).
- A range of communal open space opportunities will be available throughout the development including open spaces at ground level and all podiums will have green roofs (Objectives 3D and 3E). Based on the masterplan, communal open space accounts for approximately 25% of the site area in accordance with the ADG requirement. It is expected that the communal open space will receive adequate solar access throughout the year and deep soil zones will meet the minimum requirement of 7% of the site area. However, it is noted that the proposal will deliver more than 2 hectares of public open space in addition

to the communal open space, which will result in more open space across the site that required by the ADG.

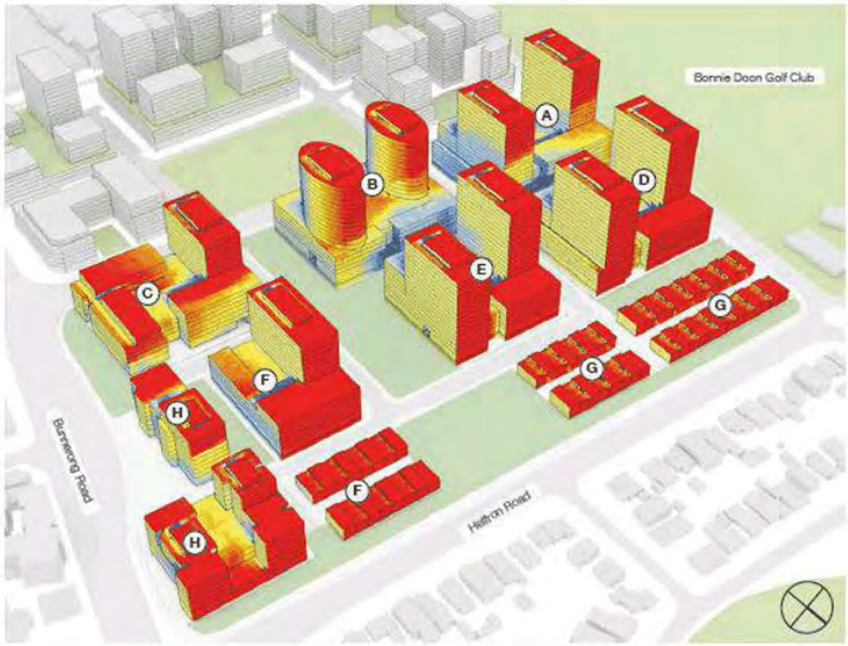
- Secure car bicycle parking will be accommodated within the podium levels of buildings and will be 'sleeved' by apartments to integrate it within the development and conceal it from view (Objective 3J).

Future applications for development consent will need to be considered on their merits, in context of final/detailed design and comply with the requirements set out in SEPP 65 and the ADG.

Figure 16 – Solar Access Analysis




View from north west




View from north east

*Source: SJB*

## 6.6. CAR PARKING

As outlined in the Transport Impact Assessment, Meriton has proposed parking rates which have been compared to the relevant provisions of the BBDCP 2013 (Part 3A and Part 9D) and the approved Stage 1 Consent for the former Lot 2, see **Table 2.**

Table 2 – Minimum Car Parking Rates

| Development type | Part 3A/9D BBDCP | Approved Stage 1 masterplan | Proposed rates |
|---|---|---|---|
| Residential flat buildings | | | |
| Studio / 1 bedroom apartments | 1 space per apartment | 1 space per apartment | 0.5 space per apartment |
| 2 bedroom apartments | 2 spaces per apartment | 1.5 space per apartment | 1 spaces per apartment |
| 3 bedroom apartments | 2 spaces per apartment | 2 space per apartment | 1.5 spaces per apartment |
| Visitor parking | 1 space per 5 apartments | 1 space per 10 apartments | 1 space per 10 apartments |
| Commercial / Retail / Infrastructure | | | |
| Shops | 1 space per 25m$^2$ | 1 space per 40m$^2$ | 1 space per 40m$^2$ |
| Childcare | 1 space per 2 employees | 1 space per 2 employees | 1 space per 2 employees |
| | 1 space per 5 children | 1 space per 5 children | 1 space per 5 children |
| | 1 pick-up and set-down space per 20 children. | 1 pick-up and set-down space per 20 children. | 1 pick-up and set-down space per 20 children. |

*Source: Arup*

The reduced car parking is considered appropriate to reduce car mode share at the development. The modified rates will be supported by proposed light rail extensions, new and extended bus services and the planned future Metro rail line.

As mentioned previously, it is anticipated that the majority of car parking will be accommodated within the podiums of the proposed buildings to limit, if not avoid, excavating the site for basement levels. This design consideration is considered appropriate for the following reasons:

- Addresses environmental constraints associated with soil conditions, contamination and groundwater as outlined in the Geotechnical and Contamination Investigations;
- Reduces extensive excavation of the site and demand for landfill;
- Avoids potential conflicts with existing services, infrastructure and utilities;
- Reduces the risk of basements being flooded or inundated due to stormwater or drainage issues;
- Provides for natural ventilation as opposed to a requirement for mechanically ventilated systems;
- Provides an opportunity to establish communal areas above the podium, allowing for improved amenity, solar access and security for residents; and
- Car parking and podiums would be designed in accordance with SEPP 65 and the ADG.

## 6.7. OPEN SPACE

The proposed development will provide approximately 20,208sqm (2.02ha) of public open space as part of the Development that will be dedicated to Council in accordance with the endorsed Planning Agreement VPA which equates to 23% of the overall site area and addresses the urgent need for public open space under the recently updated Section 7.11 Contributions Plan that applies to the broader area.

The open space provided on-site will be centrally located within easy access for the community, and provide high quality sites for passive recreation, which complement the surrounding land uses. This open space will contribute to meeting the general recreation needs of the incoming community and reduce demand on existing public open spaces in the surrounding area. The open space masterplan has been driven by the desire for the site to deliver a range of open spaces for different lifestyles and activities easily accessible to future residents of the BATA site.

The public open space has been designed around the following principles:

- Integration – creating synergy with the built form and surrounding context and build a unique local character.
- Connectivity – considers through-site links, improves walkability and integrates multiple modes of transport.
- Multifunctionality – to ensure spaces are appropriate to a range of user groups and useful to changing needs and populations.
- Participation – creating a public domain that brings to life the diversity of residents and users in Pagewood, encouraging informal encounters and building community.

The application of these principles worked together to deliver the landscape masterplan illustrated in **Figure 17** below, which delivers:

- Development arranged around a large open space in the centre of the site running along a north-south axis. It is intended that this open space provide a green link between Jellicoe Park to the north and Central Park within the southern portion of the former BATA site, and the design will incorporate a 1,000sqm civic space.
- A linear open space along the entire northern edge of the site that could be integrated with potential, future light rail stops and creates a buffer to the existing low-density residential development north of Heffron Road.
- A series of pocket parks dispersed throughout the site to create variation in the delivery of open space.
- Retention of perimeter trees where possible and provision of compensatory planting within the broader design where trees cannot be retained as per the Arborist Report.

The volume of publicly accessible open space is substantial for an urban infill development and is in addition to the 8,000m$^2$ provided as part of the Stage 1 Masterplan for the Pagewood Green Development.

In addition to the public open space, a substantial amount of communal open space is provided on podium and rooftops, which has the potential to double the open space offering and will comply with the relevant provisions of the ADG. The proponent will also be providing additional indoor recreational facilities on a site by site basis, including swimming pools, gyms and exercise studios, which is over and above the requirements of the ADG.

Apart from the ADG, there are a number of local and international open space benchmarks, and the BATA site will achieve the following relevant open space benchmarks for future residents:

- The World Health Organisation open space benchmark of 9m$^2$ per person, including communal and private open space; and
- Government Architect NSW recommends approximately 14.3m$^2$ per person of open space at a regional and local level.

Further, the proposal will benefit from access to approximately 25 hectares of open space within 800 metres of the site and more than 60 hectares within 2km of the site (refer to Section 2.3 of **Appendix A**). Not only is the site in such close proximity to existing open space, but Council recently requested a variation to the VPA executed under the Stage1 Consent for the redevelopment of the southern portion of the BATA site which has been agree d and executed. It is now proposed that some of the unspent $10.5 million contribution provided by Meriton will be directed towards improvements to Jellicoe Park and Mutch Park. Therefore, not only does the masterplan provide substantial and urgently needed public open space (as per the current Section 7.11 Contributions Plan), but significant funds have also been secured to upgrade two major open space and recreational facilities in close proximity to the site.

Figure 17 – Landscape Concept Plan




*Source: Urbis Landscape Architecture*

## 6.8. COMPARISON WITH HILL THALIS SCHEME

The masterplan prepared by SJB on behalf of Meriton has adopted and evolved some of the elements of the Hill Thalis concept scheme (see **Figure 18**) at Council's request. These have been tested and built upon to exceed the performance of the Hill Thalis scheme in the following ways:

- The streetscape layout and setbacks from the street frontages have largely been adopted from the Hill Thalis scheme. The proposed design and width of the road reserves outlined in the Hill Thalis concept plan have also been adopted.
- The location of the north-south public open space.
- Provision of a centrally located civic open space.
- Lower scale buildings along the northern portion of the site, with buildings up to 20 storeys within the less sensitive pockets of the site towards the south and west.

Key differences adopted in the SJB concept plan, which are considered to provide a superior urban design outcome:

- The proposal has introduced podiums to the majority of the buildings consistent with the design approach within the southern portion of the BATA site. The podiums will accommodate above-ground car parking sleeved with apartments and elevated communal open space to maximise solar access. The inclusion of the podiums accounts for the significant variation between the proposed FSR of the Hill Thalis scheme (1.8:1) and the SJB scheme (2.35:1).
- Building orientations and heights have been rationalised to improve efficiency, maximise solar access, natural ventilation, outlook and to ensure building depths will support a range of apartment layouts.
- Car parking will largely be accommodated within the podium levels to avoid the need for excessive excavation and fill.
- The increased building separations remove the need for non-habitable building facades across the entire site.
- Two storey townhouses have been introduced along the Heffron Road frontage to improve the interface with the low density residential area to the north.
- The height of buildings along the Bunnerong Road frontage have been reduced to minimise overshadowing to the residential properties to the east.
- The access point to Banks Avenue and Heffron Road have been deleted as they are not supported on traffic grounds (see **Appendix D)**.
- All existing buildings within the site will be demolished, however where possible the heritage values will be recognised through an interpretation strategy (refer **Section 8.3.2**)
- The extent of public open space has been increased from 20% of the site area contemplated by Hill Thalis to 23% of the site area in the SJB scheme.

Figure 18 – Hill Thalis Preferred Concept Plan




*Source: Hill Thalis*

## 6.9. PUBLIC BENEFIT OFFER

Under Section 7.4 of the EP&A Act, a proponent may enter into a VPA where a change is sought to an environmental planning instrument, under which the developer agrees to dedicate land, pay a monetary contribution and/or provide any other material public benefit in association with the change to the environmental planning instrument.

At the Council Meeting on 8 August 2018, Council resolved to draft a VPA in relation to the site to deliver the following public benefits:

- Dedication of Affordable Housing Units with a total of 100 bedrooms;
- A single monetary contribution of $23.9 million; and
- Dedication of approximately 20,000sqm of public open space and all public roads.

The proponent is finalising the documentation for the Voluntary Planning Agreement with Council. The finalised VPA will be exhibited concurrently with this Planning Proposal.

# 7. REQUEST TO PREPARE A PLANNING PROPOSAL

## 7.1. OVERVIEW

This Planning Proposal has been prepared in accordance with Sections 3.33(1) and (2) of the EP&A Act with consideration of DPE's *A guide to preparing Planning Proposals* (August 2016).

Accordingly, the Planning Proposal is addressed in the following four parts:

- **Part 1** – A statement of the objectives or intended outcomes.
- **Part 2** – An explanation of the provisions that are to be included in the proposed LEP.
- **Part 3** – The justification for those objectives, outcomes and the process for their implementation.
- **Part 4** – Maps, where relevant, to identify the intent of the Planning Proposal and the area to which it applies.
- **Part 5** – Details of community consultation for the Planning Proposal.
- **Part 6** – Project timeline.

## 7.2. PART 1 – OBJECTIVES OR INTENDED OUTCOMES

The objectives and intended outcomes of the Planning Proposal are:

- Enable the rezoning of the former BATA site at 128 and part 130-150 Bunnerong Road to an R4 High Density Residential Zone under the BBLEP 2013.
- Enable a maximum floor space ratio of 2.35:1 to apply to the site under the BBLEP 2013.
- Enable maximum building heights of RL 37.0, RL 60.0 and RL 91.0 to apply to portions of the site under the BBLEP 2013.
- Introduce a new Additional Local Provision at Clause 6.12 of the BBLEP 2013 requiring the preparation of a development control plan for the subject site.
- Permit 'commercial premises', 'recreation facility (indoor)' and 'serviced apartment' with development consent on the site, notwithstanding that these uses are prohibited under the R4 Zone. Non-residential uses across the site must have a minimum total floor space of 5,000sqm.

A conceptual design for redevelopment of the site has been prepared and is discussed in **Section 6.** The scheme will be refined as part of the DA process once the Planning Proposal has been endorsed by Council and the LEP amendment gazetted.

## 7.3. PART 2 – EXPLANATION OF THE PROVISIONS

The objectives and intended outcome of this Planning Proposal can be achieved by:

- Amending the BBLEP 2013 Land Zoning Map for the site from part R3 Medium Density Residential and Part IN1 General Industrial to R4 High Density Residential.
- Amending the BBLEP 2013 Height of Buildings Map for the site from part 11m, part 17m, part 28m and part 32m to allow a maximum permissible height of part RL 37.0, part RL 60.0 and part RL 91.0.
- Amending the BBLEP 2013 FSR Map for the site from 1:1 to 2.35:1.
- Introduce a new Additional Local Provision at Clause 6.12 of the BBLEP 2013:

  ***6.12 Development requiring the preparation of a development control plan***

  *(1) The objective of this clause is to ensure that development on certain land occurs in accordance with a site-specific development control plan.*

*(2) This clause applies to the land known as Lot 1 DP 1187426 and part Lot 2 DP 1236250, also known as 128 and part 130-150 Bunnerong Road, Pagewood.*

*(3) Development consent must not be granted for development on land to which this clause applies unless:*

*(a) a development control plan that provides for the matters specified in subclause (4) has been prepared for the land, or*

*(b) guidelines and controls similar to those mentioned in subclause (4) already apply to the land, or*

*(c) the development is of a minor nature and is consistent with the objectives of the zone in which the land is situated.*

*(4) The development control plan must consider for all of the following:*

*(a) design principles drawn from an analysis of the site and its context,*

*(b) the compatibility of the proposed development with the desired future character of the area,*

*(c) phasing of development and how it will provide for the social and recreational needs of a new community,*

*(d) distribution of land uses, including open space (its function and landscaping) and environment protection areas,*

*(e) the existing and proposed mix of land uses,*

*(f) subdivision pattern and provision of services,*

*(g) building envelopes and built form controls, including bulk, massing and modulation of buildings,*

*(h) housing mixes and tenure choices, including affordable and adaptable housing,*

*(i) heritage conservation, including both Aboriginal and European heritage,*

*(j) encouraging sustainable transport, including increased use of public transport, walking and cycling, road access and the circulation network and car parking provision, including integrated options to reduce car use,*

*(k) overall transport hierarchy showing the major circulation routes and connections to achieve a simple and safe movement system for private vehicles, with particular regard to public transport, pedestrians and cyclists,*

*(l) improvements to the public domain,*

*(m) minimising adverse impacts on adjoining buildings or the public domain,*

*(n) achieving appropriate interface at ground level between buildings and the public domain,*

*(o) whether the proposed development has an adverse impact on view corridors,*

*(p) the application of the principles of ecologically sustainable development,*

*(q) environmental impacts, such as overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity,*

*(r) environmental constraints, including, acid sulfate soils, flooding, groundwater, stormwater, aircraft movement and noise, contamination and remediation,*

*(s) opportunities to apply integrated water sensitive urban design.*

*(t) No additional overshadowing will occur to the residential buildings in the R2 zone on the eastern side of Bunnerong Road between 9am and 3pm in mid-winter.*

- Introduce a new clause at Schedule 1 Additional Permitted Uses of the BBLEP 2013:

  Use of certain land at 128 and part 130-150 Bunnerong Road, Pagewood

(1) This clause applies to land at 128 and 130-150 Bunnerong Road, Pagewood, being Lot 1 in DP 1187426 and Lot 24 in DP 1242288 and identified as "X" on the Additional Permitted Uses Map.

(2) Development for the purposes of *'commercial premises'*, *'recreation facility (indoor)'*, and *'serviced apartment'* are permitted with development consent. Non-residential uses must have a minimum total floor space of 5,000sqm.

The proposed changes to the zoning, maximum height of building and maximum FSR maps are illustrated in the figures provided at **Appendix J**.

These amendments will support the development of the site for high-density residential purposes and is consistent with the preliminary concept plan and achieves the key objective and intent of this Planning Proposal request.

It is considered that the proposed amendments to the BBLEP 2013 are the best, most efficient and time effective approach to delivering the intended outcome of the proposal.

Once the Planning Proposal has been endorsed by Council and the LEP amendment gazetted, Meriton intends to refine the masterplan as part of a future concept DA in accordance with Section 4.22 of the EP&A Act. Consistent with the concept Stage 1 Consent of the BATA site, it is anticipated that the concept DA will specify the subdivision layout, land uses, maximum yield and building envelopes.

# 8. PART 3 - JUSTIFICATION

## 8.1. SECTION A – NEED FOR THE PLANNING PROPOSAL

### 8.1.1. Question 1: Is the Planning Proposal a result of any strategic study or report?

The Planning Proposal is not the direct result of a strategic study or report for the site. Rather, this proposal builds on:

- Earlier Council / BATA initiated work that commenced some years ago that led to the rezoning of former Lot 2 in June 2013.
- A long-standing recognition and dialogue that has existed between Meriton and Council since Meriton's initial acquisition of former Lot 2 in 2013 and subsequent acquisition of Lot 1 in 2015 from BATA that is reflected in Council's own engagement of Hill Thalis to investigate the high density residential redevelopment potential of the site.

The Planning Proposal seeks to rezone the site in response to an identified development opportunity that is now strongly aligned with state and regional strategic documents that set out goals to respond to housing demand and to locate new infill housing close to public transport and existing infrastructure and jobs. These documents include the following:

- *A Metropolis of Three Cities - the Greater Sydney Region Plan;*
- *Eastern City District Plan; and*
- *Botany Bay Planning Strategy 2031.*

Further detail in respect of the alignment with these documents is set out in **Section 8.2**. As highlighted in the Gateway Determination Report, which allows the Planning Proposal to proceed, DPE prepared a briefing report to the Sydney Eastern City Planning Panel noting the strategic and site-specific merit of the planning proposal.

### 8.1.2. Question 2: Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

A Planning Proposal is the only means of achieving the objectives and intended outcomes for the site as the proposed residential uses are prohibited within the existing IN1 General Industrial Zone. An amendment to the height of building and FSR standards is also required to accommodate a high-quality design outcome, which responds to the site and wider locality.

The existing industrial location is an isolated parcel of land that generates little employment and provides a less desirable interface for the amenity of adjoining and surrounding residential uses.

Without an amendment to the planning controls, the opportunity to redevelop this strategic site and make a substantial contribution to the Eastern City District's current dwelling target and increase the range of accommodate available within the locality will be lost. Furthermore, retaining the IN1 Zoning has the potential to create land use conflicts between industrial operations and the proposed development envisaged as part of the Stage 1 Consent for the southern portion of the former BATA site.

The site is a logical and appropriate place to concentrate future growth within the LGA being within an area designated for urban growth and infill development (namely an identified strategic centre) and conveniently located near to facilities and public transport infrastructure.

## 8.2. SECTION B – RELATIONSHIP TO STRATEGIC PLANNING FRAMEWORK

DPE's Planning Circular (PS 16-004) notes that a key factor in determining whether a proposal should proceed to Gateway determination should be its strategic merit and site-specific merit. It is considered that the Planning Proposal meets these tests as outlined in the following sections.

### 8.2.1. Question 3: Is the Planning Proposal consistent with the objectives and actions of the applicable regional, sub-regional or district plan or strategy (including any exhibited draft plans or strategies)?

***a) Does the proposal have strategic merit?***

The strengthened strategic merit test requires that a planning proposal demonstrate strategic merit against at least one of the three criteria.

***Consistent with the relevant district plan, or corridor/precinct plans applying to the site, including any draft regional, district or corridor/precinct plans released for public comment.***

The Planning Proposal is consistent with the relevant objectives of the Region Plan as discussed in **Table 3**.

Table 3 – Assessment of Planning Proposal against the Relevant Objectives of the Greater Sydney Region Plan

| Relevant Objectives | Planning Proposal Response |
|---|---|
| **Liveability** | |
| Objective 6: *Services and infrastructure meet communities' changing needs.* | The proposal will provide direct benefits for future residents and the broader community and accords with this objective by:<br>• The inclusion of two child care centres (1,200sqm), each accommodating 75 children.<br>• Provision of a permeable network of connected open spaces providing active and positive recreation facilities. The open space has a combined area of approximately 20.208sqm that will be accessible and useable by the incoming community.<br>• Provision of on-site commercial services and complementary uses (minimum 5,000sqm as per Gateway Determination) to accommodate the day-to-day needs of residents and encourage active transport around the site.<br>• Provision of space for the extension of existing public bus services and large setbacks to main roads to allow for potential future light rail services. |
| Objective 7: Communities are healthy, resilient and socially connected. | The site forms part of the proposed Eastgardens – Maroubra Strategic Centre, which provides opportunities for future residents to access a wide range of retail, community facilities and services within easy walking distance. The strategic centre is serviced by an extensive bus network, which will link to the CBD/SE light rail at Kingsford. The site is also within planned corridors for light rail and metro rail extension under the 2056 Transport Strategy.<br>The proposal also reflects an opportunity to integrate the open space network with adjoining open spaces external to the site, which will also enhance pedestrian and cycling opportunities as part of a wider green grid. |
| Objective 10: *Greater housing supply.* | The broader BATA site covers an area of over 16.5ha and represents the largest privately-owned landholding in the Eastern City District of Sydney immediately available for development. The Stage 1 Consent together with the current proposal has the capacity to generate approximately 3,700 new dwellings, thereby providing an opportunity to make a substantial contribution to supply of housing to meet the NSW Government's target of 157,500 new homes in the Eastern City District by 2036. In addition, the Proponent is committed to delivering 100 beds of affordable housing as part of a VPA to be negotiated with Council.<br>The Region Plan recognises that accommodating the housing supply in the right locations will create more liveable neighbourhoods and support Greater Sydney's |

| Relevant Objectives | Planning Proposal Response |
|---|---|
| | growing population. The subject site satisfies the proposed locational criteria for urban renewal investigation opportunities, noting the siting within a designated strategic centre and within the walking catchment of high frequency bus routes and planned major transport corridors. |
| Objective 11: *Housing is more diverse and affordable.* | Redevelopment of the site will provide approximately 2,015 new dwellings and accommodate a mix of unit types including one, two and three-bedroom units, with adequate provision of on-site services and facilities (i.e. retail, open space, pools, gyms, saunas etc).<br><br>The existing housing supply in the surrounding area is characterised by low-density residential dwellings in suburb settings. The proposal therefore provides an opportunity to further diversify housing options in the area through the delivery of high-density housing in a readily accessible location. The masterplan also has the potential to accommodate seniors housing in the form of ILUs, thereby allowing older members of the community to 'age in place'.<br><br>The Region Plan also aims to implement the Affordable Rental Housing Target as part of planning proposals or strategic plans for new urban renewal or greenfield areas. Discussions between Meriton and Council regarding the provision of affordable housing as part of this Planning Proposal are ongoing. |
| **Productivity** | |
| Objective 14: *A metropolis of three cities – integrated land use and transport creates walkable and 30-minute cities.* | A key aim of the Region Plan is the notion of three '30-minute' cities, with jobs, shops and services in well-located centres with efficient transport connections and convenient walking and cycling routes. The subject site has good access to public transport, with high frequency bus routes stopping on Bunnerong Road near the site and at the major transport interchange at Westfield Eastgardens, providing access to the CBD/SE light rail and direct to Mascot Station (refer Transport Impact Assessment prepared by Arup).<br><br>The proposal expands the urban renewal occurring within the southern portion of the former BATA site and is considered to form part of a planned strategic centre designated for urban growth. The site is conveniently located near to a range of retail, services and public transport and within 30 minutes travel time of significant employment opportunities, including:<br>• Sydney's CBD;<br>• Banksmeadow employment area that connects through to the Port Botany precinct; and<br>• Sydney Airport and surrounding employment land.<br><br>The Region Plan makes reference to Future Transport 2056 and in particular, the vision for the Greater Sydney mass transit network. This vision identifies the potential extension of a new train/mass transit corridor to Maroubra Junction and Malabar. As outlined earlier, Meriton, in liaison with the former Botany Bay Council and Randwick Council, has approached the NSW State Government to consider extending the current CBD and South East Light Rail to Maroubra Junction and on to the subject site. The masterplan that accompanies the Planning Proposal makes an allowance for light rail along the Heffron Road frontage. |

| Relevant Objectives | Planning Proposal Response |
|---|---|
| Objective 22: *Investment and business activity in centres.* | This objective recognises that strategic centres will be well-connected and enable the community to access a wide range of goods, services and jobs.<br><br>The redevelopment of the broader BATA site will create a vibrant and sustainable residential community close to existing and planned public transport infrastructure and will contribute to the growth of the Eastgardens–Maroubra Junction Strategic Centre.<br><br>As outlined in the Gateway Determination, the Planning Proposal is to include a minimum of 5,000sqm of commercial floor space. Whilst this is discussed in more detail in **Section 6.3**, the non-residential uses envisaged for the site are expected to complement (and not compete) with the nearby Westfield Eastgardens site. These uses will also increase employment opportunities within the site and provide additional services and amenities for future residents and the surrounding community. |
| Objective 23: *Industrial and urban services land is planned, protected and managed.* | The Planning Proposal does not directly align with this objective as it seeks to rezone industrial zoned land to high density residential. However, the Gateway Determination considers this inconsistency to be justified and states:<br><br>*"The planning proposal is considered justifiably inconsistent with this Direction as the proposal will enhance economic activity and create employment opportunity on the site, contributing to the viability of the strategic centre."*<br><br>It is also noted that Council engaged Hill PDA to review the Planning Proposal which concluded that:<br><br>*"Overall there is sufficient justification to rezone the Subject Site to allow for mixed used predominantly residential development given the existing or potential land conflicts with residential to the north, south, east and west and given the site's proximity to major amenities (i.e. Westfield Eastgardens), employment hubs and education establishments.*<br><br>*The only issue is our analysis shows that rezoning the Subject Site would result in the loss of 6 hectares of industrial land in Bayside LGA. Despite this the site is not proximate to the ports area and it is surrounded by residential on all sides."*<br><br>The minimum 5,000m² of non-commercial uses/serviced apartment and seniors housing will generate more jobs than would be provided on the site under the existing industrial zoning. In addition, the on-going use of the site for industrial purposes would conflict with existing and planned surrounding land uses.<br><br>A review of the proposal's against section 117 Direction 1.1 Business and Industrial Zones is discussed in more detail in **Section 8.2.4**. |

The Planning Proposal is also generally consistent with the relevant planning priorities of the District Plan as discussed in **Table 4**.

Table 4 – Assessment of Planning Proposal against the Relevant Planning Priorities of the Eastern City District Plan

| Relevant Planning Priority | Planning Proposal Response |
|---|---|
| **Liveability** | |
| Planning Priority E3: *Providing services and social infrastructure to meet people's changing needs.* | The planning priority focuses on providing services and social infrastructure to meet the changing needs of the population. In particular, the District Plan has identified an expected 20% increase in the number of children ages 0-4 who live in the Eastern City District, with 25% of the growth anticipated in LGA. The proposal makes provision for two child care centres and will therefore make a positive contribution to meeting the demand for child care services.<br><br>The planning priority also recognises that more compact housing in walkable neighbourhoods will create opportunities for older people to downsize within their community. The proposal will accommodate a mix of one, two and three-bedroom units and potentially seniors housing, and is within a highly accessible location, adjacent to Westfield Eastgardens. A broad range of retail, community facilities and services will therefore be readily available within walking distance. |
| Planning Priority E5: *Providing housing supply, choice and affordability with access to jobs and services.* | As mentioned previously, the broader site) would generate approximately 3,700 dwellings, just under 3% of the overall target for the Eastern City District. In addition, the current proposal would represent 19.8% of Bayside LGA's five-year housing target (10,150 dwellings) expressed in the District Plan.<br><br>The apartment sizes and potential seniors housing envisaged across the site will provide housing choice and cater to a range of households, including older members of the community looking to downsize.<br><br>Consistent with the Region Plan, a proportion of new floorspace dedicated to affordable housing will be provided. Discussions between Meriton and Council regarding the provision of affordable housing as part of the development are ongoing. |
| Planning Priority E6: *Creating and renewing great places and local centres, and respecting the District's heritage.* | Consistent with this planning priority, the Planning Proposal will facilitate the redevelopment of underutilised land into a vibrant and sustainable neighbourhood. The concept plan identifies a mixed use development designed around a network of public open spaces and a civic square with a minimum of 5,000sqm non-residential floorspace that will activate and provide engaging spaces for the community. The proposal may also deliver serviced apartment accommodation and possibly seniors housing which will further contribute to the vibrancy of the site.<br><br>Public access to the site has historically been limited given its industrial use and therefore the transfer of a substantial part of the site to public land would allow appreciation of the site's values and create substantial new opportunities for active and passive recreation in the area that could recognise the former uses of the land. |
| **Productivity** | |
| Planning Priority E10: *Delivering integrated land use* | This has been discussed previously under the Region Plan (Objective 14) in **Table 3**. The proposal accords with the actions aimed at delivering a 30-minute city and is readily accessible to significant employment opportunities, including Sydney CBD. As mentioned previously, the site has good access to public transport, with high frequency |

| Relevant Planning Priority | Planning Proposal Response |
|---|---|
| *and transport planning and a 30-minute city.* | bus routes stopping on Bunnerong Road near the site and at the major transport interchange at Westfield Eastgardens, providing bus priority services direct to the CBD as well as direct access to CBD/SE light rail and Mascot Station. The site may also benefit from the future extension to the Sydney Metro West extension shown in the Transport Strategy 2056.<br><br>As outlined in the Transport Impact Assessment (prepared by Arup) the road network surrounding the site is expected to cope with the proposed residential development.<br><br>Given the site is proposed to be located within a planned strategic centre, which will be a focus of public transport investment as stated in the District Plan, it is expected that there will be more services/facilities and transport options in the future to support the surrounding growth and proposed development. |
| Planning Priority E11: *Growing investment, business opportunities and jobs in strategic centres.* | This planning priority recognises that strategic centres provide services, jobs and places for communities and states that their vitality and viability is important to the local economy. The District Plan also states that the Eastern City District will need to accommodate 1.77 million sqm of additional retail floor space over the next 20 years and there will be significant demand for additional office floor space.<br><br>The site's location within the Eastgardens-Maroubra Junction Strategic Centre provides an opportunity to generate additional employment opportunities and deliver complementary land uses to the proposed residential development. In response, the Planning Proposal has been revised to make allowance for 5,000sqm of non-residential commercial floorspace, which together with the proposed child care centre equates to an estimated 330 direct and 190 indirect jobs.<br><br>The 342 direct ongoing jobs delivered by the Planning Proposal constitute 16%-31% of the estimated 1,100-2,100 jobs (2016-36) of the Eastgardens-Maroubra Junction Strategic Centre outlined in the District Plan. The direct ongoing jobs also represent a 2,180% increase on the 15 jobs currently provided on the site under its existing use as outlined in **Appendix B**. |
| Planning Priority E12: *Protecting industrial and urban services.* | This has been discussed previously under the Region Plan (Objective 23) in **Table 3**. |
| **Sustainability** | |
| Planning Priority E18: *Delivering high quality open space.* | This planning priority highlights that there are few opportunities to increase the quantity of public open space and notes that high density neighbourhoods need to have high quality open space within close proximity for recreation and to support social networks and create a sense of community. To achieve this, the actions aim to investigate opportunities for all high-density development to be located within 200m of quality open space.<br><br>As discussed in more detail in **Section 6.7**, the proposed development will provide approximately 20,208sqm of publicly accessible open space. The open space provided on-site will be centrally located within easy access of the community, and provide high quality areas for passive recreation, which complement the surrounding land uses. In addition to the 2.5ha of open space in the original development, the broader precinct |

| Relevant Planning Priority | Planning Proposal Response |
|---|---|
| | will deliver over 4ha of new publicly accessible open space on a site that has been closed to the public for many decades. |

**Consistent with a relevant local council strategy that has been endorsed by the Department.**

The 2031 Strategy adopted by Council in 2009 provides a framework for growth and development over a 25-year period and informed the preparation of the BBLEP 2013.

The 2031 Strategy addresses key employment and dwelling targets identified within *A Plan for Growing Sydney* (now replaced with the Region Plan) and the East Subregional Strategy (now replaced with the Eastern City District Plan). This Strategy identifies a target of 6,500 additional dwellings within the Botany Bay LGA by 2031, however the analysis highlights that:

> *"Only around 108 hectares of the LGA is unconstrained land… a notional capacity of around 3,000 additional dwellings is identified. This falls well short of the target of 6,500. After excluding constrained land, the settings under the existing development controls do not provide sufficient capacity to meet the target."*

Notably, the 2031 Strategy which identifies this "planning gap" was prepared whilst the BATA facility was still operational but does acknowledge (at the time) of its longer term "conversion" potential:

> *"The British American Tobacco industrially zoned site to the north of the shopping centre is large. However, it is actively used and there is no particular need for it to be converted to alternative uses at this time. There is potential for conversion in long-term." (p.58)*

Subsequent actions by Council to rezone former Lot 2 and this current proposal to rezone Lot 1 reinforce the arguments that residential intensification within the LGA is required to meet this dwelling target.

Housing targets have been reviewed as part of the District Plan and in response to the amalgamation of Botany Bay and Rockdale Councils, the 2016-2021 housing target for Bayside is 10,150 new dwellings, further exacerbating the already acknowledged "gap". As indicated previously, the proposed development has the potential to make a significant and positive contribution to this five-year target.

The proposal is also entirely consistent with the strategic vision for Eastgardens as outlined in the 2031 Strategy, which envisaged a mixed-use centre in the long term, once BATA had vacated the land.

**Responding to a change in circumstances, such as the investment in new infrastructure or changing demographic trends that have not been recognised by existing planning controls.**

The site was not rezoned in entirety in 2013 because BATA retained an operational (albeit scaled back) presence on the site. It was considered at the time that a staged approach was most appropriate. The earlier rezoning (and subsequent Stage 1 Master Plan Consent) also sought to manage the interface between residential uses within Urban Blocks 1 and 2, and the remaining BATA operations. The withdrawal of industrial operations at the site by BATA and subsequently disposal of the site to Meriton therefore provides an opportunity to reconsider and integrate the entire northern portion of the BATA site (north of Meriton Boulevard).

The change in approach to height and built form is also in response to the site being within a new strategic centre (under the District Plan), near to planned infrastructure investment (light rail or bus rapid to Maroubra Junction) and the increased housing targets for the LGA.

**Summary**

It is considered that the Planning Proposal meets the relevant criteria of the strategic merit test as it is entirely consistent with the Region Plan and associated District Plan. Furthermore, the Planning Proposal is a clear response to a change in circumstances as the existing provisions do not align with the new designation of Eastgardens-Maroubra Junction as a strategic centre with the site being an important opportunity to provide appropriate high-density housing within a district centre.

***b) Does the proposal have site-specific merit?***

In addition to meeting at least one of the strategic merit criteria, a planning proposal is required to demonstrate site-specific merit against the following criteria:

Table 5 – Site-Specific Merit Test

| Criteria | Planning Proposal Response |
|---|---|
| Does the planning proposal have site-specific merit with regard to:<br><br>*the natural environment (including known significant environmental values, resources or hazards)?* | There is no environmentally sensitive land or land with significant biodiversity value on or surrounding the subject site that will be affected by the proposed rezoning. Furthermore, there are no environmental constraints or hazards of such significance that would precluded the redevelopment of the site for residential purposes. |
| Does the planning proposal have site-specific merit with regard to:<br><br>*the existing uses, approved uses and likely future uses of land in the vicinity of the land subject to a proposal?* | It is considered that the Planning Proposal has site-specific merit with regard to existing, approved and future uses in the vicinity of the site as follows:<br><br>• As outlined in the Economic Impact Assessment at **Appendix B**, the subject site does not have the locational attributes to support industrial users that appeal to a local customer base, or the transport accessibility to appeal to growing industrial sectors such as freight and logistics. The interface with existing and proposed residential uses further reduces the ongoing viability of industrial uses within the site.<br><br>• The proposed rezoning will expand the approved urban renewal occurring on the balance of the former BATA site in accordance with the strategic directions in Council's 2031 Strategy.<br><br>• The proposal will create a vibrant and sustainable residential community close to existing and planned public transport infrastructure and will contribute to the growth of the Eastgardens–Maroubra Junction Strategic Centre.<br><br>• The indicative built form layout maintains the reduction in building heights towards the northern portion of the site in response to the existing low density residential development north of Heffron Road.<br><br>• The proposed open spaces will provide improved amenities for existing residential properties surrounding the site.<br><br>The Gateway Determination confirmed the proposal has site specific and strategic planning merit that aligns with key state, district and local strategic planning policies. |
| Does the planning proposal have site-specific merit with regard to:<br><br>*the services and infrastructure that are or will be available to meet the demands arising from the proposal and any proposed financial arrangements for infrastructure provision?* | The Due Diligence Report prepared by AT&L and provided at **Appendix C** confirms that the site is serviced by existing water, sewer and electricity that is readily available and can accommodate the intended outcome of the Planning Proposal.<br><br>This report also demonstrates that a stormwater management system can be provided for the proposed development and can achieve the target requirements for Council, Sydney Water and BASIX.<br><br>Intersection upgrades have recently taken place for Bunnerong Road/Heffron Road as part of the Stage 1 Consent for the former Lot 2. There are also new traffic lights proposed at the Meriton Boulevard/Bunnerong Road intersection and the roundabout at |

| Criteria | Planning Proposal Response |
|---|---|
| | the Banks Avenue/Heffron Road. These intersection improvements are considered adequate to accommodate the redevelopment of the subject site.<br><br>The site will provide for a hierarchy of new access roads to service future development and therefore, suitable infrastructure is available to meet the demands arising from the proposal. Furthermore, any future development would be subject to s7.11 contributions as applicable to the site.<br><br>Based on the supporting technical studies as well as the opportunity for VPA / s7.11 contributions, it is considered that the Planning Proposal has site-specific merit with regard to the services and infrastructure that are or will be available to meet the needs for the site. |

### 8.2.2. Question 4: Is the Planning Proposal consistent with a council's local strategy or other local strategic plan?

As discussed previously in **Section 8.2.2**, it is considered that the Planning Proposal is consistent with the key directions of Council's 2031 Strategy and will make a significant contribution to Council's five year housing target.

### 8.2.3. Question 5: Is the Planning Proposal consistent with applicable State Environmental Planning Policies?

The Planning Proposal is consistent with all relevant State Environmental Planning Policies (SEPPs) as outlined in **Table 6**.

Table 6 – SEPP Consistency Review

| POLICY | DETAILS |
|---|---|
| SEPP 55 Remediation of Land | Clause 6 of SEPP 55 requires in the event of a change of land use, the planning authority must consider whether the land is contaminated, if the land can be suitably remediated for the proposed use and that the authority is satisfied that this remediation is sufficient for the proposed uses on the land.<br><br>The Summary of Contamination Investigations has been prepared by Douglas Partners (DP) and is provided at **Appendix F.** Whilst this report was undertaken for the previous Hassell concept plan, the conclusions remain relevant for the revised masterplan and states:<br><br>*DP considers that the site is suitable for rezoning for mixed uses (including residential), and can be made suitable for the proposed development contingent on the following additional investigations and documents being prepared and provided to Council and the Site Auditor, prior to development consent:*<br><br>• *Additional soil, groundwater and soil vapour investigations to meet the NSW EPA sampling guidelines and with reference to the intended site use as residential and to supplement the previous works undertaken from 2011-2013;*<br><br>• *Preparation of a Remediation Action Plan (RAP);*<br><br>• *Preparation of an Asbestos Management Plan (AMP);*<br><br>• *Site Remediation and Validation reporting; and* |

| POLICY | DETAILS |
|---|---|
| | • *Preparation of a Site Audit Statement (Part A).* |
| SEPP (Infrastructure) 2007 | The Infrastructure SEPP aims to facilitate the effective delivery of infrastructure across the State by (amongst other things) identifying matters to be considered in the assessment of development adjacent to particular types of development.<br><br>The proposed development is identified as traffic generating development to be referred to the Roads and Maritime Services in accordance with Schedule 3 of the SEPP.<br><br>The Transport Impact Assessment undertaken by Arup and provided at **Appendix D** concludes that the road network has been determined to handle the development traffic levels with minimal impacts to the road network. Traffic related matters are discussed in more detail at **Section 8.3.2**. |
| SEPP 65 Design Quality of Residential Flat Buildings | Future development of the land for residential purposes will need to accord with SEPP 65 and the associated ADG. Of relevance, SEPP 65 and the ADG seek to provide a framework for the consideration of design matters, including but not limited to, the following:<br><br>• Overall building orientation.<br>• Dwelling mix and sizes.<br>• Provision of private and communal open space.<br>• Solar access.<br>• Acoustic privacy.<br>• Parking.<br><br>The masterplan which forms part of this proposal have been designed to facilitate achievement of the SEPP 65 principles and 'rules of thumb' in relation to building orientation, solar access, separation distances and related controls.<br><br>Detailed compliance with SEPP 65 will be demonstrated as part of any future DA. |
| SEPP (Buildings Sustainability Index: BASIX) 2004 | The BASIX SEPP requires residential development to achieve mandated levels of energy and water efficiency.<br><br>The proposed concept has been designed with building massing and orientation to facilitate future BASIX compliance, which will be documented at the DA stage. |
| SEPP (Housing for Seniors or People with a Disability) 2004 | Any potential future development of the land for seniors housing will need to accord with the Seniors SEPP. The Seniors SEPP provides development standards, related to the following:<br><br>• Site size and frontage.<br>• Building heights.<br>• Landscaped area and deep soil zones.<br>• Solar access. |

| POLICY | DETAILS |
|---|---|
| | • Private open space.<br>• Parking.<br>It is noted that under Clause 45 of the Seniors SEPP, a consent authority may consent to a DA for the purposes of seniors housing involving a building having a density and scale (when expressed as FSR) by a bonus of 0.5 added to the GFA component of that FSR.<br>Detailed compliance with the Seniors SEPP will be demonstrated as part of any future DA for seniors housing. |

### 8.2.4. Question 6: Is the Planning Proposal consistent with applicable Ministerial Directions?

The Planning Proposal has been assessed against the Section 117 (now Section 9.1) Ministerial Directions and is consistent with each of the relevant matters, as outlined below.

Table 7 – Consistency with Section 117 Ministerial Directions

| Direction | Requirements | Comment |
|---|---|---|
| **1.1 Business and Industrial Zones** | *The objectives of this direction are to:*<br>*(a) encourage employment growth in suitable locations,*<br>*(b) protect employment land in business and industrial zones, and*<br>*(c) support the viability of identified strategic centres.* | This direction states that *'a planning proposal must not reduce the total potential floor space area for industrial uses in industrial zones.'*<br>The direction further states that:<br>*'A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning that the provisions of the planning proposal that are inconsistent are justified.'*<br>The Planning Proposal is inconsistent with this Section 117 Direction, however the inconsistency is justified in accordance with Clause (5)(b):<br>*'(b) justified by a study (prepared in support of the planning proposal) which gives consideration to the objective of this direction.'*<br>The Economic Impact Assessment undertaken by Urbis (see **Appendix B**) concludes that the former BATA site is not strategically significant industrial land and specifically highlights the following:<br>• *The subject site does not have the attributes of other stronger industrial precincts located within the Bayside Council…*<br>• *The subject site does not have the visibility to support industrial users that appeal to a local customer base, or the transport accessibility to* |

| Direction | Requirements | Comment |
|---|---|---|
| | | *appeal to growing industrial sectors such as freight and logistics.*<br>• *In addition, the Stage 1 Masterplan Consent for Lot 2 (to the south of the subject site) will create a land use conflict with the site's existing industrial use. The existing approvals also restrict apartments to limit the impact on existing residential uses on the opposite side of Bunnerong and Heffron Roads.*<br>Given the future land use conflict created by the redevelopment occurring to the south and the restricted operating hours currently applying to Lot 1 (under DA2011/272), the ability to attract and maintain viable operators will be limited. The proposed rezoning to facilitate the transformation of underutilised industrial land in a strategically important location is therefore justified and appropriate in this instance and is supported by the Gateway Determination.<br>Lot 1 is currently occupied by small scale industrial tenants on short term leases to Meriton and employ around 15 people. As discussed previously, the proposed development on the subject site is estimated to result in a significant increase in direct and indirect employment and economic activity. For instance, Meriton has advised that there are approximately 1,000 construction workers on site as of mid-2017. Approximately 342 direct and 196 indirect jobs are also expected from the operation of the commercial premises, childcare centres, and management of the residential buildings.<br>The Gateway Determination confirmed the loss of industrial lands to have strategic merit, being supported by the Hill PDA peer review of the Economic Impact Assessment which concluded:<br>*"Overall there is sufficient justification to rezone the Subject Site to allow for mixed used predominantly residential development given the existing or potential land conflicts with residential to the north, south, east and west and given the site's proximity to major amenities (i.e. Westfield Eastgardens), employment hubs and education establishments.*<br>*The only issue is our analysis shows that rezoning the Subject Site would result in the loss of 6 hectares of industrial land in Bayside LGA. Despite this the site is not proximate to the ports area and it is surrounded by residential on all sides."* |

| Direction | Requirements | Comment |
|---|---|---|
| **3.1 Residential Zones** | *The objectives of this direction are to:*<br>*(a) to encourage a variety and choice of housing types to provide for existing and future housing needs,*<br>*(b) to make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and*<br>*(c) to minimise the impact of residential development on the environment and resource lands.* | This direction applies whenever a relevant planning authority prepares a planning proposal that will affect land within any zone in which significant residential development is permitted or proposed to be permitted.<br>The proposal seeks to broaden the range of housing provided in proximity to Eastgardens and the Eastern City District more broadly, through the provision of high density residential apartments. The site is well placed to accommodate this type of housing and will make efficient use of existing services and infrastructure and assist in meeting infill housing targets, particularly around centres and transport nodes.<br>The subject site does not contain any significant flora or fauna, which would be adversely impacted by the proposed redevelopment. In addition, any future development would incorporate relevant sustainable measures. |
| **3.4 Integrating Land Use and Transport** | *The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives:*<br>*(a) improving access to housing, jobs and services by walking, cycling and public transport, and*<br>*(b) increasing the choice of available transport and reducing dependence on cars, and*<br>*(c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and*<br>*(d) supporting the efficient and viable operation of public transport services, and*<br>*(e) providing for the efficient movement of freight* | The proposal is consistent with the direction for the following reasons:<br>• The site supports the principle of integrating land use and transport.<br>• The site exhibits good access to public and private transportation use.<br>• The site's proximity to public transport will provide opportunities for residents to access the site.<br>• The proposal will provide additional employment (during construction) within the LGA within close proximity to existing services and infrastructure.<br>• The site frontage has the opportunity to accommodate a light rail stop that is being pursued by Bayside and Randwick Councils.<br>• The Proponent is already working with TfNSW to deliver new and extended bus services to the site.<br>• The Transport Strategy 2056 identifies the area will be serviced by an extension to the Sydney West Metro Line in the future. |
| **3.5 Development Near Licensed Aerodromes** | *The objectives of this direction are:*<br>*(a) to ensure the effective and safe operation of aerodromes, and* | The subject site is outside the 2029 ANEF contours and therefore, airport noise is not a constraint to the redevelopment of the site for residential purposes. |

| Direction | Requirements | Comment |
|---|---|---|
| | *(b) to ensure that their operation is not compromised by development that constitutes an obstruction, hazard or potential hazard to aircraft flying in the vicinity, and*<br><br>*(c) to ensure development for residential purposes or human occupation, if situated on land within the Australian Noise Exposure Forecast (ANEF) contours of between 20 and 25, incorporates appropriate mitigation measures so that the development is not adversely affected by aircraft noise* | The broader BATA site is subject to an Obstacle Limitation Surface (OLS) of RL 51.0.<br><br>The proposed concept plan includes buildings up to 20 storey in height (RL 91.0), which are a similar height to buildings approved as part of the Stage 1 Consent. The Stage 1 Consent is supported by an approval from the Department of Infrastructure and Regional Development under the *Airports Act 1996* (dated 23 January 2017) that allows a maximum height of 91m (AHD) for 130-150 Bunnerong Road, including Urban Blocks 1 and 2 (now forming part of the subject site).<br><br>An Aeronautical Impact Assessment has been prepared by Landrum & Brown (see Appendix I) as part of this Planning Proposal and concludes:<br><br>*Meriton has been awarded approval to construct buildings to a maximum height of 91 m AHD which will infringe Sydney Airport prescribed airspace to a maximum of 40 m.*<br><br>• *Located in the same site as the approved development, the proposed additional buildings of Pagewood – Stage II, to a maximum height of 91 m AHD;*<br><br>• *will infringe the Inner Horizontal Surface of the Sydney Airport OLS by up to 40 m, however, due to the limited use of circling approaches, does not present a significant hazard to flight operations;*<br><br>• *will not infringe the OLS of any other airport;*<br><br>• *will not infringe the Sydney Airport PANS OPS surfaces, or the PANS OPS surfaces for any other airport in the vicinity…*<br><br>*Subsequent to the grant of any approval for this development, a detailed application to Civil Aviation Safety Authority (CASA), Airservices Australia, and Sydney Airport will need to be made for the cranes (temporary obstacles) required during the building process.*<br><br>The proposed dwellings can be appropriately designed and incorporate mitigation measures (if required) to minimise adverse aircraft noise. This would be addressed at the time of detailed design. |
| **6.3 Site-Specific Provisions** | *(1) The objective of this direction is to discourage unnecessarily* | The Planning Proposal has been prepared in accordance with the provisions of the Standard Instrument and in a manner consistent with the BBLEP 2013. |

| Direction | Requirements | Comment |
|---|---|---|
| | *restrictive site-specific planning controls.* | The proposal includes site-specific additional permitted uses via Schedule 1 to create land use flexibility and address the requirements of the Gateway Determination. |
| **7.1 Implementation of A Plan for Growing Sydney** | *The objective of this direction is to give legal effect to the planning principles; directions; and priorities for subregions, strategic centres and transport gateways contained in A Plan for Growing Sydney.* | The Planning Proposal is entirely consistent with the relevant key priorities outlined for the District Plan as discussed in **Section 8.2.1**. These priorities closely align with the relevant directions of the Region Plan. |

## 8.3. SECTION C – ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACT

### 8.3.1. Question 7: Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The site is fully developed and comprises little vegetation, with the exception of mature trees lining the northern and eastern boundaries of the site. There are no known critical habitats or threatened species, populations or ecological communities located on the site and therefore the likelihood of any negative impacts is minimal.

### 8.3.2. Question 8: Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

There are not likely to be any environmental impacts associated with the future development of the land that cannot be suitably mitigated through detailed design development. The following sections address the environmental impacts.

Traffic

An analysis of the traffic and transport related considerations for the Planning Proposal are addressed in the Transport Impact Assessment prepared by Arup and provided at **Appendix D.** In summary, the assessment concludes:

- An analysis of the road network capacity has been used to estimate that the road network could sustain development with the site comprising 1,639 additional dwellings across the broader BATA site and an additional 1,000sqm retail GFA.
- Car parking for the residential component of the development is proposed based on the following rates:
  - 0.5 spaces per studio/one bedroom apartment;
  - 1 space per two bedroom apartment;
  - 1.5 spaces per three bedroom apartment; and
  - 1 space per 10 apartments for visitors.

  These rates are generally aligned with those recommended rates in the RTA Guide to Traffic Generating Development, which indicate:
  - 0.6 spaces per one bedroom apartment;
  - 0.9 spaces per two bedroom apartment; and
  - 1.4 spaces per three plus bedroom apartment.

The reduced car parking rates are considered appropriate to reduce car mode share at the development and the modified rates will be supported by proposed light rail extensions. The site is within a designated strategic centre and it is expected that there will be more services/facilities and transport options in the future to support the surrounding growth and proposed development.

- Residential bicycle parking at a rate of 10% of the car parking figure is considered appropriate for the proposed development.
- The extensive provision of walking and cycling facilities within the development will be integrated with network of walking and cycling connections surrounding the site.
- The site has good access to existing public transport, including a range of bus services. It is anticipated that an additional eight bus services during peak hours will be required to service the proposed development.
- Sustainable transport measures such as car share schemes should be considered to reduce dependency on private car usage.

Contamination

The broader BATA site has been the subject of a number of environmental investigations by DP given the previous uses of the site as an automobile assembly plant by General Motors Holden from 1939 to 1982 and then a tobacco manufacturing plant by BATA.

As discussed previously at **Section 8.2.3**, DP concluded that the site can be rendered suitable for the proposed residential uses subject to the findings of additional investigations, monitoring and validation works normally undertaken during the development application process (see **Appendix F**).

The preferred remediation strategy for the site in accordance with the NSW EPA hierarchy for remediation, involves the retention and management of contaminated soils on-site, either through relocation to less sensitive areas and/or capping. This would reduce the need to remove large volumes of soil to landfill and therefore any design strategy that supports this strategy, such as avoiding excavating the site for basements, is preferred. In addition, large excavations have the potential to impact on groundwater and make it difficult to isolate and/or manage any identified contaminated groundwater.

Geotechnical

A Geotechnical Study has been undertaken by DP (see **Appendix E)** to determine whether any further work was required to accommodate the proposed uses on the site. Whilst this report was undertaken for the previous Hassell concept plan, the results remain relevant for the revised masterplan.

The study acknowledges that excavations at the site for car parking would be feasible, however there is increasing difficulty in construction with increasing depth of excavation. There is a preference to limit the depth of excavation at the site, particularly given that excavations deeper than 3m would require the following design considerations:

- Permanent retaining wall support.
- Temporary ground anchors to support the retaining wall will be required until permanent support from the structure can be provided.
- Excavation to below or near the groundwater level will need to carry out the following:
  - Obtain approval for temporary dewatering and construction from the relevant government departments.
  - Groundwater modelling of the effect of lowering the ground level of surrounding infrastructure.
  - Temporary dewatering of the groundwater level to allow construction.
  - Off-site deposal of groundwater (subject to appropriate approvals).
  - Construction of tanked (ie. fully water-tight) basement.
  - Allowance in the design for the ground slab to withstand the applied buoyancy forces.
  - Monitoring of groundwater levels in the area before and during construction.

Having regard to the above, it is anticipated that car parking for residents and visitors will be accommodated within the podium of each building.

In summary, the geotechnical study concludes that the site is suitable from a geotechnical perspective for rezoning to mixed uses including residential, subject to the recommendations of the report being implemented in future detailed development stages.

Flooding

External flood levels are considered in the Due Diligence Report prepared by AT&L (see **Appendix C**) and will need to be addressed during the detailed design phase of any future development. It is considered that car park entry levels and ground floor levels can be appropriately designed with adequate freeboard.

Heritage

As mentioned at **Section 5.1.4**, the subject site is not a listed heritage item under the BBLEP 2013, nor is it located within a heritage conservation area. Nonetheless, the administration building in the north-east corner of the site (see **Figure 19**) was considered to have some limited historic and associative significance at a local level. The site is also located in the general vicinity of Jellicoe Park (Item 155) and Harris Reserve (Item 66).

Figure 19 – External Image of the Administration Building



A Heritage Impact Statement was prepared based on the earlier concept plan prepared by Hassell, which included the retention of the administration building and the two northern pillars to the former assembly plant. At the time, it was intended that the administration building would be dedicated to Council for ongoing community/public use. It is understood from discussions between Meriton and Council that this dedication is not supported by Council.

Given there is no statutory requirement to retain any fabric on the site from a heritage perspective, a Complying Development Certificate (CDC) was issued on 23 July 2018 for the demolition of the administration building (see **Appendix K**). Notwithstanding the CDC and in recognition of the heritage values associated with the site, an interpretation strategy and archival recording of the site has been recommended by Urbis.

It is anticipated that the interpretation strategy and archival recording will be incorporated into any future DAs for the development of the site.

Existing Vegetation

The site is predominantly cleared of all vegetation with the exception of mature trees lining the northern, eastern and western boundaries. The Preliminary Tree Assessment prepared by Jacksons Nature Works (see **Appendix G**) concludes that there is a significant opportunity to retain a large proportion of trees in and around the site as the trees are concentrated at the perimeters. Whilst it is acknowledged that some tree removal will occur as part of the future development of the site, where possible trees will be retained, and the scale of the site provided ample opportunity to replant compensatory canopy trees, shrubs and ground covers to offset any tree loss.

Summary

Overall, it is considered that the site will not result in any significant environmental effects that would preclude the LEP amendment and the ultimate redevelopment of the site for residential purposes.

### 8.3.3. Question 9: Has the Planning Proposal adequately addressed any social and economic effects?

Social Impact

The proposal will have positive social impacts on the local community and wider LGA as follows:

- The endorsed Planning Agreement will provide:
  - approximately 100 rooms of affordable housing to house local key works that may not otherwise be able to live within the local area; and
  - monetary contribution of $23.9 million, which will go towards local infrastructure and community facility upgrades, including upgrading the Botany Aquatic Centre.
- Potential to contribute approximately 2,015 new dwellings to the local housing stock. The proposed masterplan provides flexibility with the future detailed design to accommodate a variety and size of dwelling types consistent with the ADG.
- Increased diversity of housing to meet demographic and cultural change. In particular, the provision of smaller dwellings and potential seniors housing in an area characterised by detached dwellings will increase the supply and choice of well-located rental and purchase accommodation.
- Opportunity to acknowledge the historical industrial history of the site by integrating interpretive elements into a high-quality urban design outcome that responds to its context and will enhance the surrounding public domain.
- Delivery of approximately 20,208sqm in open space – including a linear open space along the entire northern edge of the site that could be integrated with potential, future light rail stops. The additional open space, which will provide excellent solar access and potential public transport, would be accessible to the existing residential neighbourhoods surrounding the site.
- Ability to 'open up' a site that has historically been closed with new mixed-use development, open space, community services and facilities, all within a permeable and accessible public domain network.
- Increased sustainability in terms of the ability to walk, cycle or use public transport to access the range of commercial activities and services available in the strategic centre of Eastgardens-Maroubra Junction, and proximity to passive and active recreational areas.
- Whilst the principles of crime prevention through environmental design (CPTED) will be considered in the detailed design of the development, design elements and opportunities for casual surveillance across podiums, public domain and open spaces will deter anti-social behaviour.

Economic Impact

As outlined in the Economic Impact Assessment at **Appendix B**, the proposal will have the following economic benefits:

- *The proposed development on the subject site is estimated to result in an increase in direct and indirect employment and economic activity (Gross Value Added – GVA).*
  - *171 direct and 531 indirect jobs from the construction of the proposed development concept resulting in gross value add of $102.6 million.*
  - *342 direct and 196 indirect jobs from the operation of the childcare and retail facilities resulting in gross value add of $57.5 million.*
- *It is worth noting that there will be peaks and troughs of actual jobs during construction. For instance, we understand from Meriton that there are approximately 1,00 construction workers on the subject site as of mid-2017.*
- *In addition, the subject site's redevelopment will accommodate an additional 2,770 local residents (as advised by SJB):*
  - *Based on the current spending profile of residents within the Bayside Council, an average spend per capita of $13,514 in $2018 is calculated.*
  - *Therefore, additional population could generate $37.4 million in retail expenditure (in $2018).*
  - *Increasing the local resident population will activate the area, providing passive security for the residents, workers and visitors of the site.*

Summary

The Planning Proposal will therefore have positive social and economic benefits for the broader community. It is considered that the proposal has addressed social and economic impacts and is in the public interest.

### 8.3.4. Question 10: Is there adequate public infrastructure for the Planning Proposal?

It is understood that the existing infrastructure and utilities at, and surrounding, the site has the capacity to accommodate development on the site, subject to any necessary expansion and augmentation at the detailed DA stage.

A range of established services are available within close proximity of the site, including health, education and emergency services networks. As part of the broader planning under the District Plans, relevant government agencies will be undertaking necessary planning for respective public facilities and infrastructure.

It is noted that the Proponent is already working with TfNSW to provide new and extended bus routes which will improve public transport services to the site.

***Question 11: What are the views of State and Commonwealth public authorities consulted in accordance with the Gateway determination?***

As required in the Gateway Determination, Council will consult with relevant public authorities including:

- Transport for NSW;
- RMS;
- NSW Ports;
- Sydney Airport Authority;
- CASA;
- Department of Education;
- Environment Protection Authority; and
- Office of Environment and Heritage.

# 9. PART 4 – MAPPING

Three maps contained within the BBLEP 2013 are proposed to be amended:

- Land Use Zoning Map 4 and Map 5.
- Floor Space Ratio Map 4 and Map 5.
- Height of Buildings Map 4 and Map 5.

These proposed map amendments are provided at **Appendix J.**

# 10. PART 5 - COMMUNITY CONSULTATION

In accordance with the Gateway Determination, Council is required to undertake community consultation. It is anticipated that the Planning Proposal will be publicly exhibited for 28 days in accordance with the requirements of the DPE guidelines A Guide to Preparing Local Environmental Plans.

It is anticipated that the public exhibition of the Planning Proposal will be notified by way of:

- A public notice in the local newspaper(s).
- A notice on the Council website.
- Written correspondence to adjoining and surrounding landowners.

The Gateway Determination and Planning Proposal will be publicly exhibited at Council's offices and any other locations considered appropriate to provide interested parties with the opportunity to view the submitted documentation.

# 11. PART 6 – PROJECT TIMELINE

The proposed indicative timeline for the project is summarised in the following table.

Table 8 – Proposed Indicative Project Timeline

| Project Milestone | Proposed Project Timeline |
|---|---|
| Anticipated commencement date (date of Gateway determination) | Completed – December 2017 |
| Anticipated timeframe for the completion of technical information if required by Gateway. | Completed – March 2018 |
| Timeframe for government agency consultation (pre and post exhibition as required by Gateway determination) | Completed – October 2019 |
| Commencement and completion dates for public exhibition period | Q4 2018 – 28 days |
| Timeframe for consideration of submissions | Q1 2019 |
| Timeframe for the consideration of a proposal post exhibition | Q1 2019 |
| Date of submission to the Department to finalise the LEP | Q1 2019 |
| Anticipated date RPA will make the plan (if delegated) | Q1 2019 |
| Anticipated date RPA will forward to the Department for notification. | Q1 2019 |

# 12. CONCLUSION

Council's 2031 Strategy foreshadowed in 2009 a significant "gap" in the ability to provide sufficient suitable land to accommodate its forecast need for housing. That gap was based partly on BATA maintaining a full operational presence across both the broader BATA site.

Since 2009:

- BATA initially scaled back its operation and in 2015 vacated the site completely.
- The entire site of some 16.5ha of land is now under the single ownership of Meriton.
- Former Lot 2 has been rezoned and is now under development.
- Lot 1 is currently occupied by small scale industrial tenants on short term leases to Meriton.
- The finalised Region Plan identifies the site in the Global Economic Corridor.
- The Eastern City District Plan has been released reflective of updated and increased population forecasts for the District and incorporating the site in the proposed Eastgardens – Maroubra Junction Strategic Centre.
- Proposals for enhanced public transport connections to the proposed Centre have advanced, with the potential to extend the CBD and South East light rail corridor onto the site highlighted.
- No other significant lands have been rezoned in the former Botany Bay LGA area to support forecast housing targets.

**The factors combined paint a compelling picture of the strategic merit to advance rezoning of the site in the manner proposed.**

The Planning Proposal has been prepared in accordance with Section 3.33 of the EP&A Act and the relevant guidelines prepared by DPE, including A Guide to Preparing Local Environmental Plans and A Guide to Preparing Planning Proposals. It sets out the justification for the proposed LEP amendments applicable to the site to allow for a high-density residential development.

The proposal provides for an intended outcome that will contribute to meeting future housing targets in the LGA and Eastern City District more broadly. The proposal is of a similar scale to, and will complement, the urban renewal occurring to the south of the site and provides for a cohesive and well-connected redevelopment across the broader BATA site. The proposed massing of development has also considered the local context, including the established, low-density community to the north.

The Planning Proposal successfully achieves a balance between good urban design whilst also recognising the benefits of facilitating high-density development adjacent to the recently designated Eastgardens-Maroubra Junction Strategic Centre. **This change in circumstance together with BATA ceasing operations (which has been anticipated for some time by Council) at the site ensures that there is site-specific merit.** The strategic and site-specific merit of the Planning Proposal was recognised in the Gateway Determination, which ensures the Planning Proposal aligns with the established state, district and local planning policies. The proposal will result in a number of important public benefits as demonstrated within this report. In summary, the Planning Proposal will:

- Enable new dwellings to be accommodated within a designated strategic centre, thereby contributing to future housing needs in the area.
- Contribute to the range of housing available within the LGA increasing housing choice and diversity.
- Facilitate the delivery and dedication of affordable housing, public roads and over 20,000sqm of open space by way of a VPA.
- Provide an opportunity to replace an underutilised industrial site with a high-quality urban design outcome that responds to its context and will enhance the surrounding public domain.
- Create a significant number of new jobs during construction and via permanent retail uses, child care and complementary uses as well as ongoing management of residential buildings (strata management

and building maintenance). The additional residential population is also able to support and strengthen the economic activities and employment base of the district centre.

- Will provide flexibility of land uses with the inclusion of the amendments to Schedule 1 Additional Permitted Uses for *seniors housing* and *'serviced apartment'*, which will add to the potential of the site to create employment.

Overall, it is considered that the Planning Proposal has strategic merit and will result in a significant net community benefit by facilitating the redevelopment of underutilised industrial land into a vibrant urban renewal area. Accordingly, Council, DPE and the Greater Sydney Commission have all endorsed the amendment to the BBLEP 2013.

# DISCLAIMER

This report is dated 5 September 2018 and incorporates information and events up to that date only and excludes any information arising, or event occurring, after that date which may affect the validity of Urbis Pty Ltd's (**Urbis**) opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of Meriton Property Services Pty Ltd (**Instructing Party**) for the purpose of Planning Proposal (**Purpose**) and not for any other purpose or use. To the extent permitted by applicable law, Urbis expressly disclaims all liability, whether direct or indirect, to the Instructing Party which relies or purports to rely on this report for any purpose other than the Purpose, and to any other person which relies or purports to rely on this report for any purpose whatsoever (including the Purpose).

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This report has been prepared with due care and diligence by Urbis and the statements and opinions given by Urbis in this report are given in good faith and in the reasonable belief that they are correct and not misleading, subject to the limitations above.

# APPENDIX A MASTERPLAN AND URBAN DESIGN REPORT

SJB Architects

# Pagewood Green (Stage 2)
## Urban Design Report and Masterplan

128 & 130-150 Bunnerong Road
Pagewood

**Prepared for**
Meriton

**Issued**
09 November 2018

Level 2, 490 Crown Street
Surry Hills NSW 2010
Australia
T. 61 2 9380 9911
architects@sjb.com.au
sjb.com.au

# We create amazing places

At SJB we believe that the future of the city is in generating a rich urban experience through the delivery of density and activity, facilitated by land uses, at various scales, designed for everyone.

Ref: #5826
Version: 10
Prepared by: KC, GS, LW
Checked by: FL, JT

Contact Details:

SJB Architects
Level 2, 490 Crown Street
Surry Hills NSW 2010
Australia

T. 61 2 9380 9911
architects@sjb.com.au
sjb.com.au

SJB Architecture (NSW) Pty Ltd
ABN 20 310 373 425
ACN 081 094 724
Adam Haddow 7188 John Pradel 7004

| Submissions | |
|---|---|
| Pagewood Green UDR and Masterplan Final Document | 30/08/2018 |
| Pagewood Green UDR and Masterplan final draft for review | 23/08/2018 |
| Pagewood Green UDR and Masterplan draft for review | 07/08/2018 |
| Pagewood Green UDR and Masterplan draft for review | 01/08/2018 |
| Pagewood Green UDR and Masterplan draft for review | 26/07/2018 |
| Pagewood Green UDR and Masterplan draft for review | 23/07/2018 |
| Pagewood Green UDR and Masterplan draft for review | 19/07/2018 |
| Pagewood Green UDR and Masterplan draft for review | 14/08/2018 |
| Pagewood Green UDR and Masterplan draft for review | 24/08/2018 |
| Pagewood Green UDR and Masterplan final for lodgement | 03/09/2018 |

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# Introduction

1

## Introduction

### 1.1 Purpose of the Report

This Urban Design Report (UDR) has been prepared for Meriton in support of the Planning Proposal and provide an indicative layout for a future Stage One Development Application of Pagewood Green Stage II. Outlined in this report is the design rationale that underpins the site layout, built form, public domain and future land uses.

A specialist consultant team has been brought together by Meriton to provide technical expertise for the Stage One Development Application that includes; Architecture and Urban Design by SJB; Landscape Architecture and Town Planning by Urbis; Traffic Engineering by ARUP; and Civil Engineering by AT&L. SJB has included the relevant information from each consultant in the UDR.

The Pagewood Green Stage II masterplan is located on the former British American Tobacco Australia (BATA) manufacturing facility on the corner of Heffron and Bunnerong Roads in Pagewood. The Site has an area of 8.95ha and is located within a broader site that comprises a parcel of land known as 128 and 130-150 Bunnerong Road Pagewood.

Pagewood Green Stage I consists of the remaining area of the site to the south and was subject to a separate development application. Stage I is currently under construction and consists of multiple high-density residential apartment buildings, associated retail, child care and a large open space. Principles established in the Stage 1 plan have been reflected in this UDR to maintain consistency and ensure the site is contextually appropriate.

The UDR is broken down into a process that is consistent with a 'design-led' approach to masterplanning. Design-led planning is an approach that is place based and people focused, creating a new neighbourhood where future residents can live, work and play. The UDR provides a legible public domain and active interface with the built form, that will form the bones of a vibrant community in the future.

The appropriate information to support the masterplan is contained in the report, and includes the following:

- An understanding of the planning policy, site and context analysis
- A Vision and Design Principles that will inform the future character, quality of development and underpin the design response
- A masterplan, that configures the built form and public open space for the site
- Calculation of yields, dwelling sizes, building types, floor areas and FSR
- An assessment of the scheme that quantifies solar access to the site

This UDR has consolidated the much of relevant information and context provided in previous masterplans prepared for the site by HASSELL (2016, 2017) and subsequent reviews by Hills Thalis (2016, 2017) at the request of council. SJB believe that the process of building upon existing work and the iterative process that has taken place, has led to a masterplan that has a highly refined and justified outcome.



Stage I Masterplan approved by council






View accross Stage II site toward Sydney CBD



Stage I UB5W development

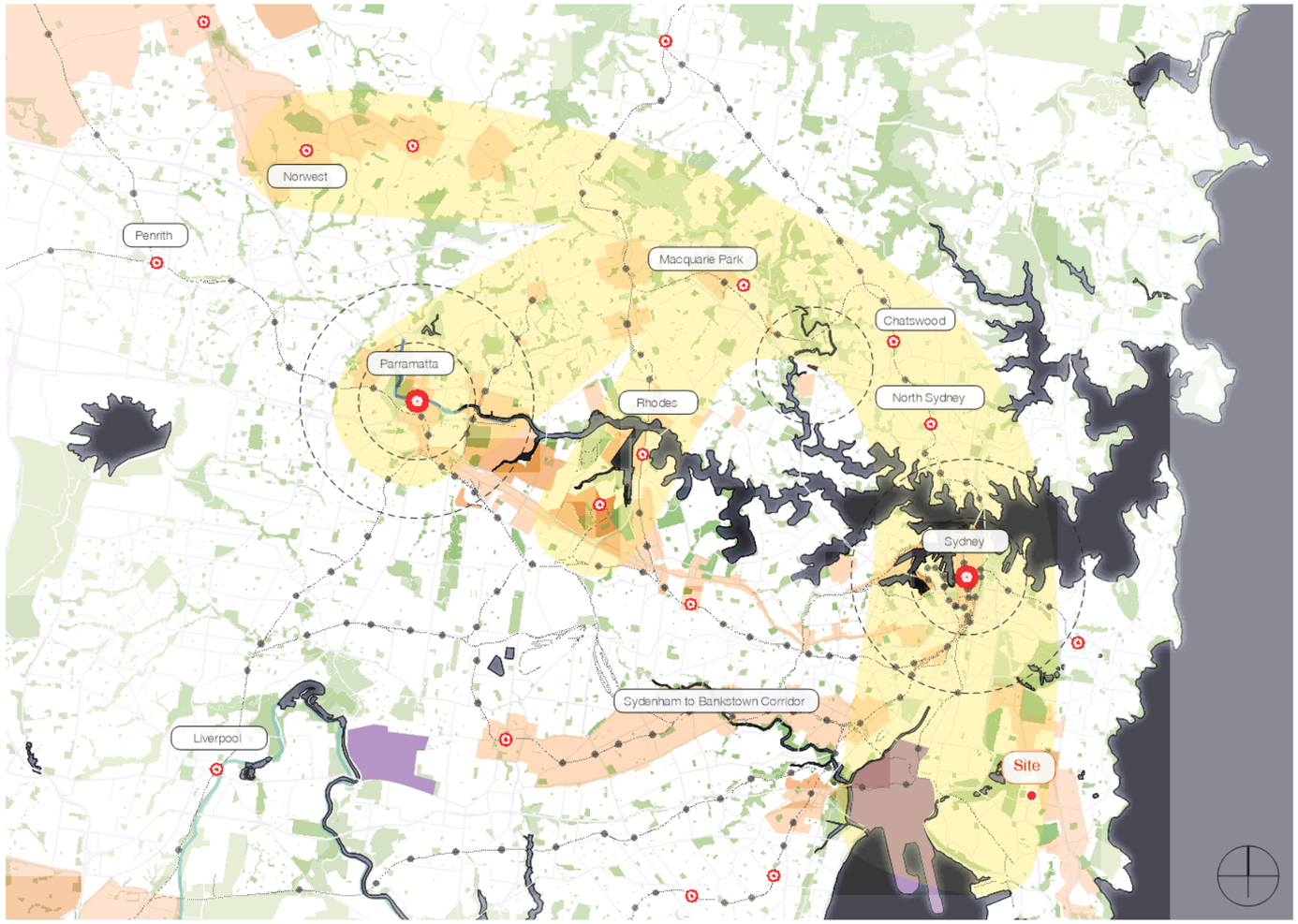
## Introduction

### 1.2 Regional Context

**The Global Economic Corridor**

The Pagewood Green Stage Two site is strategically located for redevelopment. It is recognised by past and current regional plans, including 'A Plan for Growing Sydney' and 'The Greater Sydney Regional Plan' as part of the Global Economic Corridor (GEC). The plans outline the importance of identifying opportunities for increased residential density and renewal in strategic locations.

The GEC extends from the surrounding vicinity of the site, which includes Port Botany and Sydney Airport, through Sydney CBD to the Norwest Business Park, and includes centres such as Chatswood and Bondi Junction, the Strategic Centres of St Leonards and Macquarie Park, four large universities and major health and entertainment precincts.



## Introduction

### 1.3 Strategic Context

#### Greater Sydney Regional Plan

The subject site is situated within the scope of the Eastern City District Plan, which is part of the Eastern Harbour City as identified in the Greater Sydney Regional Plan (2018). The Eastern City District includes the local government areas of Bayside, Burwood, Canada Bay, Inner West, Randwick, Strathfield, Sydney, Waverly and Woollahra.

#### Eastern City District Plan

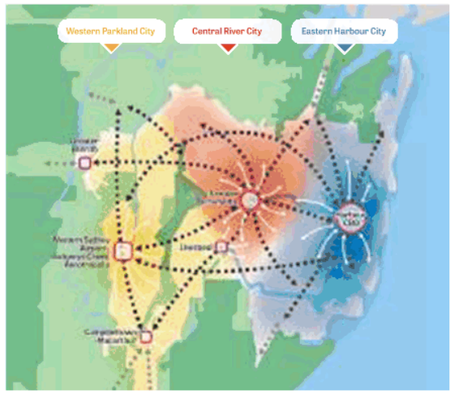
The District Plan is a guide for implementing the Greater Sydney Regional Plan at a district level over the next 20 years. The Plan identifies the Eastern City District's population is expected to grow significantly and residential densities must increase. The Plan will guide the growth and transition of the district focusing on the GEC and transport corridors.

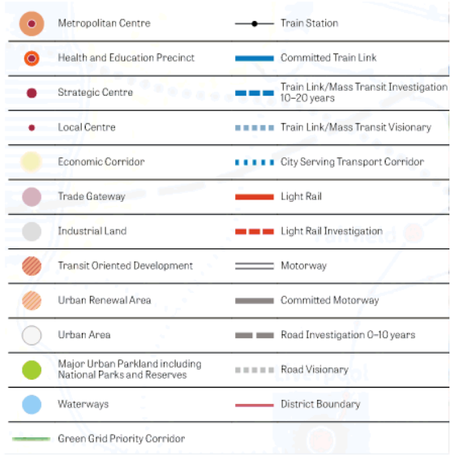
There are investigations into a transport link from Harbour CBD to Malabar via Randwick and Eastgardens/Maroubra Junction. This will open up this wider district to improved active and sustainable transport modes, and pave the way for transport oriented growth.

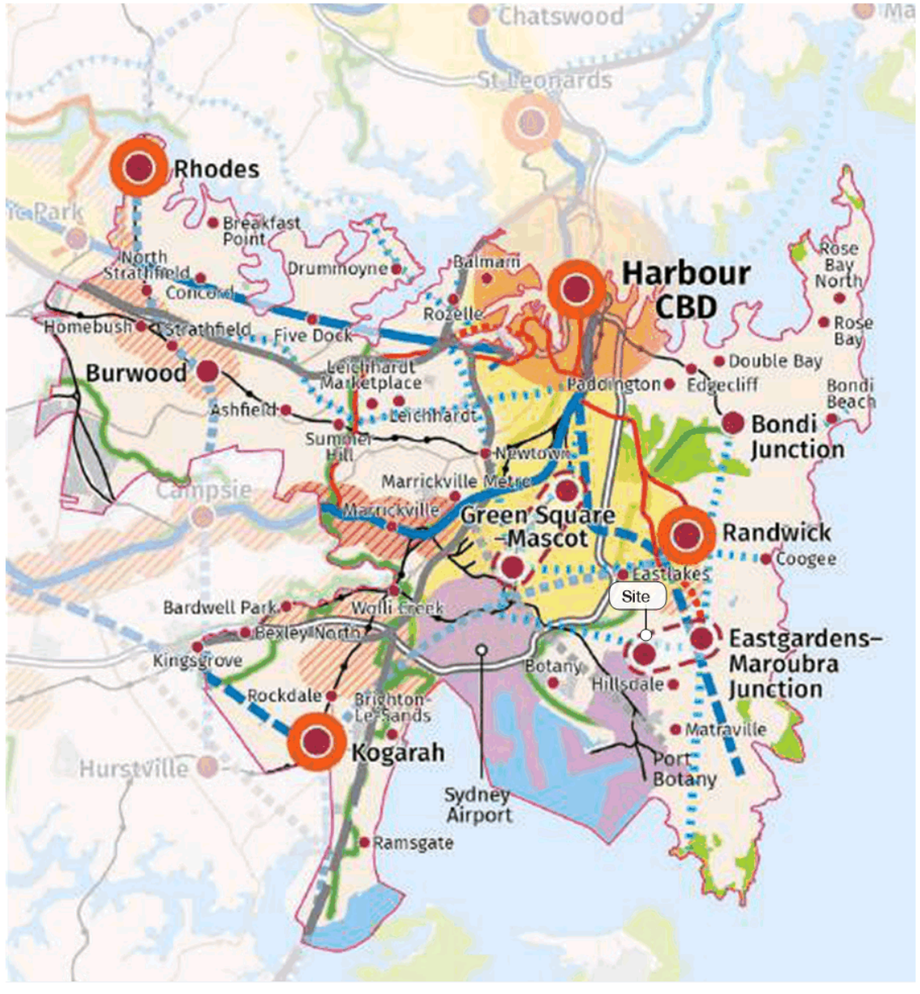
The Eastern City District Plan also identifies a range of population trends and housing targets. Some of the trends and targets relevant to this proposal are:

- An additional 325,000 people are expected to be living in the District by 2036;
- Projected dwelling requirement of157,500 dwellings within the District by 2036;
- With a 64% increase in the 65-84 age group requiring appropriate accommodation solutions.

The proposal has already received gateway approval by the DPE as a delegate of the GSC confirming that it has planning merit.



## Introduction

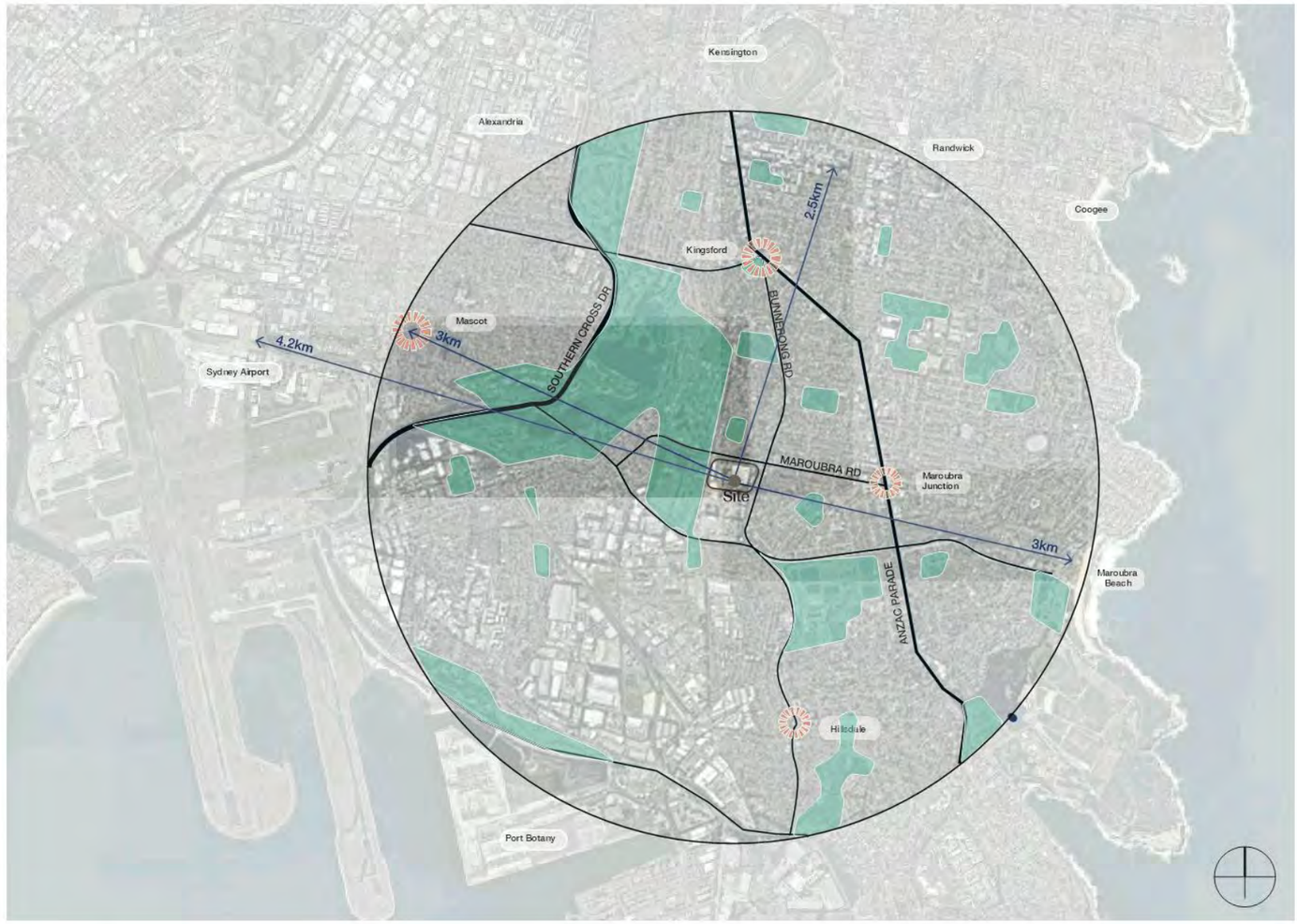
### 1.4 Local Context

The site is located on the former British American Tobacco Australia (BATA) manufacturing facility. Prior to this it was used as the General Motors Holden Factory.

The site has an area of 8.95ha and is located within a broader site that that already has an approved master planned and is under development.

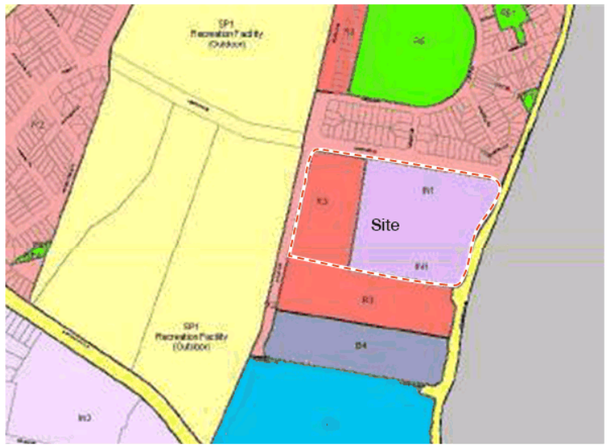
The site is located 8km from the CBD and within 6km of major employment centres, such as Sydney Airport, Port Botany, Randwick, UNSW, Centennial and Moore Parks.

It is located within 4.5 kilometres of Mascot Station and 2 kilometres to the future Kingsford Light Rail Station, with existing and future bus services providing direct access to and from the the site.



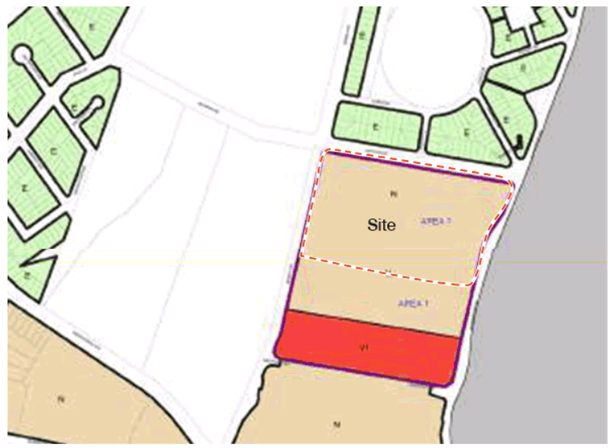
## Introduction

### 1.5 Existing Controls - Bays Council LEP



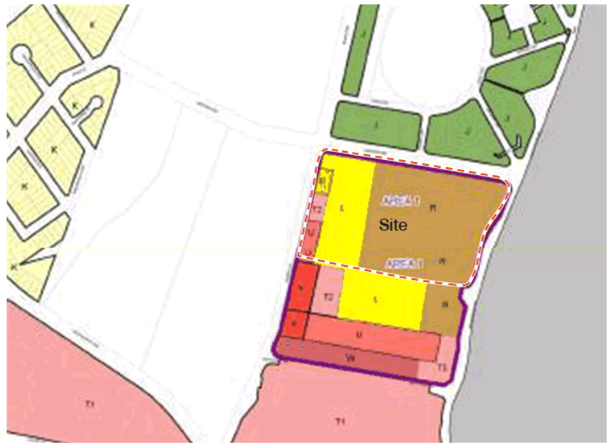

**Land Zoning, 2015**

The subject site is zoned R3 Medium Density Residential and IN1 General Industrial




**Floor Space Ratio, 2013**

The subject site currently has an allowable floor space ratio of 1:1




**Height of Buildings, 2015**

The subject site currently has an allowable building height of 11 - 32m

Key

- B1 Neighbourhood Centre
- B2 Local Centre
- B3 Commercial Core
- B4 Mixed Use
- B5 Business Development
- B7 Business Park
- IN1 General Industrial
- IN2 Light Industrial
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- SP1 Special Activities
- SP2 Infrastructure
- W3 Working Waterways

Key

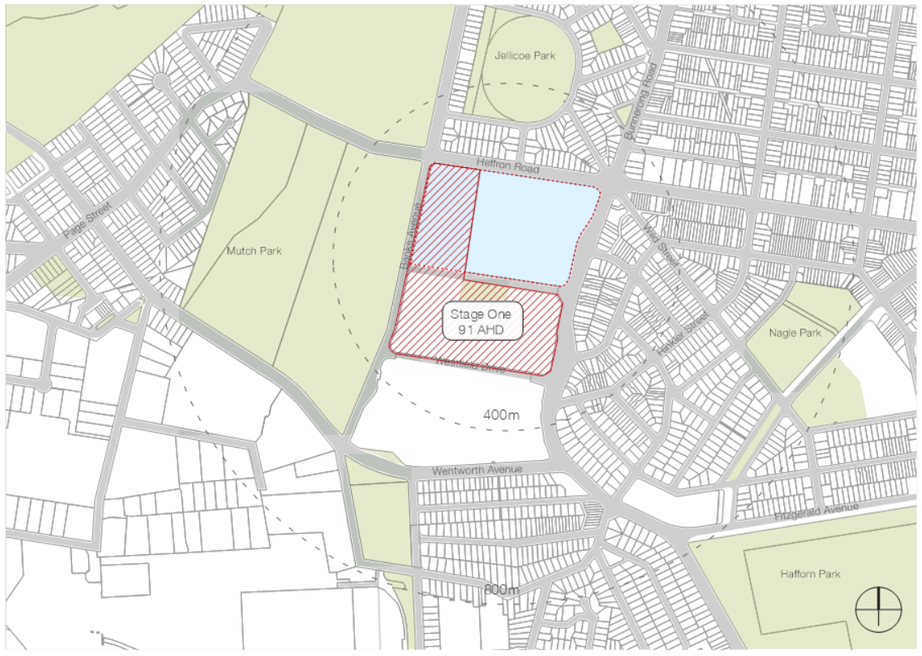
| | | | |
|---|---|---|---|
| C | 0.5 | S | 1.5 |
| E | 0.55 | T | 2 |
| F | 0.6 | U | 2.5 |
| G | 0.65 | V1 | 3 |
| H | 0.7 | V2 | 3.2 |
| K | 0.85 | V3 | 3.3 |
| L | 0.9 | W | 3.55 |
| N | 1 | | |
| P | 1.2 | | |

Key

| | | | |
|---|---|---|---|
| H | 7.5 | T | 25 |
| I | 8.5 | T1 | 26 |
| J | 9 | T2 | 28 |
| K | 10 | U | 32 |
| L | 11 | U1 | 33 |
| M | 12 | V | 39 |
| N | 14 | W | 44 |
| P | 17 | | |
| Q | 19 | | |
| R | 22 | | |

## Introduction

### 1.6 Height Restriction OLS

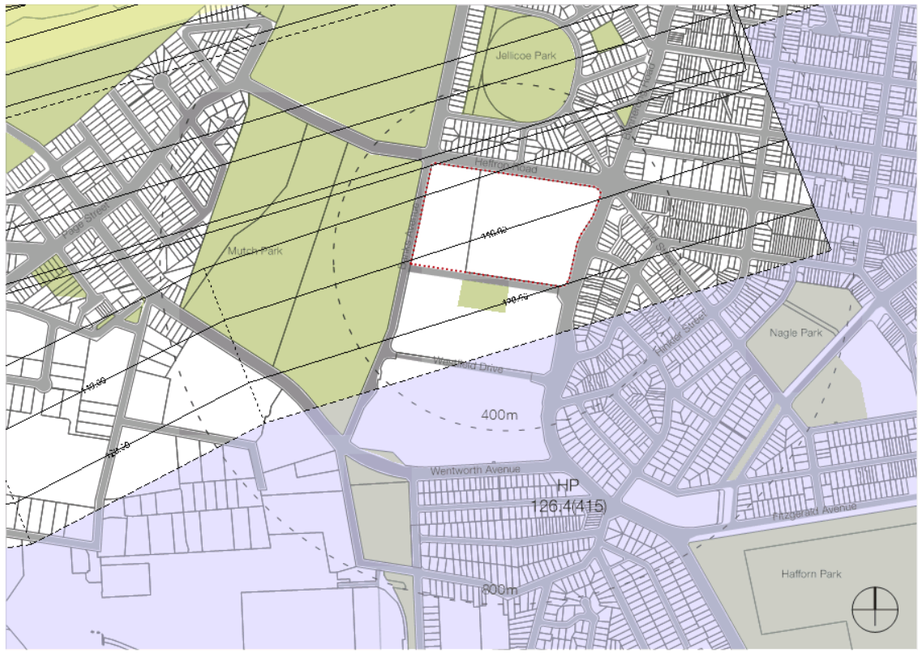



The Stage 1 precinct has a Controlled Activity Approval of 91m AHD for buildings, which penetrates the obstacle limitation surface (OLS) at 51m AHD.

**Key**

- Site Boundary
- Stage One Approved

### 1.7 Height Restrictions - PAN OPS




The Stage 1 precinct has a 'procedures for air navigation services - aircraft operations (PAN- OPS)' limit of 110m in the north west and 120m AHD for the buildings in the south east of the site. The built form will remain within these heights.

**Key**

- Site Boundary

## Introduction



### 1.8 Overview of Existing Masterplans

#### Overview

The masterplan for Pagewood Green Stage Two has been through an iterative process to refine the configuration and built form into its current state. The evaluation of each masterplan has come together into a well tested and well developed proposal for the site. The urban design framework draws on many of the principles and key moves established in earlier reports while improving other aspects, such as the street network.




**Council Masterplan by Hill Thalis, 2016**

The masterplan prepared for and endorsed by Bayside Council in 2016 was prepared by Hills Thalis.

The plan provided a structure which:
- supported adaptive reuse of older buildings along Bunnerong Road;
- created a wedge park to draw amenity into the site and connect the wider open space network;
- created well proportioned and walkable blocks and local streets; and
- communal courtyards at ground level with no basement below to ensure deep soil zones. The result is deep 'donut' style basements.




**Hassell Masterplan, 2017**

The masterplan prepared by HASSELL for Meriton in 2017 built upon the initial design response by Hills Thallis and was included in the planning proposal considered as part of the gateway determination in December 2017.

The major differences to the initial plan included:
- proposed FSR of 2.35:1;
- Existing clock tower retained for dedication to the council (this was not accepted by council);
- realignment of the open space to the west of the site in order to maximise afternoon sun; and
- the addition of sleeved podium car parking with communal open space above.



**Hassell Masterplan Review for Council by Hills Thalis, 2017**

The masterplan prepared by Hills Thallis for Bayside Council in 2017 evaluated the design response by HASSELL and consolidated their findings into a new plan.

Hills Thallis responded with a masterplan that included:
- An FSR of 2.35:1, as per HASSELLS plan;
- retention of the second existing building;
- return to the original orientation of the linear park/open space; and
- return to the basement car parking scenario.

# Site Analysis

2

The analysis provided in this section explores the existing conditions of the local area and considers the potential impact on the future development of the site. This assessment will inform the type of built form, the quantity of public open space and amenities that are suitable for the site. This section culminates in a synthesis of the 'opportunities' and 'constraints' for the development that are applicable to the site based on a thorough understanding of the local neighbourhood.

## Site Analysis

### 2.1 Existing Land Uses and Built Form

The built form in the local area reflects the existing land uses.

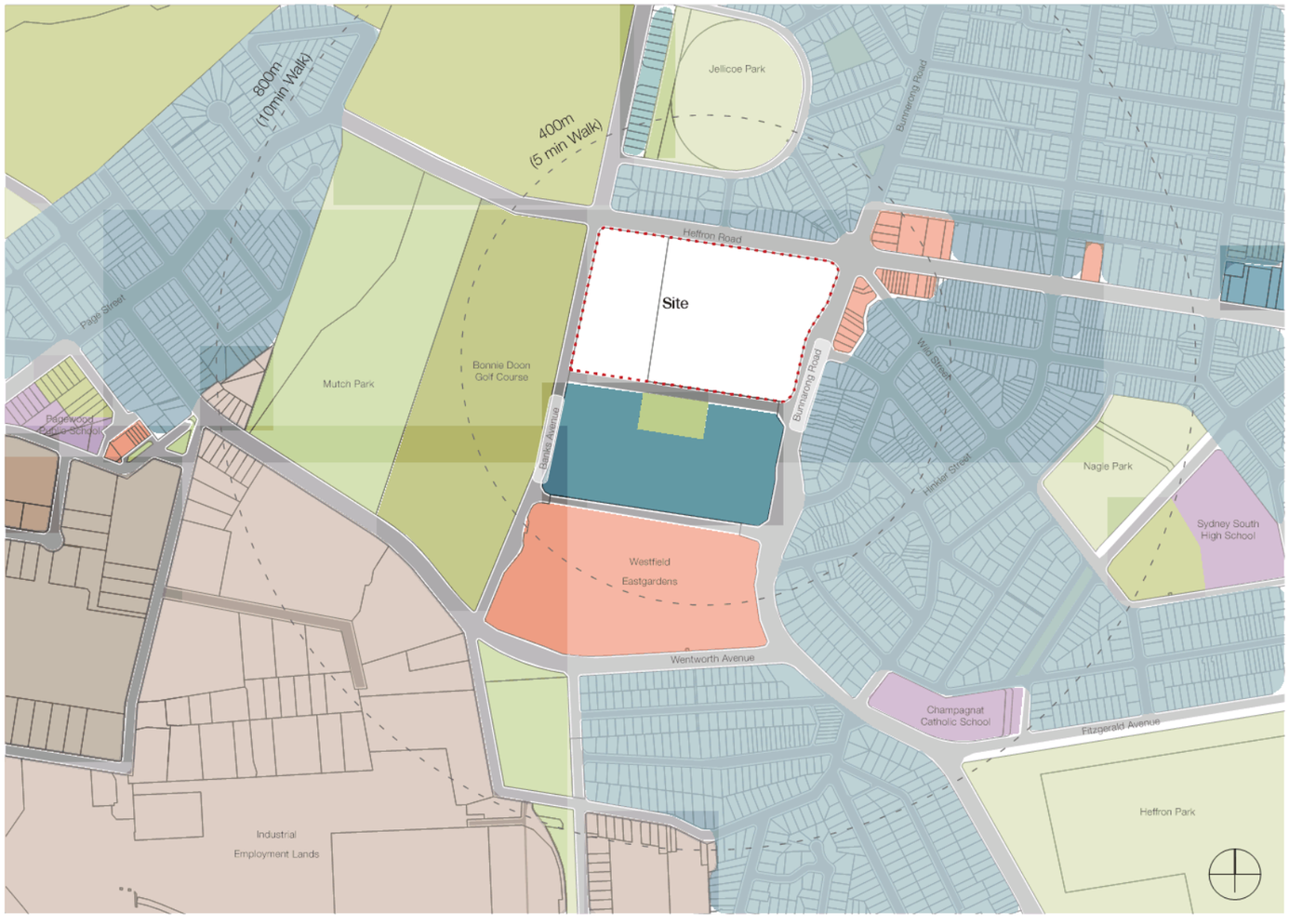
The predominate land use includes low density residential, while there are light industrial uses in and around the airport.

The emerging leader for higher density development in the local area, is the stage one portion of the site, which is under construction. This contains residential and support uses up to 20 storeys. This increase in height and form responds to the significance of Eastgarden and Maroubra as a strategic centre.

There are three schools in the local area that service the local area: Sydney South Public High School, Champagnat Catholic College and Pagewood Public School.

Local retail is consolidated in the six storey Westfield Eastgardens shopping mall with a Coles, Woolworths, Big W, Kmart, Target and Myer, Hoyts Cinema as well as Eastgardens Library.

Some additional retail is located around Bunnarong and Heffron Road intersection to the north west of the subject site.




**Key**

- Public Open Space
- Private Open Space
- Low Density Dwellings
- Medium Density Apartments
- High Density Apartments
- Retail
- Shopping Malls
- Education Facilities
- Employment Sector
- Site Boundary

## Site Analysis

### 2.2 Topography

The gradient of the region slopes away from the town centre of Maroubra down to Botany Dams to the north west and south to Botany Bay.

The subject site has minimal gradient, as shown in the adjacent plan. The 2m intervals are not sufficient to show the slope, which drains toward the south of the site.

**Key**

- Water body
- 12m
- 14m
- 16m
- 18m
- 20m
- 22m
- 24m
- 26m
- 28m
- 30m
- 32m
- 34m
- 36m
- 38m
- 40m
- 42m
- 44m
- 46m
- 48m
- 50m
- 52m
- 54m
- 56m
- Site Boundary



## Site Analysis

### 2.3 Recreation and Amenity

The subject site is fortunate to be located in close proximity to many green open spaces and active recreation spaces. It is a short walk to Bonnie Doon Golf Course, Mutch Park, Jellicoe Park, Hensley Athletics Field, Nagle Park and the new recreation spcae within Pagewood Green Stage 1. Within a 800m radius, residents will have access to ~25ha of public open space (this does not include schools or Bonnie Doon Golf course).

There are several schools within the local area that will serve future residents of Pagewood Green. This includes Sydney South Public High School, Champagnat Catholic College, Pagewood Public School, Daceyville Public School, Banksmeadow Public School, Maroubra Junction Public School and Lycée Condorcet: the International French School of Sydney.

**Key**

- Water Body
- Retail
- Childcare Facilities
- Education Facilities
- Public Open Space
- Private Open Space
- Bicycle Friendly Route
- Dedicated Lanes
- Trails
- Site Boundary
- Rugby/Soccer Field
- Running Track
- Outdoor Fitness
- Public Toilet
- Dog Walking
- Childrens Playground
- Picnic/BBQ Facilities
- Aquatic Centre
- Gymnastics Centre
- Cycling Track
- Cricket Pitch/Nets
- Netball/Basketball Courts
- Tennis Courts
- Golf Course
- Food Retail



## Site Analysis

### 2.4 Movement

The network of roads in the area services the wider area connect Pagewood to Sydney CBD via Southern Cross Drive (M1) and Anzac Drive and directly out to the south eastern suburbs of Sydney.

The site is well serviced by a network of buses that connect it to key employment areas, as well as railway stations (Mascot) and future light rail. The proponent has been in discussion with Transport for New South Wales (TfNSW) for new bus services to directly service the site, as the first building of Pagewood Green Stage One is now complete, these services will expand over time.

Lightrail connecting Kingswood Junction to the CBD is in the advanced stages of construction and will be available to the future residents of Pagewood Green. The lightrail is expected to extend down Anzac Parade, through Maroubra Junction, in future stages of development.



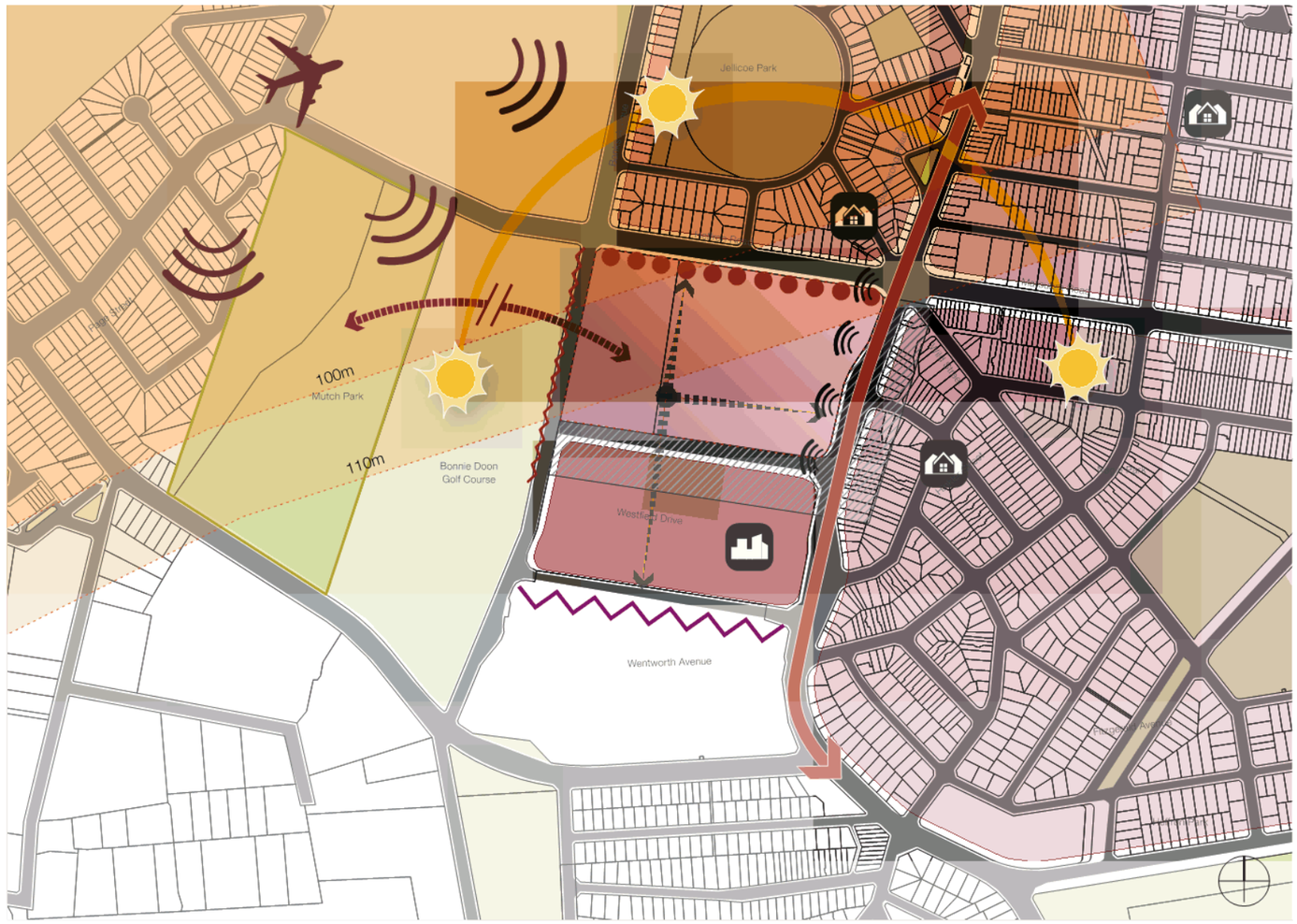

**Key**

- Military Barracks
- Employment Sector
- Street Retail
- Shopping Malls
- Water Body
- Vegetation
- Secondary Roads
- Primary Roads
- Express way
- Train Lines
- Bus Routes
- Light Rail Route
- Future Light Rail Station
- Bus Stops
- Site Boundary

## Site Analysis

### 2.5 Constraints

- Bunnerong Road is located adjacent to the site - it consists of a four lane highway.
- The interface with Eastgarden Westfield is currently a blank facade and not ideal for pedestrian walkability.
- Local retail is consolidated in the internalised six storey Westfield Eastgardens shopping mall.
- Amenity and sunlight to the adjacent low density residential dwellings must be preserved.
- An appropriate transition in scale is required for the interface with the existing low density residential. The separation provided by the wide roads helps this condition.
- The proximity of the airport creates height restrictions on the subject site.
- Golf course separates the site from active recreation spaces in Mutch Park.



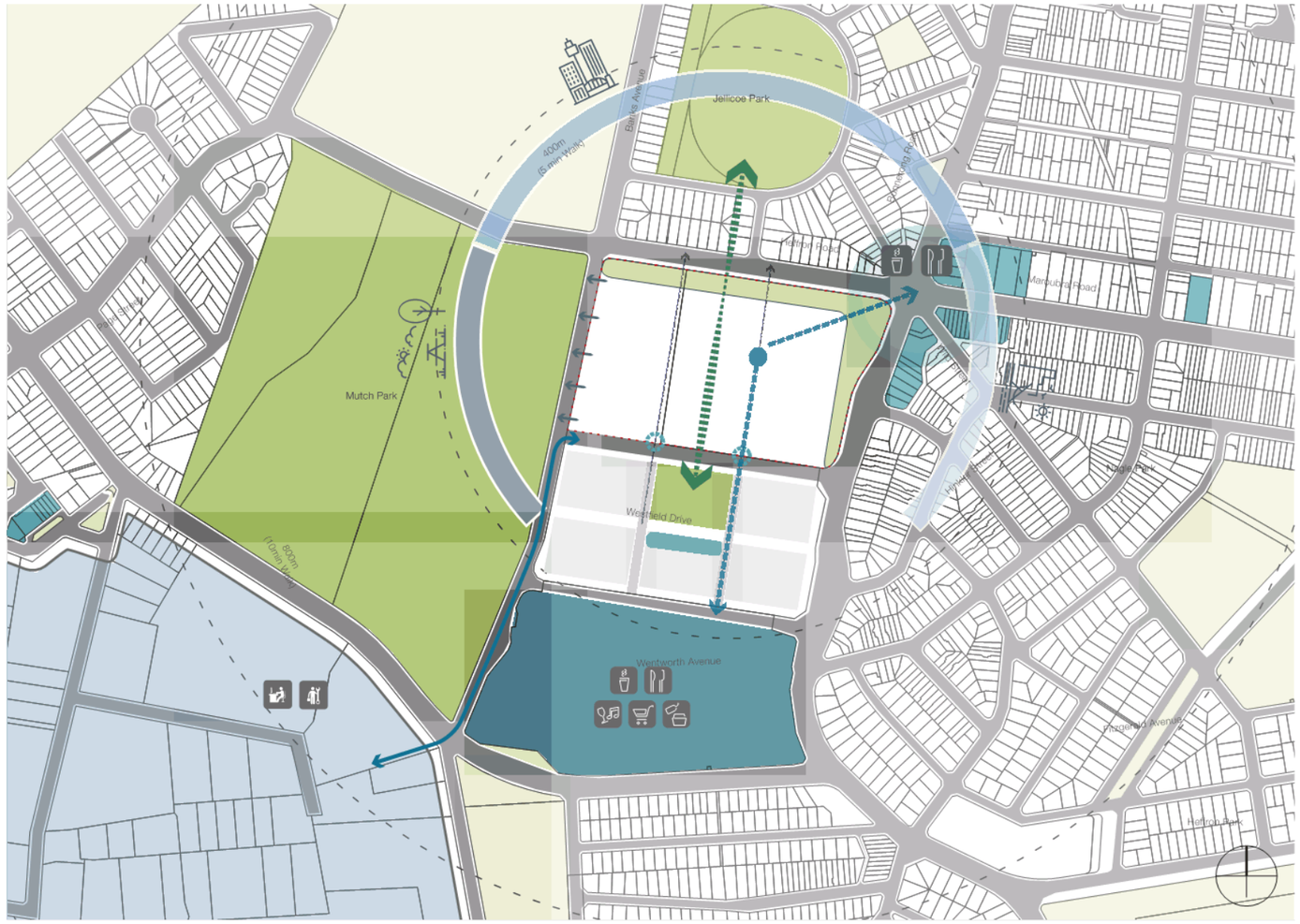

**Key**

- Pan Ops Height Restrictions
- Low Density Dwellings
- High Density Dwellings
- Height Gradient
- Public Park
- Plane Noise
- Road Noise
- Hard Wall
- Bus Stops
- Site Boundary

## Site Analysis

### 2.6 Opportunities

- There is a network of public green open spaces that offer a range of programmed and passive recreation activities.
- Open space can be connected from Jellicoe Park through to the new public open space provided in Pagewood Green Stage One.
- There is unobstructed solar access to the site throughout the day.
- Employment lands and Eastgarden shopping mall provide local job opportunities within a walkable distance.
- There is a small retail activated node around the intersection in the north-east corner of the site. There is potentail to better link this with Westfield Eastgarden.
- Amenity and views to the west over the green open space can be captured.
- Close proximity to heavy/light rail connections, which is currently connected by frequent and direct bus routes.
- There is frequent and direct bus routes to major centres and employment opportunities.
- Services and amenities provided in the mall will be an asset to local residents.
- Buildings on site offer character opportunities to the site.
- There are schools available within a 10 minute walk.
- Retail offer within 400m/5min walk of the subject site




**Key**

- Employment Lands
- Shopping Mall
- Street Retail
- Vegetation
- Secondary Roads
- Access Points
- Un-obstructed Views
- Green Connector
- Retail Connection
- Bus Stops
- Site Boundary

# Vision and Principles

3

The vision and principles will define the future character of the site and establish the values that underpin future development. The vision presents an image of the quality place and type of community that the development aims to create. The principles break down the specific qualities and measures that will be used by the developer to achieve this.

## Vision and Principles

### 3.1 Vision

The Pagewood Green masterplan (stage two) will provide a framework for creating a strong sense of character and active vibrant streets that leads to a 'village feel'. By referencing historic land uses and the architectural qualities of the existing warehouses and centering activation around a village green to create a strong sense of place and belonging.

The proposed density will accommodate Sydney's population growth in accordance with Metropolitan strategy with an offer that is varied to accommodate a diversity of people. Provision of a varied dwelling sizes and building typologies that range from two storey town houses to one bedroom apartments will create a vibrant and diverse resident population. While, the offer of convenient amenities, such as childcare, possible aged care, possible medical suites and retail, will afford residents the opportunity to live locally and age in place.

The intensity of dwellings, retail, amenities and services will support vibrant streets and open space, contributing to a community life in a transient city. High proportions of open space with deep soil zones for canopy trees and other vegetation will make a liveable environment that offers thermal comfort throughout the year. The precinct will prioritise pedestrians and other active transport modes while also offering a legible traffic environment.

The proposal will provide approximately two hectares of open space that will form a green spine through the site, linking Jellicoe Park and the open space in Pagewood Green Stage One. A civic plaza at the centre of the new development will be the heart of the future community, bringing people together through a shared enjoyment of the amenities and open space.



## 3.2 Principle 01: An accessible and legible site

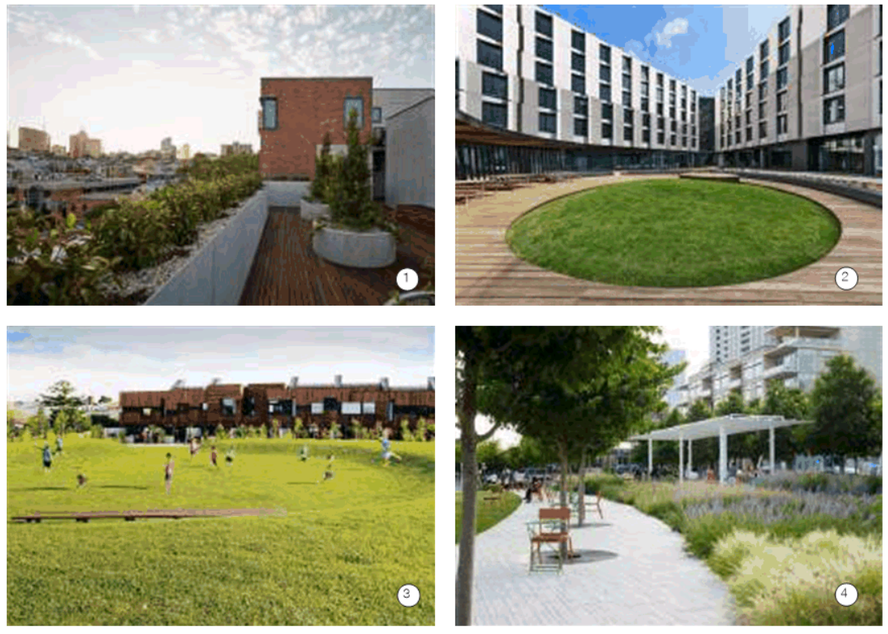


### Principles

- Extend the grid of Pagewood Green stage 1 through the precinct to provide clear east - west, north - south links.
- Connect key nodes, such as Jellicoe Park and Westfield.
- Clear hierarchy with distinctive uses and function.
- Streets as habitable open spaces and integrated public realm.
- Pedestrian priority throughout the study area that are accessible and walkable with short blocks.
- Create safe and active streets with adequate lighting and passive surveillance.
- A connected and comprehensive bicycle network.
- A logical and connected network of roads.

Figure 1: Residential street with semi-transparent interface with pedestrian path. Figure 2: Wide pavements and pedestrian friendly streets. Figure 3: Shared streets with clearly defined separation. Figure 4: Safe, active and well lit streets that provide places for people to linger and socialise. Figure 5: Highly vegetated streets that are passively irrigated.v

## 3.3 Principle 02: Diverse and connected open spaces



### Principles

- Streets occupied as part of network of public open space.
- Different types of open space provision;
  - public, private, semi-private
  - hardscape and green spaces
  - public green spaces for recreation.
- Reinforce the regional green grid.
- Consideration for ecological sensitivities and geography.
- Ensure safety through passive surveillance and adequate lighting.
- Provide green roofs on podiums with loading and soil zones for large trees.
- Retain existing trees where possible.
- Private green roofs on each building to reduce thermal loading.
- Water Sensitive Urban Design (WSUD) integrated where possible.

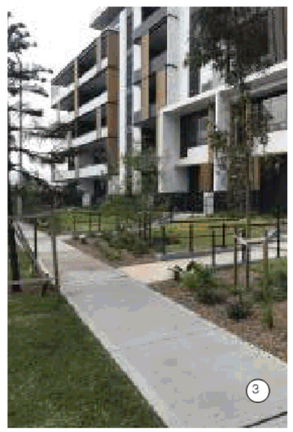
Figure 1: Vegetated and habitable shared terraces on upper levels will include viewlines. Figure 2: Semi-enclosed shared terraces are sheltered and receive passive surveillance from above. Figure 3: green open space that is protected and activated by surrounding residential dwellings. Figure 4: Hardscapes are functional and provide a civic character, while reflecting the vegetated precinct character.

## 3.4 Principle 03: Streetscape Activation













**Principles**

- Fine grain variation, transition and rhythm at street level.
- Provide benches, street furniture and informal seating areas.
- Streets will serve as public spaces as well as conduits for traffic.
- Activation at corners and edges, as well as creating nodes within the precinct – centring/consolidating activity around select locations.
- Create a distinctive village feel to local neighbourhood through provision of fine grain treatment to the street scale.
- Create a main street on through connecting street.
- External facing – Activating surrounding streets, including Bunerong road.
- Minimise vehicular crossovers through laneway/rear access to basement and podium parking.
- Support retail uses with easily accessible on-street parking.

Figure 1: Informal gathering spaces and street furniture. Figure 2: Building transparency and direct interface with the street. Figure 3: Articulation and visual interest provided through materials and planting. Figure 4: On street dining and spill over from active retail.

## 3.5 Principles 04: Community program













**Principles**

- Diverse housing types and sizes to promote population diversity.
- Accommodate a mix retail tenants, activities and informal opportunities for social interactions.
- Co-location of services such as retail, possible aged care and childcare.
- Provision of civic plaza and landscaped public open space.
- High quality street furnishings and informal gathering spaces in the public realm and private terraces.
- Introduce a civic plaza and network of open spaces, to complement the stage one master plan.
- Integration of public art.
- Create a linear park that will serve as a central community space linking the site north and south.

Figure 1: Communal rooftop terraces. Figure 2: Public art and interpretive signage. Figure 3: Public art and follies within the public realm. Figure 4: Play spaces for children - formal and informal offering.

Vision and Principles

## 3.6 Principle 05: A mix of building typologies

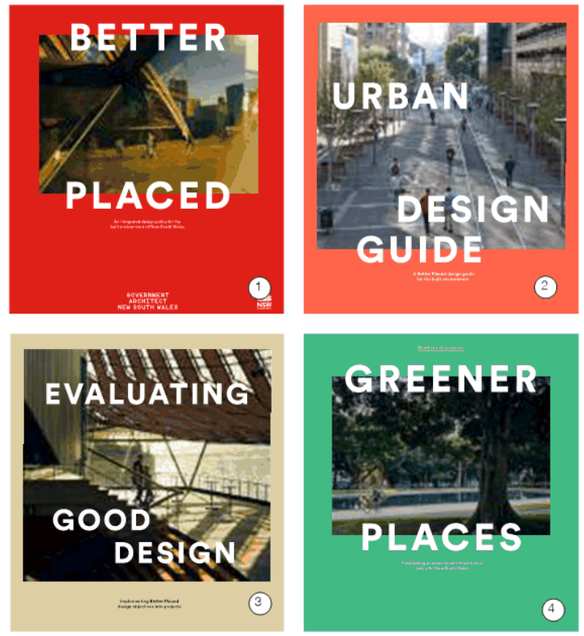


**Principles**

- A diversity of dwelling typologies with variation in heights, scale and form
- Provide a higher density around public space offering to maximise amenity and outlook for apartments.
- Building envelopes to ensure maximum solar access and compliance with Apartment Design Guidelines (ADG).
- Diversity within the building envelope with a range of dwelling sizes.
- Lower levels should interface with the street including balconies overlooking the streets and public realm.

Figure 1: Medium density residential developments. Figure 2: Mixed use development with direct interface with street. Figure 3: Town house with fine grain articulation at street level Figure 4: Podium tower typology with height that tapers away from street intersection. Figure 5: Podium tower with terrace style frontages that interface directly with the street.

## 3.7 Principle 06: Design excellence




**Principles**

- Review and analysis based on state policies around good design that includes the new strategies and frameworks created by the Government Architect New South Wales (GANSW).
- Considers economic, environmental and social benefits of proposed development, suggest pathways to achieving quality outcomes and a framework for assessment.

Figure 1: Better Placed 2017 by GANSW establishes statewide design principles. Figure 2: Urban Design Guide (GANSW 2018) outlines recommended methods. Figure 3: Evaluating Good Design (GANSW 2018) provides a measuring tool. Figure 4: Greener Places (GANSW 2017) establishes targets and values around public open space.

## 3.8 Principle 07: Architectural quality











**Principles**

- Reference history of the site through a range of mechanisms, such as reflecting the art-deco era warehouse/buildings in future designs, referencing historic land uses, using materials, detailing and form to revive character elements and /or interpretive signage.
- Contribute to local character through a consistent form, transition, setbacks and streetscape.
- Integrate podium car parking to allow for natural ventilation, while maintaining activation and retail/residential overlooking of the street.
- Minimise vehicular crossovers and presence of garage doors.
- Provide visual interest from the street through facade treatments, public art, green walls.
- Integrate public realm amenity into residential dwellings through views and outlooks.
- Create a façade and interface of the development that activates the street frontage to create an engaging environment for pedestrians, visually and materially, minimising blank façades at street level and positively contribute to the public realm.
- Build a distinct local character through vegetation, materials and detailing that provides residents and visitors with a sense of place.
- Create internal amenity through visual connection to greenery outdoors.
- Create a balance of transparency and privacy to street level dwellings.
- Integrate sustainable initiatives and passive systems where possible.

Figure 1: Facade articulation and visual interest in the detailing. Figure 2: Town houses that introduce variety and interest through material choices. Figure 3: Development is integrated with the surrounding landscape. Figure 4: Green roofs and balconies. Figure 5: Podium car parking with naturally ventilated mesh screening. Figure 6: Complimentary forms across multiple scales. Figure 7: Activated ground plane interface. Figure 8: Complimentary forms and geometries across different scales within the precinct. Figure 9: Informal places to linger, passive surveillance provided by transparency in upper levels.

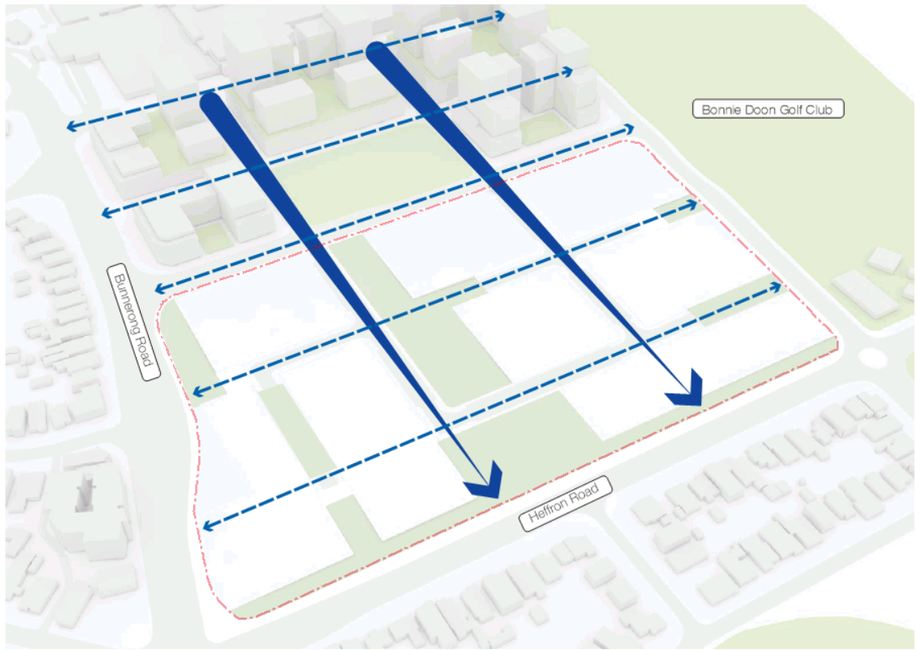
# Design Response

4

The design response sets out a layered methodology for the configuration, scale and bulk of the site. From the structure of the roads to the qualities of the public open space and built form, this section overlays the elements of the future site in a systematic way to achieve an assurance of quality in the urban form and a logical narrative to the structure of the site.

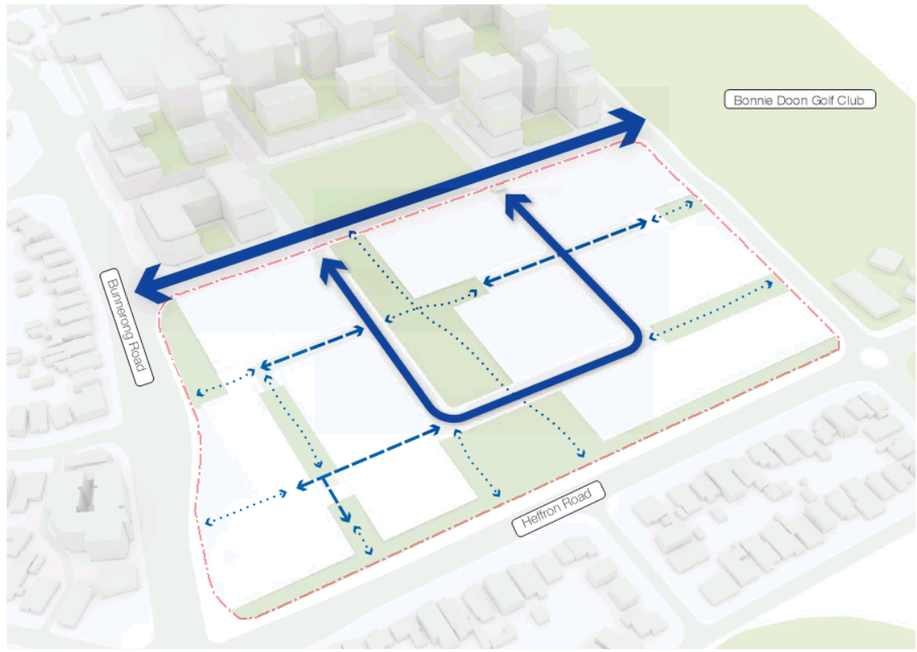
## Design Response

### 4.1 Urban Grain




**Continuation of the Grid**

Extending the grid of stage one through the northern precinct to provide clear east-west and north-south links.




**Hierarchy of Streets**

Creating a hierarchy of streets that create a legible and accessible environment, while discouraging through traffic.

**Key**

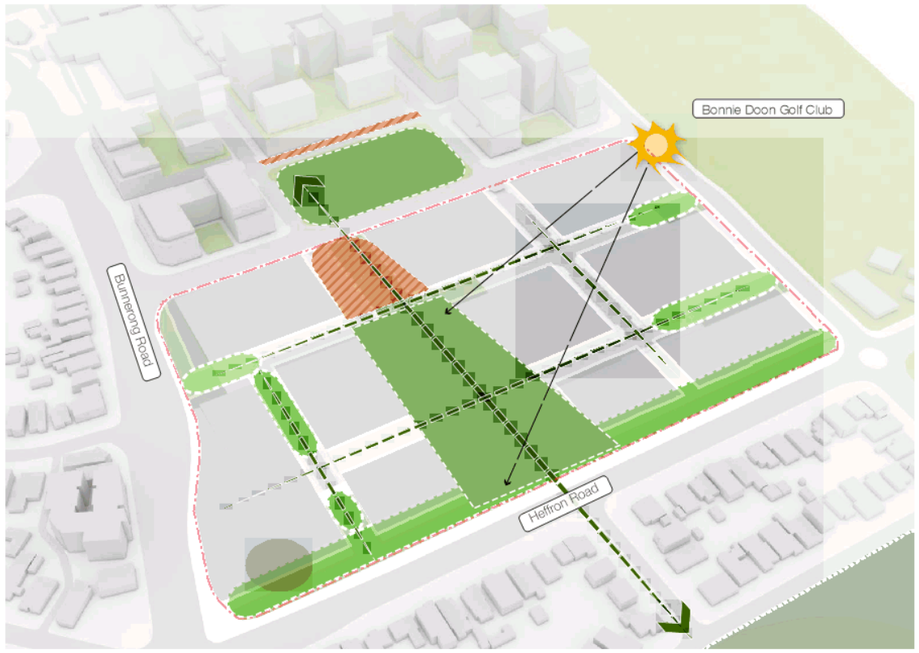
- Building Plots
- Open Space & Landscaping
- Primary Movement
- Secondary Movement
- Site Boundary

**Key**

- Building Plots
- Open Space & Landscaping
- Main Access
- Primary Streets
- Local Access
- Pedestrian Links
- Site Boundary

## Design Response

### 4.2 Public Domain Structure




**Green Network**

A network of integrated green spaces that includes surrounding infrastructure and integrates the streetscape.

**Key**

- Building Plots
- Existing Clocktower
- Primary Green Spaces (Public Open Space)
- Secondary Green Spaces (Public Open Space)
- Civic Plaza
- Main Access
- Primary Streets
- Green Links
- Site Boundary




**Land Use and Frontages**

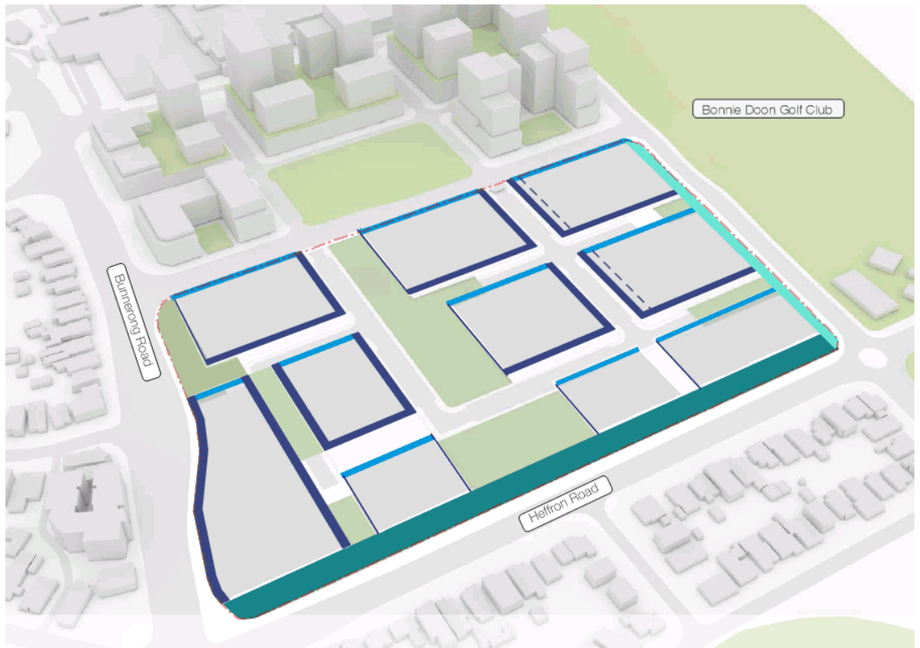
Reflecting the hierarchy of streets, the street typology integrates dedicated spaces for activation, retail and interface with open space.

**Key**

- Mixed Use Residential / Hotel / Serviced Apartments
- Mixed Use Residential Development
- High Density Residential
- Medium-Low Density Residential
- Medium-High Density Residential or Possible Aged Care
- Public Open Space
- Active Edges
- Semi - Active Edges
- Corner Active Nodes
- Site Boundary

## Design Response

### 4.3 Building Envelopes

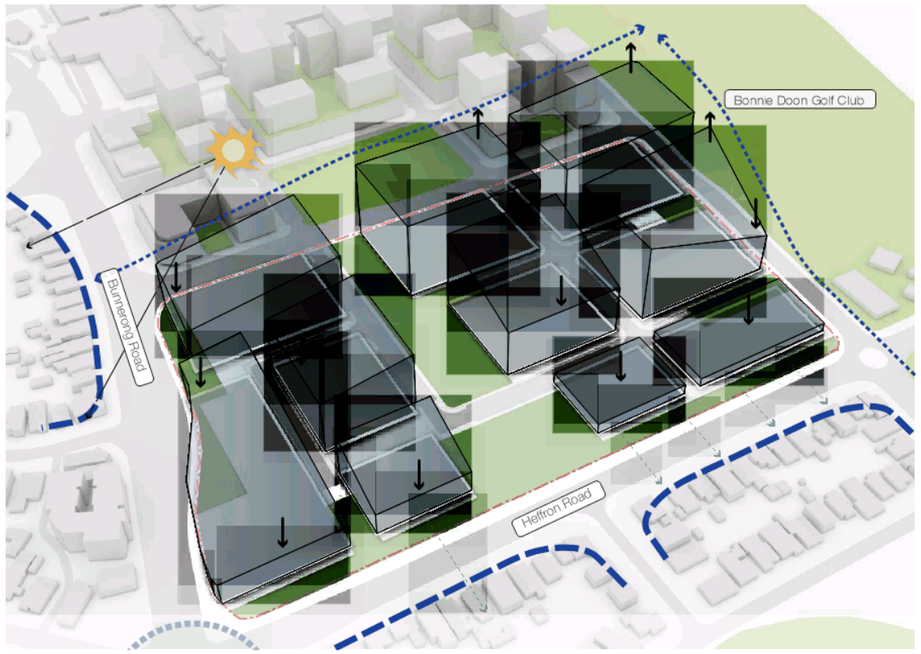



**Setbacks**

Street setbacks reflect the type of street and built form interface with the street.

**Key**

- Building Plots
- Public Open Space
- 2m Setback
- 4m Setback
- 6m Setback
- 10m Setback
- Additional 3m Podium Setback




**Building Heights**

The building heights ensure that there is no overshadowing to the surrounding residential areas between 9am and 3pm. While also ensuring that the scale and visual bulk compliment surrounding development. The buildings step down in heigh toward the east and north of the site to manage transition in scale, while locating the higher density components in the least sensitive area of the site.

**Key**

- Residential Interface
- Public Open Space
- Site Boundary

## 4.4 Built form and Open Space Typologies

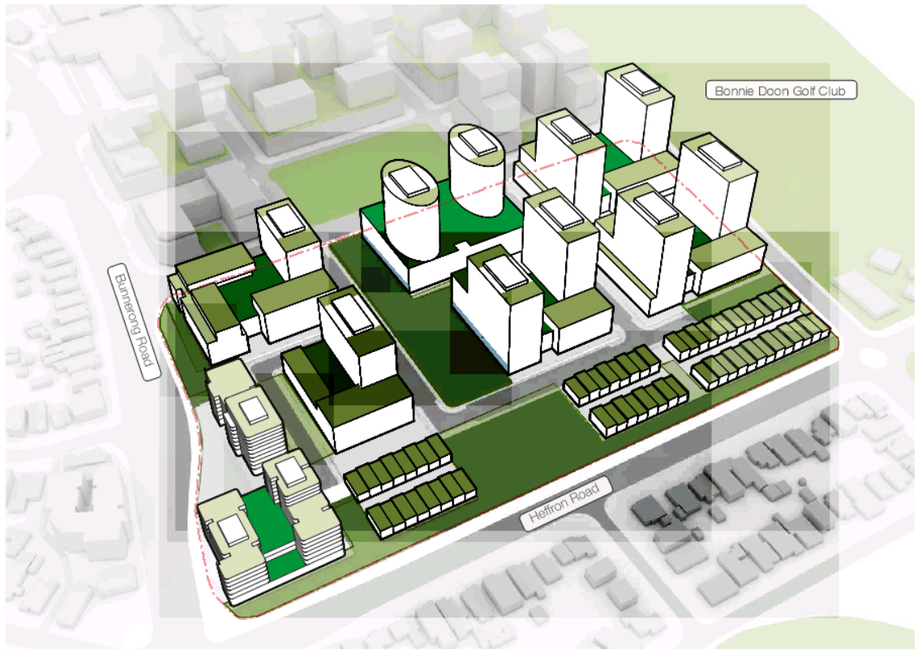



### Building Typologies

Building typologies are varied throughout the precinct with townhouses and terraces integrated into the podium to interface with residential streets, medium and high density development is integrated to the south and west of the precinct in the least sensitive parts of the site.

**Key**

- Tower
- Above Podium/Podium Sleeve Dwellings
- Podium Sleeve On-Street Terrace
- Street Level Retail
- Townhouses
- Medium Density/Possible Aged Care
- Communal Open Space
- Public Open Space




### Layers Of Landscape

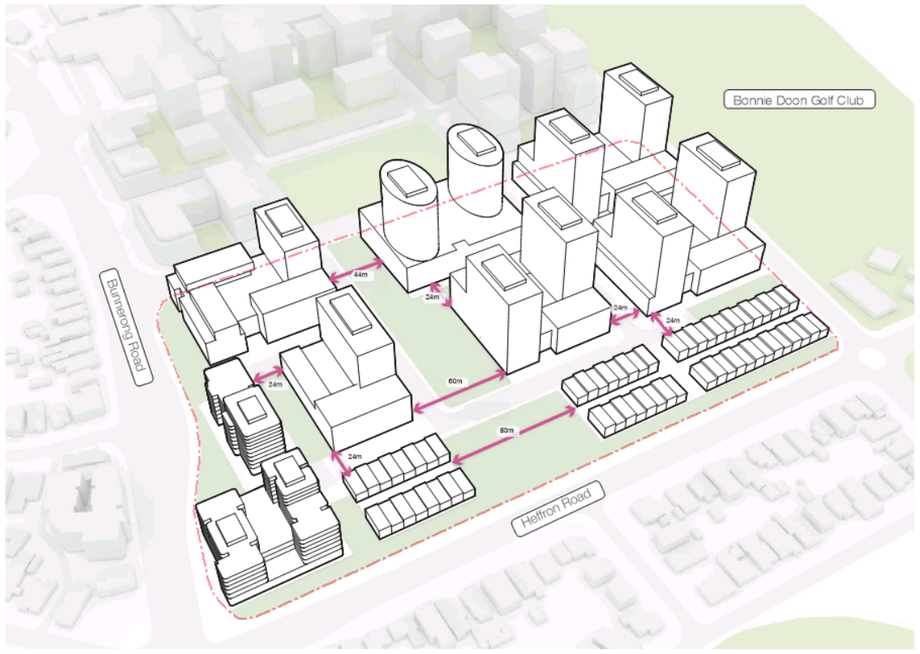
The site configuration consists of layers of landscaped space that serve the community in different ways. These landscape typologies build upon the public domain plan established for the precinct, which includes more than 2ha of public open space, this is approximately 23% of the site. Courtyards, communal terraces and rooftop spaces will be utilised for communal gardens and private open space. This will mean that most of the site has a landscaped surface.

**Key**

- Public Open Space
- Podium Communal Gardens
- Private Rooftop Terraces
- Active Retail Edges
- Semi - Active Edges
- Site Boundary

## Design Response

### 4.5 Building Separation

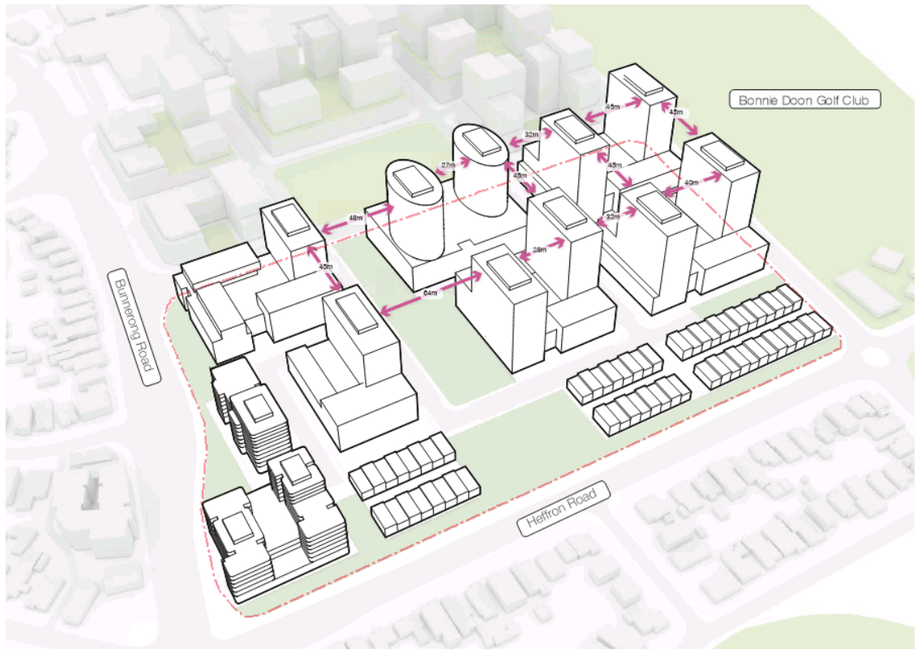



**Building Separation**

The separation between buildings are compliant with the Apartment Design Guidelines (ADG). Dimensions from tower to tower either meet or exceed ADG standards.

**Key**

- Building Separation
- Public Open Space
- Site Boundary




**Tower Separation**

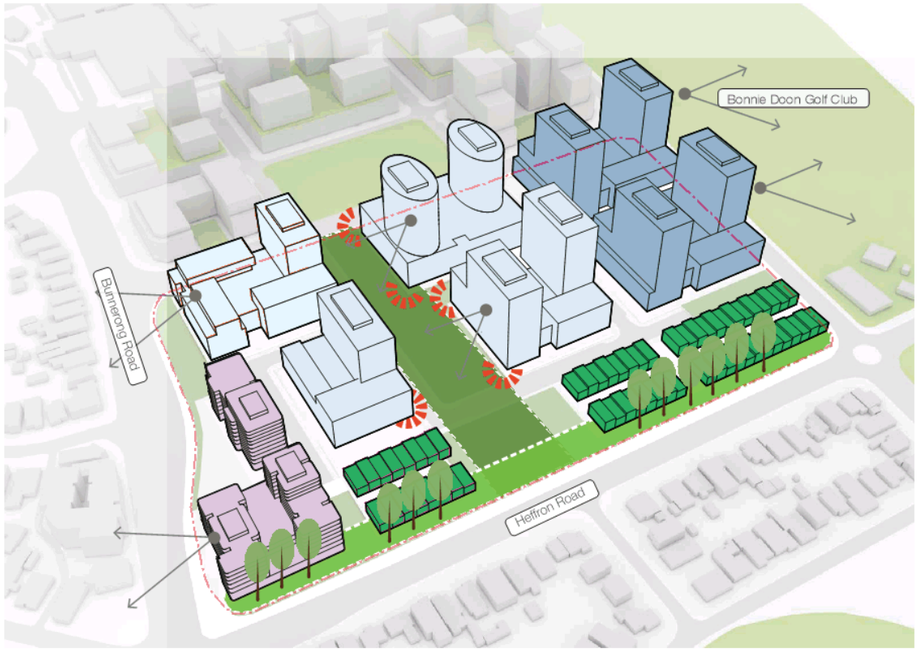
The separation between towers are compliant with, or exceed, the ADG standards.

**Key**

- Tower Separation
- Public Open Space
- Site Boundary

## Design Response

### 4.6 Design Excellence

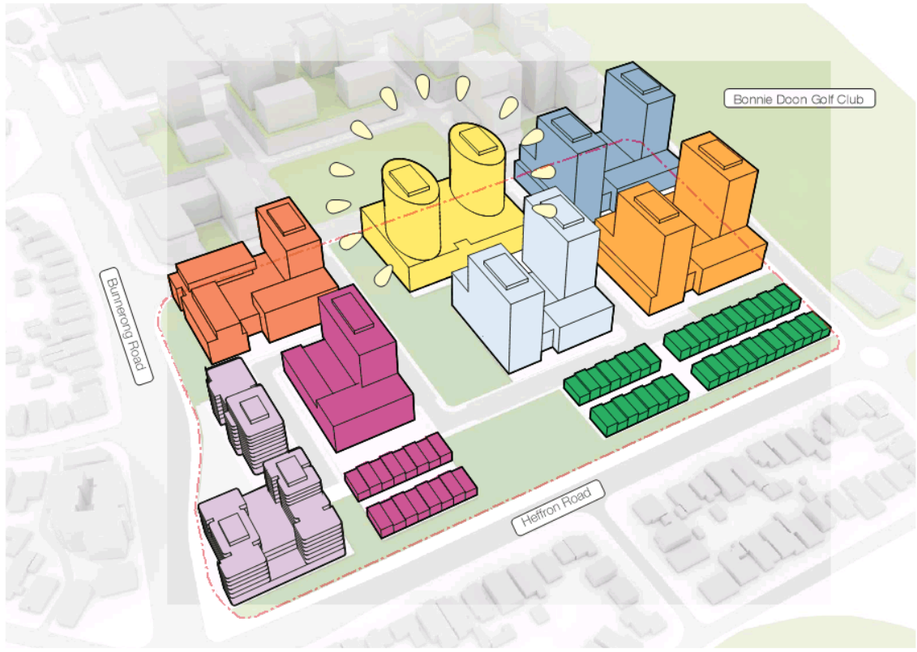



**Local Character**

The precinct's urban grid creates a number of different blocks that will each have a slightly different character. Variation will be provided across the site and the characteristics of the developments will be localised to the specific urban setting within which they are situated. For instance, the outlook to green open space or Sydney CBD will be optimised, while street level residences with have a different look and feel.

**Key**

- Views
- Vegetated Areas
- Active Street Edges
- Possble Aged Care
- Town Houses
- Site Boundary




**Architectural Excellence**

Tier one architects will be employed under the guidance of a single master architect to deliver variation across the site while ensuring quality design, compatibility and compliance with architectural standards. There is opportunity for the blocks that interface with the public domain to have distinct architectural qualities, such as central retail block adjacent to the civic plaza. Strong design principles will be established in future development application to guide development of the site.

**Key**

- Site Boundary

# Proposed Masterplan

5

This section introduces the proposed masterplan through plan, site section and 3D modelling. It demonstrates how the public realm will interface with the built form, including the nature of the road profile and landscaped building setback. It addresses the gross floor areas of each site, apartment yield and parking provision within the subject site.

## Proposed Masterplan

### 5.1 Site Layout Plan

The site varies from 20 storeys to two storeys across the site to create a sense of transition into the low density development surrounding the subject site.

The tallest parts of the plan are in the south west corner, which minimises overshadowing to sensitive areas and the surrounding development.

The open space forms a spine through the precinct, bringing sunlight deep into the development and allowing residents and retail in the local area to spill out into the public realm. This will form the basis of a high amenity, enjoyable new precinct that has a strong sense of local connection to place and one another.

The podium will allow for communal open spaces to form below the tower, providing shared facilities for residents of the building. The configuration around the podium will maximise solar access with towers to the east and west of the envelope, while also providing shelter from wind tunnel effects,with the two storeys above podium to the north and south of the communal open space.



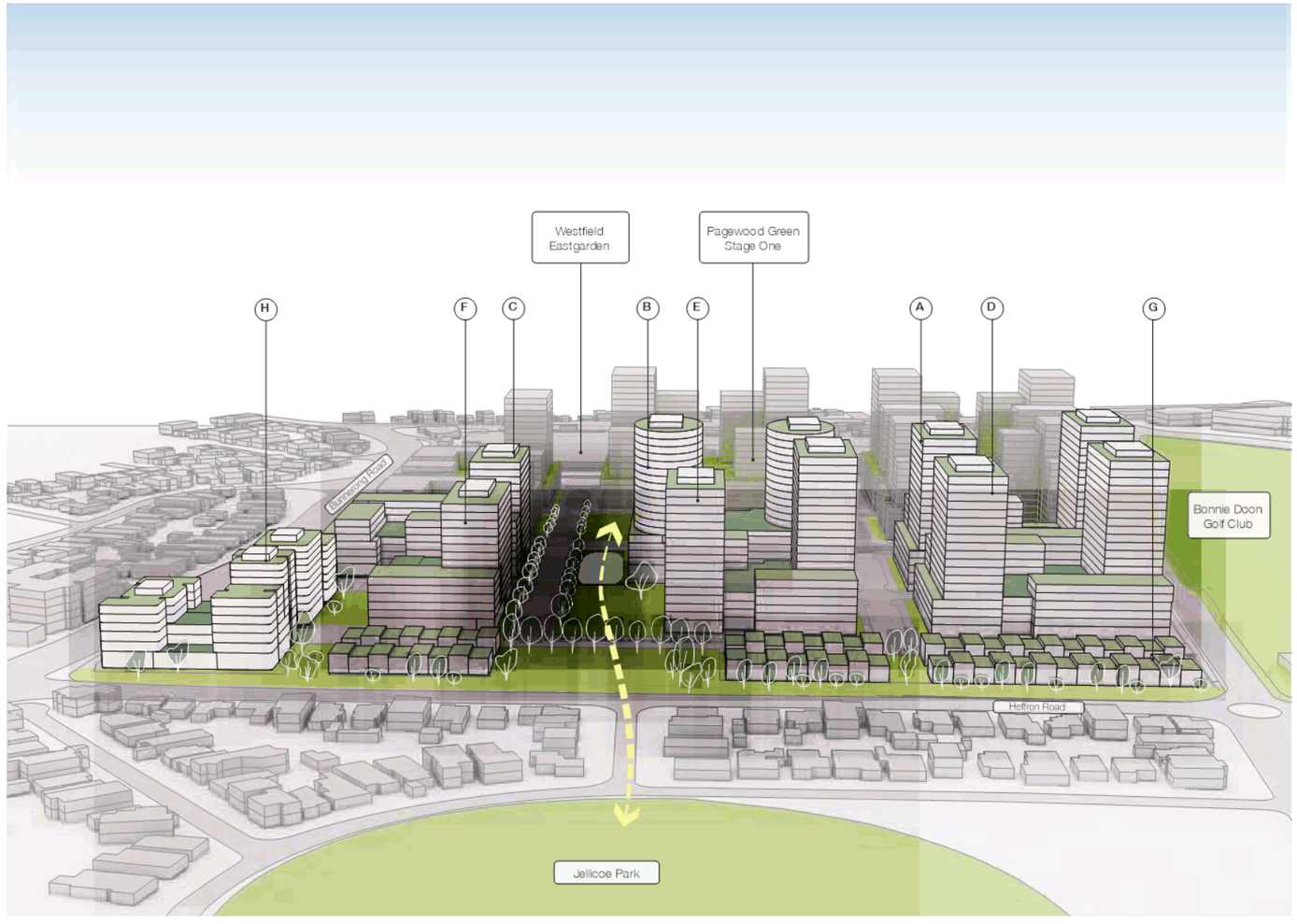
## Proposed Masterplan

### 5.2 3D perspective

The perspective view of the proposed development demonstrates how the buildings step down in height toward the east of the site to manage transition in scale and creates an appropriate interface with the surrounding residential development. The building heights ensure that there is no overshadowing to the surrounding residential areas between 9am and 3pm. While also ensuring that the scale and visual bulk compliment surrounding development. The separation between buildings are shown, with dimensions from tower to tower that either meet or exceed ADG standards

Building typologies are varied throughout the precinct with townhouses and terraces integrated into the podium to interface with residential streets, medium and high-density development is integrated to the south and west of the precinct in the least sensitive parts of the site.

The built form frames a network of green spaces that includes public open space, communal podiums, private terraces and balconies. The linear park through the centre of the site is not only an inviting entry, it also creates a legible site that connects Jellicoe Park through to the public open space of Pagewood Green Stage I and onto Westfield Eastgardens. The civic square will create a vibrant heart to the future community, where the retail spills onto the street and people linger to enjoy one another's company.



## Proposed Masterplan

### 5.3 Massing Envelopes

The massing envelope is a representation of the proposed planning control's maximum height at the boundary of the proposed building allotments.

Further design development within these envelopes will need to take into consideration ADG requirements, including solar access and building separation, and ensure no overshadowing east of Bunnarong Road between 9am and 3pm. These are considerations that will be applied as the built form is further resolved.

| Building | Max Building Height | Height of Building | Storeys |
|---|---|---|---|
| A | RL91 | 69m | 20 |
| B | RL91 | 68.3m | 20 |
| C | RL91 | 68.2m | 19 |
| D | RL60 | 37m | 9 |
| E | RL91 | 69.5m | 20 |
| F | RL91 | 69.6m | 20 |
| G | RL91 | 68.6m | 20 |
| H | RL60 | 37.5m | 10 |
| I | RL37 | 16.6m | 3 |
| J | RL37 | 16m | 3 |
| K | RL37 | 15.3m | 2 |
| L | RL60 | 38m | 10 |
| M | RL60 | 38m | 10 |

**Assumptions**

- Storey heights
  - 5.5 - 7m height for ground floor (floor to floor)
  - 3.1m height for other floors (floor to floor)
  - 2.5m height for plant & lift overrun level (floor to floor)



## Proposed Masterplan

### 5.4 Subdivision Plan

| LOT | Developable Area | Private Road | TOTAL | Percentage |
|---|---|---|---|---|
| A | 7733 m² | 378.4 m² | 8111 m² | |
| B | 6824.4 m² | 436.4 m² | 7261 m² | |
| C | 6385.3m² | 783 m² | 7168 m² | |
| D | 7354.5 m² | 378.4 m² | 7733 m² | |
| E | 5578.4 m² | 436.4 m² | 6015 m² | |
| F | 6618.6m² | 2397.4 m² | 9016 m² | |
| G | 7611 m² | | 7611 m² | |
| H | 7511 m² | | 7511 m² | |
| SUBTOTAL | 55616.2 m² | 4810 m² | 60426 m² | 67.4% |
| PUBLIC OPEN SPACE | | | 20208 m² | 22.6% |
| PUBLIC ROAD | | | 8762 m² | 9.8% |
| ROAD RESERVES | | | 193 m² | 0.2% |
| TOTAL SITE AREA | | | 89589 m² | 100% |




**Key**

- Residential
- Residential (Low Rise)
- Mixed Use
- Aged Care
- Public Road
- Private Road*
- Open Space
- Retail/Childcare
- Site Boundary

*All private roads are associated with respective lot boundaries, all of them include public access easements for pedestrians to increase the permeability of the site.

## Proposed Masterplan

### 5.5 Development Yeild and Distribution

**Lot Areas:**

The total site Area of Pagewood Green Stage Two is 89,570m², while the permitted FSR is 2.35:1. This allows for a total GFA of 210,490m².

In summary:

- The site will offer retail GFA of 5,000m² at minimum.
- Lot B is a possible hotel or serviced apartments.
- Lots F and G both have a double row of terraces. There are 58 proposed terraces, 42 in Lot G and 16 terraces in Lot F.
- Lot H is possible aged care dwellings. This permits an additional FSR of 0.5:1 (3755.5 sqm) to be developed within the envelope.
- Affordable housing is yet to be located in masterplan and is subject to consultation with council.
- The residential GFA also includes 1,200m² for 2 x 75 space Childcare Centres.

**TABLE OF AREAS**

| | Lot Area (sqm) | GFA (sqm) | Units (approx) |
|---|---|---|---|
| Lot A | 8,111 | 38,074 | 375 |
| Lot B | 7,261 | 36,993 | 327 |
| Lot C | 7,168 | 21,614 | 192 |
| Lot D | 7,733 | 37,194 | 365 |
| Lot E | 6,015 | 33,201 | 319 |
| Lot F | 9,016 | 18,713 | 181 |
| Lot G | 7,611 | 7,050 | 42 |
| Lot H | 7,511 | 21,406* | 214 |
| Total | 60,426 | 214,245 | 2,015 |

*The bonus 0.5:1 FSR associated with the potential aged care is added to the GFA of Lot H. This makes the total 210,490 sqm (allowable GFA) plus 3755 sqm (area of bonus FSR). If aged care is not proposed the bonus does not apply.



## Proposed Masterplan

### 5.6 Parking

**Parking Allowances:**

There are approximately 94 on street car parks provided, as well as an additional 2,344 parking spaces provided within the development envelopes. This is a total of 2,438 car parks across the site.

This accommodates a ratio of two cars per town house; 1.5 cars per 3 bedroom apartment; one car per two bedroom apartment; 0.5 car to every single bedroom apartment; as well as extra to support retail within the site.

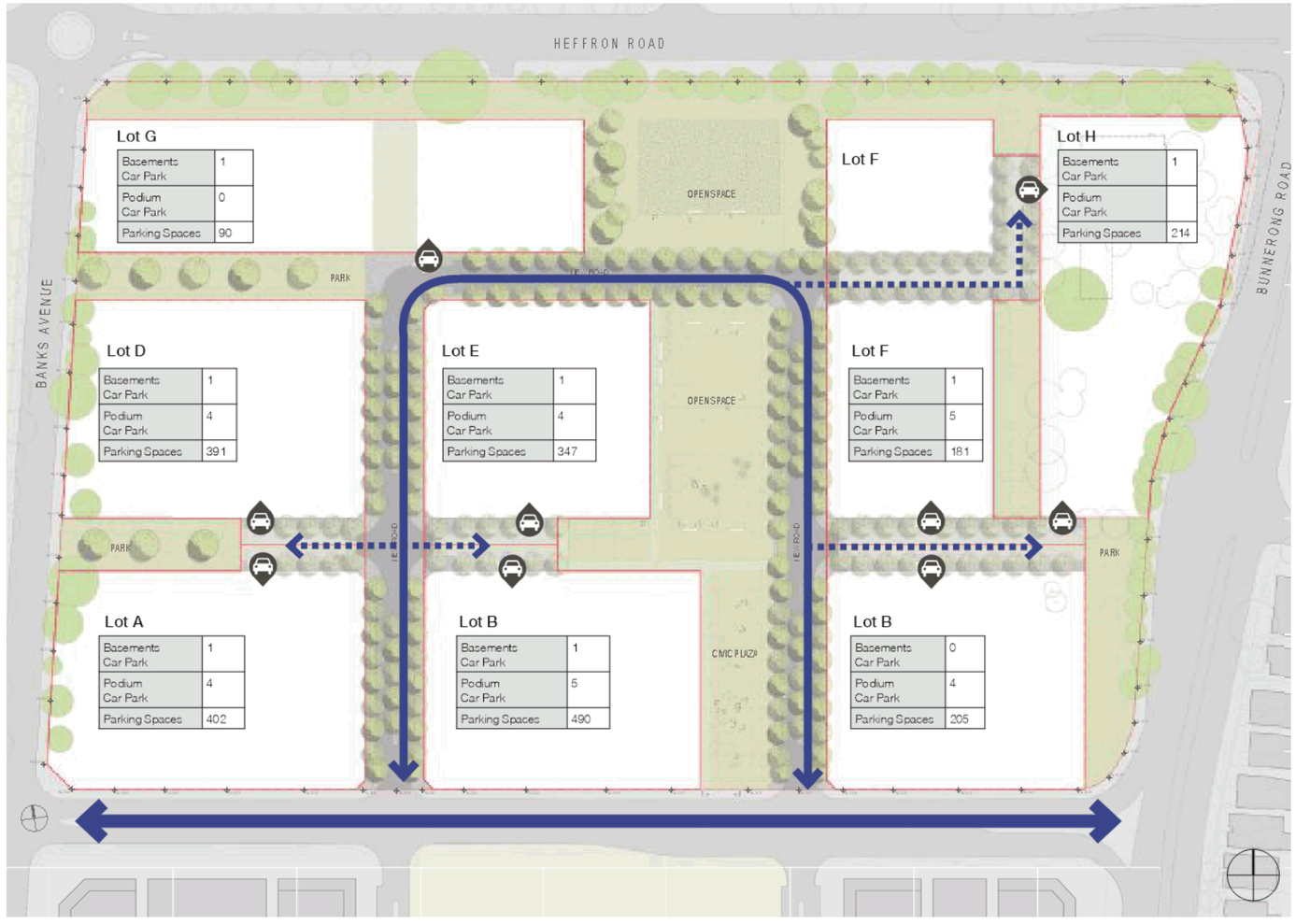
**TABLE OF AREAS**

| | Units | Parking Spaces |
|---|---|---|
| Lot A | 375 | 402 |
| Lot B | 327 | 490 |
| Lot C | 192 | 205 |
| Lot D | 365 | 391 |
| Lot E | 319 | 347 |
| Lot F | 181 | 195 |
| Lot G | 42 | 90 |
| Lot H | 214 | 224 |
| On Street | | 94 |
| Total | 2,015 | 2,438 |

The masterplan will accommodate a car sharing service with a fleet of approximately 20 share-car stations provided across the site. There will be 198 bike parks also located on the site to better facilitate active and sustainable modes of transport.

**Key**

- Development Lots
- Vehicle entry to basement
- Key Road Linking to Major Roads
- Two-Way Loop Road Through Site
- Minor/Private Streets
- Site Boundary

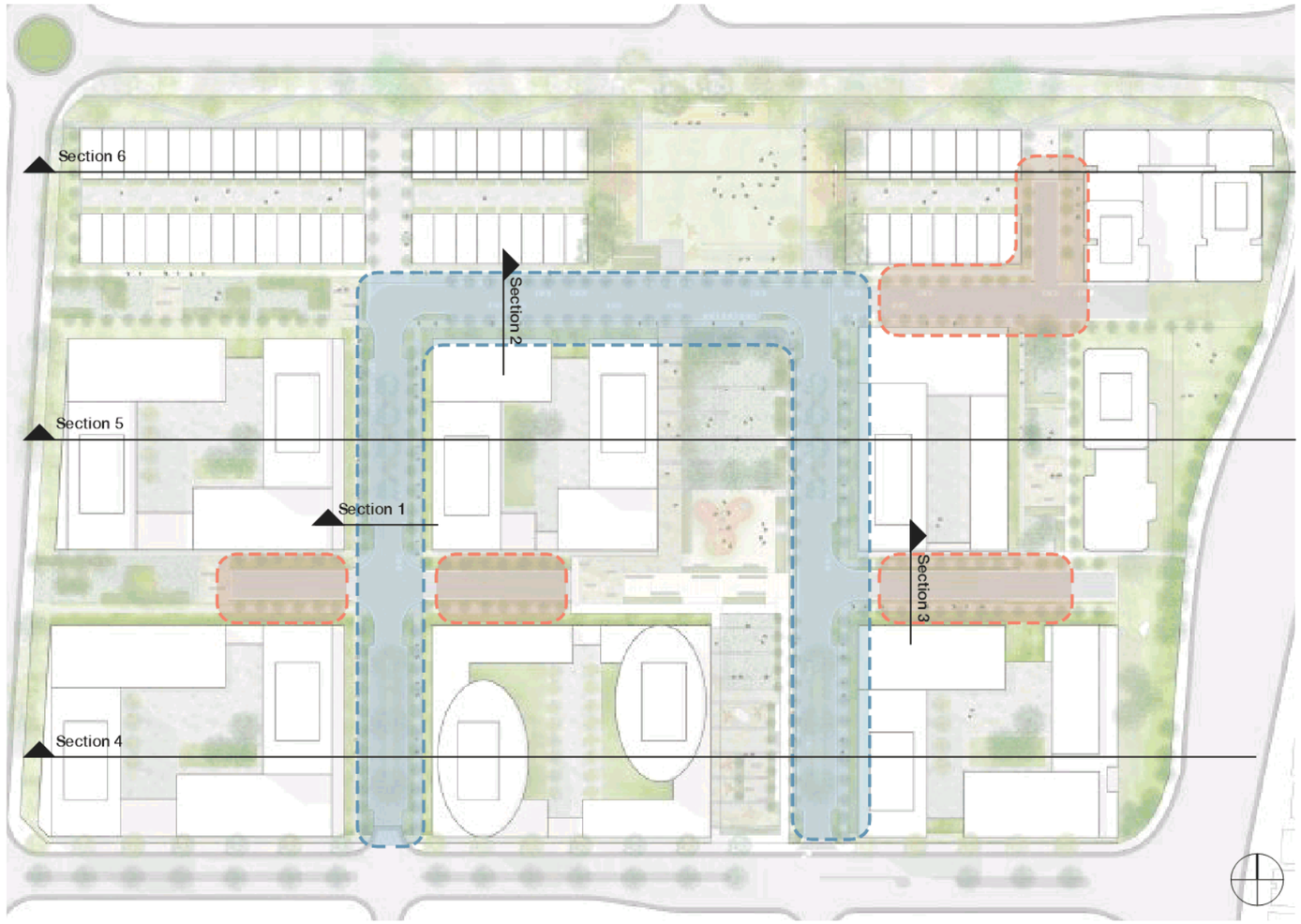


## Proposed Masterplan

### 5.7 Typical Street Sections

Six site sections have been identified to show the quality of experience on the street and the relationship to the built form.

Each of the sections demonstrates the different type of street profile, sections 1-3 highlighting the road profile, street setback and interface with the buillt form, while sections 4-6 are east to west cross-site sections of the entire subject site and incorporate the different types of public realm offer in the precinct.

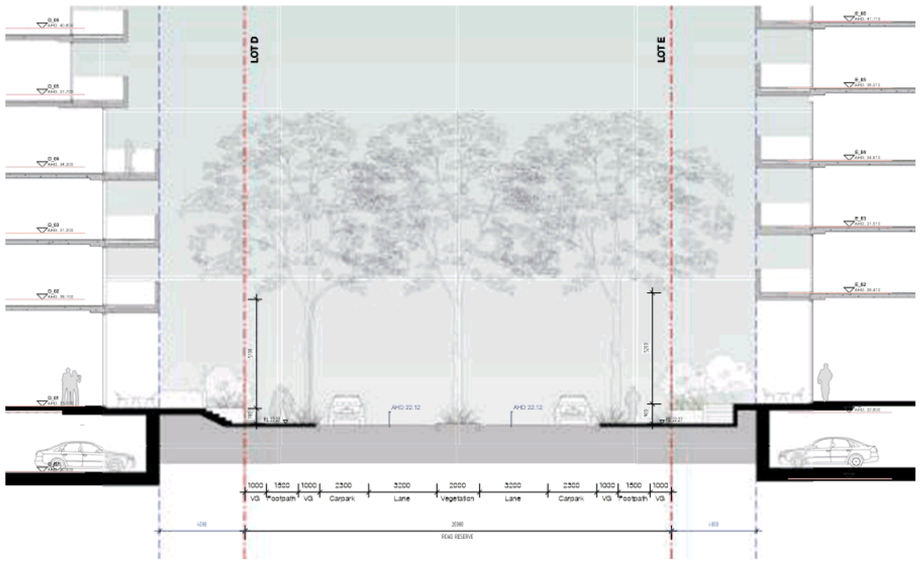


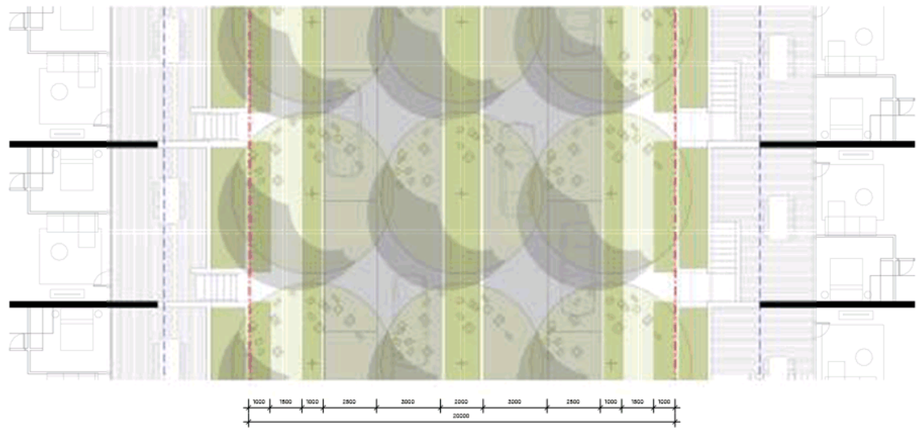

**Key**

- Local Road
- Primary Collector
- Site Boundary

**Proposed Masterplan**

## 5.8 Typical Street Sections



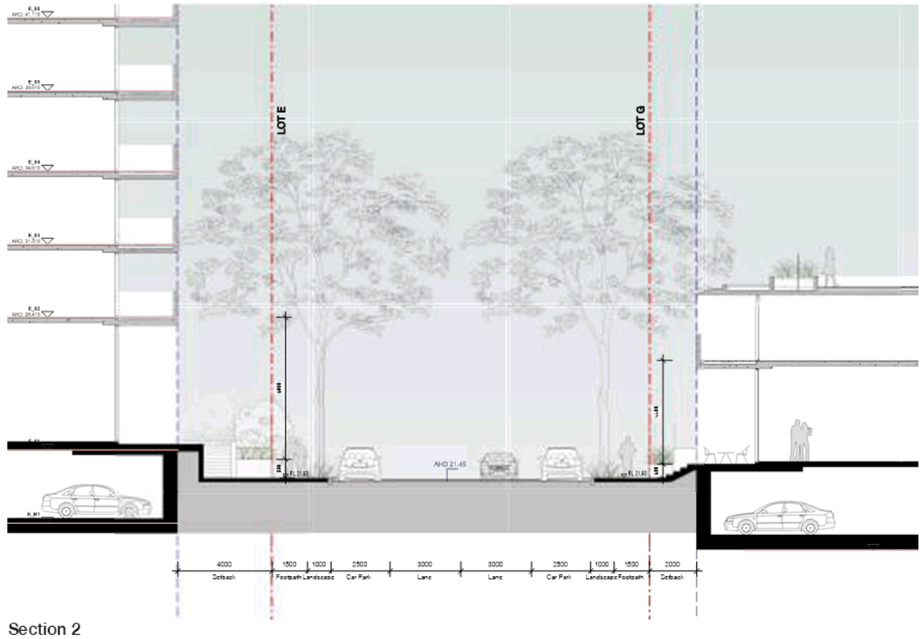



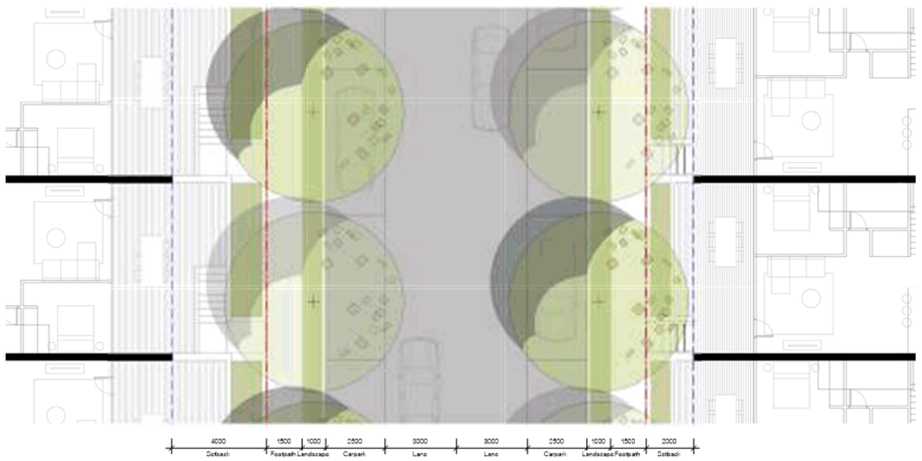

**Section 1**

This section shows how the north-south primary collector street and how it interfaces with the built form on either side of the road.

## Proposed Masterplan

### 5.9 Typical Street Sections



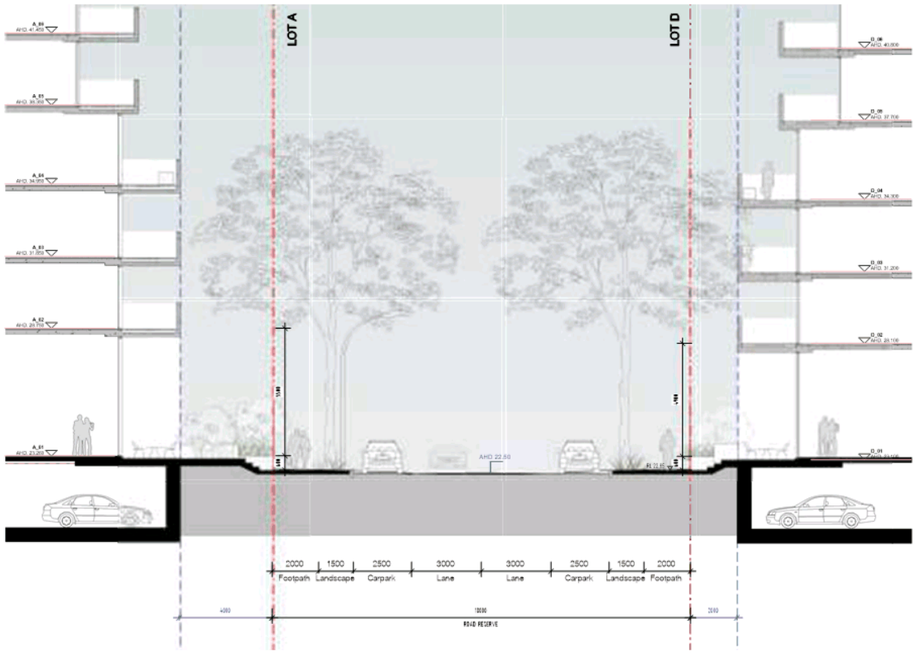



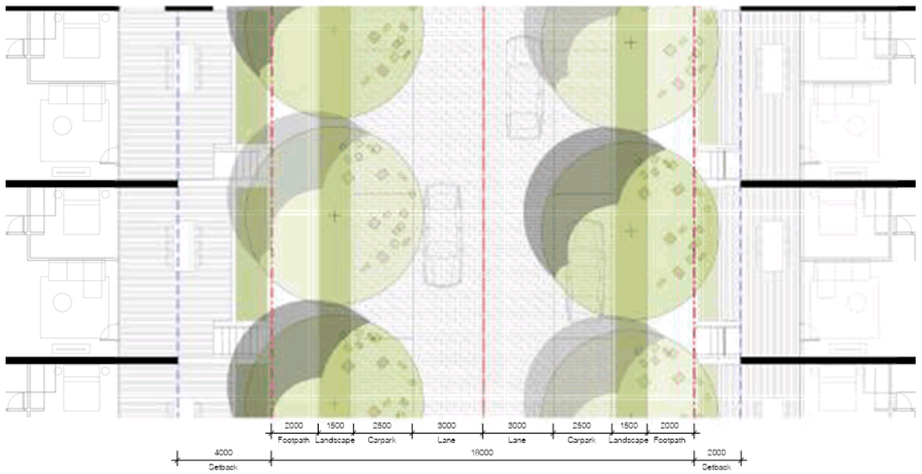

**Section 2**

This section shows how the east-west primary collector street and how it interfaces with the built form on either side of the road, this includes the town houses to the north of the site.

## Proposed Masterplan

### 5.10 Typical Street Sections



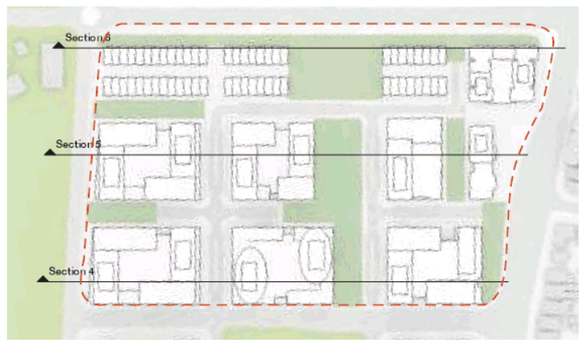

**Section 3**

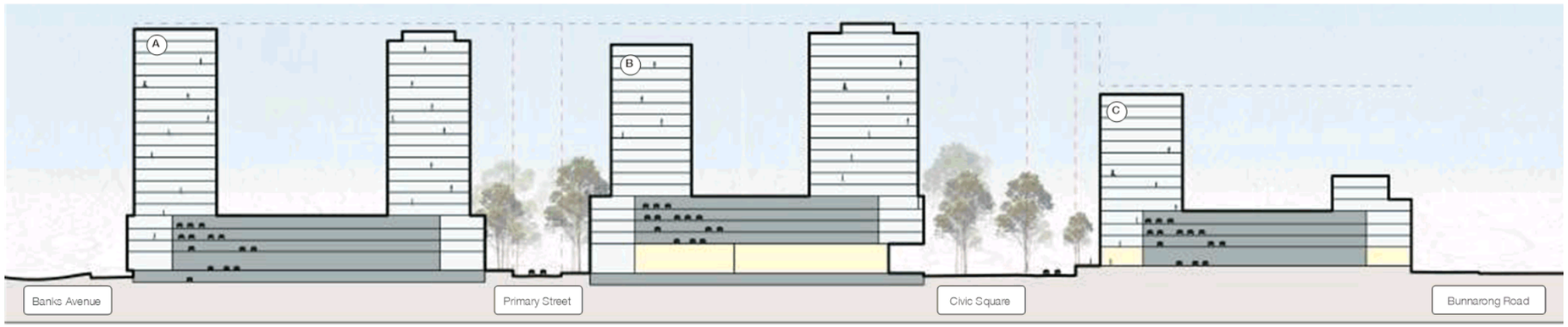
Section 3 is a typical cross section of the private streets that are local access streets for future residents.

## Proposed Masterplan

### 5.11 Through Site Sections

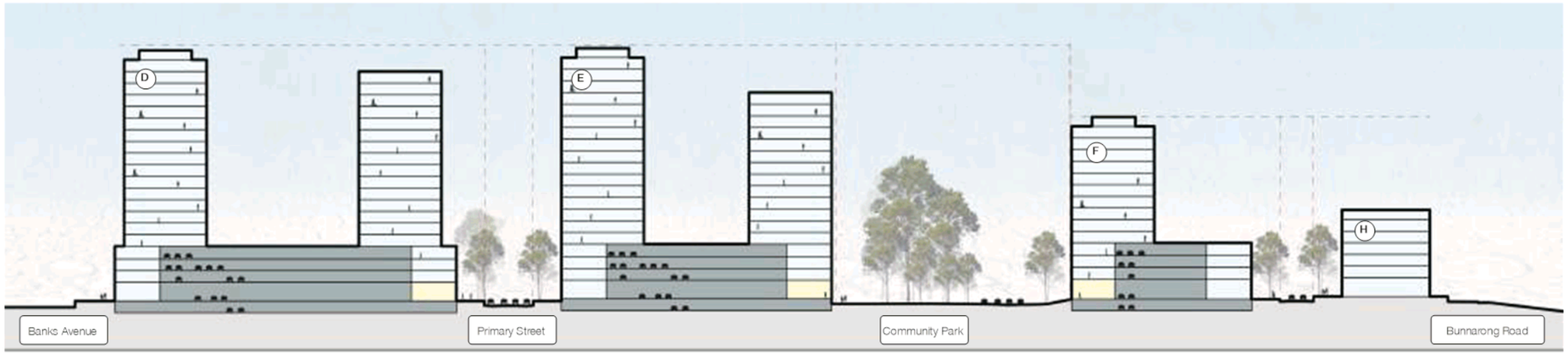
The through site section demonstrates the transition in height toward the east and north of the site. They also show how the break up of the development allows for wide streets and tower separation. The internalised parking is shown to be sleeved by residential apartments and the address of the commercial at ground level activates the civic spaces.



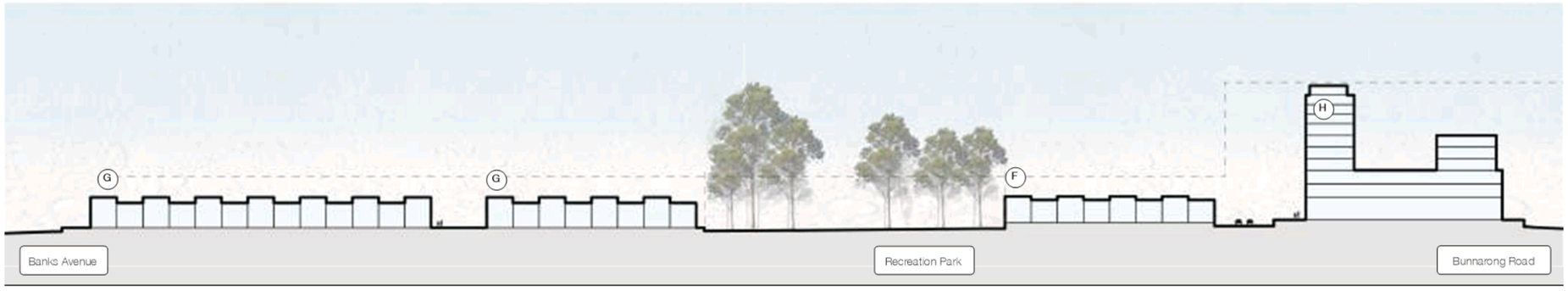




Section 4

**Proposed Masterplan**




Section 5




Section 6

## Proposed Masterplan

### 5.13 Landscape Masterplan



**Recreation Park**

- Unprogrammed grassy lawn
- Spaces to kick a ball
- Space for group fitness
- Seating options at periphery



**Civic Square**

- Creates a forecourt to the retail offer
- Place of congregation and for people to linger and socialise
- Sense of entry into the precinct



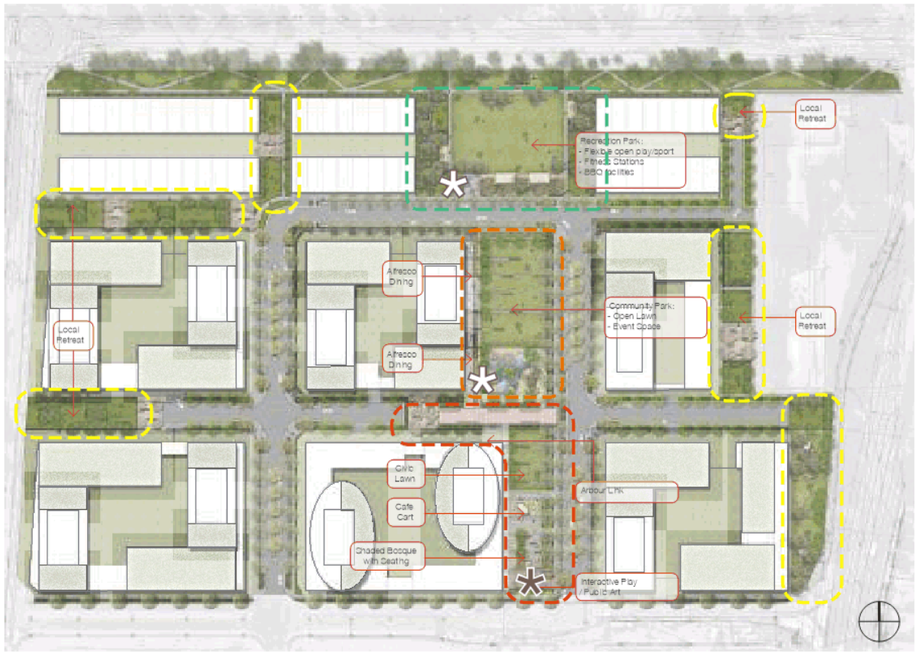
**Link Parks**

- Shaded and vegetated open spaces that contribute amenity to the wider precinct
- Transitory spaces at the edges of the subject area



**Community Park**

- Play spaces
- Informal seating spaces
- Informal open space for recreation
- Dining and alfresco area next to retail along building edges




**Materplan Principles**

The future residents of Pagewood will be provided a range of open spaces for different lifestyles and activities within a short walk from their front door.

The landscape masterplan spatially implements the many themes that were established in the broader structure and vision. The key themes that have brought this plan together include:

- Integration - creating synergy with the built form and surrounding context and build an unique local character
- Connectivity - considers through site links, improves walkability and integrates multiple modes of transport
- Multifunctionality - to ensure spaces are appropriate to a range of user groups and useful to changing needs and populations.
- Participation - creating a public domain that bring to life the diversity of residents and users in Pagewood, encouraging informal encounters and building community.

**Key**

- Link Parks
- Road Interface
- Recreation Space
- Community Park
- Civic Square
- Primary Public Art Opportunity
- Secondary Public Art Opportunity
- Site Boundary

Landscape concept by Urbis Landscape Architects

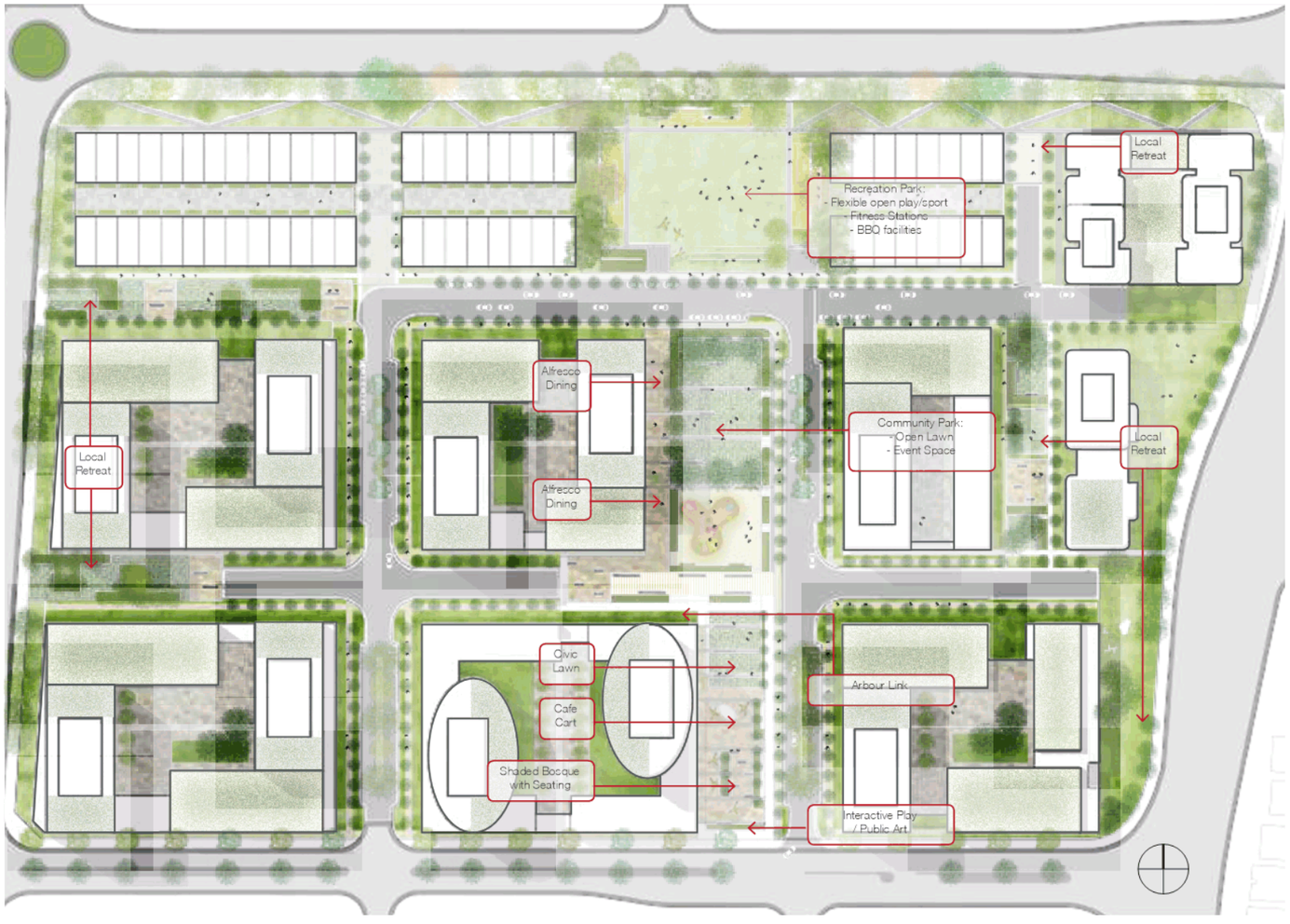
## Proposed Masterplan

### 5.14 Open Space Metrics

There is 20,208sqm of public open space provided, this is 23% of the overall site which is substantial for urban infill developments and is in addition to the 8,000m2 already approved under Stage 1 of the Pagewood Green Development. There is also a substantial amount of communal open space provided on podiums and rooftops, which has the potential to double the open space offering and will comply with the relevant provisions of the ADG.

The proponent will also be providing additional indoor recreational facilities on a site by site basis, including swimming pools, gyms and exercise studios, which is over and above the requirements of the ADG.

This substantial provision of public and communal open space, both indoor and outdoor, is in addition to the network of 25ha of publicly accessible open spaces within an 800m catchment of the site.



## Proposed Masterplan

### 5.15 Benchmarking Open Space

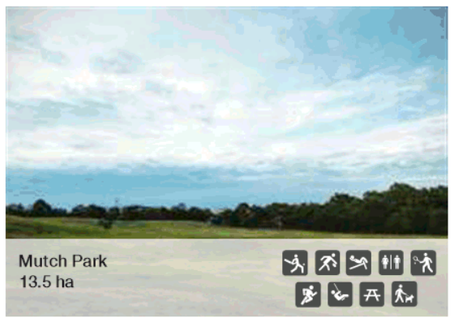
There are many measurements of public open space provision in new and existing suburban areas. These benchmarks vary in the manner that the provision is calculated and are dependent on dwelling density, type of open space, the amount of communal or private open space to compliment the offer, and most significantly the quality of the offer available. It is better to have one high quality, multi-purpose open space than multiple old, degraded, single purpose parks with no tree canopy cover.

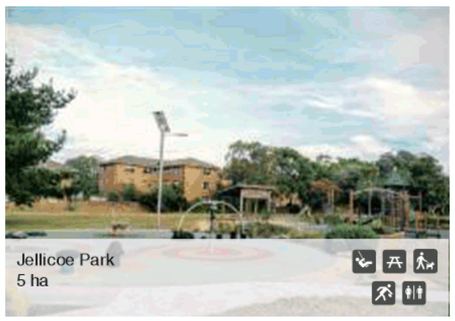
Examples of these benchmarks include:

- Metropolitan Sydney's Planned Precincts have an average of 3.5sqm of public open space per person.
- The World Health Organisation (WHO) recommends 9sqm per person, this includes communal and private open space.
- The Government Architect NSW (GANSW) recommends approximately 14.3sqm per person of open space at a regional and local level. This is broken down into open space typologies, where the minimum to achieve is:
  - All dwellings within 400m of a local level park (0.5ha to 2ha)
  - All high-density dwellings (60 dwellings or more per hectare) within 200m of a local level park (0.1 to 0.5ha)
  - All dwellings within 2ha of a district park (2 to 5 ha)
  - All dwellings within 5km of a regional park (minimum 5ha)

The Pagewood Green achieves the open space target of the three benchmarks provided. The public open space offer within the site will approximately double the average open space allowance provided in Planned Precincts. While, generous balconies, communal terraces, indoor recreation spaces and the 2.2 ha of public open space, every resident will be able to readily access 9sqm per person of open space within the development site (as per the WHO benchmark). Lastly, the GANSW's recently established benchmarks will be more than met through the local provision of Pagewood Green and will face no deficiencies in open space offer and will be well supported by the quality of local offer due to the network of 25ha of publicly accessible open spaces within an 800m catchment of the site and greater than 60 ha within 2km of the site.









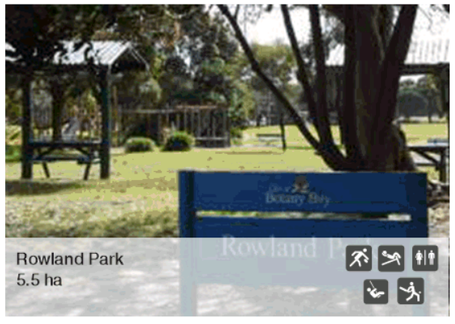












# Scheme Analysis

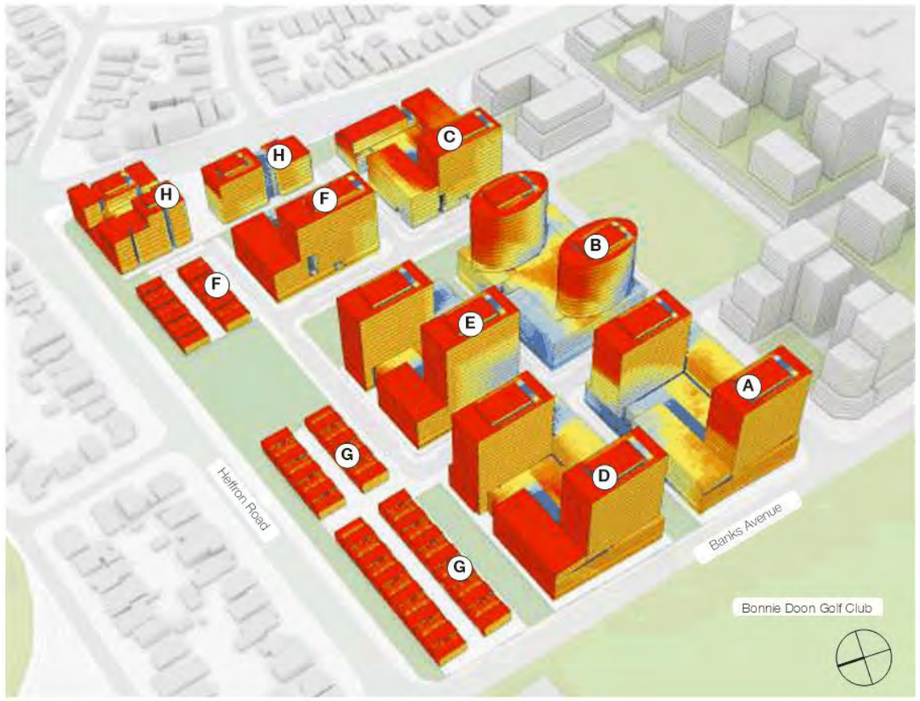
6

This section of the report demonstrates the sites ability to achieve solar requirements based on potential building envelopes that can be realised within the proposed planning controls. Solar access to façades and open space has been analysed demonstrating that the requirements of the ADG can be achieved.

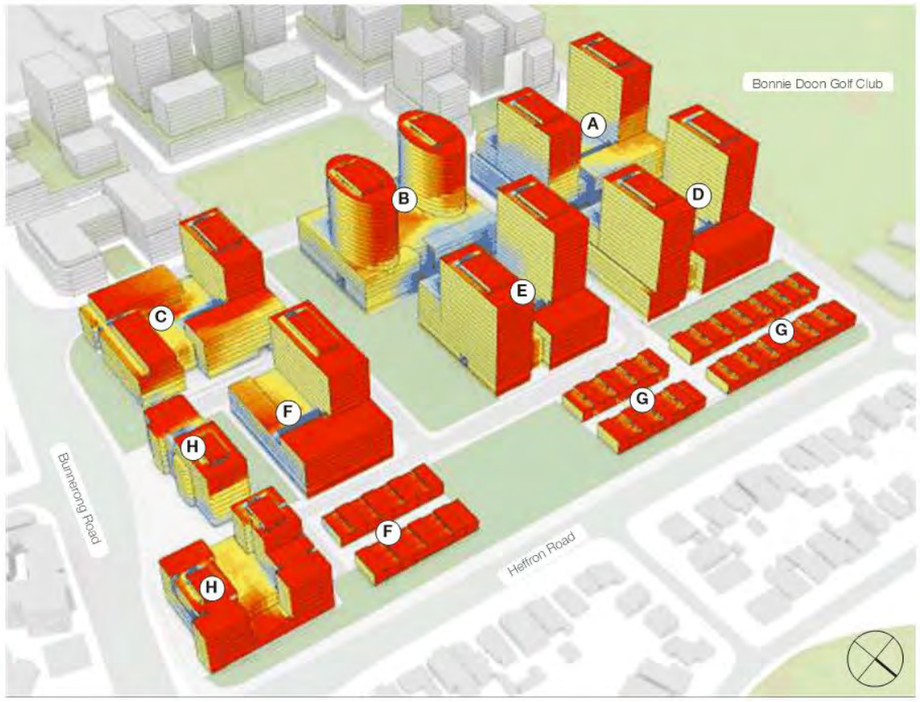
Overshadowing of neighbouring properties has also been assessed, including UB3, UB4, the central open space, and residential dwellings on the eastern side of Bunnerong Road, to ensure adequate solar access is achieved between 9am and 3pm throughout the year. The overshadowing analysis was taken on the shortest day of the year (the winter solstice) as a baseline. Based on the testing of the potential building envelopes, we believe that solar compliance can be achieved by residential dwellings on surrounding sites.

## Scheme Analysis

### 6.1 Solar Insolation: Built Form



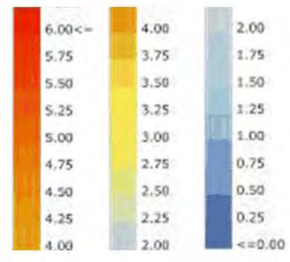

View from north west




View from north east

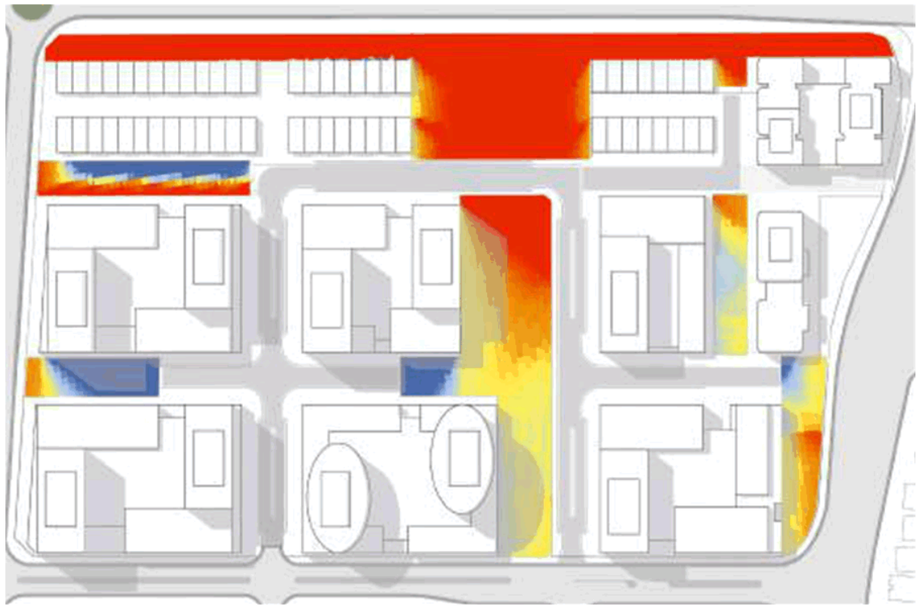
82.7% receives more than 2 hours of sunshine on the winter solstice
68.8% receives more than 3 hours of sunshine on the winter solstice

Note: this will be uplifted to 70% with more than 3 hours of sunshine through detailed design of the building, given that the assessment is based on envelopes and the %75 building efficiency under the ADG (i.e. resultant buildings will be smaller with better solar access).



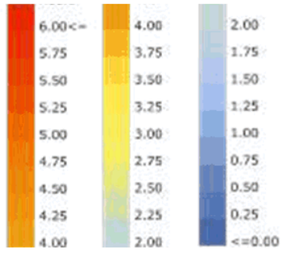
## Scheme Analysis

### 6.2 Solar Insolation: Open Space



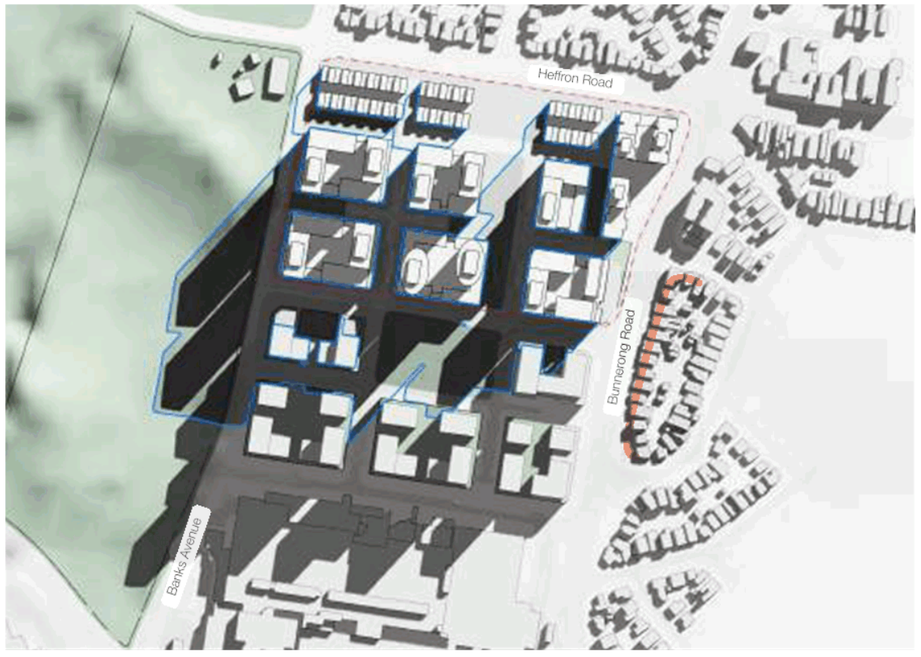
**Solar Insolation - Public Realm**

Approximately 76% of the public realm receives more than 2 hours of sunshine on the winter solstice, while 57% receives more than 3 hours of sunshine.



**Scheme Analysis**

## 6.3 Shadow Diagrams - Winter Solstice




9am - Winter Solstice

76% of public open space has direct sunlight.




10am - Winter Solstice

84% of public open space has direct sunlight.

**Key**

- Interface with Residential Area
- Site Boundary
- Shadow of permissible envelope under planning controls

**Key**

- Interface with Residential Area
- Site Boundary
- Shadow of permissible envelope under planning controls

## Scheme Analysis

### 6.4 Shadow Diagrams - Winter Solstice




11am - Winter Solstice

91% of public open space has direct sunlight.

**Key**

- Interface with Residential Area
- Site Boundary
- Shadow of permissible envelope under planning controls




12pm - Winter Solstice

86% of public open space has direct sunlight.

**Key**

- Interface with Residential Area
- Site Boundary
- Shadow of permissible envelope under planning controls

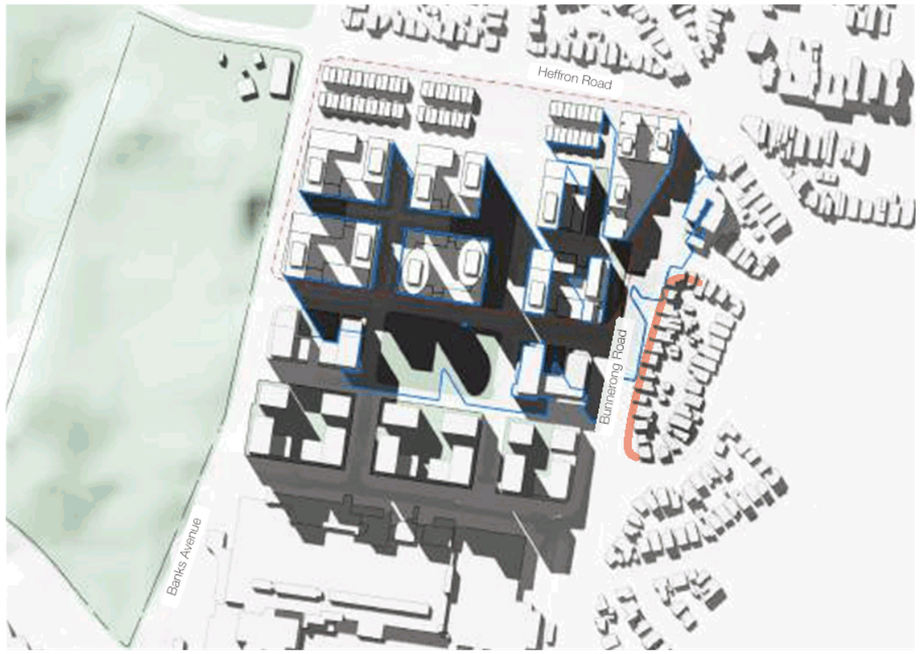
## Scheme Analysis

### 6.5 Shadow Diagrams - Winter Solstice




1pm - Winter Solstice

76% of public open space has direct sunlight.




2pm - Winter Solstice

70% of public open space has direct sunlight.

**Key**

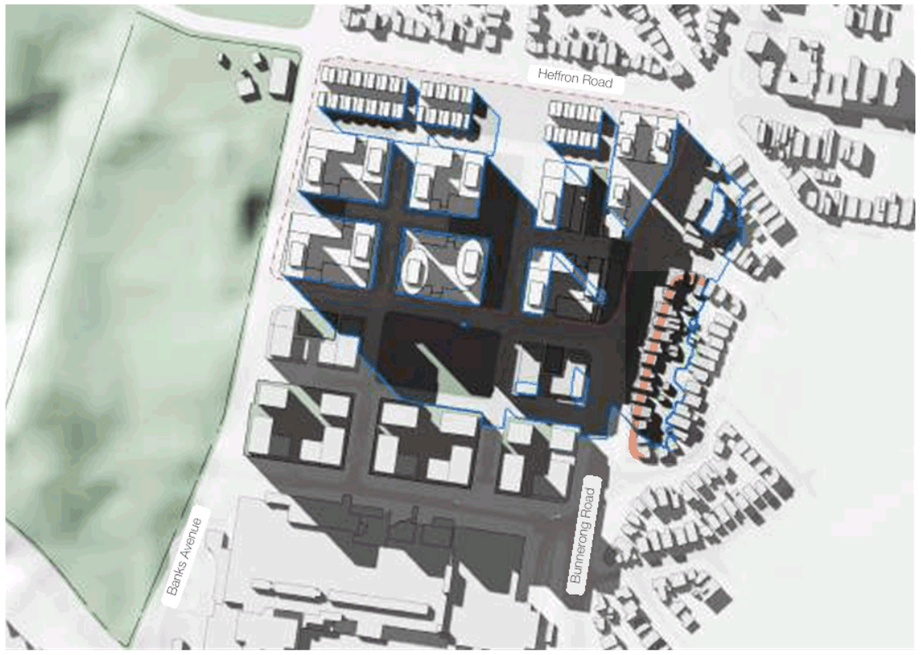
- Interface with Residential Area
- Site Boundary
- Shadow of permissible envelope under planning controls

**Key**

- Interface with Residential Area
- Site Boundary
- Shadow of permissible envelope under planning controls

## Scheme Analysis

### 6.6 Shadow Diagrams - Winter Solstice




3pm - Winter Solstice

67% of public open space has direct sunlight.

**Key**

- Interface with Residential Area
- Site Boundary
- Shadow of permissible envelope under planning controls

SJB Architects

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SJB is passionate about the
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Let's collaborate.

Level 2, 490 Crown Street
Surry Hills NSW 2010
Australia
T. 61 2 9380 9911
architects@sjb.com.au
sjb.com.au

# APPENDIX B ECONOMIC IMPACT ASSESSMENT

# ECONOMIC IMPACT ASSESSMENT

## 128 & 130-150 BUNNERONG ROAD, PAGEWOOD

24 OCTOBER 2018
FINAL
PREPARED FOR MERITON

URBIS

**URBIS STAFF RESPONSIBLE FOR THIS REPORT WERE:**

| | |
|---|---|
| Director | Princess Ventura |
| Associate Director | Ryan McKenzie |
| Consultant | Chinmay Chitale |
| Project Code | PER0052 |
| Report Number | Final |

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# EXECUTIVE SUMMARY

This report has been prepared on behalf of Meriton in support of a Planning Proposal request to rezone the land at 128 and 130-150 Bunnerong Road, Pagewood (the subject site).

Our analysis indicates that the subject site does not have the attributes of other stronger industrial precincts located within the Bayside Council. Within the Bayside Council, precincts such as Banksmeadow and Port Botany achieved higher ratings providing users with:

- Fewer land use conflicts than smaller isolated precincts
- Large contiguous industrial / business zoned precincts
- Direct access to major roads and highways.

The subject site does not have the visibility to support industrial users that appeal to a local customer base, or the transport accessibility to appeal to growing industrial sectors such as freight and logistics.

In addition, the Stage 1 Masterplan Consent for Lot 2 will deliver 2,223 apartments to the south of the subject site and create a land use conflict with the subject site's existing industrial use. The existing approvals also restrict apartments to limit the impact on existing residential uses on the opposite side of Bunnerong and Heffron Roads.

The Planning Proposal for the subject site received Gateway Determination on 12 December 2017 supporting the proposal and allowing it to 'proceed subject to conditions'.

The Planning Proposal and this report have been revised to address the following alterations of Gateway Determination dated 8th of October 2018:

- A requirement of a minimum of 5,000 square metres of gross floor area for commercial floor space and/or other permitted non-residential land uses
- Update the number of jobs to reflect the provision of an additional 5,000 square metres of non-residential land uses.

As part of the masterplan prepared by SJB, the concept identifies the potential to establish a serviced apartment in Lot B of the subject site. The Planning Proposal for the subject site has been amended to include serviced apartments as additional permitted uses for the subject site under Schedule 1 of Botany Bay LEP 2013. The development of a serviced apartment on the subject site will deliver further employment benefits for the Eastgardens / Maroubra District Centre in the order of 0.61 jobs per room.

According to Meriton the existing freight and warehousing tenants at the subject site currently employ only 15 workers, substantially lower than the estimated 342 direct ongoing jobs in childcare and retail that can be generated by the proposed development. This excludes ongoing jobs for the management and maintenance of the proposed 2,015 units.

In addition, the subject site attributes are well aligned and well suited to residential as the site has strong access to amenities and employment precincts such as Port Botany. The limited land available for residential development in a housing market with high underlying demand has resulted in a housing shortage and an affordability constraint within the Bayside Council area. New residential supply that will be delivered on the subject site will meet this demand that will improve affordability outcomes for the Bayside Council area and also deliver dwellings close to employment centres that have further capacity to grow such as the Sydney Port and East Gardens Shopping Centre.

In terms of demand for industrial land there are a number of economic changes within the NSW economy that impact land use relevant to the subject site's change in zone. For instance, in 1996 the economy relied heavily on the manufacturing sector which comprised 13.5% of GSP. By 2015 however this had contracted to 7.4% of GSP.

This change reflects structural shifts in the NSW economy, specifically:

- A contraction in trade exposed sectors, driven by an increasing Australian dollar over this period
- Increasing imports and consumption is driving demand for freight and logistics services

- Growth in 'knowledge based' sectors such as financial and professional services
- Growth in health care services, driven by an ageing population requiring health and aged care services.

The resident employment trends over 2006 to 2011 for the Bayside Council reflect similar trends to NSW, with growing employment in the service sectors and declining employment in the manufacturing sector.

- In 2011 there were a surplus of jobs compared to resident workers within the transport, postal and warehousing and manufacturing industries. This reflects the concentration of industrial land uses within the Bayside Council, in particular the role of Port Botany in providing port related services to the NSW economy. Additional housing should be delivered with accessibility to these jobs to support the workers employed within Port Botany.
- In terms of future employment growth there is an estimated additional 1,268 industrial based jobs in the Bayside Council by 2031 requiring an estimated additional 12.7 hectares of industrial land, which can adequately be met by the LGAs 18 hectares of undeveloped land.
- Further to this, there are better located industrial precincts outside the LGA with significant capacity to accommodate additional industrial jobs growth:
  - Eastern Creek (562 hectares)
  - Moorebank (336 hectares)
  - Marsden Park (238 hectares)
  - WSEA (10,000 hectares).

These precincts contain a large component of undeveloped land, and have a number of significant competitive advantages over the subject site.

Further to this, there are a number of economic benefits associated with developing the subject site:

- The proposed development on the subject site is estimated to result in an increase in direct and indirect employment and economic activity (Gross Value Added – GVA):
  - 171 direct and 531 indirect annual equivalent jobs from the construction of the proposed development concept resulting in gross value add of $102.6 million
  - 342 direct and 196 indirect jobs from the operation of the childcare and retail facilities resulting in gross value add of $57.5 million
  - 0.61 jobs per room developed as part of the potential serviced apartment.
- The 342 direct ongoing jobs to be delivered by the Planning Proposal will constitute a substantial 16%-31% of the projected 1,100–2,100 jobs (2016-36) at the Eastgardens / Maroubra District Centre. The direct ongoing jobs also represent an extensive 2,180% increase on the 15 jobs currently provided on the site under its existing use.
- It is worth noting that there will be peaks and troughs on actual jobs during construction. For instance, it has been estimated that approximately 1,000 construction workers were present on site during peak construction periods.
- In addition, the subject site's redevelopment will accommodate an additional 2,770 local-residents (as advised by SJB):
  - Based on the current spending profile of residents within the Bayside Council, an average spend per capita of $13,514 in $2018 is calculated
  - Therefore, additional population could generate $37.4 million in retail expenditure (in $2018)
  - Increasing the local resident population will activate the area, providing passive security for the residents, workers and visitors of the site.

The Plan identifies priorities for each District across Sydney, with the subject site being located in the Eastern City District. According to The Plan, the Eastern City will be a significant focus for investment and intensive growth over the next 20 years including:

- Increased access to work for residents through improved transport infrastructure networks
- The development of the subject site will house workers close to Port Botany
- Development of the subject site will improve housing affordability by adding supply to the local housing market.

# INTRODUCTION

Urbis has been appointed by Meriton Group to undertake an Economic Impact Assessment of the proposed rezoning of the former British American Tobacco site (128 Bunnerong Road, Pagewood). The intended outcome of the Planning Proposal is to amend the *Botany Bay Local Environmental Plan 2013* (BBLEP 2013) as follows:

- Rezone the subject site from part IN1 General Industrial and part R3 Medium Density Residential to R4 High Density Residential.
- Increase the maximum floor space ratio (FSR) development standard from 1:1 to 2.35:1.
- Increase the maximum height of buildings development standard to part RL 37.0 (15m), part RL 60.0 (39m) and part RL 91.0 (70m).

A masterplan illustrating the type of development facilitated by the Planning Proposal has been prepared by SJB. The masterplan contemplates a high-density residential development with buildings of 2-20 storeys oriented around a network of internal roads and public open space. The development will accommodate approximately 2,015 dwellings and allowance has been made for 5,200 sq.m retail floor space and two childcare centres totalling 1,200 sq.m.

As part of the masterplan prepared by SJB, the concept identifies the potential to establish a serviced apartment in Lot B of the subject site. The potential inclusion of serviced apartments in Lot B will further contribute to the mix of lands uses provided within the site and is a response to the site's strategic centre location and new conditions associated with the amended Gateway Determination.

The serviced apartment yield will be determined as part of a future DA, however, its inclusion in considered as part of this report as it will add to the potential of the site to create employment, and meet the minimum requirement of 5,000 sq.m of non-residential floor space as part of the Gateway Determination as amended.

The rezoning of the subject site to R4 High Density Residential is intended to facilitate the redevelopment of the entire area, which could potentially involve additional apartments, community spaces and childcare.

The purpose of this report is to:

- Explore industry and employment trends at the state and LGA level, and their land use implications for the subject site.
- Assess the competitive positioning of the subject site relative to other industrial precincts, within the new Bayside Council.
- Evaluate the suitability of the subject site for industrial, mixed use and residential uses.
- Consider whether the rezoning of the Precinct is consistent with the NSW Department of Planning Greater Sydney Regional Plan (2018) and other relevant government documents.
- Identify broader economic benefits associated with the proposed rezoning.

The report is structured as follows:

- **Section one** provides an overview of the subject site, its regional and locational context, and considers the alignment of the proposal rezoning with relevant government policy documents.
- **Section two** identifies the key competitive industrial precincts and supply within the new Bayside Council. This section provides a description of each precinct and rating based on location, scale and access, and determines the overall surplus / deficit of employment land moving forward.
- **Section three** sets out an overview of the new Bayside Council employment profile, having regard to historic, current and projected labour market segmentation. This includes analysis of the resident workforce and job base. The demand for industrial land is then quantified for the new Bayside Council.
- **Section four** identifies the economic benefits associated with the construction and ongoing operations of the redeveloped precinct.

# 1. STUDY BACKGROUND

This Chapter provides an overview of the subject site. Relevant government growth strategies and policies are analysed in the context of the proposed development concept for the subject site.

## 1.1. SUBJECT SITE

The subject site is located within a broader site known as 128 and 130-150 Bunnerong Road, Pagewood. The site is within the Bayside Local Government Area (LGA) and is legally described as Lot 1 DP1187426 and Lot 24 DP 1242288.

The Planning Proposal request relates to Lot 1 DP1187426 and Lot 24 DP 1242288 and covers an area of approximately 8.95ha. The site has frontages to an internal road (Meriton Boulevard) to the south, Bunnerong Road to the east, Banks Avenue to the west and Heffron Road to the north.

A masterplan illustrating the type of development facilitated by the Planning Proposal has been prepared by SJB. The masterplan contemplates a high-density residential development with buildings of 2-20 storeys oriented around a network of internal roads and public open space. The development will accommodate approximately 2,015 dwellings and allowance has been made for 5,200 sq.m retail floor space and 1,200 sq.m for two childcare centres (600 sq.m each).

The subject site was previously occupied by industrial uses associated with the manufacturing operations of British American Tobacco Australasia (BATA).

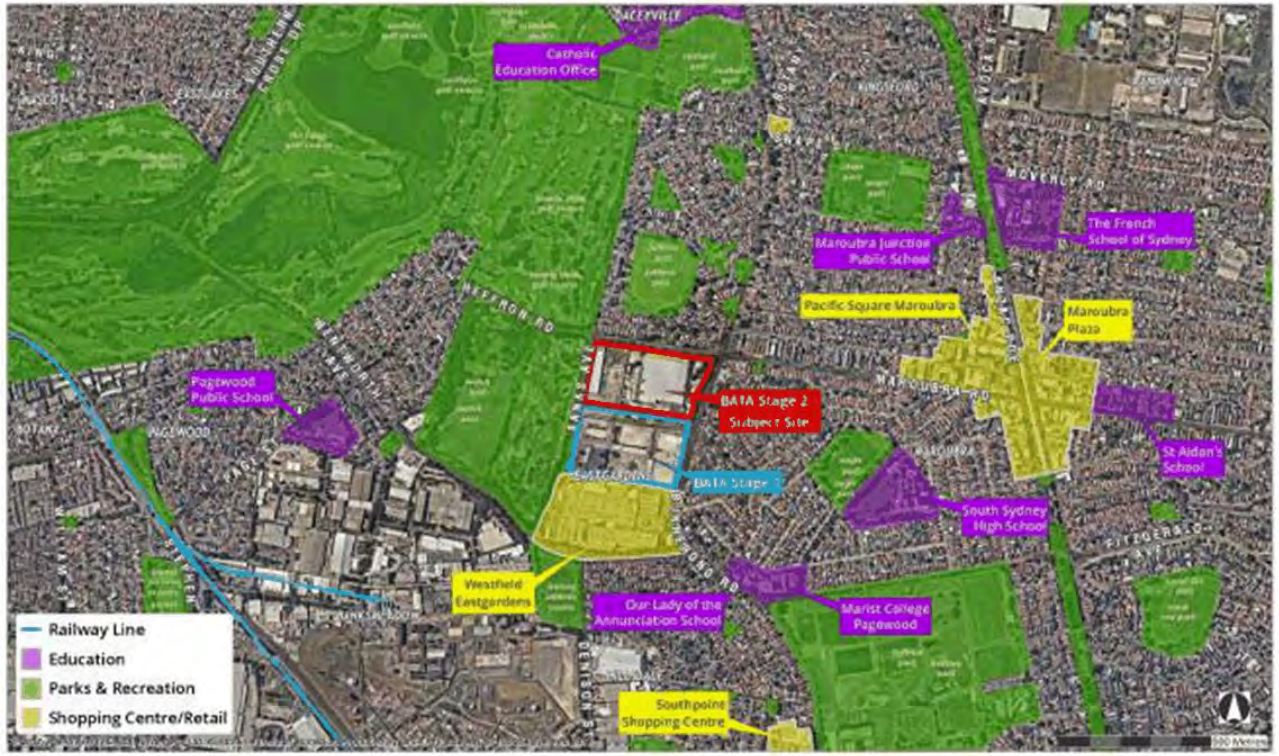
A map of the subject site and surrounding areas is provided in Map 1.1 overleaf. The subject site is part of a second stage of a broader development that will deliver over 3,700 dwellings. The proposed rezoning of the subject site will facilitate the delivery of 2,015 new apartments.

The site is currently used for industrial warehouse by a WSI Logistics who provide freight forwarding services.

As shown in Map 1.2, the subject site is in close proximity to the following key locations:

- Westfield Eastgardens Shopping Centre
- Substantial provision of open space including Mutch Park, Jellicoe Park, Nagle Park and Heffron Park
- South Sydney High School, Maroubra Junction Public School, St Aidan's Primary School and Matraville Public School.

Subject Site – Stage 1 and 2 Map 1.1

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**SUBJECT SITE AND SURROUNDING AMENITY**

AMENITY

The site is surrounded to the north and east by detached residential, to the west by the Bonnie Doon Golf Course and the south by redevelopment in accordance with the Stage 1 masterplan. Westfield Eastgardens is located to the south of the site, providing extensive grocery and discretionary retail offer to surrounding residents.

The following images provide a snap shot of the subject site collected through a physical inspection of the site.

Figure 1 – Subject site and surrounds



Picture 1 – Southern-boundary of subject site

*Source: Urbis*



Picture 2 – Existing buildings to be demolished

*Source: Urbis*



Picture 3 – Bunnerong Road, south facing

*Source: Urbis*



Picture 4 – Boundary between Stage 1 and Westfield East Gardens

*Source: Urbis*

## 1.2. PROPOSED CONCEPT

Meriton is seeking to rezone the subject site from part IN1 General Industrial and part R3 Medium Density Residential to R4 High Density Residential to allow for the development of approximately 2,015 apartments.

In addition to this, allowance has been made for ancillary non-residential uses identified for the site, specifically:

- Two childcare centres totalling 1,200 sq.m
- 5,200 sq.m retail floor space.
- 5,000 sq.m of non-residential land use, potentially as serviced apartment.

Table 1 below outlines the scale of the proposed development.

Table 1 – Proposed Residential Development Concept

| Land use | Floor area | Dwelling yield | FSR | Height |
|---|---|---|---|---|
| Residential Apartments | 205,489.5 sq.m | 2,015 units | 2.35:1 | 2 – 20 levels |

*Source: Urbis*

Map 1.2 overleaf provides an outline of the distribution and scale of the proposed development across the subject site.

It illustrates that the built form will be high density residential buildings ranging between 8 and 20 levels in height.

A network of strategically located and connected open spaces with a combined area of 20,208 sq.m will be integrated into the development.

Built form and distribution of preferred development option Map 1.2



Source: SJB

## 1.3. RELEVANT GOVERNMENT DOCUMENTS

There are broader regional government frameworks that are relevant to the subject site. These identify key priorities and objectives for Sydney and the Bayside Council. These include:

- Greater Sydney Region Plan (2018)
- Eastern City District Plan (2018)
- The Broader Western Sydney Employment Area Draft Structure Plan (2013)
- Local employment strategies such as:
  - Botany Bay Planning Strategy 2031 (2009)
  - Rockdale City Council Employment Lands Strategy (2007).

### 1.3.1. Greater Sydney Regional Plan and Eastern City District Plan (2018)

The final versions of the Region Plan and Eastern City District Plan were released in March 2018 and aim to ensure land use and transport opportunities develop more equitably across Greater Sydney.

The Region Plan conceptualises Greater Sydney as a metropolis of three '30-minute' cities, and is presented with the District Plans to reflect the most contemporary thinking about Greater Sydney's future.

The Region Plan is underpinned by four key pillars which outline specific objectives to be achieved. The four pillars include:

- Infrastructure and Collaboration
- Liveability
- Productivity
- Sustainability.

The Plan is supported by the NSW Long Term Transport Master Plan and a set of District Plans.

Identified in the Plan are priorities for each District, including key regional and strategic centres that are recognised for their renewal opportunities around existing/proposed infrastructure and which therefore offer opportunities for increased residential density close to jobs.

The priorities for this Eastern City District include:

- Providing housing supply, choice and affordability, with access to jobs and services
- Creating and renewing great places and local centres, and respecting the District's heritage
- Growing a stronger and more competitive Harbour City
- Delivering integrated land use and transport planning and a 30-minute city
- Protecting and enhancing scenic and cultural landscapes.

The District Plan sets a strategic housing target of 157,500 for the Eastern City District by 2036, equating to an average annual supply of 7,875 dwellings. At a local level, Bayside Council's housing target requires an additional 10,150 dwellings by 2021 based on the target suggested in the Plan.

The District Plan recognises that there are opportunities within the Eastern City District to deliver beyond the minimum dwellings needed in the short term. It acknowledges the importance of addressing the pent-up demand that has resulted from past undersupply. It also draws attention to the importance of addressing housing choice and affordability to provide supply for the talented workforce needed to contribute to the Eastern City District's global city aspirations and needs.

In the context of the objectives for the Eastern City District, the subject site offers significant opportunity for housing growth coordinated with existing infrastructure by providing housing near established employment, services and educational facilities.

Figure 10 – Eastern City District Structure Plan 2036




Note: The site's approximate location is shown with a red star.

*Source: Greater Sydney Commission*

### 1.3.2. The Broader Western Sydney Employment Area Draft Structure Plan (2013)

The completion of the Sydney motorway network, in particular the M4 / M7 interchange, combined with the availability of large low-cost parcels of land, has seen Western Sydney emerge as a dominant location for 'traditional' manufacturing, warehouse and logistics uses. The Western Sydney Employment Area (WSEA) is a major contributor to the supply of industrial land, together with a number of precincts along the M4 and M5 motorways including Moorebank, Ingleburn and Campbelltown.

In June 2013, the draft WSEA Structure Plan was released and it proposed to expand the WSEA from its current location at the intersection of the M4 and M7 down to and incorporating part of the South West Growth Centre and to take in the lands around Badgerys Creek identified for a second Sydney airport.

The proposed extension of the existing WSEA boundary will include an additional 4,537 hectares of new industrial lands to include Badgerys Creek, therefore equating to almost 10,000 hectares of industrial land.

Moving forward, WSEA in particular has competitive advantages for manufacturing operations in terms of access to workforce, available land area, and separation from sensitive land uses such as residential. It is well placed to accommodate 'upsizers' with reasonable supply of large sites which are limited elsewhere in the Sydney region; with these groups diversifying from local manufacturing into import and distribution models requiring additional floorspace.

There are also opportunities to build on the region's strength in manufacturing to position the Broader WSEA to become Sydney's advanced manufacturing hub. The potential catalytic effect of the Second Sydney Airport is also likely to enhance the competitive advantage of WSEA.

The NSW Department of Planning has identified key push and pull factors that will affect the take up and viability of land within the broader WSEA. These push and pull factors are considered in Table 2.1, together with the long term effect that this may have on smaller industrial precincts, such as the subject site.

### 1.3.3. Local Employment Strategy

In May 2016, NSW Premier Mike Baird and the Minister for Local Government Paul Toole announced the formation of 19 new councils in NSW as part of the NSW Stronger Councils initiative. This is expected to deliver better services and infrastructure such as roads, parks, playgrounds and sporting facilities.

New councils will receive a wide range of benefits including up to:

- $15 million to invest in community projects like junior sporting facilities, playgrounds and library or pool upgrades
- $10 million to streamline administrative operations, with the option of redirecting unspent funds into community projects.

The subject site now sits within the Bayside Council, which is the amalgamation of Botany Bay Council and Rockdale Council. This would require an assessment of existing planning strategies under the previous councils.

#### Botany Bay Planning Strategy 2031 (2009)

Botany Bay City Council undertook a planning strategy to provide the framework for growth for the next 25 years to guide the preparation of the Botany Bay LGA Local Environmental Plan (2013).

The key strategy directions identified within the document are listed below:

- Enhancing housing choice and liveability
- Revitalising Botany Road and traditional centres
- Managing growth in the Eastern centres
- Maintaining Sydney Airport as a global gateway
- Maintaining Port Botany as a global gateway
- Protecting the natural environment.

The strategy document also addresses key employment and dwelling targets identified within the NSW Metropolitan Strategy (2005) and the East Subregional Strategy (2007). There is targeted to be 6,500 additional dwellings and 11,700 additional jobs within Botany Bay LGA by 2031. However, housing capacity analysis within the document identifies:

*"Only around 108 hectares of the LGA is unconstrained land… a notional capacity of around 3,000 additional dwellings is identified. This falls well short of the target of 6,500. After excluding constrained land, the settings under the existing development controls do not provide sufficient capacity to meet the target."*

This suggests that residential intensification within the LGA is required to meet this dwelling target.

The document also outlines future directions regarding the long term potential for the subject site to become a mixed use precinct.

### Rockdale City Council Employment Lands Strategy (2007)

Rockdale City Council produced the Employment Lands Strategy (2007) to inform the Rockdale Local Environmental Plan (2011). The document is meant to guide a broader number of important qualitative outcomes that will make the City of Rockdale a more attractive place to live and visit.

The document also identifies, employment targets set out by the NSW Draft Subregional Strategy for the South Sydney region, which projects an additional 13,000 jobs in the Rockdale LGA by 2031.

The document outlines precinct specific strategies for the Council's employment lands, with the aim to protect the viability of industrial uses and provide greater employment opportunities on these precincts. Generally, these include:

- Protect existing employment sites that are suited to continued industrial use
- Retain existing industrial uses while facilitating greater employment generation through increased FSRs
- Rezone fragmented portions of industrial land to B4 mixed use given their compatibility to surrounding residential density as well as promoting greater job diversity in the region.

The document also outlines the economic significance of Sydney Airport to Rockdale's local economy, with significant growth in both employment and investment in activities closely associated with logistics and transport. However, more traditional forms of industrial activity such as manufacturing and warehousing have relocated outside of Rockdale Council to locations with lower rents and less expensive land costs.

The spatial redistribution of the manufacturing/warehousing industry in Sydney also has implications on the subject site and competing industrial precincts in the newly formed Bayside Council, with tracts of industrial land in the Western Sydney Orbital becoming attractive alternatives to traditional industrial areas for transport and logistics related activity.

# 2. COMPETITIVE POSITIONING

Section 2 will identify the industrial precincts within the Bayside Council, and their competitive positioning relative to the key attributes required by industrial tenants.

This section also consider other key regional industrial precincts that have significant undeveloped supply of industrial lands that can accommodate future demand for industrial lands.

## 2.1. COMPETING INDUSTRIAL PRECINCTS

Around 520 hectares within Bayside Council are identified as industrial land in the NSW Department of Planning and Environment's Employment Lands Development Program (ELDP). These industrial lands are illustrated in Map 2.1 (2 pages overleaf).

The 2015 ELDP Update Report notes that Bayside Council has around 24.2 hectares of undeveloped industrial lands, of which around 21.4 hectares is located in the Banksmeadow precinct.

Across the Sydney Metropolitan Region, Bayside Council contributes 3.8% of total employment lands, 4.7% of total developed and 0.8% of total undeveloped land (Source: NSW DPE ELDP 2015 Update Report).

In addition to industrial lands within the Bayside Council boundaries, there are substantial tracts of industrial lands abutting the Bayside Council boundary. These include:

- Additional Port Botany Lands around Yarra Bay (within the Randwick LGA)
- Industrial lands in Marrickville and Sydenham
- Land in South Sydney around the Alexandra Canal.

South Sydney includes the suburbs of Alexandria, Zetland and Beaconsfield which collectively comprise of the City of Sydney's "Southern Employment Lands". City of Sydney is proposing amendments to its LEP to broaden the mix of permissible uses in the South Sydney Area Employment Lands.

City of Sydney Council estimates that new zonings will allow a wider variety of businesses and organisations to locate in the area with up to 9,000 more expected over the next 15 years in jobs created in new forms of industrial activity, creative industries, retail and knowledge-based companies.

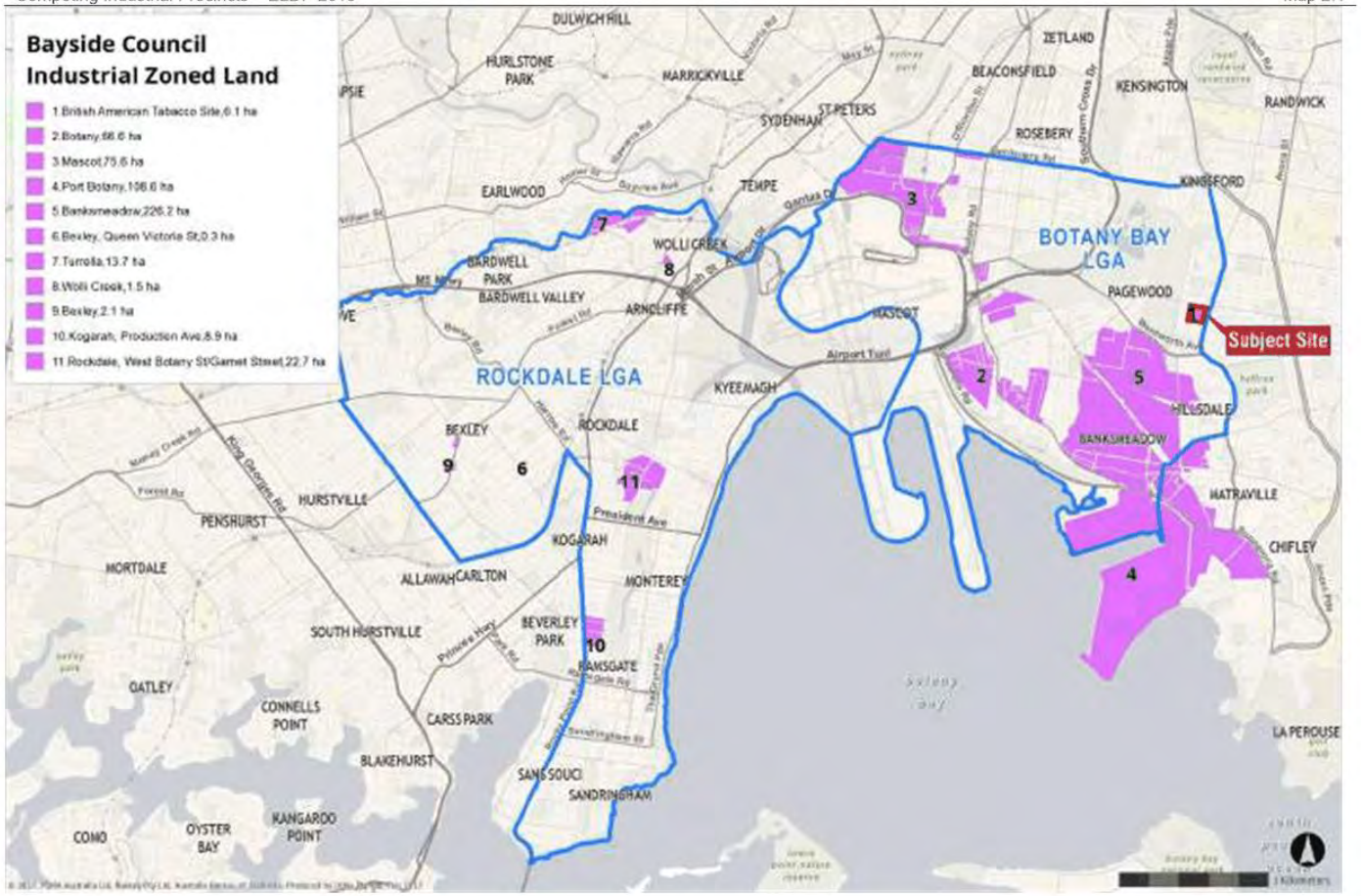
**Industrial Lands**

Bayside Council Table 2.1

| Precinct Number | Precinct Name | Current Employment Zones | Hectares |
|---|---|---|---|
| **1** | **British American Tobacco Site (Subject Site)** | **IN1 General Industrial** | **6.1** |
| 2 | Botany | SEPP (Port Botany) | 66.6 |
| 3 | Mascot | IN2 Light Industrial | 75.6 |
| 4 | Port Botany | IN2 Light Industrial | 108.6 |
| 5 | Banksmeadow | IN2 Light Industrial | 226.2 |
| 6 | Bexley, Queen Victoria Street | IN2 Light Industrial | 0.3 |
| 7 | Turrella | IN2 Light Industrial, SP2 Infrastructure | 1.3 |
| 8 | Wolli Creek | IN2 Light Industrial | 1.5 |
| 9 | Bexley | IN2 Light Industrial | 2.1 |
| 10 | Kogarah, Production Ave | IN2 Light Industrial | 8.9 |
| 11 | Rockdale, West Botany Street / Garnet Street | IN2 Light Industrial | 22.7 |
| | **Total Industrial Lands – Bayside Council** | | **519.9** |

*Source: Employment Lands Development Program 2015, Urbis*

Competing Industrial Precincts – ELDP 2015 Map 2.1

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28 AND 130-150 BUNNERONG ROAD, PAGEWOOD ECONOMIC IMPACT ASSESSMENT

COMPETITIVE POSITIONING 13

## 2.2. INDUSTRIAL LAND ASSESSMENT

### Industrial Demand Drivers – Bayside Council

Urbis have undertaken a high level review of the industrial precincts within the new Bayside Council area. There are currently around 520 hectares of industrial zoned land within the Bayside Council.

The precincts have varying characteristics that would appeal to tenants and investors. Urbis has identified key factors that drive tenant interest and underpin the functioning of industrial precincts:

- **Access** to motorway networks, B-Double routes and / or multi modal facilities.
- **Scale** of the precinct, with larger precincts offering opportunities for expansion, intensification of activity and clustering of similar industries and supply chain synergies. For the purposes of this assessment we have identified precincts with <10 hectares as small scale, 10-30 hectares as medium scale and >30 hectares as large scale.
- **Land use compatibility** with surrounding uses, and whether sensitive noise receptors (e.g. residential areas where impacts on neighbourhood amenity can lead to land use conflict) have the potential to conflict with freight vehicles/traffic.

Table 2.2 presents an evaluation of each precinct with a 'high', 'medium' or 'low' rating (high being positive and low being negative). These ratings are based on key success factors described above. Table 2.3 provides a detailed audit of each industrial precinct within the Bayside Council.

**Industrial Viability**

Competing Industrial Precincts, Bayside Council — Table 2.2

| | Precinct | Access | Scale | Land use compatibility | Overall Viability Ranking |
|---|---|---|---|---|---|
| 1 | **British American Tobacco Site (Subject Site)** | Medium | Low | Low | **Low** |
| 2 | Botany | High | Medium | Medium | **Medium** |
| 3 | Mascot | Medium | High | Medium | **Medium** |
| 4 | Port Botany | High | High | Low | **High** |
| 5 | Banksmeadow | Medium | High | Medium | **Medium** |
| 6 | Bexley, Queen Victoria Street | Low | Low | Medium | **Low** |
| 7 | Turrella | Low | Medium | Low | **Low** |
| 8 | Wolli Creek | Medium | Medium | Low | **Medium** |
| 9 | Bexley | Medium | Low | Medium | **Medium** |
| 10 | Kogarah, Production Ave | Medium | Low | Medium | **Medium** |
| 11 | Rockdale, West Botany Street / Garnet Street | Medium | High | Medium | **Medium** |

*Source: Urbis*

**Bayside Council Industrial Areas**

Summary

Table 2.3

| Precinct Number | Precinct and Zoning | Access | Scale | Land use compatibility | Future Viability | Recommendations |
|---|---|---|---|---|---|---|
| 1 | British American Tobacco Site (Subject Site) | Vehicular access via Bunnerong Road and Heffron Road, however no direct access to a major arterial road or motorway. Bus routes also provided on Bunnerong Road and Heffron Road. | **6.1 hectares** Formerly the BATA site, the precinct served as the distribution and warehousing arm for BATA's Australasia's business operations, however is small scale relative to larger competing industrial precincts. | Residential uses to the immediate north and east. However, vacant industrial zoned land to the south currently provides buffering to Westfield Eastgardens to the south. | Limited ability to support further industrial related employment. Limited road connection for heavy vehicles limits transport accessibility to subject site. | Planning proposal for potential upzoning of subject site to R4 High Density Residential. |
| 2 | Botany | Strong access to Airport and Western Sydney through M1 Motorway and Foreshore Road, Botany Road. | **66.6 hectares** Serves a range of engineering services, warehousing and manufacturing uses. | Residential uses scattered across the precinct, with retail uses located along Botany Road. | Strong viability given the continued role of precinct to provide urban support services to local residents. Limited scope for additional employment beyond current construction activity. | Retain as industrial zoned land to protect general industrial uses to continue supporting the local economy. |
| 3 | Mascot | High accessibility to Airport and Sydney CBD by Mascot train | **75.6 hectares** Clustering uses include logistics, manufacturing, and | The precinct is well separated from surrounding residential uses, with South Sydney Employment | Strong viability to increase support for airport freight and logistics industry related uses. Limited | Retain and increase IN1 zoning to facilitate intensified clustering of airport related freight and logistics, given its |

| Precinct Number | Precinct and Zoning | Access | Scale | Land use compatibility | Future Viability | Recommendations |
|---|---|---|---|---|---|---|
| | | station. However, access to Port Botany is constrained by traffic congestion along General Holmes Drive. | airport related activity. | Lands located to the north and west of the precinct. Residential uses are located to the east of O'Riordan Street. | potential to expand current IN1 zoning. | important role in a growing Sydney Airport. |
| 4 | Port Botany | Access to Airport and Sydney CBD subject to congestion along Foreshore Road/Botany Road and General Holmes Drive. | **108.6 Hectares** Serves primarily heavy industrial and oil/gas clustering uses. | No immediate residential uses surrounding the precinct, with low density housing located further out to the north in the suburb of Matraville. | Strong viability to support future port related activity and export related industries, and maintain role as state significant infrastructure serving the NSW economy. | Retain SEPP zoning to protect state significant infrastructure which will continue to support provide port related services for the NSW trade economy. |
| 5 | Banksmeadow | Access to Airport and Sydney CBD subject to congestion along Foreshore Road/Botany Road and General Holmes Drive. | **226.2 Hectares** Serves heavy industrial uses, including oil terminals, the Sydenham-Botany Goods Railway and the Orica Chemical Factory. | Immediate surrounding uses include light industrial and business to the north, and residential uses immediately surrounding the east and west of the precinct. | Strong viability to retain land as a future precinct for port and manufacturing uses. | Retain as IN3 Heavy Industrial to continue supporting port and manufacturing related uses. Potential to relocate heavy industry on undeveloped land and intensify current uses. |

| Precinct Number | Precinct and Zoning | Access | Scale | Land use compatibility | Future Viability | Recommendations |
|---|---|---|---|---|---|---|
| 6 | Bexley, Queen Victoria Street | Access through Queen Victoria Street, though however precinct is separated from major roads or motorways. | **0.3 Hectares** Consists of dated warehousing and storage facility, and a mechanical smash repair service. | The precinct is surrounded by immediate low density residential uses, and there is no buffering to protect from industrial noise. | Low long term viability given its small scale of uses and dated condition of buildings, separated from main industrial precincts within the region. | Limited opportunity to expand current IN1 zoning due to immediate surrounding residential areas. Potential to rezone to residential zoning given its compatibility with existing residential neighbourhood. |
| 7 | Turrella | No direct access to a major road or motorway impedes access to the precinct. Railway line separates the precinct, therefore access between the two industrial areas is via Reede Street. | **13.7 Hectares** The precinct contains a mix of warehousing, manufacturing and automotive services, with the majority of buildings incorporating offices. | Residential properties abutting Reede, Turrella and Loftus Streets, which represent the precinct's only points of entry/exit. This causes heavy vehicles movements along residential areas and schools. | Low long term viability given no known synergies with other established precincts in the Council, limited road access and parking, and land use conflicts with abutting residential properties. | Proposed rezoning of the precinct to B4 Mixed Use, B2 Local Centre, and R4 High Density Residential should proceed given its compatibility with existing residential neighbourhood adjacent to the precinct and increased residential density around stations. |
| 8 | Wolli Creek | Main road access through Princes Highway. Arncliffe train station is located 400 metres from the precinct. | **1.5 Hectares** Contains a mix of automotive uses, including service centres for Mazda, Kia and Ford. | The precinct is surrounded by high density residential uses to the west and south; however the nature of uses on the precinct does not | Strong long term viability to maintain automotive uses, and will continue to support existing adjacent car dealership businesses. | Retain industrial zoning to continue providing urban services to local residents. |

| Precinct Number | Precinct and Zoning | Access | Scale | Land use compatibility | Future Viability | Recommendations |
|---|---|---|---|---|---|---|
| | | | | cause any significant noise to residents. | | |
| 9 | Bexley | No direct access to arterial road or motorway, with main linkages provided through Forest Road. | **2.1 Hectares** The precinct is separated into two smaller clusters along Forest Road. Contains a mix of local businesses within the storage and automotive repairs, as well as low grade ancillary office facilities. | The precinct is surrounded by immediate low and medium density residential housing; however noise reception is likely to be subdued from passing traffic on Forest Road. | Medium long term viability given existing business continued role as urban support for local residents. However, there is potential to relocate to larger scale precincts in the region in pursuit of clustering and synergies. | Retain existing industrial zoning, although opportunities to relocate to larger precincts within the Council and create synergies with like uses. |
| 10 | Kogarah, Production Avenue | Direct connection provided through Rocky Point Road, affording good access for local residents. | **8.9 Hectares** A clustering of automotive smash repairs, electrical and warehousing. | The precinct is buffered from residential uses by recreational zoned land to the east, but is surrounded by low density housing to the north, south and west. This could potentially cause land use conflict if noise is not adequately contained. | Strong long term viability, clustering/agglomeration of automotive and warehousing will continue to support local businesses within the region. | Retain as IN2 Light Industrial to continue to provide urban support for local residents. |

| Precinct Number | Precinct and Zoning | Access | Scale | Land use compatibility | Future Viability | Recommendations |
|---|---|---|---|---|---|---|
| 11 | Rockdale, West Botany Street / Garnet Street | Precinct is split by West Botany Street, which connects to Bay Street and Princes Highway. Rockdale train station is located 1.1km to the west. | **22.7 Hectares** Precinct contains a mix of automotive, hardware and bulky goods uses. Potential to increase FSRs to increase employment yield in precinct. | The precinct is well buffered by recreational land to the east, but abutting residential properties to the north of precinct may cause some land conflict issues. | Strong long-term viability as precinct will continue to service of the needs local and regional population. Potential to rezone Garnet Street portion of industrial land to mixed use, in accordance with the Rockdale City Council Employment Lands Strategy (2007). | Retain as IN2 Light Industrial to provide bulky goods retail and urban support services for local and regional residents. |

## Major Western Sydney Industrial Precincts

In addition to assessing Bayside Council industrial precincts, it is important to assess the competitive positioning of the subject site against major industrial precincts elsewhere in Sydney that have the capacity to accommodate additional growth, and have strong locational characteristics to attract tenants.

Urbis have identified a number of major industrial precincts with these characteristics:

- Eastern Creek (562 hectares)
- Moorebank (336 hectares)
- Marsden Park (238 hectares)
- WSEA (10,000 hectares).

These precincts contain a large component of undeveloped industrial land, which is able to absorb demand from new business creation and industrial users that require larger premises to operate.

There are a number of significant competitive advantages that these precincts have over the subject site:

- B-double truck access
- Significant amounts of undeveloped land
- Direct access to major roads and intermodal terminals (IMTs)
- Larger lot sizes
- Minimal land use conflicts with non-industrial land uses.

**Competitive Positioning**

Major Central West Industrial Precincts

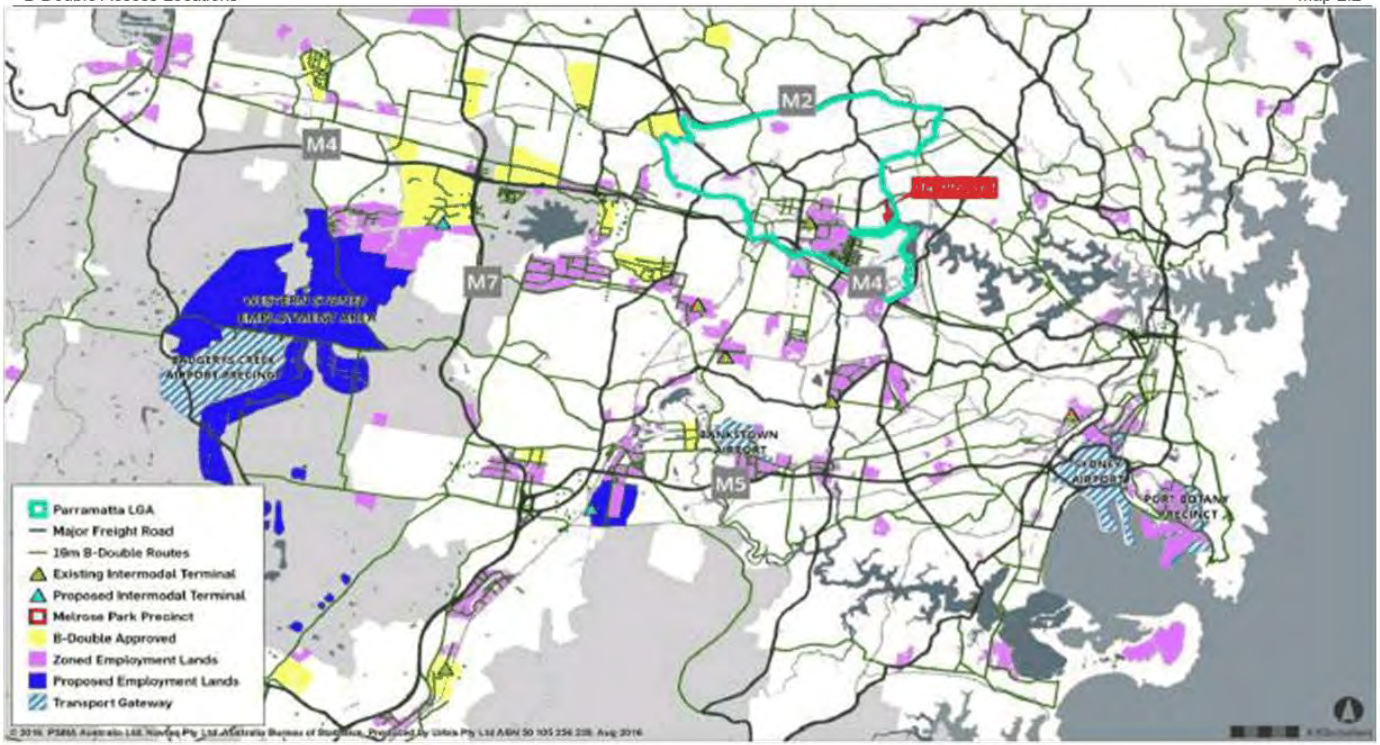
Table 2.4

| PRECINCT | SIZE | ENABLERS OF GROWTH |
|---|---|---|
| **Eastern Creek** | **Area:** 562 hectares<br><br>The largest industrial precinct within the Blacktown LGA) | • Large amount of undeveloped industrial land (as at 2015, there was 14 hectares of undeveloped industrial land)<br>• B-double trailers permitted in this area (Map 2.2)<br>• Close proximity to the proposed Western Sydney Intermodal Terminal at Eastern Creek (within approximately 4km)<br>• The take-up of 23 hectares of land in this precinct was equivalent to 12% of the total for the Sydney Metropolitan Region. Demand for residual land parcels is therefore expected to be strong, reflecting the positive attributes of the Eastern Creek Precinct. |
| **Moorebank** | **Area:** 336 hectares<br><br>The second largest industrial precinct within the Liverpool LGA. | • Large amount of undeveloped industrial land (as at 2015, there was 11.7 hectares of undeveloped industrial land)<br>• Proposed Moorebank Intermodal Terminal project (currently under construction), with an estimated value of $570 million, involves the development of freight terminal facilities linked to Port Botany and the interstate freight rail network by rail on defence land. The addition of the Moorebank Intermodal Terminal is expected to have a capacity for up to 1.1 million containers per year by 2030 for import-export freight, and up to 500,000 containers a year for interstate freight. The import-export terminal (stage 1) is expected to commence operations in late 2017and interstate terminal in 2019, with expected economic benefits of around $120 million a year for the economy of Southwestern Sydney. |

| PRECINCT | SIZE | ENABLERS OF GROWTH |
|---|---|---|
| **Marsden Park** | **Area:** 238 hectares (123 hectares of business park land) | • The industrial precinct rezoning has been fast tracked under the Government's Precinct Acceleration Protocol<br>• Key infrastructure in this area is access to the M7 Motorway (via Richmond Road)<br>• Significant expenditure in new infrastructure ($56 million upgrade of Richmond Road)<br>• Alignment of land use, transitioning from the Local Centre (B2) located on Richmond Road and South Street, to Business Park (B7) land use, and then to Industrial land use (IN1/IN2) facilitating a range of complementary uses<br>• Ability to leverage the strength of an established business park location<br>• Significant population growth associated with the North West Growth Centre<br>• A planned Marsden Park town centre<br>• Take up of business park land was around 4 hectares in 2014 – largest take-up of business park land within Metropolitan Sydney, followed closely by Norwest at around 3 hectares. Marsden Park has the largest stock of undeveloped business park land, currently at around 94 hectares (as at January 2015)<br>• Land supply / capacity for future development. |

| PRECINCT | SIZE | ENABLERS OF GROWTH |
|---|---|---|
| **WSEA** | **Area:** Around 10,000 hectares | • Close proximity to key regional infrastructure corridors including the M4 and M7 Motorways which, supports access to distribution networks and nodes, such as the Port and Airport<br>• B-double trailers permitted in some areas (Map 2.2)<br>• Proximity to planned infrastructure such as intermodal terminals (Moorebank and Eastern Creek)<br>• Connections to the proposed Moorebank Intermodal Terminal would potentially drive some demand from the south of the WSEA<br>• Proposed intermodal and freight line located within the WSEA in the Eastern Creek precinct that may assist in driving co-location of business park users with the freight based operations<br>• Take-up activity was concentrated in the precincts of Eastern Creek, Smeaton Grange, Erskine Park, Glendenning, Campbelltown Blaxland Road and Huntingwood West. Collectively take-up in these precincts totalled 96 hectares (in 2014), demonstrating that development is largely focused within WSEA where undeveloped and services land is available. |

B Double Access Locations Map 2.2



## 2.3. SUMMARY AND IMPLICATIONS

Our analysis indicates that the subject site does not have the attributes of other stronger industrial precincts located within the Bayside Council. This is due to larger regional precincts (such as Banksmeadow and Port Botany) or small industrial precincts that play a more specialised role.

Within the Bayside Council, precincts such as Banksmeadow and Port Botany achieved higher ratings providing users with:

- Access to a diversity of lot sizes that support a larger range of uses
- Fewer land use conflicts than smaller isolated precincts
- Large contiguous industrial / business zoned precincts
- Direct access to major roads and highways.

In addition, there are a number of smaller precincts that are well located and play a more specialised role that include a mix of business zoned land that provide services to a local community (e.g. Kogarah, Rockdale – West Botany Street) or enterprise corridors along major roads (e.g. Wolli Creek) that rely on passing traffic. These uses do not involve large scale warehousing and distribution and are therefore less reliant on fast access to the motorway network. Typically, these local services require exposure from passing traffic and therefore are ideally situated along a major road, which are therefore unlikely to be supported on the subject site.

The subject site does not have the visibility to support industrial users that appeal to a local customer base, or the transport accessibility to appeal to growing industrial sectors such as freight and logistics. In addition, the Stage 1 Masterplan Consent for Lot 2 will deliver 2,223 apartments to the south of the subject site and create a land use conflict with the subject site's existing industrial use.

A common factor amongst all the highly ranked Bayside Council precincts and the regional precincts is a lack of land use conflict. Land use conflicts are an issue in that they co-locate sensitive noise receptors with industrial uses that generate noise not only during the day, but at times after hours. Co-locating these uses can result in pressure from the community to constrain industrial operations, impacting their viability.

# 3. EMPLOYMENT ANALYSIS

Section 3 will identify economic trends that impact industrial land use and whether there is sufficient undeveloped industrial land to accommodate forecast employment growth.

Western Sydney industrial lands are subject to structural economic change. The broader economic trends within Metropolitan Sydney being witnessed is the gradual relocation of large industrial users to Western Sydney and the urban renewal of vacant industrial sites in inner and middle ring suburbs.

Growing industrial sectors such as transport, freight and logistics are seeking properties that provide strong transport links that reduce the time taken to transport freight between distribution centres and end users. Traditional trade exposed industrial users on the hand, such as manufacturing have experienced consistent contraction in size since the early 1990s.

These trends indicate that market demand will be focused on industrial land towards large lots in Western Sydney, directly adjacent transport infrastructure and away from conflicting land use.

## 3.1. ECONOMIC STRUCTURAL CHANGE

Chart 3.2 shows NSW GSP growth between 1995 and 2015 by industry sector. Over this period the structure of the NSW economy changed significantly. In 1996 the economy relied heavily on the manufacturing sector which comprised 13.5% of GSP. Since 1990, the following industries have increased their share of the NSW GSP:

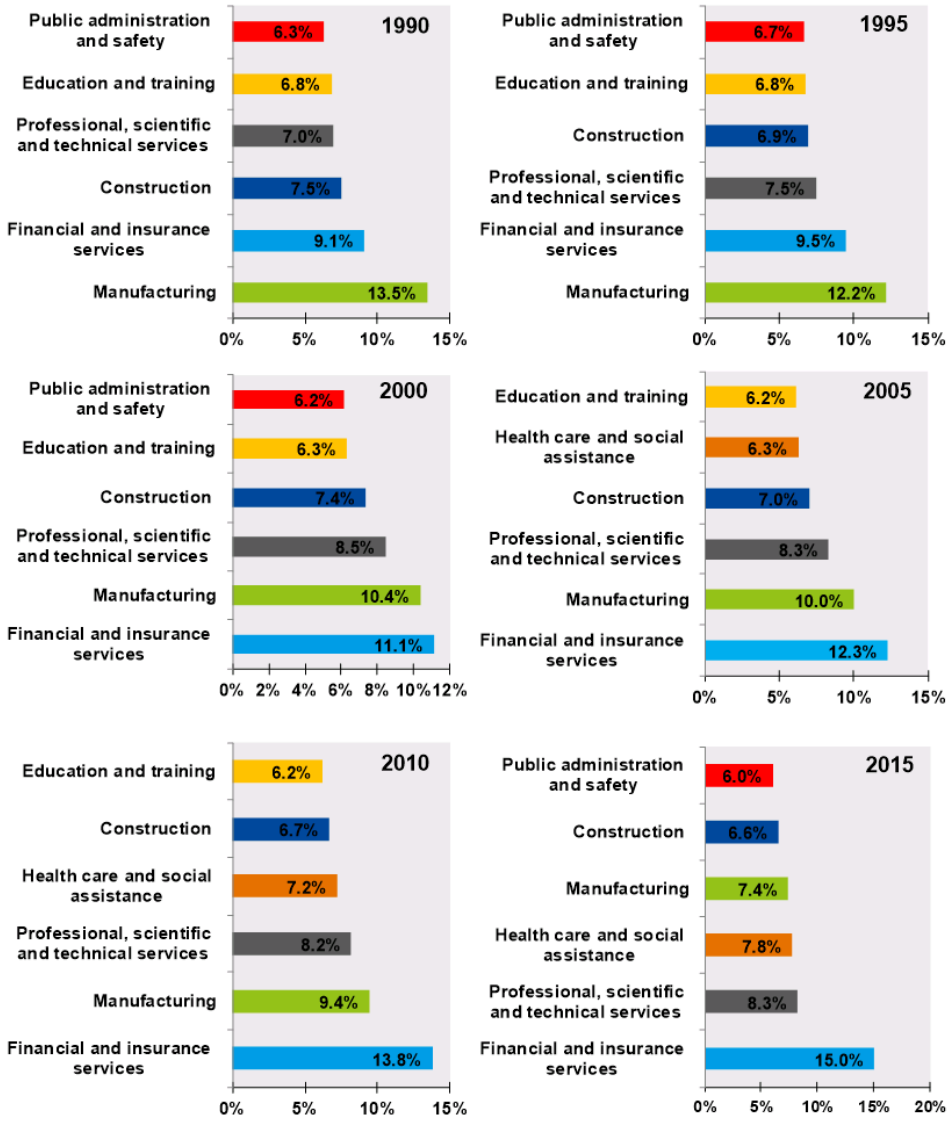
- The financial services and construction sectors have increased their share from 9.1% in 1990 to 15% in 2015
- Professional, scientific and technical services increased from 7% to 8.3% in 2015
- The health care and social assistance sector grew slightly from 5.6% in 1993 to 7.8% in 2015
- Transport. Postal and warehousing which are key users of industrial land have expanded from 4.5% to 5.1% in 2015.

The growth rates reflect structural shifts in the NSW economy. Namely:

- A contraction in trade exposed sectors, driven by an increasing Australian dollar over this period
- Increasing imports and consumption is driving demand for freight and logistics services
- Growth in 'knowledge based' sectors such as financial and professional services
- Growth in health care services, driven by an ageing population requiring health and aged care services.

**Gross State Product, Industry Sector**

NSW Chart 3.1




*Source: ABS Australian National Accounts: State Accounts June 2015; Urbis*

## 3.2. EMPLOYMENT ANALYSIS

A review of resident employment trends by industry in Bayside Council between 2006 and 2011 (as shown in Chart 3.3) confirms that:

- The largest resident employment growth sectors were in hospitals and health facilities, offices, schools and town centres. From a land use perspective, the increased employment growth in these sectors does not create any additional demand for industrial zoned land
- Employment has been affected by the same structural shifts affecting the broader NSW economy, with strong growth amongst service sectors and falling employment in the manufacturing sector
- While resident employment grew by 1.9% from 2006 to 2011, manufacturing jobs declined by 12% over this period.

The majority of the Bayside Council resident workforce growth was in non-industrial sectors including the following:

- Health Care and Social Assistance (+1,510 jobs)
- Professional, Scientific and Technical Services (+1,075 jobs)
- Education and Training (+819 jobs).

There was employment contraction experienced by Bayside Council residents in the following sectors:

- Manufacturing (-603 jobs)
- Retail Trade (-110 jobs)
- Wholesale Trade (-47 jobs).

**Resident Workers Growth**

Bayside Council 2006 and 2011 — Chart 3.2

| | Bayside Council | | |
|---|---|---|---|
| **Industry Sector** | **2006** | **2011** | **2006-11 Total Change** |
| Health Care and Social Assistance | 5,540 | 7,050 | 1,510 |
| Professional, Scientific and Technical Services | 3,866 | 4,941 | 1,075 |
| Education and Training | 3,210 | 4,029 | 819 |
| Accommodation and Food Services | 4,701 | 5,360 | 659 |
| Administrative and Support Services | 2,283 | 2,817 | 534 |
| Financial and Insurance Services | 3,569 | 3,956 | 387 |
| Transport, Postal and Warehousing | 5,879 | 6,189 | 310 |
| Rental, Hiring and Real Estate Services | 1,032 | 1,304 | 273 |
| Public Administration and Safety | 3,460 | 3,733 | 272 |
| Construction | 3,647 | 3,904 | 258 |
| Other Services | 2,370 | 2,538 | 168 |
| Arts and Recreation Services | 901 | 1,032 | 131 |
| Information Media and Telecommunications | 1,555 | 1,629 | 74 |
| Mining | 49 | 72 | 24 |
| Electricity, Gas, Water and Waste Services | 430 | 445 | 15 |
| Agriculture, Forestry and Fishing | 82 | 35 | -47 |
| Wholesale Trade | 3,333 | 3,235 | -98 |
| Retail Trade | 6,605 | 6,494 | -110 |
| Manufacturing | 5,229 | 4,626 | -603 |
| **Total** | **57,739** | **63,389** | **5,650** |

*Source: ABS Census 2006 and 2011; Urbis*

Chart 3.4 compares the number of jobs provided within Bayside Council with the number of Bayside Council resident workers in 2011. As at 2011, the number of Bayside Council resident workers (57,200) exceeded the number of local jobs (55,926) by 1,274. The data shows that there are a number of imbalances between the skills of residents and available jobs within the LGA in a number of categories.

In the following categories, there is a mismatch between the number of jobs provided within the LGA and the skills of local residents, therefore labour must be imported for the following sectors:

- Transport, Postal and Warehousing (+19,733 jobs)
- Manufacturing (+3,182 jobs)
- Wholesale Trade (+1,932 jobs)
- Retail Trade (+1,003 jobs).

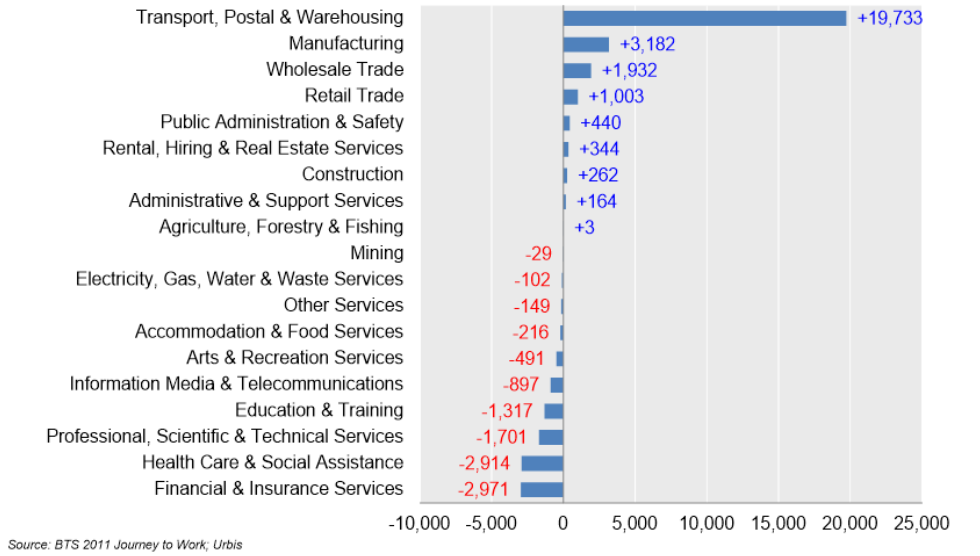
There are fewer jobs provided in the Council than there are resident workers, in the following sectors meaning that these workers need to travel beyond the Council to work (exported labour):

- Finance and Insurance Services (-2,971 jobs)
- Health Care and Social Assistance (-2,914 jobs)
- Professional, Scientific and Technical Services (-1,701 jobs)
- Education and Training (-1,317 jobs).

The particular shortage in jobs within these 'white collar' and service industry sectors highlights a broader need for the Council to increase its business zoning capacity.

**Jobs Gap Analysis (+ Surplus / -Deficit)**

Bayside Council, 2011 Chart 3.3




*Source: BTS 2011 Journey to Work; Urbis*

Table 3.1 illustrates the projected employment for Bayside Council between 2016 and 2031 and its distribution across different industry sectors using BTS data. The table shows that employment within the Council is projected to increase by around 17,300 jobs between 2016 and 2031 (around 1,200 jobs per annum).

The following industries are expected to experience large employment growth, and are consistent with the Council's historic trends:

- Retail Trade (+2,625 jobs)
- Health Care and Social Assistance (+2,133 jobs)
- Transport, Postal and Warehousing (+1,968 jobs)
- Public Administration and Safety (1,799 jobs).

The industry sectors listed above have implication for future land use, particularly for non-industrial land uses. With the exception of transport, postal and warehousing, these sectors are typically not accommodated in industrial sites; rather these jobs occur in local/business/commercial centres or adjacent to residential areas.

Table 3.2 examines how the projected employment growth for Bayside Council is likely to be split by property type and is illustrated in Chart 3.5. The analysis is based on Urbis derived benchmarks looking at land use proportions by different categories of employment. The table indicates that the employment split by sector is likely to be as follows:

- **Office sector:** to account for around 41% of employment growth, equal to around 7,000 additional jobs between 2016 and 2031. Includes office components of sectors where majority of employment is accommodated in 'non-office' floorspace, for example education and training, health, arts and recreational services, and industrial sectors such as construction and urban services.
- **Retail sector:** to account for around 15% of employment growth, equating to around 2,800 jobs between 2016 and 2031. This includes retail components of accommodation, food services and wholesale trade.
- **Health sector:** to account for around 11% of employment growth, equating to around 1,900 jobs between 2016 and 2031.
- **Off-site employment** (employment that is not property based e.g. drivers of commercial vehicles, construction site workers)**:** to account for 9% of employment growth, equating to around 1,600 jobs between 2016 to 2031.
- **Industrial sector:** to account for around 7% of employment growth, equating to around 1,300 jobs between 2016 to 2031. The vast majority of this growth would be driven by the transport, postal and warehousing sector. Components of 'non-industrial' sectors such as retail, wholesale trade and information technology are also included.
- **Education sector:** to account for around 4% of employment growth, equating to around 700 jobs between 2016 and 2031.
- **Home based employment:** to account for around 1% of employment growth, equating to around 200 jobs between 2016 and 2031.

Table 3.2 and Chart 3.5 demonstrate that around 68% of all employment growth is projected to be in the office, health and retail properties, as opposed to 7% projected in industrial zoned lands. This analysis suggests that moving forward, existing non-industrial employment precincts and centres will deliver the majority of future employment growth.

**Employment Forecast**

Bayside Council, 2016 to 2031 Table 3.1

| | Forecast | | | | | | | | 2016-31 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | | 2021 | | 2026 | | 2031 | | | |
| Industry Sector | No. | % | No. | % | No. | % | No. | % | Total Change | Annual Growth % |
| Retail Trade | 8,044 | 9% | 9,132 | 10% | 9,824 | 10% | 10,669 | 10% | 2,625 | 1.9% |
| Health Care and Social Assistance | 4,925 | 6% | 5,712 | 6% | 6,416 | 6% | 7,058 | 7% | 2,133 | 2.4% |
| Transport, Postal and Warehousing | 28,074 | 32% | 28,324 | 30% | 29,252 | 29% | 30,042 | 28% | 1,968 | 0.5% |
| Public Administration and Safety | 4,866 | 5% | 5,473 | 6% | 6,067 | 6% | 6,665 | 6% | 1,799 | 2.1% |
| Professional, Scientific and Technical Services | 3,681 | 4% | 4,205 | 4% | 4,732 | 5% | 5,432 | 5% | 1,751 | 2.6% |
| Accommodation and Food Services | 5,656 | 6% | 6,246 | 7% | 6,696 | 7% | 7,200 | 7% | 1,544 | 1.6% |
| Administrative and Support Services | 3,193 | 4% | 3,501 | 4% | 3,779 | 4% | 4,136 | 4% | 943 | 1.7% |
| Information Media and Telecommunications | 902 | 1% | 1,183 | 1% | 1,441 | 1% | 1,824 | 2% | 922 | 4.8% |
| Construction | 4,453 | 5% | 4,701 | 5% | 4,974 | 5% | 5,263 | 5% | 810 | 1.1% |
| Education and Training | 3,077 | 3% | 3,316 | 4% | 3,572 | 4% | 3,831 | 4% | 754 | 1.5% |
| Rental, Hiring and Real Estate Services | 1,948 | 2% | 2,183 | 2% | 2,404 | 2% | 2,651 | 3% | 703 | 2.1% |
| Arts and Recreation Services | 662 | 1% | 832 | 1% | 968 | 1% | 1,234 | 1% | 572 | 0.0% |
| Other Services | 2,674 | 3% | 2,819 | 3% | 2,968 | 3% | 3,125 | 3% | 451 | 1.0% |
| Wholesale Trade | 5,357 | 6% | 5,359 | 6% | 5,574 | 6% | 5,796 | 5% | 439 | 0.5% |
| Financial and Insurance Services | 1,239 | 1% | 1,359 | 1% | 1,487 | 1% | 1,639 | 2% | 400 | 1.9% |
| Unclassified | 2,071 | 2% | 2,113 | 2% | 2,159 | 2% | 2,193 | 2% | 122 | 0.4% |
| Electricity, Gas, Water and Waste Services | 329 | 0% | 358 | 0% | 392 | 0% | 423 | 0% | 94 | 1.7% |
| Mining | 35 | 0% | 40 | 0% | 44 | 0% | 47 | 0% | 12 | 0.0% |
| Agriculture, Forestry and Fishing | 44 | 0% | 42 | 0% | 41 | 0% | 39 | 0% | -5 | 0.0% |
| Manufacturing | 7,274 | 8% | 6,803 | 7% | 6,671 | 7% | 6,582 | 6% | -692 | -0.7% |
| **Total Employment** | **88,504** | **100%** | **93,701** | **100%** | **99,461** | **100%** | **105,849** | **100%** | **17,345** | **1.2%** |

*Source: BTS ; Urbis*

**Employment Split by Property Type**

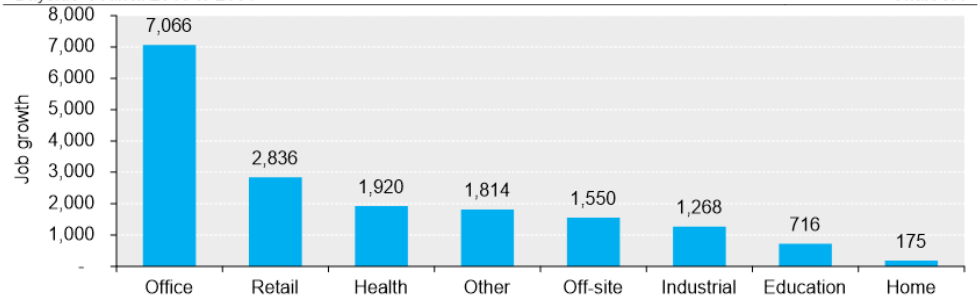
Bayside Council, 2016 to 2031 Table 3.2

| Industry Sector | Job Change 2016-31 | Job Split by Property Type | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Industrial | | Office | | Retail | | Education | | Health | | Other | | Off-site | | Home | | Total | |
| Health Care & Social Assistance | 2,133 | | | 10% | 213 | | | | | 90% | 1,920 | | | | | | | 100% | 2,133 |
| Retail Trade | 2,625 | 10% | 263 | | | 90% | 2,363 | | | | | | | | | | | 100% | 2,625 |
| Education & Training | 754 | | | 5% | 38 | | | 95% | 716 | | | | | | | | | 100% | 754 |
| Accommodation & Food Services | 1,544 | | | | | 25% | 386 | | | | | 75% | 1,158 | | | | | 100% | 1,544 |
| Wholesale Trade | 439 | 80% | 351 | | | 20% | 88 | | | | | | | | | | | 100% | 439 |
| Professional, Scientific & Technical Services | 1,751 | | | 98% | 1,716 | | | | | | | | | | | 2% | 35 | 100% | 1,751 |
| Construction | 810 | 10% | 81 | 5% | 41 | | | | | | | | | 70% | 567 | 15% | 122 | 100% | 810 |
| Other Services | 451 | | | 95% | 428 | | | | | | | 5% | 23 | | | | | 100% | 451 |
| Public Administration & Safety | 1,799 | | | 90% | 1,619 | | | | | | | 10% | 180 | | | | | 100% | 1,799 |
| Manufacturing | -692 | 100% | -692 | | | | | | | | | | | | | | | 100% | -692 |
| Financial & Insurance Services | 400 | | | 98% | 392 | | | | | | | | | | | 2% | 8 | 100% | 400 |
| Rental, Hiring & Real Estate Services | 703 | | | 98% | 689 | | | | | | | | | | | 2% | 14 | 100% | 703 |
| Administrative & Support Services | 943 | | | 95% | 896 | | | | | | | 5% | 47 | | | | | 100% | 943 |
| Transport, Postal & Warehousing | 1,968 | 50% | 984 | | | | | | | | | | | 50% | 984 | | | 100% | 1,968 |
| Information Media & Telecommunications | 922 | 20% | 184 | 80% | 738 | | | | | | | | | | | | | 100% | 922 |
| Arts & Recreation Services | 572 | | | 30% | 172 | | | | | | | 70% | 400 | | | | | 100% | 572 |
| Electricity, Gas, Water & Waste Services | 94 | 90% | 85 | 10% | 9 | | | | | | | | | | | | | 100% | 94 |
| Unclassified | 122 | | | 95% | 116 | | | | | | | 5% | 6 | | | | | 100% | 122 |
| Mining | 12 | 100% | 12 | | | | | | | | | | | | | | | 100% | 12 |
| Agriculture, Forestry & Fishing | -5 | | | | | | | | | | | | | 30% | -2 | 70% | -4 | 100% | -5 |
| **Total Employment** | **17,345** | **7%** | **1,268** | **41%** | **7,066** | **16%** | **2,836** | **4%** | **716** | **11%** | **1,920** | **10%** | **1,814** | **9%** | **1,550** | **1%** | **175** | **100%** | **17,345** |

*Source: BTS ; Urbis*

**Jobs by Land Use**

Bayside Council 2016 to 2031 Chart 3.4




*Source: BTS 2011 Journey To Work; Urbis*

## 3.3. INDUSTRIAL DEMAND FORECAST AND GAP ANALYSIS

Table 3.1 presents the calculations for deducing the projected industrial land capacity in Bayside Council by 2031.

There is currently 24.2 hectares of undeveloped industrial employment lands according to NSW Employment Land Development Program (ELDP) 2015 within the Bayside Council, comprising of the Botany Bay and Rockdale LGAs. Taking into account the potential withdrawal of the subject site from industrial land supply (row C), combined with the total demand for industrial floorspace based on 100 jobs per sq.m (row E), results in a surplus of industrial land of around +54,000 sq.m in Bayside Council. This suggests that there is more than enough capacity to support industrial employment growth within Bayside Council over the next 15 years.

Table 3.1 – Industrial Land Gap Analysis, 2031

| | Bayside Council | 2016-31 |
|---|---|---|
| A | Undeveloped Industrial Land (as per ELDP 2015) (sq.m) | +242,000 |
| B | Rezoning of Subject Site | -61,000 |
| *C* | *Total Potential Supply (A-B)* | *181,000* |
| D | Industrial Jobs Growth (2016-31) | 1,268 |
| E | Land Area (sq.m) per Job | 100 |
| *F* | *Total Industrial Land Demand (sq.m) (D x E)* | *126,770* |
| **G** | **+Surplus / -Deficit Industrial Land Capacity (C-F) (sq.m)** | **+54,230** |

*Source: Employment Land Development Program 2015; Urbis*

## 3.4. SUMMARY AND IMPLICATIONS

This section covered off a number of the key economic trends impacting employment land demand, specifically:

- In 1996 the economy relied heavily on the manufacturing sector which comprised 13.5% of GSP. By 2015 however this had contracted to 7.4% of GSP, reflecting structural shifts in the NSW economy:
  - A contraction in trade exposed sectors, driven by an increasing Australian dollar over this period
  - Increasing imports and consumption is driving demand for freight and logistics services
  - Growth in 'knowledge based' sectors such as financial and professional services
  - Growth in health care services, driven by an ageing population requiring health and aged care services.
- The resident employment trends over 2006 to 2011 for the Bayside Council reflect similar trends to the NSW GSP, with growing employment in the service sectors and declining employment in the manufacturing sector.
- Bayside Council has more local workers located within its boundary than local jobs. The exceptions to this are jobs within the transport, postal and warehousing and manufacturing, which currently have a surplus in jobs compared to resident workers. This reflects the concentration of industrial land uses within the Bayside Council, in particular the role of Port Botany in providing port related services for the NSW economy.
- In terms of future employment growth there is an estimated additional 1,268 industrial based jobs in the Bayside Council by 2031 requiring an estimated additional 12.7 hectares of industrial land, which is adequately met by the LGAs 18 hectares of undeveloped land.
- Further to this, there are better located industrial precincts identified in Section 2.2 providing significant capacity to accommodate additional industrial jobs growth:
  - Eastern Creek (562 hectares)
  - Moorebank (336 hectares)
  - Marsden Park (238 hectares)
  - WSEA (10,000 hectares).

These precincts contain a large component of undeveloped industrial land, and have a number of significant competitive advantages over the subject site.

# 4. ECONOMIC BENEFITS

This section identifies the potential employment and economic generation potential associated with the proposed development on the subject site. Specifically, this section addresses the following points:

- Potential employment and economic benefits generated during the construction of the proposed development
- Potential employment and economic benefits generated in the ongoing operation of the proposed development
- Qualitative assessment of additional economic benefits.

Modelling included in this report uses REMPLAN to assess current and potential economic impacts. REMPLAN is an Input-Output model that captures inter-industry relationships within an economy. It can assess the area-specific direct and flow-on implications across industry sectors in terms of employment, wages and salaries, output and value-added (Gross Regional Product). A region can be defined at a national, state or Local Government Area level.

REMPLAN base data is drawn from the Australian Bureau of Statistics and other government agencies. It provides highly reliable, up-to-date, and defensible economic modelling across any state or region in Australia. A summary of the REMPLAN Methodology is provided in Appendix A.

Previous modelling of economic impacts has used ABS Input-Output tables from 1996-97. The multipliers are close to 20 years old and are less accurate in estimating impacts on the economy, particularly due to:

- Productivity changes throughout the economy over the past 20 years
- The changing industry make-up of the Australian economy since 1997 – for example the decline in manufacturing and the rise in financial services.

## 4.1. CONSTRUCTION

As an indicative estimate for modelling purposes, construction costs associated with the proposed development could be in the order of $873.5 million over the 10-year construction period. After allowing for potential contingencies during the construction process, construction costs would equate to around $960.9 million. Capital expenditure assumptions have been informed by Meriton and Rawlinson's Australian Construction Handbook (2018).

**Estimated Construction Costs for Proposed Development**

Subject Site — Table 4.1

| Land Use | Unit | Size (1) | Cost per unit (2) | Total cost ($M) (1)*(2) |
|---|---|---|---|---|
| Residential | apt. | 2,015 | $400,000 | $806.0 |
| Parking | sq.m | 35,000 | $1,725 | $60.4 |
| Open Space | sq.m | 20,200 | $48 | $1.0 |
| Childcare | sq.m | 1,200 | $1,840 | $2.2 |
| Retail | sq.m | 5,200 | $763 | $4.0 |
| **Total** | | | | **$873.5** |
| Contingency allowance | | | | 10% |
| **Total (incl. contingency allowance)** | | | | **$960.9** |

*Source: Rawlinsons Australian Construction Handbook (2018); Urbis*

The construction of the development at the subject site is estimated to have the potential to generate $19.4 million in direct Gross Value Added (GVA) per annum and $83.1 million in indirect GVA per annum. Employment represents total numbers of employees without any conversions to full-time equivalence.

Further to the additional direct employment that can be generated from the ongoing operation of the new development and during construction, there are multiplier effects throughout the local, state and national

economies. These multiplier effects will be a result of increased demand for materials, services and products from a whole range of suppliers. In economic terms, it represents the absorption of excess supply in other parts of the economy driven by an increase in aggregate demand.

The construction period is estimated to generate an average 171 direct jobs and 531 indirect jobs per annum over the life of the project. It is worth noting that there will be peaks and troughs of actual jobs on the subject site, for instances it has been estimated that approximately 1,000 construction workers were present on site during peak construction periods.

Urbis notes that there are other industry bodies that attempt to estimate employment that can be generated by investment. For instance, the Urban Development Institute of Australia (UDIA) in a submission to the National Commission of Audit identified a total employment (direct and indirect) impact of 11.8 full-time equivalent jobs for every $1 million investment.

**Annual Economic Activity – Construction**

Subject Site Table 4.2

| | | |
|---|---|---|
| Construction Cost[1] | ($M) | 96.1 |
| **Employment** | | |
| Direct Jobs | (no.) | 171 |
| Indirect Jobs | (no.) | 531 |
| **Total Jobs** | **(no.)** | **702** |
| **Economic generation GVA** | | |
| Direct GVA | ($M) | 19.4 |
| Indirect GVA | ($M) | 83.1 |
| **Total GVA** | **($M)** | **102.6** |

*1. 10% contingency allowance included*
*Source: Rawlinsons Construction Handbook (2018), REMPLAN, Urbis*

## 4.2. ONGOING OPERATIONS

In addition to the construction phase of the proposed development, the ongoing operations of the non-residential components of the development will also create jobs and generate economic activity (in GVA).

The number of direct jobs for the proposed development was estimated using industry benchmarks on jobs per net lettable area. Direct jobs are entered into REMPLAN to produce an estimate of indirect jobs, and direct and indirect GVA.

The proposed development on the subject site will include space for childcare and retail, which is estimated to generate some 342 total jobs from ongoing operations as shown in Table 4.3.

**Proposed Non-Residential Gross Floor Area and Employment**

Subject Site Table 4.3

| Non-Residential | GFA (sq.m) | GFA (sq.m) per job | Ongoing Jobs |
|---|---|---|---|
| Childcare | 1,200 | 71 | 17 |
| Retail | 5,200 | 16 | 325 |
| **Total Non-Residential** | **6,400** | | **342** |

*Source: Urbis*

Furthermore, the potential serviced apartments in Lot B as identified by SJB in the concept masterplan will generate an additional 0.61 jobs per developed room. This benchmark includes both contracted and workers employed directly by the serviced apartment.

The direct and indirect impacts from economic activity forecast to occur from the proposed development are detailed in Table 4.4.

Once fully developed, it is anticipated that the proposed development on the subject site will result in 342 direct and 196 indirect ongoing jobs. These job numbers do not include the potential employment associated with the 5,000 sq.m serviced apartment.

The 342 direct ongoing jobs to be delivered by the Planning Proposal will constitute a substantial 16%-31% of the 1,100-2,100 jobs (2016-36) projected in the Eastgardens / Maroubra District Centre outlined in the Draft Eastern City District Plan. The direct ongoing jobs will also represent an extensive 2,180% increase on the 15 jobs currently provided on the site under its existing use.

The ongoing operations of the childcare and retail components of the development are estimated to have the potential to generate $24.7 million in direct Gross Value Added (GVA) per year, and $32.8 million in indirect GVA. GVA figures have been estimated using economic employment multipliers most relevant to the operation of childcare centres and retail uses.

**Annual Economic Activity – Ongoing Operations**

Subject Site — Table 4.4

| | Direct effect | Indirect effect | Total |
|---|---|---|---|
| Jobs | 342 | 196 | 538 |
| Economic generation GVA p.a. ($M) | 24.7 | 32.8 | 57.5 |

*Source: REMPLAN, Urbis*

## 4.3. RETAIL SPEND

Based on the masterplan provided, the indicative number of residents to be accommodated across the subject site is 2,770 people (as advised by SJB).

Based on the current spending profile of residents within the Bayside Council, an average spend per capita of $13,514 in $2018 is calculated. Therefore, additional population could generate $37.4 million in retail expenditure (in $2018) per annum, as illustrated in Table 4.5. These values do not account for future retail price inflation.

**Concept Plan Resident Spending by Product Category per Annum**

Based on 2,770 Additional Residents ($Million $2018) — Table 4.5

| Number of Residents | Year | Food Retail | Food Catering | Apparel | Home-wares | Bulky Goods | Leisure/ General | Retail Services | Total Retail[1] |
|---|---|---|---|---|---|---|---|---|---|
| 2,770 Residents | 2018 | 14.8 | 6.4 | 3.9 | 3.0 | 3.8 | 4.1 | 1.5 | **37.4** |

*1. Spend per annum*
*Source: ABS MarketInfo 2012; Urbis*

The economic benefits associated with this additional spending growth is that it has the potential to improve turnover performance of existing retail precincts in the vicinity of the subject site, and in turn generate additional employment within these precincts.

## 4.4. AFFORDABILITY AND HOUSING TARGETS

The proposed development can contribute to improving housing affordability and the delivery of housing targets set within NSW's Eastern City District Plan (2018).

Table 4.6 outlines the additional dwelling targets set for the Eastern City District by 2021. A target of delivering 10,150 additional dwellings has been set for the Bayside Council by 2021, equivalent to 19.8% of the total additional new dwellings projected for the Eastern City District.

The proposed development on the subject site will make a significant contribution in achieving this target by providing up to 2,015 new residential apartments to the local region, equivalent to delivering almost a fifth of the additional dwelling targets set for the LGA.

**Housing Targets**

Eastern City District Table 4.6

| Region | % of Eastern City District Total | Additional Dwellings by 2021 |
|---|---|---|
| Bayside Council | 19.8% | +10,150 |
| **Eastern City Total** | **100%** | **+46,550** |

*Source: Eastern City District Plan (2018), Urbis*

The limited land available for residential development in a housing market with high underlying demand has resulted in a housing shortage and an affordability constraint within the Bayside Council area. New supply that will be delivered on the subject site will meet this demand, improving affordability outcomes for the Bayside Council area.

Table 4.7 outlines the key drivers of residential housing demand relevant to the subject site. The table shows that the subject site attributes are well aligned and well suited to residential as the site has strong access to amenities, employment options and future public transport infrastructure.

**Residential Demand Drivers**

Subject Site

Table 4.7

| Factors | Comments | Implications for the Subject Site |
|---|---|---|
| 1. **Access to amenities** | • Westfield Eastgardens Shopping Centre is located approximately 500 metres to the south of the subject site, a shopping centre which provides discretionary retail for local and regional residents.<br>• There are a number of schools located close to the subject site including South Sydney High School, Pagewood Public School and Maroubra Junction Public School.<br>• There are a number of recreational parks located close to the subject site, including Mutch Park, Jellicoe Park and Heffron Park.<br>• Prince of Wales Private Hospital is located 3.4km north of the subject site, with City East Specialist Day Hospital (1.8km) and Maroubra Medical Centre (1.8km) also located in proximity to the subject site. | • The subject site's close proximity to Westfield Gardens makes it a desirable location for housing, noting strong residential access to high quality retail amenity and services.<br>• Good access to schooling and recreation will attract residential demand from couple families with children. |
| 2. **Access to employment** | • The subject site has good access to major commercial employment nodes due to its proximity to the M1 Motorway entry access point. The subject site is located near the Anzac Parade Corridor, which provides linkages to major employment precincts including:<br>– Randwick Health and Education Precinct (3.5km, 9 minute drive)<br>– Port Botany Industrial Area (6.5km, 12-minute drive)<br>– Sydney CBD (10.7km, 28 minute drive). | • Residents often prefer to live close to work, enabling them to minimise travel times and improve work life balance.<br>• The subject site's close proximity to the emerging Randwick Health and Education Precinct is expected to drive future residential apartment demand on the subject site. |

| Factors | Comments | Implications for the Subject Site |
|---|---|---|
| 3. **Transport and infrastructure** | • The proposed CBD and South East Light Rail will connect the Sydney CBD to the south eastern suburbs of Randwick and Kingsford, with a potential extension along the Anzac Parade Corridor. Three potential extensions to Maroubra Junction, Malabar and La Perouse will improve the subject site's connectivity to other areas of Sydney.<br>• The subject site is located adjacent to a bus station on Bunnerong Road, which provides connection to Little Bay and the Sydney CBD | • Access to good public transport and road infrastructure are important to potential purchasers and renters. Particularly, linkages to the CBD, airport and major employment centres.<br>• The proposed CBD and South East Light Rail is expected to revitalise Sydney's south eastern suburbs, as improved connectivity and linkages will create new jobs and reshape the existing community. In turn, these benefits are set to be realised by future residential development on the subject site. |

## 4.5. SUMMARY AND IMPLICATIONS

The proposed development on the subject site is estimated to result in an increase in direct and indirect employment and economic activity (Gross Value Added – GVA). This will occur in the construction phase of the proposed development and also through the ongoing operations of the non-residential land uses. The results of the economic benefits analysis are summarised in the following table:

**Annual Economic Activity**

Subject Site Table 4.8

| Construction Phase | Direct effect | Indirect effect | Total |
|---|---|---|---|
| Jobs | 173 | 539 | **712** |
| Economic generation GVA p.a. ($M) | 19.7 | 84.2 | **103.8** |
| **Ongoing Operations** | | | |
| Jobs | 342 | 196 | **538** |
| Economic generation GVA p.a. ($M) | 24.7 | 32.8 | **57.5** |

*Source: REMPLAN; Urbis*

The proposed development is also expected to deliver an increase in housing by renewing an existing urban area, improving housing affordability by delivering increased housing supply with strong access to employment, amenity and transport infrastructure.

The potential inclusion of serviced apartments in Lot B will further contribute to the mix of lands uses provided within the site and is a response to the site's strategic centre location and the requirements of the Gateway Determination. The development of a serviced apartment on the subject site has the potential to add create employment (0.61 jobs per room).

# APPENDIX A SUMMARY OF REMPLAN METHODOLOGY

- REMPLAN uses either the value of investment or employment generation as the primary input. For this analysis, the value of total upfront investment has been used as the key input to assess the benefits of the construction phase, whereas future employment on the site is the input to assessing the on-going economic benefits of the operation phase
- Outputs from the model include employment generated through the project and economic Gross Value Added at the state level
- Employment generated includes all full-time and part-time jobs created over the life of the construction phase; or in terms of the on-going operations, total on-going jobs generated
- Gross Value Added or GVA is a measure of the value of goods and services produced in an area, industry or sector of an economy during a certain period. In this case, GVA represents the total economic contribution of the project
- Both the direct and indirect benefits are modelled for employment and value added:
  - *Direct* refers to the effect felt within the industry where the investment is being made. For example, during the construction phase, new direct jobs are created within the construction industry
  - *Indirect* effects are those felt within industries that supply goods to the industries directly affected by the investment as well as consumption flow-on effects associated with additional income to households through higher wages and salaries.
- Economic benefits are modelled for the construction and the on-going operation phases. For both phases, the employment and value-added numbers are presented on an annualised basis
  - Construction phase benefits accrue each year when the project is under construction (or a pro-rata basis for any part year construction period).
  - On-going benefits accrue each year of operation.

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URBIS

**BRISBANE**
Level 7, 123 Albert Street
Brisbane QLD 4000
Australia
T +61 7 3007 3800

**GOLD COAST**
45 Nerang Street,
Southport QLD 4215
Australia
T +61 7 5600 4900

**MELBOURNE**
Level 12, 120 Collins Street
Melbourne VIC 3000
Australia
T +61 3 8663 4888

**PERTH**
Level 14, The Quadrant
1 William Street
Perth WA 6000
Australia
T +61 8 9346 0500

**SYDNEY**
Tower 2, Level 23, Darling Park
201 Sussex Street
Sydney NSW 2000
Australia
T +61 2 8233 9900

**CISTRI - SINGAPORE**
*An Urbis Australia company*
#12 Marina View
21 Asia Square, Tower 2
Singapore 018961
T +65 6653 3424
W cistri.com

**URBIS.COM.AU**

# APPENDIX C SERVICES, DRAINAGE AND FLOODING DUE DILIGENCE REPORT

# 128 & 130-150 Bunnerong Road, Pagewood



## Pagewood Part II - Due Diligence Report

**Author:** Michael Guinane

**Approver:** Michael Guinane

**Report no:** 13-155-7002 **Revision:** 02 **Date:** November 2018

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Please note that utility providers reserve the right to change their decision in relation to network deployment within the development without prior notice. Additionally it is our experience that utility providers will not reserve capacity. For this reason, they operate on a first come first serve basis.

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## Finalisation signatures

The design described in this report is considered to have been finalised.

| Signature | Date |
|---|---|
| Michael Guinane<br>Civil Engineer (Author) | 21/11/18 |
| Frank Xie<br>Lead Designer | 21/11/18 |
| Anthony McLandsborough<br>Director | 21/11/18 |

***Notes:*** The finalisation signatures shown above do not provide evidence of approval to the design. Approval signatures are shown on the title sheet of the design plans.

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# 1 Introduction

The development of the site is within the Bayside City Council Local Government Area (LGA). The site was previously owned by British American Tobacco (BATA) is classified as the land bound by Bunnerong Road to the east, Banks Avenue to the west, Westfield Drive to the south and Heffron Road to the north.

This report is intended to support a planning approval to rezone the site from part IN1 General Industrial Zone and part R3 Medium Density Residential Zone to the R4 High Density Residential.".

The site is approximately 8.95 Ha in area and consists of Lot 1 DP 1187426 & Lot 24 DP 1242288 or 128 & 130-150 Bunnerong Road, Pagewood.

This Due Diligence Report addresses the following Civil Infrastructure items, Stormwater Management, Water Quality and Utilities and has been prepared to satisfy Bayside Council (formerly Botany Bay City Council) requirements for the proposed development of the civil works on the site.

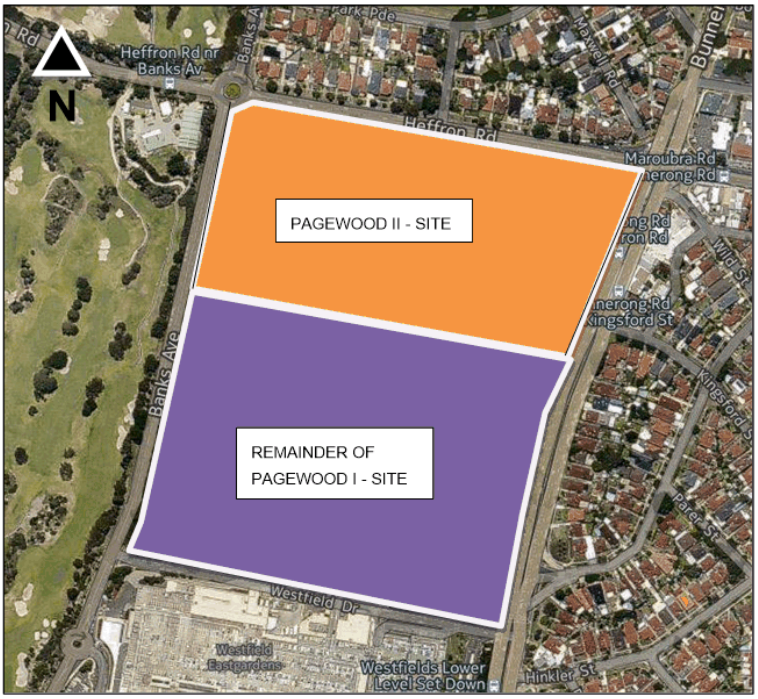


**Figure 1 Location Plan**

## 1.1 Existing Site

The entirety of the site currently comprises factory buildings and bitumen carpark which results in the entire site being an impermeable area.

A survey carried out by Denny Linker & Co in May 2011 indicates levels throughout the site are generally flat with a gentle fall towards Heffron Road.

Stormwater from the site currently drains to the north west of the site towards a trunk stormwater pipe network and ultimately to discharge into an existing Sydney Water culvert (2.44m wide by 1.21m high) which drains through the site in a south east direction. No external catchment drains into the site.

## 1.2 Proposed Development

A Masterplan illustrating the type of development facilitated by the Planning Proposal is provided in Figure 2 below.

No actual physical works are proposed as part of the planning proposal.

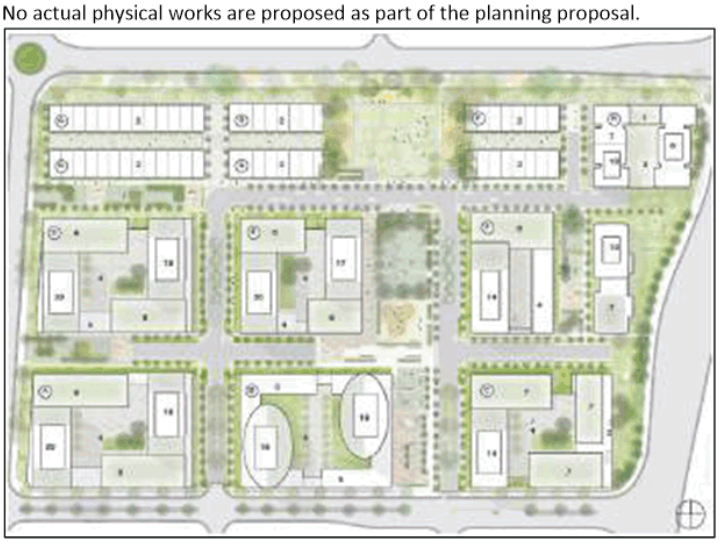

**Figure 2 Master Plan**

# 2 Road Geometry

This report should be read in conjunction with the Transport Impact Assessment prepared by ARUP Dated July 2018.

## 2.1 General Design Principles

The roads will be generally designed in accordance with:

- City of Botany Bay Part 9D British American Tobacco Australasia (BATA) Site Development Control Plan –2013.
- Austroads Guide to Road Design Part 3: Geometric Design

## 2.2 Access

The site has proposed vehicular access from Meriton Boulevard, connecting to Banks Avenue and Bunnerong Road.

## 2.3 Horizontal and Vertical Geometry

The internal roads will be designed generally in accordance with Councils DCP, AS2890.1, AS1428.1 and NSW Fire Brigades Policy to accommodate 8.8m Garbage Truck, 12.5m Bus and Fire Truck Aerial Appliance Access.

### 2.3.1 Road Cross Sections

**North South Street 1**

- 20m wide Road Reserve
- 13m wide Carriageway (2.5m Parking, 3.0m Lane)
- 2m wide Median Swale

**North South Street 2**

- 18m wide Road Reserve
- 13m wide Carriageway (2.5m Parking, 3.0m Lane)
- 2m wide Median Swale

2m wide Median

**Local Street**

- 16m wide Road Reserve
- 11m wide Carriageway (2.5m Parking, 3.0m Lane)

All alterations to lane widths from the Council DCP may be proposed in accordance with the relevant Standards and advice from Traffic Consultant. Minimum traffic lane widths are utilised to discourage speeding through Local Streets and encourage pedestrian safety.

## 2.4 Pavement

Pavement will be designed based on the requirements of:

- Austroads Pavement Design Guide – Part 2 - Pavements Structural Design, 2012 (AGPT02-12),
- Concrete Masonry Association Guidelines (MA44 and T45); and
- Site specific CBR values and traffic ESAs.

# 3 Stormwater & WSUD Management

## 3.1 General Design Principles

The stormwater management plan for the site will be generally designed in accordance with the following codes and guidelines:

- City of Botany Bay Technical Guidelines on British American Tobacco Australasia (BATA) Site – July 2013.
- Stormwater Management and Flooding Report, Rezoning of Lot 1 DP 776089 Eastgardens. Report Ref 211530 , 10 October 2011 Revision 8 by Aurecon
- Flood Study Report, Rezoning of Lot 1 DP 776089 Eastgardens. Report Ref 211530 FSR , 02 November 2011 Revision 1 by Aurecon
- Utility Services Infrastructure Report, Rezoning of Lot 1 DP 776089 Eastgardens. Report Ref 211530 , 8 August 2011 Revision 2 by Aurecon
- Australian Standards - AS 3500.3 National Plumbing and Drainage Code - Part 3 – Stormwater Drainage
- Australia publication "Australian Rainfall and Runoff, Volumes 1 and 2 (AR&R)

## 3.2 Stormwater Management

### 3.2.1 Hydrology

- Pipe drainage within the site shall be designed to accommodate the 20-year ARI storm event
- The combined piped and overland flow paths shall be designed to accommodate the 100-year ARI storm event
- Where trapped low points are unavoidable and potential for flooding private property is a concern, an overland flowpath capable of carrying the total 100-year ARI storm event shall be provided. Alternatively the pipe and inlet system may be upgraded to accommodate the 100 year ARI storm event
- Rainfall intensities shall be as per the Intensity-Frequency-Duration table in accordance with the Australian Rainfall and Runoff volume 2
- Times of concentration for each subcatchment shall be determined using the kinematic wave equation
- Runoff coefficients shall be calculated in accordance with the AR&R. The fraction impervious shall be determined from analysis of the subcatchments

- Flow width in gutter shall not exceed 1.5m for the minor design storm event.
- Velocity depth rations shall not exceed 0.4 for all storms up to and including the 100 year ARI event
- Blockage factors of 20% and 50% shall be adopted for pits on grade and at sags respectively for all storm events
- The maximum spacing between pits shall be 60m
- The minimum lintel size for any road drainage pit shall be 2.4m (3.6m for East-West Boulevard)

### 3.2.2 Hydraulics

- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design. The HGL shall be shown on all drainage long sections
- The minimum pipe size shall be 375mm diameter
- The minimum pipe grade shall be 0.5%
- All pipes shall be Rubber Ring jointed
- The minimum cover over pipes shall be 500mm
- All trafficable pipes shall be Class 3 Reinforced Concrete Pipes or Fibre Reinforced Cement equivalent
- The pipe friction coefficients to be adopted shall be:

| Materials | Mannings – n | Colebrook-White – k | Min. Pipe Class |
|---|---|---|---|
| RCP | 0.012 | 0.3 | 3 |
| FRC | 0.01 | 0.15 | 3 |

**Table 1 - Pipe Details**

- All pipes shall be designed for the ultimate service loads and where applicable, construction loads will be designed for
- Where the tailwater level is unknown 150mm freeboard shall be adopted
- Pit Loss coefficients shall be calculated in accordance with Missouri Charts
- A minimum 150mm freeboard shall be maintained between pit HGL and pit surface levels
- Overland flowpaths shall maintain a minimum of 500mm freeboard to all habitable floor levels
- Pits deeper than 1.2m shall contain step irons at 300mm centres

## 3.3 Proposed Stormwater

Within Section 2.2 of the *Stormwater Management and Flooding Report* by Aurecon is the clause *"Discussions with Sydney Water indicate that surface water from the new rezoned area (i.e. new proposed residential and retail area) will continue to discharge into the Sydney Water culvert after flow reductions have been achieved through on-site detention."*

Stormwater from the proposed building lots will drain via internal OSD tanks (Some with Infiltration) with water quality devices prior to discharging into the surrounding street network and ultimately the Sydney Water Culvert.

As part of the Initial Pagewood Development, and due to the existing flat gradient of the existing Sydney Water culvert it was proposed to replace the existing 1050mm diameter pipe in the northern portion of the site and box culvert with a new 1200mm diameter pipe laid at a steeper gradient. This new pipe will connect the majority of the Pagewood Part II Development.

Based on the City of Botany Bay Technical Guidelines on the BATA site a maximum Permissible Site Discharge (PSD) of 5,849L/second needs to be achieved. Further to this requirement Sydney Water imposed PSD of 3,657L/sec for water discharging into the Sydney Water Culvert; under the Case Number 124768. Also a minimum Site Storage Requirement (SSR) of 2,970m$^3$ is required across the site. Refer Appendix A for Sydney Water requirements.

Through DRAINs modelling the above most onerous conditions have been achieved:

- PSD = 3,657 L/s

Refer Table 2 below for summary of PSD vs Post Developed Discharge and Appendix D for DRAINs results.

| | PSD (m$^3$/s) | Discharge (m$^3$/s) |
|---|---|---|
| Outlet | 3.65 | 3.56 |

**Table 2 – PSD vs Post Developed Discharge**

Refer to Sketch within Appendix C for proposed stormwater networks.

## 3.4 On-Site Detention (OSD)

On Site Detention tanks will be placed in building lots to detain flows for all storms up to the 100 year ARI events. These tanks will:

- Reduce runoff volumes by infiltration to sub-soils (if allowable); and
- Delay runoff peaks by providing detention storage capacity

To achieve the required minimum OSD volume of 2,970m$^3$, detention tanks are proposed within each building which will be pro-rated across all buildings, as

outlined in Table 3. It is noted the minimum OSD volume is exceeded, in order to achieve the PSD. This is as a result of the Open Space and Road reserve flows bypassing the OSD.

| Building No. | Lot Area (Ha) | OSD Volume ($m^3$) | Method of OSD |
|---|---|---|---|
| Urban Block A | 0.773 | 500 | HED |
| Urban Block B | 0.865 | 560 | HED |
| Urban Block C | 0.756 | 450 | HED |
| Urban Block D | 0.735 | 495 | HED |
| Urban Block E | 0.557 | 405 | HED |
| Urban Block Fa | 0.372 | 180 | HED |
| Urban Block Fb | 0.410 | 260 | HED |
| Urban Block Ga | 0.384 | 370 | HED |
| Urban Block Gb | 0.567 | 450 | HED |
| Urban Block H | 0.823 | 460 | HED |
| Urban Block 1 | 1.218 | 517 | HED |
| Urban Block 2 | 0.451 | 197 | HED |
| Urban Block 3 | 0.749 | 366 | HED |
| Urban Block 4 | 0.640 | 324 | PUMP |
| Urban Block 5 East | 1.000 | 355 | HED |
| Urban Block 5 West | 1.014 | 512 | HED |
| Urban Block 5 Central | 0.799 | 336 | HED |

**Table 3 – Minimum OSD Requirements**

### 3.4.1 Infiltration

The infiltration rate for the site has be determined to be $7x10^{-5}$ by Coffey. Refer Geotechnical Report GEOTLCOV24928AE-AH Dated 26 October 2016.

The tanks have been sized to ensure 100% infiltration into the subgrade with zero outflow. This has the benefit of reducing the required pipe size in the surrounding roadways as well as negating the need to OSD on the Open Space lots.

## 3.5 Water Sensitive Urban Design (WSUD)

### 3.5.1 Policy and Guidelines

The stormwater design considers the following guidelines:

- Australian Rainfall Quality (2006)
- Department of Environment and Climate Change NSW (DECC), Management Urban Stormwater: Urban Design (Consultation Draft, 2008)
- Botany Bay Catchment Water Quality Improvement Plan (WQIP)
- Botany Bay Local Environmental Plan (LEP) 2013

### 3.5.2 Music Modeling Parameters

#### Climate Date

Rainfall Station 66037 Sydney with 6 minute timestep was used in the MUSIC model.

#### Pollutant Concentration Parameters

Stormwater pollutant parameters used in the MUSIC model will be adopted from the following guidelines:

- NSW MUSIC Modeling Guidelines (CMA, 2010)
- Using MUSIC in Sydneys Drinking Water Catchment (SCA, 2012)

Pollutant concentration parameters for each land-use type adopted in the MUSIC model are shown in Table 4a and 4b below.

| Catchment Type | TSS (mg/L) | | TP (mg/L) | | TN (mg/L) | |
|---|---|---|---|---|---|---|
| | Mean | Std. Dev | Mean | Std. Dev | Mean | Std. Dev |
| Residential/Commercial | 1.200 | 0.170 | -0.850 | 0.190 | 0.110 | 0.120 |
| Sealed Roads | 1.200 | 0.170 | -0.850 | 0.190 | 0.110 | 0.120 |

**Table 4a Adopted base flow concentration parameters**

| Catchment Type | TSS (mg/L) | | TP (mg/L) | | TN (mg/L) | |
|---|---|---|---|---|---|---|
| | Mean | Std. Dev | Mean | Std. Dev | Mean | Std. Dev |
| Residential/Commercial | 2.15 | 0.32 | -0.60 | 0.25 | 0.30 | 0.19 |
| Sealed Roads | 2.43 | 0.32 | -0.30 | 0.25 | 0.34 | 0.19 |

**Table 4b Adopted storm flow concentration parameters**

### 3.5.3 Objectives

These stormwater management objectives will be applied to treating stormwater runoff from the development to meet pollution reduction targets outlined in Table 5.

| Pollutants | Retention Objectives |
|---|---|
| Total Suspended Solids (TSS) | 85% |
| Total Phosphorus | 60% |
| Total Nitrogen (TN) | 45% |
| Gross Pollutants | 90% |

**Table 5 Pollutant Retention**

The proposed stormwater management for this development will also ensure the Botany Bay LEP clause 6.3 (as stated below) on Stormwater Management is met.

*(c) avoids any significant adverse impacts of stormwater runoff on adjoining properties, native bushland and receiving waters, or if that impact cannot be reasonably avoided, minimises and mitigates the impact*

In order to achieve these reductions, a treatment train approach will be implemented into the development where the following treatment measures will be used:

- Rainwater Tanks – used for stormwater re-use from roofed areas
- On Site Detention - stormwater will be captured and detained in OSD tanks (with infiltration if required) to capture water and slow the discharge rates
- Gross Pollutant Traps (GPTs) – used to reduce the gross pollutants from the stormwater runoff
- Tertiary Treatment Devices – used to reduce TSS, TN and TP.
- Vegetated Swales – used to remove coarse and medium sized sediments from roadways and overland flow

### 3.5.4 Stormwater Quality Improvement Devices (SQIDS)

Proposed SQIDs used in the proposed development are described in Table 7 below.

| Element | Water Quality Function | Description | Preliminary Specification |
|---|---|---|---|
| Rainwater Tank (RWT) | Stormwater Harvesting for re-use as Irrigartion and/or grey water | 10kL tank min. to be included to collect roof runoff for each Block | Properties assumed for modeling purposes:<br>Volume below pipe: 10kL<br>Depth above overflow pipe: 0.2m<br>Surface Area: 10sq.m<br>Re-use: 5kL/day |
| On-Site Detention Tank (OSD) | Provide temporary storage and control of stormwater generated within the site | OSD tanks to be included to collect all runoff from each Block | OSD tank properties for modeling purposes:<br>Surface Area: DRAINs<br>Extended detention depth: 1.5m<br>Exfiltration Rate: 0mm/hr<br>Evaporative Loss % of PET: 100% |
| Pit Inserts (i.e. Enviropods or Similar) | Captures trash, debris, and other pollutants by catch basin inserts installed in stormwater pits | Pit inserts to be installed in all pits on site. | Treatement efficiencies of the pit inserts based on the Enviropod treatement node provided by Stormwater 360:<br>TSS: 55% retention<br>TN: 20% retention<br>TP: 30% retention<br>Gross Pollutant: 100% retention |
| Primary Gross Pollutant Traps – GPT (i.e. Humeguard or Similar) | Removal of gross pollutants and course sediments of low flow events | Humeguard Unit to be included to collect roof runoff for each Block | Treatment efficiencies of the GPT based on Humeguard node provided by Humes:<br>TSS: 50% retention<br>TN: 20% retention<br>TP: 20% retention<br>Gross Pollutant: 85% retention |
| Tertiary Gross Pollutant Trap – GPT (i.e. Jellyfish or Similar) | Removal of fine solids, soluble heavy metals, oil and nutrients through filtration of low flow events | Jellyfish Unit to be included to collect roof runoff for each Block | Treatment efficiencies of the GPT based on Jellyfish node provided by Humes:<br>TSS: 85% retention<br>TN: 51% retention<br>TP: 59% retention<br>Gross Pollutant: 99% retention |
| Swales | Removal of gross pollutants and course sediments of low flow events | Swales to be included to collect runoff from roads and open space | Swale properties for modeling purposes:<br>K (m/yr) C* C**<br>8000 (mg/L) (mg/L)<br>TSS: 6000 20.000 14.000<br>TP: 500 0.130 0.130<br>TN: 1.400 1.400 |

**Table 7 Statistics – Summary of proposed SQIDs**

### 3.5.5 Sediment and Erosion Control (Construction)

Stormwater runoff generated from within the works area during construction will likely contain sediments and oils from construction machinery. A number of options are available for the removal of these contaminants from stormwater, some of which include:

- Wheel wash down/cattle grid at site access
- Sediment fence at downstream boundary
- Stabilisation of finished areas

Erosion and Sedimentation controls are to be installed and maintained in accordance with Department of Housing (1998), *Managing Urban Stormwater, Soils and Construction*, Fourth Edition. Following are possible levels of control that are to be constructed.

- Silt fences shall be installed along the base of excavated slopes and stockpiles to prevent runoff.
- Kerb inlet sediment traps are to be installed at the completion of the drainage works. Whilst works are underway, geotextile filter fabric fences are to be installed around open pits.

## 3.6 Flooding and Overland Flows

The Stormwater Management and Flooding Report by Aurecon outlines the flooding affects of the development. Section 4.2 states:

*"The proposed stormwater management strategy outlined in this report will lead to a reduction in the peak runoff from the site through the inclusion of a number of techniques:"*

- *Increase in permeable surface area by 15% of total site area*
- *On-site detention tanks*

*"Our preliminary analysis, based on the rezoning Masterplan, has resulted in the reduction of peak flows for all storms up to the ARI 100-year storm. Detailed analysis is required at the Development Application stage when the building footprint, external access roads and parking and landscaping is detailed to a stage that permits the location of the required vegetated swales and underground pipe system."*

Within Section 4.3 of the report Aurecon summarise that with the increase of permeable areas and inclusion of on-site detention basins, the peak stormwater flows off site post development will be less than pre developed rates. This is stated in Section 4.3 as follows:

*"The reduction of the existing site discharge to less than the Sydney Water requirement will lead to a reduction in the runoff of stormwater from the site onto*

*the external roads and the collection of this water into the stormwater pipe system that serves these roads."*

### 3.6.1 Flood Levels

External Flood Levels along Bunnerong Road and Heffron Road have been determined by the Aurecon Report and are to be adopted when setting habitable floor levels with adequate freeboard. Refer to Figure 3 below for extract of Flood levels.

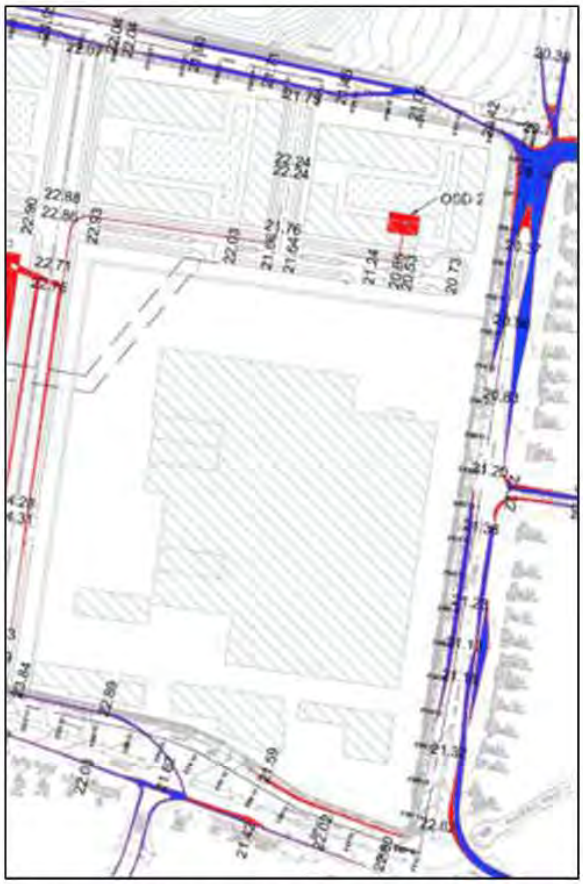

**Figure 3 – Flood Levels (*Appendix D – Aurecon Flood Report*)**

Car park entry levels and habitable floor levels are to be 300mm above the adjacent top of kerb as per Part 8(v) of the DCP.

# 4 Utilities

## 4.1 Aurecon Utilities Report

A Utility Services Infrastructure Report Rezoning of Lot 1 DP 776089 Eastgardens, Report Ref: 211530, 8 August 2011 Revision 2 by Aurecon discusses all utility services across the site and proposed works required to service the development.

Based on the Aurecon Report and the MotMacdonald Feasibility Application the following works are required for each utility to service the development:

### 4.1.1 Potable Water (WSC MotMacdonald)

The water servicing coordinator will determine if there is enough capacity within the existing water main to service the proposed development. For the internal water reticulation of the site the following will likely be required:

- A water main extension must be constructed along proposed roads to provide frontage to all lots
- New 200mm Diameter mains have been installed within the road reserves of Stage 1 that can provide connections to the proposed additional Urban Blocks.
- A proposed 200mm Diameter main may need to be required to interconnect the two existing water mains in Heffron and Meriton Blv.

A feasibility application under Case Number 160744 has been lodged. The development will be subject to Section 73 Application by Water Servicing Coordinator.

### 4.1.2 Recycled Water (WSC MotMacdonald)

Based on advice from Sydney Water there is no proposal to provide recycled water to the development from outside sources. Rainwater tanks and grey-water treatment tanks may be incorporated during detailed design to reduce the requirement of potable water.

### 4.1.3 Sewer (WSC MotMacdonald)

It is anticipated based on previous advice from Sydney Water that there is adequate capacity within the existing sewer to connect the development.

As part of the previous stage of works a section of the existing Sydney Water sewer pipe traversing the site has been relocated to avoid future lots. The existing 375mm Diameter main running through the site may need to be adjusted to suit the proposed layout and sewer reticulation mains extended to service the individual Urban Blocks, subject to Sydney Water requirements.

A feasibility application under Case Number 160744 has been lodged. The development will be subject to Section 73 Application by Water Servicing Coordinator.

### 4.1.4 Electricity (By Others)

Agreement will need to be reached with Ausgrid for any HV lead in services.

Any reticulation within the development will include the normal cabling, ducting, road crossings, HV substations, lot connection boxes and street lighting. It is anticipated any electrical cables will be installed within a shared trench with gas and telecommunications.

Subject to ASP1 design and Ausgrid Approval.

### 4.1.5 Telecommunications

This development will require the upgrading of all future telecommunications infrastructure to optical fibre in order to comply with the requirements of the Federal Governments NSW Policy. The extent of these upgrade works will need to be confirmed with Telstra.

### 4.1.6 Gas

Based on advice from Jemena there is adequate gas supply within the existing gas infrastructure to service the development. Gas mains (PE), compressors, vents and lot connections will be installed as required by Jemena.

# 5 CONCLUSION

This report has demonstrated that a storm water system consistent with good management practices can be provided for the proposed development and can achieve the target requirements for Council and Sydney Waters OSD and WSUD principles.

The Aurecon Utility report indicates all other required services for the development are within the vicinity. All supply and connections will need to be confirmed with the relevant authorities.

# Appendix A

## Sydney Water Correspondence

Appendix
AT&L
ABN 96 130 882 405
REVISION 02

at&l

**From:** ORTEGA, FERNANDO [mailto:FERNANDO.ORTEGA@sydneywater.com.au]
**Sent:** Monday, March 31, 2014 12:07 PM
**To:** Anthony McLandsborough
**Cc:** JEYADEVAN, JEYA
**Subject:** RE: Pagewood Stormwater Options

Good morning Anthony

We are comfortable with Option 3. However, please note this site was part of a previous development application to Sydney Water for Subdivision of Lot 1 DP 776089.

Sydney Water's requirements must be met. Please refer to Case Number 124768 and/or attached Terms of Reply for stormwater which were included in the NOR.

**OSD** is required for this site. As per Sydney Waters requirements on Case Number 124768 for the proposed subdivision of Lot 1 DP776089 OSD is required for the discharge of stormwater into Sydney Water system.

- OSD of 18 cubic meter / 1000 square meters
- Permissible Site Discharge of 35 litres per second per 1000 square meters
- Must comply with Councils OSD requirements

**Water Sensitive Urban Design**

Direct Connections to Sydney Waters stormwater system must meet the following stormwater water quality targets, as per WSUD MUSIC model.

90% Gross Pollutants

85% Total Suspended Solids

60% Total Phosphorous

45% Total Nitrogen.

**Flood Study**, please refer to the flood study for Subdivision of Lot 1 DP 776089.

**Stormwater Easement** requirements

I will be happy to meet and discuss these with Jeya as he was involved in previous discussions later in the week preferably Thursday afternoon at 1.30 pm or morning

Regards




Fernando Ortega | Senior Asset Planner, Land and Waterways

Liveable City Solutions | Sydney Water
Level 10, 1 Smith St Parramatta NSW 2150
PO Box 399 Parramatta NSW 2124
T 02 8849 5207 | M 0407 702 994
fernando.ortega@sydneywater.com.au | sydneywater.com.au

Appendix
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ABN 96 130 882 405
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# Appendix B

## Removed From Report

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Appendix
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# Appendix C

## Civil Stormwater Plans

Appendix
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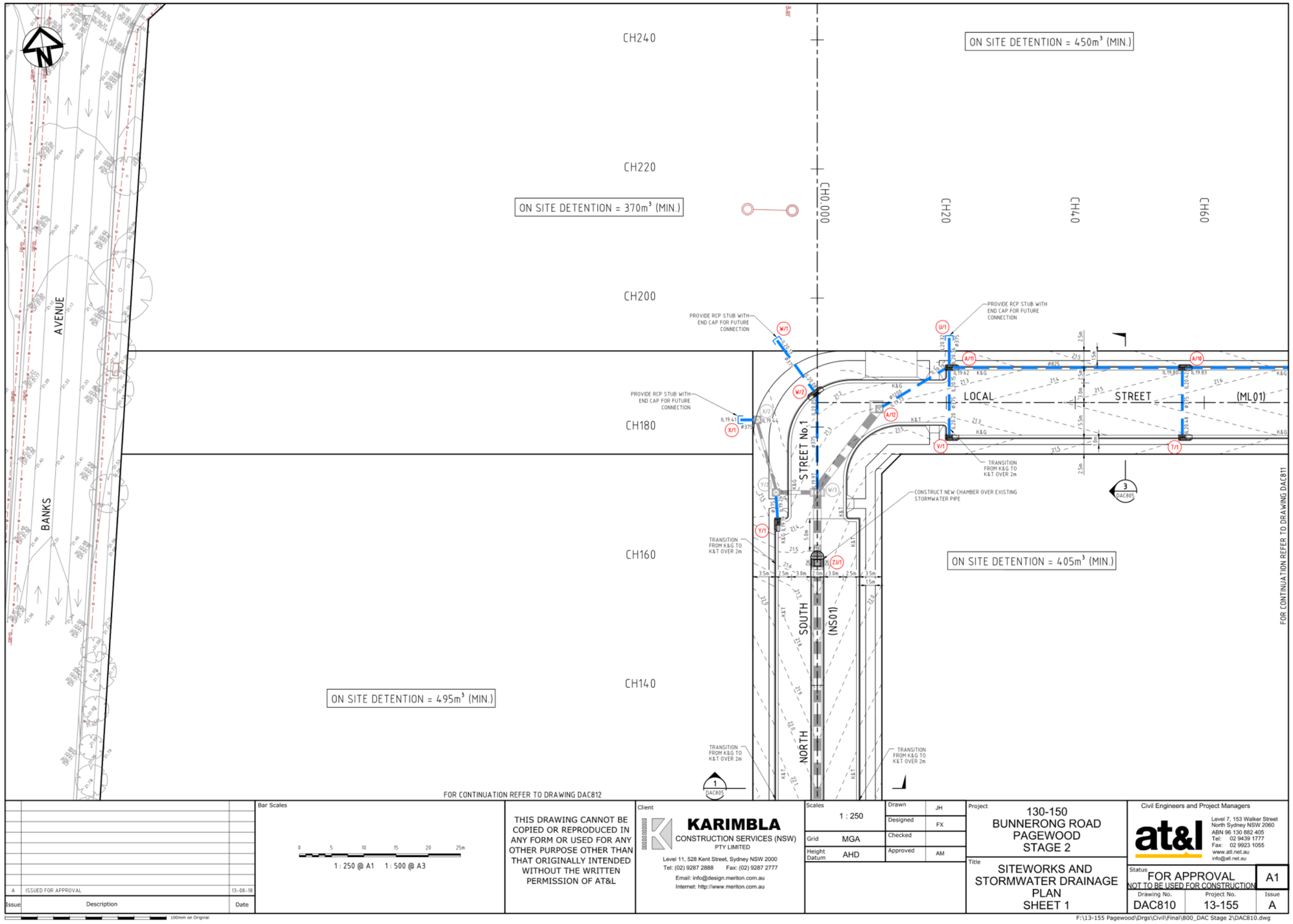


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Level 11, 528 Kent Street, Sydney NSW 2000
Tel: (02) 9287 2888 Fax: (02) 9287 2777
Email: info@design.meriton.com.au
Internet: http://www.meriton.com.au

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| Drawn | JH |
| Designed | FX |
| Checked | |
| Approved | AM |

Project
130-150 BUNNERONG ROAD PAGEWOOD STAGE 2

Title
SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 1

Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

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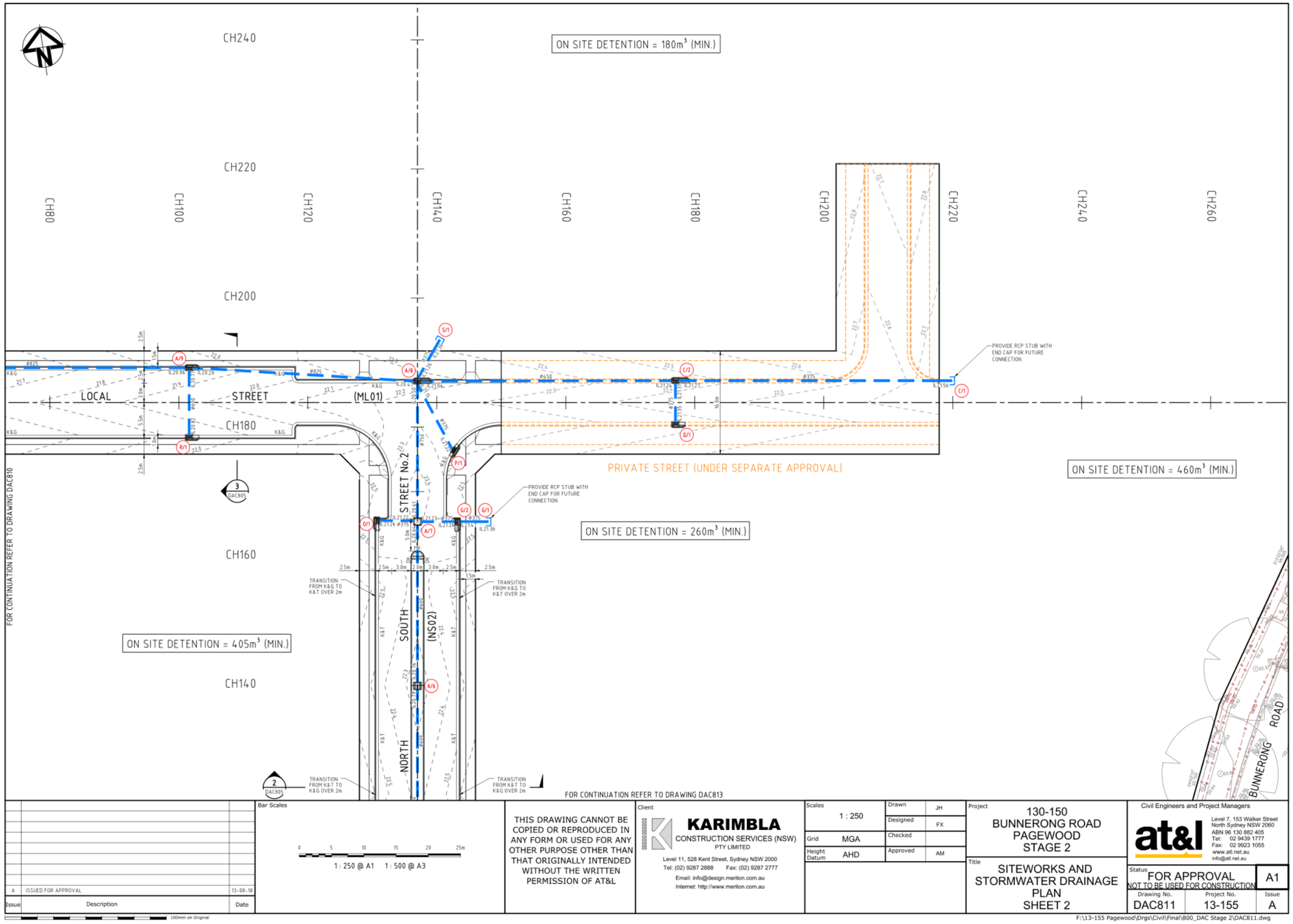


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Level 11, 528 Kent Street, Sydney NSW 2000
Tel: (02) 9287 2888 Fax: (02) 9287 2777
Email: info@design.meriton.com.au
Internet: http://www.meriton.com.au

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| Height Datum | AHD | Approved | AM |

Project
130-150 BUNNERONG ROAD PAGEWOOD STAGE 2

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SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 2

Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

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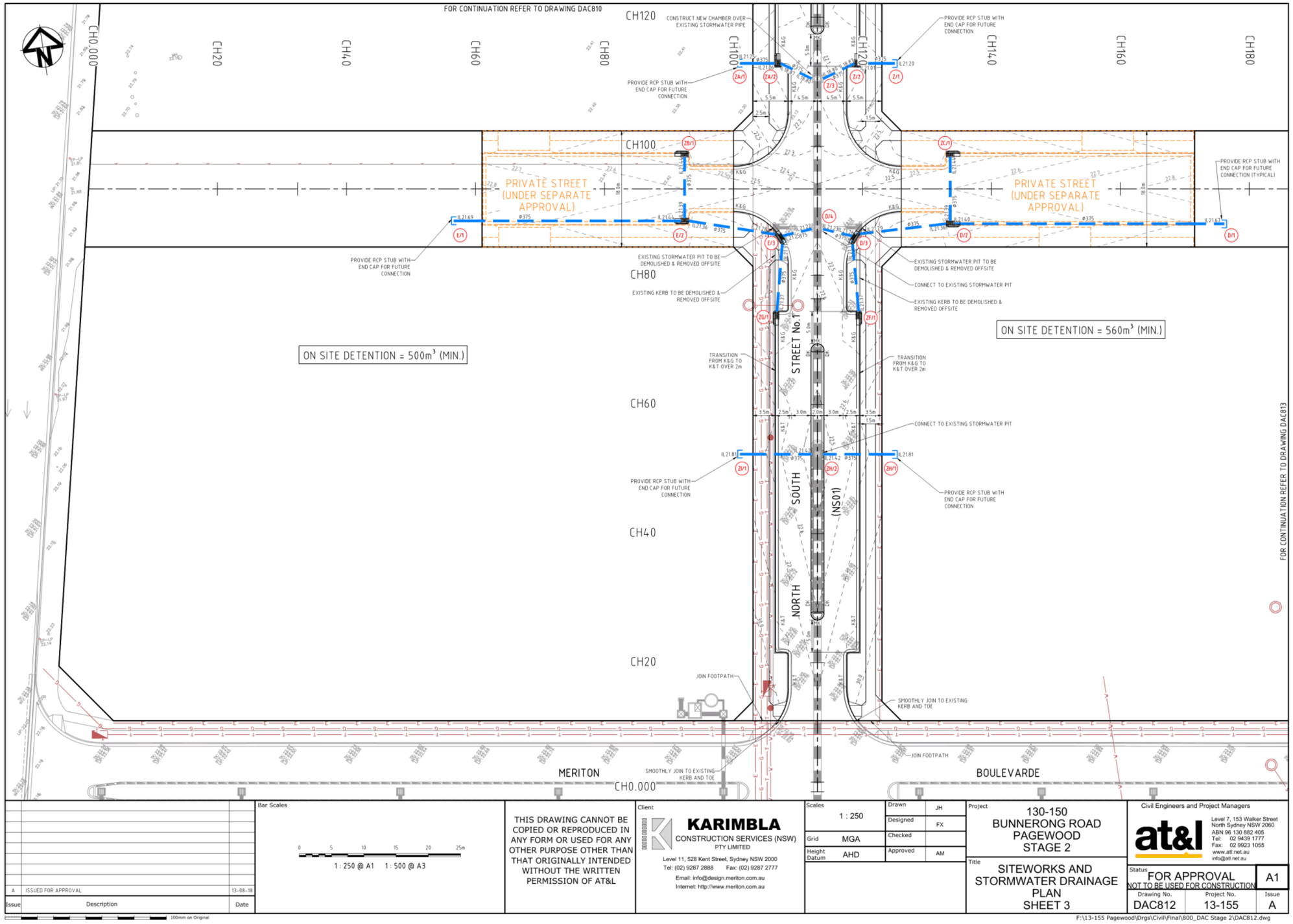


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Level 11, 528 Kent Street, Sydney NSW 2000
Tel: (02) 9287 2888 Fax: (02) 9287 2777
Email: info@design.meriton.com.au
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| Height Datum | AHD | Approved | AM |

Project: 130-150 BUNNERONG ROAD PAGEWOOD STAGE 2

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 3

Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

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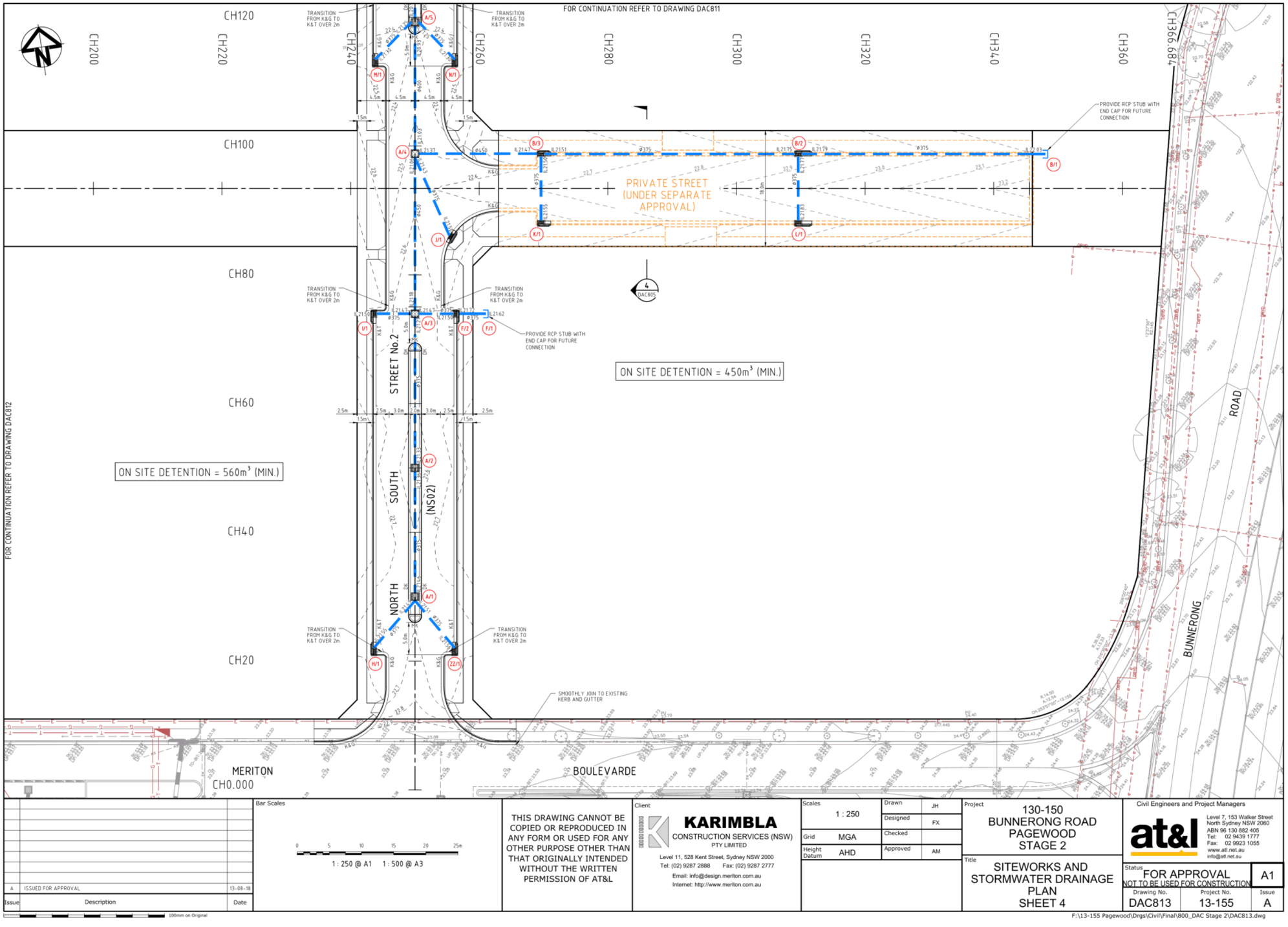


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CONSTRUCTION SERVICES (NSW) PTY LIMITED
Level 11, 528 Kent Street, Sydney NSW 2000
Tel: (02) 9287 2888 Fax: (02) 9287 2777
Email: info@design.meriton.com.au
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Project
130-150
BUNNERONG ROAD
PAGEWOOD
STAGE 2

Title
SITEWORKS AND STORMWATER DRAINAGE PLAN
SHEET 4

Civil Engineers and Project Managers

at&l

Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

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A1

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Appendix
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ABN 96 130 882 405
REVISION 02

# Appendix D

## DRAINs Model and Results

Appendix
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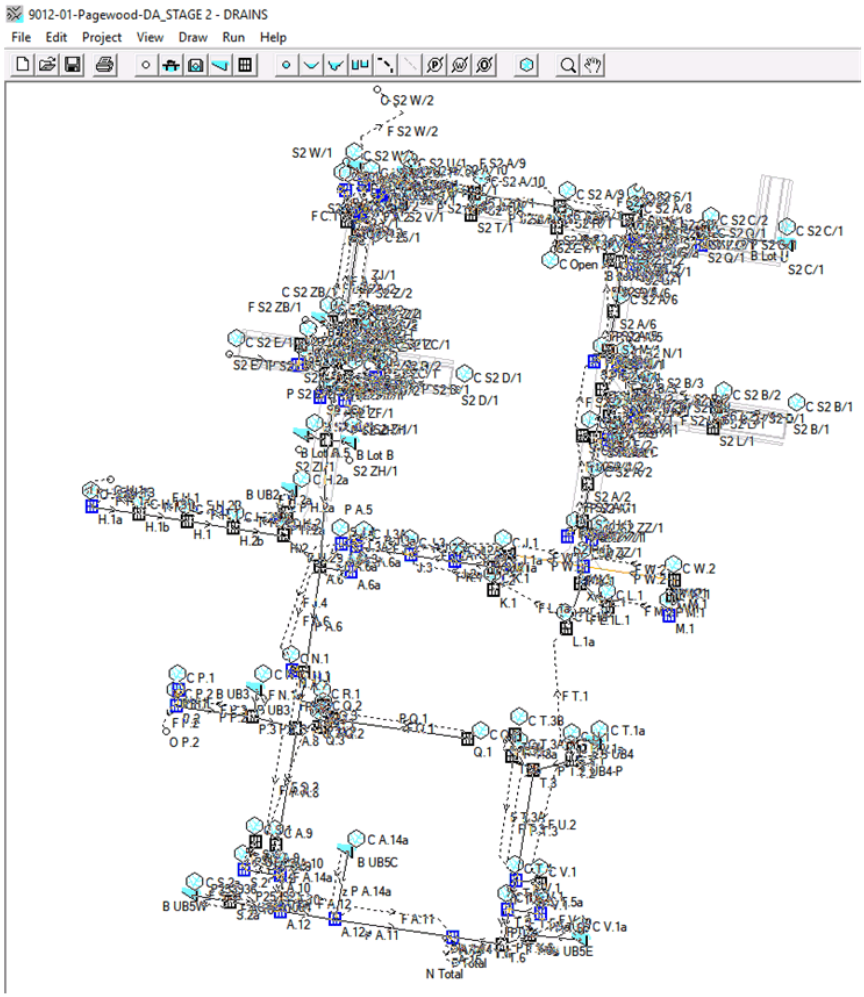
REVISION 02

at&l

**DRAINSs Model**

9012-01-Pagewood-DA_STAGE 2.drn




Appendix
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REVISION 02

**PIT / NODE DETAILS** **Version 13**

| Name | Type | Family | Size | Ponding Volume (cu.m) | Pressure Change Coeff. Ku | Surface Elev (m) | Max Pond Depth (m) | Base Inflow (cu.m/s) | Blocking Factor | x | y | Bolt-down id | Part Full Shock Loss | Inflow Hydrograph | Pit is |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.2a | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 0.2 | | 22.971 | | | 0 | 0.2 | 335910.1 | 6242872 No | 50206828 1 x Ku | No | New |
| H.2 | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 0.9 | | 22.624 | | | 0 | 0.2 | 335908.3 | 6242860 No | 50206827 1 x Ku | No | New |
| A.6 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.1 | | 22.926 | | | 0 | 0.2 | 335927.1 | 6242844 No | 50206807 1 x Ku | No | New |
| A.7 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 0.5 | | 22.393 | | | 0 | 0.2 | 335919.1 | 6242789 No | 50206808 1 x Ku | No | New |
| A.8 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 0.5 | | 22.245 | | | 0 | 0.2 | 335914.7 | 6242761 No | 50206809 1 x Ku | No | New |
| A.9 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.5 | | 21.564 | | | 0 | 0.2 | 335904.7 | 6242700 No | 50206810 1 x Ku | No | New |
| A.10 | Sag | GRATED KI | 2.4m LINTE 30 | 0.5 | | 21.32 | 0.3 | | 0 | 0.5 | 335906.8 | 6242685 No | 50206811 1 x Ku | No | New |
| A.12 | Sag | JUNCTION | 1.2 x 1.2 IN 30 | 2 | | 21.6 | 0.2 | | 0 | 0.5 | 335907 | 6242666 No | 50206812 1 x Ku | No | New |
| A.12a | Sag | JUNCTION | 1.2 x 1.2 IN 30 | 0.5 | | 21.6 | 0.2 | | 0 | 0.5 | 335934.8 | 6242662 No | 1.81E+08 1 x Ku | No | New |
| A.14 | Sag | JUNCTION | 1.2 x 1.2 IN 15 | 2 | | 21.8 | 0.15 | | 0 | 0.5 | 335996 | 6242653 No | 50206813 1 x Ku | No | New |
| A.15 | Node | | | | | 22.15 | | | 0 | | 335996.2 | 6242646 | 50206814 | No | |
| P.3 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.4 | | 22.25 | | | 0 | 0.2 | 335892.5 | 6242766 No | 50206842 1 x Ku | No | New |
| S.2a | OnGrade | JUNCTION | 0.6 x 0.6 INFILL LID | 0.2 | | 21.83 | | | 0 | 0.2 | 335880.5 | 6242671 No | 50206849 1 x Ku | No | New |
| T.6a | OnGrade | GROSS POI | HUMEGUARD | 1.6 | | 22.126 | | | 0 | 0.2 | 336035.6 | 6242654 No | 1.65E+08 1 x Ku | No | New |
| T.6 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 4.6 | | 22 | | | 0 | 0.2 | 336021.5 | 6242649 No | 50206853 1 x Ku | No | New |
| H.1a | Sag | JUNCTION | 0.9 x 0.9 G 15 | 2.6 | | 21.988 | 0.15 | | 0 | 0.5 | 335809.2 | 6242875 No | 50206825 1 x Ku | No | New |
| H.1b | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 1.2 | | 22.132 | | | 0 | 0.2 | 335833.5 | 6242871 No | 1.08E+08 1 x Ku | No | New |
| H.1 | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 0.9 | | 22.309 | | | 0 | 0.2 | 335858.8 | 6242867 No | 50206826 1 x Ku | No | New |
| H.2b | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 0.7 | | 22.486 | | | 0 | 0.2 | 335882.6 | 6242864 No | 1.08E+08 1 x Ku | No | New |
| K.1 | OnGrade | GRATED KI | 3.0m LINTEL RIGHT | 2.6 | | 22.852 | | | 0 | 0.2 | 336017.1 | 6242832 No | 50206834 1 x Ku | No | New |
| J.2 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.7 | | 23.29 | | | 0 | 0.2 | 336017.1 | 6242844 No | 50206831 1 x Ku | No | New |
| J.2a | Sag | JUNCTION | 0.9 x 0.9 G 15 | 0.2 | | 22.887 | 0.15 | | 0 | 0.5 | 335996.9 | 6242847 No | 1.1E+08 1 x Ku | No | New |
| J.3 | Sag | JUNCTION | 0.9 x 0.9 G 15 | 0.2 | | 22.643 | 0.15 | | 0 | 0.5 | 335974.3 | 6242850 No | 50206832 1 x Ku | No | New |
| J.3a | Sag | JUNCTION | 0.9 x 0.9 G 30 | 0.3 | | 22.5 | 0.5 | | 0 | 0.5 | 335946 | 6242854 No | 1.1E+08 1 x Ku | No | New |
| J.4 | Sag | JUNCTION | 0.9 x 0.9 G 30 | 0.7 | | 22.578 | 0.5 | | 0 | 0.5 | 335938.4 | 6242855 No | 50206833 1 x Ku | No | New |
| L.1 | OnGrade | GRATED KI | 3.0m LINTEL LEFT | 2.5 | | 23.2 | | | 0 | 0.2 | 336076 | 6242823 No | 50206835 1 x Ku | No | New |
| X.1 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.4 | | 23.412 | | | 0 | 1 | 336061.9 | 6242835 No | 50206863 1 x Ku | No | New |
| W.3 | Sag | GRATED KI | 3.0m LINTE 15 | 1.8 | | 23.041 | 0.12 | | 0 | 0.5 | 336063.3 | 6242844 No | 50206862 1 x Ku | No | New |
| J.1a | OnGrade | JUNCTION | 0.9 x 0.9 INFILL LID | 0 | | 23.157 | | | 0 | 1 | 336025.1 | 6242850 No | 50206829 1 x Ku | No | New |
| J.1 | OnGrade | GRATED KI | 3.0m LINTEL LEFT | 1 | | 23.157 | | | 0 | 0.2 | 336022.3 | 6242850 No | 50206830 1 x Ku | No | New |
| L.1a | OnGrade | JUNCTION | 0.6 x 0.6 GRATED SUR | 2.5 | | 23.15 | | | 0 | 0.2 | 336054.4 | 6242812 No | 50206836 1 x Ku | No | New |
| M.1 | Sag | GRATED KI | 3.0m LINTE 15 | 3.2 | | 23.408 | 0.15 | | 0 | 0.5 | 336107.5 | 6242818 No | 50206837 1 x Ku | No | New |
| W.1 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 0.2 | | 23.88 | | | 0 | 1 | 336109.1 | 6242829 No | 50206860 1 x Ku | No | New |
| W.2 | OnGrade | GRATED KI | 3.0m LINTEL SAG RIGH | 2.6 | | 23.525 | | | 0 | 0.2 | 336110.3 | 6242837 No | 50206861 1 x Ku | No | New |
| N.1 | Sag | JUNCTION | 0.6 x 0.6 G 30 | 5.9 | | 22.164 | 0.23 | | 0 | 0.2 | 335912.6 | 6242790 No | 50206839 1 x Ku | No | New |
| P.1 | Sag | GRATED KI | 2.4m LINTE 15 | 5.9 | | 21.789 | 0.15 | | 0 | 0.5 | 335854.2 | 6242780 No | 50206840 1 x Ku | No | New |
| P.2 | Sag | GRATED KI | 2.4m LINTE 20 | 0 | | 21.711 | 0.2 | | 0 | 0.5 | 335852.9 | 6242772 No | 50206841 1 x Ku | No | New |
| T.3b | OnGrade | GRATED KI | 0.9m LINTEL LEFT | 5.9 | | 23.502 | | | 0 | 0.2 | 336027.8 | 6242757 No | 50206843 1 x Ku | No | New |
| T.3a | OnGrade | GRATED KI | 0.9m LINTEL LEFT | 7.9 | | 23.442 | | | 0 | 0.2 | 336026.2 | 6242746 No | 50206844 1 x Ku | No | New |
| T.3 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.8 | | 23.477 | | | 0 | 0.2 | 336037.2 | 6242739 No | 50206850 1 x Ku | No | New |
| T.4 | Sag | GRATED KI | 2.4m LINTE 15 | 0 | | 21.893 | 0.15 | | 0 | 0.5 | 336028.4 | 6242682 No | 50206851 1 x Ku | No | New |
| T.5 | Sag | GRATED KI | 2.4m LINTE 25 | 0.2 | | 21.871 | 0.2 | | 0 | 0.5 | 336024.2 | 6242667 No | 50206852 1 x Ku | No | New |
| R.1 | OnGrade | GRATED KI | 0.9m LINTEL LEFT | 5.9 | | 22.087 | | | 0 | 0.2 | 335928.6 | 6242772 No | 50206846 1 x Ku | No | New |
| Q.3 | OnGrade | GRATED KI | 0.9m LINTEL LEFT | 4.1 | | 22.087 | | | 0 | 0.2 | 335927 | 6242761 No | 50206845 1 x Ku | No | New |
| S.1 | OnGrade | GRATED KI | 2.4m LINTEL RIGHT | 5.9 | | 21.565 | | | 0 | 0.2 | 335893.9 | 6242702 No | 50206847 1 x Ku | No | New |
| S.2 | Sag | GRATED KI | 2.4m LINTE 15 | 1.4 | | 21.36 | 0.15 | | 0 | 0.5 | 335887.7 | 6242687 No | 50206848 1 x Ku | No | New |
| T.5a | Sag | GRATED KI | 0.9m LINTE 20 | 5.9 | | 21.705 | 0.17 | | 0 | 0.5 | 336041.3 | 6242664 No | 50206854 1 x Ku | No | New |
| T.1 | OnGrade | GRATED KI | 2.4m LINTEL RIGHT | 7.9 | | 23.731 | | | 0 | 0.2 | 336058 | 6242750 No | 50206856 1 x Ku | No | New |
| T.2 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 2.6 | | 23.731 | | | 0 | 0.2 | 336057.1 | 6242746 No | 50206857 1 x Ku | No | New |
| V.1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 5.9 | | 21.982 | | | 0 | 0.2 | 336041 | 6242680 No | 50206859 1 x Ku | No | New |
| O H.1a | Node | | | | | 21.988 | | | 0 | | 335818.7 | 6242889 | 50206867 | No | |
| O P.2 | Node | | | | | 21.711 | | | 0 | | 335847.5 | 6242759 | 50206868 | No | |
| N Total | Node | | | | | 22 | | | 0 | | 335996.7 | 6242639 | 50207035 | No | |
| A.6a | Sag | STUB (FUT | CAP SEAL 4 30 | 3 | | 22.776 | 0.15 | | 0 | 0 | 335943.5 | 6242841 No | 50207219 1 x Ku | No | New |
| Q.1 | OnGrade | DISH DRAIN | 0.6 x 0.9 V GRATE | 5.9 | | 23.359 | | | 0 | 0.2 | 336003.6 | 6242755 No | 1.41E+08 1 x Ku | No | New |
| Q.2 | OnGrade | DISH DRAIN | 0.6 x 0.9 V GRATE | 4.4 | | 22.399 | | | 0 | 0.2 | 335933.2 | 6242765 No | 1.41E+08 1 x Ku | No | New |
| S2 B/1 | Node | | | | | 23.038 | | | 0 | | 336169.8 | 6242921 | 1.83E+08 | No | |
| S2 B/2 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 2.2 | | 22.8 | | | 0 | 0.2 | 336131.8 | 6242926 No | 1.83E+08 1 x Ku | No | New |
| S2 B/3 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.6 | | 22.52 | | | 0 | 0.2 | 336092.3 | 6242932 No | 1.83E+08 1 x Ku | No | New |
| S2 A/4 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.4 | | 22.536 | | | 0 | 0.2 | 336072.9 | 6242935 No | 1.83E+08 1 x Ku | No | New |
| S2 A/5 | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 1.1 | | 22.393 | | | 0 | 0.2 | 336075.9 | 6242955 No | 1.83E+08 1 x Ku | No | New |
| S2 A/6 | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 0 | | 22.248 | | | 0 | 0.2 | 336079 | 6242976 No | 1.83E+08 1 x Ku | No | New |
| S2 A/7 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.2 | | 22.425 | | | 0 | 0.2 | 336082.7 | 6243001 No | 1.83E+08 1 x Ku | No | New |
| S2 A/8 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.6 | | 22.127 | | | 0 | 0.2 | 336086 | 6243023 No | 1.83E+08 1 x Ku | No | New |
| S2 A/9 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 0.7 | | 21.791 | | | 0 | 0.2 | 336051.3 | 6243030 No | 1.83E+08 1 x Ku | No | New |
| S2 A/10 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 0.4 | | 21.449 | | | 0 | 0.2 | 336006.8 | 6243037 No | 1.83E+08 1 x Ku | No | New |
| S2 A/11 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 0.7 | | 21.174 | | | 0 | 0.2 | 335971 | 6243042 No | 1.83E+08 1 x Ku | No | New |
| A.1 | Sag | JUNCTION | 0.9 x 0.9 IN 20 | 0 | | 21.378 | 0.25 | | 0 | 0.5 | 335959.1 | 6243036 Yes | 50206802 1 x Ku | No | New |
| A.2 | Sag | JUNCTION | 0.9 x 0.9 IN 15 | 0.9 | | 21.464 | 0.3 | | 0 | 0.5 | 335948 | 6243026 Yes | 50206803 1 x Ku | No | New |
| ZI/1 | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 0.3 | | 21.6 | | | 0 | 0.2 | 335946.5 | 6243015 No | 1.83E+08 1 x Ku | No | New |
| A.3 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1 | | 22.123 | | | 0 | 0.2 | 335939.1 | 6242967 No | 50206804 1 x Ku | No | New |
| A.4 | OnGrade | GRATED KI | 2.4m LINTEL RIGHT | 1.1 | | 22.427 | | | 0 | 0.2 | 335935.7 | 6242944 No | 50206805 1 x Ku | No | New |
| A.5 | OnGrade | GRATED KI | 0.9m LINTEL LEFT | 1.7 | | 22.628 | | | 0 | 0.2 | 335930.6 | 6242909 No | 50206806 1 x Ku | No | New |
| S2 C/1 | Node | | | | | 22.609 | | | 0 | | 336166.7 | 6243003 | 1.83E+08 | No | |
| S2 D/1 | Node | | | | | 22.681 | | | 0 | | 335998.2 | 6242935 | 1.83E+08 | No | |
| S2 D/2 | Sag | GRATED KI | 2.4m LINTE 20 | 0.7 | | 22.408 | 0.15 | | 0 | 0.5 | 335956.2 | 6242942 No | 1.83E+08 1 x Ku | No | New |
| S2 D/3 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.2 | | 22.508 | | | 0 | 0.2 | 335941.2 | 6242942 No | 1.83E+08 1 x Ku | No | New |
| S2 E/1 | Node | | | | | 22.701 | | | 0 | | 335880.1 | 6242954 | 1.83E+08 | No | |
| S2 E/2 | Sag | GRATED KI | 2.4m LINTE 20 | 0.6 | | 22.448 | 0.15 | | 0 | 0.5 | 335915.5 | 6242948 No | 1.83E+08 1 x Ku | No | New |
| S2 E/3 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.3 | | 22.508 | | | 0 | 0.2 | 335929.7 | 6242943 No | 1.83E+08 1 x Ku | No | New |
| S2 F/1 | Node | | | | | 22.726 | | | 0 | | 336080.1 | 6242908 | 1.83E+08 | No | |
| S2 G/1 | Node | | | | | 22.691 | | | 0 | | 336092.7 | 6242997 | 1.83E+08 | No | |
| S2 H/1 | Sag | GRATED KI | 2.4m LINTE 20 | 3.3 | | 22.528 | 0.2 | | 0 | 0.5 | 336055 | 6242860 No | 1.83E+08 1 x Ku | No | New |
| S2 A/1 | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 1.5 | | 22.668 | | | 0 | 0.2 | 336062.7 | 6242867 No | 1.83E+08 1 x Ku | No | New |
| S2 A/2 | OnGrade | JUNCTION | 0.9 x 0.9 GRATED SUR | 1.1 | | 22.528 | | | 0 | 0.2 | 336065.6 | 6242887 No | 1.83E+08 1 x Ku | No | New |
| S2 A/3 | OnGrade | JUNCTION | 1.2 x 1.2 INFILL LID | 1.8 | | 22.695 | | | 0 | 0.2 | 336069.2 | 6242911 No | 1.83E+08 1 x Ku | No | New |
| S2 I/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 3.3 | | 22.474 | | | 0 | 0.2 | 336062.8 | 6242912 No | 1.83E+08 1 x Ku | No | New |
| S2 J/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 3.6 | | 22.633 | | | 0 | 0.2 | 336076.7 | 6242921 No | 1.83E+08 1 x Ku | No | New |
| S2 K/1 | Sag | GRATED KI | 2.4m LINTE 20 | 3.5 | | 22.52 | 0.15 | | 0 | 0.5 | 336090.6 | 6242921 No | 1.83E+08 1 x Ku | No | New |
| S2 L/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 4 | | 22.8 | | | 0 | 0.2 | 336130.1 | 6242916 No | 1.83E+08 1 x Ku | No | New |
| S2 M/1 | Sag | GRATED KI | 2.4m LINTE 20 | 3.3 | | 22.27 | 0.15 | | 0 | 0.5 | 336068.8 | 6242950 No | 1.83E+08 1 x Ku | No | New |
| S2 N/1 | Sag | GRATED KI | 2.4m LINTE 20 | 3.3 | | 22.27 | 0.15 | | 0 | 0.5 | 336081.2 | 6242948 No | 1.83E+08 1 x Ku | No | New |
| S2 O/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 3.8 | | 22.223 | | | 0 | 0.2 | 336076.4 | 6243002 No | 1.83E+08 1 x Ku | No | New |
| S2 P/1 | Sag | GRATED KI | 2.4m LINTE 20 | 3.9 | | 22.358 | 0.2 | | 0 | 0.5 | 336090.2 | 6243011 No | 1.83E+08 1 x Ku | No | New |
| S2 Q/1 | Sag | GRATED KI | 2.4m LINTE 15 | 3.3 | | 22.319 | 0.5 | | 0 | 0.5 | 336124.5 | 6243010 No | 1.83E+08 1 x Ku | No | New |
| S2 C/2 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 2.2 | | 22.32 | | | 0 | 0.2 | 336125.5 | 6243017 No | 1.83E+08 1 x Ku | No | New |
| S2 S/1 | Node | | | | | 22.37 | | | 0 | | 336091.1 | 6243039 | 1.83E+08 | No | |
| S2 T/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 3.3 | | 21.449 | | | 0 | 0.2 | 336005.1 | 6243026 No | 1.83E+08 1 x Ku | No | New |
| S2 U/1 | Node | | | | | 21.37 | | | 0 | | 335974.4 | 6243053 | 1.83E+08 | No | |
| S2 V/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 3.3 | | 21.174 | | | 0 | 0.2 | 335969.4 | 6243031 No | 1.83E+08 1 x Ku | No | New |
| S2 W/1 | Node | | | | | 21.135 | | | 0 | | 335940.4 | 6243053 | 1.83E+08 | No | |
| S2 X/1 | Node | | | | | 21.363 | | | 0 | | 335937.8 | 6243039 | 1.83E+08 | No | |
| B.1 | Sag | GRATED KI | 2.4m LINTE 30 | 1 | | 21.506 | 0.2 | | 0 | 0.5 | 335940.5 | 6243038 No | 50206816 1 x Ku | No | New |
| C.1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.8 | | 21.587 | | | 0 | 0.2 | 335941.5 | 6243027 No | 50206818 1 x Ku | No | New |
| S2 Y/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 2 | | 21.251 | | | 0 | 0.2 | 335941 | 6243022 No | 1.83E+08 1 x Ku | No | New |
| S2 Z/1 | Node | | | | | 22.297 | | | 0 | | 335956.6 | 6242963 | 1.83E+08 | No | |
| S2 ZA/1 | Node | | | | | 22.297 | | | 0 | | 335919.3 | 6242971 | 1.83E+08 | No | |
| S2 ZB/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 5.9 | | 22.408 | | | 0 | 0.2 | 335917 | 6242959 No | 1.83E+08 1 x Ku | No | New |
| S2 ZC/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 5.9 | | 22.426 | | | 0 | 0.2 | 335957.8 | 6242952 No | 1.83E+08 1 x Ku | No | New |
| S2 ZF/1 | Sag | GRATED KI | 2.4m LINTE 20 | 2 | | 22.39 | 0.15 | | 0 | 0.5 | 335940.1 | 6242930 No | 1.83E+08 1 x Ku | No | New |
| S2 ZG/1 | Sag | GRATED KI | 2.4m LINTE 20 | 2 | | 22.39 | 0.15 | | 0 | 0.5 | 335927.3 | 6242932 No | 1.83E+08 1 x Ku | No | New |
| S2 ZH/1 | Node | | | | | 22.849 | | | 0 | | 335942.3 | 6242899 | 1.83E+08 | No | |
| S2 ZI/1 | Node | | | | | 22.849 | | | 0 | | 335916.3 | 6242904 | 1.83E+08 | No | |
| S2 ZJ/1 | Sag | GRATED KI | 2.4m LINTE 20 | 3.3 | | 22.547 | 0.2 | | 0 | 0.5 | 336067.6 | 6242858 No | 1.83E+08 1 x Ku | No | New |
| O S2 W/2 | Node | | | | | 21.098 | | | 0 | | 335956.7 | 6243090 | 1.83E+08 | No | |
| O S2 Z/2 | Node | | | | | 21.97 | | | 0 | | 335950.7 | 6242973 | 1.83E+08 | No | |
| O S2 ZA/2 | Node | | | | | 21.97 | | | 0 | | 335938.3 | 6242975 | 1.83E+08 | No | |
| S2 F/2 | Sag | GRATED KI | 2.4m LINTE 20 | 0.2 | | 22.474 | 0.2 | | 0 | 0.5 | 336075.6 | 6242910 No | 1.83E+08 1 x Ku | No | New |
| S2 G/2 | Sag | GRATED KI | 2.4m LINTE 20 | 0.2 | | 22.241 | 0.2 | | 0 | 0.5 | 336088.9 | 6243000 No | 1.83E+08 1 x Ku | No | New |
| S2 W/2 | Sag | GRATED KI | 2.4m LINTE 40 | 1 | | 21.098 | 0.25 | | 0 | 0.5 | 335949.9 | 6243041 No | 1.83E+08 1 x Ku | No | New |
| S2 Z/2 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.4 | | 21.97 | | | 0 | 0.2 | 335945.7 | 6242968 No | 1.83E+08 1 x Ku | No | New |
| S2 ZA/2 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1.4 | | 21.97 | | | 0 | 0.2 | 335933.3 | 6242970 No | 1.83E+08 1 x Ku | No | New |
| S2 ZY/1 | Node | | | | | 21.8 | | | 0 | | 336048 | 6243008 | 1.9E+08 | No | |
| S2 R/1 | OnGrade | GRATED KI | 2.4m LINTEL LEFT | 1 | | 21.791 | | | 0 | 0.2 | 336049.6 | 6243019 No | 1.83E+08 1 x Ku | No | New |

DETENTION BASIN DETAILS

| Name | Elev | Surf. Area | Not Used | Outlet Type | K | Dia(mm) | Centre RL | Pit Family | Pit Type | x | y | HED | Crest RL | Crest Length | id |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B UB2 | 21.11 | 2 | | Orifice | | 140 | 21.61 | | | 335912.4 | 6242883 | Yes | 22.81 | 4 | 1960740 |
| | 21.61 | 2 | | | | | | | | | | | | | |
| | 21.71 | 152 | | | | | | | | | | | | | |
| | 22.11 | 152 | | | | | | | | | | | | | |
| | 22.61 | 152 | | | | | | | | | | | | | |
| | 23.11 | 152 | | | | | | | | | | | | | |
| B UB3 | 19.5 | 2 | | Orifice | | 180 | 20 | | | 335894 | 6242780 | Yes | 21.5 | 4 | 1960746 |
| | 19.85 | 2 | | | | | | | | | | | | | |
| | 20 | 2 | | | | | | | | | | | | | |
| | 20.15 | 243 | | | | | | | | | | | | | |
| | 21 | 243 | | | | | | | | | | | | | |
| | 21.8 | 243 | | | | | | | | | | | | | |
| B UBSW | 18.94 | 2 | | Orifice | | 195 | 19.74 | | | 335860.9 | 6242674 | Yes | 20.75 | 4 | 1960750 |
| | 19.74 | 2 | | | | | | | | | | | | | |
| | 19.75 | 280 | | | | | | | | | | | | | |
| | 20.75 | 280 | | | | | | | | | | | | | |
| | 21.75 | 280 | | | | | | | | | | | | | |
| B UBSE | 19 | 2 | | Orifice | | 155 | 19.93 | | | 336062.2 | 6242651 | Yes | 21.75 | 4 | 1960755 |
| | 19.75 | 2 | | | | | | | | | | | | | |
| | 19.76 | 170 | | | | | | | | | | | | | |
| | 20.76 | 170 | | | | | | | | | | | | | |
| | 21.76 | 170 | | | | | | | | | | | | | |
| | 22.76 | 170 | | | | | | | | | | | | | |
| B UB4 | 18.5 | 2 | | None | | | | | | 336069.4 | 6242753 | No | | | 1960760 |
| | 19.29 | 2 | | | | | | | | | | | | | |
| | 19.3 | 10 | | | | | | | | | | | | | |
| | 19.46 | 109 | | | | | | | | | | | | | |
| | 21.3 | 109 | | | | | | | | | | | | | |
| | 22.55 | 109 | | | | | | | | | | | | | |
| B UB5C | 19 | 2 | | Orifice | | 245 | 19.5 | | | 335941.1 | 6242697 | Yes | 20.7 | 3 | 1960786 |
| | 19.49 | 2 | | | | | | | | | | | | | |
| | 19.5 | 2 | | | | | | | | | | | | | |
| | 19.7 | 254 | | | | | | | | | | | | | |
| | 21 | 254 | | | | | | | | | | | | | |
| | 21.8 | 254 | | | | | | | | | | | | | |
| B Lot C | 21.39 | 2 | | Orifice | | 170 | 21.89 | | | 336080.1 | 6242909 | Yes | 22.9 | 4 | 1.84E+08 |
| | 21.89 | 2 | | | | | | | | | | | | | |
| | 21.9 | 250 | | | | | | | | | | | | | |
| | 22.9 | 250 | | | | | | | | | | | | | |
| | 23.7 | 250 | | | | | | | | | | | | | |
| B Lot Fa | 21.13 | 2 | | Orifice | | 120 | 21.63 | | | 336093.8 | 6242999 | Yes | 22.64 | 4 | 1.84E+08 |
| | 21.63 | 2 | | | | | | | | | | | | | |
| | 21.64 | 170 | | | | | | | | | | | | | |
| | 22.64 | 170 | | | | | | | | | | | | | |
| | 23.44 | 170 | | | | | | | | | | | | | |
| B Lot H | 21.24 | 2 | | Orifice | | 190 | 21.74 | | | 336168.3 | 6243010 | Yes | 22.75 | 4 | 1.84E+08 |
| | 21.74 | 2 | | | | | | | | | | | | | |
| | 21.75 | 260 | | | | | | | | | | | | | |
| | 22.75 | 260 | | | | | | | | | | | | | |
| | 23.55 | 260 | | | | | | | | | | | | | |
| B Lot Fb | 21.04 | 2 | | Orifice | | 150 | 21.54 | | | 336090.6 | 6243028 | Yes | 22.55 | 4 | 1.86E+08 |
| | 21.54 | 2 | | | | | | | | | | | | | |
| | 21.55 | 155 | | | | | | | | | | | | | |
| | 22.55 | 155 | | | | | | | | | | | | | |
| | 23.35 | 155 | | | | | | | | | | | | | |
| B Lot Gb | 20.04 | 2 | | Orifice | | 170 | 20.54 | | | 335971.8 | 6243046 | Yes | 21.54 | 4 | 1.86E+08 |
| | 20.54 | 2 | | | | | | | | | | | | | |
| | 20.55 | 250 | | | | | | | | | | | | | |
| | 21.55 | 250 | | | | | | | | | | | | | |
| | 22.35 | 250 | | | | | | | | | | | | | |
| B Lot Ga | 19.8 | 2 | | Orifice | | 170 | 20.3 | | | 335945.6 | 6243050 | Yes | 21.3 | 4 | 1.86E+08 |
| | 20.3 | 2 | | | | | | | | | | | | | |
| | 20.31 | 250 | | | | | | | | | | | | | |
| | 21.31 | 250 | | | | | | | | | | | | | |
| | 22.01 | 250 | | | | | | | | | | | | | |
| B Lot E | 18.65 | 2 | | Orifice | | 150 | 19.15 | | | 335951.6 | 6242968 | Yes | 20.15 | 4 | 1.86E+08 |
| | 19.14 | 2 | | | | | | | | | | | | | |
| | 19.15 | 230 | | | | | | | | | | | | | |
| | 20.15 | 230 | | | | | | | | | | | | | |
| | 20.95 | 230 | | | | | | | | | | | | | |
| B Lot B | 18.59 | 2 | | Orifice | | 220 | 19 | | | 335942.6 | 6242908 | Yes | 20 | 4 | 1.87E+08 |
| | 18.99 | 2 | | | | | | | | | | | | | |
| | 19 | 310 | | | | | | | | | | | | | |
| | 20 | 310 | | | | | | | | | | | | | |
| | 20.8 | 310 | | | | | | | | | | | | | |
| B Lot D | 18.65 | 2 | | Orifice | | 200 | 19.15 | | | 335927.6 | 6242971 | Yes | 20.15 | 4 | 1.87E+08 |
| | 19.14 | 2 | | | | | | | | | | | | | |
| | 19.15 | 290 | | | | | | | | | | | | | |
| | 20.15 | 290 | | | | | | | | | | | | | |
| | 20.95 | 290 | | | | | | | | | | | | | |
| B Lot A | 18.59 | 2 | | Orifice | | 210 | 19 | | | 335918.4 | 6242911 | Yes | 20 | 4 | 1.87E+08 |
| | 18.99 | 2 | | | | | | | | | | | | | |
| | 19 | 290 | | | | | | | | | | | | | |
| | 20 | 290 | | | | | | | | | | | | | |
| | 20.8 | 290 | | | | | | | | | | | | | |

SUB-CATCHMENT DETAILS

| Name | Pit or Node | Total Area (ha) | Paved Area % | Grass Area % | Supp Area % | Paved Time (min) | Grass Time (min) | Supp Time (min) | Paved Length (m) | Grass Length (m) | Supp Length (m) | Paved Slope(%) | Grass Slope % | Supp Slope % | Paved Rough | Grass Rough |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C H.2a | B UB2 | 0.451 | 55 | 45 | 0 | 10 | 15 | 0 | | | | | | | | |
| C H.2 | H.2 | 0.0223 | 85 | 15 | 0 | 5 | 10 | 0 | | | | | | | | |
| C A.9 | A.9 | 0.0899 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C A.10 | A.10 | 0.0365 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C N.1a | B UB3 | 0.7496 | 55 | 45 | 0 | 10 | 10 | 0 | | | | | | | | |
| C S.2a | B UBSW | 1 | 55 | 45 | 0 | 10 | 15 | 0 | | | | | | | | |
| C V.1a | B UBSE | 0.7995 | 55 | 45 | 0 | 10 | 10 | 0 | | | | | | | | |
| C T.1a | B UB4 | 0.6406 | 55 | 45 | 0 | 10 | 10 | 0 | | | | | | | | |
| C A.14a | B UB5C | 1.014 | 55 | 45 | 0 | 10 | 15 | 0 | | | | | | | | |
| C H.1a | H.1a | 0.0825 | 85 | 15 | 0 | 5 | 10 | 0 | | | | | | | | |
| C H.1B | H.1b | 0.0825 | 85 | 15 | 0 | 5 | 10 | 0 | | | | | | | | |
| C H.1 | H.1 | 0.0746 | 85 | 15 | 0 | 5 | 10 | 0 | | | | | | | | |
| C H.2B | H.2b | 0.0746 | 85 | 15 | 0 | 5 | 10 | 0 | | | | | | | | |
| C K.1 | K.1 | 0.088 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C J.2A | J.2a | 0.0042 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C J.3 | J.3 | 0.0042 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C J.3A | J.3a | 0.1417 | 85 | 15 | 0 | 5 | 10 | 0 | | | | | | | | |
| C J.4 | J.4 | 0.0354 | 85 | 15 | 0 | 5 | 10 | 0 | | | | | | | | |
| C L.1 | L.1 | 0.0796 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C W.3 | W.3 | 0.0739 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C J.1 | J.1 | 0.0843 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C L.1a | L.1a | 0.2064 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C M.1 | M.1 | 0.1218 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C W.2 | W.2 | 0.0646 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C N.1 | N.1 | 0.1965 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C P.1 | P.1 | 0.0688 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C P.2 | P.2 | 0.0557 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C T.3B | T.3b | 0.052 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C T.3A | T.3a | 0.05 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C T.4 | T.4 | 0.0839 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C T.5 | T.5 | 0.0221 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C R.1 | R.1 | 0.052 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C Q.3 | Q.3 | 0.05 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C S.1 | S.1 | 0.0888 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C S.2 | S.2 | 0.0375 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C T.5a | T.5a | 0.0224 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C U.1 | T.1 | 0.0953 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C U.2 | T.2 | 0.0923 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C V.1 | V.1 | 0.0883 | 90 | 10 | 0 | 5 | 10 | 0 | | | | | | | | |
| C A.6a | A.6a | 0.7979 | 10 | 90 | 0 | 10 | 20 | 0 | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| C Q_1 | Q_1 | 0.0512 | 80 | 20 | 0 | 5 | 10 | 0 |
| C Q_2 | Q_2 | 0.0407 | 80 | 20 | 0 | 5 | 10 | 0 |
| C S2 B/1 | S2 B/1 | 0.0371 | 20 | 80 | 0 | 5 | 10 | 0 |
| C S2 B/2 | S2 B/2 | 0.0318 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 B/3 | S2 B/3 | 0.0362 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 A/6 | S2 A/6 | 0.0691 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 A/8 | S2 A/8 | 0.0315 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 A/9 | S2 A/9 | 0.0288 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 A/10 | S2 A/10 | 0.036 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 A/11 | S2 A/11 | 0.0281 | 90 | 10 | 0 | 5 | 10 | 0 |
| C ZI/1 | ZI/1 | 0.071 | 90 | 10 | 0 | 5 | 10 | 0 |
| C A.4 | A.4 | 0.0916 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 D/1 | S2 D/1 | 0.1251 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 D/2 | S2 D/2 | 0.0346 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 D/3 | S2 D/3 | 0.0282 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 E/1 | S2 E/1 | 0.1099 | 20 | 80 | 0 | 5 | 10 | 0 |
| C S2 E/2 | S2 E/2 | 0.0273 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 E/3 | S2 E/3 | 0.0295 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 H/1 | S2 H/1 | 0.0299 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 A/2 | S2 A/2 | 0.0461 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 I/1 | S2 I/1 | 0.0107 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 J/1 | S2 J/1 | 0.0264 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 K/1 | S2 K/1 | 0.0362 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 L/1 | S2 L/1 | 0.0318 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 M/1 | S2 M/1 | 0.0428 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 N/1 | S2 N/1 | 0.0373 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 O/1 | S2 O/1 | 0.0079 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 P/1 | S2 P/1 | 0.0369 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 Q/1 | S2 Q/1 | 0.1503 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 C/2 | S2 C/2 | 0.1245 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 T/1 | S2 T/1 | 0.0361 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 V/1 | S2 V/1 | 0.029 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 X/1 | S2 X/1 | 0.1558 | 80 | 20 | 0 | 5 | 10 | 0 |
| C B.1 | B.1 | 0.0378 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZB/1 | S2 ZB/1 | 0.0273 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZC/1 | S2 ZC/1 | 0.0345 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZF/1 | S2 ZF/1 | 0.0102 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZG/1 | S2 ZG/1 | 0.0102 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZZ/1 | S2 ZZ/1 | 0.0299 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 F/1 | B Lot C | 0.7567 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 F/2 | S2 F/2 | 0.0106 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 G/1 | B Lot Fa | 0.4103 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 G/2 | S2 G/2 | 0.0079 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 C/1 | B Lot H | 0.8235 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 S/1 | B Lot Fb | 0.3726 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 U/1 | B Lot Gb | 0.7519 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 W/1 | B Lot Ga | 0.6364 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 W/2 | S2 W/2 | 0.0885 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 Z/1 | B Lot E | 0.5572 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 Z/2 | S2 Z/2 | 0.0369 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZH/1 | B Lot B | 0.866 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZA/1 | B Lot D | 0.7353 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZA/2 | S2 ZA/2 | 0.0383 | 90 | 10 | 0 | 5 | 10 | 0 |
| C S2 ZI/1 | B Lot A | 0.7732 | 90 | 10 | 0 | 5 | 10 | 0 |
| C Open A | S2 ZY/1 | 0.5572 | 10 | 90 | 0 | 5 | 10 | 0 |
| C S2 R/1 | S2 R/1 | 0.0331 | 90 | 10 | 0 | 5 | 10 | 0 |

PIPE DETAILS

| Name | From | To | Length (m) | U/S IL (m) | D/S IL (m) | Slope (%) | Type | Dia (mm) | I.D. (mm) | Rough | Pipe Is | No. Pipes | Chg From | At Chg | Chg (m) | RI (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| z P H.2a | B UB2 | H.2a | 2.5 | 21.423 | 21.398 | | 1 RCP | 375 | 375 | 0.3 | NewFixed | 1 | B UB2 | 0 | 0 | 22.971 |
| P H.2a | H.2a | H.2 | 11.967 | 21.398 | 21.278 | 1.01 | RCP | 375 | 375 | 0.3 | New | 1 | H.2a | 0 | 0 | 22.971 |
| P H.2 | H.2 | A.6 | 24.831 | 19.611 | 19.363 | | 1 RCP | 450 | 450 | 0.3 | New | 1 | H.2 | 0 | 0 | 22.624 |
| P A.6 | A.6 | A.7 | 55.224 | 18.22 | 17.984 | 0.43 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.6 | 0 | 0 | 22.926 |
| P A.7 | A.7 | A.8 | 28.988 | 17.964 | 17.864 | 0.34 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.7 | 0 | 0 | 22.393 |
| P A.8 | A.8 | A.9 | 61.105 | 17.844 | 17.601 | | 0.4 RCP | 1200 | 1200 | 0.3 | New | 1 | A.8 | 0 | 0 | 22.245 |
| P A.9 | A.9 | A.10 | 15.837 | 17.581 | 17.517 | | 0.4 RCP | 1200 | 1200 | 0.3 | New | 1 | A.9 | 0 | 0 | 21.564 |
| P A.10 | A.10 | A.12 | 18.621 | 17.497 | 17.398 | 0.53 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.10 | 0 | | |
| P A.12 | A.12 | A.12a | 28 | 17.36 | 17.248 | | 0.4 RCP | 1200 | 1200 | 0.3 | New | 1 | A.12 | 0 | | |
| P A.11 | A.12a | A.14 | 70.625 | 17.248 | 16.966 | | 0.4 RCP | 1200 | 1200 | 0.3 | New | 1 | A.12a | 0 | | |
| P A.14 | A.14 | A.15 | 10 | 16.966 | 16.902 | 0.64 | Box Culver | 2.44W x 1.21H | | 0.3 | Existing | 1 | A.14 | 0 | | |
| P UB3 | B UB3 | P.3 | 5 | 19.85 | 19.8 | | 1 RCP | 375 | 375 | 0.3 | NewFixed | 1 | B UB3 | 0 | 0 | 22.25 |
| P P.3 | P.3 | A.8 | 22.911 | 19.78 | 19.55 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | P.3 | 0 | 0 | 22.25 |
| P253936 | B UB5W | S.2a | 30 | 19.44 | 19.061 | 1.26 | RCP | 600 | 600 | 0.3 | NewFixed | 1 | B UB5W | 0 | 0 | 21.511 |
| P253921 | S.2a | A.12 | 16 | 19.061 | 18.88 | 1.13 | RCP | 600 | 600 | 0.3 | NewFixed | 1 | S.2a | 0 | 0 | 21.511 |
| P T.6b | B UB5E | T.6a | 26.8 | 19.7 | 19.45 | 0.93 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B UB5E | 0 | 0 | 22.126 |
| P T.6a | T.6a | T.6 | 10.76 | 19.11 | 19.04 | 0.65 | RCP | 375 | 375 | 0.3 | New | 1 | T.6a | 0 | 0 | 21.705 |
| P T.6 | T.6 | A.14 | 25.849 | 19.04 | 18.782 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | T.6 | 0 | | |
| z P A.14a | B UB5C | A.12a | 10 | 19.35 | 19.25 | | 1 RCP | 375 | 375 | 0.3 | NewFixed | 1 | B UB5C | 0 | | |
| P H.1a | H.1a | H.1b | 25.557 | 20.713 | 20.457 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | H.1a | 0 | 0 | 21.988 |
| P H.1b | H.1b | H.1 | 24.606 | 20.427 | 20.181 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | H.1b | 0 | 0 | 21.988 |
| P H.1 | H.1 | H.2b | 24.509 | 20.151 | 19.906 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | H.1 | 0 | 0 | 22.309 |
| P H.2b | H.2b | H.2 | 25.505 | 19.886 | 19.631 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | H.2b | 0 | 0 | 22.309 |
| P K.1 | K.1 | J.2 | 11.632 | 21.125 | 21.003 | 1.05 | RCP | 375 | 375 | 0.3 | New | 1 | K.1 | 0 | 0 | 22.852 |
| P J.2a | J.2 | J.2a | 18.497 | 20.778 | 20.593 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | J.2 | 0 | 0 | 23.29 |
| P J.2 | J.2a | J.3 | 24.772 | 20.563 | 20.315 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | J.2a | 0 | 0 | 23.29 |
| P J.3a | J.3 | J.3a | 26.004 | 20.285 | 20.025 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | J.3 | 0 | 0 | 22.643 |
| P J.3 | J.3a | J.4 | 10.273 | 20.025 | 19.922 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | J.3a | 0 | 0 | 22.643 |
| P J.4 | J.4 | A.6 | 16.126 | 19.892 | 19.731 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | J.4 | 0 | 0 | 22.541 |
| P L.1 | L.1 | X.1 | 18.624 | 21.73 | 21.598 | 0.71 | RCP | 375 | 375 | 0.3 | New | 1 | L.1 | 0 | 0 | 23.2 |
| P X.1 | X.1 | W.3 | 8.934 | 21.585 | 21.496 | | 1 RCP | 375 | 375 | 0.3 | Existing | 1 | X.1 | 0 | 0 | 23.412 |
| P W.3 | W.3 | J.1a | 38.674 | 21.397 | 21.01 | | 1 RCP | 450 | 450 | 0.3 | Existing | 1 | W.3 | 0 | 0 | 23.041 |
| P J.1a | J.1a | J.1 | 2.801 | 21.008 | 20.98 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | J.1a | 0 | 0 | 23.151 |
| P J.1 | J.1 | J.2 | 8.541 | 20.98 | 20.905 | 0.88 | RCP | 525 | 525 | 0.3 | New | 1 | J.1 | 0 | 0 | 23.157 |
| P L.1a | L.1a | X.1 | 24.896 | 21.718 | 21.594 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | L.1a | 0 | 0 | 23.15 |
| P M.1 | M.1 | W.1 | 10.6 | 22.225 | 22.119 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | M.1 | 0 | 0 | 23.408 |
| P W.1 | W.1 | W.2 | 8.193 | 22.119 | 22.023 | 1.17 | RCP | 375 | 375 | 0.3 | Existing | 1 | W.1 | 0 | 0 | 23.88 |
| P W.2 | W.2 | W.3 | 47.58 | 21.923 | 21.447 | | 1 RCP | 375 | 375 | 0.3 | Existing | 1 | W.2 | 0 | 0 | 23.525 |
| P N.1 | N.1 | A.7 | 6.575 | 20.4 | 20.27 | 1.98 | RCP | 375 | 375 | 0.3 | New | 1 | N.1 | 0 | 0 | 22.164 |
| P P.1 | P.1 | P.2 | 8.498 | 20.6 | 20.515 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | P.1 | 0 | 0 | 21.789 |
| P P.2 | P.2 | P.3 | 39.993 | 20.495 | 20.095 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | P.2 | 0 | 0 | 21.711 |
| P T.3b | T.3b | T.3a | 6 | 21.719 | 21.599 | | 2 RCP | 375 | 375 | 0.3 | New | 1 | T.3b | 0 | 0 | 23.147 |
| P T.3a | T.3a | T.3 | 10.288 | 21.569 | 21.363 | | 2 RCP | 375 | 375 | 0.3 | New | 1 | T.3a | 0 | | |
| P T.3 | T.3 | T.4 | 57.274 | 21.343 | 20.197 | | 2 RCP | 375 | 375 | 0.3 | New | 1 | T.3 | 0 | 0 | 23.477 |
| P T.4 | T.4 | T.5 | 15.691 | 20.177 | 20.021 | 0.99 | RCP | 525 | 525 | 0.3 | New | 1 | T.4 | 0 | 0 | 21.893 |
| P T.5 | T.5 | T.6 | 18.387 | 20.001 | 19.817 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | T.5 | 0 | | |
| P R.1 | R.1 | Q.3 | 6 | 20.607 | 20.487 | | 2 RCP | 375 | 375 | 0.3 | New | 1 | R.1 | 0 | 0 | 22.03 |
| P Q.3 | Q.3 | A.8 | 7.692 | 19.689 | 19.535 | | 2 RCP | 375 | 375 | 0.3 | New | 1 | Q.3 | 0 | 0 | 21.967 |
| P S.1 | S.1 | S.2 | 15.78 | 20.5 | 20.342 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | S.1 | 0 | 0 | 21.565 |
| P S.2 | S.2 | A.10 | 19.25 | 20.117 | 19.929 | 0.98 | RCP | 450 | 450 | 0.3 | New | 1 | S.2 | 0 | 0 | 21.36 |
| P T.5a | T.5a | T.5 | 17.25 | 20.226 | 20.053 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | T.5a | 0 | 0 | 21.705 |
| P T.1 | T.1 | T.2 | 6 | 21.9 | 21.84 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | T.1 | 0 | 0 | 23.731 |
| P T.2 | T.2 | T.3 | 20.603 | 21.82 | 21.614 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | T.2 | 0 | 0 | 23.731 |
| P V.1 | V.1 | T.4 | 12.751 | 20.551 | 20.424 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | V.1 | 0 | 0 | 21.982 |
| P A.6a | A.6a | A.6 | 16.126 | 20.089 | 19.96 | 0.8 | RCP | 450 | 450 | 0.3 | New | 1 | A.6a | 0 | 0 | 22.541 |
| P Q.1 | Q.1 | Q.2 | 76.793 | 21.4 | 19.864 | | 2 RCP | 375 | 375 | 0.3 | New | 1 | Q.1 | 0 | 0 | 23.074 |
| P Q.2 | Q.2 | Q.3 | 6.759 | 19.844 | 19.709 | | 2 RCP | 375 | 375 | 0.3 | New | 1 | Q.2 | 0 | | |
| P S2 B/1 | S2 B/1 | S2 B/2 | 38.403 | 22.028 | 21.793 | 0.61 | RCP | 375 | 375 | 0.3 | New | 1 | S2 B/1 | 0 | 0 | 23.038 |
| P S2 B/2 | S2 B/2 | S2 B/3 | 40 | 21.745 | 21.513 | 0.58 | RCP | 375 | 375 | 0.3 | New | 1 | S2 B/2 | 0 | 0 | 22.8 |
| P S2 B/3 | S2 B/3 | S2 A/4 | 19.6 | 21.465 | 21.367 | 0.5 | RCP | 450 | 450 | 0.3 | New | 1 | S2 B/3 | 0 | 0 | 22.52 |
| P S2 A/4 | S2 A/4 | S2 A/5 | 20.431 | 21.028 | 20.926 | 0.5 | RCP | 600 | 600 | 0.3 | New | 1 | S2 A/4 | 0 | 0 | 22.536 |
| P S2 A/5 | S2 A/5 | S2 A/6 | 20.683 | 20.896 | 20.793 | 0.5 | RCP | 600 | 600 | 0.3 | New | 1 | S2 A/5 | 0 | 0 | 22.393 |
| P S2 A/6 | S2 A/6 | S2 A/7 | 25.437 | 20.763 | 20.636 | 0.5 | RCP | 600 | 600 | 0.3 | New | 1 | S2 A/6 | 0 | 0 | 22.248 |
| P S2 A/7 | S2 A/7 | S2 A/8 | 21.87 | 20.606 | 20.496 | 0.5 | RCP | 750 | 750 | 0.3 | New | 1 | S2 A/7 | 0 | 0 | 22.425 |
| P S2 A/8 | S2 A/8 | S2 A/9 | 35.463 | 20.466 | 20.289 | 0.5 | RCP | 825 | 825 | 0.3 | New | 1 | S2 A/8 | 0 | 0 | 22.127 |
| P S2 A/9 | S2 A/9 | S2 A/10 | 45 | 20.059 | 19.834 | 0.5 | RCP | 825 | 825 | 0.3 | New | 1 | S2 A/9 | 0 | 0 | 21.791 |
| P S2 A/10 | S2 A/10 | S2 A/11 | 36.152 | 19.804 | 19.623 | 0.5 | RCP | 825 | 825 | 0.3 | New | 1 | S2 A/10 | 0 | 0 | 21.449 |
| P S2 A/11 | S2 A/11 | A.1 | 12.837 | 19.194 | 19.13 | 0.5 | RCP | 1200 | 1200 | 0.3 | New | 1 | S2 A/11 | 0 | 0 | 21.174 |
| P A.1 | A.1 | A.2 | 11.992 | 19.1 | 19.052 | 0.4 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.1 | 0 | 0 | 20.788 |
| P A.2a | A.2 | ZJ/1 | 11 | 19.032 | 18.988 | 0.4 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.2 | 0 | 0 | 21.072 |
| P A.2 | ZJ/1 | A.3 | 48.389 | 18.988 | 18.794 | 0.4 | RCP | 1200 | 1200 | 0.3 | New | 1 | ZJ/1 | 0 | 0 | 21.072 |
| P A.3 | A.3 | A.4 | 24.386 | 18.774 | 18.684 | 0.37 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.3 | 0 | 0 | 21.922 |
| P A.4 | A.4 | A.5 | 26.784 | 18.664 | 18.537 | 0.47 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.4 | 0 | 0 | 22.276 |
| P A.5 | A.5 | A.6 | 72.354 | 18.537 | 18.24 | 0.41 | RCP | 1200 | 1200 | 0.3 | New | 1 | A.5 | 0 | 0 | 22.533 |
| P S2 D/1 | S2 D/1 | S2 D/2 | 42.487 | 21.671 | 21.401 | 0.64 | RCP | 375 | 375 | 0.3 | New | 1 | S2 D/1 | 0 | 0 | 22.681 |
| P S2 D/2 | S2 D/2 | S2 D/3 | 14.917 | 21.36 | 21.286 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 D/2 | 0 | 0 | 22.408 |
| P S2 D/3 | S2 D/3 | A.4 | 6.015 | 21.256 | 21.225 | 0.52 | RCP | 375 | 375 | 0.3 | New | 1 | S2 D/3 | 0 | 0 | 22.508 |
| P S2 E/1 | S2 E/1 | S2 E/2 | 35.769 | 21.691 | 21.441 | 0.7 | RCP | 375 | 375 | 0.3 | New | 1 | S2 E/1 | 0 | 0 | 22.701 |
| P S2 E/2 | S2 E/2 | S2 E/3 | 15.001 | 21.355 | 21.28 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 E/2 | 0 | 0 | 22.448 |
| P S2 E/3 | S2 E/3 | A.4 | 6.019 | 21.25 | 21.22 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 E/3 | 0 | 0 | 22.508 |
| P S2 H/1 | S2 H/1 | S2 A/1 | 10.738 | 21.546 | 21.492 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 H/1 | 0 | 0 | 22.528 |
| P S2 A/1 | S2 A/1 | S2 A/2 | 20 | 21.462 | 21.362 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 A/1 | 0 | 0 | 22.668 |
| P S2 A/2 | S2 A/2 | S2 A/3 | 23.95 | 21.332 | 21.213 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 A/2 | 0 | 0 | 22.528 |
| P S2 A/3 | S2 A/3 | S2 A/4 | 24.85 | 21.183 | 21.058 | 0.5 | RCP | 450 | 450 | 0.3 | New | 1 | S2 A/3 | 0 | 0 | 22.695 |
| P S2 I/1 | S2 I/1 | S2 A/3 | 6.5 | 21.504 | 21.472 | 0.49 | RCP | 375 | 375 | 0.3 | New | 1 | S2 I/1 | 0 | 0 | 22.474 |
| P S2 J/1 | S2 J/1 | S2 A/4 | 14.218 | 21.502 | 21.431 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 J/1 | 0 | 0 | 22.633 |
| P S2 K/1 | S2 K/1 | S2 B/3 | 11 | 21.55 | 21.495 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 K/1 | 0 | 0 | 22.52 |
| P S2 L/1 | S2 L/1 | S2 B/2 | 11 | 21.83 | 21.775 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 L/1 | 0 | 0 | 22.8 |
| P S2 M/1 | S2 M/1 | S2 A/5 | 8.945 | 21.297 | 21.252 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 M/1 | 0 | 0 | 22.27 |
| P S2 N/1 | S2 N/1 | S2 A/5 | 8.946 | 21.297 | 21.252 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 N/1 | 0 | 0 | 22.27 |
| P S2 O/1 | S2 O/1 | S2 A/7 | 6.422 | 21.256 | 21.224 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 O/1 | 0 | 0 | 22.223 |
| P S2 P/1 | S2 P/1 | S2 A/8 | 12.401 | 21.222 | 21.147 | 0.6 | RCP | 375 | 375 | 0.3 | New | 1 | S2 P/1 | 0 | 0 | 22.358 |
| P S2 Q/1 | S2 Q/1 | S2 C/2 | 7 | 21.349 | 21.314 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 Q/1 | 0 | 0 | 22.319 |
| P S2 C/2 | S2 C/2 | S2 A/8 | 40 | 21.243 | 21.043 | 0.5 | RCP | 450 | 450 | 0.3 | New | 1 | S2 C/2 | 0 | 0 | 22.32 |
| P S2 T/1 | S2 T/1 | S2 A/10 | 11 | 20.479 | 20.424 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 T/1 | 0 | 0 | 21.449 |
| P S2 V/1 | S2 V/1 | S2 A/11 | 11 | 20.204 | 20.149 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 V/1 | 0 | 0 | 21.174 |
| P S2 X/1 | S2 X/1 | B.1 | 2.6 | 19.438 | 19.412 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | S2 X/1 | 0 | 0 | 21.363 |
| P B.1 | B.1 | C.1 | 17.968 | 19.372 | 19.192 | | 1 RCP | 450 | 450 | 0.3 | New | 1 | B.1 | 0 | 0 | 20.844 |
| P C.1 | C.1 | A.2 | 13 | 19.162 | 19.032 | | 1 RCP | 525 | 525 | 0.3 | New | 1 | C.1 | 0 | 0 | 21.204 |
| P S2 Y/1 | S2 Y/1 | C.1 | 4.53 | 19.237 | 19.192 | 0.99 | RCP | 375 | 375 | 0.3 | New | 1 | S2 Y/1 | 0 | 0 | 21.251 |
| P S2 ZB/1 | S2 ZB/1 | S2 E/2 | 10.55 | 21.438 | 21.385 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 ZB/1 | 0 | 0 | 22.408 |
| P S2 ZC/1 | S2 ZC/1 | S2 D/2 | 10.803 | 21.444 | 21.39 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 ZC/1 | 0 | 0 | 22.426 |
| P S2 ZF/1 | S2 ZF/1 | S2 D/3 | 12.046 | 21.371 | 21.311 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 ZF/1 | 0 | 0 | 22.39 |
| P S2 ZG/1 | S2 ZG/1 | S2 E/3 | 12.046 | 21.371 | 21.311 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 ZG/1 | 0 | 0 | 22.39 |
| P S2 ZZ/1 | S2 ZZ/1 | S2 A/1 | 10.603 | 21.563 | 21.51 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 ZZ/1 | 0 | 0 | 22.547 |
| P S2 F/1 | B Lot C | S2 F/2 | 4.5 | 21.716 | 21.622 | 2.09 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot C | 0 | 0 | 22.726 |
| P S2 F/2 | S2 F/2 | S2 A/3 | 6.5 | 21.504 | 21.472 | 0.49 | RCP | 375 | 375 | 0.3 | New | 1 | S2 F/2 | 0 | 0 | 22.474 |
| P S2 G/1 | B Lot Fa | S2 G/2 | 4.73 | 21.475 | 21.356 | 2.52 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot Fa | 0 | 0 | 22.491 |
| P S2 G/2 | S2 G/2 | S2 A/7 | 6.27 | 21.26 | 21.228 | 0.51 | RCP | 375 | 375 | 0.3 | New | 1 | S2 G/2 | 0 | 0 | 22.241 |
| P S2 C/1 | B Lot H | S2 C/2 | 42.904 | 21.56 | 21.273 | 0.67 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot H | 0 | 0 | 22.609 |
| P S2 S/1 | B Lot Fb | S2 A/8 | 7.201 | 21.358 | 21.262 | 1.33 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot Fb | 0 | 0 | 22.37 |
| P S2 U/1 | B Lot Gb | S2 A/11 | 4.5 | 20.358 | 20.319 | 0.87 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot Gb | 0 | 0 | 21.37 |
| P S2 W/1 | B Lot Ga | S2 W/2 | 10.018 | 20.125 | 20.075 | 0.5 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot Ga | 0 | 0 | 21.135 |
| P S2 W/2 | S2 W/2 | A.2 | 15.442 | 20.045 | 19.968 | 0.5 | RCP | 375 | 375 | 0.3 | New | 1 | S2 W/2 | 0 | 0 | 21.098 |
| P S2 Z/1 | B Lot E | S2 Z/2 | 5.73 | 18.957 | 18.9 | 0.99 | RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot E | 0 | 0 | 22.297 |
| P S2 Z/2 | S2 Z/2 | A.3 | 6.7 | 18.867 | 18.8 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | S2 Z/2 | 0 | 0 | 21.97 |
| P S2 ZH/1 | B Lot B | A.5 | 12.001 | 18.72 | 18.6 | | 1 RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot B | 0 | 0 | 22.869 |
| P S2 ZA/1 | B Lot D | S2 ZA/2 | 5.727 | 18.957 | 18.9 | | 1 RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot D | 0 | 0 | 22.297 |
| P S2 ZA/2 | S2 ZA/2 | A.3 | 6.701 | 18.867 | 18.8 | | 1 RCP | 375 | 375 | 0.3 | New | 1 | S2 ZA/2 | 0 | 0 | 21.97 |
| P S2 ZI/1 | B Lot A | A.5 | 12 | 18.72 | 18.6 | | 1 RCP | 375 | 375 | 0.3 | NewFixed | 1 | B Lot A | 0 | 0 | 22.849 |
| P S2 ZY/1 | S2 ZY/1 | S2 R/1 | 11 | 20.876 | 20.821 | 0.5 | RCP | 600 | 600 | 0.3 | New | 1 | S2 ZY/1 | 0 | 0 | 21.791 |
| P S2 R/1 | S2 R/1 | S2 A/9 | 11 | 20.821 | 20.766 | 0.5 | RCP | 600 | 600 | 0.3 | New | 1 | S2 R/1 | 0 | 0 | 21.791 |

DETAILS of SERVICES CROSSING PIPES

| Pipe | Chg (m) | Bottom Elev (m) | Height of S Chg (m) | Chg (m) | Bottom Elev (m) | Height of S Chg (m) | Chg (m) | Bottom Elev (m) | Height of S etc (m) | etc |
|---|---|---|---|---|---|---|---|---|---|---|

CHANNEL DETAILS

| Name | From | To | Type | Length (m) | U/S IL (m) | D/S IL (m) | Slope (%) | Base Width (m) | L.B. Slope (1:?) | R.B. Slope (1:?) | Manning n | Depth (m) | Roofed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

OVERFLOW ROUTE DETAILS

| Name | From | To | Travel Time (min) | Spill Level (m) | Crest Length (m) | Weir Coeff. C | Cross Section | Safe Depth Major Stor (m) | Safe Depth Minor Stor (m) | Safe DeV (sq.m/sec) | Bed Slope (%) | D/S Area Contributing % | id | U/S IL | D/S IL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F H.2a | B UB2 | H.2 | | 1 | 23.11 | 2 | 1.6 | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 774528 | 22.971 | 22.624 |
| F H.2 | H.2 | H.2b | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206991 | 22.624 | 22.309 |
| F A.6 | A.6 | N.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206973 | 22.926 | 22.164 |
| F A.7 | A.7 | A.8 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206974 | 22.393 | 22.245 |
| F A.8 | A.8 | A.9 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 50206975 | 22.245 | 21.564 |
| F A.9 | A.9 | A.10 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 50206976 | 21.564 | 21.32 |
| F A.10 | A.10 | A.12 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206977 | 21.32 | 22.16 |
| F A.12 | A.12 | A.12a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206978 | 22.16 | 22.102 |
| F A.11 | A.12a | A.14 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 1.81E+08 | 22.16 | 22.102 |
| F A.14 | A.14 | A.15 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206979 | | |
| F Total | A.15 | N Total | | 1 | | | | 7.5 m road | 0.3 | 0.15 | 0.4 | 1 | 0 | 333 | | |
| F N.1a | B UB3 | P.3 | | 1 | 22.43 | 2 | 1.6 | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 774514 | 22.585 | 22.164 |
| F P.3 | P.3 | P.2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.7 | 0 | 50207004 | 22.25 | 21.711 |
| F S.2a | B UB5W | S.2a | | 1 | 21.93 | 2 | 1.6 | 7.5 m road | 0.14 | 0.14 | 0.6 | 0.8 | 0 | 774485 | 21.511 | 21.36 |
| OF241084 | S.2a | A.12 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 1.64E+08 | 21.36 | 21.32 |
| F V.1a | B UB5E | T.6a | | 1 | 22.36 | 2 | 1.6 | 7.5 m road | 0.14 | 0.14 | 0.6 | 2.3 | 0 | 774498 | 22.126 | 21.982 |
| F T.6a | T.6a | T.6 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.65E+08 | 21.705 | 22.19 |
| F T.6 | T.6 | A.14 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207014 | | |
| F T.1a | B UB4 | T.2 | | 0.1 | 24 | 2 | 1.6 | 4 m wide p | 0.3 | 0.15 | 0.4 | 2.5 | 0 | 774506 | 22.3 | 22 |
| F A.14a | B UB5C | A.12a | | 1 | 22.2 | 2 | 1.6 | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 50206980 | 22 | 22.102 |
| F H.1a | H.1a | O H.1a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 50206989 | | |
| F H.1B | H.1b | H.1a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 1.08E+08 | 22.309 | 21.988 |
| F H.1 | H.1 | H.1b | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206990 | 22.309 | 21.988 |
| F H.2B | H.2b | H.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 1.08E+08 | 22.624 | 22.309 |
| F K.1 | K.1 | J.3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206997 | 22.852 | 22.643 |
| F J.2 | J.2 | J.2a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 1 | 1 | 0 | 50206994 | 23.29 | 22.643 |
| F J.2A | J.2a | J.3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 1 | 1 | 0 | 1.1E+08 | 23.29 | 22.643 |
| F J.3 | J.3 | J.3a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 1 | 1 | 0 | 50206995 | 22.643 | 22.541 |
| F J.3A | J.3a | J.4 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 1 | 1 | 0 | 1.1E+08 | 22.643 | 22.541 |
| F J.4 | J.4 | N.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206996 | 22.541 | 22.164 |
| F L.1 | L.1 | L.1a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206998 | 23.2 | 23.15 |
| F K.1 | K.1 | W.3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207023 | 23.412 | 23.041 |
| F W.3 | W.3 | J.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207022 | 23.041 | 23.157 |
| F J.1a | J.1a | J.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 50206992 | 23.151 | 23.157 |
| F J.1 | J.1 | J.3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206993 | 23.157 | 22.643 |
| F L.1a | L.1a | K.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 50206999 | 23.15 | 22.852 |
| F M.1 | M.1 | L.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207000 | 23.408 | 23.2 |
| F W.1 | W.1 | W.2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207020 | 23.88 | 23.525 |
| F W.2 | W.2 | W.3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207021 | 23.525 | 23.041 |
| F N.1 | N.1 | A.7 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.6 | 0 | 50207001 | 22.164 | 22.393 |
| F P.1 | P.1 | P.2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.7 | 0 | 50207002 | 21.789 | 21.711 |
| F P.2 | P.2 | O P.2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207003 | | |
| F T.3B | T.3b | T.3a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 2.7 | 0 | 50207005 | 23.147 | 22.03 |
| F T.3A | T.3a | T.4 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 2.7 | 0 | 1.41E+08 | 23.147 | 22.03 |
| F T.3 | T.3 | T.4 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 3 | 0 | 50207011 | 23.477 | 21.893 |
| F T.4 | T.4 | T.5 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 50207012 | 21.893 | 21.871 |
| F T.5 | T.5 | T.6 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207013 | 21.871 | 22.19 |
| F R.1 | R.1 | Q.3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207008 | 22.03 | 22.164 |
| F Q.3 | Q.3 | A.9 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 50207007 | 21.967 | 21.564 |
| F S.1 | S.1 | S.2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 50207009 | 21.565 | 21.36 |
| F S.2 | S.2 | A.10 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 50207010 | 21.36 | 21.32 |
| F T.5a | T.5a | T.5 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 50207015 | 21.705 | 22.19 |
| F T.1 | T.1 | L.1a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50207017 | 23.731 | 23.15 |
| F U.2 | T.2 | V.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 2.3 | 0 | 50207018 | 23.731 | 21.982 |
| F V.1 | V.1 | T.5a | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.8 | 0 | 50207019 | 21.982 | 21.705 |
| z F A.6a | A.6a | A.6 | | 1 | | | | 7.5 m road | 0.3 | 0.15 | 0.4 | 1 | 0 | 50207225 | | |
| F Q.1 | Q.1 | Q.2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 2.7 | 0 | 50207006 | 23.074 | 21.967 |
| F Q.2 | Q.2 | Q.3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 2.7 | 0 | 1.42E+08 | 23.074 | 21.967 |
| F S2 B/2 | S2 B/2 | S2 B/3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.8 | 22.52 |
| F S2 B/3 | S2 B/3 | S2 N/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.52 | 22.27 |
| F S2 A/5 | S2 A/5 | S2 A/6 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.393 | 22.248 |
| F S2 A/6 | S2 A/6 | S2 O/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.248 | 22.223 |
| F S2 A/8 | S2 A/8 | S2 A/9 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.127 | 21.791 |
| F S2 A/9 | S2 A/9 | S2 A/11 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 21.791 | 21.174 |
| F S2 A/10 | S2 A/10 | S2 A/11 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.96E+08 | 21.449 | 21.174 |
| F S2 A/11 | S2 A/11 | S2 W/2 | | 1 | | | | 7.5 m road | 0.3 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 21.174 | 21.098 |
| F A.1 | A.1 | B.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206968 | 20.788 | 20.83 |
| F A.2 | A.2 | A.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.6 | 0 | 50206969 | 21.072 | 20.788 |
| F A.2a | ZJ/1 | A.2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 0.6 | 0 | 1.89E+08 | 21.072 | 20.788 |
| F A.3 | A.3 | ZJ/1 | | 1 | | | | Swale with | 0.45 | 0.3 | 1 | 1 | 0 | 1.86E+08 | 22.508 | 21.97 |
| F A.4 | A.4 | A.3 | | 1 | | | | Swale with | 0.45 | 0.3 | 1 | 1 | 0 | 1.85E+08 | 22.508 | 21.97 |
| F S2 D/2 | S2 D/2 | S2 D/3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.408 | 22.508 |
| F S2 D/3 | S2 D/3 | S2 Z/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.508 | 21.97 |
| F S2 E/2 | S2 E/2 | S2 E/3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.448 | 22.508 |
| F S2 E/3 | S2 E/3 | S2 ZA/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.508 | 21.97 |
| F S2 H/1 | S2 H/1 | S2 A/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.528 | 22.668 |
| F S2 A/1 | S2 A/1 | S2 A/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.668 | 22.528 |
| F S2 A/2 | S2 A/2 | S2 I/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.528 | 22.474 |
| F S2 I/1 | S2 I/1 | S2 M/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.474 | 22.27 |
| F S2 I/1 | S2 J/1 | S2 N/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.633 | 22.27 |
| F S2 K/1 | S2 K/1 | S2 J/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.52 | 22.633 |
| F S2 L/1 | S2 L/1 | S2 K/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.8 | 22.52 |
| F S2 M/1 | S2 M/1 | S2 A/5 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.27 | 22.393 |
| F S2 N/1 | S2 N/1 | S2 A/5 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.27 | 22.393 |
| F S2 O/1 | S2 O/1 | S2 R/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.223 | 21.791 |
| F S2 P/1 | S2 P/1 | S2 A/8 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.358 | 22.127 |
| F S2 Q/1 | S2 Q/1 | S2 P/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.319 | 22.358 |
| F S2 C/2 | S2 C/2 | S2 A/8 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.32 | 22.127 |
| F S2 T/1 | S2 T/1 | S2 V/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 21.449 | 21.174 |
| F S2 V/1 | S2 V/1 | S2 W/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 21.174 | 21.098 |
| F C.1 | C.1 | B.1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.4 | 1 | 0 | 50206982 | 21.204 | 20.83 |
| F S2 Y/1 | S2 Y/1 | S2 W/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 21.251 | 21.098 |
| F S2 ZB/1 | S2 ZB/1 | S2 ZA/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.408 | 21.97 |
| F S2 ZC/1 | S2 ZC/1 | S2 Z/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.426 | 21.97 |
| F S2 ZF/1 | S2 ZF/1 | S2 D/3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.39 | 22.508 |
| F S2 ZG/1 | S2 ZG/1 | S2 E/3 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.39 | 22.508 |
| F S2 ZZ/1 | S2 ZZ/1 | S2 A/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.547 | 22.668 |
| F S2 F/2 | S2 F/2 | S2 J/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.474 | 22.633 |
| F S2 G/2 | S2 G/2 | S2 P/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 22.241 | 22.358 |
| F S2 W/2 | S2 W/2 | O S2 W/2 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | | |
| F S2 Z/1 | S2 Z/2 | ZJ/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | | |
| F S2 ZA/2 | S2 ZA/2 | ZJ/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | | |
| F S2 R/1 | S2 R/1 | S2 T/1 | | 1 | | | | 7.5 m road | 0.14 | 0.14 | 0.6 | 1 | 0 | 1.83E+08 | 21.791 | 21.449 |

PIPE COVER DETAILS

| Name | Type | Dia (mm) | Safe Cover | Cover (m) | |
|---|---|---|---|---|---|
| z P H.2a | RCP | 375 | 0.6 | 0.91 | |
| P H.2a | RCP | 375 | 0.6 | 0.94 | |
| P H.2 | RCP | 450 | 0.6 | 2.51 | |
| P A.6 | RCP | 1200 | 0.6 | 3.12 | |
| P A.7 | RCP | 1200 | 0.6 | 2.97 | |
| P A.8 | RCP | 1200 | 0.6 | 2.68 | |
| P A.9 | RCP | 1200 | 0.6 | 2.52 | |
| P A.10 | RCP | 1200 | 0.6 | 2.54 | |
| P A.12 | RCP | 1200 | 0.6 | 2.95 | |
| P A.11 | RCP | 1200 | 0.6 | 3.07 | |
| P A.14 | Box Culver | 0 | 0.6 | 3.52 | |
| P UB3 | RCP | 375 | 0.6 | 1.24 | |
| P P.3 | RCP | 375 | 0.6 | 2.04 | |
| P253936 | RCP | 600 | 0.6 | 0.66 | |
| P253921 | RCP | 600 | 0.6 | 1.63 | |
| P T.6b | RCP | 375 | 0.6 | 1.64 | |
| P T.6a | RCP | 375 | 0.6 | 2.18 | |
| P T.6 | RCP | 525 | 0.6 | 2.39 | |
| z P A.14a | RCP | 375 | 0.6 | 0.94 | |
| P H.1a | RCP | 375 | 0.6 | 0.86 | |
| P H.1b | RCP | 375 | 0.6 | 1.14 | |
| P H.1 | RCP | 375 | 0.6 | 1.75 | |
| P H.2b | RCP | 375 | 0.6 | 2.01 | |
| P K.1 | RCP | 375 | 0.6 | 1.32 | |
| P J.2a | RCP | 525 | 0.6 | 1.71 | |
| P J.2 | RCP | 525 | 0.6 | 1.75 | |
| P J.3a | RCP | 525 | 0.6 | 1.79 | |
| P J.3 | RCP | 525 | 0.6 | 1.91 | |
| P J.4 | RCP | 525 | 0.6 | 2.08 | |
| P L.1 | RCP | 375 | 0.6 | 1.01 | |
| P X.1 | RCP | 375 | 0.6 | 1.13 | |
| P W.3 | RCP | 450 | 0.6 | 1.15 | |
| P J.1a | RCP | 525 | 0.6 | 1.57 | |
| P J.1 | RCP | 525 | 0.6 | 1.5 | |
| P L.1a | RCP | 375 | 0.6 | 1.02 | |
| P M.1 | RCP | 375 | 0.6 | 0.77 | |
| P W.1 | RCP | 375 | 0.6 | 1.09 | |
| P W.2 | RCP | 375 | 0.6 | 1.17 | |
| P N.1 | RCP | 375 | 0.6 | 1.35 | |
| P P.1 | RCP | 375 | 0.6 | 0.78 | |
| P P.2 | RCP | 375 | 0.6 | 0.81 | |
| P T.3b | RCP | 375 | 0.6 | 0.99 | |
| P T.3a | RCP | 375 | 0.6 | 1.46 | |
| P T.3 | RCP | 375 | 0.6 | 1.28 | |
| P T.4 | RCP | 525 | 0.6 | 1.15 | |
| P T.5 | RCP | 525 | 0.6 | 1.3 | |
| P R.1 | RCP | 375 | 0.6 | 1 | |
| P Q.3 | RCP | 375 | 0.6 | 1.87 | |
| P S.1 | RCP | 375 | 0.6 | 0.61 | |
| P S.2 | RCP | 450 | 0.6 | 0.75 | |
| P T.5a | RCP | 375 | 0.6 | 1.07 | |
| P T.1 | RCP | 375 | 0.6 | 1.42 | |
| P T.2 | RCP | 375 | 0.6 | 1.29 | |
| P V.1 | RCP | 375 | 0.6 | 0.97 | |
| P A.6a | RCP | 450 | 0.6 | 1.96 | |
| P Q.1 | RCP | 375 | 0.6 | 1.26 | |
| P Q.2 | RCP | 375 | 0.6 | 1.97 | |
| P S2 B/1 | RCP | 375 | 0.6 | 0.6 | |
| P S2 B/2 | RCP | 375 | 0.6 | 0.6 | |
| P S2 B/3 | RCP | 450 | 0.6 | 0.55 | Unsafe |
| P S2 A/4 | RCP | 600 | 0.6 | 0.82 | |
| P S2 A/5 | RCP | 600 | 0.6 | 0.81 | |
| P S2 A/6 | RCP | 600 | 0.6 | 0.84 | |
| P S2 A/7 | RCP | 750 | 0.6 | 0.82 | |
| P S2 A/8 | RCP | 825 | 0.6 | 0.62 | |
| P S2 A/9 | RCP | 825 | 0.6 | 0.73 | |
| P S2 A/10 | RCP | 825 | 0.6 | 0.67 | |
| P S2 A/11 | RCP | 1200 | 0.6 | 0.69 | |
| P A.1 | RCP | 1200 | 0.6 | 0.4 | Unsafe |
| P A.2a | RCP | 1200 | 0.6 | 0.75 | |
| P A.2 | RCP | 1200 | 0.6 | 0.8 | |
| P A.3 | RCP | 1200 | 0.6 | 1.86 | |
| P A.4 | RCP | 1200 | 0.6 | 2.33 | |
| P A.5 | RCP | 1200 | 0.6 | 2.71 | |
| P S2 D/1 | RCP | 375 | 0.6 | 0.6 | |
| P S2 D/2 | RCP | 375 | 0.6 | 0.64 | |
| P S2 D/3 | RCP | 375 | 0.6 | 0.69 | |
| P S2 E/1 | RCP | 375 | 0.6 | 0.6 | |
| P S2 E/2 | RCP | 375 | 0.6 | 0.68 | |
| P S2 E/3 | RCP | 375 | 0.6 | 0.7 | |
| P S2 H/1 | RCP | 375 | 0.6 | 0.57 | Unsafe |
| P S2 A/1 | RCP | 375 | 0.6 | 0.76 | |
| P S2 A/2 | RCP | 375 | 0.6 | 0.79 | |
| P S2 A/3 | RCP | 450 | 0.6 | 0.99 | |
| P S2 I/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 J/1 | RCP | 375 | 0.6 | 0.57 | Unsafe |
| P S2 K/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 L/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 M/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 N/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 O/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 P/1 | RCP | 375 | 0.6 | 0.57 | Unsafe |
| P S2 Q/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 C/2 | RCP | 450 | 0.6 | 0.58 | Unsafe |
| P S2 T/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 V/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 X/1 | RCP | 375 | 0.6 | 1.52 | |
| P B.1 | RCP | 450 | 0.6 | 0.98 | |
| P C.1 | RCP | 525 | 0.6 | 1.38 | |
| P S2 Y/1 | RCP | 375 | 0.6 | 1.59 | |
| P S2 ZB/1 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 ZC/1 | RCP | 375 | 0.6 | 0.57 | Unsafe |
| P S2 ZF/1 | RCP | 375 | 0.6 | 0.6 | |
| P S2 ZG/1 | RCP | 375 | 0.6 | 0.6 | |
| P S2 ZZ/1 | RCP | 375 | 0.6 | 0.57 | Unsafe |
| P S2 F/1 | RCP | 375 | 0.6 | 0.44 | Unsafe |
| P S2 F/2 | RCP | 375 | 0.6 | 0.56 | Unsafe |
| P S2 G/1 | RCP | 375 | 0.6 | 0.45 | Unsafe |
| P S2 G/2 | RCP | 375 | 0.6 | 0.57 | Unsafe |
| P S2 C/1 | RCP | 375 | 0.6 | 0.6 | |
| P S2 S/1 | RCP | 375 | 0.6 | 0.45 | Unsafe |
| P S2 U/1 | RCP | 375 | 0.6 | 0.44 | Unsafe |
| P S2 W/1 | RCP | 375 | 0.6 | 0.6 | |
| P S2 W/2 | RCP | 375 | 0.6 | 0.64 | |
| P S2 Z/1 | RCP | 375 | 0.6 | 0.78 | |
| P S2 Z/2 | RCP | 375 | 0.6 | 2.69 | |
| P S2 ZH/1 | RCP | 375 | 0.6 | 0.87 | |
| P S2 ZA/1 | RCP | 375 | 0.6 | 0.78 | |
| P S2 ZA/2 | RCP | 375 | 0.6 | 2.69 | |
| P S2 ZI/1 | RCP | 375 | 0.6 | 0.87 | |
| P S2 ZY/1 | RCP | 600 | 0.6 | 0.27 | Unsafe |
| P S2 R/1 | RCP | 600 | 0.6 | 0.33 | Unsafe |

This model has no pipes with non-return valves

**DRAINS results prepared from Version 2018.06 20 YEAR**

PIT / NODE DETAILS Version 8

| Name | Max HGL | Max Pond HGL | Max Surfac Flow Arrivi (cu.m/s) | Max Pond Volume (cu.m) | Min Freeboard (m) | Overflow (cu.m/s) | Constraint |
|---|---|---|---|---|---|---|---|
| H.2a | 21.54 | | 0 | | 1.44 | | None |
| H.2 | 20.39 | | 0.013 | | 2.24 | 0 | Inlet Capacity |
| A.6 | 20.22 | | 0 | | 2.71 | 0 | None |
| A.7 | 19.93 | | 0 | | 2.47 | 0 | None |
| A.8 | 19.78 | | 0 | | 2.47 | 0 | None |
| A.9 | 19.51 | | 0.067 | | 2.06 | 0.012 | Inlet Capacity |
| A.10 | 19.13 | 21.38 | 0.033 | 0.2 | 2.19 | 0 | Inlet Capacity |
| A.12 | 18.95 | 21.6 | 0 | 0 | 2.65 | 0 | None |
| A.12a | 18.33 | 21.6 | 0 | 0 | 3.27 | 0 | None |
| A.14 | 17.67 | 21.8 | 0 | 0 | 4.13 | 0 | None |
| A.15 | 17.28 | | 0 | | | | |
| P.3 | 20.12 | | 0 | | 2.13 | 0 | None |
| S.2a | 19.22 | | 0 | | 2.61 | 0 | None |
| T.6a | 20.16 | | 0 | | 1.97 | 0 | None |
| T.6 | 20.11 | | 0 | | 1.89 | 0 | None |
| H.1a | 20.92 | 22.05 | 0.053 | 0.3 | 1.07 | 0 | Inlet Capacity |
| H.1b | 20.81 | | 0.053 | | 1.32 | 0.005 | Inlet Capacity |
| H.1 | 20.73 | | 0.048 | | 1.58 | 0.005 | Inlet Capacity |
| H.2b | 20.59 | | 0.044 | | 1.9 | 0.004 | Inlet Capacity |
| K.1 | 21.41 | | 0.101 | | 1.44 | 0.02 | Inlet Capacity |
| J.2 | 21.32 | | 0 | | 1.97 | 0 | None |
| J.2a | 20.98 | 22.89 | 0.002 | 0 | 1.9 | 0 | Inlet Capacity |
| J.3 | 20.83 | 22.68 | 0.027 | 0.2 | 1.81 | 0 | Inlet Capacity |
| J.3a | 20.65 | 22.59 | 0.083 | 0.2 | 1.85 | 0 | Inlet Capacity |
| J.4 | 20.51 | 22.61 | 0.021 | 0.1 | 2.07 | 0 | Inlet Capacity |
| L.1 | 22.04 | | 0.047 | | 1.16 | 0.004 | Inlet Capacity |
| X.1 | 22.01 | | 0 | | 1.41 | 0 | None |
| W.3 | 21.9 | 23.11 | 0.046 | 0.4 | 1.14 | 0 | Inlet Capacity |
| J.1a | 21.45 | | 0 | | 1.71 | 0 | None |
| J.1 | 21.44 | | 0.05 | | 1.71 | 0.004 | Inlet Capacity |
| L.1a | 22.11 | | 0.135 | | 1.04 | 0.049 | Inlet Capacity |
| M.1 | 22.46 | 23.5 | 0.072 | 0.5 | 0.95 | 0 | Inlet Capacity |
| W.1 | 22.29 | | 0 | | 1.59 | 0 | None |
| W.2 | 22.24 | | 0.038 | | 1.29 | 0.002 | Inlet Capacity |
| N.1 | 20.74 | 22.38 | 0.117 | 2.1 | 1.43 | 0 | Inlet Capacity |
| P.1 | 20.8 | 21.85 | 0.036 | 0.3 | 0.99 | 0 | Inlet Capacity |
| P.2 | 20.64 | 21.77 | 0.033 | 0.3 | 1.07 | 0 | Inlet Capacity |
| T.3b | 22.04 | | 0.031 | | 1.47 | 0.007 | Inlet Capacity |
| T.3a | 21.92 | | 0.037 | | 1.52 | 0.009 | Inlet Capacity |
| T.3 | 21.75 | | 0 | | 1.73 | 0 | None |
| T.4 | 20.5 | 21.98 | 0.059 | 0.5 | 1.39 | 0 | Inlet Capacity |
| T.5 | 20.36 | 21.9 | 0.013 | 0.2 | 1.51 | 0 | Inlet Capacity |
| R.1 | 20.77 | | 0.031 | | 1.32 | 0.007 | Inlet Capacity |
| Q.3 | 19.98 | | 0.047 | | 2.1 | 0.014 | Inlet Capacity |
| S.1 | 20.74 | | 0.053 | | 0.83 | 0.007 | Inlet Capacity |
| S.2 | 20.32 | 21.42 | 0.03 | 0.2 | 1.04 | 0 | Inlet Capacity |
| T.5a | 20.38 | 21.78 | 0.023 | 0.4 | 1.32 | 0 | Inlet Capacity |
| T.1 | 22.33 | | 0.057 | | 1.4 | 0.009 | Inlet Capacity |
| T.2 | 22.25 | | 0.055 | | 1.48 | 0.008 | Inlet Capacity |
| V.1 | 20.76 | | 0.061 | | 1.22 | 0.01 | Inlet Capacity |
| A.6a | 20.74 | 22.84 | 0.253 | 0.6 | 2.04 | 0 | Inlet Capacity |
| Q.1 | 21.55 | | 0.03 | | 1.81 | 0.009 | Inlet Capacity |
| Q.2 | 20.06 | | 0.033 | | 2.33 | 0.01 | Inlet Capacity |
| S2 B/1 | 22.11 | | 0.018 | | | | |
| S2 B/2 | 21.93 | | 0.019 | | 0.87 | 0.001 | Inlet Capacity |
| S2 B/3 | 21.7 | | 0.022 | | 0.82 | 0.001 | Inlet Capacity |
| S2 A/4 | 21.51 | | 0 | | 1.03 | | None |
| S2 A/5 | 21.43 | | 0 | | 0.96 | 0 | None |
| S2 A/6 | 21.35 | | 0.041 | | 0.89 | 0.003 | Inlet Capacity |
| S2 A/7 | 21.31 | | 0 | | 1.11 | | None |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| S2 A/8 | 21.26 | | 0.035 | | 0.86 | 0.002 | Inlet Capacity |
| S2 A/9 | 21.11 | | 0.019 | | 0.68 | 0.001 | Inlet Capacity |
| S2 A/10 | 20.89 | | 0.021 | | 0.56 | 0.001 | Inlet Capacity |
| S2 A/11 | 20.73 | | 0.018 | | 0.45 | 0.001 | Inlet Capacity |
| A.1 | 20.7 | 21.38 | 0 | 0 | 0.68 | 0 | None |
| A.2 | 20.69 | 21.56 | 0.005 | 0.2 | 0.78 | 0 | Inlet Capacity |
| ZJ/1 | 20.63 | | 0.047 | | 0.97 | 0.005 | Inlet Capacity |
| A.3 | 20.58 | | 0.008 | | 1.54 | 0.005 | Inlet Capacity |
| A.4 | 20.5 | | 0.054 | | 1.92 | 0.008 | Inlet Capacity |
| A.5 | 20.39 | | 0 | | 2.24 | | None |
| S2 D/1 | 21.84 | | 0.074 | | | | |
| S2 D/2 | 21.67 | 22.45 | 0.021 | 0.2 | 0.73 | 0 | Inlet Capacity |
| S2 D/3 | 21.6 | | 0.017 | | 0.91 | 0.001 | Inlet Capacity |
| S2 E/1 | 21.83 | | 0.053 | | | | |
| S2 E/2 | 21.61 | 22.48 | 0.016 | 0.2 | 0.84 | 0 | Inlet Capacity |
| S2 E/3 | 21.54 | | 0.018 | | 0.97 | 0.001 | Inlet Capacity |
| S2 H/1 | 21.68 | 22.57 | 0.018 | 0.2 | 0.85 | 0 | Inlet Capacity |
| S2 A/1 | 21.64 | | 0 | | 1.03 | 0 | None |
| S2 A/2 | 21.62 | | 0.027 | | 0.91 | 0.002 | Inlet Capacity |
| S2 A/3 | 21.59 | | 0 | | 1.1 | | None |
| S2 I/1 | 21.6 | | 0.008 | | 0.87 | 0 | None |
| S2 J/1 | 21.61 | | 0.016 | | 1.03 | 0.001 | Inlet Capacity |
| S2 K/1 | 21.73 | 22.57 | 0.022 | 0.3 | 0.79 | 0 | Inlet Capacity |
| S2 L/1 | 21.98 | | 0.019 | | 0.82 | 0.001 | Inlet Capacity |
| S2 M/1 | 21.47 | 22.32 | 0.025 | 0.3 | 0.8 | 0 | Inlet Capacity |
| S2 N/1 | 21.47 | 22.32 | 0.023 | 0.3 | 0.8 | 0 | Inlet Capacity |
| S2 O/1 | 21.34 | | 0.008 | | 0.88 | 0 | None |
| S2 P/1 | 21.35 | 22.4 | 0.022 | 0.2 | 1.01 | 0 | Inlet Capacity |
| S2 Q/1 | 21.88 | 22.44 | 0.089 | 0.2 | 0.44 | 0 | Inlet Capacity |
| S2 C/2 | 21.76 | | 0.074 | | 0.56 | 0.016 | Inlet Capacity |
| S2 T/1 | 20.9 | | 0.022 | | 0.55 | 0.001 | Inlet Capacity |
| S2 V/1 | 20.74 | | 0.018 | | 0.44 | 0.001 | Inlet Capacity |
| S2 X/1 | 20.75 | | 0.09 | | | | |
| B.1 | 20.74 | 21.55 | 0.022 | 0.3 | 0.76 | | Inlet Capacity |
| C.1 | 20.71 | | 0 | | 0.88 | 0 | None |
| S2 Y/1 | 20.71 | | 0 | | 0.54 | 0 | None |
| S2 ZB/1 | 21.63 | | 0.016 | | 0.78 | 0.001 | Inlet Capacity |
| S2 ZC/1 | 21.69 | | 0.02 | | 0.74 | 0.001 | Inlet Capacity |
| S2 ZF/1 | 21.6 | 22.41 | 0.006 | 0.1 | 0.79 | 0 | Inlet Capacity |
| S2 ZG/1 | 21.54 | 22.41 | 0.006 | 0.1 | 0.85 | 0 | Inlet Capacity |
| S2 ZZ/1 | 21.69 | 22.59 | 0.018 | 0.2 | 0.86 | 0 | Inlet Capacity |
| S2 F/2 | 21.7 | 22.49 | 0.006 | 0.1 | 0.77 | 0 | Inlet Capacity |
| S2 G/2 | 21.39 | 22.25 | 0.005 | 0.1 | 0.85 | 0 | Inlet Capacity |
| S2 W/2 | 20.76 | 21.18 | 0.054 | 0.6 | 0.34 | 0 | Inlet Capacity |
| S2 Z/2 | 20.58 | | 0.023 | | 1.39 | 0.001 | Inlet Capacity |
| S2 ZA/2 | 20.57 | | 0.024 | | 1.4 | 0.001 | Inlet Capacity |
| S2 ZY/1 | 21.24 | | 0.261 | | | | |
| S2 R/1 | 21.21 | | 0.02 | | 0.58 | 0.001 | Inlet Capacity |

SUB-CATCHMENT DETAILS

| Name | Max Flow Q (cu.m/s) | Paved Max Q (cu.m/s) | Grassed Max Q (cu.m/s) | Paved Tc (min) | Grassed Tc (min) | Supp. Tc (min) | Due to Storm |
|---|---|---|---|---|---|---|---|
| C H.2a | 0.192 | 0.13 | 0.067 | 10 | 15 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C H.2 | 0.013 | 0.012 | 0.002 | 5 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C A.9 | 0.053 | 0.049 | 0.004 | 5 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C A.10 | 0.022 | 0.02 | 0.002 | 5 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C N.1a | 0.368 | 0.216 | 0.152 | 10 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S.2a | 0.425 | 0.288 | 0.149 | 10 | 15 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C V.1a | 0.393 | 0.23 | 0.163 | 10 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C T.1a | 0.315 | 0.185 | 0.13 | 10 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C A.14a | 0.431 | 0.292 | 0.151 | 10 | 15 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C H.1a | 0.048 | 0.043 | 0.006 | 5 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C H.1B | 0.048 | 0.043 | 0.006 | 5 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C H.1 | 0.044 | 0.039 | 0.005 | 5 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C H.2B | 0.044 | 0.039 | 0.005 | 5 | 10 | 0 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| C K.1 | 0.052 | 0.048 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C J.2A | 0.002 | 0.002 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C J.3 | 0.002 | 0.002 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C J.3A | 0.083 | 0.073 | 0.01 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C J.4 | 0.021 | 0.018 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C L.1 | 0.047 | 0.044 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C W.3 | 0.044 | 0.041 | 0.003 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C J.1 | 0.05 | 0.046 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C L.1a | 0.123 | 0.113 | 0.009 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C M.1 | 0.072 | 0.067 | 0.006 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C W.2 | 0.038 | 0.035 | 0.003 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C N.1 | 0.117 | 0.108 | 0.009 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C P.1 | 0.036 | 0.033 | 0.003 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C P.2 | 0.033 | 0.031 | 0.003 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C T.3B | 0.031 | 0.029 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C T.3A | 0.03 | 0.027 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C T.4 | 0.05 | 0.046 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C T.5 | 0.013 | 0.012 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C R.1 | 0.031 | 0.029 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C Q.3 | 0.03 | 0.027 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S.1 | 0.053 | 0.049 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S.2 | 0.022 | 0.021 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C T.5a | 0.013 | 0.012 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C U.1 | 0.057 | 0.052 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C U.2 | 0.055 | 0.051 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C V.1 | 0.052 | 0.048 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C A.6a | 0.253 | 0.035 | 0.22 | 10 | 20 | 0 AR&R 20 year, 1.5 hours storm, average 55.6 mm/h, Zone 1 |
| C Q.1 | 0.03 | 0.025 | 0.005 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C Q.2 | 0.024 | 0.02 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 B/1 | 0.018 | 0.005 | 0.013 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 B/2 | 0.019 | 0.017 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 B/3 | 0.022 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 A/6 | 0.041 | 0.038 | 0.003 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 A/8 | 0.019 | 0.017 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 A/9 | 0.017 | 0.016 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 A/10 | 0.021 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 A/11 | 0.017 | 0.015 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C ZJ/1 | 0.042 | 0.039 | 0.003 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C A.4 | 0.054 | 0.05 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 D/1 | 0.074 | 0.069 | 0.006 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 D/2 | 0.021 | 0.019 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 D/3 | 0.017 | 0.015 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 E/1 | 0.053 | 0.013 | 0.04 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 E/2 | 0.016 | 0.015 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 E/3 | 0.018 | 0.016 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 H/1 | 0.018 | 0.016 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 A/2 | 0.027 | 0.025 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 I/1 | 0.006 | 0.006 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 J/1 | 0.016 | 0.014 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 K/1 | 0.022 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 L/1 | 0.019 | 0.017 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 M/1 | 0.025 | 0.023 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 N/1 | 0.022 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 O/1 | 0.005 | 0.004 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 P/1 | 0.022 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 Q/1 | 0.089 | 0.083 | 0.007 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 C/2 | 0.074 | 0.068 | 0.006 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 T/1 | 0.021 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 V/1 | 0.017 | 0.016 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 X/1 | 0.09 | 0.076 | 0.014 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C B.1 | 0.022 | 0.021 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZB/1 | 0.016 | 0.015 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZC/1 | 0.02 | 0.019 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZF/1 | 0.006 | 0.006 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZG/1 | 0.006 | 0.006 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZZ/1 | 0.018 | 0.016 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| C S2 F/1 | 0.45 | 0.415 | 0.034 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 F/2 | 0.006 | 0.006 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 G/1 | 0.244 | 0.225 | 0.019 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 G/2 | 0.005 | 0.004 | 0 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 C/1 | 0.489 | 0.452 | 0.037 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 S/1 | 0.221 | 0.205 | 0.017 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 U/1 | 0.447 | 0.413 | 0.034 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 W/1 | 0.378 | 0.349 | 0.029 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 W/2 | 0.053 | 0.049 | 0.004 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 Z/1 | 0.331 | 0.306 | 0.025 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 Z/2 | 0.022 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZH/1 | 0.514 | 0.475 | 0.039 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZA/1 | 0.437 | 0.404 | 0.033 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZA/2 | 0.023 | 0.021 | 0.002 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 ZI/1 | 0.459 | 0.424 | 0.035 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C Open A | 0.261 | 0.034 | 0.227 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| C S2 R/1 | 0.02 | 0.018 | 0.001 | 5 | 10 | 0 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |

Outflow Volumes for Total Catchment (12.6 impervious + 4.58 pervious = 17.2 total ha)

| Storm | Total Rainf cu.m | Total Runo cu.m (Runc | Impervious cu.m (Runc | Pervious Runoff cu.m (Runoff %) |
|---|---|---|---|---|
| AR&R 20 y | 3001.14 | 2355.13 (7 | 2061.22 (9 | 293.91 (36.7%) |
| AR&R 20 y | 4687.85 | 3888.20 (8 | 3290.02 (9 | 598.18 (47.8%) |
| AR&R 20 y | 6022.32 | 5099.31 (8 | 4262.21 (9 | 837.10 (52.1%) |
| AR&R 20 y | 7124.84 | 6101.14 (8 | 5065.42 (9 | 1035.71 (54.5%) |
| AR&R 20 y | 8061.27 | 6933.80 (8 | 5747.63 (9 | 1186.17 (55.1%) |
| AR&R 20 y | 8865.96 | 7648.18 (8 | 6333.88 (9 | 1314.29 (55.6%) |
| AR&R 20 y | 10786.06 | 9353.59 (8 | 7732.74 (9 | 1620.85 (56.3%) |
| AR&R 20 y | 12216.04 | 10621.06 ( | 8775.32 (9 | 1845.74 (56.6%) |
| AR&R 20 y | 14330.01 | 12840.62 ( | 10366.85 ( | 2473.77 (64.7%) |
| AR&R 20 y | 15841.75 | 14267.22 ( | 11483.10 ( | 2784.12 (65.9%) |
| AR&R 20 y | 18092.75 | 16293.02 ( | 13139.21 ( | 3153.81 (65.3%) |

PIPE DETAILS

| Name | Max Q (cu.m/s) | Max V (m/s) | Max U/S HGL (m) | Max D/S HGL (m) | Due to Storm |
|---|---|---|---|---|---|
| z P H.2a | 0.048 | 1.41 | 21.553 | 21.536 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P H.2a | 0.048 | 1.58 | 21.518 | 21.398 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P H.2 | 0.235 | 1.48 | 20.306 | 20.216 | AR&R 20 year, 15 minutes storm, average 140.2 mm/h, Zone 1 |
| P A.6 | 2.019 | 1.78 | 20.039 | 19.928 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.7 | 2.107 | 1.86 | 19.839 | 19.777 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.8 | 2.337 | 2.07 | 19.668 | 19.506 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.9 | 2.383 | 2.11 | 19.173 | 19.129 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.10 | 2.475 | 2.19 | 19.002 | 18.948 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.12 | 2.565 | 2.38 | 18.56 | 18.334 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.11 | 2.708 | 3.07 | 18.12 | 17.868 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.14 | 3.091 | 3.35 | 17.344 | 17.281 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P UB3 | 0.084 | 0.95 | 20.13 | 20.122 | AR&R 20 year, 20 minutes storm, average 124.4 mm/h, Zone 1 |
| P P.3 | 0.15 | 2.77 | 19.964 | 19.78 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P253936 | 0.091 | 1.93 | 19.573 | 19.221 | AR&R 20 year, 1 hour storm, average 71.1 mm/h, Zone 1 |
| P253921 | 0.091 | 1.86 | 19.198 | 19.018 | AR&R 20 year, 1 hour storm, average 71.1 mm/h, Zone 1 |
| P T.6b | 0.089 | 0.81 | 20.198 | 20.16 | AR&R 20 year, 20 minutes storm, average 124.4 mm/h, Zone 1 |
| P T.6a | 0.092 | 0.83 | 20.131 | 20.11 | AR&R 20 year, 15 minutes storm, average 140.2 mm/h, Zone 1 |
| P T.6 | 0.405 | 2.66 | 19.564 | 19.13 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| z P A.14a | 0.144 | 2.09 | 19.574 | 19.474 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P H.1a | 0.05 | 1.6 | 20.836 | 20.813 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P H.1b | 0.093 | 0.85 | 20.785 | 20.733 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P H.1 | 0.129 | 1.17 | 20.673 | 20.59 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P H.2b | 0.161 | 1.46 | 20.514 | 20.386 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P K.1 | 0.075 | 1.22 | 21.329 | 21.316 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P J.2a | 0.369 | 2.81 | 21.084 | 20.983 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P J.2 | 0.367 | 2.18 | 20.944 | 20.833 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P J.3a | 0.397 | 1.84 | 20.807 | 20.655 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P J.3 | 0.461 | 2.13 | 20.585 | 20.508 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P J.4 | 0.478 | 2.29 | 20.409 | 20.216 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |

| | | | | |
|---|---|---|---|---|
| P L.1 | 0.041 | 0.46 | 22.014 | 22.007 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P X.1 | 0.118 | 1.07 | 21.952 | 21.902 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P W.3 | 0.259 | 2.13 | 21.718 | 21.451 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P J.1a | 0.258 | 1.33 | 21.451 | 21.445 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P J.1 | 0.299 | 2.22 | 21.294 | 21.316 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P L.1a | 0.082 | 0.77 | 22.062 | 22.007 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P M.1 | 0.068 | 3.07 | 22.32 | 22.29 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P W.1 | 0.068 | 1.61 | 22.271 | 22.24 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P W.2 | 0.102 | 2.38 | 22.077 | 21.902 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P N.1 | 0.085 | 2.37 | 20.535 | 20.406 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P P.1 | 0.033 | 1.38 | 20.702 | 20.64 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P P.2 | 0.064 | 1.7 | 20.635 | 20.236 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P T.3b | 0.039 | 0.66 | 21.919 | 21.92 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P T.3a | 0.07 | 1.11 | 21.777 | 21.752 AR&R 20 year, 2 hours storm, average 46.1 mm/h, Zone 1 |
| P T.3 | 0.22 | 3.15 | 21.57 | 20.499 AR&R 20 year, 15 minutes storm, average 140.2 mm/h, Zone 1 |
| P T.4 | 0.325 | 2.33 | 20.499 | 20.362 AR&R 20 year, 15 minutes storm, average 140.2 mm/h, Zone 1 |
| P T.5 | 0.338 | 2.57 | 20.308 | 20.124 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P R.1 | 0.024 | 1.66 | 20.678 | 20.558 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P Q.3 | 0.099 | 5.15 | 19.776 | 19.777 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S.1 | 0.045 | 1.55 | 20.617 | 20.458 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S.2 | 0.07 | 1.87 | 20.246 | 20.067 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P T.5a | 0.017 | 0.47 | 20.361 | 20.362 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P T.1 | 0.048 | 0.43 | 22.27 | 22.249 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P T.2 | 0.159 | 2.5 | 22.03 | 21.853 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P V.1 | 0.049 | 6.5 | 20.596 | 20.546 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.6a | 0.252 | 2.17 | 20.538 | 20.269 AR&R 20 year, 1.5 hours storm, average 55.6 mm/h, Zone 1 |
| P Q.1 | 0.02 | 1.56 | 21.465 | 20.065 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P Q.2 | 0.043 | 1.14 | 19.984 | 19.984 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 B/1 | 0.018 | 0.99 | 22.11 | 21.934 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 B/2 | 0.053 | 1.79 | 21.863 | 21.701 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 B/3 | 0.09 | 2.07 | 21.609 | 21.556 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/4 | 0.235 | 1.1 | 21.451 | 21.434 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/5 | 0.271 | 1.11 | 21.38 | 21.355 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/6 | 0.304 | 1.08 | 21.355 | 21.315 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/7 | 0.362 | 0.87 | 21.279 | 21.264 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/8 | 0.65 | 1.41 | 21.128 | 21.107 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/9 | 0.902 | 1.69 | 21.015 | 20.893 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/10 | 0.971 | 1.82 | 20.837 | 20.728 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/11 | 1.068 | 0.94 | 20.701 | 20.696 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.1 | 1.073 | 0.95 | 20.696 | 20.689 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.2a | 1.216 | 1.08 | 20.639 | 20.633 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.2 | 1.232 | 1.09 | 20.615 | 20.578 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.3 | 1.273 | 1.13 | 20.521 | 20.504 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.4 | 1.432 | 1.27 | 20.418 | 20.392 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P A.5 | 1.49 | 1.32 | 20.275 | 20.216 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 D/1 | 0.074 | 1.5 | 21.842 | 21.673 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 D/2 | 0.109 | 1.27 | 21.632 | 21.596 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 D/3 | 0.128 | 1.88 | 21.479 | 21.487 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 E/1 | 0.053 | 1.42 | 21.83 | 21.607 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 E/2 | 0.081 | 1.21 | 21.574 | 21.542 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 E/3 | 0.101 | 1.59 | 21.46 | 21.443 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 H/1 | 0.016 | 0.67 | 21.648 | 21.643 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/1 | 0.033 | 0.73 | 21.621 | 21.617 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/2 | 0.054 | 0.63 | 21.603 | 21.594 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 A/3 | 0.133 | 1.12 | 21.499 | 21.507 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 I/1 | 0.008 | 0.39 | 21.594 | 21.594 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 J/1 | 0.015 | 2.09 | 21.546 | 21.51 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 K/1 | 0.02 | 0.47 | 21.703 | 21.701 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 L/1 | 0.018 | 0.69 | 21.938 | 21.934 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 M/1 | 0.023 | 0.59 | 21.438 | 21.434 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 N/1 | 0.021 | 0.54 | 21.437 | 21.434 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 O/1 | 0.008 | 0.64 | 21.318 | 21.315 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 P/1 | 0.02 | 1.75 | 21.283 | 21.264 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 Q/1 | 0.088 | 0.8 | 21.769 | 21.759 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 C/2 | 0.222 | 1.77 | 21.613 | 21.375 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 T/1 | 0.025 | 0.23 | 20.896 | 20.893 AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |

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|---|---|---|---|---|---|
| P S2 V/1 | 0.018 | 0.16 | 20.733 | 20.728 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 X/1 | 0.09 | 0.82 | 20.752 | 20.745 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P B.1 | 0.11 | 0.69 | 20.727 | 20.711 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P C.1 | 0.106 | 0.49 | 20.692 | 20.689 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 Y/1 | 0.004 | 0.04 | 20.71 | 20.711 | AR&R 20 year, 1 hour storm, average 71.1 mm/h, Zone 1 |
| P S2 ZB/1 | 0.015 | 0.31 | 21.606 | 21.607 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 ZC/1 | 0.019 | 0.28 | 21.673 | 21.673 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 ZF/1 | 0.006 | 0.09 | 21.597 | 21.596 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 ZG/1 | 0.006 | 0.12 | 21.542 | 21.542 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 ZZ/1 | 0.016 | 0.83 | 21.651 | 21.643 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 F/1 | 0.069 | 2.28 | 21.836 | 21.742 | AR&R 20 year, 1.5 hours storm, average 55.6 mm/h, Zone 1 |
| P S2 F/2 | 0.073 | 1.41 | 21.682 | 21.656 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 G/1 | 0.033 | 1.98 | 21.554 | 21.434 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 G/2 | 0.037 | 1.22 | 21.38 | 21.353 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 C/1 | 0.085 | 1.03 | 21.822 | 21.759 | AR&R 20 year, 5 minutes storm, average 209.6 mm/h, Zone 1 |
| P S2 S/1 | 0.052 | 1.78 | 21.475 | 21.378 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 U/1 | 0.068 | 0.62 | 20.733 | 20.728 | AR&R 20 year, 1.5 hours storm, average 55.6 mm/h, Zone 1 |
| P S2 W/1 | 0.065 | 0.58 | 20.77 | 20.762 | AR&R 20 year, 5 minutes storm, average 209.6 mm/h, Zone 1 |
| P S2 W/2 | 0.111 | 1 | 20.721 | 20.689 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 Z/1 | 0.051 | 0.47 | 20.578 | 20.578 | AR&R 20 year, 10 minutes storm, average 163.7 mm/h, Zone 1 |
| P S2 Z/2 | 0.062 | 0.56 | 20.578 | 20.578 | AR&R 20 year, 5 minutes storm, average 209.6 mm/h, Zone 1 |
| P S2 ZH/1 | 0.112 | 1.02 | 20.387 | 20.392 | AR&R 20 year, 5 minutes storm, average 209.6 mm/h, Zone 1 |
| P S2 ZA/1 | 0.088 | 0.8 | 20.571 | 20.574 | AR&R 20 year, 5 minutes storm, average 209.6 mm/h, Zone 1 |
| P S2 ZA/2 | 0.097 | 0.88 | 20.574 | 20.578 | AR&R 20 year, 5 minutes storm, average 209.6 mm/h, Zone 1 |
| P S2 ZI/1 | 0.103 | 0.93 | 20.388 | 20.392 | AR&R 20 year, 5 minutes storm, average 209.6 mm/h, Zone 1 |
| P S2 ZY/1 | 0.26 | 1.45 | 21.24 | 21.212 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |
| P S2 R/1 | 0.279 | 1.92 | 21.127 | 21.107 | AR&R 20 year, 25 minutes storm, average 112.6 mm/h, Zone 1 |

CHANNEL DETAILS

| Name | Max Q (cu.m/s) | Max V (m/s) | Due to Storm |
|---|---|---|---|

OVERFLOW ROUTE DETAILS

| Name | Max Q U/S | Max Q D/S | Safe Q | Max D | Max DxV | Max Width | Max V | Due to Storm |
|---|---|---|---|---|---|---|---|---|
| F H.2a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F H.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.9 | 0.012 | 0.012 | 0 | 0.053 | 0.03 | 0.9 | 0.65 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F A.10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F Total | 3.091 | 3.091 | 0 | 0.318 | 0.73 | 8.54 | 2.3 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F N.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F P.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S.2a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| OF241084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F V.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.6a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.6 | 0 | 0 | 1.701 | 0 | 0 | 0 | 0 | |
| UB4-P | 0.065 | 0 | | | | | | AR&R 20 year, 5 minutes storm, average 209.6 mm |
| F T.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.14a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F H.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F H.1B | 0.005 | 0.005 | 0.295 | 0.04 | 0.02 | 0.46 | 0.59 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F H.1 | 0.005 | 0.005 | 0 | 0.038 | 0.02 | 0.44 | 0.56 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F H.2B | 0.004 | 0.004 | 0 | 0.035 | 0.02 | 0.4 | 0.54 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F K.1 | 0.02 | 0.02 | 0 | 0.061 | 0.05 | 1.18 | 0.76 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F J.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.2A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.3A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F L.1 | 0.004 | 0.004 | 0 | 0.035 | 0.02 | 0.4 | 0.52 | AR&R 20 year, 25 minutes storm, average 112.6 mı |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| F X.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F W.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.1 | 0.004 | 0.004 | 0 | 0.037 | 0.02 | 0.42 | 0.55 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F L.1a | 0.049 | 0.049 | 0 | 0.082 | 0.07 | 1.86 | 0.85 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F M.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F W.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F W.2 | 0.002 | 0.002 | 0 | 0.027 | 0.01 | 0.31 | 0.46 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F N.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F P.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F P.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.3B | 0.007 | 0.007 | 0 | 0.037 | 0.03 | 0.42 | 0.9 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F T.3A | 0.009 | 0.009 | 0 | 0.04 | 0.04 | 0.47 | 0.97 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F T.3 | 0 | 0 | 1.1 | 0 | 0 | 0 | 0 | |
| F T.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.5 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | |
| F R.1 | 0.007 | 0.007 | 0 | 0.044 | 0.03 | 0.58 | 0.63 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F Q.3 | 0.014 | 0.014 | 0 | 0.056 | 0.04 | 0.99 | 0.65 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S.1 | 0.007 | 0.007 | 0.56 | 0.046 | 0.03 | 0.65 | 0.6 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.5a | 0 | 0 | 0.602 | 0 | 0 | 0 | 0 | |
| F T.1 | 0.009 | 0.009 | 0.09 | 0.047 | 0.03 | 0.69 | 0.67 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F U.2 | 0.008 | 0.008 | 0 | 0.04 | 0.04 | 0.47 | 0.88 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F V.1 | 0.01 | 0.01 | 0 | 0.05 | 0.03 | 0.8 | 0.62 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| z F A.6a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F Q.1 | 0.009 | 0.009 | 0 | 0.041 | 0.04 | 0.48 | 0.99 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F Q.2 | 0.01 | 0.01 | 0 | 0.042 | 0.04 | 0.52 | 1.03 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 B/2 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 B/3 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 20 year, 30 minutes storm, average 103.2 mı |
| F S2 A/5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 A/6 | 0.003 | 0.003 | 0 | 0.033 | 0.02 | 0.38 | 0.52 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 A/8 | 0.002 | 0.002 | 0 | 0.026 | 0.01 | 0.29 | 0.44 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 A/9 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.34 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 A/10 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 20 year, 20 minutes storm, average 124.4 mı |
| F S2 A/11 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.34 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F A.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.2a | 0.005 | 0.005 | 0 | 0.041 | 0.02 | 0.5 | 0.46 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F A.3 | 0.005 | 0.005 | 0 | 0.061 | 0.02 | 0.49 | 0.32 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F A.4 | 0.008 | 0.008 | 0 | 0.075 | 0.03 | 0.6 | 0.36 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 D/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 D/3 | 0.001 | 0.001 | 0 | 0.017 | 0.01 | 0.2 | 0.35 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 E/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 E/3 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.33 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 H/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 A/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 A/2 | 0.002 | 0.002 | 0 | 0.027 | 0.01 | 0.31 | 0.45 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 I/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 J/1 | 0.001 | 0.001 | 0 | 0.017 | 0.01 | 0.2 | 0.32 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 K/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 L/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 M/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 N/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 O/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 P/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 Q/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 C/2 | 0.016 | 0.016 | 0 | 0.056 | 0.04 | 1.01 | 0.74 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 T/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 20 year, 15 minutes storm, average 140.2 mı |
| F S2 V/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.34 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F C.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 Y/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 ZB/1 | 0.001 | 0.001 | 0 | 0.017 | 0.01 | 0.2 | 0.34 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 ZC/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 ZF/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 ZG/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 ZZ/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F S2 F/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F S2 G/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F S2 W/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F S2 Z/2 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 ZA/2 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 AR&R 20 year, 25 minutes storm, average 112.6 mı |
| F S2 R/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 AR&R 20 year, 25 minutes storm, average 112.6 mı |

DETENTION BASIN DETAILS

| Name | Max WL | MaxVol | Max Q Total | Max Q Low Level | Max Q High Level |
|---|---|---|---|---|---|
| B UB2 | 22.52 | 130.2 | 0.048 | 0.048 | 0 |
| B UB3 | 20.97 | 212.8 | 0.084 | 0.084 | 0 |
| B UB5W | 20.9 | 325.3 | 0.091 | 0.091 | 0 |
| B UB5E | 21.3 | 263.9 | 0.089 | 0.089 | 0 |
| B UB4 | 21.18 | 197 | 0.065 | 0 | 0.065 |
| B UB5C | 20.52 | 228.7 | 0.144 | 0.144 | 0 |
| B Lot C | 23.1 | 303 | 0.069 | 0.069 | 0 |
| B Lot Fa | 22.67 | 177.5 | 0.033 | 0.033 | 0 |
| B Lot H | 22.92 | 305.3 | 0.085 | 0.085 | 0 |
| B Lot Fb | 22.24 | 108.1 | 0.052 | 0.052 | 0 |
| B Lot Gb | 21.75 | 302.5 | 0.068 | 0.068 | 0 |
| B Lot Ga | 21.25 | 237.4 | 0.065 | 0.065 | 0 |
| B Lot E | 20.31 | 268.7 | 0.051 | 0.051 | 0 |
| B Lot B | 20.14 | 356.3 | 0.112 | 0.112 | 0 |
| B Lot D | 20.24 | 316.8 | 0.088 | 0.088 | 0 |
| B Lot A | 20.09 | 318.3 | 0.103 | 0.103 | 0 |

CONTINUITY CHECK for AR&R 20 year, 1.5 hours storm, average 55.6 mm/h, Zone 1

| Node | Inflow (cu.m) | Outflow (cu.m) | Storage Ch (cu.m) | Difference % |
|---|---|---|---|---|
| B UB2 | 317.69 | 300.64 | 15.8 | 0.4 |
| H.2a | 300.64 | 300.38 | 0 | 0.1 |
| H.2 | 564.54 | 563.44 | 0 | 0.2 |
| A.6 | 8084.54 | 8067.35 | 0 | 0.2 |
| A.7 | 8225.39 | 8211.98 | 0 | 0.2 |
| A.8 | 8954.5 | 8939.34 | 0 | 0.2 |
| A.9 | 9016.2 | 8998.48 | 0 | 0.2 |
| A.10 | 9128.79 | 9121.95 | 0 | 0.1 |
| A.12 | 9753.23 | 9742.4 | 0 | 0.1 |
| A.12a | 10455.63 | 10438.74 | 0 | 0.2 |
| A.14 | 11755.67 | 11745.92 | 0 | 0.1 |
| A.15 | 11745.92 | 11742.04 | 0 | 0 |
| B UB3 | 528.5 | 502.33 | 24.82 | 0.3 |
| P.3 | 595.57 | 594.88 | 0 | 0.1 |
| B UB5W | 704.42 | 632.54 | 68.13 | 0.5 |
| S.2a | 632.54 | 631.29 | 0 | 0.2 |
| B UB5E | 563.69 | 467.21 | 93.27 | 0.6 |
| T.6a | 467.21 | 466.99 | 0 | 0 |
| T.6 | 1317.73 | 1316.94 | 0 | 0.1 |
| B UB4 | 451.65 | 450.12 | 1.53 | 0 |
| B UB5C | 714.28 | 713.24 | 0.77 | 0 |
| H.1a | 67.81 | 67.9 | 0 | -0.1 |
| H.1b | 135.21 | 135.61 | 0 | -0.3 |
| H.1 | 193.37 | 193.2 | 0 | 0.1 |
| H.2b | 249.12 | 249.02 | 0 | 0 |
| K.1 | 108.96 | 108.89 | 0 | 0.1 |
| J.2 | 567.44 | 567.68 | 0 | 0 |
| J.2a | 571.04 | 571.27 | 0 | 0 |
| J.3 | 584.44 | 584.95 | 0 | -0.1 |
| J.3a | 696.09 | 696.33 | 0 | 0 |
| J.4 | 724.1 | 724.47 | 0 | -0.1 |
| L.1 | 63.49 | 63.47 | 0 | 0 |
| X.1 | 192.37 | 192.37 | 0 | 0 |
| W.3 | 400.46 | 402.13 | 0 | -0.4 |
| J.1a | 402.13 | 401.23 | 0 | 0.2 |

| | | | | |
|---|---|---|---|---|
| J.1 | 468.46 | 468.37 | 0 | 0 |
| L.1a | 169.39 | 169.3 | 0 | 0.1 |
| M.1 | 97.14 | 97.33 | 0 | -0.2 |
| W.1 | 97.33 | 97.37 | 0 | 0 |
| W.2 | 148.89 | 149.15 | 0 | -0.2 |
| N.1 | 156.72 | 158.04 | 0.01 | -0.8 |
| P.1 | 48.49 | 48.61 | 0 | -0.2 |
| P.2 | 93.03 | 93.24 | 0 | -0.2 |
| T.3b | 41.47 | 41.46 | 0 | 0 |
| T.3a | 81.34 | 81.33 | 0 | 0 |
| T.3 | 670.31 | 670.76 | 0 | -0.1 |
| T.4 | 810.84 | 811.06 | 0 | 0 |
| T.5 | 849.89 | 850.73 | 0 | -0.1 |
| R.1 | 41.47 | 41.48 | 0 | 0 |
| Q.3 | 152.28 | 152.77 | 0 | -0.3 |
| S.1 | 70.82 | 70.83 | 0 | 0 |
| S.2 | 100.74 | 101.19 | 0 | -0.4 |
| T.5a | 20.95 | 21.2 | 0 | -1.2 |
| T.1 | 76.01 | 76 | 0 | 0 |
| T.2 | 596.57 | 594.79 | 0 | 0.3 |
| V.1 | 73.29 | 73.3 | 0 | 0 |
| O H.1a | 0 | 0 | 0 | 0 |
| O P.2 | 0 | 0 | 0 | 0 |
| N Total | 11742.04 | 11742.04 | 0 | 0 |
| A.6a | 363.72 | 360.06 | 0.15 | 1 |
| Q.1 | 39.48 | 39.51 | 0 | -0.1 |
| Q.2 | 70.9 | 70.92 | 0 | 0 |
| S2 B/1 | 22.72 | 22.96 | 0 | -1 |
| S2 B/2 | 73.42 | 73.34 | 0 | 0.1 |
| S2 B/3 | 131.46 | 131.48 | 0 | 0 |
| S2 A/4 | 757.1 | 756.06 | 0 | 0.1 |
| S2 A/5 | 820.72 | 820.07 | 0 | 0.1 |
| S2 A/6 | 875.18 | 874.42 | 0 | 0.1 |
| S2 A/7 | 1131.79 | 1130.54 | 0 | 0.1 |
| S2 A/8 | 2284.84 | 2280.18 | 0 | 0.2 |
| S2 A/9 | 2656.09 | 2653.3 | 0 | 0.1 |
| S2 A/10 | 2710.46 | 2708.3 | 0 | 0.1 |
| S2 A/11 | 3253.61 | 3254.96 | 0 | 0 |
| A.1 | 3254.77 | 3254.26 | 0 | 0 |
| A.2 | 3921.54 | 3917.17 | 0.2 | 0.1 |
| ZJ/1 | 3976.25 | 3973.17 | 0 | 0.1 |
| A.3 | 4865.19 | 4857.5 | 0 | 0.2 |
| A.4 | 5256.71 | 5251.7 | 0 | 0.1 |
| A.5 | 6449.36 | 6436.55 | 0 | 0.2 |
| S2 C/1 | 0 | 0 | 0 | 0 |
| S2 D/1 | 99.78 | 99.7 | 0 | 0.1 |
| S2 D/2 | 154.49 | 154.73 | 0 | -0.2 |
| S2 D/3 | 185.43 | 185.48 | 0 | 0 |
| S2 E/1 | 67.32 | 67.36 | 0 | -0.1 |
| S2 E/2 | 110.73 | 110.97 | 0 | -0.2 |
| S2 E/3 | 142.69 | 142.69 | 0 | 0 |
| S2 F/1 | 0 | 0 | 0 | 0 |
| S2 G/1 | 0 | 0 | 0 | 0 |
| S2 H/1 | 23.85 | 23.94 | 0 | -0.4 |
| S2 A/1 | 47.86 | 47.95 | 0 | -0.2 |
| S2 A/2 | 84.71 | 84.73 | 0 | 0 |
| S2 A/3 | 606.43 | 605.03 | 0 | 0.2 |
| S2 I/1 | 9.32 | 9.3 | 0 | 0.2 |
| S2 J/1 | 21.06 | 21.06 | 0 | 0 |
| S2 K/1 | 29.11 | 29.25 | 0 | -0.5 |
| S2 L/1 | 25.36 | 25.34 | 0 | 0.1 |
| S2 M/1 | 34.14 | 34.29 | 0 | -0.4 |
| S2 N/1 | 30.23 | 30.37 | 0 | -0.5 |
| S2 O/1 | 8.43 | 8.43 | 0 | 0 |
| S2 P/1 | 29.43 | 29.53 | 0 | -0.3 |
| S2 Q/1 | 119.88 | 119.82 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| S2 C/2 | 806.73 | 804.83 | 0 | 0.2 |
| S2 S/1 | 0 | 0 | 0 | 0 |
| S2 T/1 | 29.06 | 29 | 0 | 0.2 |
| S2 U/1 | 0 | 0 | 0 | 0 |
| S2 V/1 | 23.49 | 23.45 | 0 | 0.2 |
| S2 W/1 | 0 | 0 | 0 | 0 |
| S2 X/1 | 120.14 | 120.25 | 0 | -0.1 |
| B.1 | 150.4 | 150.4 | 0 | 0 |
| C.1 | 150.58 | 150.03 | 0 | 0.4 |
| S2 Y/1 | 0 | 0.18 | 0 | 0 |
| S2 Z/1 | 0 | 0 | 0 | 0 |
| S2 ZA/1 | 0 | 0 | 0 | 0 |
| S2 ZB/1 | 21.77 | 21.73 | 0 | 0.2 |
| S2 ZC/1 | 27.52 | 27.5 | 0 | 0.1 |
| S2 ZF/1 | 8.14 | 8.2 | 0 | -0.8 |
| S2 ZG/1 | 8.14 | 8.19 | 0 | -0.7 |
| S2 ZH/1 | 0 | 0 | 0 | 0 |
| S2 ZI/1 | 0 | 0 | 0 | 0 |
| S2 ZZ/1 | 23.85 | 23.92 | 0 | -0.3 |
| O S2 W/2 | 0 | 0 | 0 | 0 |
| O S2 Z/2 | 0 | 0 | 0 | 0 |
| O S2 ZA/2 | 0 | 0 | 0 | 0 |
| B Lot C | 603.52 | 504.99 | 96.63 | 0.3 |
| S2 F/2 | 513.44 | 513.19 | 0 | 0 |
| B Lot Fa | 327.24 | 244.92 | 80.17 | 0.7 |
| S2 G/2 | 251.22 | 251.07 | 0 | 0.1 |
| B Lot H | 656.8 | 587.61 | 66.6 | 0.4 |
| B Lot Fb | 297.18 | 294.82 | 1.26 | 0.4 |
| B Lot Gb | 599.69 | 499.45 | 98.26 | 0.3 |
| B Lot Ga | 507.58 | 444.02 | 61.79 | 0.3 |
| S2 W/2 | 514.99 | 514.79 | 0 | 0 |
| B Lot E | 444.41 | 324.55 | 117.63 | 0.5 |
| S2 Z/2 | 354.45 | 353.91 | 0 | 0.2 |
| B Lot B | 690.7 | 633.99 | 55.26 | 0.2 |
| B Lot D | 586.46 | 508.25 | 76.65 | 0.3 |
| S2 ZA/2 | 539.12 | 538.54 | 0 | 0.1 |
| B Lot A | 616.68 | 566.47 | 48.82 | 0.2 |
| S2 ZY/1 | 326.57 | 326.63 | 0 | 0 |
| S2 R/1 | 353.03 | 353.22 | 0 | -0.1 |

Run Log for 9012 run at 16:48:21 on 9/8/2018
No water upwelling from any pit. Freeboard was adequate at all pits.
The maximum flow in these overflow routes is unsafe: F Total

**DRAINS results prepared from Version 2018.06 100 YEAR**

PIT / NODE DETAILS Version 8

| Name | Max HGL | Max Pond HGL | Max Surfac Flow Arrivi (cu.m/s) | Max Pond Volume (cu.m) | Min Freeboard (m) | Overflow (cu.m/s) | Constraint |
|---|---|---|---|---|---|---|---|
| H.2a | 21.54 | | 0 | | 1.43 | | None |
| H.2 | 20.93 | | 0.015 | | 1.7 | 0.001 | Inlet Capacity |
| A.6 | 20.67 | | 0 | | 2.26 | 0 | None |
| A.7 | 20.35 | | 0.045 | | 2.05 | 0.005 | Inlet Capacity |
| A.8 | 20.17 | | 0.005 | | 2.07 | 0.003 | Inlet Capacity |
| A.9 | 19.86 | | 0.081 | | 1.71 | 0.018 | Inlet Capacity |
| A.10 | 19.41 | 21.39 | 0.044 | 0.3 | 1.91 | 0 | Inlet Capacity |
| A.12 | 19.19 | 21.6 | 0 | 0 | 2.41 | 0 | None |
| A.12a | 18.46 | 21.6 | 0 | 0 | 3.14 | 0 | None |
| A.14 | 17.72 | 21.8 | 0 | 0 | 4.08 | 0 | None |
| A.15 | 17.3 | | 0 | | | | |
| P.3 | 20.42 | | 0 | | 1.83 | 0 | None |
| S.2a | 19.24 | | 0 | | 2.59 | 0 | None |
| T.6a | 20.33 | | 0 | | 1.8 | 0 | None |
| T.6 | 20.29 | | 0 | | 1.71 | 0 | None |
| H.1a | 21.72 | 22.06 | 0.064 | 0.4 | 0.27 | 0 | Inlet Capacity |
| H.1b | 21.66 | | 0.063 | | 0.47 | 0.007 | Inlet Capacity |
| H.1 | 21.53 | | 0.057 | | 0.78 | 0.006 | Inlet Capacity |
| H.2b | 21.29 | | 0.052 | | 1.2 | 0.005 | Inlet Capacity |
| K.1 | 22.34 | | 0.142 | | 0.51 | 0.04 | Inlet Capacity |
| J.2 | 22.24 | | 0 | | 1.05 | 0 | None |
| J.2a | 21.78 | 22.9 | 0.003 | 0 | 1.1 | 0 | Inlet Capacity |
| J.3 | 21.58 | 22.7 | 0.047 | 0.3 | 1.06 | 0 | Inlet Capacity |
| J.3a | 21.32 | 22.6 | 0.098 | 0.3 | 1.18 | 0 | Inlet Capacity |
| J.4 | 21.1 | 22.62 | 0.025 | 0.1 | 1.48 | 0 | Inlet Capacity |
| L.1 | 23.1 | | 0.056 | | 0.1 | 0.006 | Inlet Capacity |
| X.1 | 23.06 | | 0 | | 0.35 | 0 | None |
| W.3 | 22.96 | 23.11 | 0.055 | 0.5 | 0.08 | 0 | Inlet Capacity |
| J.1a | 22.4 | | 0 | | 0.76 | 0 | None |
| J.1 | 22.39 | | 0.059 | | 0.77 | 0.007 | Inlet Capacity |
| L.1a | 23.14 | | 0.163 | | 0.01 | 0.083 | Inlet Capacity |
| M.1 | 23.38 | 23.51 | 0.085 | 0.6 | 0.03 | 0 | Inlet Capacity |
| W.1 | 23.28 | | 0 | | 0.6 | 0 | None |
| W.2 | 23.26 | | 0.045 | | 0.26 | 0.003 | Inlet Capacity |
| N.1 | 20.76 | 22.39 | 0.138 | 2.4 | 1.4 | 0.045 | Inlet Capacity |
| P.1 | 20.82 | 21.86 | 0.043 | 0.4 | 0.97 | 0 | Inlet Capacity |
| P.2 | 20.65 | 21.78 | 0.039 | 0.3 | 1.06 | 0 | Inlet Capacity |
| T.3b | 22.06 | | 0.036 | | 1.44 | 0.009 | Inlet Capacity |
| T.3a | 21.97 | | 0.044 | | 1.47 | 0.012 | Inlet Capacity |
| T.3 | 21.82 | | 0 | | 1.66 | 0 | None |
| T.4 | 20.52 | 21.99 | 0.071 | 0.6 | 1.37 | 0 | Inlet Capacity |
| T.5 | 20.43 | 21.91 | 0.015 | 0.2 | 1.45 | 0 | Inlet Capacity |
| R.1 | 20.78 | | 0.036 | | 1.31 | 0.009 | Inlet Capacity |
| Q.3 | 20.38 | | 0.057 | | 1.71 | 0.018 | Inlet Capacity |
| S.1 | 20.75 | | 0.062 | | 0.81 | 0.011 | Inlet Capacity |
| S.2 | 20.34 | 21.42 | 0.037 | 0.3 | 1.02 | 0 | Inlet Capacity |
| T.5a | 20.45 | 21.8 | 0.031 | 0.6 | 1.26 | 0 | Inlet Capacity |
| T.1 | 22.43 | | 0.067 | | 1.31 | 0.013 | Inlet Capacity |
| T.2 | 22.33 | | 0.065 | | 1.41 | 0.012 | Inlet Capacity |
| V.1 | 20.78 | | 0.074 | | 1.2 | 0.015 | Inlet Capacity |
| A.6a | 21.2 | 22.85 | 0.342 | 0.7 | 1.58 | 0 | Inlet Capacity |
| Q.1 | 21.56 | | 0.035 | | 1.8 | 0.012 | Inlet Capacity |
| Q.2 | 20.42 | | 0.039 | | 1.98 | 0.013 | Inlet Capacity |
| S2 B/1 | 22.3 | | 0.022 | | | | |
| S2 B/2 | 22.32 | | 0.022 | | 0.48 | 0.001 | Inlet Capacity |
| S2 B/3 | 22.18 | | 0.026 | | 0.34 | 0.001 | Inlet Capacity |
| S2 A/4 | 22.19 | | 0 | | 0.35 | | None |
| S2 A/5 | 22.15 | | 0 | | 0.25 | 0 | None |
| S2 A/6 | 22.02 | | 0.048 | | 0.23 | 0.005 | Inlet Capacity |
| S2 A/7 | 21.98 | | 0 | | 0.44 | | None |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| S2 A/8 | 21.92 | | 0.044 | | 0.21 | 0.004 | Inlet Capacity |
| S2 A/9 | 21.72 | | 0.024 | | 0.07 | 0.001 | Inlet Capacity |
| S2 A/10 | 21.43 | | 0.025 | | 0.02 | 0.002 | Inlet Capacity |
| S2 A/11 | 21.17 | | 0.021 | | 0 | 0.117 | Outlet System |
| A.1 | 21.14 | 21.38 | 0 | 0 | 0.24 | 0 | None |
| A.2 | 21.14 | 21.61 | 0.006 | 0.4 | 0.33 | 0 | Inlet Capacity |
| ZJ/1 | 21.08 | | 0.058 | | 0.52 | 0.006 | Inlet Capacity |
| A.3 | 21.03 | | 0.012 | | 1.09 | 0.007 | Inlet Capacity |
| A.4 | 20.96 | | 0.064 | | 1.47 | 0.012 | Inlet Capacity |
| A.5 | 20.84 | | 0 | | 1.78 | | None |
| S2 D/1 | 21.86 | | 0.088 | | | | |
| S2 D/2 | 21.76 | 22.46 | 0.024 | 0.3 | 0.65 | 0 | Inlet Capacity |
| S2 D/3 | 21.66 | | 0.02 | | 0.85 | 0.001 | Inlet Capacity |
| S2 E/1 | 21.84 | | 0.064 | | | | |
| S2 E/2 | 21.65 | 22.49 | 0.019 | 0.2 | 0.8 | 0 | Inlet Capacity |
| S2 E/3 | 21.59 | | 0.021 | | 0.92 | 0.001 | Inlet Capacity |
| S2 H/1 | 22.39 | 22.57 | 0.021 | 0.2 | 0.13 | 0 | Inlet Capacity |
| S2 A/1 | 22.39 | | 0 | | 0.27 | 0 | None |
| S2 A/2 | 22.39 | | 0.032 | | 0.14 | 0.002 | Inlet Capacity |
| S2 A/3 | 22.35 | | 0 | | 0.34 | | None |
| S2 I/1 | 22.35 | | 0.01 | | 0.13 | 0 | None |
| S2 J/1 | 22.17 | | 0.018 | | 0.46 | 0.001 | Inlet Capacity |
| S2 K/1 | 22.25 | 22.57 | 0.026 | 0.3 | 0.27 | 0 | Inlet Capacity |
| S2 L/1 | 22.33 | | 0.022 | | 0.47 | 0.001 | Inlet Capacity |
| S2 M/1 | 22.16 | 22.33 | 0.03 | 0.3 | 0.11 | 0 | Inlet Capacity |
| S2 N/1 | 22.16 | 22.32 | 0.027 | 0.3 | 0.11 | 0 | Inlet Capacity |
| S2 O/1 | 22 | | 0.01 | | 0.23 | 0 | None |
| S2 P/1 | 21.93 | 22.41 | 0.026 | 0.2 | 0.42 | 0 | Inlet Capacity |
| S2 Q/1 | 22.34 | 22.46 | 0.105 | 0.2 | 0 | 0 | Outlet System |
| S2 C/2 | 22.23 | | 0.087 | | 0.09 | 0.021 | Inlet Capacity |
| S2 T/1 | 21.43 | | 0.049 | | 0.02 | 0.01 | Inlet Capacity |
| S2 V/1 | 21.17 | | 0.025 | | 0 | 0.016 | Outlet System |
| S2 X/1 | 21.25 | | 0.107 | | | | |
| B.1 | 21.24 | 21.56 | 0.026 | 0.3 | 0.27 | | Inlet Capacity |
| C.1 | 21.18 | | 0 | | 0.41 | 0 | None |
| S2 Y/1 | 21.18 | | 0 | | 0.07 | 0 | None |
| S2 ZB/1 | 21.67 | | 0.019 | | 0.74 | 0.001 | Inlet Capacity |
| S2 ZC/1 | 21.77 | | 0.024 | | 0.66 | 0.001 | Inlet Capacity |
| S2 ZF/1 | 21.66 | 22.41 | 0.007 | 0.1 | 0.73 | 0 | Inlet Capacity |
| S2 ZG/1 | 21.59 | 22.41 | 0.007 | 0.1 | 0.8 | 0 | Inlet Capacity |
| S2 ZZ/1 | 22.41 | 22.59 | 0.021 | 0.2 | 0.14 | 0 | Inlet Capacity |
| S2 F/2 | 22.39 | 22.5 | 0.007 | 0.1 | 0.09 | 0 | Inlet Capacity |
| S2 G/2 | 21.98 | 22.26 | 0.006 | 0.1 | 0.26 | 0 | Inlet Capacity |
| S2 W/2 | 21.18 | 21.29 | 0.188 | 1.9 | 0 | 0 | Outlet System |
| S2 Z/2 | 21.04 | | 0.027 | | 0.93 | 0.001 | Inlet Capacity |
| S2 ZA/2 | 21.02 | | 0.028 | | 0.95 | 0.001 | Inlet Capacity |
| S2 ZY/1 | 21.82 | | 0.317 | | | | |
| S2 R/1 | 21.79 | | 0.023 | | 0 | 0.026 | Outlet System |

SUB-CATCHMENT DETAILS

| Name | Max Flow Q (cu.m/s) | Paved Max Q (cu.m/s) | Grassed Max Q (cu.m/s) | Paved Tc (min) | Grassed Tc (min) | Supp. Tc (min) | Due to Storm |
|---|---|---|---|---|---|---|---|
| C H.2a | 0.24 | 0.157 | 0.088 | 10 | 15 | 0 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone |
| C H.2 | 0.015 | 0.014 | 0.002 | 5 | 10 | 0 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C A.9 | 0.063 | 0.058 | 0.005 | 5 | 10 | 0 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C A.10 | 0.026 | 0.024 | 0.002 | 5 | 10 | 0 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C N.1a | 0.449 | 0.26 | 0.189 | 10 | 10 | 0 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone |
| C S.2a | 0.531 | 0.347 | 0.195 | 10 | 15 | 0 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone |
| C V.1a | 0.479 | 0.278 | 0.201 | 10 | 10 | 0 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone |
| C T.1a | 0.384 | 0.223 | 0.161 | 10 | 10 | 0 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone |
| C A.14a | 0.539 | 0.352 | 0.197 | 10 | 15 | 0 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone |
| C H.1a | 0.057 | 0.05 | 0.007 | 5 | 10 | 0 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C H.1B | 0.057 | 0.05 | 0.007 | 5 | 10 | 0 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C H.1 | 0.052 | 0.045 | 0.006 | 5 | 10 | 0 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C H.2B | 0.052 | 0.045 | 0.006 | 5 | 10 | 0 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |

| | | | | | | |
|---|---|---|---|---|---|---|
| C K.1 | 0.062 | 0.057 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C J.2A | 0.003 | 0.003 | 0 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C J.3 | 0.003 | 0.003 | 0 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C J.3A | 0.098 | 0.086 | 0.012 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C J.4 | 0.025 | 0.022 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C L.1 | 0.056 | 0.051 | 0.004 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C W.3 | 0.052 | 0.048 | 0.004 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C J.1 | 0.059 | 0.054 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C L.1a | 0.145 | 0.133 | 0.011 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C M.1 | 0.085 | 0.079 | 0.007 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C W.2 | 0.045 | 0.042 | 0.004 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C N.1 | 0.138 | 0.127 | 0.011 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C P.1 | 0.043 | 0.039 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C P.2 | 0.039 | 0.036 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C T.3B | 0.036 | 0.034 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C T.3A | 0.035 | 0.032 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C T.4 | 0.059 | 0.054 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C T.5 | 0.015 | 0.014 | 0.001 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C R.1 | 0.036 | 0.034 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C Q.3 | 0.035 | 0.032 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S.1 | 0.062 | 0.057 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S.2 | 0.026 | 0.024 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C T.5a | 0.016 | 0.014 | 0.001 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C U.1 | 0.067 | 0.061 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C U.2 | 0.065 | 0.06 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C V.1 | 0.062 | 0.057 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C A.6a | 0.342 | 0.043 | 0.299 | 10 | 20 | 0 AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| C Q.1 | 0.035 | 0.029 | 0.006 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C Q.2 | 0.028 | 0.023 | 0.004 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 B/1 | 0.022 | 0.005 | 0.016 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 B/2 | 0.022 | 0.021 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 B/3 | 0.025 | 0.023 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 A/6 | 0.048 | 0.045 | 0.004 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 A/8 | 0.022 | 0.02 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 A/9 | 0.02 | 0.019 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 A/10 | 0.025 | 0.023 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 A/11 | 0.02 | 0.018 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C ZJ/1 | 0.05 | 0.046 | 0.004 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C A.4 | 0.064 | 0.059 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 D/1 | 0.088 | 0.081 | 0.007 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 D/2 | 0.024 | 0.022 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 D/3 | 0.02 | 0.018 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 E/1 | 0.064 | 0.016 | 0.049 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 E/2 | 0.019 | 0.018 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 E/3 | 0.021 | 0.019 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 H/1 | 0.021 | 0.019 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 A/2 | 0.032 | 0.03 | 0.003 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 I/1 | 0.007 | 0.007 | 0.001 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 J/1 | 0.018 | 0.017 | 0.001 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 K/1 | 0.025 | 0.023 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 L/1 | 0.022 | 0.021 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 M/1 | 0.03 | 0.028 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 N/1 | 0.026 | 0.024 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 O/1 | 0.006 | 0.005 | 0 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 P/1 | 0.026 | 0.024 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 Q/1 | 0.105 | 0.097 | 0.008 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 C/2 | 0.087 | 0.08 | 0.007 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 T/1 | 0.025 | 0.023 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 V/1 | 0.02 | 0.019 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 X/1 | 0.107 | 0.089 | 0.017 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C B.1 | 0.026 | 0.024 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZB/1 | 0.019 | 0.018 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZC/1 | 0.024 | 0.022 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZF/1 | 0.007 | 0.007 | 0.001 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZG/1 | 0.007 | 0.007 | 0.001 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZZ/1 | 0.021 | 0.019 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |

| | | | | | | |
|---|---|---|---|---|---|---|
| C S2 F/1 | 0.53 | 0.488 | 0.042 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 F/2 | 0.007 | 0.007 | 0.001 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 G/1 | 0.287 | 0.265 | 0.023 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 G/2 | 0.006 | 0.005 | 0 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 C/1 | 0.577 | 0.531 | 0.046 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 S/1 | 0.261 | 0.24 | 0.021 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 U/1 | 0.527 | 0.485 | 0.042 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 W/1 | 0.446 | 0.411 | 0.035 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 W/2 | 0.062 | 0.057 | 0.005 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 Z/1 | 0.39 | 0.36 | 0.031 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 Z/2 | 0.026 | 0.024 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZH/1 | 0.607 | 0.559 | 0.048 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZA/1 | 0.515 | 0.475 | 0.041 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZA/2 | 0.027 | 0.025 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 ZI/1 | 0.542 | 0.499 | 0.043 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C Open A | 0.317 | 0.04 | 0.277 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |
| C S2 R/1 | 0.023 | 0.021 | 0.002 | 5 | 10 | 0 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone |

Outflow Volumes for Total Catchment (12.6 impervious + 4.58 pervious = 17.2 total ha)

| Storm | Total Rainf cu.m | Total Runo cu.m (Runc | Impervious cu.m (Runc | Pervious Runoff cu.m (Runoff %) |
|---|---|---|---|---|
| AR&R 100 ' | 3844.49 | 3156.66 (8 | 2675.63 (9 | 481.03 (46.9%) |
| AR&R 100 ' | 6045.23 | 5178.62 (8 | 4278.91 (9 | 899.71 (55.8%) |
| AR&R 100 ' | 7822.15 | 6808.82 (8 | 5573.44 (9 | 1235.37 (59.2%) |
| AR&R 100 ' | 9301.24 | 8163.51 (8 | 6650.91 (9 | 1512.60 (60.9%) |
| AR&R 100 ' | 10559.97 | 9303.47 (8 | 7568.00 (9 | 1735.47 (61.6%) |
| AR&R 100 ' | 11658.05 | 10300.34 ( | 8367.89 (9 | 1932.45 (62.1%) |
| AR&R 100 ' | 14239.95 | 12639.77 ( | 10248.92 (' | 2390.86 (62.9%) |
| AR&R 100 ' | 16168.5 | 14382.93 ( | 11655.31 (' | 2727.62 (63.2%) |
| AR&R 100 ' | 18969.03 | 17403.83 ( | 13762.28 (' | 3641.54 (71.9%) |
| AR&R 100 ' | 20996.38 | 19383.47 ( | 15260.18 (' | 4123.30 (73.6%) |
| AR&R 100 ' | 23917.48 | 22090.50 ( | 17409.72 (' | 4680.78 (73.3%) |

PIPE DETAILS

| Name | Max Q (cu.m/s) | Max V (m/s) | Max U/S HGL (m) | Max D/S HGL (m) | Due to Storm |
|---|---|---|---|---|---|
| z P H.2a | 0.051 | 1.44 | 21.557 | 21.54 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P H.2a | 0.051 | 1.61 | 21.522 | 21.402 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P H.2 | 0.271 | 1.7 | 20.804 | 20.669 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.6 | 2.208 | 1.95 | 20.467 | 20.347 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.7 | 2.3 | 2.03 | 20.242 | 20.172 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.8 | 2.543 | 2.25 | 20.043 | 19.856 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.9 | 2.598 | 2.3 | 19.46 | 19.409 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.10 | 2.722 | 2.41 | 19.257 | 19.191 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.12 | 2.804 | 2.48 | 18.564 | 18.46 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.11 | 2.947 | 3.1 | 18.286 | 17.908 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.14 | 3.381 | 3.45 | 17.368 | 17.304 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P UB3 | 0.097 | 0.88 | 20.421 | 20.415 | AR&R 100 year, 30 minutes storm, average 135.7 mm/h, Zone 1 |
| P P.3 | 0.166 | 1.5 | 20.283 | 20.172 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P253936 | 0.111 | 2.05 | 19.588 | 19.238 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P253921 | 0.111 | 1.98 | 19.213 | 19.191 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P T.6b | 0.088 | 0.79 | 20.35 | 20.327 | AR&R 100 year, 10 minutes storm, average 211.1 mm/h, Zone 1 |
| P T.6a | 0.094 | 0.85 | 20.3 | 20.291 | AR&R 100 year, 10 minutes storm, average 211.1 mm/h, Zone 1 |
| P T.6 | 0.437 | 2.68 | 19.564 | 19.152 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| z P A.14a | 0.159 | 2.14 | 19.589 | 19.489 | AR&R 100 year, 1 hour storm, average 94.1 mm/h, Zone 1 |
| P H.1a | 0.061 | 0.55 | 21.68 | 21.659 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P H.1b | 0.114 | 1.03 | 21.594 | 21.529 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P H.1 | 0.164 | 1.48 | 21.424 | 21.29 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P H.2b | 0.209 | 1.89 | 21.157 | 20.928 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P K.1 | 0.093 | 0.85 | 22.256 | 22.237 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P J.2a | 0.428 | 1.98 | 21.903 | 21.784 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P J.2 | 0.43 | 1.99 | 21.744 | 21.579 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P J.3a | 0.466 | 2.15 | 21.527 | 21.323 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P J.3 | 0.558 | 2.58 | 21.218 | 21.103 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P J.4 | 0.581 | 2.69 | 20.862 | 20.669 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |

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|---|---|---|---|---|
| P L.1 | 0.054 | 0.49 | 23.073 | 23.063 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P X.1 | 0.144 | 1.31 | 22.979 | 22.956 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P W.3 | 0.297 | 1.86 | 22.654 | 22.4 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P J.1a | 0.295 | 1.36 | 22.399 | 22.392 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P J.1 | 0.343 | 1.58 | 22.271 | 22.237 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P L.1a | 0.096 | 0.87 | 23.083 | 23.063 AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P M.1 | 0.08 | 0.73 | 23.296 | 23.281 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P W.1 | 0.083 | 0.75 | 23.276 | 23.264 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P W.2 | 0.121 | 1.1 | 23.107 | 22.956 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P N.1 | 0.093 | 2.42 | 20.542 | 20.414 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P P.1 | 0.04 | 1.42 | 20.712 | 20.655 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P P.2 | 0.076 | 1.79 | 20.649 | 20.415 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P T.3b | 0.045 | 0.59 | 21.962 | 21.975 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P T.3a | 0.07 | 0.86 | 21.828 | 21.817 AR&R 100 year, 1 hour storm, average 94.1 mm/h, Zone 1 |
| P T.3 | 0.228 | 3.49 | 21.558 | 20.521 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P T.4 | 0.346 | 2.3 | 20.521 | 20.426 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P T.5 | 0.374 | 2.24 | 20.379 | 20.291 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P R.1 | 0.027 | 1.72 | 20.683 | 20.563 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P Q.3 | 0.113 | 1.02 | 20.189 | 20.172 AR&R 100 year, 15 minutes storm, average 182.1 mm/h, Zone 1 |
| P S.1 | 0.051 | 1.6 | 20.625 | 20.466 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S.2 | 0.084 | 1.97 | 20.258 | 20.08 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P T.5a | 0.024 | 0.41 | 20.423 | 20.426 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P T.1 | 0.054 | 0.49 | 22.329 | 22.325 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P T.2 | 0.172 | 2.16 | 22.135 | 21.868 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P V.1 | 0.057 | 6.94 | 20.599 | 20.555 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.6a | 0.338 | 2.12 | 20.686 | 20.669 AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P Q.1 | 0.023 | 1.63 | 21.47 | 20.418 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P Q.2 | 0.047 | 0.43 | 20.379 | 20.376 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P S2 B/1 | 0.046 | 0.54 | 22.301 | 22.316 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 B/2 | 0.08 | 0.72 | 22.276 | 22.179 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 B/3 | 0.119 | 0.75 | 22.164 | 22.189 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 A/4 | 0.272 | 0.96 | 22.153 | 22.145 AR&R 100 year, 30 minutes storm, average 135.7 mm/h, Zone 1 |
| P S2 A/5 | 0.33 | 1.17 | 22.099 | 22.019 AR&R 100 year, 30 minutes storm, average 135.7 mm/h, Zone 1 |
| P S2 A/6 | 0.358 | 1.27 | 22.019 | 21.98 AR&R 100 year, 30 minutes storm, average 135.7 mm/h, Zone 1 |
| P S2 A/7 | 0.416 | 0.94 | 21.942 | 21.916 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P S2 A/8 | 0.705 | 1.32 | 21.79 | 21.725 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P S2 A/9 | 1.012 | 1.89 | 21.605 | 21.427 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 A/10 | 1.056 | 1.98 | 21.353 | 21.174 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 A/11 | 1.095 | 0.97 | 21.146 | 21.143 AR&R 100 year, 15 minutes storm, average 182.1 mm/h, Zone 1 |
| P A.1 | 1.099 | 0.97 | 21.143 | 21.139 AR&R 100 year, 15 minutes storm, average 182.1 mm/h, Zone 1 |
| P A.2a | 1.296 | 1.15 | 21.086 | 21.082 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.2 | 1.326 | 1.17 | 21.063 | 21.033 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P A.3 | 1.304 | 1.15 | 20.976 | 20.961 AR&R 100 year, 10 minutes storm, average 211.1 mm/h, Zone 1 |
| P A.4 | 1.534 | 1.36 | 20.869 | 20.844 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P A.5 | 1.565 | 1.38 | 20.727 | 20.669 AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 D/1 | 0.086 | 1.5 | 21.865 | 21.756 AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 D/2 | 0.128 | 1.17 | 21.731 | 21.658 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 D/3 | 0.152 | 1.67 | 21.571 | 21.512 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 E/1 | 0.064 | 1.5 | 21.845 | 21.651 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 E/2 | 0.098 | 1.18 | 21.618 | 21.586 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 E/3 | 0.122 | 1.88 | 21.463 | 21.475 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 H/1 | 0.023 | 0.21 | 22.39 | 22.394 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 A/1 | 0.048 | 0.44 | 22.384 | 22.387 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 A/2 | 0.077 | 0.7 | 22.367 | 22.354 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 A/3 | 0.153 | 0.96 | 22.286 | 22.189 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 I/1 | 0.014 | 0.12 | 22.347 | 22.354 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 J/1 | 0.022 | 0.2 | 22.173 | 22.189 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 K/1 | 0.039 | 0.35 | 22.23 | 22.179 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 L/1 | 0.023 | 0.21 | 22.328 | 22.316 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 M/1 | 0.031 | 0.28 | 22.149 | 22.145 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 N/1 | 0.028 | 0.26 | 22.148 | 22.145 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 O/1 | 0.013 | 0.11 | 21.996 | 21.98 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P S2 P/1 | 0.027 | 0.24 | 21.923 | 21.916 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 Q/1 | 0.103 | 0.93 | 22.237 | 22.229 AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 C/2 | 0.245 | 1.54 | 22.04 | 21.916 AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 T/1 | 0.086 | 0.78 | 21.422 | 21.427 AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |

| | | | | | |
|---|---|---|---|---|---|
| P S2 V/1 | 0.047 | 0.42 | 21.174 | 21.174 | AR&R 100 year, 15 minutes storm, average 182.1 mm/h, Zone 1 |
| P S2 X/1 | 0.106 | 0.96 | 21.247 | 21.238 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P B.1 | 0.129 | 0.81 | 21.205 | 21.181 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P C.1 | 0.134 | 0.62 | 21.147 | 21.139 | AR&R 100 year, 20 minutes storm, average 162.4 mm/h, Zone 1 |
| P S2 Y/1 | 0.004 | 0.04 | 21.181 | 21.181 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 ZB/1 | 0.018 | 0.28 | 21.651 | 21.651 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 ZC/1 | 0.022 | 0.23 | 21.756 | 21.756 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 ZF/1 | 0.008 | 0.09 | 21.659 | 21.658 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 ZG/1 | 0.007 | 0.1 | 21.586 | 21.586 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 ZZ/1 | 0.023 | 0.21 | 22.4 | 22.394 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 F/1 | 0.083 | 0.75 | 22.39 | 22.387 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 F/2 | 0.085 | 0.77 | 22.384 | 22.354 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 G/1 | 0.038 | 0.35 | 21.99 | 21.984 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 G/2 | 0.044 | 0.4 | 21.983 | 21.98 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 C/1 | 0.1 | 0.91 | 22.264 | 22.229 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 S/1 | 0.053 | 0.48 | 21.921 | 21.916 | AR&R 100 year, 30 minutes storm, average 135.7 mm/h, Zone 1 |
| P S2 U/1 | 0.082 | 0.75 | 21.176 | 21.174 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 W/1 | 0.074 | 0.67 | 21.185 | 21.183 | AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1 |
| P S2 W/2 | 0.171 | 1.55 | 21.154 | 21.139 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 Z/1 | 0.057 | 0.51 | 21.031 | 21.035 | AR&R 100 year, 1 hour storm, average 94.1 mm/h, Zone 1 |
| P S2 Z/2 | 0.066 | 0.59 | 21.035 | 21.033 | AR&R 100 year, 5 minutes storm, average 268.5 mm/h, Zone 1 |
| P S2 ZH/1 | 0.122 | 1.1 | 20.827 | 20.844 | AR&R 100 year, 1 hour storm, average 94.1 mm/h, Zone 1 |
| P S2 ZA/1 | 0.096 | 0.87 | 21.016 | 21.021 | AR&R 100 year, 1 hour storm, average 94.1 mm/h, Zone 1 |
| P S2 ZA/2 | 0.101 | 0.91 | 21.021 | 21.033 | AR&R 100 year, 5 minutes storm, average 268.5 mm/h, Zone 1 |
| P S2 ZI/1 | 0.109 | 0.99 | 20.829 | 20.844 | AR&R 100 year, 1 hour storm, average 94.1 mm/h, Zone 1 |
| P S2 ZY/1 | 0.317 | 1.12 | 21.82 | 21.791 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |
| P S2 R/1 | 0.34 | 1.2 | 21.734 | 21.725 | AR&R 100 year, 25 minutes storm, average 147.5 mm/h, Zone 1 |

CHANNEL DETAILS

| Name | Max Q (cu.m/s) | Max V (m/s) | Due to Storm |
|---|---|---|---|

OVERFLOW ROUTE DETAILS

| Name | Max Q U/S | Max Q D/S | Safe Q | Max D | Max DxV | Max Width | Max V | Due to Storm |
|---|---|---|---|---|---|---|---|---|
| F H.2a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F H.2 | 0.001 | 0.001 | 0 | 0.019 | 0.01 | 0.22 | 0.35 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F A.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.7 | 0.005 | 0.005 | 0 | 0.038 | 0.02 | 0.44 | 0.56 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F A.8 | 0.003 | 0.003 | 0 | 0.033 | 0.02 | 0.38 | 0.46 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F A.9 | 0.018 | 0.018 | 0 | 0.061 | 0.04 | 1.18 | 0.69 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F A.10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F Total | 3.381 | 3.381 | 0 | 0.328 | 0.78 | 8.79 | 2.37 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F N.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F P.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S.2a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| OF241084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F V.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.6a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.6 | 0 | 0 | 1.466 | 0 | 0 | 0 | 0 | |
| UB4-P | 0.065 | 0 | | | | | | AR&R 100 year, 5 minutes storm, average 268.5 mı |
| F T.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.14a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F H.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F H.1B | 0.007 | 0.007 | 0.291 | 0.043 | 0.03 | 0.56 | 0.64 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F H.1 | 0.006 | 0.006 | 0 | 0.041 | 0.02 | 0.48 | 0.6 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F H.2B | 0.005 | 0.005 | 0 | 0.04 | 0.02 | 0.46 | 0.59 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F K.1 | 0.04 | 0.04 | 0 | 0.077 | 0.06 | 1.69 | 0.83 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F J.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.2A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.3 | 0 | 0 | 6.74E+22 | 0 | 0 | 0 | 0 | |
| F J.3A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F L.1 | 0.006 | 0.006 | 0 | 0.041 | 0.02 | 0.48 | 0.6 | AR&R 100 year, 25 minutes storm, average 147.5 n |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| F X.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F W.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.1a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F J.1 | 0.007 | 0.007 | 0 | 0.043 | 0.03 | 0.56 | 0.63 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F L.1a | 0.083 | 0.083 | 0 | 0.096 | 0.09 | 2.34 | 0.94 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F M.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F W.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F W.2 | 0.003 | 0.003 | 0 | 0.033 | 0.02 | 0.38 | 0.51 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F N.1 | 0.045 | 0.045 | 0 | 0.086 | 0.06 | 2.01 | 0.68 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F P.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F P.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.3B | 0.009 | 0.009 | 0 | 0.04 | 0.04 | 0.47 | 0.98 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F T.3A | 0.012 | 0.012 | 0 | 0.045 | 0.05 | 0.62 | 1.05 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F T.3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| F T.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.5 | 0 | 0 | 0.45 | 0 | 0 | 0 | 0 | |
| F R.1 | 0.009 | 0.009 | 0 | 0.047 | 0.03 | 0.71 | 0.67 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F Q.3 | 0.018 | 0.018 | 0 | 0.061 | 0.04 | 1.18 | 0.68 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S.1 | 0.011 | 0.011 | 0.543 | 0.052 | 0.03 | 0.86 | 0.63 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F T.5a | 0 | 0 | 0.485 | 0 | 0 | 0 | 0 | |
| F T.1 | 0.013 | 0.013 | 0.08 | 0.052 | 0.04 | 0.88 | 0.72 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F U.2 | 0.012 | 0.012 | 0 | 0.045 | 0.04 | 0.62 | 1.01 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F V.1 | 0.015 | 0.015 | 0 | 0.058 | 0.04 | 1.05 | 0.67 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| z F A.6a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F Q.1 | 0.012 | 0.012 | 0 | 0.044 | 0.05 | 0.58 | 1.05 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F Q.2 | 0.013 | 0.013 | 0 | 0.045 | 0.05 | 0.63 | 1.08 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 B/2 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 100 year, 20 minutes storm, average 162.4 n |
| F S2 B/3 | 0.001 | 0.001 | 0 | 0.019 | 0.01 | 0.22 | 0.35 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 A/5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 A/6 | 0.005 | 0.005 | 0 | 0.038 | 0.02 | 0.44 | 0.57 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 A/8 | 0.004 | 0.004 | 0 | 0.035 | 0.02 | 0.4 | 0.53 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 A/9 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 100 year, 30 minutes storm, average 135.7 n |
| F S2 A/10 | 0.002 | 0.002 | 0 | 0.028 | 0.01 | 0.32 | 0.46 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 A/11 | 0.117 | 0.117 | 0 | 0.108 | 0.11 | 2.72 | 1 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F A.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F A.2a | 0.006 | 0.006 | 0 | 0.044 | 0.02 | 0.6 | 0.5 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F A.3 | 0.007 | 0.007 | 0 | 0.071 | 0.02 | 0.57 | 0.35 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F A.4 | 0.012 | 0.012 | 0 | 0.085 | 0.03 | 0.68 | 0.4 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 D/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 D/3 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 E/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 E/3 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 100 year, 15 minutes storm, average 182.1 n |
| F S2 H/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 A/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 A/2 | 0.002 | 0.002 | 0 | 0.029 | 0.01 | 0.34 | 0.49 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 I/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 J/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.34 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 K/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 L/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 100 year, 20 minutes storm, average 162.4 n |
| F S2 M/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 N/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 O/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 P/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 Q/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 C/2 | 0.021 | 0.021 | 0 | 0.063 | 0.05 | 1.22 | 0.76 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 T/1 | 0.01 | 0.01 | 0 | 0.049 | 0.03 | 0.75 | 0.68 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 V/1 | 0.016 | 0.016 | 0 | 0.057 | 0.04 | 1.03 | 0.74 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F C.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 Y/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 ZB/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 ZC/1 | 0.001 | 0.001 | 0 | 0.018 | 0.01 | 0.2 | 0.35 | AR&R 100 year, 10 minutes storm, average 211.1 n |
| F S2 ZF/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 ZG/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 ZZ/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| F S2 F/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 G/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 W/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| F S2 Z/2 | 0.001 | 0.001 | 0 | 0.02 | 0.01 | 0.23 | 0.36 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 ZA/2 | 0.001 | 0.001 | 0 | 0.022 | 0.01 | 0.25 | 0.38 | AR&R 100 year, 25 minutes storm, average 147.5 n |
| F S2 R/1 | 0.026 | 0.026 | 0 | 0.067 | 0.05 | 1.35 | 0.79 | AR&R 100 year, 25 minutes storm, average 147.5 n |

DETENTION BASIN DETAILS

| Name | Max WL | MaxVol | Max Q Total | Max Q Low Level | Max Q High Level |
|---|---|---|---|---|---|
| B UB2 | 23.06 | 211.8 | 0.051 | 0.051 | 0 |
| B UB3 | 21.54 | 352 | 0.097 | 0.097 | 0 |
| B UB5W | 21.52 | 499.2 | 0.111 | 0.111 | 0 |
| B UB5E | 22.24 | 424.2 | 0.088 | 0.088 | 0 |
| B UB4 | 22.34 | 323.5 | 0.065 | 0 | 0.065 |
| B UB5C | 21.14 | 385.9 | 0.159 | 0.159 | 0 |
| B Lot C | 23.66 | 443.1 | 0.083 | 0.083 | 0 |
| B Lot Fa | 23.15 | 258 | 0.038 | 0.038 | 0 |
| B Lot H | 23.48 | 451.1 | 0.1 | 0.1 | 0 |
| B Lot Fb | 22.66 | 173.5 | 0.053 | 0.053 | 0 |
| B Lot Gb | 22.32 | 445.3 | 0.082 | 0.082 | 0 |
| B Lot Ga | 21.76 | 363.7 | 0.074 | 0.074 | 0 |
| B Lot E | 20.89 | 401.3 | 0.057 | 0.057 | 0 |
| B Lot B | 20.78 | 554.7 | 0.122 | 0.122 | 0 |
| B Lot D | 20.85 | 493.8 | 0.096 | 0.096 | 0 |
| B Lot A | 20.72 | 500.1 | 0.109 | 0.109 | 0 |

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 73.6 mm/h, Zone 1

| Node | Inflow (cu.m) | Outflow (cu.m) | Storage Ch (cu.m) | Difference % |
|---|---|---|---|---|
| B UB2 | 439.1 | 367.76 | 68.99 | 0.5 |
| H.2a | 367.76 | 367.34 | 0 | 0.1 |
| H.2 | 720.82 | 718.98 | 0 | 0.3 |
| A.6 | 10113.04 | 10081.65 | 0 | 0.3 |
| A.7 | 10289.54 | 10267 | 0 | 0.2 |
| A.8 | 11194.99 | 11170.7 | 0 | 0.2 |
| A.9 | 11276.93 | 11249.23 | 0 | 0.2 |
| A.10 | 11422.33 | 11411.26 | 0 | 0.1 |
| A.12 | 12190.86 | 12174.11 | 0 | 0.1 |
| A.12a | 13159.2 | 13132.77 | 0 | 0.2 |
| A.14 | 14751.05 | 14729 | 0 | 0.1 |
| A.15 | 14729 | 14722.85 | 0 | 0 |
| B UB3 | 730.47 | 612.26 | 115.64 | 0.4 |
| P.3 | 735.89 | 734.29 | 0 | 0.2 |
| B UB5W | 973.62 | 781.31 | 186.51 | 0.6 |
| S.2a | 781.31 | 779.6 | 0 | 0.2 |
| B UB5E | 779.09 | 571.11 | 202.74 | 0.7 |
| T.6a | 571.11 | 570.51 | 0 | 0.1 |
| T.6 | 1622.08 | 1618.27 | 0 | 0.2 |
| B UB4 | 624.25 | 527.58 | 96.87 | 0 |
| B UB5C | 987.26 | 985.09 | 1.25 | 0.1 |
| H.1a | 92 | 91.61 | 0 | 0.4 |
| H.1b | 182.78 | 182.6 | 0 | 0.1 |
| H.1 | 259.96 | 259.66 | 0 | 0.1 |
| H.2b | 334.17 | 333.73 | 0 | 0.1 |
| K.1 | 153.09 | 153.17 | 0 | -0.1 |
| J.2 | 751.93 | 750.77 | 0 | 0.2 |
| J.2a | 755.25 | 755.12 | 0 | 0 |
| J.3 | 778.99 | 778.67 | 0 | 0 |
| J.3a | 928.05 | 927.38 | 0 | 0.1 |
| J.4 | 964.7 | 963.73 | 0 | 0.1 |
| L.1 | 84.97 | 84.89 | 0 | 0.1 |
| X.1 | 252.16 | 251.91 | 0 | 0.1 |
| W.3 | 529.17 | 528.42 | 0 | 0.1 |
| J.1a | 528.42 | 528.13 | 0 | 0.1 |

| | | | | |
|---|---|---|---|---|
| J.1 | 618.11 | 618.13 | 0 | 0 |
| L.1a | 229.8 | 229.55 | 0 | 0.1 |
| M.1 | 130.01 | 129.58 | 0 | 0.3 |
| W.1 | 129.58 | 129.59 | 0 | 0 |
| W.2 | 198.54 | 198.37 | 0 | 0.1 |
| N.1 | 209.75 | 207.89 | 0 | 0.9 |
| P.1 | 64.9 | 64.63 | 0 | 0.4 |
| P.2 | 124.08 | 123.63 | 0 | 0.4 |
| T.3b | 55.51 | 55.44 | 0 | 0.1 |
| T.3a | 108.81 | 108.81 | 0 | 0 |
| T.3 | 816.96 | 812.78 | 0 | 0.5 |
| T.4 | 1001.76 | 999.35 | 0 | 0.2 |
| T.5 | 1053.11 | 1051.57 | 0 | 0.1 |
| R.1 | 55.51 | 55.49 | 0 | 0 |
| Q.3 | 204.35 | 203.98 | 0 | 0.2 |
| S.1 | 94.79 | 94.74 | 0 | 0 |
| S.2 | 134.77 | 134.12 | 0 | 0.5 |
| T.5a | 30.58 | 30.17 | 0 | 1.3 |
| T.1 | 101.73 | 101.51 | 0 | 0.2 |
| T.2 | 721.26 | 720.04 | 0 | 0.2 |
| V.1 | 100.1 | 100.04 | 0 | 0.1 |
| O H.1a | 0 | 0 | 0 | 0 |
| O P.2 | 0 | 0 | 0 | 0 |
| N Total | 14722.85 | 14722.85 | 0 | 0 |
| A.6a | 508.39 | 506.06 | 0.24 | 0.4 |
| Q.1 | 53.29 | 53.25 | 0 | 0.1 |
| Q.2 | 95.61 | 95.48 | 0 | 0.1 |
| S2 B/1 | 32.7 | 32.82 | 0 | -0.3 |
| S2 B/2 | 100.18 | 99.78 | 0 | 0.4 |
| S2 B/3 | 177.28 | 176.82 | 0 | 0.3 |
| S2 A/4 | 942.55 | 940.86 | 0 | 0.2 |
| S2 A/5 | 1026.62 | 1025.12 | 0 | 0.1 |
| S2 A/6 | 1098.88 | 1097.46 | 0 | 0.1 |
| S2 A/7 | 1403.27 | 1400.69 | 0 | 0.2 |
| S2 A/8 | 2844.04 | 2836.69 | 0 | 0.3 |
| S2 A/9 | 3377.9 | 3371.28 | 0 | 0.2 |
| S2 A/10 | 3447.58 | 3442.46 | 0 | 0.1 |
| S2 A/11 | 4101.69 | 4099.35 | 0 | 0.1 |
| A.1 | 4098.96 | 4094.92 | 0 | 0.1 |
| A.2 | 4922.75 | 4913.22 | 0.35 | 0.2 |
| ZJ/1 | 4993.78 | 4983.37 | 0 | 0.2 |
| A.3 | 6027.67 | 6009.87 | 0 | 0.3 |
| A.4 | 6546.95 | 6534.8 | 0 | 0.2 |
| A.5 | 7948.97 | 7924.34 | 0 | 0.3 |
| S2 C/1 | 0 | 0 | 0 | 0 |
| S2 D/1 | 133.54 | 133.32 | 0 | 0.2 |
| S2 D/2 | 206.5 | 206.13 | 0 | 0.2 |
| S2 D/3 | 247.02 | 246.91 | 0 | 0 |
| S2 E/1 | 96.88 | 96.79 | 0 | 0.1 |
| S2 E/2 | 154.69 | 154.47 | 0 | 0.1 |
| S2 E/3 | 196.75 | 196.56 | 0 | 0.1 |
| S2 F/1 | 0 | 0 | 0 | 0 |
| S2 G/1 | 0 | 0 | 0 | 0 |
| S2 H/1 | 31.92 | 31.75 | 0 | 0.5 |
| S2 A/1 | 63.48 | 63.36 | 0 | 0.2 |
| S2 A/2 | 112.57 | 112.33 | 0 | 0.2 |
| S2 A/3 | 740.62 | 738.58 | 0 | 0.3 |
| S2 I/1 | 13 | 12.92 | 0 | 0.6 |
| S2 J/1 | 28.18 | 28.04 | 0 | 0.5 |
| S2 K/1 | 39.09 | 38.85 | 0 | 0.6 |
| S2 L/1 | 33.94 | 33.87 | 0 | 0.2 |
| S2 M/1 | 45.69 | 45.36 | 0 | 0.7 |
| S2 N/1 | 40.71 | 40.4 | 0 | 0.8 |
| S2 O/1 | 11.72 | 11.65 | 0 | 0.6 |
| S2 P/1 | 39.39 | 39.09 | 0 | 0.8 |
| S2 Q/1 | 160.44 | 160.08 | 0 | 0.2 |

| | | | | |
|---|---|---|---|---|
| S2 C/2 | 1007.84 | 1003.56 | 0 | 0.4 |
| S2 S/1 | 0 | 0 | 0 | 0 |
| S2 T/1 | 39.02 | 38.89 | 0 | 0.3 |
| S2 U/1 | 0 | 0 | 0 | 0 |
| S2 V/1 | 31.56 | 31.46 | 0 | 0.3 |
| S2 W/1 | 0 | 0 | 0 | 0 |
| S2 X/1 | 162.17 | 162.24 | 0 | 0 |
| B.1 | 202.59 | 201.92 | 0 | 0.3 |
| C.1 | 201.81 | 200.52 | 0 | 0.6 |
| S2 Y/1 | 0 | -0.11 | 0 | 0 |
| S2 Z/1 | 0 | 0 | 0 | 0 |
| S2 ZA/1 | 0 | 0 | 0 | 0 |
| S2 ZB/1 | 29.14 | 29.08 | 0 | 0.2 |
| S2 ZC/1 | 36.83 | 36.78 | 0 | 0.1 |
| S2 ZF/1 | 10.89 | 10.79 | 0 | 0.9 |
| S2 ZG/1 | 10.89 | 10.79 | 0 | 0.9 |
| S2 ZH/1 | 0 | 0 | 0 | 0 |
| S2 ZI/1 | 0 | 0 | 0 | 0 |
| S2 ZZ/1 | 31.92 | 31.74 | 0 | 0.6 |
| O S2 W/2 | 0 | 0 | 0 | 0 |
| O S2 Z/2 | 0 | 0 | 0 | 0 |
| O S2 ZA/2 | 0 | 0 | 0 | 0 |
| B Lot C | 807.73 | 606.01 | 199.06 | 0.3 |
| S2 F/2 | 617.33 | 616.95 | 0 | 0.1 |
| B Lot Fa | 437.97 | 289.3 | 145.6 | 0.7 |
| S2 G/2 | 297.74 | 297.45 | 0 | 0.1 |
| B Lot H | 879.04 | 714.87 | 160.26 | 0.4 |
| B Lot Fb | 397.73 | 367.06 | 28.9 | 0.4 |
| B Lot Gb | 802.61 | 597.78 | 202.09 | 0.3 |
| B Lot Ga | 679.32 | 529.44 | 147.24 | 0.4 |
| S2 W/2 | 624.71 | 623.29 | 0 | 0.2 |
| B Lot E | 594.78 | 368.74 | 223.12 | 0.5 |
| S2 Z/2 | 409.01 | 407.89 | 0 | 0.3 |
| B Lot B | 924.4 | 751.38 | 170.63 | 0.3 |
| B Lot D | 784.89 | 595.82 | 187.3 | 0.2 |
| S2 ZA/2 | 637.41 | 636.04 | 0 | 0.2 |
| B Lot A | 825.34 | 668.51 | 154.62 | 0.3 |
| S2 ZY/1 | 476.38 | 476.49 | 0 | 0 |
| S2 R/1 | 511.83 | 510.95 | 0 | 0.2 |

Run Log for 9012 run at 16:52:59 on 9/8/2018
Upwelling occurred at: S2 R/1, S2 A/11
Freeboard was less than 0.15m at S2 ZZ/1, S2 Y/1, S2 W/2, S2 V/1, S2 T/1, S2 Q/1, S2 N/1, S2 M/1, S2 I/1, S2 H/1, S2 F/2, S2 C/2, S2 A/10, S2 A

# Appendix E

## Sewer & Water

Appendix
AT&L
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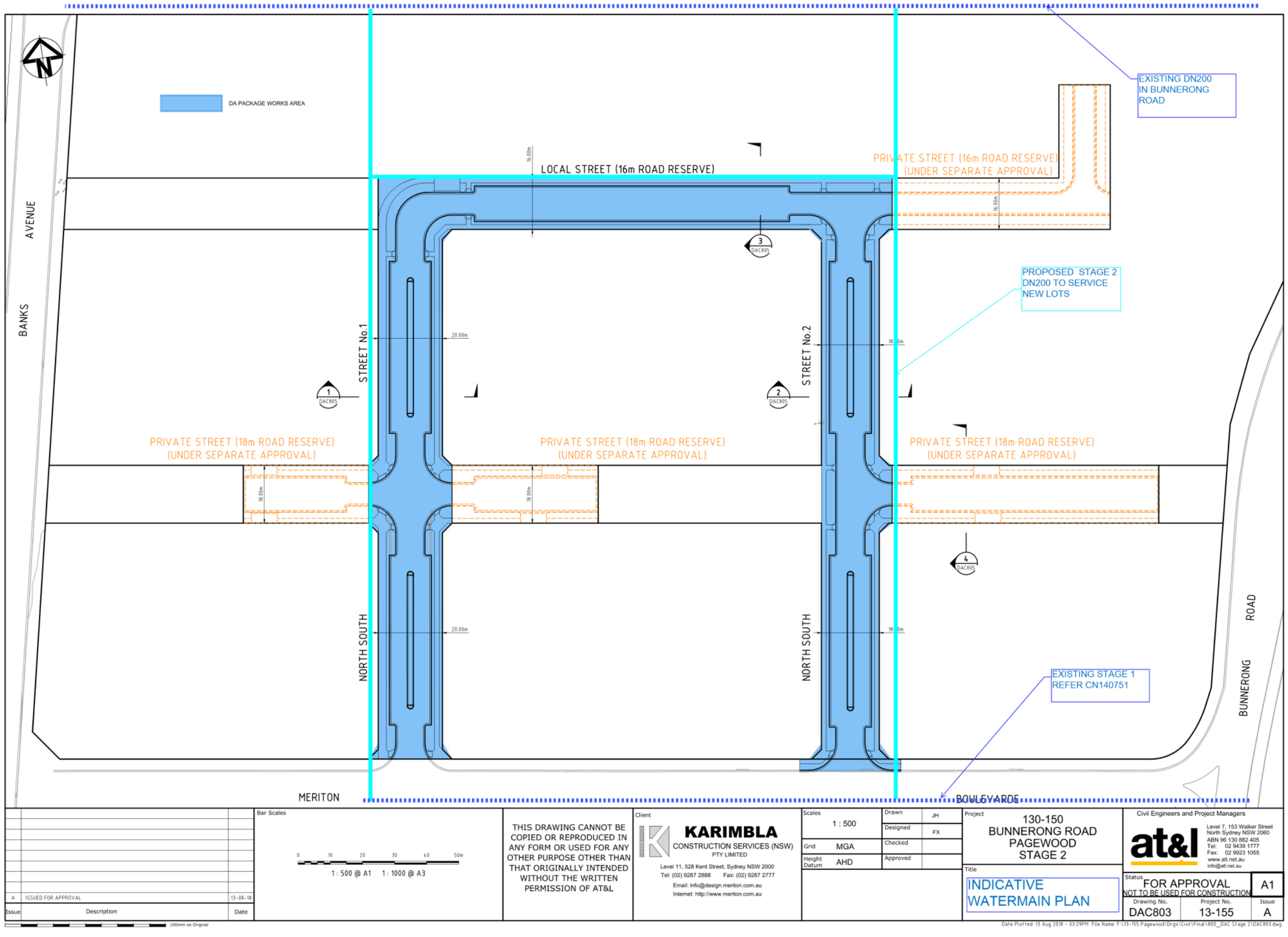
DA PACKAGE WORKS AREA
EXISTING DN200 IN BUNNERONG ROAD
LOCAL STREET (16m ROAD RESERVE)
PRIVATE STREET (16m ROAD RESERVE) (UNDER SEPARATE APPROVAL)
PROPOSED STAGE 2 DN200 TO SERVICE NEW LOTS
BANKS AVENUE
STREET No.1
STREET No.2
PRIVATE STREET (18m ROAD RESERVE) (UNDER SEPARATE APPROVAL)
PRIVATE STREET (18m ROAD RESERVE) (UNDER SEPARATE APPROVAL)
PRIVATE STREET (18m ROAD RESERVE) (UNDER SEPARATE APPROVAL)
NORTH SOUTH
NORTH SOUTH
EXISTING STAGE 1 REFER CN140751
BUNNERONG ROAD
MERITON BOULEVARDE
Bar Scales
1 : 500 @ A1 1 : 1000 @ A3
THIS DRAWING CANNOT BE COPIED OR REPRODUCED IN ANY FORM OR USED FOR ANY OTHER PURPOSE OTHER THAN THAT ORIGINALLY INTENDED WITHOUT THE WRITTEN PERMISSION OF AT&L
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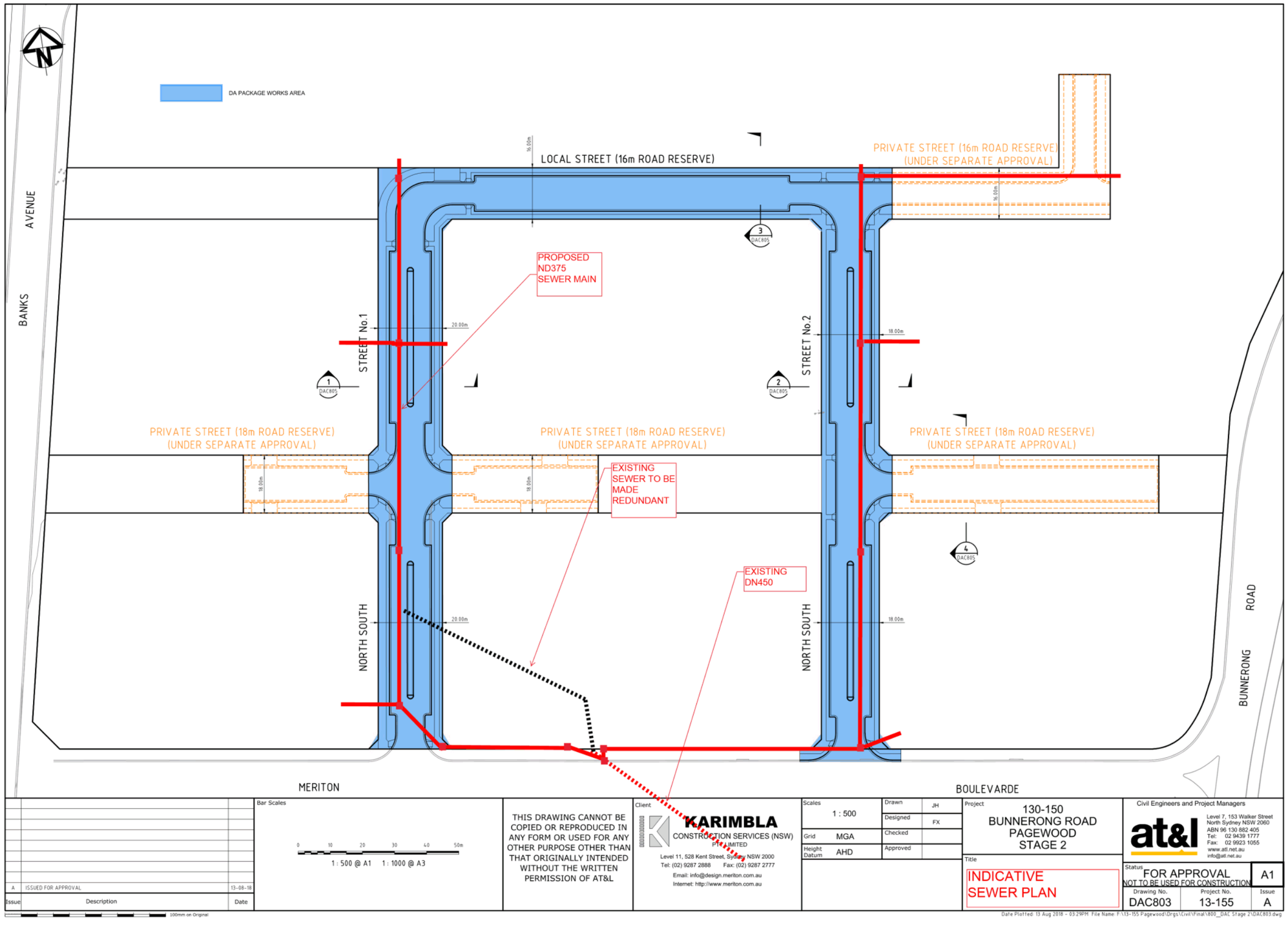
KARIMBLA CONSTRUCTION SERVICES (NSW) PTY LIMITED
Level 11, 528 Kent Street, Sydney NSW 2000
Tel: (02) 9287 2888 Fax: (02) 9287 2777
Email: info@design.meriton.com.au
Internet: http://www.meriton.com.au
Scales 1 : 500
Grid MGA
Height Datum AHD
Drawn JH
Designed FX
Checked
Approved
Project 130-150 BUNNERONG ROAD PAGEWOOD STAGE 2
Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au
Title INDICATIVE WATERMAIN PLAN
Status FOR APPROVAL NOT TO BE USED FOR CONSTRUCTION
A1
Drawing No. DAC803
Project No. 13-155
Issue A
A ISSUED FOR APPROVAL 13-08-18
Issue Description Date
Date Plotted: 13 Aug 2018 - 03:29PM File Name: F:\13-155 Pagewood\Drgs\Civil\Final\800_DAC Stage 2\DAC803.dwg


DA PACKAGE WORKS AREA
LOCAL STREET (16m ROAD RESERVE)
PRIVATE STREET (16m ROAD RESERVE)
(UNDER SEPARATE APPROVAL)
PROPOSED
ND375
SEWER MAIN
STREET No.1
STREET No.2
PRIVATE STREET (18m ROAD RESERVE)
(UNDER SEPARATE APPROVAL)
EXISTING
SEWER TO BE
MADE
REDUNDANT
EXISTING
DN450
NORTH SOUTH
BANKS AVENUE
BUNNERONG ROAD
MERITON
BOULEVARDE
A ISSUED FOR APPROVAL 13-08-18
Issue Description Date
Bar Scales
1 : 500 @ A1 1 : 1000 @ A3
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CONSTRUCTION SERVICES (NSW)
PTY LIMITED
Level 11, 528 Kent Street, Sydney NSW 2000
Tel: (02) 9287 2888 Fax: (02) 9287 2777
Email: info@design.meriton.com.au
Internet: http://www.meriton.com.au
Scales 1 : 500
Grid MGA
Height Datum AHD
Drawn JH
Designed FX
Checked
Approved
Project
130-150
BUNNERONG ROAD
PAGEWOOD
STAGE 2
Title
INDICATIVE
SEWER PLAN
Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au
Status
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A1
Drawing No. DAC803
Project No. 13-155
Issue A

# APPENDIX D TRANSPORT IMPACT ASSESSMENT

Meriton Properties

# 128 and 130-150 Bunnerong Road, Pagewood

Transport Impact Assessment

Rev E | 21 November 2018

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 237575

**Arup**
Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com

ARUP

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**Appendix A**

Traffic modelling report

# 1 Introduction

## 1.1 Background

Meriton Properties (Meriton) commissioned Arup to undertake traffic and transport analysis for the proposed 128 and 130-150 Bunnerong Road, Pagewood site. An L-shaped parcel (10.35ha) known as 130-150 Bunnerong Road, Pagewood was approved as a concept masterplan in 2014. A Development Control Plan (DCP) including a site specific chapter has been prepared (refer to Chapter 9D – British American Tobacco Australasia, of the Botany Bay DCP 2013).

The intended outcome of the Planning Proposal is to amend the *Botany Bay Local Environmental Plan 2013* (BBLEP 2013) as follows:

- Rezone the subject site from part IN1 General Industrial and part R3 Medium Density Residential to R4 High Density Residential.
- Increase the maximum floor space ratio (FSR) development standard from 1:1 to 2.35:1.
- Increase the maximum height of buildings development standard to part RL 37.0 (15m), part RL 60.0 (39m) and park RL 91.0 (70m).
- Introduce a new clause at Schedule 1 Additional Permitted Uses of the BBLEP 2013 to permit 'commercial premises', 'recreational facility (indoor)' and 'hotel and motel accommodation'. Non-residential uses across the site must have a minimum total floor space of 5,000sqm.

A concept plan illustrating the type of development facilitated by the Planning Proposal has been prepared by SJB. The concept plan contemplates a high-density residential development with buildings of 2-20 storeys oriented around a network of internal roads and public open space. The development will accommodate approximately 2,015 dwellings and allowance has been made for 5,000m$^2$ retail floor space and 2×75-place childcare centres.

The subject site is located within a broader site known as 128 and 130-150 Bunnerong Road, Pagewood. The site is within the Bayside Local Government Area (LGA) and is legally described as Lot 1 DP 1187426 and Lot 24 DP 1242288 or 128 and 130-150 Bunnerong Road, Pagewood (see **Figure 1**).

The broader site was previously occupied by industrial uses associated with the manufacturing operations of British American Tobacco Australasia (BATA). Lot 1 was excised from the larger site, remaining for reduced industrial uses while the remaining portion of the site was rezoned in June 2013 to support mixed use development, including high density residential uses.

The Planning Proposal request relates to Lot 1 DP 1187426 and Lot 24 DP 1242288 or 128 and 130-150 Bunnerong Road, Pagewood and covers an area of approximately 8.95ha. The site has frontages to an internal road (Meriton Boulevard) to the south, Bunnerong Road to the east, Banks Avenue to the west and Heffron Road to the north.




Figure 1: Location plan

This report has been prepared for review by Roads and Maritime in response to previous correspondence to determine the necessity for road upgrades on surrounding roads. The traffic models used and described within this report and supporting reports are submitted together with this report.

This report references the previously prepared documentation for the remainder of the BATA site including:

- Colston Budd Hunt and Kafes and supplementary PB report dated March 2012
- Arup Traffic Impact Assessment dated 24 July 2014
- Arup S34 Conference Report dated 5 May 2015

## 1.2 Report scope

This transport report supports the rezoning application related to 128 Bunnerong Road, Pagewood and the northern portion of 130-150 Bunnerong Road, Pagewood and will outline the following:

- Existing transport conditions
- Forecast traffic generation
- Road network impacts
- Parking provision
- Access arrangements
- Public transport availability
- Pedestrian and cycle linkages

# 2 Existing site context

## 2.1 Site description

The proposed development site relates to 128 Bunnerong Road, Pagewood and the northern portion of 130-150 Bunnerong Road, Pagewood which is shown in Figure 2. The site is located within the Bayside Council local government area. The overall site is bound by Heffron Road to the north, Meriton Boulevard to the south, Bunnerong Road to the east and the north-south street No.1 to the west. The site is located some 8kms south of the Sydney CBD and 1km west of Maroubra Junction and located within the Bayside Council Local Government Area. Adjacent land uses include:

- Approved concept masterplan for 2,223 residential units, four child care centres and 5,000m$^2$ retail at 130-150 Bunnerong Road, Pagewood;
- Westfield Eastgardens shopping centre to the south of the site;
- Existing low-density residential development to the north and east of the site; and
- Bonnie Doon Golf Club to the west of the site across Banks Avenue.




Figure 2: Site location plan

The site was previously used by the British American Tobacco Australia (BATA) as a production facility and contains a large warehouse. There are also some heritage buildings on the northeast corner of the site. The site has staff car parking and loading areas suitable for B-double vehicles. Existing vehicular access to the BATA site is provided from Meriton Boulevard, which is accessed from Bunnerong Road as a left-in / left-out priority intersection.

In 2008, BATA lodged a proposal to rezone part of the site to allow medium density residential development plus other non-residential uses which was approved in June 2013. The site has been subdivided into two lots under DA 11/272. Lot 1 which is located in the north-east corner of the site was retained by BATA for its reduced operation. The approved rezoning of the site is as follows:

- Zone IN1 for industrial use within the BATA retained site at 128 Bunnerong Road;
- Zone B4 mixed use and Zone R3 medium density residential for 130-150 Bunnerong Road.

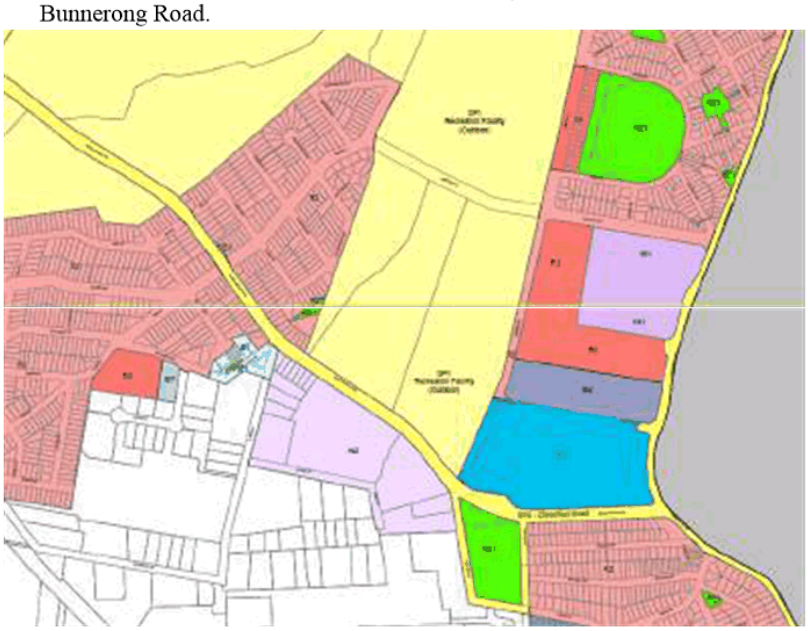

Figure 3: Current Botany Bay LEP zoning

## 2.2 Road network

The main roads surrounding the site are Bunnerong Road to the east, Wentworth Avenue to the south, Banks Avenue to the west and Heffron Road/Maroubra Road to the north.

Bunnerong Road is a north-south state road connecting La Perouse to Kingsford Nine Ways. It generally has three traffic lanes in each direction and a speed limit of 60km/h. Bunnerong Road is a major bus corridor with buses connecting to the Sydney CBD, La Perouse and Matraville.

Wentworth Avenue, (located further south to the site) is a state road with three traffic lanes in each direction. It serves as a major connection between Mascot and Eastgardens. Wentworth Avenue has a speed limit of 70km/h.

Westfield Drive is a private road located between Banks Avenue and Bunnerong Road and provides access to both the Westfield Eastgardens and the approved 130-150 Bunnerong Road, Pagewood masterplan site.

Banks Avenue is a local road connecting Eastgardens to Kingsford. It has generally has two traffic lanes in each direction and has a speed limit of 50km/h.

Heffron Road and Maroubra Road are regional roads that connect Banksmeadow to Maroubra. Heffron Road generally has one traffic lane and one parking lane in each direction and Maroubra Road is a multi-lane divided road. In the immediate vicinity of the site Heffron Road has a speed limit of 50km/h. Bus services also operate on Heffron Road and Maroubra Road.

There are also internal roads being constructed as part of the approved masterplan site, which include a series of public and private roads. The public roads include Meriton Boulevard which runs east-west through the site between Bunnerong Road and Banks Avenue, a local street east-west street north of Meriton Boulevard and two north-south streets.

## 2.3 Public transport

The site has good access to public transport. The main public transport servicing the site are buses. A number of major bus routes operate on nearby roads as shown in Table 1. Bus stops are located on Heffron Road between Banks Avenue and Bunnerong Road, Bunnerong Road near Heffron Road (northeast of the site) and at the Westfield Eastgardens bus terminal (southeast of the site).

Table 1: Bus services

| Bus route | Frequency |
|---|---|
| Route 301, Eastgardens to City – Circular Quay via Mascot, Eastlakes, Roseberry, Zetland, Waterloo and Surry Hills | Every 30 minutes throughout the day in both directions of travel |
| Route 302, Eastgardens to City – Circular Quay via Kingsford, Kensington, Waterloo and Surry Hills | Every hour throughout the day in both directions of travel |
| Route 310 Port Botany and Eastgardens to city | Every 20 minutes throughout the day in both directions of travel |
| Route 316, Eastgardens to Bondi Junction via South Maroubra, Maroubra Beach, South Coogee, Randwick Junction and Waverley | Every 20 minutes throughout the day in both directions of travel |
| Route 317, Eastgardens to Bondi Junction via South Maroubra, Maroubra Beach, South Coogee, Randwick Junction and Waverley | Every 30 minutes throughout the day in both directions of travel |
| Route 353, Eastgardens to Bondi Junction via Maroubra, Maroubra Beach, South Coogee, Coogee, Clovelly and Waverley | Every 30 minutes throughout the day in both directions of travel |
| Route 391, La Perouse and Little Bay to City via Bunnerong Road | Every 30 minutes throughout the day in both directions of travel |
| Route 392, La Perouse and Little Bay to City via Bunnerong Road | Every 30 minutes throughout the day in both directions of travel |
| Route 400 Burwood to Bondi Junction | Every 30 minutes throughout the day in both directions of travel |
| Route 410 Rockdale to Bondi Junction | Every 15 minutes throughout the day in both directions of travel.<br>Only operates during the AM and PM peak periods |

## 2.4 Active transport

### 2.4.1 Cycling

There are a number of cycle facilities surrounding the development site, consisting mainly of on-road facilities or shoulders. These include an off-road facility along Wentworth Avenue and on-road marked cycle lanes on Heffron Road / Page Street and Banks Avenue. A map of surrounding cycleways is shown in Figure 4.

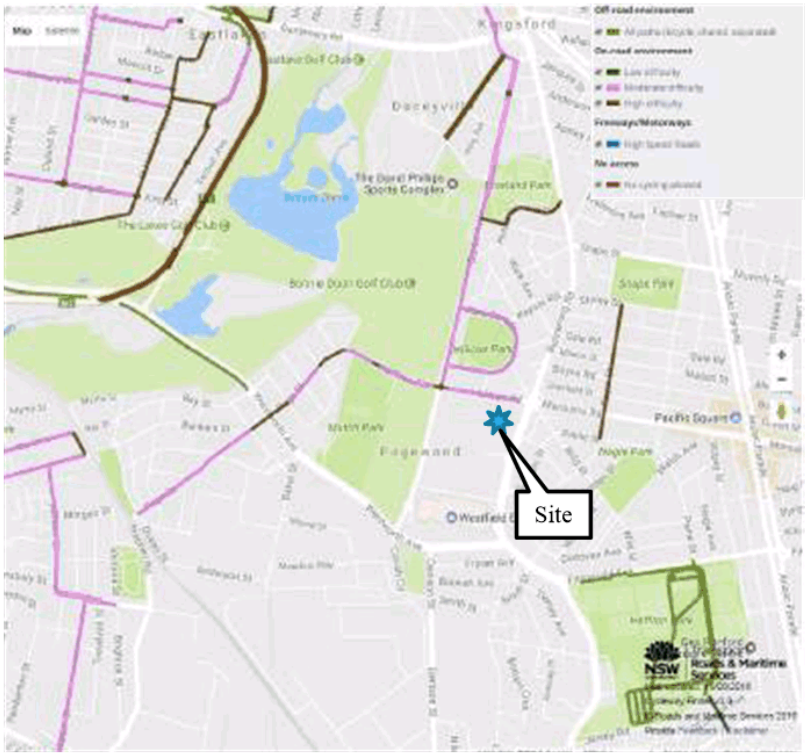


Figure 4: Cycling routes (Source: Roads and Maritime Cycleway Finder)

### 2.4.2 Walking

Due to the site's close proximity to public transport and local amenities, there is a good network of local footpaths. Footpaths and kerb ramps are provided on both sides of the road on Bunnerong Road, Heffron Road and Westfield Drive. A pedestrian footpath is provided on the eastern side of Banks Avenue.

There are also ample pedestrian crossing opportunities in the area, with multiple signalized pedestrian crossing opportunities on Westfield Drive, Bunnerong Road and Maroubra Road. The local area has wide roads which are shared between cyclists and motorists. An on-road separated cycleway is marked along Heffron Road, north of the site.

Pedestrian connections to surrounding amenities such as shops, transport, parks, sports fields and schools were plotted and then audited. The diagram below shows the most direct and safest connections to these amenities. Main attractors include:

- Pacific Square
- Maroubra Road shops
- Westfield Eastgardens (including bus interchange)
- Nagle Park
- Jellicoe Park
- Heffron Park
- Hensley Athletic Field
- Mutch Park
- Our Lady of the Annunciation Catholic School and Church
- South Sydney High School
- Pagewood Public School
- Future light rail stop at Kingsford

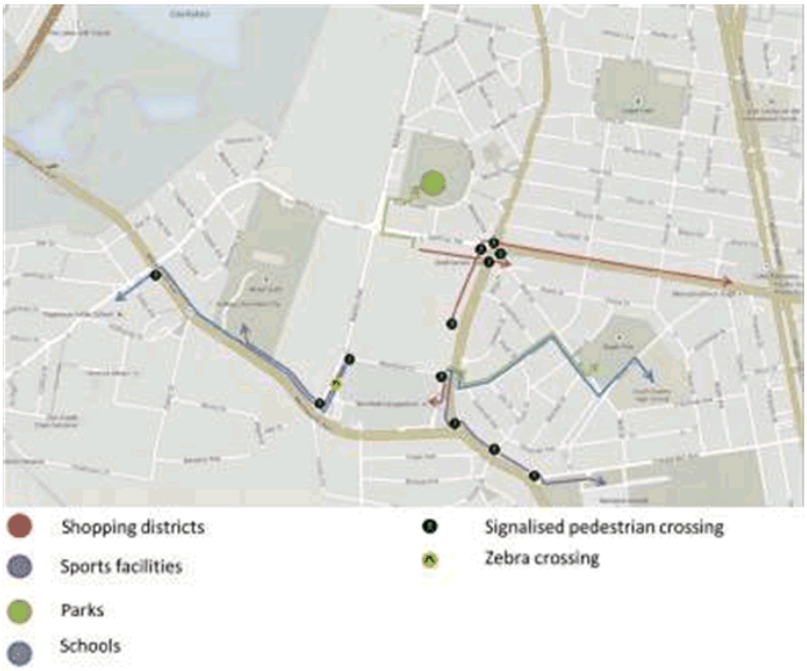


Figure 5: Walking routes from development

## 2.5 Travel patterns

Mode share patterns at the site were analysed using 2011 Journey to Work (JTW) Census data from the Bureau of Transport Statistics. The JTW data for travel zone 421, 423, 424 and 640 were used to assess the likely mode of peak hour trips approaching/departing the site (as the travel zone containing the site is purely employment). The results of the analysis are presented in Table 2.

Table 2: 2011 Journey to Work (JTW) travel patterns (for travel zones 421, 423, 424 and 640)

| Mode | Inbound trips to work | Outbound trips to work |
|---|---|---|
| Train | 4% | 3% |
| Bus | 11% | 19% |
| Car | 62% | 57% |
| Walk | 5% | 6% |
| Other | 3% | 4% |
| Did Not Travel | 15% | 12% |
| Total % | 100% | 100% |
| Total Trips | 4,466 | 3,622 |

*Source: BTS, 2011*

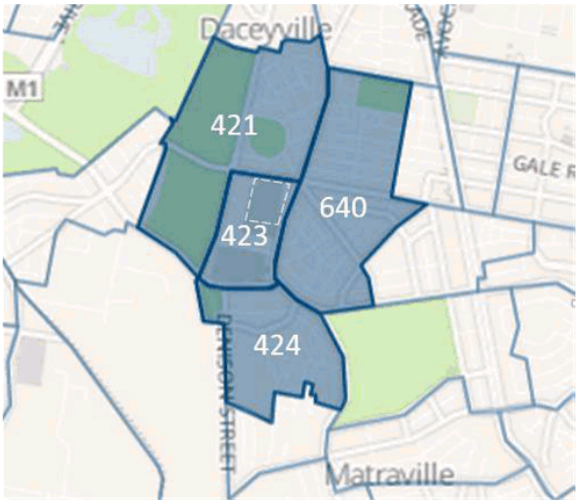


Figure 6: Journey to Work travel zone coverage

The data revealed that outbound trips by local residents rely more heavily on car trip modes (57%), followed by bus (19%). Other modes noted walking (6%) and train (3%).

## 2.6 Road safety

Crashes were analysed on the surrounding streets of the site over the most recent five-year period (from January 2009 – December 2013 inclusive). Overall, there were 123 crashes recorded, of which there were no fatalities, 51 injuries and 72

non-casualty (tow away) crashes. The data also indicates a fairly even distribution of crashes per year as shown in Figure 7.

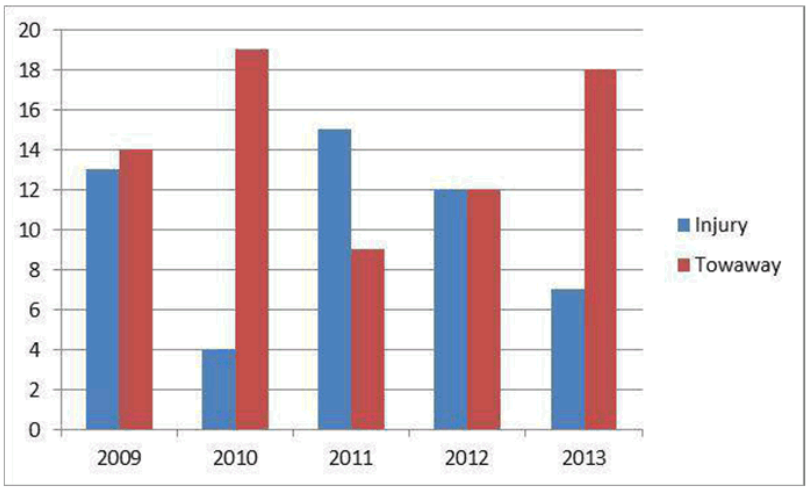


Figure 7: Degree of crashes per year (2008-2013) on surrounding streets

The crash data was sorted into hourly time periods (Figure 8). Crashes were more concentrated in the commuter peak periods. Interestingly, the highest recorded hourly time period was in the PM peak hours (4pm-6pm), likely indicating higher traffic volumes.

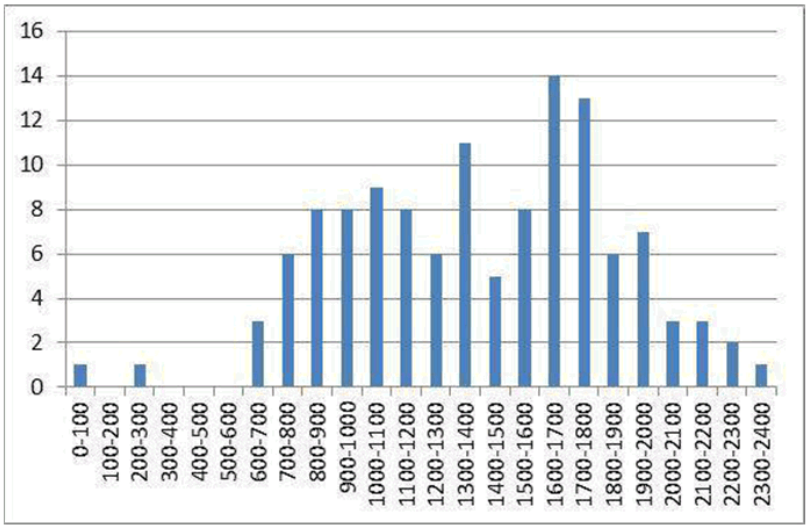


Figure 8: Crashes by time period

The crash data was sorted into days of the week (Figure 9). Crashes were more concentrated in the earlier days of the week, indicating that they were not directly related to shopper peaks (which are Thursdays and weekends).

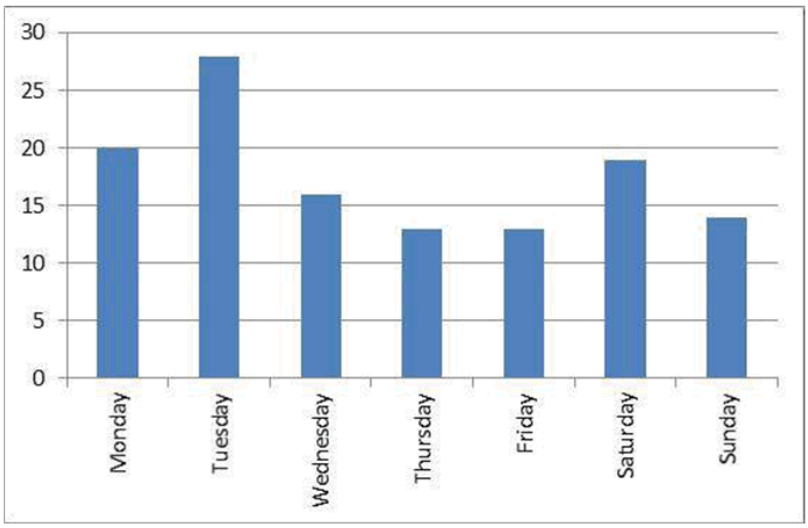


Figure 9: Crashes by day of the week

The crash data was classified into the various road user movement (RUM) codes to analyse crash clustering. The majority of crash types were recorded as vehicles from opposing directions, followed by vehicles in same direction which are common along arterial roads and at intersections (Figure 10).

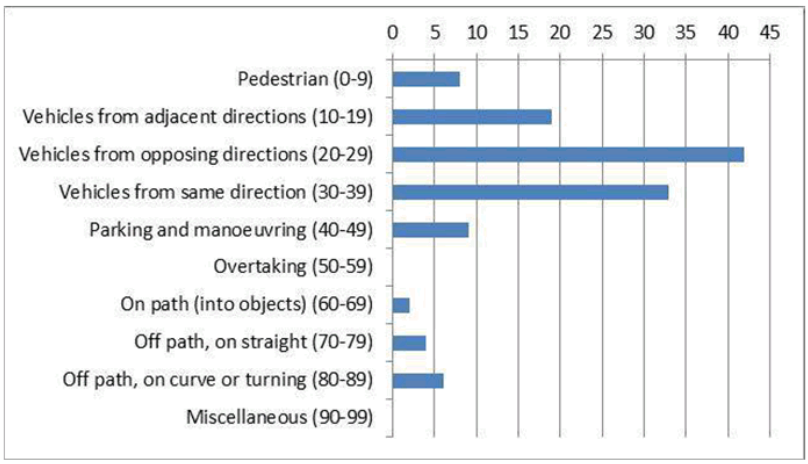


Figure 10: Crash types by road user movement categories

## 2.7 Crash clusters

Crash clusters for the purposes of this study were defined as three or more crashes with the same RUM code, within 50m of each other. Crash clusters were focused around key intersections and are detailed in Table 3 and Figure 11. There were no recognisable clusters for pedestrians, but crash types were similarly 'emerging pedestrians' crash types surrounding the site.

Table 3: Investigation of crash clusters at intersections by road user movements

| Primary street | Cross street | Adjacent cross traffic | Adjacent right-thru from right | Same rear end | Opposite right through |
|---|---|---|---|---|---|
| | |  |  |  |  |
| Bunnerong Road | Heffron Road | **3** | | **7** | |
| Heffron Road | Banks Avenue | **6** | | **4** | |
| Bunnerong Road | Westfield Drive | | | **3** | **13** |
| Bunnerong Road | Wentworth Avenue | | | **3** | **12** |
| Wentworth Avenue | Banks Avenue | | **4** | | **6** |
| Wentworth Avenue | Denison Street | | | | **11** |

**Bunnerong Road / Heffron Road** had a number of rear ends and cross traffic crashes recorded. These were recorded in all approaches, indicating no common contributing factors. These are inherently common at a signalised intersection, considering the current traffic volumes and are not easily treatable without major upgrades. There were a number of rear ends that appeared to occur on the southbound lanes leaving the intersection, perhaps due to driveways and merging from upstream parking along the carriageway.

**Heffron Road / Banks Avenue** had a large number of cross traffic crashes and rear ends. Similarly, these are inherently common at intersections such as a roundabout (or signalised) intersection and are not treatable without major upgrades. It is likely that a signalised intersection will continue to have these types of crashes, with a reduced rate, but more severity (given increase of traffic speeds). Crashes were more common along Heffron Road, but were spread either side of the intersection at no specific area.

**Bunnerong Road / Westfield Drive** and **Bunnerong Road / Wentworth Avenue** had a large number of opposite right through crashes, which are treatable given the filter right turn occurring from Bunnerong Road. It is suggested to remove the filer if non-detrimental to traffic flows or amend the sightlines for this approach.

**Wentworth Avenue / Banks Avenue** had a number of opposing right through and adjacent right through crashes. This is likely resulting due to filter right turns and vehicles running red due to saturation of the turn bay on Wentworth Avenue. More right turn capacity (extra lane) is suggested for Wentworth Avenue to help alleviate traffic volumes and safety at this intersection.

**Wentworth Avenue / Denison Street** had a large number of right through crashes. This is likely a result of the phase that allows Westfield to exit and filter right turns from Dension Street. No upgrades are suggested without major detriments to the traffic flows.

The crash types identified as clusters are considered common at intersections (where the majority of crashes were recorded). Therefore, as a consequence of the level of traffic on surrounding roads, crashes are fairly typical and there are no further safety upgrades recommended as a result of the assessment.

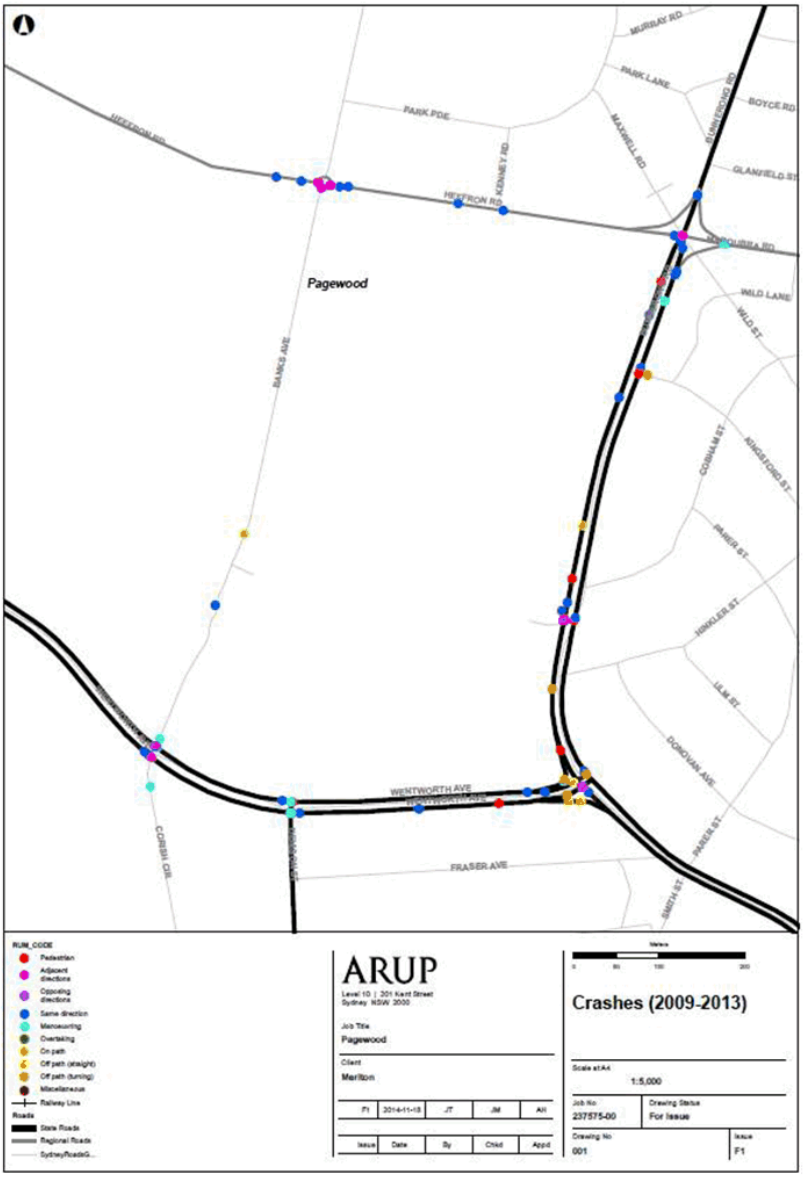


Figure 11: Crash investigation 2008 - 2013

# 3 Planning context

## 3.1 Sydney Light Rail

The current Sydney Light Rail is proposed to terminate at Kingsford, which is a 25-minute walk from the site. However, Infrastructure NSW noted that the light rail may be extended to La Perouse via Maroubra Junction in the State Infrastructure Strategy Update. This would place a light rail stop within a 15-minute walk of the proposed site.

**Figure 2.9 Potential Anzac Parade Light Rail extensions**




Source: Transport for NSW

Figure 12: Potential Light Rail extension

Meriton, in liaison with the former Botany Bay Council and Randwick Council, had also approached the NSW State Government to consider extending the current CBD and South East Light Rail to Maroubra Junction and on to the site. This would service the suburbs of Maroubra, Pagewood, Matraville, Eastgardens and the broader South-East Sydney area. There would also be further opportunities to expand this service beyond the site to the south and west, expanding the potential for cross district transport connections.

## 3.2 Sydney Metro West

The NSW Government has announced a new underground metro railway line linking the Parramatta and Sydney CBDs, and communities along the way. The Sydney Metro West project addresses Sydney's rapid growth, with the city's population to increase above 6 million in the next 20 years. The new railway is expected to be built largely underground and operational in the second half of the 2020s. The final number of potential stations will be identified following community and industry consultation. Four key precincts to be serviced have initially been identified at:

- Parramatta, where the number of jobs is expected to double over the next 20 years to 100,000.
- Sydney Olympic Park, where 34,000 jobs and more than 23,000 residents will be located by 2030.
- The Bays Precinct, Sydney's new innovation hub where 95 hectares of land is being regenerated.
- The Sydney CBD, allowing easy access to the existing public transport network and Stages 1 and 2 of Sydney Metro, which is currently under construction.

Following the announcement, a consortium proposed value-capture for the project, including connections further west to Badgerys Creek via Westmead and further east to La Perouse via Maroubra. The potential alignments proposed by the consortium are noted in Figure 13 and could have a connection as close as Maroubra to the proposed site.

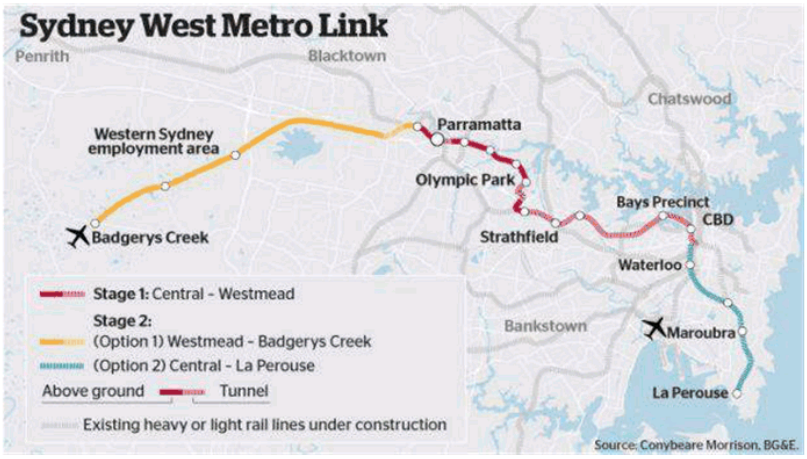


Figure 13: Potential Metro West alignments (Source Conybeare Morrison, BG&E)

## 3.3 Previous studies

BATA resolved that a large proportion of their large industrial landholding at Pagewood was superfluous to their future production needs. A draft Master Plan was prepared and submitted to Council in early 2011. Council prepared a site specific DCP to include the rezoning of the surplus part of the site.

A Traffic and Transport Study (CBH&K) was prepared in March 2012 to accompany the draft LEP and this was supported by a Traffic Modelling Assessment (Parsons Brinkerhoff). Scenarios tested for the rezoned site included:

- 35,000m$^2$ retail with 1,200 residential apartments generating 1,650 to 1,850 peak hour trips during the PM and weekend peaks respectively
- 5,000m$^2$ retail with 1,500 residential apartments generating 550 to 700 peak hour trips during the PM and weekend peaks respectively

The LEP and DCP documents were subsequently enacted and development consent granted for subdivision of the total site along with alterations, additions and fit-out of production facility buildings on the retained lot. Roads and Maritime has agreed with the above processes subject to a number of conditions including:

- provision of traffic signals at the Bunnerong Road/Access Road intersection with separate right and left turn lanes
- widening of Bunnerong Road (south) to upgrade the Maroubra Road/Heffron Road intersection

## 3.4 Previously approved intersection upgrades

A number of intersection upgrades were required to permit the development of the approved concept masterplan at 130-150 Bunnerong Road. These includes funded upgrades (either fully or partially by developer) at the following locations:

- Marourbra Road / Heffron Road Bunnerong Road
- Heffron Road and Banks Avenue
- Wentworth Avenue and Page Street

### 3.4.1 Maroubra Road / Heffron Road and Bunnerong Road

Proposed upgrades to this intersection include additional right turn lanes for the south and north approach of Bunnerong Road (incorporating previous PB modelling advice and additional traffic modelling undertaken by SMEC and Arup). Upgrades would require civil works including relocation of the central median, repaving and widening of the road on the northern approach.

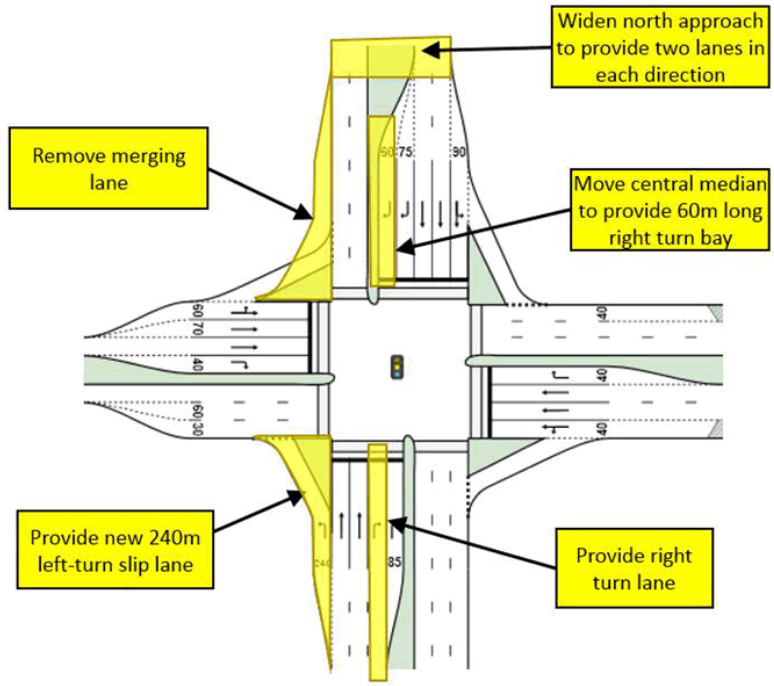


Figure 14: Approved upgrade for Maroubra Road / Heffron Road and Bunnerong Road

### 3.4.2 Heffron Road and Banks Avenue

The adopted option (by Council preference) was to upgrade the intersection to a two-phase signalised intersection. This would require a new set of signal infrastructure, major civil works to remove the roundabout and approach islands, and reinstatement of kerbs to tighten approaches. An indicative diagram of the upgrades is shown below.

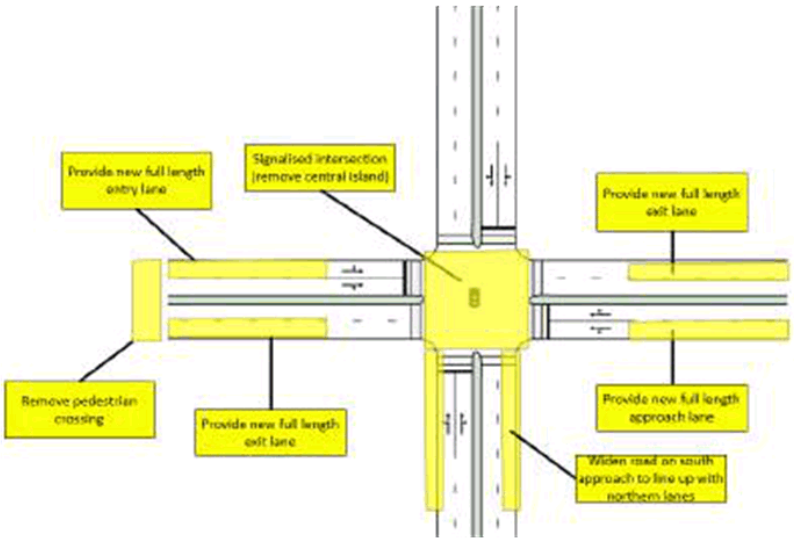


Figure 15: Approved upgrade for Heffron Road and Banks Avenue

### 3.4.3 Page Street and Wentworth Avenue

Upgrades to this intersection were previously outlined in the SMEC report (2015) to include:

- An additional right turn bay from Wentworth Avenue north approach
- Extension of right turn bays on Page Street west and east
- Extension of two lane section on Page Street east (up to 60m length)
- Left turn slip lane provisions on the west and south approaches.

It is anticipated that upgrades will require major civil works including relocation of the kerb and central median on Wentworth Avenue.

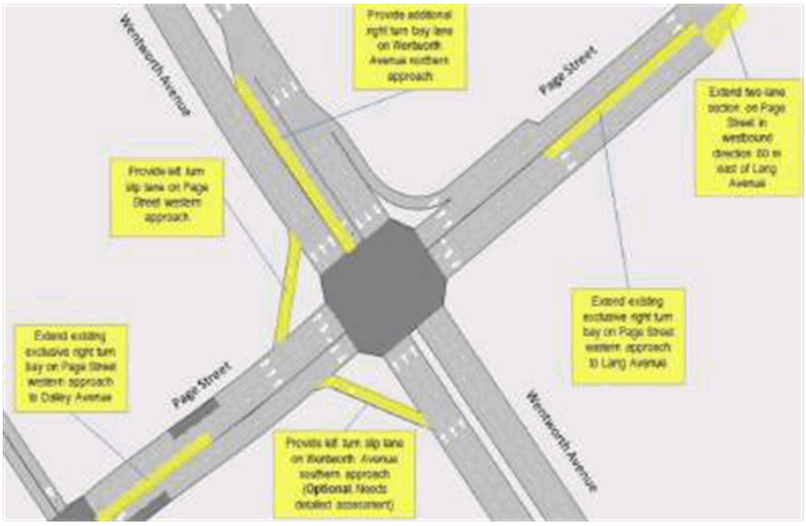


Figure 16: Upgrade to Page Street and Wentworth Avenue

### 3.4.4 Intersections of Banks Avenue and Wentworth Avenue; and Denison Street and Wentworth Avenue

Upgrade works were discussed with Council for these intersections and there is no scope to provide infrastructure upgrades without significant land acquisition. Previous upgrades were identified in previous reports, but were not addressed in the latest development application submitted by Westfield. Therefore, given that the intersection operates within acceptable level of service parameters with the approved development traffic, there were proposed no proposed upgrades of these intersections.

# 4 Development proposal

The proposed site incorporates some of the area of the previously approved concept masterplan at 130-150 Bunnerong Road. It is proposed to absorb urban blocks 1 and 2 of the Stage 1 Pagewood Green concept masterplan and incorporate these blocks into a new northern precinct.

Meriton proposes to provide 5,000m$^2$ retail on the site, two 75-child childcare centres and provide a total of 2,015 residential units with potential for aged care in the northeast block. Some of the 2,015 residential units may also be considered as serviced apartments in future development applications.

As a result, it is proposed that the approved concept masterplan site reduces the residential apartments by approx. 376 dwellings, and reduces the retail provision on the site from originally approved 5,000m$^2$ GFA. This equates to an additional 1,639 residential apartments, an additional child care centre (approx. 50 children) and a net increase of approx. 1,300m$^2$ retail against the approved concept masterplan (for 130-150 Bunnerong Road, Pagewood). This scenario was adopted for the traffic and transport analysis.

## 4.1 Internal site access

The proposed development will utilise the approved concept masterplan internal road network, with some adjustments to the undeveloped portion of the site to accommodate the additional urban blocks. The internal road network will provide separation and access to up to the urban blocks and parklands within the site. The proposed internal road networks are shown in Figure 17.

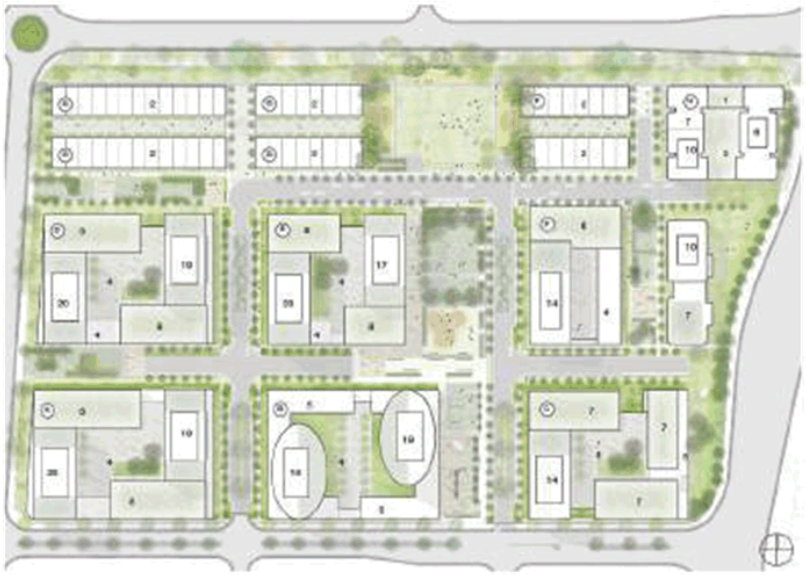

Figure 17: Proposed development masterplan

## 4.2 External site access

The proposed site intends to utilise the existing Meriton Boulevard accesses as external access arrangements (shown in Figure 18) which includes:

- An all movements access to Banks Avenue to the west of the site (Meriton Boulevard only); and
- A left in and left out access to Bunnerong Road.

These accesses were the adopted access points for the traffic modelling, which create a balanced distribution across the external road network. Other access options were assessed, but this minimum layout forms the best-balanced approach as later described in Section 6.6.

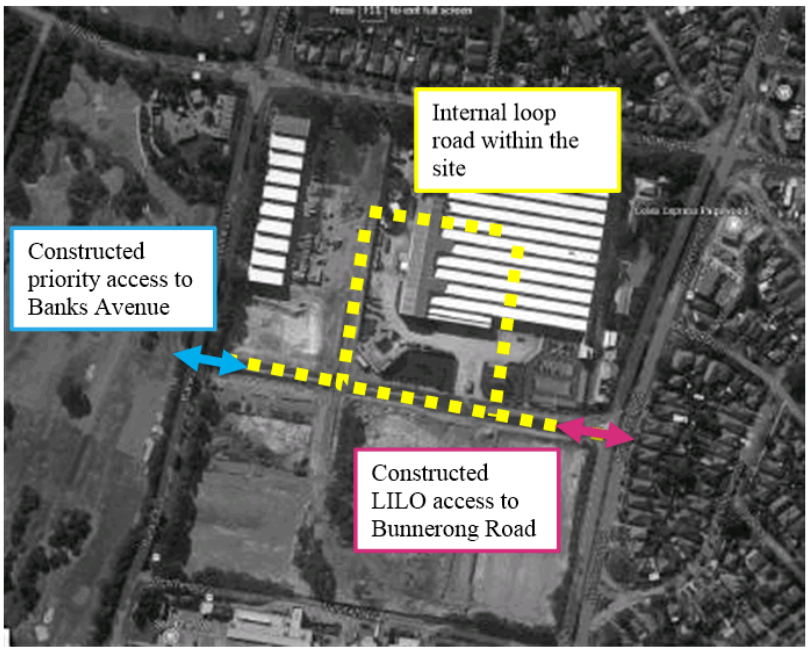


Figure 18: Proposed access arrangements

# 5 Transport Assessment

## 5.1 Future mode split

### 5.1.1 Traffic generation

The traffic generation rates used for the previous Concept Masterplan were adopted, which utilised an adjusted rate from the Roads and Maritime Technical Direction (TDT 2013/04a) and Journey to Work data based on the following:

$$\frac{Journey\ to\ Work\ car\ mode}{'surveyed\ sites'car\ mode\ \times 'surveyed\ sites'\ trip\ rates\ per\ unit}$$

The rate for high density residential was determined as a function of the mode share for the development by calculating the peak hour ratios between the sites from the Technical Direction. Given the non-car mode share was 58% for the surveyed sites (in Metropolitan Sydney) and 38% from the JTW data (in Table 2), this resulted in the following peak hour generation rates for the proposed development:

- Weekday AM 0.277
- Weekday PM 0.217
- Weekend Noon 0.246

Serviced apartments are considered to have a similar trip rate to the expected residential uses of the site due to the close proximity to transport and the similar demographics expected in the accommodation.

### 5.1.2 Forecast mode split

The Roads and Maritime Technical Direction (TDT 2013/04a) and Journey to Work data was utilised to determine the person trips and forecast mode split for the development. It should be acknowledged that demographics will likely be different to the current journey to work dataset, which is focused on a low density established residential area context. The person peak hour trip generation rates that have been adopted for the proposed development are as follows, which are based on the average rates for high density residential developments as outlined in TDT 2013/04a:

- Weekday AM 0.725
- Weekday PM 0.592
- Weekend Noon 0.660

As a result of the traffic generation and person trip generation, the forecast mode splits have been analysed and illustrated in Table 4.

Table 4: Forecast mode split

| Mode | AM Peak Hour | | PM Peak Hour | | Weekend Peak Hour | |
|---|---|---|---|---|---|---|
| | % | Number | % | Number | % | Number |
| Car | 38% | 454 | 30% | 356 | 34% | 403 |
| Train | 6% | 69 | 5% | 58 | 5% | 64 |
| Bus | 37% | 436 | 31% | 365 | 34% | 403 |

| Mode | AM Peak Hour | | PM Peak Hour | | Weekend Peak Hour | |
|---|---|---|---|---|---|---|
| | % | Number | % | Number | % | Number |
| Walk | 12% | 138 | 10% | 115 | 11% | 127 |
| Other | 8% | 92 | 6% | 77 | 7% | 85 |
| Total | 100% | 1,188 | 100% | 971 | 100% | 1,081 |

The number represents a significant shift to bus modes, which is further discussed in Section 5.4.

## 5.2 Parking and loading provisions

### 5.2.1 Car parking

The number of off-street parking spaces are specified by Bayside Council in the Development Control Plan (DCP) 2013. Meriton have proposed parking rates which have been compared to the relevant DCP Part 3A and 9D rates, and the approved Stage 1 concept masterplan rates (summarised below in Table 5.)

Table 5: Minimum car parking rates

| Development type | Part 3A/9D BBDCP | Approved Stage 1 masterplan | Proposed rates |
|---|---|---|---|
| Residential flat buildings | | | |
| Studio / 1 bedroom apartments | 1 space per apartment | 1 space per apartment | 0.5 space per apartment |
| 2 bedroom apartments | 2 spaces per apartment | 1.5 space per apartment | 1 spaces per apartment |
| 3 bedroom apartments | 2 spaces per apartment | 2 space per apartment | 1.5 spaces per apartment |
| Visitor parking | 1 space per 5 apartments | 1 space per 10 apartments | 1 space per 10 apartments |
| Commercial / Retail / Infrastructure | | | |
| Shops | 1 space per 25m$^2$ | 1 space per 40m$^2$ | 1 space per 40m$^2$ |
| Childcare | 1 space per 2 employees | 1 space per 2 employees | 1 space per 2 employees |
| | 1 space per 5 children | 1 space per 5 children | 1 space per 5 children |
| | 1 pick-up and set-down space per 20 children. | 1 pick-up and set-down space per 20 children. | 1 pick-up and set-down space per 20 children. |

It is considered appropriate to reduce car parking for residential uses to reduce car mode share from the development. Car parking is a major contributor to car usage and the reduced rates are expected to result in reduced traffic generation. The rates proposed are more aligned to the recommended RTA Guide to Traffic Generating Developments rates which indicate:

- 0.6 spaces for 1-bedroom apartments
- 0.9 spaces for 2-bedroom apartments
- 1.4 spaces for 3+ bedrooms apartments

As a point of comparison, the 2011 Census car ownership in the surrounding suburbs (Botany, Pagewood, Hillsdale, Banksmeadow, Maroubra, Kingsford) for

multi-unit dwellings was considered. The car ownership rates (Table 6) are also comparable with the RTA parking rates and subsequently the proposed rates.

Table 6: Car ownership in surrounding suburbs

| Units (in area) | No. Units | No. Cars | Required Rate |
|---|---|---|---|
| One bedroom/studio | 1245 | 895 | **0.7189** |
| Two bedroom | 5301 | 5376 | **1.0141** |
| Three bedroom + | 1940 | 2403 | **1.2387** |
| **Total** | **8493** | **8685** | **1.0226** |

The total car parking rates are comparable with the proposed unit mix, given the approximate 1:1 ratio overall as shown in Table 7.

Table 7: Meriton unit mix

| Meriton proposed | Indicative unit mix | Cars | Rate |
|---|---|---|---|
| One bedroom/studio | 392 | 196 | 0.5 |
| Two bedroom | 1,371 | 1,371 | 1 |
| Three bedroom + | 196 | 294 | 1.5 |
| **Total** | **2,015** | **1,861** | **0.95** |

The reduced parking rates are also supported by the good public transport network both planned and under constructions. The potential Light Rail extensions (identified in the NSW Transport Masterplan) and potential Sydney Metro connection may be within walking distance of the site and will further encourage mode shift away from cars and hence the reduced parking rates.

The site is within the Eastgardens and Maroubra district centre and it is expected that there will more services/facilities and transport options in the future to support the surrounding growth and proposed development.

### 5.2.2 Bicycle parking

The City of Botany Bay DCP states the following in relation to bicycle parking:

*C7 In every new building, where the floor space exceeds 600m² GFA (**except for houses and multi unit housing**) bicycle parking equivalent to 10% of the required car spaces or part therefore as required in Table 1 shall be provided.*

*C8 Residential flat buildings where the floor space exceeds 600m² GFA shall provide secure bicycle storage as per AS 2890.3.*

In the absence of specific rates for the provision of bicycle parking in the residential component, the 10% of car parking figure has been adopted consistent with the remainder of the Pagewood concept masterplan site.

## 5.3 Walk and cycle access

There are changes proposed to the walking and cycling network interface to the site. The extensive provision of walking/cycling facilities provided within the development will be integrated with the number of cycleways surrounding the site, which are shown in the figure below.

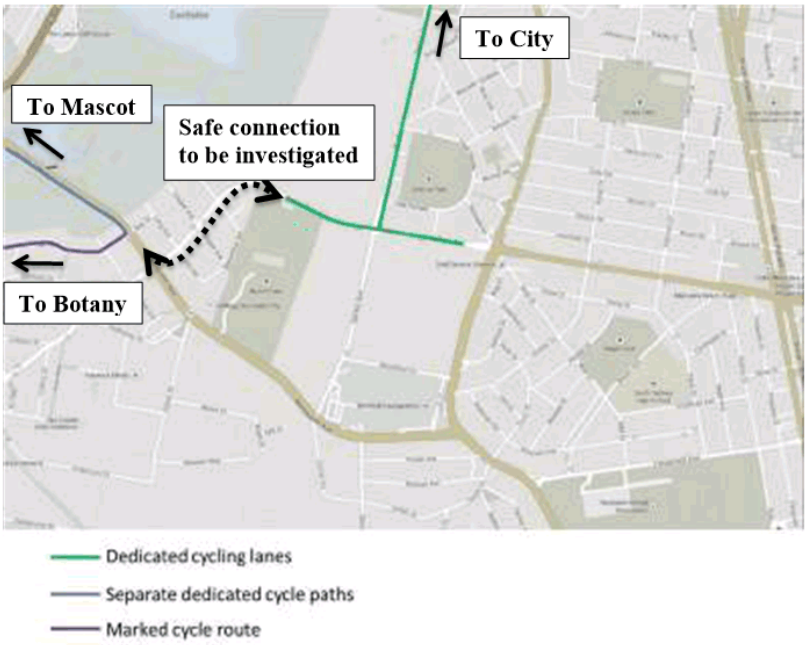


Figure 19: Cycleways surrounding site

The site has some good cycleway connections to the north. The northern route connects directly to the city via Kensington and the western route (from Bay Street) connects to General Holmes Drive and Botany. There are good regional connections to the west as well; however there is a gap along Page Street and limited safe opportunities to cross Wentworth Avenue to the shared path. It is recommended for Bayside Council to investigate this link or prepare a Bike Plan for the area for better regional cycle connections.

Secure bicycle parking is to be provided as a component of the proposed development. Provision of these facilities (along with the site being adjacent to regional shopping facilities) will encourage active travel, such as cycling as a viable mode of transport to the site. This will further contribute to a reduced car mode share of trips.

## 5.4 Public transport

The following sections outline the current, proposed and potential public transport servicing the site. These are also summarised in Figure 20.

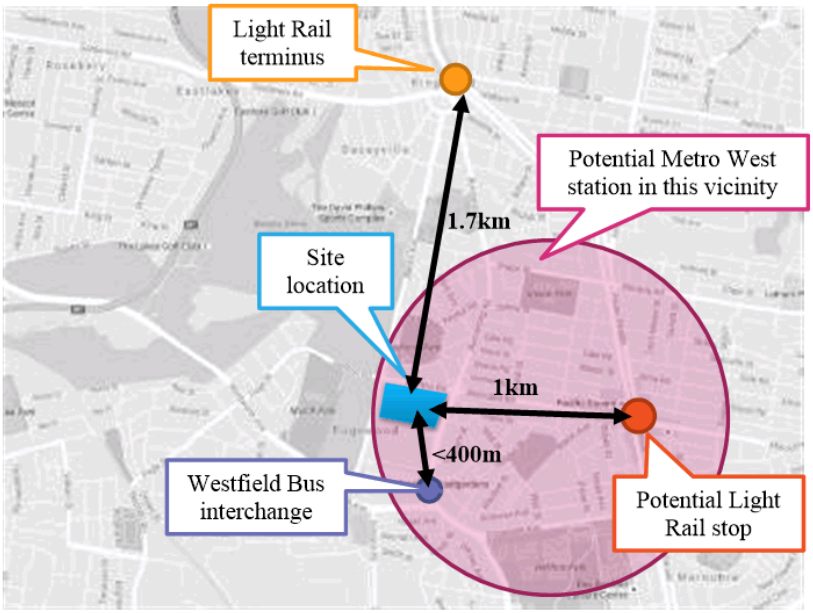


Figure 20: Public transport servicing the development

### 5.4.1 Bus infrastructure

Using the mode splits for buses established in Section 5.1, this equates to between 365 to 436 additional people using the bus during peak hours. From site observations, buses were generally 50% full leaving the Westfield interchange, however there may be impacts further towards the destinations such as the City. Therefore, using a bus occupancy of 50 people, this equates to an additional eight bus services during each of the peak hours to service the development. While a number of buses are being rerouted in this area to the Light Rail, it is likely these will need to be supplied towards the City as express services, which will supplement the local feeder services being directed to the Light Rail.

Meriton have discussed increased bus services and current capacities with Sydney Buses. It is understood that Sydney Buses will implement more than the required eight buses noted in the Transport Impact Assessment.

### 5.4.2 Sydney Light Rail

The current Sydney Light Rail stop under construction at Kingsford terminus is located 1.7km to the north, which may be considered just outside walking distance for most people. However, there will likely be some people who may consider walking within 25 minutes to the stop or cycling for 5 minutes. It is likely that future residents of the site will drive and park at the stop.

### 5.4.3 Potential Light Rail extension

The government has indicated that Light Rail may be extended to Maroubra Junction in the future, which is within 15 minutes' walk of the site. However, given the distance from the site, there is still expected to be a lower proportion of walk-up of this mode compared to bus, and people will likely try and drive to a commuter car park if available.

If Light Rail is extended to the site as discussed, patronage of bus is likely to be less and the need for additional services could potentially be mitigated given there will be a mode shift in the surrounding area to Light Rail.

### 5.4.4 West Metro

As stated in Section 3.2, there are also plans being considered for a West Metro rail line linking the second proposed Sydney Airport at Badgerys Creek to Central and possible extension to the south eastern suburbs. The potential extension may continue near the site and have the potential to attract patronage from the proposed development. This will further encourage less car trips from the development if the station is located within 800m of the site. However, given the uncertainty of the project, no mode split to this mode have been assumed.

## 5.5 Transport measures

### 5.5.1 Travel Plans

One of the objectives to reduce the level of private car usage is to favour more sustainable modes of travel such as walking, cycling and public transport. A method of achieving this is personalised marketing strategies to assist in modifying travel behaviour through communicating relevant travel choice information to the community. Marketing would begin through information to be produced by the developer, including:

- Travel information kits for residents (including Travel Access Guides)
- Travel Plans for employees and residents.

### 5.5.2 Wayfinding

Wayfinding signage would be installed at entry points to allow people to navigate their way around the precinct. Maps would also be installed to allow people to know about the nearby pedestrian and cycle connections.

### 5.5.3 Car share schemes

Car share schemes are designed to provide a flexible option for people who only require occasional car use and choose not to own a vehicle. They provide access to a vehicle when it is the most suitable mode choice, while avoiding the need and expense of owning a vehicle. They would potentially require lower parking rates than proposed in Section 5.2 to provide sufficient incentive for residents and businesses to reconsider purchasing a first or second vehicle in favour of using the car share vehicle. Without a vehicle sitting in a garage, private car is not the first

mode considered, increasing the likelihood that other mode sustainable modes will be chosen.

Successful car share operations are based in metropolitan areas with high-density and mixed-use development, good levels of pedestrian access and constrained parking (fewer car parks or parking that is more expensive). When used in conjunction with public transport, walking, and cycling, car sharing has the ability to be an integral part of the sustainable transport network for urban areas.

Car sharing also has the ability to reduce the total fleet vehicles for an employer and reduce the use of private vehicles for commuting. This trend is supported by current research, such as the Transportation Research Board report that estimated that 'at least five private vehicles are replaced by each shared car' in 2005. Sydney's Go-Get club advertises that its research shows that each car in the scheme gets seven others off the roads.

# 6 Traffic impact assessment

## 6.1 Traffic generation

Using the mode splits for cars established in Section 5.1, this equates to the following peak one hour generation rates for the proposed development:

- 0.277 trips per apartment for Weekday AM peak hour
- 0.217 trips per apartment for Weekday PM peak hour
- 0.246 trips per apartment for Weekend Noon peak hour

In addition, child care and retail uses are proposed, which utilise different rates from Roads and Maritime as follows:

- 0.7 trips per child for childcare uses; and
- The following peak hour rates for retail uses:
  - 0.08 / $m^2$ GFA for AM peak hour trips
  - 0.12 / $m^2$ GFA for PM peak hour trips
  - 0.16 / $m^2$ GFA for weekend peak hour trips

A two-hour conversion of the traffic generation rates outlined in Section 5.1 were adopted for the modelling based on the development yield outlined in Chapter 4. This is outlined further in the appendices.

Table 8 outlines the net change of traffic generation relating to 128 Bunnerong Road, Pagewood and the northern portion of 130-150 Bunnerong Road, Pagewood. The net changes are approximately 1,639 additional residential units, an additional child care centre and an additional 1,000$m^2$ retail uses.

Table 8 Change to development traffic (over two-hour peak periods)

| Development Type | Original Development Proposal | | | Proposed Changes | | |
|---|---|---|---|---|---|---|
| | AM | PM | WE | AM | PM | WE |
| Residential | 977 | 765 | 868 | +723 | +566 | +642 |
| Retail | 0 | 238 | 317 | 0 | +48 | +63 |
| Childcare | 222 | 222 | 0 | +28 | +28 | 0 |
| Warehouse | 397 | 397 | 0 | -397 | -397 | 0 |
| **Total** | **1,596** | **1,622** | **1,185** | **+354** | **+245** | **+705** |

## 6.2 Traffic modelling methodology

A series of AIMSUM micro simulation traffic models have been created to assess traffic impacts from the proposed development. Further details of the modelling process and results are provided in Appendix A of this report. A series of existing conditions (Year 2016) traffic models were established for the AM, PM and weekend two-hour peak periods for the immediate surrounding road network. Travel time and turning count data was used to calibrate and validate the existing conditions models.

Future year models were created for each of the peak periods for Year 2021 (which is the intended completion year of development) and the 10-year horizon to Year 2031, which were the discussed years to be modelled with Roads and

Maritime during a meeting in December 2015. Future year models included background growth and surrounding key approved developments proposed such as Bunnings, Orica Industrial and Masters, with the following intersection upgrades:

- Page Street / Wentworth Avenue modifications
- Maroubra Road / Bunnerong Road / Heffron Road modification
- Heffron Road signalisation

In total 15 different scenario models were run, three base models, six future year base case models and six development models. Table 9 below details each model scenario that was run for an AM, PM and Weekend peak period. For each scenario the intersection Level of Service (LoS), travel time analysis and network performance will be explored.

Table 9 Model Scenarios

| Model | Abbreviation | Design Year | Description |
|---|---|---|---|
| Base Model | Base | 2016 | Calibrated base model exploring existing conditions. |
| Future Base | FB | 2021, 2031 | Future base model that includes all likely and currently approved developments. This includes the original Meriton Pagewood proposal. This model will form the benchmark for all future year models. |
| Proposed Development | PD | 2021, 2031 | Future options model that includes the changes to the previously proposed Meriton development. |

The model extent included an area from Page Street and Wentworth Avenue to Bunnerong Road between Wentworth Avenue and Maroubra Road. The modelling extent is shown in Figure 21 as previously agreed with Roads and Maritime Services.

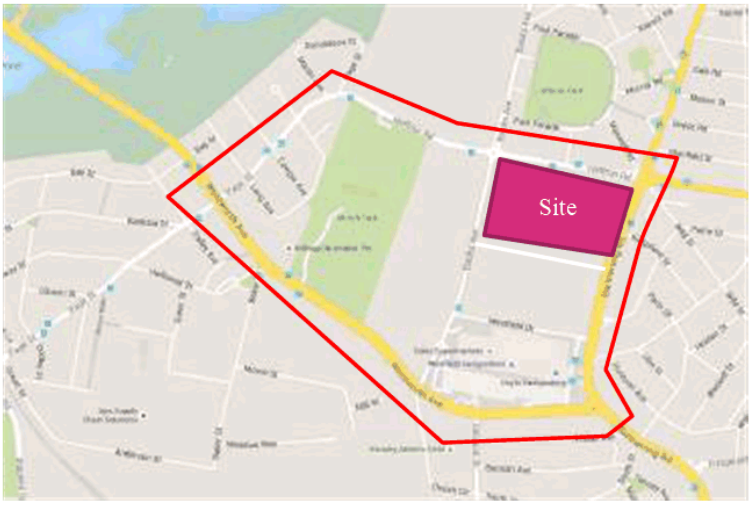


Figure 21: Modelling extents

## 6.3 Modelling results

In urban areas, the traffic capacity of the major road network is generally a function of the performance of key intersections. This performance is quantified in terms of Level of Service (LOS), which is based on the average delay per vehicle. The results of the surrounding intersections and network are summarised in the Traffic Modelling report in the Appendix. The following sections summarise the future models developed with the development traffic.

## 6.4 Year 2021

In the AM peak period, Wentworth Avenue / Banks Avenue / Corish Circle, Wentworth Avenue / Denison Street and Wentworth Avenue / Page Street intersections have the largest increase in delays as traffic accesses the wider network from the development site increasing the pressure on the side roads. This issue is further exacerbated with the introduction of the right hand turn as it creates an alternative route to Heffron Road. The introduced right turn does however remove the pressure off Wentworth Avenue / Page Street and to a lesser extent, the Banks Avenue / Heffron Road intersection via the alternative route.

Table 10 AM peak Level of Service results

| Intersection | Future Base | | Future Dev | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 41 | C |
| Bunnerong/Meriton | 1 | A | 2 | A |
| Bunnerong/Westfield | 10 | A | 13 | A |
| Bunnerong/Wentworth | 23 | B | 23 | B |
| Wentworth/Dennison | 35 | C | 31 | C |
| Wentworth/Banks/Corish | 32 | C | 24 | B |
| Banks/Westfield entrance | 4 | A | 3 | A |
| Banks/Westfield | 6 | A | 5 | A |
| Banks/Meriton | 1 | A | 2 | A |
| Banks/Heffron | 24 | B | 35 | C |
| Wentworth/Page | 63 | E | 59 | E |

The issues noted in the AM peak are also experienced in the PM peak period with an intensification of delays around Wentworth Avenue / Banks Avenue / Corish Circle intersection as retail traffic to Westfield Eastgardens intensifies.

Table 11 PM peak Level of Service results

| Intersection | Future Base | | Future Dev | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 39 | C |
| Bunnerong/Meriton | 1 | A | 2 | A |
| Bunnerong/Westfield | 10 | A | 16 | B |
| Bunnerong/Wentworth | 21 | B | 22 | B |
| Wentworth/Dennison | 32 | C | 32 | C |
| Wentworth/Banks/Corish | 21 | B | 37 | C |
| Banks/Westfield entrance | 2 | A | 3 | A |
| Banks/Westfield | 7 | A | 7 | A |
| Banks/Meriton | 1 | A | 3 | A |
| Banks/Heffron | 28 | B | 26 | B |
| Wentworth/Page | 68 | E | 46 | D |

In the weekend peak period, the worst delays are experienced as the intensification of Westfield Eastgardens traffic causes the saturation of the Wentworth Avenue / Banks Avenue / Corish Circle intersection shifting traffic to the Heffron Road corridor, resulting in an increase of delay at the Banks Avenue / Heffron Road intersection. With the introduction of the right-hand turn resulting in the further intensification of traffic on Banks Avenue, additional traffic is forced onto Heffron Road / Banks Avenue and the intersection begins to reach saturation point as well.

Table 12 Weekend peak Level of Service results

| Intersection | Future Base | | Future Dev | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 56 | D | 49 | D |
| Bunnerong/Meriton | 2 | A | 3 | A |
| Bunnerong/Westfield | 28 | B | 26 | B |
| Bunnerong/Wentworth | 32 | C | 30 | C |
| Wentworth/Dennison | 46 | D | 34 | C |
| Wentworth/Banks/Corish | 115 | F | 41 | C |
| Banks/Westfield entrance | 11 | A | 5 | A |
| Banks/Westfield | 7 | A | 7 | A |
| Banks/Meriton | 1 | A | 3 | A |
| Banks/Heffron | 54 | D | 26 | B |
| Wentworth/Page | 54 | D | 53 | D |

In the AM and PM peaks all the intersections along Bunnerong Road remain largely unaffected. However, in the Weekend peak these intersections come under increased pressure.

## 6.5 Year 2031

Despite the development traffic, the network capacity in 2031 was able to be improved over and above the existing future base scenario. Indicating that there is currently spare capacity on the network that is only restricted by the operation of a number of key intersections.

As the AM peak period model is relatively uncongested there is little change in the intersection level of service (LoS) as indicated in Table 13. Where the changes make the most difference is in the PM peak period (see

Table 14). The double diamond phasing at Wentworth Avenue and Page Street allows the intersections to effectively deal with the tidal peak demands competing with retail trips around the Westfield Eastgardens site. In the Weekend peak period (see Table 15), two of the intersections start to come under pressure again however overall there is still a network improvement even with the increased demand.

Table 13 AM Peak Period Intersection Level of Service

| Intersection | Future Base | | Development | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 45 | D |
| Bunnerong/Westfield | 10 | A | 15 | B |
| Bunnerong/Wentworth | 23 | B | 27 | B |
| Wentworth/Denison | 35 | C | 33 | C |
| Wentworth/Banks/Corish | 32 | C | 27 | B |
| Banks/Westfield entrance | 4 | A | 5 | A |
| Banks/Heffron | 24 | B | 33 | C |
| Wentworth/Page | 63 | E | 67 | E |

Table 14 PM Peak Period Intersection Level of Service

| Intersection | Future Base | | Development | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 43 | D |
| Bunnerong/Westfield | 10 | A | 22 | B |
| Bunnerong/Wentworth | 21 | B | 27 | B |
| Wentworth/Denison | 32 | C | 36 | C |
| Wentworth/Banks/Corish | 21 | B | 43 | D |
| Banks/Westfield entrance | 2 | A | 11 | A |
| Banks/Heffron | 28 | B | 36 | C |
| Wentworth/Page | 68 | E | 61 | E |

Table 15 Weekend Peak Period Intersection Level of Service

| Intersection | Future Base | | Development | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 56 | D | 54 | D |
| Bunnerong/Westfield | 28 | B | 33 | C |
| Bunnerong/Wentworth | 32 | C | 42 | C |
| Wentworth/Denison | 46 | D | 37 | C |
| Wentworth/Banks/Corish | 115 | F | 58 | E |
| Banks/Westfield entrance | 11 | A | 7 | A |
| Banks/Heffron | 54 | D | 32 | C |
| Wentworth/Page | 54 | D | 58 | E |

## 6.6 Road network impacts

During the operational modelling process, it was found that the development yields have little impact on the network. In the weekend peak period, development traffic has trouble accessing the wider network due to the intensification of retail traffic around Eastgardens. The deterioration in performance is established in the future based scenario, without the proposed development traffic and improves slightly across the peak periods with the proposed development.

It was also found that as the road network is expanded and additional connections are added to the wider network, delays increase. This is in part due to the intensification of traffic around Eastgardens from the growth in the retail catchment. This new traffic is using the expanded network for alternative routes increasing turning movements and the associated merging and weaving.

In summary, the network operates satisfactorily with the expanded development however it is advisable that the road layout is refined as to minimise new connections onto Banks Avenue and Heffron Road (consistent with the accesses nominated in Section 4.2). It is also recommended to assess possible changes to the network to account for the increased demand to Eastgardens shopping centre as it is retail traffic that has the largest effect on the network.

It is not advisable to include a right turn into Meriton Boulevard even though minimal additional delay is experienced along Bunnerong Road the right turn introduces an alternative route to Eastgardens. Increasing delays along Banks Avenue and Wentworth Avenue as a result.

# 7 Key recommendations

This transport impact assessment has been prepared for the rezoning of 128 Bunnerong Road, Pagewood and the northern portion of 130-150 Bunnerong Road, Pagewood based on the information available for this study. The rezoning will convert the Precinct to a mixed residential and community precinct. The assessment of the transport network required to support this rezoning has identified a number of influences from the wider Sydney road and light rail networks that could play a key role in determining the magnitude of development within the Eastern Suburbs subregion. The following recommendations are made to assess the impact of these wider regional impacts.

## 7.1 Arterial road network capacity

The region contains a number of arterial roads, including Wentworth Avenue, Bunnerong Road and Maroubra Road. All of these roads currently experience a level of congestion and are expected to face increased demand in the future. The Sydney Light Rail extension project is likely being considered by government, which may provide additional road capacity in the study area. Its impact on the amount of road capacity in the future and on flows is being investigated by state government.

The region has three main gateways that are mostly operating near capacity, with long delays and queues during peak periods. As a result, some intersections are already being upgraded to cater for development traffic of the 130-150 Bunnerong Road, Pagewood concept masterplan. Others have some spare capacity to accommodate future growth.

The future arterial road network conditions will have a large influence on the amount of traffic that can be generated by the subregion. Upgrades to the arterial road network may cause a re- distribution of trips in the area, changing the balance of traffic that uses each of the three gateway intersections.

Accordingly, there are no upgrades required to the surrounding local or arterial road network as a result of the Planning Proposal.

## 7.2 Public transport

Public transport surrounding the site is to be accommodated by buses. While a light rail extension has been planned to extend to Maroubra, this is still quite some distance from the site (approximately 1.0km from the site). In addition, the light rail extension adjacent to the site has not yet been approved by government. As such, with the additional residents expected, there may be capacity issues with the public transport system.

The buses servicing the surrounding roads are described in Section 2.3 of the traffic impact assessment. There are approximately 23 bus services during the AM peak hour (of which 7 provide services to the City).

Additional demand may be distributed amongst some of the buses within the area as there was observed capacity on the local routes. However, with the cumulative effects from the approved concept masterplan, Section 5.4 indicates that an extra eight bus services will likely need to be provided so that there is spare capacity retained for the routes further down the lines.

## 7.3 Development levels

An analysis of the road network capacity has been used to estimate that the road network could sustain development within the 128 Bunnerong Road, Pagewood and the northern portion of 130-150 Bunnerong Road, Pagewood site to the following levels:

- 1,639 additional dwellings across the entire project accommodating approximately 4,400 residents
- 1,000m$^2$ GFA additional retail

Other strategies to reduce vehicle trip generation without the need to construct more road upgrades include.

- a more extensive public transport upgrade
- higher public transport frequencies assisted by dedicated public transport priority
- reduced parking rates to encourage the use of alternative modes of transport.

## 7.4 Summary

This traffic and transport assessment has been undertaken for the proposed rezoning of the 128 Bunnerong Road, Pagewood and the northern portion of 130-150 Bunnerong Road, Pagewood site. The subject site has an area of 8.95ha. A Development Control Plan (DCP) including a site-specific chapter has been prepared (refer to Chapter 9D - British American Tobacco Australasia, of the Botany Bay DCP 2013).

The site will have good access to public transport, with buses and light rail (under construction) providing alternatives to car usage. The potential extended transport network and reduced parking rates on the site in comparison to the site specific DCP will also reduce car dependence and result in lesser road network impacts.

Through the operational modelling process it was found that the development yields have little impact on the network with the current approved and committed upgrades proposed. In the weekend peak however development traffic has trouble accessing the wider network due to the intensification of retail traffic around Eastgardens.

This is a broader network issue not generated by the proposed development as the project will have local retail or is within walking distance to the Westfield Centre. Accordingly, the development does not generate the need for any localised upgrades.

.

## Appendix A

Traffic modelling report

Meriton Properties

# 128 Bunnerong Road, Pagewood

Traffic Modelling Report

Rev A | 6 August 2018

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 237575

Arup
Arup Pty Ltd ABN 18 000 966 165

**Arup**
Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com

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# 1 Introduction

## 1.1 Background

The objective of this study was to develop a traffic model suitable for analysing the proposed extension of the Meriton Properties Pagewood development to include the British American Tobacco Australia (BATA) site. The modelling is used to test development yields, assess network impacts and understand access arrangements.

This report also details the option testing that was undertaken to support the expanded Meriton Properties development on the British American Tobacco Australia site. In order to test the traffic and transport implications of potential development options and network changes the base models are to be modified to reflect potential future conditions. The types of changes to the base models that are required include:

- Additional demands due to existing site development approvals, which are expected to be taken up in the near-term
- Possible minor adjustments to road network arraignments
- Potential increases in external traffic passing through the study area

Once the future base model has been established then the incremental demands and network changes associated with the development options will be added to the future base model creating the options models.

## 1.2 Purpose of this report

This report aims to provide background information relevant to the development of the micro-simulation model, and demonstrate that the model has been developed in accordance with the relevant guidelines. The ultimate goal is to establish confidence that the model is fit-for-purpose for use as part of the subject study only. This is achieved through the presentation of information relevant to the development, calibration and validation of the model including:

- Identification of the network area to be modelled
- Identification of the data used as inputs to the model
- Traffic demand matrix development
- Model validation and calibration

## 1.3 Software package

The software used for the analysis presented in this report was Aimsun Next 8.2.3 (R54491x64). Aimsun is an integrated transport modelling software package approved by the RMS that is commonly used for micro and mesoscopic traffic models.

## 1.4 Site location

Pagewood is located directly to the east of Sydney Airport and 8km south of the Sydney CBD. The University of New South Wales is located immediately to the north with port botany located immediately to the south. There are four wider network connections within the site: Bunnerong Road, Wentworth Avenue, Denison Street and Page Street/Heffron Road.

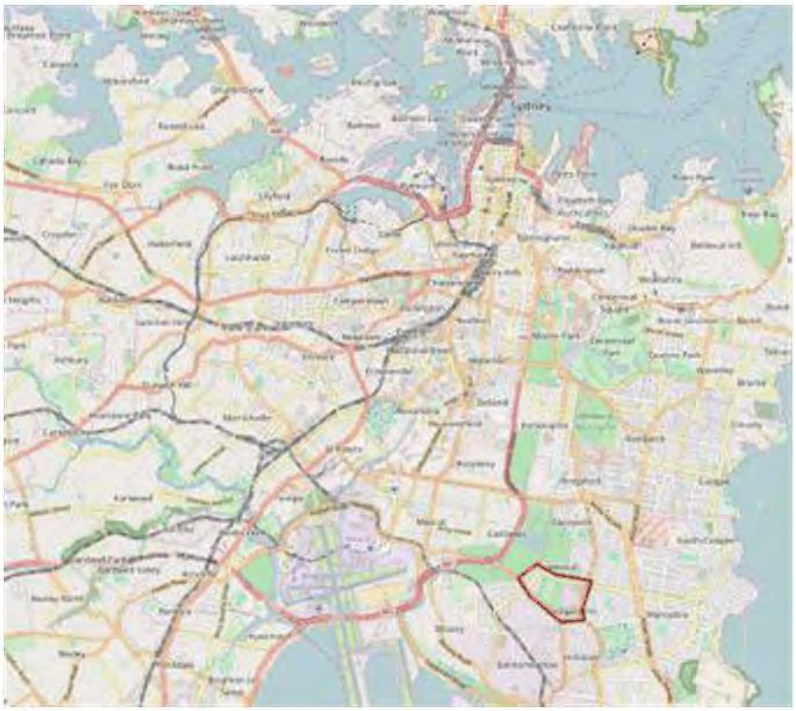

Figure 1 Pagewood location within Sydney (*source: Open Street Maps*)

## 1.5 Study area

The study area was defined by the major roads surrounding the BATA extension site and is illustrated in Figure 2 below.

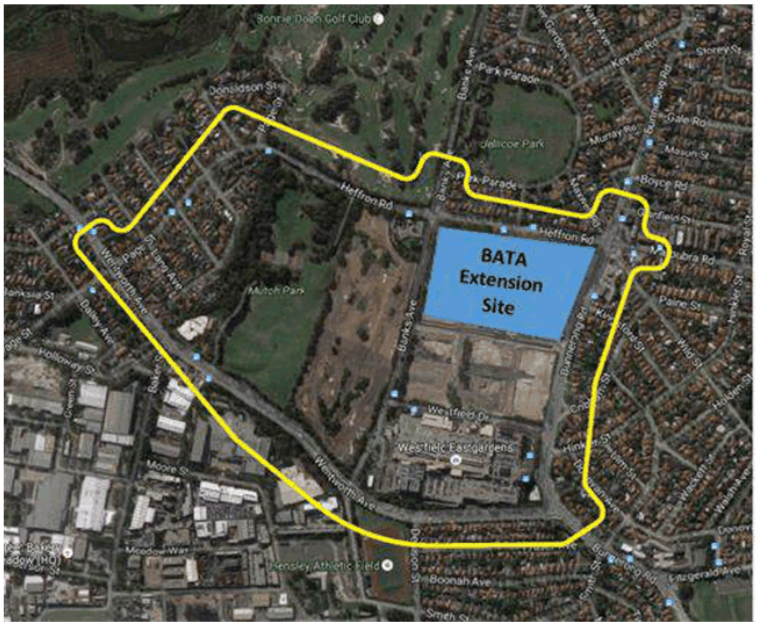


Figure 2 Study area definition (*source: google maps)*

The study area includes residential and retail areas, notably the Eastgardens Westfield in the south east corner of the study area. In order to understand how the road network functions, it is crucial to consider the strong freight corridor formed by Wentworth Road running along the southern edge of the study network and Denison Street extending to the south.

## 1.6 Time periods

In order to select the appropriate time periods to assess, data from the traffic counts were collated across the network with the 15 minute overall demand graphed, see Figure 3. The 15 minute flows were also calculated by surmising the hourly volumes beginning every 15 minutes, see Figure 4, Figure 5 and Figure 6.

This process clearly highlighted the busiest period for the morning, afternoon and weekend peak. As the demand profile was fairly flat for a sustained period of time in the PM and weekend time period a two hour peak was chosen to be modelled. The AM peak for consistency was also modelled as 2 hours.

- AM weekday peak: 7:30 – 9:30am
- PM weekday peak: 4:30 – 6:30pm
- Weekend peak: 11:15am – 1:15pm

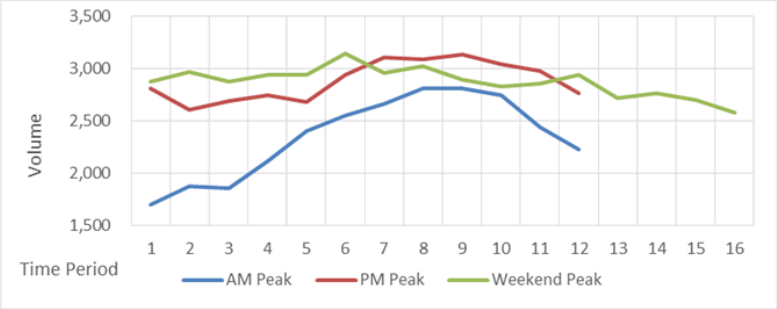


Figure 3 Demand profiling, volume per 15min period

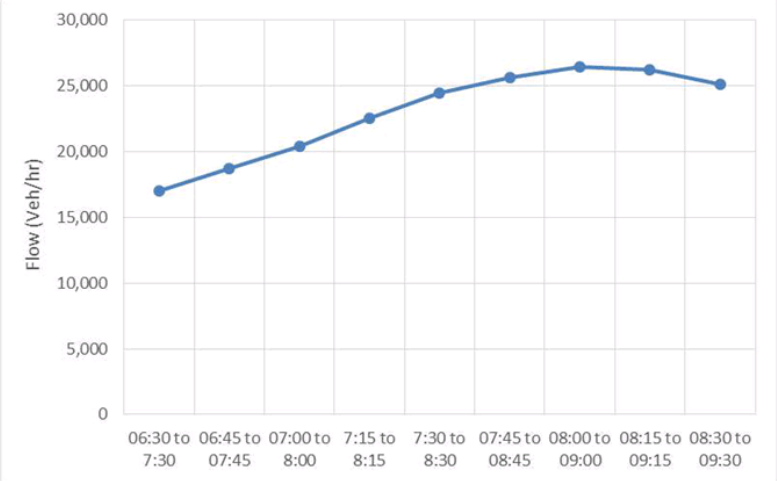


Figure 4 AM Peak identification, 15 min flows

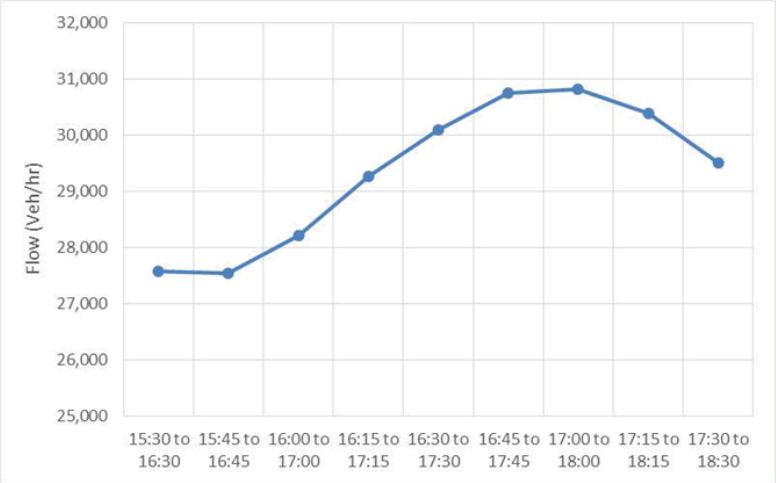


Figure 5 PM Peak identification, 15 min flows

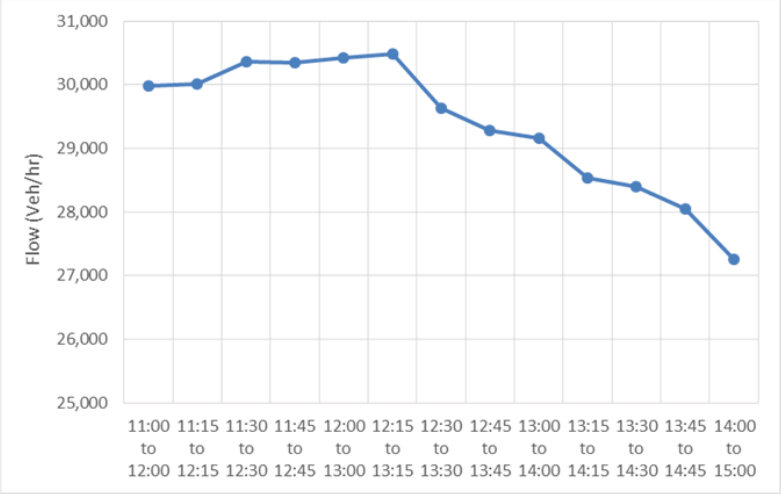


Figure 6 Weekend Peak identification, 15 min flows

# 2 Data Collection

Developing the model of the study network required the collection of several different data types. This data was used for coding the base model and subsequently during the calibration and validation process. Table 1 below details the types of data collected and their respective uses.

Table 1 Summary of data used in base model

| Data type | Description | Location | Date and time | Used for |
|---|---|---|---|---|
| Intersection counts | Turn counts were undertaken by subconsultants Matrix.<br>This data was recorded in 15minute intervals and categorised into car, truck, bus and pedestrians. | 11 intersections across the study area (See Figure 7) | Thursday 18 August, 6:30-9:30am and 3:30-6:30pm<br>Saturday 20 August, 11am – 3pm | Prior matrix and Calibration |
| Videos of intersections | Videos were used to collect data about average phasing data to use as a starting point for the base model signals. | 11 intersections across the study area<br>(See Figure 7) | Thursday 18 August, 6:30-9:30am and 3:30-6:30pm<br>Saturday 20 August, 11am – 3pm | Signal operations |
| Travel time | Travel time through the model along two routes<br>1. Page Street – Heffron Rd – Maroubra Rd<br>2. Wentworth Rd – Bunnerong Rd | 2 routes through the study area<br>(See Figure 8) | Thursday 18 August and Saturday 20 August | Model Validation |
| Site observation | Site visit to study area | Whole study area | Wednesday 16 November | Assessing model operation |
| TCS plans | Plans from the RTA (now RMS) showing layout and possible phases for signalised intersections | 6 signalised intersections in network | NA | Signal operations |
| Bus network data | Timetabling and routing data for buses operating in study area (See Section 3.3) | Whole study area | Timetables for Nov 2016 used | Creating base model Public Transport demand |
| Journey to Work data | Data from 2011 census about travel patterns in the area | Wider Pagewood area | 2011 Census | Developing trip distribution for prior matrix |
| RMS guide to traffic generating developments | Information on land use trip generation | Internal network zones | 2013 release | Estimating demand in prior matrix |



Figure 7 Intersection Count Locations *(source: Matrix traffic and transport data)*

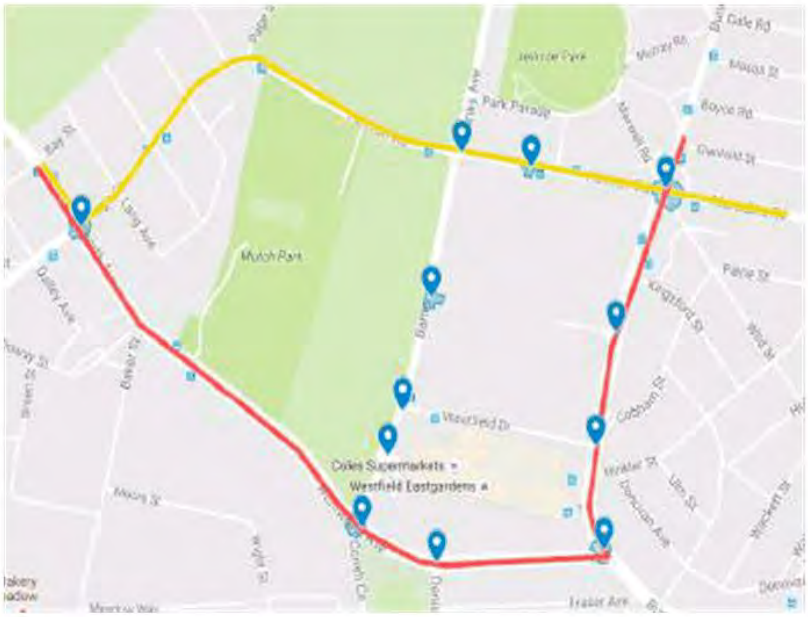


Figure 8 Travel time routes assessed *(source: Matrix traffic and transport data)*

# 3 Network Development

The network was initially created through the importation of an open street map data file of the study area. The network was then subsequently refined using aerial images from SIXmaps until the required level of detail was obtained.

## 3.1 Road hierarchy

Three primary road types have been used in the model, sub-arterial (orange), collector (yellow) and local roads (white) as shown in Figure 9. Although not specifically built as sub arterial roads, Page Street and Heffron Road perform a sub-arterial function with regards to network connections. The coding of road types was undertaken primarily for the purpose of static model adjustments and static assignment.



Figure 9 Road Hierarchy

## 3.2 Travel speeds

Travel speeds within the network have been applied in accordance with posted speeds. These are generally as follows:

- 70km/h along Wentworth Road
- 60km/h along Bunnerong Road
- 50km/h along all residential roads

The default speed distributions within each of these speed categories have been adopted.

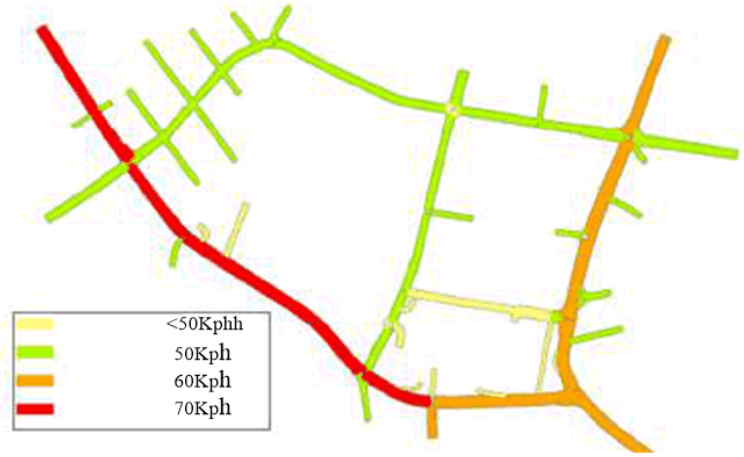


Figure 10 Speed ranges within model

## 3.3 Public transport

Buses are the only form of public transport (excluding taxis) within the study area. Table 2 highlights the bus routes that have been coded within the model. Dead running buses and school buses have not been explicitly coded as it is expected that these services will be captured within the heavy vehicle counts.

The bus interchange at Eastgardens has been coded as a bus only area with a number of buses starting and terminating in this area. Site observations indicated that there was no congestion associated with bus layovers and as such there was no need to explicitly model bus layovers.

Table 2 Bus routes included within the model

| Route |
|---|
| 301 |
| 302 |
| 310, X10 |
| 316, 317 |
| 353 |
| 391, 392, X92 |
| 400, 410 |

## 3.4 Signal operations

Actuated signals have been coded into the model to capture the variability of signal times within Pagewood. A maximum and minimum green time was specified for all phases with some having the ability to be skipped if no demand was present. A gap out parameter of 5 seconds was used with some of the

mainline movements having a reducing gap parameter to account for potentially long green times.

The reducing gap parameter reduces the gap required for gapping out over a specified time period so that phases have the ability to substantially extend the maximum green time only when necessary.

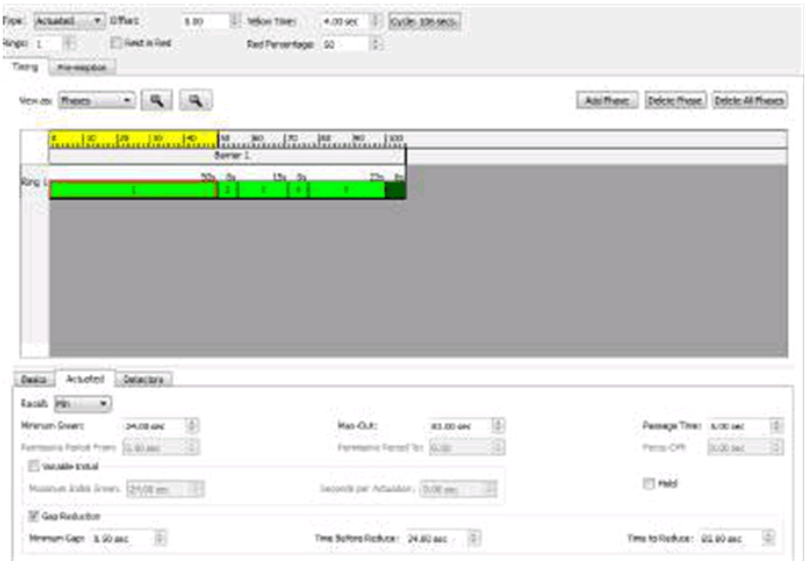

Figure 11 Example of Actuated Signal Coding

Table 3 compares the phase green time proportion for the signalised intersections in the model with observed values. This highlights that the actuated signals, with the exception of 53 phases, are acceptable as per table 11.3 page 105 of the *RMS Modelling guidelines (Roads and Maritime, 2013)*.

Three of the phases that lie just outside the criteria do so due to the balance between green times given to the right hand turn and the through movement. This occurs at the Bunnerong Road / Westfield Drive intersection where the right turn starts off as a filter before transitioning to a trailing right turn arrangement. In the weekend peak the through movement is running for a larger proportion of the green time than observed with the right hand turn running for less. In the model, vehicles are finding gaps in traffic during the filter turns while in reality it is more likely that less confident drivers will instead wait for the priority phase as they know this phase is coming. This intersection only shows a 21% difference in green time and as such, this issue is not considered to be significant enough to apply a different signal logic from the other signals. There is a less significant occurrence of this in the PM peak.

The three phase operation in the AM peak at the Wentworth Avenue / Denison Road intersection lies 1% above the required criteria. However as the intersection performs well within criteria for the other two peaks this was not considered significant enough to change the signal logic for all the peaks.

The final signal phase that exceeds criteria is the right hand turn from Wentworth Avenue into Page Street. Similar to the aforementioned issue at Bunnerong Road / Westfield Drive, more vehicles in the model are finding gaps during the filtered right turn than observed on site, again because more conservative drivers are aware of the trailing right hand turn and thus only accept larger than normal gaps. This movement is only 4% above the criteria and again is not considered significant enough to warrant applying different signal logic.

Table 3 Phase Green time proportions, Modelled vs Observed

| Intersection | Run | Phase | Modelled | Observed | abs diff |
|---|---|---|---|---|---|
| Bunnerong_Westfield | AM | 1 | 81% | 82% | 1% |
| | | 2 | 5% | 11% | 5% |
| | | 3 | 14% | 15% | 2% |
| | PM | 1 | 62% | 52% | 10% |
| | | 2 | 12% | 25% | 13% |
| | | 3 | 26% | 22% | 3% |
| | WE | 1 | 63% | 45% | 18% |
| | | 2 | 11% | 32% | 21% |
| | | 3 | 26% | 25% | 2% |
| Wentworth_Corish | AM | 1 | 64% | 54% | 10% |
| | | 2 | 6% | 11% | 6% |
| | | 3 | 22% | 24% | 3% |
| | | 4 | 8% | 10% | 2% |
| | PM | 1 | 59% | 49% | 10% |
| | | 2 | 13% | 17% | 3% |
| | | 3 | 21% | 30% | 9% |
| | | 4 | 7% | 5% | 2% |
| | WE | 1 | 48% | 51% | 3% |
| | | 2 | 18% | 17% | 1% |
| | | 3 | 26% | 29% | 2% |
| | | 4 | 8% | 4% | 4% |
| Bunnerong_Wentworth | AM | 1 | 48% | 50% | 1% |
| | | 2 | 14% | 18% | 3% |
| | | 3 | 37% | 33% | 5% |
| | PM | 1 | 51% | 48% | 4% |
| | | 2 | 9% | 17% | 8% |
| | | 3 | 40% | 36% | 4% |
| | WE | 1 | 49% | 44% | 4% |
| | | 2 | 17% | 19% | 2% |
| | | 3 | 34% | 36% | 3% |
| Banks_Westfield | AM | 1 | 76% | 86% | 10% |
| | | 2 | 24% | 14% | 10% |
| | PM | 1 | 76% | 78% | 2% |
| | | 2 | 14% | 22% | 7% |
| | WE | 1 | 79% | 80% | 1% |
| | | 2 | 21% | 20% | 1% |

..Table 3 continued

| Intersection | Run | Phase | Modelled | Observed | abs diff |
|---|---|---|---|---|---|
| Wentworth_dension | AM | 1 | 46% | 53% | 7% |
| | | 2 | 16% | 20% | 4% |
| | | 3 | 38% | 27% | 11% |
| | PM | 1 | 48% | 58% | 9% |
| | | 2 | 15% | 12% | 3% |
| | | 3 | 36% | 30% | 6% |
| | WE | 1 | 48% | 54% | 6% |
| | | 2 | 13% | 13% | 0% |
| | | 3 | 39% | 33% | 6% |
| Wentworth_Page | AM | 1 | 38% | 38% | 0% |
| | | 2 | 13% | 22% | 9% |
| | | 3 | 25% | 19% | 6% |
| | | 4 | 25% | 21% | 4% |
| | PM | 1 | 48% | 45% | 3% |
| | | 2 | 3% | 17% | 14% |
| | | 3 | 20% | 19% | 1% |
| | | 4 | 29% | 19% | 10% |
| | WE | 1 | 53% | 46% | 7% |
| | | 2 | 0% | 8% | 8% |
| | | 3 | 24% | 27% | 3% |
| | | 4 | 23% | 19% | 4% |
| Bunnerong_Heffron | AM | 1 | 38% | 31% | 7% |
| | | 2 | 11% | 15% | 4% |
| | | 3 | 10% | 18% | 8% |
| | | 4 | 21% | 25% | 4% |
| | | 5 | 21% | 16% | 5% |
| | PM | 1 | 43% | 34% | 9% |
| | | 2 | 10% | 15% | 5% |
| | | 3 | 23% | 29% | 6% |
| | | 4 | 19% | 18% | 1% |
| | | 5 | 5% | 11% | 6% |
| | WE | 1 | 44% | 34% | 10% |
| | | 2 | 8% | 16% | 8% |
| | | 3 | 20% | 29% | 9% |
| | | 4 | 16% | 19% | 3% |
| | | 5 | 12% | 11% | 1% |

## 3.5 Priority controlled movements

Priority control movements at intersections as well as right turn filter movements at signalised intersections have had priority rules applied. These priority rules (known as warnings in Aimsun) are consistent with observed signposted and functional priorities in Pagewood. Figure 12 details the gap acceptance parameters used in the model.

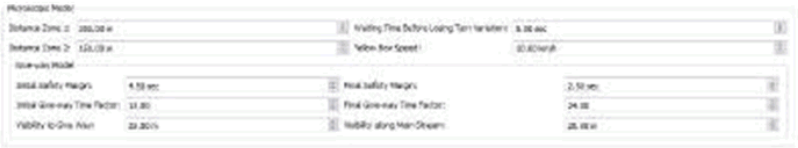

Figure 12 Gap acceptance parameters

The initial safety margin is the initial gap that vehicles will look for. After 58.5 seconds (4.5 * 13.0), vehicles will decrease their gap acceptance linearly to a gap of 2.5 seconds over a 60 second (2.5 * 24.0) period. The visibility to give way (25m) is when vehicles start to look for a gap and visibility along main stream (20m) is the distance into the opposing stream of traffic that vehicles can see.

## 3.6 Traffic management

Traffic management functions have been used in Aimsun to model lane closures, school zones and traffic calming devices (e.g. chicanes and speed humps). Lane closures have been modelled for Wentworth Avenue westbound in the PM and weekend models to account for parking that is restricted for only park of the simulation period. A speed change has been used to model the school zone on Bunnerong Road that is similarly only active for part of the AM simulation period. A permanent speed change is used for sections along Page/Heffron Road corridor to capture the effects of the traffic calming devices along this corridor. The speed change is representative of the suggested speed of 25km/hr.

## 3.7 Pedestrian conflicts

Pedestrian right of way conflicts within the model have been coded using the traffic management functionality "Periodic Section Incident". A periodic section incident will close off a section of road for a specified period of time based on an occurrence rate and an occurrence length. The average arrival interval of a pedestrian at a crossing based of the pedestrian volumes was used for the occurrence rate and the occurrence length was based of calculated crossing times. A standard deviation was applied to both the occurrence rate and length to randomise the closures.

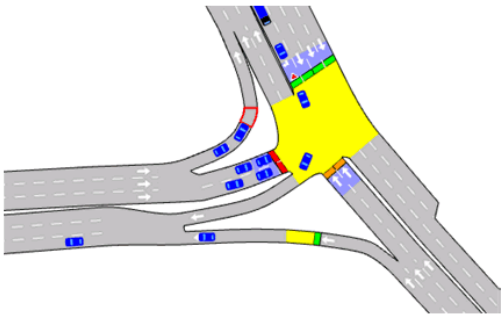

Figure 13 Periodic section incident at the location of a zebra crossing

The effect of pedestrian crossings on signal times was not explicitly modelled due to signals being coded as actuated. However as the green time proportions in the model matched the green time observed it can be deduced that pedestrian effects at signals are being captured.

# 4 Base Model Development

## 4.1 Demand development

To model demand in the network, the study area was broken into 29 zones shown in Figure 14. Zones 101 to 114 are internal zones with the Meriton Properties site being covered by zone 108 and the BATA site by 109. Zones 1 through 15 are external zones.

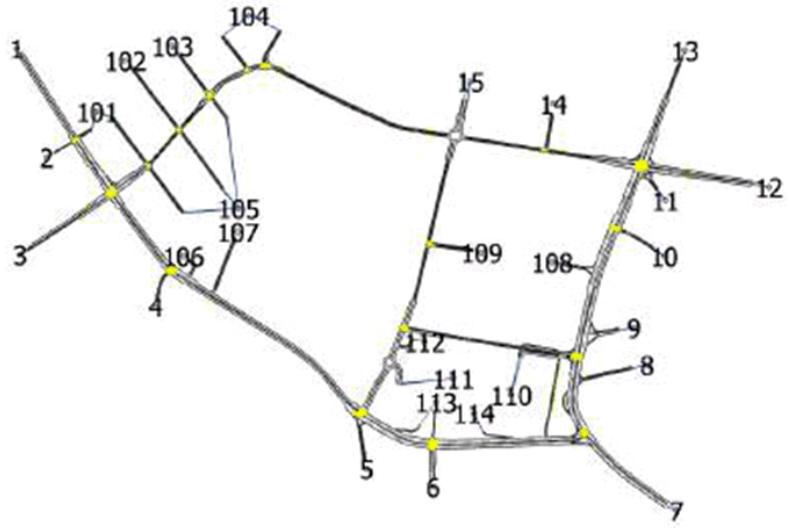


Figure 14 Zones used for demand development

In order to generate the correct matrix pattern traffic from the internal zones was estimated using traffic generation rates based on land use and journey to work information. Estimations were then confirmed and/or corrected using site observations.

External zones were calculated using turn count survey data, by calculation the entering and exiting traffic volumes with major trunk movements deduced using wider network linkages and site observations. Once the total demand for each zone was estimated, a prior origin-destination matrix was constructed.

A static origin destination (OD) adjustment scenario was run on the prior matrix in which the prior OD pairs were automatically adjusted by the modelling software to better match the turning count survey data. A deviation matrix was created also created and applied to restrict the amount of traffic that could be added or removed from particular model zones. This prevents unrealistic zone pair volumes such as unrealistically large weaving trips, which may match the survey data but are extremely unlikely to occur in reality.

After the static OD adjustment was complete the matrices were manually checked for unrealistic zone pairs with some final manual edits being made to increase model calibrations.

The last step in the process was to split the matrices into 8, 15 minute periods to profile the volumes. Table 4 highlights the demand profile used in each peak period.

Table 4 Demand Profile

| Time Period | AM | PM | WE |
|---|---|---|---|
| 1 | 12% | 11% | 12% |
| 2 | 12% | 12% | 12% |
| 3 | 13% | 13% | 12% |
| 4 | 14% | 13% | 13% |
| 5 | 14% | 13% | 13% |
| 6 | 13% | 13% | 13% |
| 7 | 12% | 13% | 13% |
| 8 | 11% | 12% | 12% |

## 4.2 Traffic assignment

Traffic was assigned to the network using a combination of static assignment and stochastic assignment. The static assignment method calculated paths and costs based of instantaneous flows using a Frank and Wolfe Assignment engine. The stochastic assignment was based on a c-logit model with the parameters shown in Figure 15.

The combination of 50% static and 50% stochastic allows for a representation of a mix of drivers on the network. 50% being drivers not entirely familiar with the network and less likely to react to changes in traffic with the other 50% being very familiar with the network and likely to change routes based of day to day conditions.

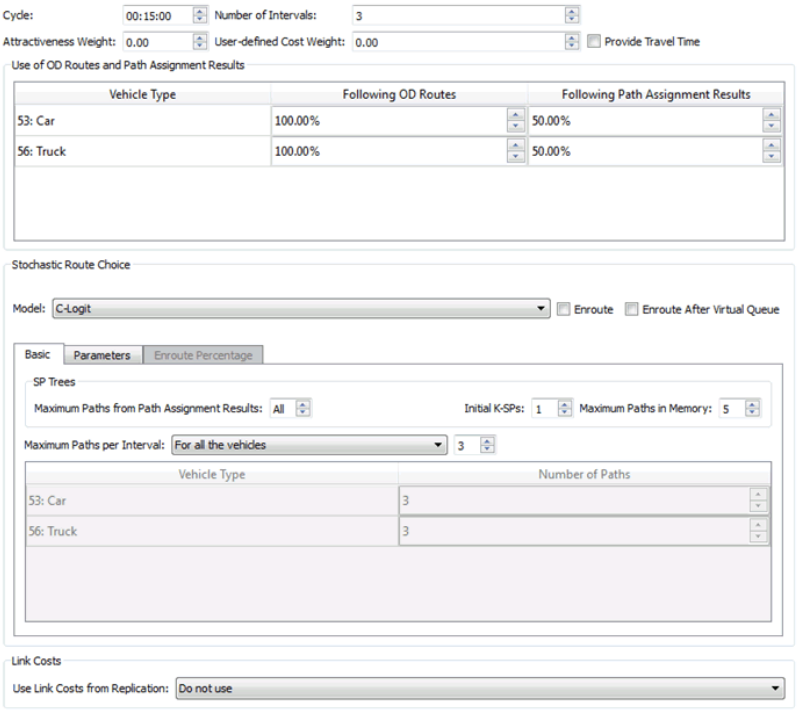


Figure 15 Assignment Parameters

## 4.3 Model stability

Section 11 of the *RMS Modelling guidelines* provide guidance on calibrating and validating microsimulation traffic models. For the purposes of presenting calibration results, the guidelines suggest comparing vehicle hours travelled for each simulated seed run and identifying the median value. As shown in Table 5, the comparison shows that the median seed for both AM and weekend peak periods is 28 while for the PM peak, the median seed is 560.

Table 5 Total travelled time for each peak period and seed number (medians highlighted)

| Seed No. | AM | PM | Weekend |
|---|---|---|---|
| 28 | **680.91** | 708.19 | **788.49** |
| 560 | 726.54 | **710.32** | 791.36 |
| 2849 | 663.91 | 715.09 | 897.73 |
| 7771 | 704.33 | 706.43 | 767.67 |
| 86524 | 677.88 | 738.77 | 781.10 |

The median seeds were used for the volume and travel time validation for the corresponding peak periods.

# 5 Base Model Calibration

*Table 11.2* of the *RMS Modelling guidelines* state that the proportion of links within a microsimulation model with a GEH of 5 or lower to be greater than 85% across the whole network. Plots showing the observed volumes compared to modelled volumes using the corresponding median seed simulations are shown in Figure 16, Figure 17 and Figure 18 for AM, PM and weekend traffic respectively.

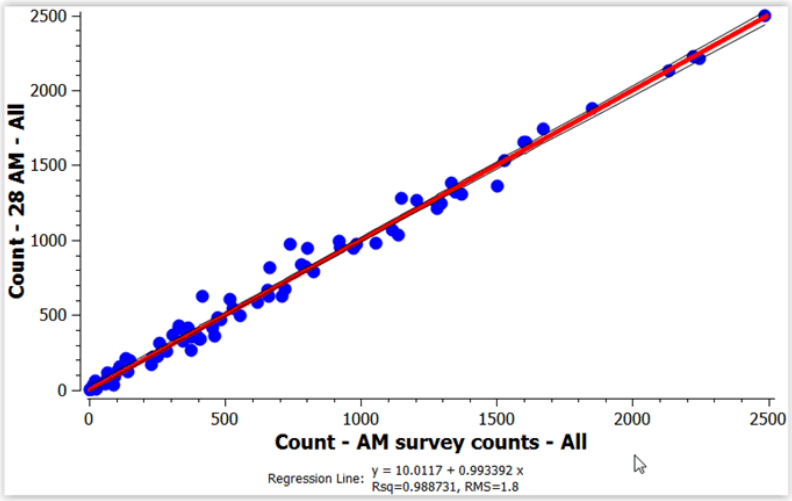


Figure 16 Observed vs modelled plot for AM peak traffic

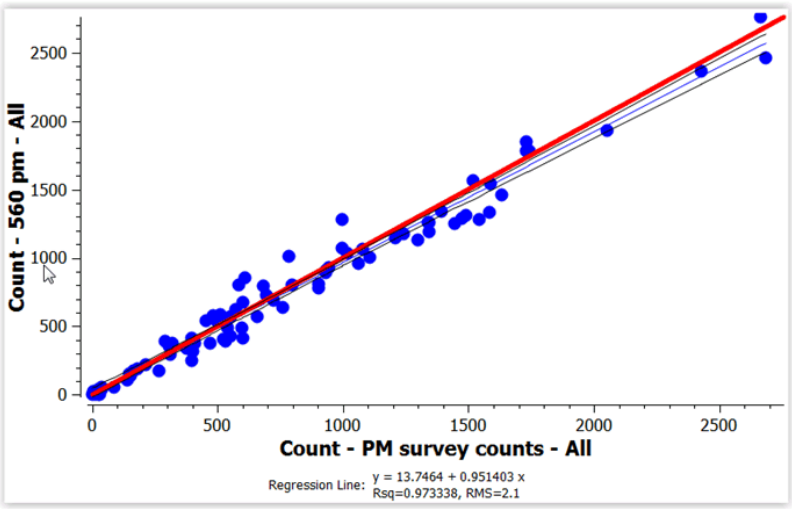


Figure 17 Observed vs modelled plot for PM peak traffic

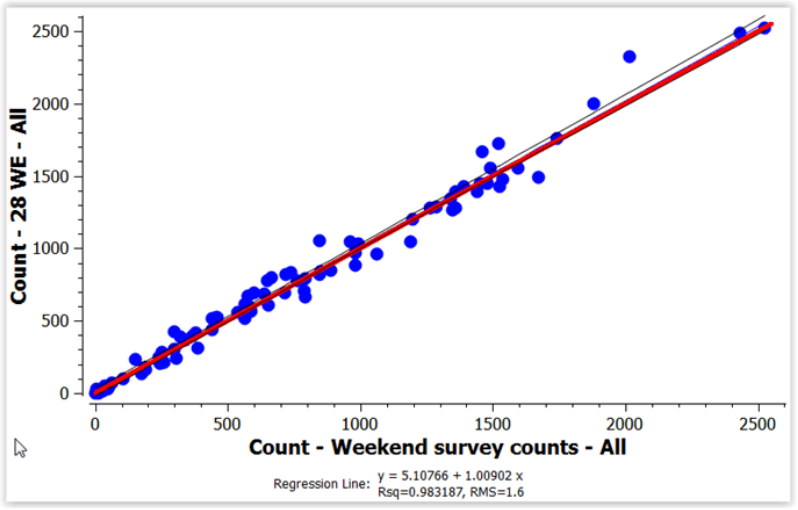


Figure 18 Observed vs modelled plot for weekend traffic

The R squared values are above 97% in all scenarios indicating very good fits between the observed and modelled volumes. The cumulative percent distribution GEH plots are shown in Figure 19, Figure 20 and Figure 21 for AM, PM and weekend traffic respectively.

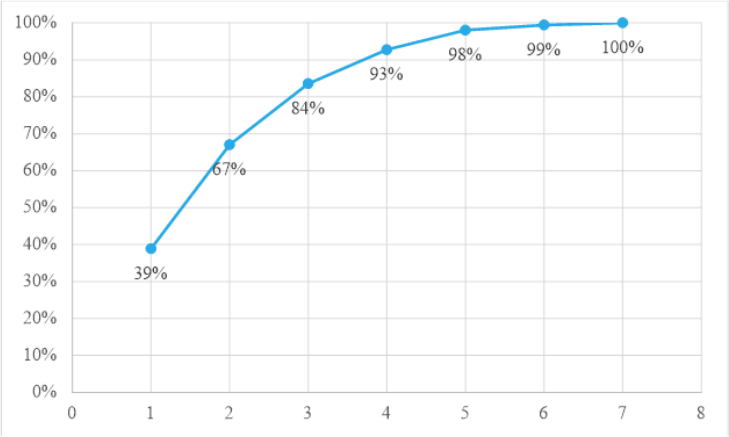


Figure 19 GEH distribution plot for AM traffic

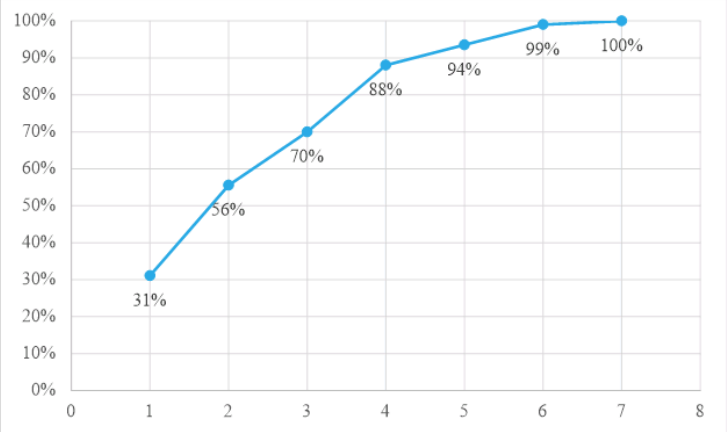


Figure 20 GEH distribution plot for PM traffic

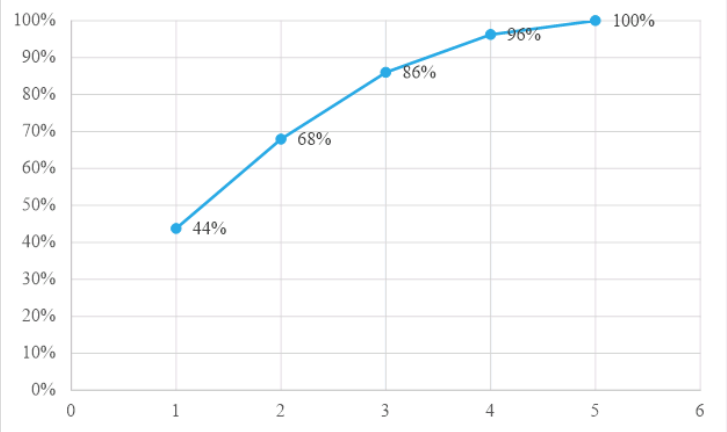


Figure 21 GEH distribution plot for weekend traffic

As shown, the proportion of links with GEH lower than or equal to 5 exceed 85% as suggested by the *RMS Modelling guidelines*. The weekend peak exhibits lower GEH overall compared to the weekday AM and PM peaks due to having lower rat-running movements.

Table 6 GEH Summary Statistics

| Model | GEH < 5 | GEH < 10 |
|---|---|---|
| AM Peak | 98% | 100% |
| PM Peak | 93% | 100% |
| WE Peak | 100% | 100% |

# 6 Base Model Validation

As described in Section 2, travel time data was also collected for two routes. Both routes have the same start and end points: from the Wentworth Avenue / Page Street intersection to Maroubra Road / Bunnerong Road intersection. Route 1 passes via Page Street and Heffron Road while Route 2 passes through Wentworth Avenue and Bunnerong Road as shown in Figure 22.




Figure 22 Location of travel time routes

## 6.1.1 Travel time results

*Table 11.3* from the *RMS Modelling guidelines* suggest that the modelled travel times should be within 15% of the observed travel times. The modelled travel times compared to the observed travel times are shown below for the AM, PM and weekend peaks.

### 6.1.1.1 AM peak

Modelled and observed travel times along Route 1 and Route 2 in both directions during the AM peak are shown in Figure 23, Figure 24, Figure 25, and Figure 26. Only one route, Route 1 in the east to west direction lies marginally outside the specified criteria. There are a number of on-street parking and driveways along this route that could potentially lead to lower travel speeds than estimated in the model. However, as the model speeds are only marginally outside the criteria and

as congestion increases drivers often behave more aggressively with regards to parking and turning into driveways this issue is not considered significant.

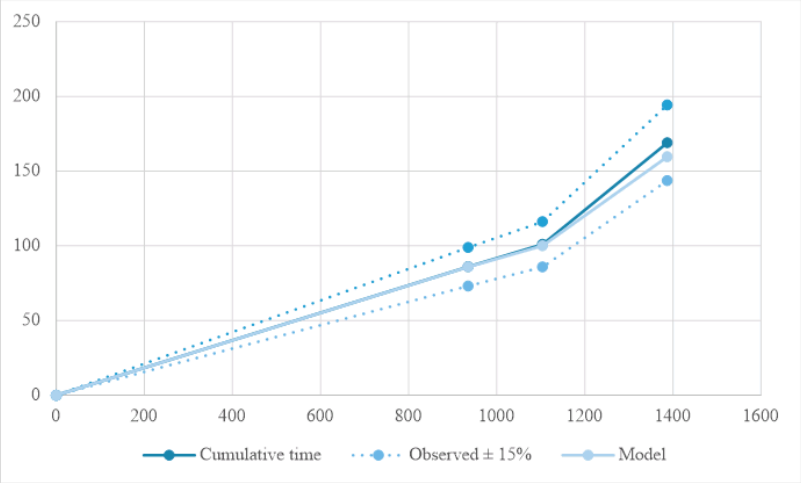


Figure 23 Route 1 - West to East (AM)

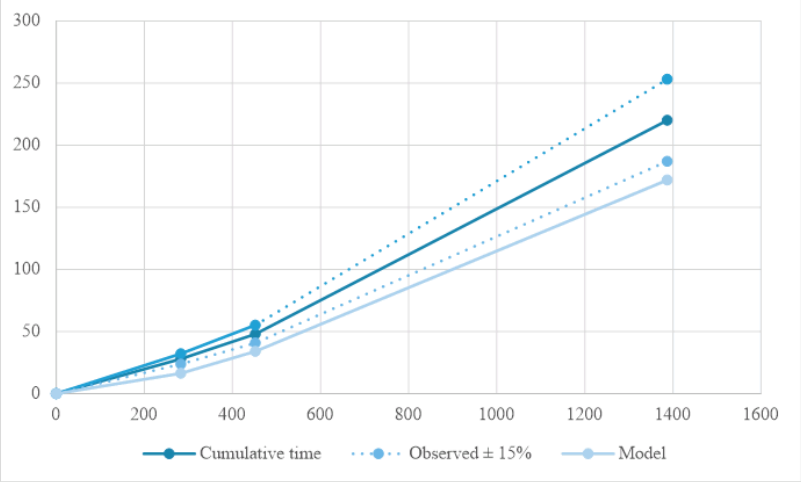


Figure 24 Route 1 - East to West (AM)

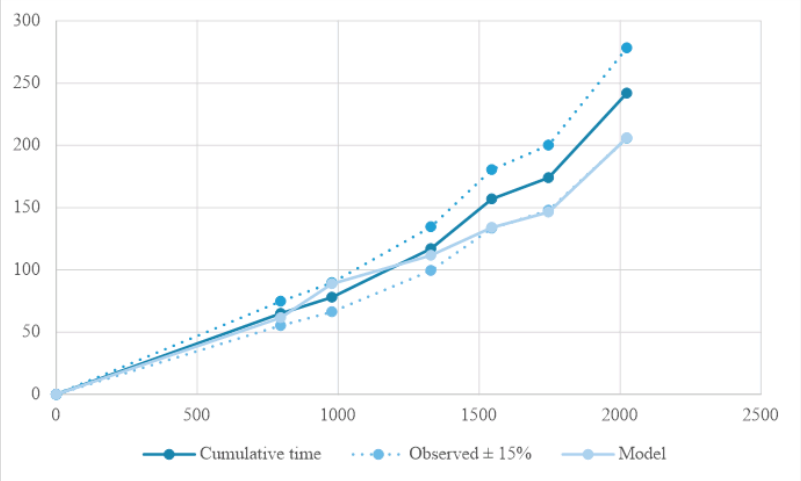


Figure 25 Route 2 - West to East (AM)

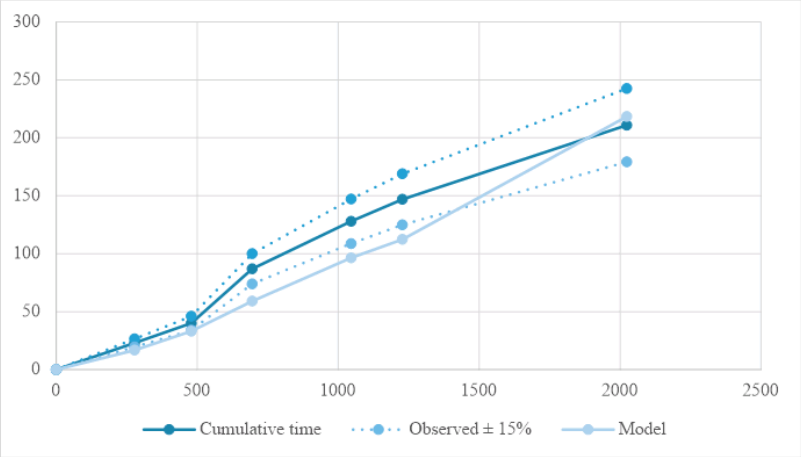


Figure 26 Route 2 - East to West (AM)

Table 7 Route 1 West to East (AM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 2 | 935 | 935 | 86 | 86 | 99 | 73 | 86 | 86 |
| 2 | 3 | 169 | 1104 | 15 | 101 | 116 | 86 | 14 | 100 |
| 3 | 4 | 283 | 1387 | 68 | 169 | 194 | 144 | 60 | 160 |

Table 8 Route 1 East to West (AM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 3 | 283 | 283 | 28 | 28 | 32 | 24 | 16 | 16 |
| 3 | 2 | 169 | 452 | 20 | 48 | 55 | 41 | 18 | 34 |
| 2 | 1 | 935 | 1387 | 172 | 220 | 253 | 187 | 138 | 172 |

Table 9 Route 2 West to East (AM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 2 | 796 | 796 | 65 | 65 | 75 | 55 | 62 | 62 |
| 2 | 3 | 182 | 978 | 13 | 78 | 90 | 66 | 27 | 89 |
| 3 | 4 | 351 | 1329 | 39 | 117 | 135 | 99 | 23 | 112 |
| 4 | 5 | 216 | 1545 | 40 | 157 | 181 | 133 | 22 | 134 |
| 5 | 6 | 201 | 1746 | 17 | 174 | 200 | 148 | 12 | 146 |
| 6 | 7 | 278 | 2024 | 68 | 242 | 278 | 206 | 60 | 206 |

Table 10 Route 2 East to West (AM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 7 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 6 | 278 | 278 | 23 | 23 | 26 | 20 | 17 | 17 |
| 6 | 5 | 201 | 479 | 17 | 40 | 46 | 34 | 16 | 33 |
| 5 | 4 | 216 | 695 | 47 | 87 | 100 | 74 | 26 | 59 |
| 4 | 3 | 351 | 1046 | 41 | 128 | 147 | 109 | 37 | 96 |
| 3 | 2 | 182 | 1228 | 19 | 147 | 169 | 125 | 16 | 112 |
| 2 | 1 | 796 | 2024 | 64 | 211 | 243 | 179 | 106 | 218 |

### 6.1.1.2 PM peak

Modelled and observed travel times along Route 1 and Route 2 in both directions during the PM peak are shown in Figure 27, Figure 28, Figure 29, and Figure 30. Similarly as the AM peak only one route lies marginally outside the criteria, Route 1 east to west.

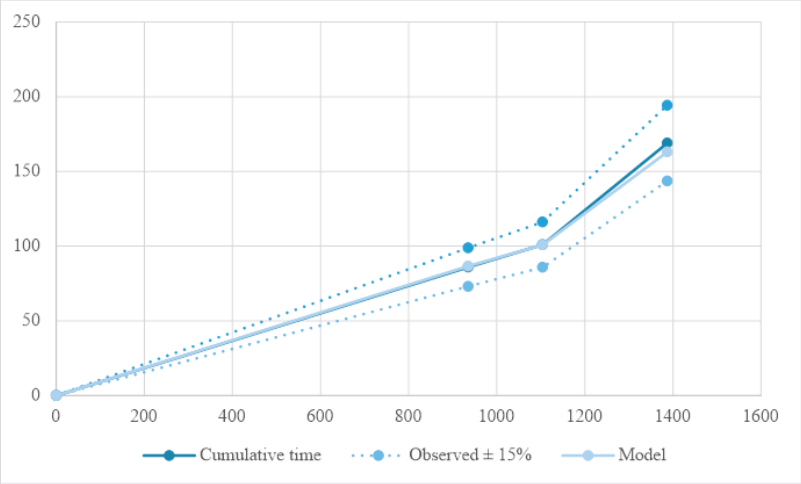


Figure 27 Route 1 - West to East (PM)

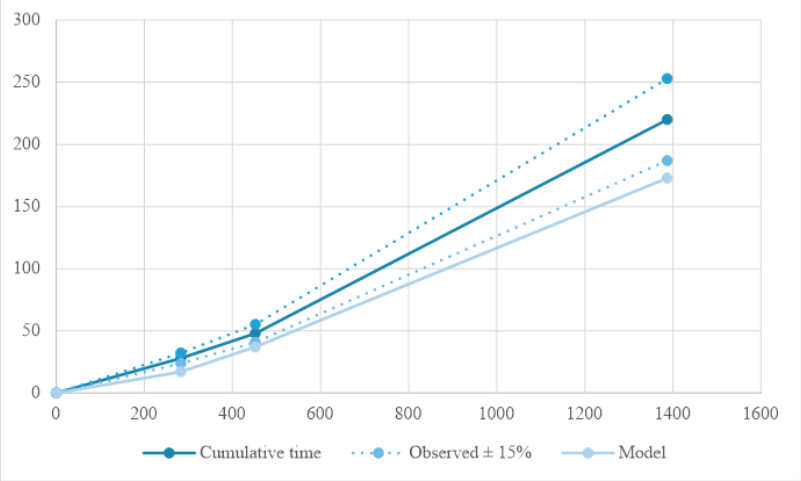


Figure 28 Route 1 - East to West (PM)

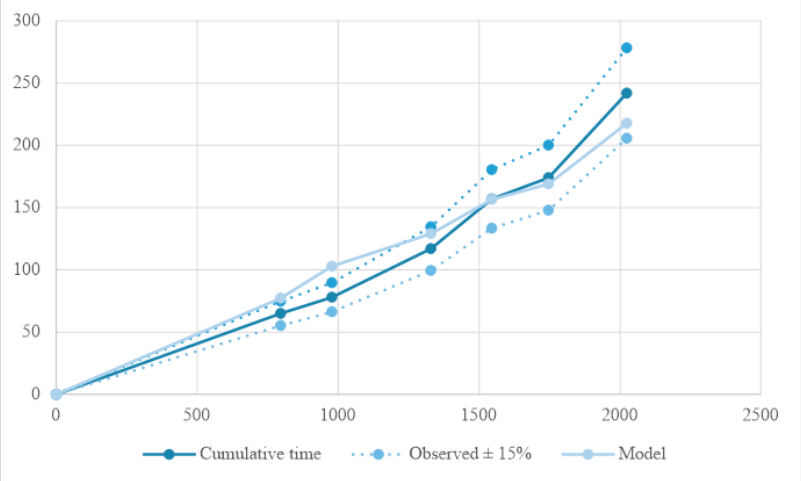


Figure 29 Route 1 - West to East (PM)

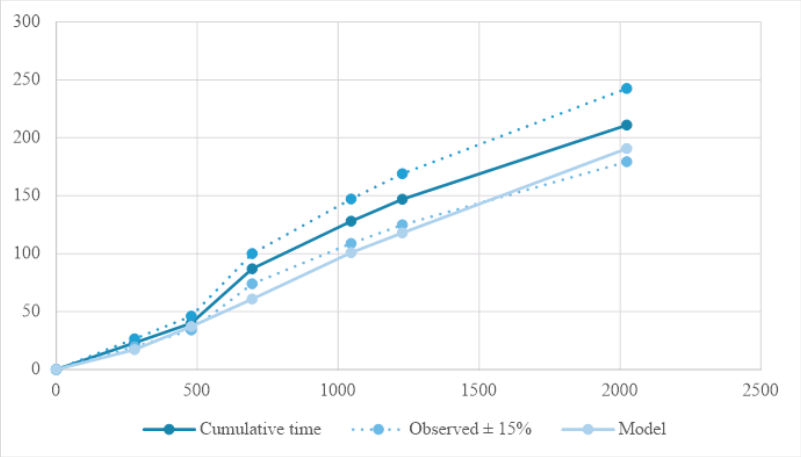


Figure 30 Route 1 - East to West (PM)

Table 11 Route 1 West to East (PM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 2 | 935 | 935 | 86 | 86 | 99 | 73 | 87 | 87 |
| 2 | 3 | 169 | 1104 | 15 | 101 | 116 | 86 | 14 | 101 |
| 3 | 4 | 283 | 1387 | 68 | 169 | 194 | 144 | 62 | 163 |

Table 12 Route 1 East to West (PM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 3 | 283 | 283 | 28 | 28 | 32 | 24 | 17 | 17 |
| 3 | 2 | 169 | 452 | 20 | 48 | 55 | 41 | 20 | 37 |
| 2 | 1 | 935 | 1387 | 172 | 220 | 253 | 187 | 136 | 173 |

Table 13 Route 2 West to East (PM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 2 | 796 | 796 | 65 | 65 | 75 | 55 | 77 | 77 |
| 2 | 3 | 182 | 978 | 13 | 78 | 90 | 66 | 26 | 103 |
| 3 | 4 | 351 | 1329 | 39 | 117 | 135 | 99 | 26 | 129 |
| 4 | 5 | 216 | 1545 | 40 | 157 | 181 | 133 | 28 | 157 |
| 5 | 6 | 201 | 1746 | 17 | 174 | 200 | 148 | 12 | 169 |
| 6 | 7 | 278 | 2024 | 68 | 242 | 278 | 206 | 49 | 218 |

Table 14 Route 2 East to West (PM)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 7 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 6 | 278 | 278 | 23 | 23 | 26 | 20 | 17 | 17 |
| 6 | 5 | 201 | 479 | 17 | 40 | 46 | 34 | 20 | 37 |
| 5 | 4 | 216 | 695 | 47 | 87 | 100 | 74 | 24 | 61 |
| 4 | 3 | 351 | 1046 | 41 | 128 | 147 | 109 | 40 | 101 |
| 3 | 2 | 182 | 1228 | 19 | 147 | 169 | 125 | 17 | 118 |
| 2 | 1 | 796 | 2024 | 64 | 211 | 243 | 179 | 73 | 191 |

### 6.1.1.3 Weekend peak

Modelled and observed travel times along Route 1 and Route 2 in both directions during the weekend peak are shown in Figure 31, Figure 32, Figure 33, and Figure 34. As with the AM and PM peak only one route lies marginally outside the criteria, route 1 east to west.

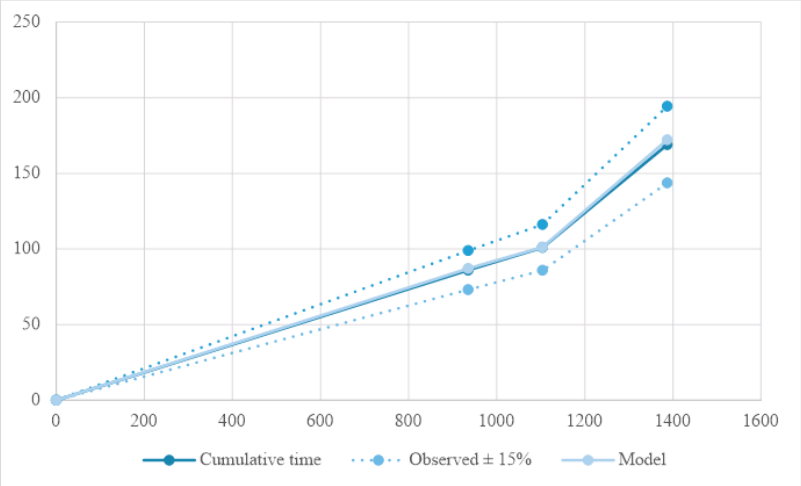


Figure 31 Route 1 - West to East (Weekend)

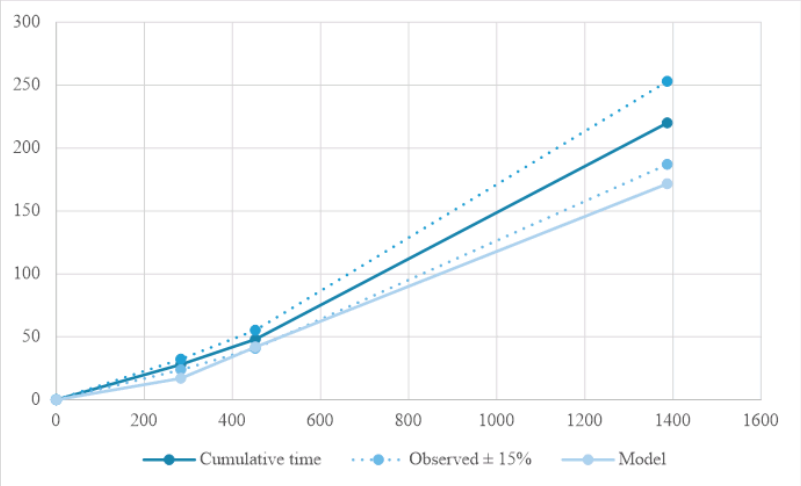


Figure 32 Route 1 – East to West (Weekend)

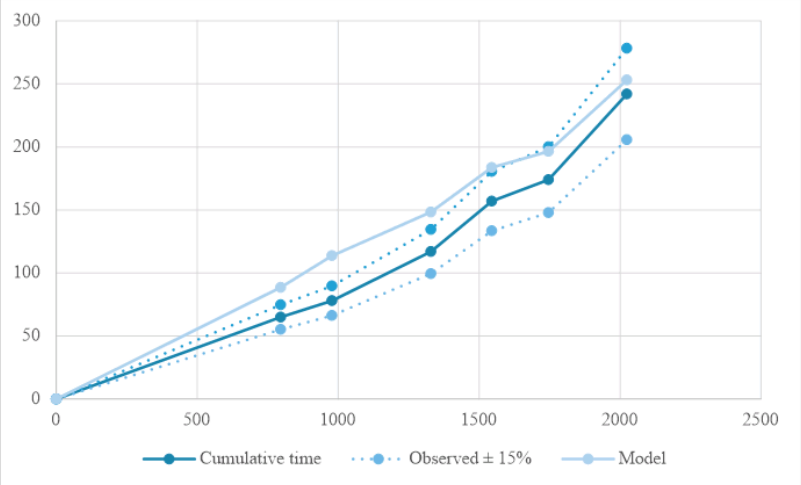


Figure 33 Route 2 - West to East (Weekend)

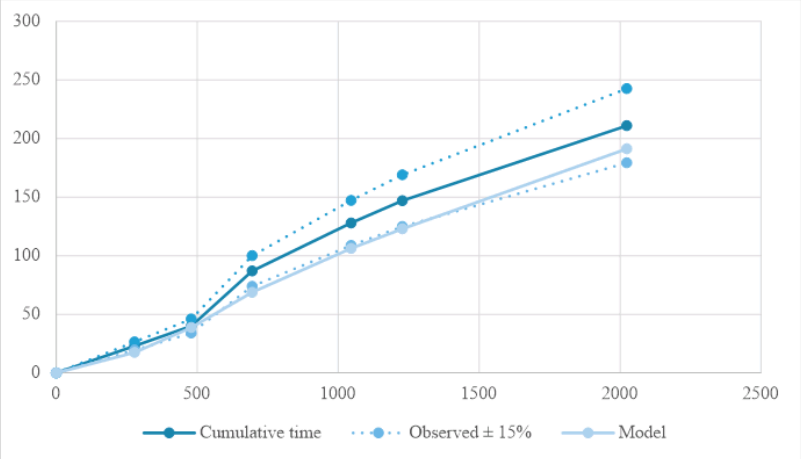


Figure 34 Route 2 - East to West (Weekend)

Table 15 Route 1 West to East (Weekend)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 2 | 935 | 935 | 86 | 86 | 99 | 73 | 87 | 87 |
| 2 | 3 | 169 | 1104 | 15 | 101 | 116 | 86 | 14 | 101 |
| 3 | 4 | 283 | 1387 | 68 | 169 | 194 | 144 | 71 | 172 |

Table 16 Route 1 East to West (Weekend)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 3 | 283 | 283 | 28 | 28 | 32 | 24 | 17 | 17 |
| 3 | 2 | 169 | 452 | 20 | 48 | 55 | 41 | 25 | 42 |
| 2 | 1 | 935 | 1387 | 172 | 220 | 253 | 187 | 130 | 172 |

Table 17 Route 2 West to East (Weekend)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 2 | 796 | 796 | 65 | 65 | 75 | 55 | 89 | 89 |
| 2 | 3 | 182 | 978 | 13 | 78 | 90 | 66 | 25 | 114 |
| 3 | 4 | 351 | 1329 | 39 | 117 | 135 | 99 | 35 | 148 |
| 4 | 5 | 216 | 1545 | 40 | 157 | 181 | 133 | 35 | 184 |
| 5 | 6 | 201 | 1746 | 17 | 174 | 200 | 148 | 13 | 196 |
| 6 | 7 | 278 | 2024 | 68 | 242 | 278 | 206 | 57 | 253 |

Table 18 Route 2 East to West (Weekend)

| | | | | Observed (sec) | | | | Modelled (sec) | |
|---|---|---|---|---|---|---|---|---|---|
| START | END | Section distance | Cumulative distance | section time | Cumulative time | Observed ± 15% | Observed ± 15% | Section time | Cumulative time |
| 7 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 6 | 278 | 278 | 23 | 23 | 26 | 20 | 17 | 17 |
| 6 | 5 | 201 | 479 | 17 | 40 | 46 | 34 | 21 | 39 |
| 5 | 4 | 216 | 695 | 47 | 87 | 100 | 74 | 30 | 69 |
| 4 | 3 | 351 | 1046 | 41 | 128 | 147 | 109 | 38 | 106 |
| 3 | 2 | 182 | 1228 | 19 | 147 | 169 | 125 | 17 | 123 |
| 2 | 1 | 796 | 2024 | 64 | 211 | 243 | 179 | 68 | 191 |

# 7 Future Demand Development

## 7.1 Methodology

The future traffic demands that are to be analysed using the traffic micro-simulation model have been developed based on projections of future land uses, increases in population and employment as well as historical growth along traffic corridors. A number of residential and mixed use sites are expected to be developed around the site in the near to medium term, including the currently approved developments on the British American Tobacco Australia (BATA) site. The additional traffic generated by these developments form a baseline future for assessment.

As the main purpose of this study is to analyse the impacts of the changes to development on the BATA site. The additional traffic will be calculated as a change to the original proposed development.

To cross check the demands the proposed floor space and dwelling yields with associated employment and population forecasts are calculated and compared against government forecasts prepared by the Bureau of Transport Statistics for 2021. These checks indicate that the proposed scenarios being used in this study are broadly in line with this separate set of projections.

As the 2031 design year model is also required, a scenario 10 years after completion of the development, the demand for year 2031 are calculated using growth factors. To increase accuracy the growth factors for different regions in the model were determined using a combination of population and employment forecasts. Through traffic movements and shopping centre traffic volumes were increased separately to maintain the separate distribution for these trips.

## 7.2 Design horizons

Two design year horizons are to be considered for the future year modelling, Year 2021 and 2031. Future baseline models as well development models will be developed for both horizon years. 2021 represents the year of completion and 2031 is the ten year horizon past opening.

## 7.3 Development of Year 2021 demands

The future base traffic generation involves estimating both the increase in background traffic generation from approved developments, the increase in through trips and the increase in shopping trips to Eastgardens Westfield's. Subsequent options will be tested against this future base case.

Development traffic was then calculated as a change to the future base demands. Through this process public transport and pedestrian demands remained as per the base model as it is unlikely public transport frequencies will increases in the immediate future. Pedestrian demand was modelled using section incidents and an increase in pedestrians will not necessarily lead to a direct increase in conflicts with cars as pedestrians are likely to bunch.

### 7.3.1 Background traffic growth

At the micro-simulation level of granularity background growth is the traffic generated by the number of residential and mixed use sites in and around the study area that are expected to be developed in the near future.

There are two developments within close proximity to the site, Bunnings and the Orica development site, that along with the currently approved Meriton Properties development, will form the network background growth. It is also assumed that the BATA site under investigation will continue to operate as a warehouse. The background traffic generation is detailed below in Table 19 and Table 20.

Table 19 Meriton Properties Site traffic generation

| Land Use | Size | Traffic Generation (2hr) | | |
|---|---|---|---|---|
| | | AM | PM | WE |
| Residential | 2,222 units | 977 | 765 | 868 |
| Specialty Retail | 5,000 m2 | 0 | 238 | 317 |
| Childcare | 4 centres (100- children each) | 222 | 222 | 0 |
| Warehouse | 50,000 m2 | 397 | 397 | |
| Total | | 1,596 | 1,622 | 1,185 |

Table 20 Adjacent land use changes traffic generation

| Land Use | Size | Traffic Generation (2hr) | | |
|---|---|---|---|---|
| | | AM | PM | WE |
| Bunnings | 14,900m2 | 400 | 560 | 1216 |
| Office | 6,000m2 | 288 | 288 | 0 |
| Industrial | 60,000m2 | | | |
| Masters | 9,803m2 | 168 | 236 | 512 |
| Total | | 856 | 1084 | 1728 |

### 7.3.2 Eastgardens traffic

Changes in population in the Eastgardens Catchment is expected to change access and egress traffic levels and distributions. The Eastgardens trade area extends around 5km to 7km radius from the centre. A 6.5km boundary was drawn around Eastgardens with the catchment being broken up into 4 quadrants whose size depends on network access, see Figure 35. The predicted population increases for the travel zones within each of these quadrants was then assessed to calculate the increase in traffic and any potential change in traffic profile. The largest increase in traffic was experienced to the north and south.

Table 21 Eastgardens growth rates

| Quadrant | Population Increase to 2021 | Population Increase to 2032 from 2021 |
|---|---|---|
| North | 23% | 15% |
| East | 11% | 13% |
| South | 20% | 14% |
| West | 14% | 15% |

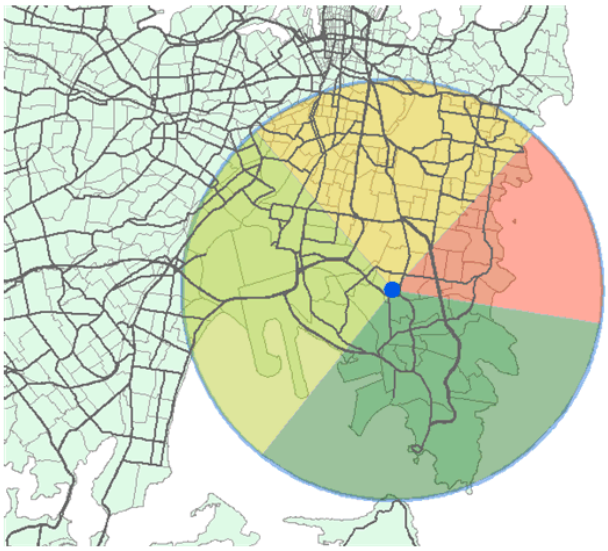

Figure 35 Eastgardens retail catchment

### 7.3.3 Through traffic growth

The Roads and Maritime traffic volume viewer was used to assess increase in volumes on through movements, trips that start and end in external zones. Data for Wentworth Avenue was only available for two years, see Table 22, where a decrease was observed in the eastbound direction and an increase in the westbound. No data was available for Bunnerong Road with the closest count being located on Anzac Parade north of Lang Road. Given the lack of available information a 1% per annum growth rate was assumed for the trough movements.

Table 22 Wentworth Avenue traffic volumes *source: RMS traffic volume viewer*

| | 2011 | 2015 | Growth |
|---|---|---|---|
| Wentworth Ave (eastbound) | 23,673 | 21,679 | -8% |
| Wentworth Ave (westbound) | 21,550 | 22,227 | +3% |

### 7.3.4 Development traffic

The changes to the development include the removal of the warehouse, the construction of an additional 1,639 residential apartments as well as the increase of 1,000 m2 Gross Floor Area (GFA) of retail bring the total development up to 5,000 m2 GFA of specialty retail. Table 23 below highlights the original traffic generation numbers with the associated changes as a result of the above development traffic.

Table 23 Change to development traffic

| Development Type | Original Development Proposal | | | Proposed Changes | | |
|---|---|---|---|---|---|---|
| | AM | PM | WE | AM | PM | WE |
| Residential | 977 | 765 | 868 | +723 | +566 | +642 |
| Retail | 0 | 238 | 317 | 0 | +48 | +63 |
| Childcare | 222 | 222 | 0 | +28 | +28 | 0 |
| Warehouse | 397 | 397 | 0 | -397 | -397 | 0 |
| **Total** | **1,596** | **1,622** | **1,185** | **+354** | **+245** | **+705** |

The traffic generated by both Stage 1 and Stage 2 development is assumed to follow the same distribution as current Journey to Work trips for the surrounding area as documented in the *Arup BATA 2014 Traffic Report*. The zones in the previous model correlate well with zones in the new model being developed and so it is simple to allocate the trips generated by the development to origin-destination pairs.

| Zone | Origin/Destination | PM Peak | | SAT Peak | |
|---|---|---|---|---|---|
| | | In | Out | In | Out |
| 1 | Wentworth Ave (W) | 37% | 16% | 26% | 26% |
| 2 | Heffron Road (W) | 4% | 2% | 3% | 3% |
| 3 | Banks Avenue (N) | 4% | 2% | 3% | 3% |
| 4 | Bunnerong Road (N) | 5% | 2% | 4% | 4% |
| 5 | Maroubra Road (E) | 4% | 2% | 3% | 3% |
| 6 | Bunnerong Road (S) | 14% | 6% | 10% | 10% |
| 7 | Denison Road (S) | 4% | 2% | 3% | 3% |
| | | 70% | 30% | 50% | 50% |

Figure 36 Development traffic distribution

## 7.4 Development of 2031 demands

As the 2031 design year horizon is an additional 10 years out (a total of 15 years from the survey data) it is not appropriate to try and account for all potential land use changes. As such to develop demands for the 2031 design hear horizon the Bureau of Transport Statistics population and employment forecasts were used to determine growth factors for all the internal zones between the years of 2021 and 2031.

The growth factors were determined for all travel zones within or immediately adjacent to the site with the exception of the development travel zone, zone D and were used to create a growth factor matrix as opposed to applying a blanket growth factor to all demands. Traffic in the development zone would remain as per the proposed development planes. In the AM and PM peaks a combination of population and employment was used to determine the growth factors with the combination depending on direction of travel. For the weekend peak only population was used.

To account for through trips the 1% per annum growth rate was carried through to 2031 from 2021. Eastgardens traffic was estimated by again looking at the catchment growth, see Table 21. And a heavy vehicle growth factor was calculated based on increase in employment only. Through this process public transport and pedestrian demands remained as per the base model as the future of bus frequencies is uncertain due to the possibility of light rail being extended within the vicinity of Pagewood. Pedestrian demand was modelled using section incidents and an increase in pedestrians will not necessarily lead to a direct increase in conflicts with cars as pedestrians are likely to bunch.

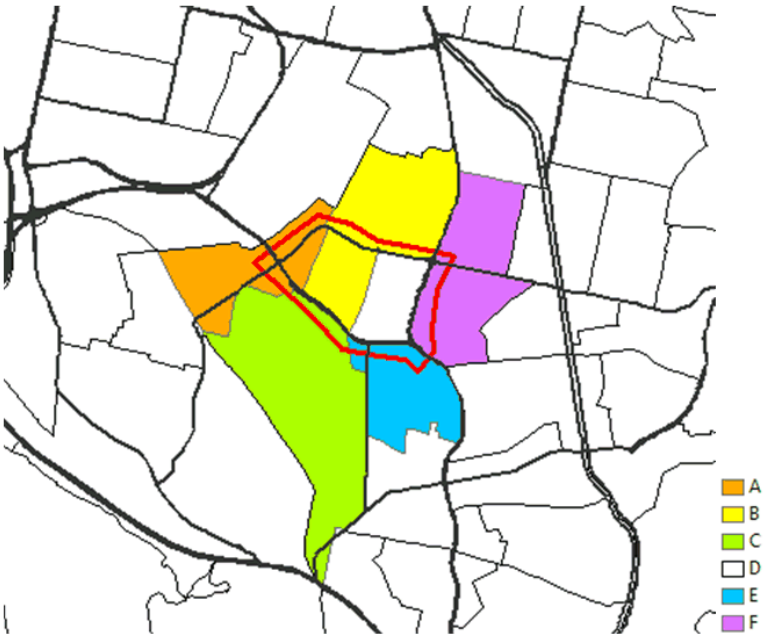


Figure 37 Study area travel zones

Table 24 Travel zones population and employment increases

| Travel Zone | Population Increase | Employment Increase |
|---|---|---|
| A | 6% | 8% |
| B | 5% | 13% |
| C | 0% | 5% |
| E | 46% | 10% |
| F | 9% | 12% |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 101 | 102 | 103 | 104 | 105 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | - | 7% | - | 6% | 7% | 7% | - | 9% | 9% | 9% | 9% | - | - | 10% | - | 7% | 7% | 7% | 7% | 7% |
| 2 | 7% | - | 7% | 6% | 7% | 7% | 7% | 9% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | 7% | 7% | 7% | 7% | 7% |
| 3 | - | 7% | - | 6% | 7% | 7% | - | 9% | 9% | 9% | 9% | - | - | 10% | - | 7% | 7% | 7% | 7% | 7% |
| 4 | 4% | 4% | 4% | - | 4% | 4% | 4% | 6% | 6% | 6% | 6% | 6% | 6% | 7% | 7% | 4% | 4% | 4% | 4% | 4% |
| 5 | 16% | 16% | 16% | 14% | - | 15% | 15% | 18% | 18% | 18% | 18% | 18% | 18% | 18% | 18% | 16% | 16% | 16% | 16% | 16% |
| 6 | 16% | 16% | 16% | 14% | 15% | - | 15% | 18% | 18% | 18% | 18% | 18% | 18% | 18% | 18% | 16% | 16% | 16% | 16% | 16% |
| 7 | - | 18% | - | 16% | 18% | 18% | - | 20% | 20% | 20% | 20% | - | - | 20% | - | 18% | 18% | 18% | 18% | 18% |
| 8 | 9% | 9% | 9% | 7% | 8% | 8% | 8% | - | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 9% | 9% | 9% | 9% | 9% |
| 9 | 9% | 9% | 9% | 7% | 8% | 8% | 8% | 11% | - | 11% | 11% | 11% | 11% | 11% | 11% | 9% | 9% | 9% | 9% | 9% |
| 10 | 9% | 9% | 9% | 7% | 8% | 8% | 8% | 11% | 11% | - | 11% | 11% | 11% | 11% | 11% | 9% | 9% | 9% | 9% | 9% |
| 11 | 9% | 9% | 9% | 7% | 8% | 8% | 8% | 11% | 11% | 11% | - | 11% | 11% | 11% | 11% | 9% | 9% | 9% | 9% | 9% |
| 12 | - | 9% | - | 7% | 8% | 8% | - | 11% | 11% | 11% | 11% | - | - | 11% | - | 9% | 9% | 9% | 9% | 9% |
| 13 | - | 8% | - | 6% | 7% | 7% | - | 10% | 10% | 10% | 10% | - | - | 10% | - | 8% | 8% | 8% | 8% | 8% |
| 14 | 7% | 7% | 7% | 5% | 6% | 6% | 6% | 9% | 9% | 9% | 9% | 9% | 9% | - | 9% | 7% | 7% | 7% | 7% | 7% |
| 15 | - | 7% | - | 5% | 6% | 6% | - | 9% | 9% | 9% | 9% | - | - | 9% | - | 7% | 7% | 7% | 7% | 7% |
| 101 | 7% | 7% | 7% | 6% | 7% | 7% | 7% | 9% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | - | 7% | 7% | 7% | 7% |
| 102 | 7% | 7% | 7% | 6% | 7% | 7% | 7% | 9% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | 7% | - | 7% | 7% | 7% |
| 103 | 7% | 7% | 7% | 6% | 7% | 7% | 7% | 9% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | 7% | 7% | - | 7% | 7% |
| 104 | 7% | 7% | 7% | 6% | 7% | 7% | 7% | 9% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | 7% | 7% | 7% | - | 7% |
| 105 | 7% | 7% | 7% | 6% | 7% | 18% | 18% | 9% | 9% | 9% | 9% | 9% | 9% | 10% | 10% | 7% | 7% | 7% | 7% | - |

Figure 38 AM peak growth factor matrix

# 8 Future Network Changes

## 8.1 Wider network changes

There are three intersections in the network that being upgraded in the immediate future; Bunnerong Road and Heffron Road, Heffron Road and Banks Avenue, Wentworth Avenue and Page Street. The changes are detailed below in Figure 39, Figure 40 and Figure 41.

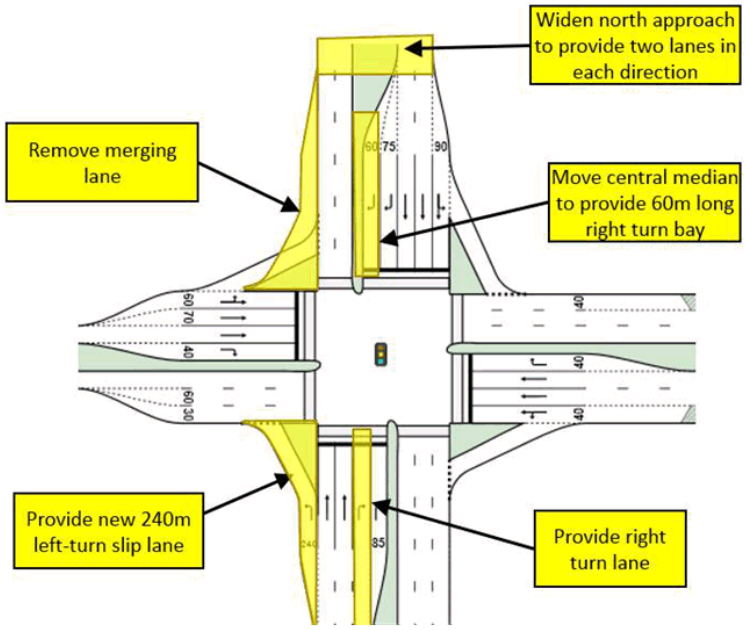


Figure 39 Bunnerong Road / Heffron Road changes, *source: Arup, 130-150 Bunnerong Road, Pagewood Section 34 Conference Report*

There has also been further signal optimisation of all the remaining signalised intersections with the exception of Bunnerong Road / Wentworth Avenue to cater for the increased demand to and from Eastgardens Shopping Centre.

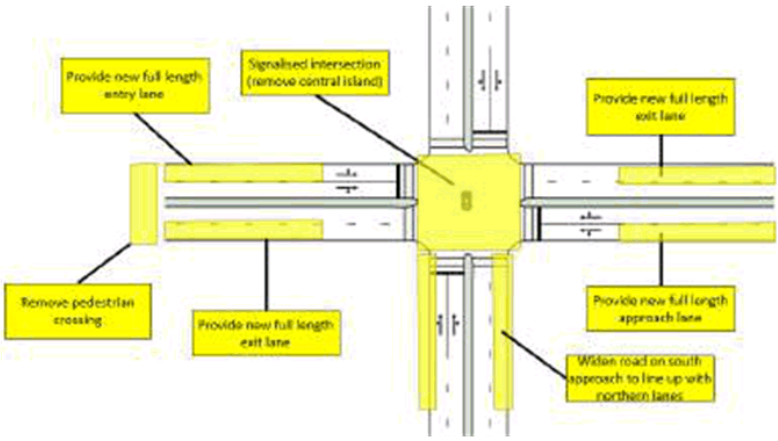


Figure 40 Heffron Road / Banks Avenue changes, *source: Arup, 130-150 Bunnerong Road, Pagewood Section 34 Conference Report*

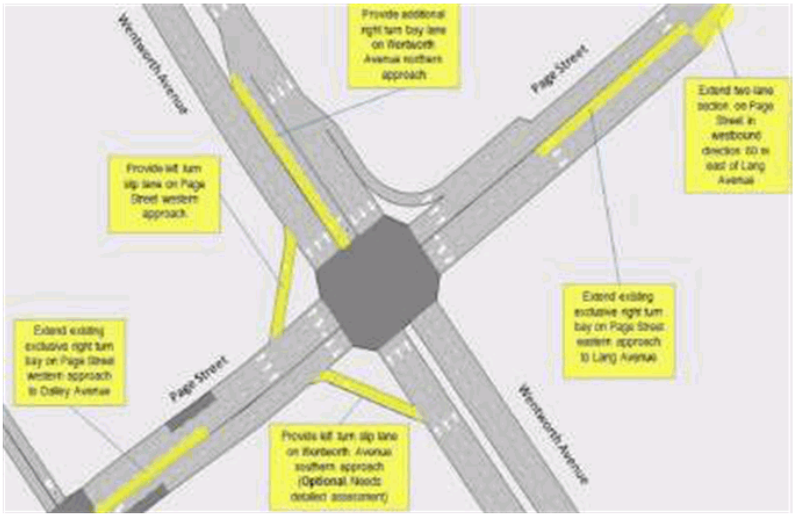


Figure 41 Wentworth Avenue and Page Street *source: SMEC*

Additional changes required as a result of background traffic included the expansion of Wentworth Avenue eastbound (with the removal of unused parking) to three lanes between Page Street and Banks Avenue allowed for the required additional capacity needed to reduce effective green time to the mainline movements. It is understood that this intersection is currently being tendered as a different layout, but no further information has been provided to update future traffic models.

## 8.2 Development network changes

### 8.2.1 Original masterplan

As per the original masterplan outlined in, *130-150 Bunnerong Road, Pagewood Section 35 Conference Report* the following network in the development site was coded as the future base model, see Figure 42.




Figure 42 Original Pagewood masterplan

### 8.2.2 Future network testing

The proposed site intends to utilise the existing Meriton Boulevard accesses as external access arrangements (shown in **Error! Reference source not found.**) which includes an all movements access to Banks Avenue to the west of the site (Meriton Boulevard only) and a left in and left out access to Bunnerong Road.

These accesses were the adopted access points for the traffic modelling, which create a balanced distribution across the external road network. Other access options were assessed, but this minimum layout forms the best-balanced approach



Figure 43 Future proposed masterplan

# 9 Results

In-total 15 models were run, three base models, six future year base case models and six development models. Table 25 below details each model scenario that was run for an AM, PM and Weekend peak period. For each scenario the intersection Level of Service (LoS), Travel time analysis and network performance will be explored.

Table 25 Model Scenarios

| Model | Abbreviation | Design Year | Description |
|---|---|---|---|
| Base Model | Base | 2016 | Calibrated base model exploring existing conditions. |
| Future Base | FB | 2021, 2031 | Future base model that includes all likely and currently approved developments. This includes the original Meriton Properties Pagewood proposal. This model forms the benchmark for all future year models. |
| Future Development | FD | 2021, 2031 | Future options model that includes the changes to the previously proposed Meriton Properties development. |

## 9.1 Intersection Level of Service (LoS)

## 9.2 Year 2021

Table 26 AM peak LoS results

| Intersection | Future Base | | Future Dev | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 41 | C |
| Bunnerong/Meriton | 1 | A | 2 | A |
| Bunnerong/Westfield | 10 | A | 13 | A |
| Bunnerong/Wentworth | 23 | B | 23 | B |
| Wentworth/Dennison | 35 | C | 31 | C |
| Wentworth/Banks/Corish | 32 | C | 24 | B |
| Banks/Westfield entrance | 4 | A | 3 | A |
| Banks/Westfield | 6 | A | 5 | A |
| Banks/Meriton | 1 | A | 2 | A |
| Banks/Heffron | 24 | B | 35 | C |
| Wentworth/Page | 63 | E | 59 | E |

The issues noted in the AM peak are also experienced in the PM peak period with an intensification of delays around Wentworth Avenue / Banks Avenue / Corish Circle intersection as retail traffic to Westfield Eastgardens intensifies.

Table 27 PM peak LoS results

| Intersection | Future Base | | Future Dev | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 39 | C |
| Bunnerong/Meriton | 1 | A | 2 | A |
| Bunnerong/Westfield | 10 | A | 16 | B |
| Bunnerong/Wentworth | 21 | B | 22 | B |
| Wentworth/Dennison | 32 | C | 32 | C |
| Wentworth/Banks/Corish | 21 | B | 37 | C |
| Banks/Westfield entrance | 2 | A | 3 | A |
| Banks/Westfield | 7 | A | 7 | A |
| Banks/Meriton | 1 | A | 3 | A |
| Banks/Heffron | 28 | B | 26 | B |
| Wentworth/Page | 68 | E | 46 | D |

The weakness in the network for the PM peak period occurs around Wentworth / Banks / Corish, with the intersection deteriorating to Level of Service E and F across the future scenarios. This intersection is the main access point to Westfield Shopping Centre as well as the primary access point to the site from the south. This performs worse in the future base because the combination of the Westfield and onsite retail results in a more pronounced peak. In the future development of the Meriton site, when retail is largely removed, this effect diminishes. A similar effect can be seen at the Banks/ Heffron intersection which is the primary northern access point. Wentworth / Page intersection also experiences some deterioration in the PM peak but this is less pronounced than the effect in the AM peak.

Table 28 Weekend peak LoS results

| Intersection | Future Base | | Future Dev | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 56 | D | 49 | D |
| Bunnerong/Meriton | 2 | A | 3 | A |
| Bunnerong/Westfield | 28 | B | 26 | B |
| Bunnerong/Wentworth | 32 | C | 30 | C |
| Wentworth/Dennison | 46 | D | 34 | C |
| Wentworth/Banks/Corish | 115 | F | 41 | C |
| Banks/Westfield entrance | 11 | A | 5 | A |
| Banks/Westfield | 7 | A | 7 | A |
| Banks/Meriton | 1 | A | 3 | A |
| Banks/Heffron | 54 | D | 26 | B |
| Wentworth/Page | 54 | D | 53 | D |

The weekend scenarios display a similar pattern of delay as the PM but with increased delays due to increased retail demand. Similar intersections deteriorate as in the PM peak. Intersections around the Westfield all experience increasing delays in the future scenarios.

Wentworth/Banks/Corish is unable to cope with the increased weekend demand and fails in all future scenarios (as opposed to only the future base in the PM peak). The result of this is a flow on affect to Dennison / Wentworth intersection which also deteriorates.

Worthy of note is Heffron/ Banks intersection where some evidence of "rat-running" is observed where people take unintended routes through the site to avoid signals on the main road network.

In the AM and PM peaks all the intersections along Bunnerong Road remain largely unaffected. However, in the Weekend peak these intersections come under increased pressure.

## 9.3 Year 2031

Despite the development traffic, the network capacity in 2031 was able to be improved over and above the existing future base scenario. Indicating that there is currently spare capacity on the network that is only restricted by the operation of a number of key intersections.

Table 29 Network Statistics

| Peak Period | Average Speeds (Km/hr) | | Average Delay (Seconds) | | Travel Time (seconds) | |
|---|---|---|---|---|---|---|
| | Future Base | Development | Future Base | Development | Future Base | Development |
| AM | 31 | 30 | 87 | 83 | 144 | 141 |
| PM | 25 | 30 | 160 | 84 | 218 | 142 |
| WE | 24 | 25 | 127 | 116 | 184 | 174 |

As the AM peak period model is relatively uncongested there is little change in the intersection level of service (LoS) as indicated in Table 30. Where the changes make the most difference is in the PM peak period (see

Table 31). The double diamond phasing at Wentworth Avenue and Page Street allows the intersections to effectively deal with the tidal peak demands competing with retail trips around the Westfield Eastgardens site. In the Weekend peak period (see Table 32), two of the intersections start to come under pressure again however overall there is still a network improvement even with the increased demand.

Table 30 AM Peak Period Intersection Level of Service

| Intersection | Future Base | | Development | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 45 | D |
| Bunnerong/Westfield | 10 | A | 15 | B |
| Bunnerong/Wentworth | 23 | B | 27 | B |
| Wentworth/Denison | 35 | C | 33 | C |
| Wentworth/Banks/Corish | 32 | C | 27 | B |
| Banks/Westfield entrance | 4 | A | 5 | A |
| Banks/Heffron | 24 | B | 33 | C |
| Wentworth/Page | 63 | E | 67 | E |

Table 31 PM Peak Period Intersection Level of Service

| Intersection | Future Base | | Development | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 42 | C | 43 | D |
| Bunnerong/Westfield | 10 | A | 22 | B |
| Bunnerong/Wentworth | 21 | B | 27 | B |
| Wentworth/Denison | 32 | C | 36 | C |
| Wentworth/Banks/Corish | 21 | B | 43 | D |
| Banks/Westfield entrance | 2 | A | 11 | A |
| Banks/Heffron | 28 | B | 36 | C |
| Wentworth/Page | 68 | E | 61 | E |

Table 32 Weekend Peak Period Intersection Level of Service

| Intersection | Future Base | | Development | |
|---|---|---|---|---|
| | Delay (s) | LOS | Delay (s) | LOS |
| Heffron/Maroubra/Bunnerong | 56 | D | 54 | D |
| Bunnerong/Westfield | 28 | B | 33 | C |
| Bunnerong/Wentworth | 32 | C | 42 | C |
| Wentworth/Denison | 46 | D | 37 | C |
| Wentworth/Banks/Corish | 115 | F | 58 | E |
| Banks/Westfield entrance | 11 | A | 7 | A |
| Banks/Heffron | 54 | D | 32 | C |
| Wentworth/Page | 54 | D | 58 | E |

# 10 Summary

In order to assess the impacts of proposed developments, and works identified as part of the study, a micro-simulation model has been developed using software package Aimsun. The model has been calibrated and validated carried out using criteria defined by RMS' Traffic Modelling Guidelines. The key results of the models' calibration and validation against RMS criteria are as follows.

- Intersection turning movements satisfied GEH criteria for each of the three peak periods assessed with 85% of GEH below 5 and 100% below 10.
- The $R^2$ was greater than 0.9 for each peak period, when plotting modelled and observed traffic flows.
- The travel time routs were generally within approximately 15% or 1 minute with only one route in each peak period being slightly quicker than observed.
- Observations made onsite at areas of congestion were generally comparable to behaviours observed within the model

The input data, model development, calibration and validation is considered to have produced a model that is considered 'fit for purpose' for the type of study being undertaken.

Through the operational modelling process it was found that the development yields have little impact on the network with some increases in delays at intersection. In the weekend peak however development traffic has trouble accessing the wider network due to the intensification of retail traffic around Eastgardens with the associated congestion.

It was also found that as the road network is expanded and additional connections are added to the wider network delays increase. This is impart due to the intensification of traffic around Eastgardens from the growth in the retail catchment. This new traffic is using the expanded network for alternative routes increasing turning movements and the associated merging and weaving behaviour reducing road capacity.

In summary, the network operates satisfactorily with the expanded development and upgrades already committed to, however it is advisable that the road layout is refined as to minimise new connections onto Banks Avenue and Heffron Road. It is also advisable to assess possible changes to the network to account for the increased demand to Eastgardens shopping centre as it is retail traffic that has the largest effect on the network.

# APPENDIX E SUMMARY OF GEOTECHNICAL CONDITIONS

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
96 Hermitage Road
West Ryde NSW 2114
PO Box 472
West Ryde NSW 1685
Phone (02) 9809 0666
Fax (02) 9809 4095

**Meriton Properties**
**Level 11 Meriton Tower**
**528 Kent Street**
**Sydney NSW 2000**

Project 85009.02
85009.02.R.002.Rev0
21 November 2018
LJH:mm

Attention: Mr Matthew Lennartz

Email: matthewl@meriton.com.au

Dear Sirs

**Summary of Geotechnical Conditions**
**Pagewood Part II – Due Diligence**
**128, 130-150 Bunnerong Road, Pagewood**

## 1. Introduction

This report presents the results of a geotechnical desktop study of part of 128, 130-150 Bunnerong Road, Pagewood, referred to herein as Pagewood Part II (or "the site"), as shown on the attached Drawing 1. The site comprises Lot 1 in DP1187426 (Lot 1) and Lot 24 in DP1242288 (Lot 24) and covers an area of approximately 8.95 hectares (ha).

Preparation of this report was commissioned by Mr Matthew Lennartz of Meriton via email on 19 November 2018 and undertaken in general accordance with Douglas Partners Pty Ltd (DP) standard conditions of engagement. It is understood that the report will be used for due diligence purposes and to support a rezoning application for mixed uses including residential (refer to proposed Masterplan layout shown on Drawing 1).

The objective of the geotechnical desktop study is to assess the likely geotechnical conditions at the site and to identify issues (based on reviewed information) that may be detrimental to the proposed development layout.

## 2. Site Description and Geology

The site is bound by Heffron Road to the north, Bunnerong Road to the east, Banks Avenue to the west and an internal road (Meriton Boulevard) to the south. At the time of preparing this report, the eastern portion of the site was occupied by commercial / industrial buildings and pavements and was being used for storage. The western portion was occupied by a large warehouse building and was being utilised for materials storage associated with the ongoing development of Pagewood Part I (refer attached Drawing 1).

Reference to the Sydney 1:100,000 Series Geological Sheet indicates that the site is underlain by Quaternary alluvial deposits, which typically comprise fine to medium grained "marine" sands with

podsols. Hawkesbury Sandstone, comprising medium to coarse grained quartz sandstone with minor shale and laminite lenses, underlies the site at depth.

The site is located over the Botany Sand Aquifer, a shallow unconfined to semi-confined groundwater system. The average saturated thickness of the Botany Sands Aquifer is 15 - 20 m. Hydraulic conductivity within the sand beds is highly variable and is typically around 20 m/day in clean sand.

## 3. Review of Previous Reports

Douglas Partners Pty Ltd (DP) has completed a number of environmental and contamination investigations across the site and the remainder of Lot 2 since 2011. The attached Drawing 3 (Project 71631.01) and Drawing 3 (Project 71631.02) show the previous CPT, bore and groundwater monitoring well locations.

The general sequence of subsurface materials encountered in the previous investigations is described below in increasing depth order:

| | |
|---|---|
| **FILLING:** | Sand filling to typical depths of 1.0 m to 2.5 m, generally well compacted in the upper 1 m. In isolated locations the filling was as shallow as 0.3 m and as deep as 4.6 m; |
| **SAND (alluvial)** | Medium dense and medium dense to dense sand to depths of 5 – 7 m, becoming dense and very dense with occasional thin (<0.5m) clay and peat bands to depths of 21 – 38 m. The base of the alluvial sand unit was found to be up to 44 m in isolated locations; |
| **CLAY & SAND: (residual)** | Residual clayey sand and sandy clay of 0.4 – 2.0 m thick. In most locations no residual soil was encountered and in some isolated locations it was 4 – 8 m thick; and |
| **SANDSTONE:** | Hawkesbury sandstone was encountered at depths of between 21 – 49 m depth. |

Groundwater levels varied from a depth of 5.9 m to 7.8 m bgl or an RL of 14.2 m AHD to 16.6 m AHD. Based on these measured groundwater levels the inferred direction of groundwater flow is south to south west, i.e. towards Botany Bay and the groundwater extraction exclusion zone.

DP has also conducted numerous geotechnical investigations for multi-story tower developments across the Pagewood, Banksmeadow and Mascot areas, in which similar sub-surface soil and profiles have been encountered.

## 4. Conclusion and Recommendations

Based on our experience on the site and in nearby areas, the ground conditions at the site are considered likely to be similar to the surrounding areas (within Botany and Randwick Council) currently zoned as residential. Therefore from a geotechnical perspective, DP considers that site is suitable for rezoning to mixed uses including residential.

Excavations on-site are feasible, however, there is increasing difficulty in construction with increasing depth of excavation (and associated basement construction). Excavation will require relocation of

underground services, short and long-term retention support, excavation of material and possibly off-site disposal of excavated spoil if it is unsuitable or unable to be re-used elsewhere on-site.

Excavations up to 3 m depth are likely to be able to temporarily batter sidewalls during excavation works with permanent support provided by a cantilevered retaining wall (e.g. block wall or similar).

Excavations deeper than 3 m are likely to also require design consideration of the following items:

- Permanent Retaining Wall support – a continuous, secant pile wall constructed using a continuous flight auger (CFA) piling rig or a diaphragm wall is likely to be required to provide wall support during permanent retaining wall solution (Note: Continuous walls only appropriate above the groundwater level). Sheet piling may also be considered for shallower excavations but is likely to require additional ground anchor support and will not be suitable in any vibration sensitive areas or where surcharge loads require support. The size and depth of embedment of walls below the bulk excavation level will be required to be determined by the structural engineer;
- Ground Anchors – temporary ground anchors to support the retaining wall will be required until permanent support from the structure can be provided;
- Groundwater – excavation to below or near the groundwater level will need to carry out the following:
  - Obtain approval for temporary dewatering and construction from the relevant government department(s). Presently this approval includes the NSW Department of Primary Industries (Water);
  - Groundwater modeling of the effect of lowering the groundwater level on surrounding infrastructure;
  - Temporary dewatering of the groundwater level to allow construction;
  - Off-site disposal of groundwater (appropriate permission to dispose of this material to storm water or sewer will need to be obtained from the service provider);
  - Construction of a tanked (i.e. fully water-tight) basement;
  - Allowance in the design for the ground slab to withstand the applied buoyancy forces. This generally includes ground anchors during construction to hold down the slab until the building has sufficient weight to counter the buoyancy forces; and
  - Monitoring of groundwater levels in the area before and during construction.

Therefore, given the above, the preference would be to limit the depth of excavation on-site.

Additional geotechnical investigation and consultation will be required prior to preliminary and detailed design.

Reference should be made to DP Report 85009.02.R.001.Rev0 regarding environmental/ contamination comments on the proposed rezoning of the site.

## 5. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project at Pagewood in accordance with DP's original proposal dated 11 January 2017 and acceptance received from Mr

Matthew Lennartz dated 19 November 2018 for revision to the previous report (Report 85009.01.R.002.Rev2 dated 30 March 2017).

The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Meriton for this project only and for the purposes as described in the report. It should not be used for other projects or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
**Douglas Partners Pty Ltd**

**Luke Jame-Hall**
Geotechnical Engineer

Reviewed by

**Michael J Thom**
Principal

Attachments: About this Report
Drawing 1
Drawing 3 (Project 71631.01)
Drawing 3 (Project 71631.02)

# About this Report

Douglas Partners

**Introduction**
These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

**Copyright**
This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

**Borehole and Test Pit Logs**
The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

**Groundwater**
Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

**Reports**
The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

July 2010

# About this Report

**Site Anomalies**
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

**Information for Contractual Purposes**
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

**Site Inspection**
The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

July 2010




| | | | | | |
|---|---|---|---|---|---|
| Douglas Partners Geotechnics \| Environment \| Groundwater | CLIENT: Meriton | | TITLE: **Pagewood Part II - Due Diligence** | PROJECT No: | 85009.02 |
| | OFFICE: Sydney | DRAWN BY: NW | **128, 130-150 Bunnerong Road, Pagewood** | DRAWING No: | 1 |
| | SCALE: As shown | DATE: 20 Nov 2018 | | REVISION: | 2 |




Douglas Partners
Geotechnics / Environment / Groundwater

| | | | |
|---|---|---|---|
| CLIENT: A | | TITLE: Phase 2 Sampling Locations | PROJECT No: 71631.01 |
| OFFICE: Sydney | DRAWN BY: PSCH | Remediation Action Plan | DRAWING No: 3 |
| SCALE: As shown | DATE: MARCH 2012 | Part Lot 1 DP776089, Westfield Drive, Eastgardens | REVISION: A |

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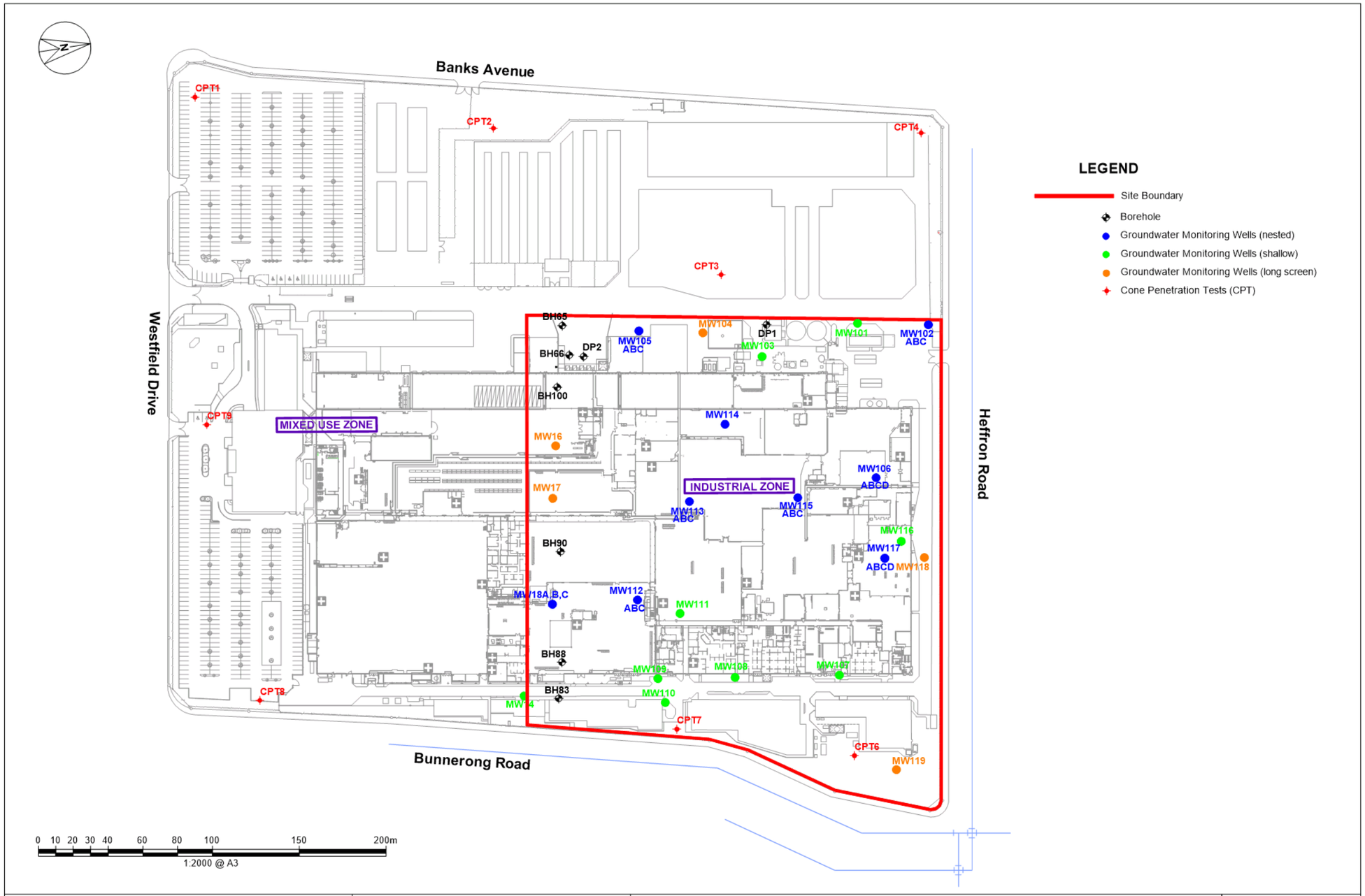


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Douglas Partners
Geotechnics / Environment / Groundwater

| | | | |
|---|---|---|---|
| CLIENT: Brittish American Tobacco Australia Ltd | | TITLE: **Test Bore Locations** | PROJECT No: 71631.02 |
| OFFICE: Sydney | DRAWN BY: PSCH | **Phase 2 Contamination Assessment** | DRAWING No: 3 |
| SCALE: As shown | DATE: JULY 2012 | **Part Lot 1 DP776089, Westfield Drive, Eastgardens** | REVISION: 0 |

# APPENDIX F SUMMARY OF CONTAMINATION INVESTIGATIONS

Douglas Partners
Geotechnics | Environment | Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
96 Hermitage Road
West Ryde NSW 2114
PO Box 472
West Ryde NSW 1685
Phone (02) 9809 0666
Fax (02) 9809 4095

**Meriton Properties**
**Level 11 Meriton Tower**
**528 Kent Street**
**Sydney NSW 2000**

Project 85009.02
85009.02.R.001.Rev0
21 November 2018
PMM:mm

Attention: Mr Matthew Lennartz

Email: matthewl@meriton.com.au

Dear Sirs

**Summary of Previous Investigations**
**Pagewood Part II**
**128, 130-150 Bunnerong Road, Pagewood**

## 1. Introduction

This report presents the results of a contamination desktop study of part of 128, 130-150 Bunnerong Road, Pagewood, referred to herein as Pagewood Part II (or "the site"), as shown on the attached Drawing 1. The site comprises Lot 1 in DP1187426 (Lot 1) and Lot 24 in DP1242288 (Lot 24) and covers an area of approximately 8.95 hectares (ha).

Preparation of this report was commissioned by Mr Matthew Lennartz of Meriton via email on 11 January 2017 and undertaken in general accordance with Douglas Partners Pty Ltd (DP) standard conditions of engagement. It is understood that the report will be used for due diligence purposes and in support of a rezoning application for mixed uses including residential (refer to proposed Masterplan layout shown on Drawing 1).

The objective of the desktop study was to assess the likely contamination conditions at the site and to identify issues (based on reviewed information) that may be detrimental to the proposed development layout.

## 2. Site Description and Geology

The site is bound by Heffron Road to the north, Bunnerong Road to the east, Banks Avenue to the west and an internal road (Meriton Boulevard) to the south. At the time of preparing this report, the eastern portion of the site was occupied by commercial / industrial buildings and pavements and was being used for storage. The western portion was occupied by a large warehouse building and was being utilised for materials storage associated with the ongoing development of Pagewood Part I (refer attached Drawing 1).

Reference to the Sydney 1:100,000 Series Geological Sheet indicates that the site is underlain by Quaternary alluvial deposits, which typically comprise fine to medium grained "marine" sands with

podsols. Hawkesbury Sandstone, comprising medium to coarse grained quartz sandstone with minor shale and laminite lenses, underlies the site at depth.

The site is located over the Botany Sand Aquifer, a shallow unconfined to semi-confined groundwater system. The average saturated thickness of the Botany Sands Aquifer is 15 - 20 m. Hydraulic conductivity within the sand beds is highly variable and is typically around 20 m/day in clean sand.

## 3. Previous Reports

Douglas Partners Pty Ltd (DP) has completed a number of environmental and contamination investigations across the site since 2011. The attached Drawing 3 (Project 71631.01) and Drawing 3 (Project 71631.02) show the previous CPT, bore and groundwater monitoring well locations.

The general sequence of subsurface materials encountered in the previous investigations is described below in increasing depth order:

| | |
|---|---|
| FILLING: | Sand filling to typical depths of 1.0 m to 2.5 m, generally well compacted in the upper metre. In isolated locations the filling was as shallow as 0.3 m and as deep as 4.6 m; |
| SAND | Medium dense and medium dense to dense sand to depths of 5 – 7 m, becoming dense and very dense with occasional thin (<0.5m) clay and peat bands to depths of 21 – 38 m. The base of the alluvial sand unit was found to be up to 44 m in isolated locations; |
| CLAY/SAND: | Residual clayey sand and sandy clay of 0.4 – 2.0 m thick. In most locations no residual soil was encountered and in some isolated locations it was 4 – 8 m thick; and |
| SANDSTONE: | Hawkesbury sandstone was encountered at depths of between 21 – 49 m depth. |

Groundwater levels varied from a depth of 5.9 m to 7.8 m bgl or an RL of 14.2 m AHD to 16.6 m AHD. Based on these measured groundwater levels the inferred direction of groundwater flow is south to south west, i.e. towards Botany Bay and the groundwater extraction exclusion zone.

## 4. Background

The site and the remainder of Lot 1 have been the subject of a number of environmental investigations by DP and others. The aspects of the previous investigations relevant to the site are presented in this section.

Site history information indicated that the site and the remainder of Lot 24 was originally formed in the 1930s through reclamation of virgin marshland. Since its reclamation a number of parcels along the eastern boundary were used mainly for residential/rural purposes (possibly including paddocks and poultry farming) from at least 1929 (the year the records start) to 1938/1939.

The site and remainder of Lot 24 was owned by General Motors Holden (GMH) and was operated as an automobile assembly plant from 1939 to 1982 when the plant was closed down. The land parcel was subsequently purchased by Quintilis Pty Ltd (a subsidiary of British American Tobacco Australia)

in 1982. Quintilis Pty Ltd was incorporated into British American Tobacco Services Limited in 1989 and BATA in 2001.

The GMH factory was officially opened on 15 February 1940 by Prime Minister Menzies. The factory assisted in manufacturing of car bodies during WWII. Afterwards, the facility was used for the assembly and distribution of Holden vehicles. The manufacturing areas were largely concentrated in the north-eastern portion of the GMH owned land parcel.

BATA operated within the western and southern portions of the site and remainder of Lot 24, either as owner or tenant, until July 2014. The main factory building is used for the manufacturing and packaging of various cigarette products. Several ancillary buildings were located around the main factory building including corporate, administration, security, and IT buildings. Utility buildings (flavour room, boiler house, electrical substation, etc.), a technical centre and a canteen are other buildings detached from the main factory building and were located generally along the eastern portion of the operation. A large warehouse type building (No. 1 Bond Store) located on the western portion of the site still exists at the time of preparing this report. The south western portion of the site and remainder of Lot 24 was used for car parking by BATA staff and visitors.

### 4.1 Phase 1 and Phase 2 Assessments

Based on the historical information examined it appears that the site (and the remainder of Lot 24) was originally formed in the 1930's through reclamation of virgin marshland. Since its reclamation a number of parcels along the facility's eastern boundary were used mainly for residential/rural purposes (possibly including paddocks and poultry farming) from at least 1929 (the year the records start) to 1938/1939. The site was owned by General Motors Holden (GMH) and was operated as an automobile assembly plant from 1939 to 1982 when the plant was closed down. Most of the facility was subsequently purchased by Quintilis Pty Ltd (a subsidiary of British American Tobacco Australia) in 1982. A small parcel along the southern boundary of the site was owned from 1982 to 1986 by Amaretto Pty Ltd. Quintilis Pty Ltd was incorporated into British American Tobacco Services Limited in 1989 and BATA in 2001.

The site was used by BATA or the manufacturing and distribution of cigarettes. The main factory building occupied the greater portion of the site (and the remainder of Lot 24). Several ancillary buildings were located around the main factory building including corporate, administration, security, and IT buildings. Utility buildings (flavour room, boiler house, electrical substation, etc.), a technical centre and a canteen were detached from the main factory building and located generally along the eastern portion of the site adjacent to Bunnerong Road. A large warehouse type building (Bond no. 3) was used for storing raw tobacco and is located on the north western portion of the site (still remaining). Car parks occupied the south western portion of the site and the remainder of Lot 24.

Based on the history information, the areas of environmental concern (AEC) identified for the site (and the remainder of Lot 24) included filling, underground storage tanks (USTs), above ground storage tanks (AGSTs), the use of solvents, electrical substations, former spray painting booths, former engine and car assembly works, battery storage and disposal, former soldering booths, storage areas (dangerous and hazardous goods), former bus depot and car parking areas, and buildings (hazardous materials).

The Phase 2 contamination assessments conducted across the site and the remainder of Lot 24 in 2011 and 2012 included a review of the previous investigations undertaken at the site, the drilling and sampling of a total of nine cone penetration tests (CPT1 to CPT 9), the drilling and sampling of 144 test bores, and the installation and sampling of groundwater monitoring wells in 37 of the test bores. All relevant bore and well locations are shown on the attached Drawing 3 (Project 71631.01) and Drawing 3 (Project 71631.02).

Given the introduction of NEPC (2013), DP updated the Phase 2 contamination assessment in 2013. The main objective of the subsequent report (DP, 2013) was to update previously reported data (in regards to site contamination assessment) to then current guidelines and supplement the earlier data with additional soil sampling and testing to better characterise the contamination status of Lot 24, and to inform the preparation of a revised Remediation Action Plan (RAP) for Lot 1 that identifies areas of soil requiring remediation on this basis of the re-assessment of the data.

The updated assessment (labelled a Detailed Site Investigation (DSI) in keeping with the terminology used in NEPC, 2013) included the excavation of 63 test pits for asbestos assessment, additional testing to conduct a preliminary ecological risk assessment (ERA), the drilling and sampling of 16 test bores for further delineation of chemical contamination, the drilling of four test bores in the former corporate office.

Soil samples from the bores were analysed for a variety of potential contaminants including heavy metals, PAH, TPH, BTEX, PAH, OCP, OPP, PCB, VOC, phenols, synthetic pyrethroids, hexavalent chromium, cyanide, ammonia and asbestos. Analytical results for soil samples were compared to site assessment criteria (SAC) applicable for residential (western portion of the site) and commercial and industrial (eastern portion of the site) land uses. The concentrations of contaminants in soil were within the SAC for all samples and analytes with the following general exceptions:

- Elevated TPH in soil at MW110 and BH39; and
- Marginally elevated lead and OCP at BH46.

Recovered groundwater samples were analysed for potential contaminants including heavy metals, PAH, TPH, BTEX, PAH, OCP, OPP, PCB, VOC, phenols, hexavalent chromium, cyanide and ammonia. Groundwater analyses were compared predominantly to the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, (ANZECC 2000) guidelines for marine water for the protection of 95% of species.

Elevated concentrations of tetrachloroethene (PCE) were found in groundwater at a number of wells in the eastern portion of the site, namely MW18, MW108, MW109, MW110 and MW112, with only two locations (MW18 and MW110) exceeding the adopted assessment criteria. The generally clustered results are an indication of a potential dissolved phase PCE plume, and possible source sites, in this area. Elevated concentrations of TPH were also found in groundwater at MW18, MW106, MW109, MW110, MW111 and MW114. The source around MW18 and MW109 to MW111 may be one or a number of the former USTs located in the eastern portion of the site, whilst the detections at MW106 and MW114 may be attributed to a former UST located along the northern access road, or localised spills or leaks within the main building.

DP concluded that based on the results of the assessment that the site can be rendered suitable for the proposed land uses subject to the findings of additional investigations, monitoring and validation works.

### 4.2 Passive Soil Gas Assessment (Draft)

DP conducted a passive soil gas survey in the south eastern portion of the site in an attempt to assess potential source sites for the chlorinated solvents and petroleum hydrocarbons concentrations in groundwater, the extent of associated groundwater contamination plumes (if present) and the potential for migration of the contaminants on to site from off-site sources. The assessment included the installation of 39 passive soil gas samplers, the retrieval of the PSG samples, semi-volatile organic compounds (SVOC) and VOC analysis (of the passive soil gas samplers) and the preparation of isopleth maps.

PCE, TCE, xylenes and trimethylbenzene (TMB) were detected in the PSG samplers (as well as other VOC), however the concentrations were typically low. The following conclusions were drawn from the results of the PSG assessment:

1. No significant on or off-site potential contamination source had been identified through the distribution and/or the soil vapour measurements reported; and
2. Although the soil vapour distribution identified some of the highest soil vapour measurements at or close to the fringes of the study area, an extension of the study area was not considered necessary as the measurements were low and not considered to represent a source within the study area. Groundwater results beyond the study area do not suggest a likely source of significant groundwater contamination elsewhere within the site.

Based on the findings of the PSG assessment the following recommendations were made:

- Installation of soil vapour ports for active soil vapour sampling, nominally in locations of highest detected groundwater and passive soil vapour concentrations, and one up-gradient of the study area for background purposes;
- An additional round of groundwater monitoring across Lot 1 to obtain current concentrations to use in a human health risk assessment, if considered appropriate; and
- Based on the outcomes of the above complete a human health risk assessment considering industrial, residential and construction worker receptors.

### 4.3 Active Soil Vapour Assessment (Draft)

An active soil vapour assessment was undertaken within a portion of the proposed Industrial Zone (the study area) in the vicinity of MW118 and MW110. The location of the ASVA was designed to target previous comparatively elevated petroleum hydrocarbon and chlorinated solvent concentrations detected in groundwater and passive soil vapour samples.

The assessment included the review of the previous reports and the installation of a six nested active soil vapour sampling ports (with sample depths of 1 m, 4 m and 7 m below ground level) and one shallow active soil vapour sampling port (1 m bgl) and collection of soil vapour samples for VOC analysis and general gases.

DP provided the following conclusions in the report:

(i) The report quantifies the concentrations of VOC in soil gas in the target locations;

(ii) The results indicate that it is unlikely that there is a significant off-site source of VOC or petroleum hydrocarbon contamination and no significant on-site source of VOC or petroleum hydrocarbon contamination such that active remediation and/or management is required. The results from sample location ASV1 suggest that there may be a previously unidentified (minor) on-site source of VOC (PCE/TCE) in the vicinity of ASV1 or that a narrow vapour/groundwater plume migrates onto the site from up-gradient sources to the north east of the site near the northern side of the canteen block. However if this was a significant off-site source it would be expected it would have been reflected in the groundwater and/or passive soil vapour assessment but there was no indications of a significant off-site source in these; and

(iii) The three data sets, passive soil vapour, active soil vapour and groundwater generally do not show a strong correlation.

DP concluded that the significance or otherwise of the detected soil vapour concentrations be determined via the site specific human health risk assessment. DP also recommended that following completion of the human health risk assessment it is possible that a period of groundwater and soil vapour monitoring will be recommended such that a suitable data base of groundwater and soil vapour results can be established to show that concentrations of the contaminants of concern are either stable or falling over time.

## 5. Conclusion and Recommendations

State Environmental Planning Policy (SEPP) No. 55 refers to the planning and development control process as provided for in the Environmental Planning and Assessment Act 1979 (EP&A Act) plays an important role in the management of land contamination. The integration of land contamination management into the planning and development control process will:

- Ensure that changes of land use will not increase the risk to health or the environment;
- Avoid inappropriate restrictions on land use; and
- Provide information to support decision making and to inform the community.

SEPP55 also specifies that:

*Essentially, the Guidelines recommend that rezonings, development control plans and development applications (DAs) are backed up by information demonstrating that the land is suitable for the proposed use or can be made suitable, either by remediation or by the way the land is used. Where remediation has already occurred but residual contamination is above the recommended thresholds, it may be necessary to restrict the land uses allowed. This approach may also be appropriate for cases where investigation shows that only some land uses would be suitable. In situations where the land is not suitable for the proposed use and cannot be rendered suitable for technical or practical reasons, the proposal should be refused.*

Based on Figure 2 of SEPP55 – Options Available in the Rezoning Process where the Specific End Use is Known, DP provides the following responses:

1. *Is information sufficient for decision making*? Yes – see previous sections on various documents reviewed above which provide a reasonable amount of information on site contamination.

2. *Has land been proven suitable for proposed uses without need for further testing or treatment*? No. Recommendations are provided below.
3. *Remediation or further investigation required – consider need for provisions in LEP/REP to ensure investigation or remediation occurs before development of land*? Yes – see specified documents and recommendations listed below.
4. *Proceed with process of rezoning*? Yes.
5. Record decision and information.

On this basis, DP considers that the site is suitable for rezoning for mixed uses (including residential), and can be made suitable for the proposed development contingent on the following additional investigations and documents being prepared and provided to Council and the Site Auditor, prior to development consent:

- Additional soil, groundwater and soil vapour investigations to meet the NSW EPA sampling guidelines and with reference to the intended site use as residential and to supplement the previous works undertaken from 2011-2013;
- Preparation of a Remediation Action Plan (RAP);
- Preparation of an Asbestos Management Plan (AMP);
- Site Remediation and Validation reporting; and
- Preparation of a Site Audit Statement (Part A).

In accordance with the NSW EPA hierarchy for remediation, the preferred remediation strategy is likely to comprise the retention and management of contaminated soils on site, either through relocation to less sensitive areas and/or physical encapsulation or capping, therefore reducing the need to remove large volumes of soil to landfill. Any design configuration that supports this strategy (e.g. no basement excavations) would be preferred. Furthermore, large excavations could impact on the groundwater dynamics and make it more difficult to isolate and/or manage any identified contaminated groundwater.

## 6. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project at 128 and 130-150 Bunnerong Road, Pagewood in accordance with DP's proposal dated 11 January 2017 and acceptance received from Mr Matthew Lennartz dated 11 January 2017. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Meriton for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological

processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
**Douglas Partners Pty Ltd**

**Paula Maurici**
Environmental Scientist

Reviewed by

PP

**Paul Gorman**
Environmental Manager, Principal

Attachments: About this Report
Drawing 1 (Rev2)
Drawing 3 (Project 71631.01)
Drawing 3 (Project 71631.02)

# About this Report

Douglas Partners

**Introduction**
These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

**Borehole and Test Pit Logs**
The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

**Groundwater**
Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

**Reports**
The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

July 2010

# *About this Report*

**Site Anomalies**
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

**Information for Contractual Purposes**
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

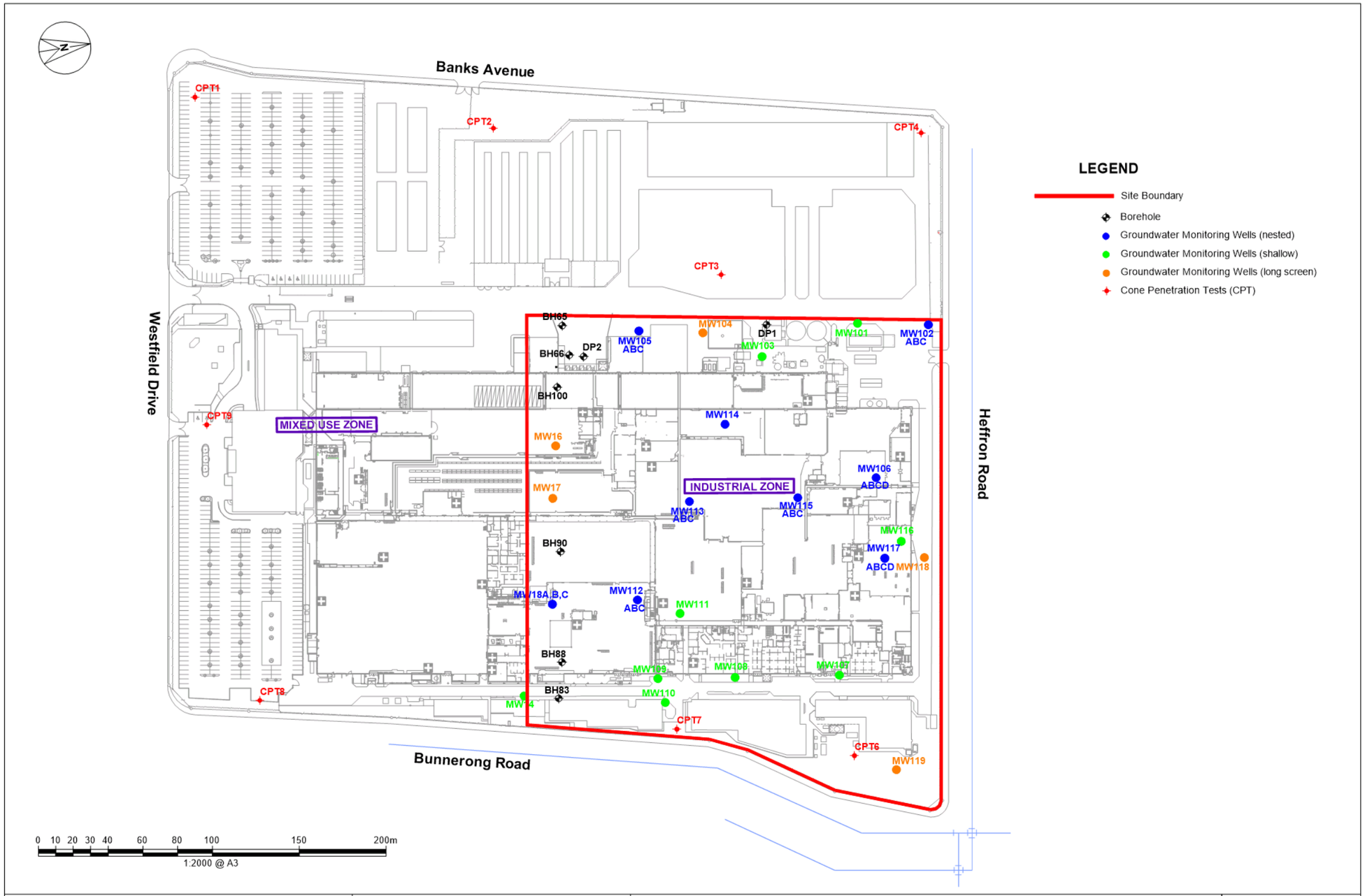
**Site Inspection**
The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

July 2010




| | | | | | |
|---|---|---|---|---|---|
| Douglas Partners Geotechnics / Environment / Groundwater | CLIENT: Meriton | | TITLE: Pagewood Part II - Due Diligence<br>128, 130-150 Bunnerong Road, Pagewood | PROJECT No: | 85009.02 |
| | OFFICE: Sydney | DRAWN BY: NW | | DRAWING No: | 1 |
| | SCALE: As shown | DATE: 20 Nov 2018 | | REVISION: | 2 |


Banks Avenue
Westfield Drive
Heffron Road
Bunnerong Road
MIXED USE ZONE
INDUSTRIAL ZONE
LEGEND
Site Boundary
Initial site boundary identified prior to fieldwork
Borehole
Groundwater Monitoring Wells (nested)
Groundwater Monitoring Wells (shallow)
Groundwater Monitoring Wells (long screen)
Cone Penetration Tests (CPT)
0 10 20 30 40 60 80 100 150 200m
1:2000 @ A3
Douglas Partners
Geotechnics / Environment / Groundwater
CLIENT: A
OFFICE: Sydney
DRAWN BY: PSCH
SCALE: As shown
DATE: MARCH 2012
TITLE: Phase 2 Sampling Locations
Remediation Action Plan
Part Lot 1 DP776089, Westfield Drive, Eastgardens
PROJECT No: 71631.01
DRAWING No: 3
REVISION: A

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Douglas Partners
Geotechnics / Environment / Groundwater

| | | | |
|---|---|---|---|
| CLIENT: Brittish American Tobacco Australia Ltd | | TITLE: **Test Bore Locations** | PROJECT No: 71631.02 |
| OFFICE: Sydney | DRAWN BY: PSCH | **Phase 2 Contamination Assessment** | DRAWING No: 3 |
| SCALE: As shown | DATE: JULY 2012 | **Part Lot 1 DP776089, Westfield Drive, Eastgardens** | REVISION: 0 |

# APPENDIX G PRELIMINARY TREE ASSESSMENT REPORT

**JACKSONS NATURE WORKS**
34 CALOOLA CRESCENT, BEVERLY HILLS 2209
9 150 4430
0 4 18) 414 502

# PRELIMINARY TREE ASSESSMENT REPORT

**At**

**Pagewood Green (Stage 2)**
**Banks Avenue, Heffron & Bunnerong Roads**

**Prepared for**

**Meriton Group**

**30.7.2018**

**Prepared by:** Ross Jackson
Graduate Certificate in Arboriculture (AQF L 8)
Dip. Horticulture (Arboriculture – AQF L 5)
Certificate III in Horticulture (Arboriculture)
Certificate in Horticulture (Landscape)

Member of the Arboriculture Australia (MAA)
Member of the Australian Institute of Horticulture
Consulting Arborist Nos.1695

E: jacksonsnatureworks@bigpond.com

## DISCLAIMER

The Client acknowledges that this Report, and any opinions, advice or recommendations expressed or given in it, are the information supplied by the Client and on the data inspections, measurements and analysis carried out or obtained by Jacksons Nature Works (JNW) and referred to in the Report. The Client should rely on The Report, and on its contents, only to that extent.

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However, Ross Jackson – Consulting Arborist can neither guarantee nor be responsible for the accuracy of information provided by others. Unless stated otherwise:

- Information contained in this report covers only the trees examined and reflects the health and structure of the trees at the time of inspection. The documented, observations, results, recommendations and conclusions given may vary after the site visit due to environmental conditions.
- The inspection was limited to visual examination from the base of the subject tree without dissection, probing or coring; and
- There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.

Ross Jackson.

Consulting Arborist

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## 1. BACKGROUND and METHODODOLGY

1.1 The purpose of this Tree Report is to inform and accompany the development application works at Pagewood Stage 2: Banks Avenue, Heffron & Bunnerong Roads – The Site.

1.2 The report was commissioned by Meriton Group to respond to Council's requirements to consider the development impacts on trees located on and around the Site.

1.3 This report outlines the health and condition of the subject trees, the remaining life expectancy of the trees, identifies any visible defects or other problems, describes which trees require pruning, removal, retention or represent a potential hazard and comments on the impact on these trees in relation to the works proposed. The report also provides recommended tree protection measures (Tree Management Plan) to ensure the long-term preservation of the trees to be retained where appropriate.

1.4 The Site is a former commercial site with gardens at Pagewood.

1.5 The trees were identified by ground level Visual Tree Assessment (VTA) [1] only in the data collection, taken on 13, 14 & 15.6.2018. No aerial (climbing) was undertaken.

1.6 All site photographs were taken by the author at the site. All photographs were taken using a digital camera (Canon 7D) with no image enhancement either within the camera or on computer.

1.7 The subject trees were located on plans supplied. The trees have been plotted and can be found on Annexure B – Tree Location Plan.

1.8 The trees were identified, and their genus species and common name used. The trees were identified by the use of data collected and compared to G Burnie, S Forrester et al (1997) **Botanica** Random House, Milsons Point, NSW, Australia.

1.9 DBH. The Trunk Diameter at Breast Height (1.4 metres above ground level) in centimetres was measured over bark using a metal tape which automatically converts to diameter and assumes a circular trunk cross section.

1.10 DRB. The trunk Diameter above Root Buttress in centimetres was measured over bark using a metal tape which automatically converts to diameter and assumes a circular trunk cross section.

1.11 Height. Estimated overall height in metres.

1.12 Spread. Measured with a metal tape measure and shown in metres.

1.13 Useful Life Expectancy (ULE)[2].

---

[1] Mattheck, Dr. Clause & Breloer, Helge (1994) – Sixth Edition (2001) **The Body Language of Trees – A Handbook for Failure Analysis** The Stationery Office, London, England

[2] Barrell, Jeremy (1996, 2001) **Pre-development Tree Assessment** Proceedings of the International Conference on Trees and Building Sites (Chicago) International Society of Arboriculture, Illinois, USA

A systematic pre-development tree assessment procedure developed by Jeremy Barrell, Hampshire, England. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of the inspection. SULE ratings are Long (retainable for 40 years or more with an acceptable level of risk), Medium, (retainable for 16 – 39 years), Short (retainable for 5 – 15 years) and Removal (tree requiring immediate removal due to imminent hazard or absolute unsuitability).

1.14 The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) have been calculated in terms of AS 4970 – 2009 Protection of trees on development site Section 3.

1.15 To prepare this report we have reviewed the following documents:

- Detail survey by JBW Surveyors Pty Ltd, dated 27.6.2018, Rev 23;
- Architectural plans by SJB Architects;
- Botany Bay Council, DCP 2013 – 3F Tree Management (DCP); &
- Australian Standard AS 4970 – 2009 Protection of trees on development sites.

## 2. OBSERVATIONS as seen on the days of inspection (13, 14 & 15.6.18)

2.1 Our tree observations can be found in Annexure A.

## 3. DISCUSSIONS

3.1 We have been commissioned by Meriton Group, to examine the health and condition of the trees on and around this development site.

It is proposed to demolish the existing and the construction of a new residential precinct on Site (development works).

3.2 We have examined the trees on site and can suggest the following considerations for the development works:

1. The following trees are street trees along Banks Avenue, Heffron & Bunnerong Avenue. These trees show on the whole good vitality:

a. Tree 1 – 21 ***Callistemon viminalis***;
b. Tree 406 – 410, 412 – 413, 415 – 419, 424, 427 – 431, 433 – 437, 439 – 447, ***Melaleuca quinquenervia*;**
c. Tree 411, 414, ***Banksia serrata*;**
d. Tree 420 – 423, 425 – 426, ***Leptospermum petersonii*;**
e. Tree 432 ***Nerium oleander*;**
f. Tree 438 ***Platanus x acerifolius*;**
g. Tree 448 – 449 ***Lophostemon confertus*;**
h. Tree 450 – 451, 457 ***Podocarpus falcatus*;**
i. Tree 452 – 456, 458 - 459 ***Cupaniopsis anacardioides*;**

2. The following trees are classified as Exempts in Council's DCP and can be removed without consent: Tree 54, 57, 194, 196, 206, 224, 225, 227, 228, 263, 284, 286, 289 **Dead tree;**

3. The following trees are assessed as being of poor vitality or form and should be removed:
a. Tree 28, 246, 341, 366, 387 ***Eucalyptus botryoides***;
b. Tree 40, 78 ***Lophostemon confertus***;
c. Tree 58 - 60 ***Melaleuca armillaris***;
d. Tree 83, 85 - 86, 88, 90, 91 108 – 109, 199, 230, 273, 280, 282, 256, 258, ***Acacia binervia***;
e. Tree 102, 106 ***Eucalyptus tereticornis*;**
f. Tree 105, 145, 216, 241, 268, 288 ***Casuarina glauca***;
g. Tree 121, 193, 382 ***Corymbia citriodora*;**
h. Tree 122 – 123, 212 ***Banksia integrifolia***;
i. Tree 125, 174, 177 ***Melaleuca quinquenervia*;**
j. Tree 213, 217, 222, 229, 248, 296, 362, 370, 373, 405 ***Eucalyptus microcorys***;
k. Tree 333 ***Corymbia gummifera***;
l. Tree 364 ***Eucalyptus robusta***.

4. The following trees show good vitality and can be considered for retention, subject to development impacts:

a. Tree 22, 56, 119, 131,134, 201, 203, 207, 232 – 234, 236, 237, 261, 262, 264, 267, 338 ***Melaleuca quinquenervia*;**
b. Tree 23 – 27, 29, 33, 36 – 39, 41 – 53, 55, 61 – 63, 65 – 67, 72 – 74, 76, 77, 80, 94, 98 – 99, 103 – 104, 110, 115 – 118, 126 – 128, 130, 140 – 142, 144, 146, 175, 176, 179, 180, 182, 197, 198, 200, 204, 205, 215, 220, 221, 235, 238 – 240, 253, 254, 260, 265, 266, 269, 270, 271, 274, 275, 277, 294, 295, 303, 349 – 359, 363, 365, 369, 374, 376 – 379, 386, 388, 389, 391 – 402 ***Casuarina glauca***;
c. Tree 30 – 32, 34, 35, 68 – 71, 186, 188, 189, 210, 211, 214, 301 ***Banksia integrifolia***;
d. Tree 64, 75, 79, 82, 95 – 97, 107, 111, 112, 114, 138, 143, 148, 150, 152, 161 – 164, 166, 167, 170, 171, 178, 218, 219, 223, 226, 245, 247, 249 – 251, 290 – 293, 297, 342, 343, 345, 368, 371 ***Eucalyptus microcorys***;
e. Tree 81, 158, 184, 187, 190, 191, 208, 209, 231, 242 – 244, 328, 331, 332, 335, 339, 385, 403, 404 ***Eucalyptus botryoides***;
f. Tree 84, 87, 89, 92 – 93, 139, 149, 151, 153 – 157, 172, 173, 192, 195, 252, 255, 257, 259, 298, 300, 302, 304 – 314, 316 – 327, 329, 330, 360, 361, 383, 384 ***Corymbia citriodora*;**
g. Tree 100, 101, 132, 133, 135- 137 ***Eucalyptus tereticornis*;**
h. Tree 113, 120, 124 ***Banksia serrata***;
i. Tree 129 ***Eucalyptus sp.***
j. Tree 147, 287 ***Ficus microcarpa var. hillii***;
k. Tree 160, 202, 315, 334 ***Corymbia gummifera***;
l. Tree 165, 168 ***Angophora costata***;
m. Tree 181, 183, 185, 272, 276, 278, 279, 281, 283, 285 ***Lophostemon confertus***;
n. Tree 299 ***Elaeocarpus reticulatus***;
o. Tree 337 ***Tristaniopsis laurina***;
p. Tree 340 ***Pittosporum undulatum;***
q. Tree 344, 346, 347, ***Brachychiton acerifolius***;
r. Tree 348, 367, ***Araucaria heterophylla;***
s. Tree 372, ***Podocarpus elatus***;
t. Tree 375, 380, 381, ***Podocarpus falcatus***;
u. Tree 390 ***Casuarina cunninghamiana***.

## 4. CONCLUSIONS

The trees assessed within this report are predominantly native trees, being on the whole in good vitality and their retention and removal will need further assessment when the final design of the buildings is completed.

The various roads and associated civil works and drainage plans will also have an impact on the retention of trees.

There is a significant opportunity to retain a large proportion of trees in and around this site as the trees are concentrated at the perimeters.

It is acknowledged the design has attempted to increase the distances (setback) from the trees identified for retention.

Notwithstanding, not all trees can be retained within this design. This is mitigated by the scale of the site which provides ample opportunity to replant compensatory canopy trees, shrubs and ground covers to offset any tree loss.

Accordingly the site design presented is supported.



Ross Jackson M.A.A (Nos. 1695) & M.A.I.H.
Consulting Arborist
Graduate Certificate in Arboriculture – AQF Level 8 (Honours)
Diploma Horticulture (Arboriculture) – AQF Level 5
Certificate III in Horticulture
Certificate in Horticulture (Landscape – Honours)

## Annexure A: Observations as seen on the day of inspection of trees

| Tree No | Botanical Name | Age Class | Height (m) | Spread (m) | D.B.H. (cm) | D.R.B. (cm) | TPZ (radius m) | SRZ (radius m) | Condition comments as seen on site | ULE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Callistemon viminalis* | M | 5 | 2 | 22 | 28 | 2.6 | 1.9 | G vitality, ST, pruned | 2a |
| 2 | *Callistemon viminalis* | M | 6 | 4 | 14, 18 | 30 | 2.7 | 2.0 | G vitality, ST, twin @ 1m | 2a |
| 3 | *Callistemon viminalis* | M | 5 | 2 | 18 | 22 | 2.2 | 1.8 | G vitality, ST | 2a |
| 4 | *Callistemon viminalis* | M | 5 | 3 | 2 x 20 | 36 | 3.4 | 2.2 | G vitality, ST, twin @ ground-level | 2a |
| 5 | *Callistemon viminalis* | M | 5 | 2 | 16, 12 | 30 | 2.4 | 2.0 | G vitality, ST, twin @ ground-level | 2a |
| 6 | *Callistemon viminalis* | M | 5 | 1 | 12 | 18 | 2.0 | 1.6 | F vitality, failed branch, small crown, ST | 2b |
| 7 | *Callistemon viminalis* | M | 5 | 3 | 18 | 22 | 2.2 | 1.8 | F vitality, ST | 2b |
| 8 | *Callistemon viminalis* | M | 5 | 4 | 2 x 14 | 2 x 20 | 2.4 | 3.4 | G vitality, ST | 2a |
| 9 | *Callistemon viminalis* | M | 5 | 2 | 14 | 18 | 2.0 | 1.6 | G vitality, ST | 2a |
| 10 | *Callistemon viminalis* | M | 5 | 3 | 20 | 26 | 2.4 | 1.9 | G vitality, ST | 2a |
| 11 | *Callistemon viminalis* | M | 5 | 3 | 20 | 24 | 2.4 | 1.8 | G vitality, stem failed @ 0.3m, ST | 2a |
| 12 | *Callistemon viminalis* | M | 5 | 3 | 30 | 32 | 3.6 | 2.1 | G vitality, ST | 2a |
| 13 | *Callistemon viminalis* | M | 5 | 3 | 30 | 30 | 3.6 | 2.0 | G vitality, ST, low 3 stems | 2a |
| 14 | *Callistemon viminalis* | M | 5 | 2 | 14 | 22 | 2.0 | 1.8 | F vitality, ST, trunk hollow @ 0.5m | 2b |
| 15 | *Callistemon viminalis* | M | 5 | 3 | 4 x 10 | 30 | 2.4 | 2.0 | G vitality, ST | 2a |
| 16 | *Callistemon viminalis* | M | 5 | 3 | 21 | 24 | 2.5 | 1.8 | G vitality, ST | 2a |
| 17 | *Callistemon viminalis* | M | 4 | 3 | 14, 12 | 24 | 2.2 | 1.8 | G vitality, branch snap-out @ 1.5m, ST | 2a |
| 18 | *Callistemon viminalis* | M | 5 | 4 | 2 x 16 | 32 | 2.7 | 2.1 | G vitality, ST | 2a |
| 19 | *Callistemon viminalis* | M | 5 | 3 | 3 x 14 | 40 | 2.9 | 2.3 | G vitality, ST | 2a |
| 20 | *Callistemon viminalis* | M | 5 | 3 | 26 | 32 | 3.1 | 2.1 | G vitality, ST | 2a |
| 21 | *Callistemon viminalis* | M | 5 | 4 | 27, 32 | 40 | 5.0 | 2.3 | G vitality, ST | 2a |
| 22 | *Melaleuca quinquenervia* | M | 5 | 3 | 24 | 28 | 2.9 | 1.9 | G vitality | 2a |
| 23 | *Casuarina glauca* | M | 7 | 3 | 14 | 16 | 2.0 | 1.5 | G vitality, suppressed T24 | 2a |
| 24 | *Casuarina glauca* | M | 8 | 7 | 24, 20, 30 | 56 | 5.2 | 2.6 | G vitality | 2b |

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|---|---|---|---|---|---|---|---|---|---|---|
| 25 | *Casuarina glauca* | M | 7 | 4 | 27 | 32 | 3.2 | 2.1 | G vitality | 2b |
| 26 | *Casuarina glauca* | M | 7 | 1 | 14 | 16 | 2.0 | 1.5 | G vitality | 2b |
| 27 | *Casuarina glauca* | M | 6 | 1 | 10 | 14 | 2.0 | 1.5 | G vitality | 2b |
| 28 | *Eucalyptus botryoides* | M | 6 | 1 | 14 | 18 | 2.0 | 1.6 | P vitality, top dead | 3a |
| 29 | *Casuarina glauca* | M | 8 | 2 | 19 | 24 | 2.3 | 1.8 | G vitality | 2b |
| 30 | *Banksia integrifolia* | M | 7 | 3 | 18 | 32 | 2.2 | 2.1 | F vitality, trunk injury @ 3m & 4m | 2b |
| 31 | *Banksia integrifolia* | M | 6 | 2 | 14 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 32 | *Banksia integrifolia* | M | 8 | 5 | 34 | 40 | 4.1 | 2.3 | G vitality | 2a |
| 33 | *Casuarina glauca* | M | 12 | 6 | 34 | 40 | 4.1 | 2.3 | G vitality | 2b |
| 34 | *Banksia integrifolia* | M | 7 | 7 | 2 x 20 | 40 | 3.4 | 2.3 | G vitality | 2a |
| 35 | *Banksia integrifolia* | M | 6 | 3 | 22 | 26 | 2.6 | 1.9 | G vitality | 2a |
| 36 | *Casuarina glauca* | M | 16 | 8 | 42 | 50 | 5.0 | 2.5 | G vitality | 2b |
| 37 | *Casuarina glauca* | M | 7 | 2 | 13 | 17 | 2.0 | 1.6 | G vitality | 2b |
| 38 | *Casuarina glauca* | M | 7 | 2 | 14 | 18 | 2.0 | 1.6 | G vitality | 2b |
| 39 | *Casuarina glauca* | M | 9 | 3 | 22 | 26 | 2.6 | 1.9 | G vitality | 2b |
| 40 | *Lophostemon confertus* | M | 6 | 1 | 12 | 16 | 2.0 | 1.5 | P vitality, suppressed | 3a |
| 41 | *Casuarina glauca* | M | 7 | 2 | 15 | 18 | 2.0 | 1.6 | F vitality | 3b |
| 42 | *Casuarina glauca* | M | 10 | 3 | 24 | 28 | 2.9 | 1.9 | G vitality | 2b |
| 43 | *Casuarina glauca* | M | 10 | 3 | 25 | 33 | 3.0 | 2.1 | G vitality | 2b |
| 44 | *Casuarina glauca* | M | 10 | 4 | 22 | 30 | 2.6 | 2.0 | G vitality | 2b |
| 45 | *Casuarina glauca* | M | 9 | 1 | 14 | 18 | 2.0 | 1.6 | G vitality, pole-like | 2b |
| 46 | *Casuarina glauca* | M | 11 | 4 | 22 | 28 | 2.6 | 1.9 | G vitality | 2b |
| 47 | *Casuarina glauca* | M | 7 | 2 | 14 | 18 | 2.0 | 1.6 | G vitality | 2b |
| 48 | *Casuarina glauca* | M | 6 | 2 | 12 | 14 | 2.0 | 1.5 | G vitality | 2b |
| 49 | *Casuarina glauca* | M | 8 | 3 | 16 | 20 | 2.0 | 1.7 | G vitality | 2b |
| 50 | *Casuarina glauca* | M | 14 | 10 | 34 | 42 | 4.1 | 2.3 | G vitality, bifurcated @ 4m | 2b |
| 51 | *Casuarina glauca* | M | 9 | 5 | 24 | 28 | 2.9 | 1.9 | G vitality | 2b |

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|---|---|---|---|---|---|---|---|---|---|---|
| 52 | *Casuarina glauca* | M | 8 | 4 | 22 | 26 | 2.6 | 1.9 | G vitality | 2b |
| 53 | *Casuarina glauca* | M | 10 | 4 | 22 | 30 | 2.6 | 2.0 | G vitality | 2b |
| 54 | *Melaleuca armillaris* | D | - | - | - | - | - | - | Dead Tree | 4a |
| 55 | *Casuarina glauca* | M | 10 | 8 | 32 | 42 | 3.8 | 2.3 | G vitality | 2b |
| 56 | *Melaleuca quinquenervia* | M | 7 | 7 | 42 | 50 | 5.0 | 2.5 | G vitality, multi-trunk | 2a |
| 57 | *Melaleuca armillaris* | D | - | - | - | - | - | - | Dead Tree | 4a |
| 58 | *Melaleuca armillaris* | M | 6 | 2 | 15, 18 | 36 | 2.8 | 2.2 | F vitality, 1/4 dead | 2b |
| 59 | *Melaleuca armillaris* | M | 5 | 2 | 15, 12 | 22 | 2.3 | 1.8 | P vitality, 1/2 dead | 3b |
| 60 | *Melaleuca armillaris* | M | 4 | 1 | 10 | 14 | 2.0 | 1.5 | P vitality, 1/4 dead | 3b |
| 61 | *Casuarina glauca* | M | 10 | 5 | 27 | 40 | 3.2 | 2.3 | G vitality, bifurcated @ 4m | 2b |
| 62 | *Casuarina glauca* | M | 8 | 1 | 17 | 22 | 2.0 | 1.8 | F vitality | 3b |
| 63 | *Casuarina glauca* | M | 10 | 5 | 23 | 32 | 2.8 | 2.1 | G vitality, upper canopy suppressed by T64 | 2b |
| 64 | *Eucalyptus microcorys* | M | 12 | 12 | 56 | 56 | 6.7 | 2.6 | G vitality | 2a |
| 65 | *Casuarina glauca* | M | 8 | 3 | 18 | 24 | 2.2 | 1.8 | G vitality | 2a |
| 66 | *Casuarina glauca* | M | 8 | 3 | 15 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 67 | *Casuarina glauca* | M | 12 | 8 | 40 | 48 | 4.8 | 2.4 | G vitality | 2b |
| 68 | *Banksia integrifolia* | M | 8 | 6 | 34 | 44 | 4.1 | 2.3 | G vitality | 2a |
| 69 | *Banksia integrifolia* | M | 7 | 4 | 24 | 32 | 2.9 | 2.1 | G vitality | 2a |
| 70 | *Banksia integrifolia* | M | 8 | 7 | 42 | 46 | 5.0 | 2.4 | G vitality, bifurcated @ 1m (stable) | 2a |
| 71 | *Banksia integrifolia* | M | 8 | 4 | 30 | 50 | 3.6 | 2.5 | G vitality | 2a |
| 72 | *Casuarina glauca* | M | 11 | 5 | 30 | 34 | 3.6 | 2.1 | G vitality | 2b |
| 73 | *Casuarina glauca* | M | 10 | 2 | 19 | 24 | 2.3 | 1.8 | G vitality | 2b |
| 74 | *Casuarina glauca* | M | 10 | 5 | 26 | 34 | 3.1 | 2.1 | G vitality | 2b |
| 75 | *Eucalyptus microcorys* | M | 11 | 10 | 44 | 52 | 5.3 | 2.5 | G vitality | 2a |
| 76 | *Casuarina glauca* | M | 10 | 4 | 26 | 32 | 3.1 | 2.1 | G vitality | 2b |
| 77 | *Casuarina glauca* | M | 9 | 3 | 17 | 20 | 2.0 | 1.7 | G vitality | 2b |
| 78 | *Lophostemon confertus* | M | 9 | 4 | 25 | 32 | 3.0 | 2.1 | F vitality, thin foliage density, DB & DW | 2a |

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|---|---|---|---|---|---|---|---|---|---|---|
| 79 | *Eucalyptus microcorys* | M | 9 | 6 | 32 | 38 | 3.8 | 2.2 | F - G vitality | 2a |
| 80 | *Casuarina glauca* | M | 10 | 4 | 25 | 33 | 3.0 | 2.1 | G vitality | 2b |
| 81 | *Eucalyptus botryoides* | M | 10 | 10 | 2 x 30 | 54 | 5.1 | 2.6 | G vitality, twin @ 0.8m | 2a |
| 82 | *Eucalyptus microcorys* | M | 12 | 10 | 43 | 52 | 5.2 | 2.5 | G vitality | 2a |
| 83 | *Acacia binervia* | M | 9 | 6 | 30 | 42 | 3.6 | 2.3 | G vitality, lean to Sth | 2b |
| 84 | *Corymbia citriodora* | M | 10 | 6 | 30 | 38 | 3.6 | 2.2 | G vitality | 2a |
| 85 | *Acacia binervia* | M | 5 | 5 | 12, 20 | 36 | 2.8 | 2.2 | A vitality, 2 x snap-outs, suppressed | 2b |
| 86 | *Acacia binervia* | M | 8 | 6 | 32 | 42 | 3.8 | 2.3 | P vitality, top dead, DB | 3b |
| 87 | *Corymbia citriodora* | M | 12 | 4 | 20 | 32 | 2.4 | 2.1 | G vitality | 2a |
| 88 | *Acacia binervia* | M | 8 | 4 | 22 | 24 | 2.6 | 1.8 | F vitality, lean to Est, suppressed | 2b |
| 89 | *Corymbia citriodora* | M | 12 | 8 | 42 | 50 | 5.0 | 2.5 | G vitality | 2a |
| 90 | *Acacia binervia* | M | 7 | 3 | 24 | 32 | 2.9 | 2.1 | P vitality, apical point gone, DW, basal injury | 3b |
| 91 | *Acacia binervia* | M | 9 | 7 | 27 | 35 | 3.2 | 2.1 | G vitality | 2b |
| 92 | *Corymbia citriodora* | M | 8 | 5 | 23 | 28 | 2.8 | 1.9 | G vitality, stem divide @ 2m | 2a |
| 93 | *Corymbia citriodora* | M | 12 | 12 | 44 | 52 | 5.3 | 2.5 | G vitality, self-corrected stem | 2a |
| 94 | *Casuarina glauca* | M | 8 | 3 | 22 | 26 | 2.6 | 1.9 | G vitality | 2b |
| 95 | *Eucalyptus microcorys* | M | 14 | 12 | 44 | 56 | 5.3 | 2.6 | G vitality, lower DW | 2a |
| 96 | *Eucalyptus microcorys* | M | 14 | 12 | 34 | 44 | 4.1 | 2.3 | G vitality | 2a |
| 97 | *Eucalyptus microcorys* | M | 14 | 10 | 36 | 42 | 4.3 | 2.3 | G vitality | 2a |
| 98 | *Casuarina glauca* | M | 12 | 10 | 34 | 42 | 4.1 | 2.3 | G vitality | 2b |
| 99 | *Casuarina glauca* | M | 10 | 5 | 32 | 42 | 3.8 | 2.3 | G vitality | 2b |
| 100 | *Eucalyptus tereticornis* | M | 12 | 14 | 60 | 67 | 7.2 | 2.8 | G vitality | 2a |
| 101 | *Eucalyptus tereticornis* | M | 14 | 10 | 56 | 72 | 6.7 | 2.9 | G vitality, dead branch stub @ 1.5 (hollow) | 2a |
| 102 | *Eucalyptus tereticornis* | M | 7 | 2 | 22 | 26 | 2.6 | 1.9 | P vitality, small canopy, suppressed, apical dead | 3a (4a) |
| 103 | *Casuarina glauca* | M | 10 | 5 | 2 x 10 | 28 | 2.0 | 1.9 | G vitality | 2b |
| 104 | *Casuarina glauca* | M | 10 | 6 | 28 | 36 | 3.4 | 2.2 | G vitality | 2b |
| 105 | *Casuarina glauca* | M | 9 | 2 | 25 | 27 | 3.0 | 1.9 | F vitality, small suppressed crown | 2b (4a) |

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|---|---|---|---|---|---|---|---|---|---|---|
| 106 | *Eucalyptus tereticornis* | M | 7 | 1 | 15 | 18 | 2.0 | 1.6 | P vitality, top dead | 3a (4a) |
| 107 | *Eucalyptus microcorys* | M | 16 | 10 | 54 | 72 | 6.5 | 2.9 | G vitality, mid canopy DW, canopy to Sth | 2a |
| 108 | *Acacia binervia* | M | 5 | 2 | 15 | 18 | 2.0 | 1.6 | A vitality, suppressed | 2b |
| 109 | *Acacia binervia* | M | 7 | 3 | 27 | 34 | 3.2 | 2.1 | A vitality, canopy pruning 1/2 gone | 2b |
| 110 | *Casuarina glauca* | M | 12 | 8 | 32 | 40 | 3.8 | 2.3 | G vitality | 2b |
| 111 | *Eucalyptus microcorys* | M | 18 | 14 | 62 | 80 | 7.4 | 3.0 | G vitality | 2a |
| 112 | *Eucalyptus microcorys* | M | 18 | 10 | 52 | 62 | 6.2 | 2.7 | F vitality, mid canopy DW, twin @ 4m | 2a |
| 113 | *Banksia serrata* | M | 5 | 3 | 16 | 22 | 2.0 | 1.8 | G vitality, lean to Sth | 2a |
| 114 | *Eucalyptus microcorys* | M | 16 | 10 | 51 | 64 | 6.1 | 2.7 | G vitality, lean to street | 2a |
| 115 | *Casuarina glauca* | M | 16 | 8 | 44 | 54 | 5.3 | 2.6 | G vitality, mid canopy DW | 2b |
| 116 | *Casuarina glauca* | M | 12 | 4 | 25 | 32 | 3.0 | 2.1 | G vitality, small suppressed canopy | 2b |
| 117 | *Casuarina glauca* | M | 12 | 3 | 22 | 30 | 2.6 | 2.0 | G vitality, small suppressed canopy | 2b |
| 118 | *Casuarina glauca* | M | 12 | 7 | 33 | 44 | 4.0 | 2.3 | G vitality | 2b |
| 119 | *Melaleuca quinquenervia* | M | 9 | 6 | 52 | 64 | 6.2 | 2.7 | G vitality, multi-stem @ 1.6m | 2a |
| 120 | *Banksia serrata* | M | 8 | 4 | 27 | 34 | 3.2 | 2.1 | G vitality | 2a |
| 121 | *Corymbia citriodora* | M | 6 | 7 | 18 | 22 | 2.2 | 1.8 | F vitality, poor form | 3a (4a) |
| 122 | *Banksia serrata* | M | 7 | 3 | 2 x 22 | 54 | 3.7 | 2.6 | P vitality, 3/4 dead | 3a (4a) |
| 123 | *Banksia serrata* | M | 7 | 3 | 23 | 27 | 2.8 | 1.9 | P vitality, 1/2 dead | 3a (4a) |
| 124 | *Banksia serrata* | M | 7 | 7 | 38 | 48 | 4.6 | 2.4 | G vitality | 2a |
| 125 | *Melaleuca quinquenervia* | M | 7 | 2 | 18 | 22 | 2.2 | 1.8 | P vitality, 1/4 dead, apical DB | 3b |
| 126 | *Casuarina glauca* | M | 9 | 3 | 26 | 34 | 3.1 | 2.1 | G vitality, suppressed T132 & T133, canopy skewed to West | 2b |
| 127 | *Casuarina glauca* | M | 9 | 2 | 26 | 32 | 3.1 | 2.1 | G vitality, suppressed T132 & T133, canopy skewed to West | 2b |
| 128 | *Casuarina glauca* | M | 7 | 2 | 20 | 30 | 2.4 | 2.0 | G vitality, suppressed T132 & T133, canopy skewed to West | 2b |
| 129 | *Eucalyptus sp* | M | 6 | 2 | 20 | 24 | 2.4 | 1.8 | F vitality, suppressed T132 & T133, canopy skewed to West | 2a |
| 130 | *Casuarina glauca* | M | 9 | 4 | 26 | 38 | 3.1 | 2.2 | G vitality, suppressed T132 & T133, canopy skewed to West | 2b |
| 131 | *Melaleuca quinquenervia* | M | 8 | 5 | 48 | 52 | 5.8 | 2.5 | G vitality | 2a |

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|---|---|---|---|---|---|---|---|---|---|---|
| 132 | *Eucalyptus tereticornis* | M | 12 | 5 | 33 | 38 | 4.0 | 2.2 | G vitality, small crown, suppressed T133 | 2a |
| 133 | *Eucalyptus tereticornis* | M | 14 | 10 | 52 | 62 | 6.2 | 2.7 | G vitality, 4 x branch snap-outs | 2a |
| 134 | *Melaleuca quinquenervia* | M | 8 | 5 | 27 | 34 | 3.2 | 2.1 | G vitality | 2a |
| 135 | *Eucalyptus tereticornis* | M | 10 | 6 | 28 | 36 | 3.4 | 2.2 | G vitality | 2a |
| 136 | *Eucalyptus tereticornis* | M | 12 | 12 | 49 | 55 | 5.9 | 2.6 | G vitality | 2a |
| 137 | *Eucalyptus tereticornis* | M | 12 | 8 | 48 | 60 | 5.8 | 2.7 | G vitality, 4 x branch snap-outs | 2a |
| 138 | *Eucalyptus microcorys* | M | 12 | 12 | 55 | 68 | 6.6 | 2.8 | G vitality, mid canopy DW | 2a |
| 139 | *Corymbia citriodora* | M | 7 | 5 | 18 | 20 | 2.2 | 1.7 | F vitality, canopy over road, DW | 2b (4a) |
| 140 | *Casuarina glauca* | M | 11 | 4 | 28 | 34 | 3.4 | 2.1 | G vitality | 2b |
| 141 | *Casuarina glauca* | M | 10 | 4 | 18 | 24 | 2.2 | 1.8 | G vitality | 2b |
| 142 | *Casuarina glauca* | M | 10 | 5 | 30 | 44 | 3.6 | 2.3 | G vitality | 2b |
| 143 | *Eucalyptus microcorys* | M | 10 | 7 | 40 | 48 | 4.8 | 2.4 | G vitality, canopy to Est | 2a |
| 144 | *Casuarina glauca* | M | 9 | 5 | 22 | 28 | 2.6 | 1.9 | G vitality | 2b |
| 145 | *Casuarina glauca* | M | 9 | 6 | 30 | 44 | 3.6 | 2.3 | F vitality, branch snap-out x 6 | 2b (4a) |
| 146 | *Casuarina glauca* | M | 9 | 7 | 33, 30 | 61 | 5.4 | 2.7 | G vitality | 2b |
| 147 | *Ficus microcarpa var. hillii* | M | 18 | 28 | 120 | 140 | 14.4 | 3.8 | G vitality | 2a |
| 148 | *Eucalyptus microcorys* | SM | 5 | 2 | 14 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 149 | *Corymbia citriodora* | SM | 5 | 2 | 10 | 12 | 2.0 | 1.5 | G vitality | 2a |
| 150 | *Eucalyptus microcorys* | SM | 5 | 2 | 14 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 151 | *Corymbia citriodora* | SM | 5 | 2 | 12 | 14 | 2.0 | 1.5 | G vitality | 2 |
| 152 | *Eucalyptus microcorys* | SM | 5 | 2 | 10 | 12 | 2.0 | 1.5 | G vitality | 2a |
| 153 | *Corymbia citriodora* | SM | 5 | 2 | 10 | 12 | 2.0 | 1.5 | G vitality | 2a |
| 154 | *Corymbia citriodora* | M | 18 | 14 | 48 | 54 | 5.8 | 2.6 | G vitality, slight lean to West | 2a |
| 155 | *Corymbia citriodora* | M | 18 | 12 | 56 | 64 | 6.7 | 2.7 | G vitality | 2a |
| 156 | *Corymbia citriodora* | M | 18 | 12 | 56 | 70 | 6.7 | 2.8 | G vitality, mid - upper canopy DW, old basal injury | 2a |
| 157 | *Corymbia citriodora* | M | 18 | 12 | 36 | 44 | 4.3 | 2.3 | G vitality | 2a |

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|---|---|---|---|---|---|---|---|---|---|---|
| 158 | *Eucalyptus botryoides* | M | 12 | 8 | 43 | 51 | 5.2 | 2.5 | F vitality, DW, DB, suspected lightning strike | 3a |
| 159 | *Corymbia gummifera* | M | 14 | 10 | 45 | 55 | 5.4 | 2.6 | G vitality | 2a |
| 160 | *Corymbia gummifera* | M | 16 | 12 | 50 | 62 | 6.0 | 2.7 | G vitality | 2a |
| 161 | *Eucalyptus microcorys* | SM | 6 | 2 | 12, 14 | 22 | 2.2 | 1.8 | G vitality | 2a |
| 162 | *Eucalyptus microcorys* | SM | 5 | 2 | 8, 12 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 163 | *Eucalyptus microcorys* | SM | 4 | 2 | 10 | 12 | 2.0 | 1.5 | G vitality | 2a |
| 164 | *Eucalyptus microcorys* | M | 4 | 2 | 12 | 14 | 2.0 | 1.5 | G vitality | 2a |
| 165 | *Angophora costata* | SM | 7 | 2 | 18 | 20 | 2.2 | 1.7 | G vitality | 2a |
| 166 | *Eucalyptus microcorys* | SM | 5 | 2 | 12 | 14 | 2.0 | 1.5 | G vitality | 2a |
| 167 | *Eucalyptus microcorys* | SM | 5 | 2 | 10 | 12 | 2.0 | 1.5 | G vitality | 2a |
| 168 | *Angophora costata* | SM | 6 | 2 | 14 | 16 | 2.0 | 1.5 | G vitality | 2a |
| 169 | *Angophora costata* | SM | 7 | 2 | 16 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 170 | *Eucalyptus microcorys* | M | 20 | 16 | 82 | 94 | 9.8 | 3.2 | G vitality, upper canopy DW | 2a |
| 171 | *Eucalyptus microcorys* | M | 20 | 12 | 60 | 70 | 7.2 | 2.8 | G vitality | 2a |
| 172 | *Corymbia citriodora* | M | 18 | 10 | 44 | 48 | 5.3 | 2.4 | G vitality | 2a |
| 173 | *Corymbia citriodora* | M | 16 | 8 | 36 | 41 | 4.3 | 2.3 | G vitality | 2a |
| 174 | *Melaleuca quinquenervia* | M | 6 | 10 | 2 x 20, 34 | 70 | 5.3 | 2.8 | P vitality, stems collapsing apart | 4a |
| 175 | *Casuarina glauca* | M | 8 | 6 | 30 | 36 | 3.6 | 2.2 | F vitality, lost apical point > 2ndary leader | 3b |
| 176 | *Casuarina glauca* | M | 8 | 3 | 15 | 18 | 2.0 | 1.6 | G vitality | 2b (4a) |
| 177 | *Melaleuca quinquenervia* | M | 6 | 4 | 36 | 40 | 4.3 | 2.3 | F vitality, poor form & branch prune | 2b (4a) |
| 178 | *Eucalyptus microcorys* | M | 8 | 2 | 16 | 18 | 2.0 | 1.6 | F vitality, suppressed | 2a |
| 179 | *Casuarina glauca* | M | 7 | 2 | 12 | 16 | 2.0 | 1.5 | G vitality | 2b |
| 180 | *Casuarina glauca* | M | 12 | 10 | 45 | 50 | 5.4 | 2.5 | G vitality | 2b |
| 181 | *Lophostemon confertus* | M | 8 | 3 | 18 | 24 | 2.2 | 1.8 | F vitality, suppressed | 2a |
| 182 | *Casuarina glauca* | M | 9 | 2 | 15 | 20 | 2.0 | 1.7 | F vitality, suppressed | 2b |
| 183 | *Lophostemon confertus* | M | 9 | 4 | 24 | 28 | 2.9 | 1.9 | F vitality, suppressed | 2a |
| 184 | *Eucalyptus botryoides* | M | 10 | 4 | 23 | 26 | 2.8 | 1.9 | G vitality | 2a |

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|---|---|---|---|---|---|---|---|---|---|---|
| 185 | *Lophostemon confertus* | M | 8 | 6 | 28 | 32 | 3.4 | 2.1 | G vitality | 2a |
| 186 | *Banksia integrifolia* | M | 7 | 4 | 3 x 20 | 42 | 4.2 | 2.3 | G vitality | 2a |
| 187 | *Eucalyptus botryoides* | M | 7 | 3 | 28 | 32 | 3.4 | 2.1 | F vitality, suppressed T191 | 2a |
| 188 | *Banksia integrifolia* | M | 5 | 2 | 15 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 189 | *Banksia integrifolia* | M | 8 | 3 | 20 | 26 | 2.4 | 1.9 | G vitality | 2a |
| 190 | *Eucalyptus botryoides* | M | 6 | 2 | 30 | 34 | 3.6 | 2.1 | F vitality, suppressed T191 | 2a |
| 191 | *Eucalyptus botryoides* | M | 16 | 16 | 70 | 90 | 8.4 | 3.2 | G vitality | 2a |
| 192 | *Corymbia citriodora* | M | 8 | 3 | 20 | 24 | 2.4 | 1.8 | G vitality | 2a |
| 193 | *Corymbia citriodora* | M | 5 | 2 | 2 x 10 | 20 | 2.0 | 1.7 | F vitality, all canopy ER | 2b (4a) |
| 194 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 195 | *Corymbia citriodora* | M | 9 | 4 | 30 | 36 | 3.6 | 2.2 | F vitality, small crown, 1st order long lateral | 2a |
| 196 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 197 | *Casuarina glauca* | M | 8 | 3 | 19 | 25 | 2.3 | 1.8 | G vitality | 2b |
| 198 | *Casuarina glauca* | M | 8 | 4 | 23 | 27 | 2.8 | 1.9 | G vitality | 2b |
| 199 | *Acacia binervia* | M | 6 | 4 | 14 | 18 | 2.0 | 1.6 | G vitality | 2b |
| 200 | *Casuarina glauca* | M | 12 | 8 | 30 | 38 | 3.6 | 2.2 | G vitality | 2b |
| 201 | *Melaleuca quinquenervia* | M | 8 | 1 | 20 | 24 | 2.4 | 1.8 | F vitality, pole-like | 2a |
| 202 | *Corymbia gummifera* | M | 12 | 8 | 27 | 34 | 3.2 | 2.1 | G vitality | 2a |
| 203 | *Melaleuca quinquenervia* | M | 7 | 2 | 20, 15 | 32 | 3.0 | 2.1 | F vitality | 2a |
| 204 | *Casuarina glauca* | M | 12 | 6 | 26 | 34 | 3.1 | 2.1 | G vitality | 2b |
| 205 | *Casuarina glauca* | M | 12 | 4 | 28 | 36 | 3.4 | 2.2 | G vitality | 2b |
| 206 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 207 | *Melaleuca quinquenervia* | M | 8 | 6 | 38 | 42 | 4.6 | 2.3 | G vitality, bifurcated @ 1m | 2a |
| 208 | *Eucalyptus botryoides* | M | 8 | 8 | 38 | 44 | 4.6 | 2.3 | G vitality, squat form | 2a |
| 209 | *Eucalyptus botryoides* | M | 8 | 8 | 38 | 42 | 4.6 | 2.3 | G vitality, squat form | 2a |
| 210 | *Banksia integrifolia* | M | 6 | 5 | 15 | 18 | 2.0 | 1.6 | G vitality | 2a |
| 211 | *Banksia integrifolia* | M | 4 | 1.5 | 12 | 14 | 2.0 | 1.5 | F vitality, multi-pruned @ 1.5m | 2a |
| 212 | *Banksia integrifolia* | M | 7 | 5 | 34 | 40 | 4.1 | 2.3 | P vitality, top 1/2 dead | 4a |
| 213 | *Eucalyptus microcorys* | M | 14 | 10 | 35 | 42 | 4.2 | 2.3 | P vitality, top 1/2 dead | 4a |

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|---|---|---|---|---|---|---|---|---|---|---|
| 214 | *Banksia integrifolia* | M | 5 | 2 | 12 | 14 | 2.0 | 1.5 | G vitality | 2a |
| 215 | *Casuarina glauca* | M | 9 | 5 | 25 | 32 | 3.0 | 2.1 | G vitality, lost apical > 2nd leader | 3b |
| 216 | *Casuarina glauca* | M | 7 | 4 | 20 | 24 | 2.4 | 1.8 | P vitality, lost apical > 2nd leader | 4a |
| 217 | *Eucalyptus microcorys* | M | 6 | 1 | 11 | 14 | 2.0 | 1.5 | P vitality, suppressed | 4a |
| 218 | *Eucalyptus microcorys* | M | 10 | 8 | 46 | 54 | 5.5 | 2.6 | G vitality | 2a |
| 219 | *Eucalyptus microcorys* | M | 12 | 10 | 48 | 56 | 5.8 | 2.6 | G vitality | 2a |
| 220 | *Casuarina glauca* | M | 7 | 2 | 18 | 22 | 2.2 | 1.8 | F vitality, suppressed T218 & T219 | 2b |
| 221 | *Casuarina glauca* | M | 10 | 3 | 18 | 28 | 2.2 | 1.9 | G vitality | 2b |
| 222 | *Eucalyptus microcorys* | M | 10 | 3 | 28 | 34 | 3.4 | 2.1 | P vitality, 3/4 dead | 4a |
| 223 | *Eucalyptus microcorys* | M | 5 | 2 | 10 | 12 | 2.0 | 1.5 | G vitality | 2a |
| 224 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 225 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 226 | *Eucalyptus microcorys* | M | 5 | 2 | 10 | 12 | 2.0 | 1.5 | F vitality | 2a |
| 227 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 228 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 229 | *Eucalyptus microcorys* | M | 7 | 7 | 24 | 28 | 2.9 | 1.9 | F vitality, 50% ER | 2a |
| 230 | *Acacia binervia* | M | 10 | 8 | 45 | 54 | 5.4 | 2.6 | P vitality, 1/2 dead | 4a |
| 231 | *Eucalyptus botryoides* | M | 12 | 10 | 42 | 48 | 5.0 | 2.4 | G vitality | 2a |
| 232 | *Melaleuca quinquenervia* | M | 7 | 2 | 18 | 22 | 2.2 | 1.8 | G vitality, pole-like | 2a |
| 233 | *Melaleuca quinquenervia* | M | 9 | 3 | 20 | 26 | 2.4 | 1.9 | G vitality, pole-like | 2a |
| 234 | *Melaleuca quinquenervia* | M | 6 | 1 | 12 | 14 | 2.0 | 1.5 | G vitality, pole-like | 2a |
| 235 | *Casuarina glauca* | M | 8 | 4 | 25 | 28 | 3.0 | 1.9 | G vitality | 2b |
| 236 | *Melaleuca quinquenervia* | M | 8 | 3 | 27 | 32 | 3.2 | 2.1 | G vitality, pole-like | 2a |
| 237 | *Melaleuca quinquenervia* | M | 8 | 4 | 2 x 24 | 42 | 4.1 | 2.3 | G vitality, bifurcated @ 1m | 2a |
| 238 | *Casuarina glauca* | M | 12 | 6 | 30 | 38 | 3.6 | 2.2 | G vitality | 2b |
| 239 | *Casuarina glauca* | M | 11 | 5 | 20 | 26 | 2.4 | 1.9 | G vitality | 2b |
| 240 | *Casuarina glauca* | M | 12 | 5 | 26 | 34 | 3.1 | 2.1 | G vitality | 2b |
| 241 | *Casuarina glauca* | M | 10 | 3 | 24 | 28 | 2.9 | 1.9 | F vitality, lost apical point @5m > 2ndary leader | 2b |
| 242 | *Eucalyptus botryoides* | M | 5 | 1 | 10 | 14 | 2.0 | 1.5 | F vitality, suppressed, pole-like | 2a (4a) |

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|---|---|---|---|---|---|---|---|---|---|---|
| 243 | *Eucalyptus botryoides* | M | 10 | 8 | 28 | 34 | 3.4 | 2.1 | F vitality, large amounts ER, DB & DW | 3a (4a) |
| 244 | *Eucalyptus botryoides* | M | 4 | 1 | 14 | 18 | 2.0 | 1.6 | F vitality, suppressed & stunted | 3a (4a) |
| 245 | *Eucalyptus microcorys* | M | 6 | 2 | 14 | 18 | 2.0 | 1.6 | F vitality, suppressed, lost apical point | 3a (4a) |
| 246 | *Eucalyptus botryoides* | M | 8 | 6 | 44 | 50 | 5.3 | 2.5 | P vitality, 1/2 dead | 3a (4a) |
| 247 | *Eucalyptus microcorys* | M | 14 | 14 | 54 | 64 | 6.5 | 2.7 | G vitality, DW | 2a |
| 248 | *Eucalyptus microcorys* | M | 5 | 2 | 18 | 22 | 2.2 | 1.8 | P vitality, topped @ 5m | 4a |
| 249 | *Eucalyptus microcorys* | M | 14 | 12 | 52 | 60 | 6.2 | 2.7 | G vitality, DW | 2a |
| 250 | *Eucalyptus microcorys* | M | 6 | 3 | 18 | 20 | 2.2 | 1.7 | G vitality, suppressed | 2a |
| 251 | *Eucalyptus microcorys* | M | 6 | 2 | 10 | 12 | 2.0 | 1.5 | F vitality, suppressed | 2a |
| 252 | *Corymbia citriodora* | M | 10 | 10 | 32 | 38 | 3.8 | 2.2 | F vitality | 2a |
| 253 | *Casuarina glauca* | M | 9 | 6 | 38 | 44 | 4.6 | 2.3 | G vitality | 2b |
| 254 | *Casuarina glauca* | M | 14 | 8 | 38 | 48 | 4.6 | 2.4 | G vitality | 2b |
| 255 | *Corymbia citriodora* | M | 9 | 6 | 30 | 38 | 3.6 | 2.2 | F vitality, suppressed T254 | 2a |
| 256 | *Acacia binervia* | M | 5 | 3 | 12 | 14 | 2.0 | 1.5 | G vitality | 2b |
| 257 | *Corymbia citriodora* | M | 12 | 4 | 24 | 28 | 2.9 | 1.9 | G vitality | 2a |
| 258 | *Acacia binervia* | M | 8 | 4 | 22 | 28 | 2.6 | 1.9 | G vitality, suppressed | 2b |
| 259 | *Corymbia citriodora* | M | 12 | 8 | 34 | 42 | 4.1 | 2.3 | G vitality | 2a |
| 260 | *Casuarina glauca* | M | 9 | 4 | 28 | 34 | 3.4 | 2.1 | G vitality | 2b |
| 261 | *Melaleuca quinquenervia* | M | 6 | 1 | 14 | 16 | 2.0 | 1.5 | G vitality, pole-like | 2a |
| 262 | *Melaleuca quinquenervia* | M | 6 | 1 | 15 | 18 | 2.0 | 1.6 | G vitality, bifurcated @ 1m | 2a |
| 263 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 264 | *Melaleuca quinquenervia* | M | 8 | 3 | 23 | 28 | 2.8 | 1.9 | G vitality | 2a |
| 265 | *Casuarina glauca* | M | 11 | 4 | 20 | 24 | 2.4 | 1.8 | G vitality | 2b |
| 266 | *Casuarina glauca* | M | 8 | 1 | 16 | 20 | 2.0 | 1.7 | G vitality | 2b |
| 267 | *Melaleuca quinquenervia* | M | 5 | 1 | 14 | 18 | 2.0 | 1.6 | G vitality, pole-like | 2a |
| 268 | *Casuarina glauca* | M | 12 | 6 | 2 x 34 | 70 | 5.8 | 2.8 | F vitality, bifurcation @ 1m, Nth stem topped @ 3m > 2nd leader, Sth stem lost apical @ 4m | 3b |
| 269 | *Casuarina glauca* | M | 10 | 3 | 23 | 70 | 2.8 | 2.8 | G vitality | 2b |

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|---|---|---|---|---|---|---|---|---|---|---|
| 270 | *Casuarina glauca* | M | 12 | 5 | 30 | 34 | 3.6 | 2.1 | G vitality | 2b |
| 271 | *Casuarina glauca* | M | 9 | 3 | 22 | 26 | 2.6 | 1.9 | G vitality | 2b |
| 272 | *Lophostemon confertus* | M | 7 | 3 | 14 | 16 | 2.0 | 1.5 | F vitality, suppressed | 2a |
| 273 | *Acacia binervia* | M | 12 | 5 | 38 | 44 | 4.6 | 2.3 | P vitality, 1/2 dead | 4a |
| 274 | *Casuarina glauca* | M | 14 | 8 | 40 | 52 | 4.8 | 2.5 | G vitality | 2b |
| 275 | *Casuarina glauca* | M | 14 | 6 | 35 | 42 | 4.2 | 2.3 | G vitality | 2b |
| 276 | *Lophostemon confertus* | M | 7 | 3 | 14 | 18 | 2.0 | 1.6 | G vitality, suppressed | 2a |
| 277 | *Casuarina glauca* | M | 8 | 3 | 21 | 26 | 2.5 | 1.9 | G vitality | 2b |
| 278 | *Lophostemon confertus* | M | 7 | 4 | 16 | 18 | 2.0 | 1.6 | F vitality, multiple stems @ 2m | 2a |
| 279 | *Lophostemon confertus* | M | 7 | 4 | 17 | 20 | 2.0 | 1.7 | G vitality | 2a |
| 280 | *Acacia binervia* | M | 10 | 8 | 40 | 52 | 4.8 | 2.5 | P vitality, 1/2 dead | 4a |
| 281 | *Lophostemon confertus* | M | 7 | 4 | 2 x 14 | 30 | 2.4 | 2.0 | F vitality, suppressed | 2a |
| 282 | *Acacia binervia* | M | 11 | 6 | 33 | 54 | 4.0 | 2.6 | P vitality, 1/2 dead | 4a |
| 283 | *Lophostemon confertus* | M | 8 | 3 | 16 | 20 | 2.0 | 1.7 | G vitality | 2a |
| 284 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 285 | *Lophostemon confertus* | M | 5 | 2 | 13 | 18 | 2.0 | 1.6 | G vitality | 2 |
| 286 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 287 | *Ficus microcarpa var. hillii* | M | 18 | 20 | 200 | 240 | 15.0 | 4.8 | G vitality | 2a |
| 288 | *Casuarina glauca* | M | 7 | 1 | 15 | 18 | 2.0 | 1.6 | P vitality, 1/2 dead | 4a |
| 289 | *Dead Tree* | D | - | - | - | - | - | - | Exempt tree | 4a |
| 290 | *Eucalyptus microcorys* | M | 12 | 10 | 40 | 48 | 4.8 | 2.4 | G vitality | 2a |
| 291 | *Eucalyptus microcorys* | M | 12 | 4 | 23 | 28 | 2.8 | 1.9 | G vitality | 2a |
| 292 | *Eucalyptus microcorys* | M | 14 | 8 | 48 | 54 | 5.8 | 2.6 | G vitality | 2a |
| 293 | *Eucalyptus microcorys* | M | 14 | 8 | 57 | 72 | 6.8 | 2.9 | G vitality | 2a |
| 294 | *Casuarina glauca* | M | 9 | 3 | 20 | 26 | 2.4 | 1.9 | G vitality, pole-like | 2b |
| 295 | *Casuarina glauca* | M | 10 | 4 | 19 | 25 | 2.3 | 1.8 | G vitality, pole-like | 2b |
| 296 | *Eucalyptus microcorys* | M | 14 | 6 | 30 | 38 | 3.6 | 2.2 | P vitality, large amount ER | 4a |
| 297 | *Eucalyptus microcorys* | M | 12 | 4 | 25 | 32 | 3.0 | 2.1 | F vitality | 2a |
| 298 | *Corymbia citriodora* | M | 12 | 8 | 28 | 34 | 3.4 | 2.1 | G vitality | 2a |
| 299 | *Elaeocarpus reticulatus* | M | 5 | 2 | 12 | 14 | 2.0 | 1.5 | G vitality | 2a |

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|---|---|---|---|---|---|---|---|---|---|---|
| 300 | *Corymbia citriodora* | M | 12 | 8 | 25 | 29 | 3.0 | 2.0 | G vitality | 2a |
| 301 | *Banksia integrifolia* | M | 7 | 5 | 18 | 22 | 2.2 | 1.8 | G vitality | 2a |
| 302 | *Corymbia citriodora* | M | 16 | 8 | 37 | 44 | 4.4 | 2.3 | G vitality | 2a |
| 303 | *Casuarina glauca* | M | 16 | 6 | 40 | 48 | 4.8 | 2.4 | G vitality | 2a |
| 304 | *Corymbia citriodora* | M | 14 | 12 | 44 | 54 | 5.3 | 2.6 | G vitality | 2a |
| 305 | *Corymbia citriodora* | M | 12 | 10 | 36 | 40 | 4.3 | 2.3 | G vitality, suppressed T304 | 2a |
| 306 | *Corymbia citriodora* | M | 8 | 6 | 25 | 32 | 3.0 | 2.1 | G vitality, suppressed T304 & T305 | 2a |
| 307 | *Corymbia citriodora* | M | 12 | 10 | 43 | 52 | 5.2 | 2.5 | G vitality | 2a |
| 308 | *Corymbia citriodora* | M | 12 | 12 | 35 | 43 | 4.2 | 2.3 | G vitality | 2a |
| 309 | *Corymbia citriodora* | M | 12 | 8 | 36 | 42 | 4.3 | 2.3 | G vitality | 2a |
| 310 | *Corymbia citriodora* | M | 12 | 10 | 40 | 46 | 4.8 | 2.4 | G vitality | 2a |
| 311 | *Corymbia citriodora* | M | 12 | 12 | 36 | 50 | 4.3 | 2.5 | G vitality | 2a |
| 312 | *Corymbia citriodora* | M | 12 | 12 | 46 | 62 | 5.5 | 2.7 | G vitality | 2a |
| 313 | *Corymbia citriodora* | M | 9 | 6 | 34 | 38 | 4.1 | 2.2 | G vitality | 2a |
| 314 | *Corymbia citriodora* | M | 16 | 16 | 52 | 60 | 6.2 | 2.7 | G vitality | 2a |
| 315 | *Corymbia gummifera* | M | 10 | 6 | 2 x 23 | 42 | 3.9 | 2.3 | F vitality, bifurcation @ 0.6m, thin foliage density | 3a |
| 316 | *Corymbia citriodora* | M | 12 | 10 | 38 | 44 | 4.6 | 2.3 | G vitality | 2a |
| 317 | *Corymbia citriodora* | M | 10 | 8 | 28, 30 | 60 | 4.9 | 2.7 | G vitality | 2a |
| 318 | *Corymbia citriodora* | M | 12 | 8 | 38 | 44 | 4.6 | 2.3 | F vitality, DB | 2a |
| 319 | *Corymbia citriodora* | M | 16 | 12 | 44 | 54 | 5.3 | 2.6 | G vitality | 2a |
| 320 | *Corymbia citriodora* | M | 16 | 10 | 45 | 50 | 5.4 | 2.5 | G vitality | 2a |
| 321 | *Corymbia citriodora* | M | 10 | 6 | 24 | 30 | 2.9 | 2.0 | G vitality | 2a |
| 322 | *Corymbia citriodora* | M | 10 | 6 | 28 | 34 | 3.4 | 2.1 | G vitality | 2a |
| 323 | *Corymbia citriodora* | M | 12 | 12 | 36 | 42 | 4.3 | 2.3 | G vitality | 2a |
| 324 | *Corymbia citriodora* | M | 12 | 6 | 27 | 30 | 3.2 | 2.0 | G vitality | 2a |
| 325 | *Corymbia citriodora* | M | 12 | 7 | 38 | 42 | 4.6 | 2.3 | G vitality, trunk injury @ 1-2m occluded | 2a |

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|---|---|---|---|---|---|---|---|---|---|---|
| 326 | *Corymbia citriodora* | M | 6 | 3 | 24 | 28 | 2.9 | 1.9 | F vitality, suppressed | 2a |
| 327 | *Corymbia citriodora* | M | 7 | 5 | 24 | 28 | 2.9 | 1.9 | F vitality | 2a |
| 328 | *Eucalyptus botryoides* | M | 18 | 20 | 100 | 110 | 12.0 | 3.4 | G vitality, active termites | 2a |
| 329 | *Corymbia citriodora* | M | 12 | 12 | 50 | 60 | 6.0 | 2.7 | G vitality | 2a |
| 330 | *Corymbia citriodora* | M | 10 | 10 | 40 | 48 | 4.8 | 2.4 | G vitality | 2a |
| 331 | *Eucalyptus botryoides* | M | 8 | 10 | 2 x 30 | 58 | 5.1 | 2.6 | F vitality, squat stunted form | 2a |
| 332 | *Eucalyptus botryoides* | M | 8 | 10 | 30 | 35 | 3.6 | 2.1 | F vitality, squat stunted form | 2a |
| 333 | *Corymbia gummifera* | M | 10 | 6 | 30, 24 | 50 | 4.6 | 2.5 | P vitality, 1/3 dead | 4a |
| 334 | *Corymbia gummifera* | M | 11 | 7 | 40 | 48 | 4.8 | 2.4 | F vitality | 2a |
| 335 | *Eucalyptus botryoides* | M | 12 | 4 | 38 | 42 | 4.6 | 2.3 | F vitality, 20% ER | 3a (4a) |
| 336 | *Eucalyptus botryoides* | M | 18 | 10 | 55 | 56 | 6.6 | 2.6 | G vitality, stem failed @ 8m (dead) | 4a |
| 337 | *Tristaniopsis laurina* | M | 6 | 4 | 18 | 24 | 2.2 | 1.8 | G vitality | 2a |
| 338 | *Melaleuca quinquenervia* | M | 8 | 3 | 18 | 22 | 2.2 | 1.8 | G vitality | 2a |
| 339 | *Eucalyptus botryoides* | M | 20 | 14 | 60 | 80 | 7.2 | 3.0 | G vitality | 2a |
| 340 | *Pittosporum undulatum* | M | 6 | 6 | 18 | 22 | 2.2 | 1.8 | G vitality | 2a |
| 341 | *Eucalyptus botryoides* | M | 10 | 8 | 34 | 38 | 4.1 | 2.2 | F vitality, 20% ER, bifurcation @ 3m, suppressed | 2b |
| 342 | *Eucalyptus microcorys* | M | 22 | 14 | 50 | 64 | 6.0 | 2.7 | F vitality, 20% ER, DW | 2a |
| 343 | *Eucalyptus microcorys* | M | 14 | 6 | 36 | 40 | 4.3 | 2.3 | F vitality, suppressed | 2a |
| 344 | *Brachychiton acerifolius* | M | 8 | 3 | 18 | 22 | 2.2 | 1.8 | G vitality | 2a |
| 345 | *Eucalyptus microcorys* | M | 22 | 14 | 54 | 64 | 6.5 | 2.7 | G vitality | 2a |
| 346 | *Brachychiton acerifolius* | M | 8 | 3 | 18 | 20 | 2.2 | 1.7 | G vitality | 2a |
| 347 | *Brachychiton acerifolius* | M | 10 | 4 | 24 | 26 | 2.9 | 1.9 | G vitality | 2a |
| 348 | *Araucaria heterophylla* | M | 16 | 8 | 60 | 72 | 7.2 | 2.9 | G vitality | 2a |
| 349 | *Casuarina glauca* | M | 10 | 4 | 27 | 34 | 3.2 | 2.1 | G vitality | 2b |
| 350 | *Casuarina glauca* | M | 7 | 2 | 12 | 16 | 2.0 | 1.5 | G vitality | 2b |
| 351 | *Casuarina glauca* | M | 9 | 2 | 22 | 26 | 2.6 | 1.9 | G vitality | 2b |
| 352 | *Casuarina glauca* | M | 5 | 1 | 12 | 14 | 2.0 | 1.5 | G vitality, pole-like | 2b |

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|---|---|---|---|---|---|---|---|---|---|---|
| 353 | *Casuarina glauca* | M | 7 | 1 | 13 | 15 | 2.0 | 1.5 | G vitality, pole-like | 2b |
| 354 | *Casuarina glauca* | M | 7 | 1 | 13 | 15 | 2.0 | 1.5 | G vitality, pole-like | 2b |
| 355 | *Casuarina glauca* | M | 9 | 1 | 17 | 22 | 2.0 | 1.8 | G vitality, pole-like | 2b |
| 356 | *Casuarina glauca* | M | 11 | 3 | 32 | 54 | 3.8 | 2.6 | G vitality | 2b |
| 357 | *Casuarina glauca* | M | 10 | 2 | 22 | 34 | 2.6 | 2.1 | G vitality | 2b |
| 358 | *Casuarina glauca* | M | 9 | 2 | 17 | 22 | 2.0 | 1.8 | G vitality | 2b |
| 359 | *Casuarina glauca* | M | 10 | 3 | 26 | 37 | 3.1 | 2.2 | G vitality | 2b |
| 360 | *Corymbia citriodora* | M | 12 | 7 | 28 | 34 | 3.4 | 2.1 | G vitality | 2a |
| 361 | *Corymbia citriodora* | M | 10 | 8 | 32 | 42 | 3.8 | 2.3 | G vitality | 2a |
| 362 | *Eucalyptus microcorys* | M | 24 | 14 | 52 | 68 | 6.2 | 2.8 | F - P vitality, 70% canopy ER, crown-lifted to 8m | 4a |
| 363 | *Casuarina glauca* | M | 10 | 3 | 21 | 27 | 2.5 | 1.9 | G vitality | 2b (4a) |
| 364 | *Eucalyptus robusta* | M | 18 | 6 | 38 | 44 | 4.6 | 2.3 | P vitality, 1/2 dead, root damaged by excavators | 4a |
| 365 | *Casuarina glauca* | M | 9 | 2 | 18 | 22 | 2.2 | 1.8 | F vitality | 2b |
| 366 | *Eucalyptus botryoides* | M | 7 | 3 | 16 | 24 | 2.0 | 1.8 | P vitality, 90% canopy ER | 3a |
| 367 | *Araucaria heterophylla* | M | 12 | 8 | 38 | 44 | 4.6 | 2.3 | G vitality | 2a |
| 368 | *Eucalyptus microcorys* | M | 20 | 10 | 50 | 63 | 6.0 | 2.7 | F vitality, 50% ER | 2a |
| 369 | *Casuarina glauca* | M | 8 | 1 | 14 | 18 | 2.0 | 1.6 | F vitality, pole-like | |
| 370 | *Eucalyptus microcorys* | M | 7 | 2 | 21 | 25 | 2.5 | 1.8 | P vitality, top dead, ER | 4a |
| 371 | *Eucalyptus microcorys* | M | 20 | 10 | 44 | 58 | 5.3 | 2.6 | G vitality, 10% DW | 2a |
| 372 | *Podocarpus elatus* | M | 5 | 2 | 10 | 12 | 2.0 | 1.5 | G vitality | 2a |
| 373 | *Eucalyptus microcorys* | M | 9 | 6 | 32 | 44 | 3.8 | 2.3 | F vitality, poor form, lost apical @ 4m > 2nd leader, suppressed T372 | 3a |
| 374 | *Casuarina glauca* | M | 10 | 4 | 21 | 30 | 2.5 | 2.0 | G vitality, suppressed T375 | 2b |
| 375 | *Podocarpus falcatus* | M | 12 | 8 | 40 | 48 | 4.8 | 2.4 | G vitality | 2a |
| 376 | *Casuarina glauca* | M | 14 | 10 | 52 | 61 | 6.2 | 2.7 | G vitality | 2b |
| 377 | *Casuarina glauca* | M | 14 | 8 | 27 | 32 | 3.2 | 2.1 | G vitality | 2b |

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|---|---|---|---|---|---|---|---|---|---|---|
| 378 | *Casuarina glauca* | M | 10 | 8 | 26 | 32 | 3.1 | 2.1 | G vitality, lost apical @ 7m > multiple leaders | 3b |
| 379 | *Casuarina glauca* | M | 12 | 6 | 23 | 27 | 2.8 | 1.9 | G vitality | 2b |
| 380 | *Podocarpus falcatus* | M | 8 | 4 | 23 | 28 | 2.8 | 1.9 | G vitality, crown-lifted to 5m on West side | 2a |
| 381 | *Podocarpus falcatus* | M | 10 | 8 | 30 | 43 | 3.6 | 2.3 | G vitality, crown-lifted to 5m on West side, bifurcated @ 2.5m | 2a |
| 382 | *Corymbia citriodora* | M | 8 | 6 | 23 | 28 | 2.8 | 1.9 | P vitality, 25% DW & DB, thin foliage density | 4a |
| 383 | *Corymbia citriodora* | M | 14 | 10 | 23, 30 | 62 | 4.5 | 2.7 | G vitality | 2a |
| 384 | *Corymbia citriodora* | M | 16 | 10 | 40 | 52 | 4.8 | 2.5 | G vitality | 2a |
| 385 | *Eucalyptus botryoides* | M | 8 | 5 | 24 | 33 | 2.9 | 2.1 | F vitality, suppressed T384 | 2a (4a) |
| 386 | *Casuarina glauca* | M | 11 | 4 | 18 | 24 | 2.2 | 1.8 | G vitality | 2b |
| 387 | *Eucalyptus botryoides* | M | 10 | 8 | 44, 22 | 63 | 5.9 | 2.7 | P vitality, 1/2 dead | 4a |
| 388 | *Casuarina glauca* | M | 10 | 5 | 26 | 32 | 3.1 | 2.1 | G vitality | 2b |
| 389 | *Casuarina glauca* | M | 11 | 6 | 24 | 32 | 2.9 | 2.1 | G vitality | 2b |
| 390 | *Casuarina cunninghamiana* | M | 12 | 8 | 33 | 43 | 4.0 | 2.3 | G vitality | 2b |
| 391 | *Casuarina glauca* | M | 12 | 8 | 46 | 54 | 5.5 | 2.6 | G vitality | 2b |
| 392 | *Casuarina glauca* | M | 8 | 5 | 24 | 28 | 2.9 | 1.9 | G vitality, self-corrected stem | 2b |
| 393 | *Casuarina glauca* | M | 10 | 4 | 21 | 24 | 2.5 | 1.8 | G vitality | 2b |
| 394 | *Casuarina glauca* | M | 10 | 4 | 24 | 30 | 2.9 | 2.0 | G vitality | 2b |
| 395 | *Casuarina glauca* | M | 14 | 8 | 38 | 56 | 4.6 | 2.6 | G vitality | 2b |
| 396 | *Casuarina glauca* | M | 12 | 6 | 30 | 38 | 3.6 | 2.2 | G vitality | 2b |
| 397 | *Casuarina glauca* | M | 10 | 4 | 30 | 36 | 3.6 | 2.2 | G vitality | 2b |
| 398 | *Casuarina glauca* | M | 9 | 3 | 18 | 24 | 2.2 | 1.8 | G vitality | 2b |
| 399 | *Casuarina glauca* | M | 12 | 4 | 27 | 32 | 3.2 | 2.1 | G vitality | 2b |
| 400 | *Casuarina glauca* | M | 10 | 4 | 35 | 42 | 4.2 | 2.3 | G vitality | 2b |
| 401 | *Casuarina glauca* | M | 12 | 5 | 30 | 42 | 3.6 | 2.3 | G vitality | 2b |
| 402 | *Casuarina glauca* | M | 12 | 4 | 34 | 38 | 4.1 | 2.2 | G vitality | 2b |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 403 | *Eucalyptus botryoides* | M | 9 | 5 | 30 | 36 | 3.6 | 2.2 | G vitality | 2a |
| 404 | *Eucalyptus botryoides* | M | 10 | 10 | 38 | 50 | 4.6 | 2.5 | G vitality, self-corrected stem | 2a |
| 405 | *Eucalyptus microcorys* | M | 14 | 10 | 38 | 44 | 4.6 | 2.3 | P vitality, 1/2 dead | 4a |
| 406 | *Melaleuca quinquenervia* | M | 6 | 7 | 40 | 45 | 4.8 | 2.4 | G vitality, OHPL, ST | 2a |
| 407 | *Melaleuca quinquenervia* | M | 6 | 6 | 42 | 45 | 5.0 | 2.4 | G vitality, OHPL, ST | 2a |
| 408 | *Melaleuca quinquenervia* | M | 7 | 7 | 90 | 100 | 10.8 | 3.3 | G vitality, OHPL, ST, multi-stemmed @ 1m | 2a |
| 409 | *Melaleuca quinquenervia* | M | 7 | 6 | 34 | 38 | 4.1 | 2.2 | G vitality, OHPL, ST | 2a |
| 410 | *Melaleuca quinquenervia* | M | 7 | 7 | 32 | 38 | 3.8 | 2.2 | G vitality, OHPL, ST | 2a |
| 411 | *Banksia serrata* | SM | 2 | 1 | 6, 4 | 8 | 2.0 | 1.5 | G vitality, ST | 5a |
| 412 | *Melaleuca quinquenervia* | M | 4 | 2 | 23 | 25 | 2.8 | 1.8 | G vitality, lean to West, ST | 2a |
| 413 | *Melaleuca quinquenervia* | M | 5 | 5 | 22 | 27 | 2.6 | 1.9 | G vitality, OHPL, ST | 2a |
| 414 | *Banksia serrata* | SM | 3 | 1 | 8 | 10 | 2.0 | 1.5 | G vitality. ST | 2a |
| 415 | *Melaleuca quinquenervia* | M | 5 | 5 | 22 | 26 | 2.6 | 1.9 | G vitality, OHPL, ST | 2a |
| 416 | *Melaleuca quinquenervia* | M | 4 | 6 | 32 | 40 | 3.8 | 2.3 | G vitality, OHPL, ST | 2a |
| 417 | *Melaleuca quinquenervia* | M | 5 | 6 | 25 | 34 | 3.0 | 2.1 | G vitality, OHPL, ST | 2a |
| 418 | *Melaleuca quinquenervia* | M | 5 | 5 | 26 | 35 | 3.1 | 2.1 | G vitality, OHPL, ST | 2a |
| 419 | *Melaleuca quinquenervia* | M | 5 | 3 | 24 | 29 | 2.9 | 2.0 | G vitality, OHPL, ST | 2a |
| 420 | *Leptospermum petersonii* | SM | 1 | 1 | 4 | 6 | 2.0 | 1.5 | F vitality, ST | 5a |
| 421 | *Leptospermum petersonii* | SM | 1.5 | 1 | 6 | 6 | 2.0 | 1.5 | F vitality, ST | 5a |
| 422 | *Leptospermum petersonii* | SM | 2 | 1.5 | 8 | 10 | 2.0 | 1.5 | F vitality, ST | 5a |
| 423 | *Leptospermum petersonii* | SM | 1 | 0.5 | 3 | 4 | 2.0 | 1.5 | P vitality, 1/2 dead, ST | 3a |
| 424 | *Melaleuca quinquenervia* | M | 4 | 4 | 3 x 15 | 33 | 3.1 | 2.1 | G vitality, OHPL, ST | 2a |
| 425 | *Leptospermum petersonii* | SM | 2 | 1 | 6 | 8 | 2.0 | 1.5 | P vitality, 1/2 dead. ST | 3a |
| 426 | *Leptospermum petersonii* | SM | 2.5 | 1 | 8 | 10 | 2.0 | 1.5 | G vitality. ST | 5a |
| 427 | *Melaleuca quinquenervia* | M | 5 | 5 | 24 | 28 | 2.9 | 1.9 | G vitality, OHPL, ST | 2a |
| 428 | *Melaleuca quinquenervia* | M | 4.5 | 3 | 2 x 13 | 30 | 2.2 | 2.0 | G vitality, ST | 2a |
| 429 | *Melaleuca quinquenervia* | M | 5 | 6 | 2 x 24 | 38 | 4.1 | 2.2 | G vitality, OHPL, ST | 2a |
| 430 | *Melaleuca quinquenervia* | M | 4.5 | 3 | 16 | 19 | 2.0 | 1.6 | G vitality, ST | 2a |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 431 | *Melaleuca quinquenervia* | M | 4 | 2 | 16 | 18 | 2.0 | 1.6 | G vitality, ST | 2a |
| 432 | *Nerium oleander* | M | 3 | 3 | 8 x 3 | 20 | 2.0 | 1.7 | G vitality, ST | 2b |
| 433 | *Melaleuca quinquenervia* | M | 5 | 5 | 30 | 40 | 3.6 | 2.3 | G vitality, ST | 2a |
| 434 | *Melaleuca quinquenervia* | M | 2.5 | 1 | 8 | 12 | 2.0 | 1.5 | F vitality, ST | 2a |
| 435 | *Melaleuca quinquenervia* | M | 5 | 6 | 25, 35 | 60 | 5.2 | 2.7 | G vitality, OHPL, ST | 2a |
| 436 | *Melaleuca quinquenervia* | M | 5 | 5 | 25 | 37 | 3.0 | 2.2 | G vitality, OHPL, ST | 2a |
| 437 | *Melaleuca quinquenervia* | M | 6 | 6 | 30, 25 | 42 | 4.7 | 2.3 | G vitality, OHPL, ST | 2a |
| 438 | *Platanus x acerifolia* | M | 4 | 1 | 5 | 8 | 2.0 | 1.5 | G vitality, ST | 2a |
| 439 | *Melaleuca quinquenervia* | M | 5 | 6 | 33 | 42 | 4.0 | 2.3 | G vitality, OHPL, ST | 2a |
| 440 | *Melaleuca quinquenervia* | M | 4 | 3 | 2 x 17 | 30 | 2.9 | 2.0 | G vitality, OHPL, ST | 2a |
| 441 | *Melaleuca quinquenervia* | M | 4 | 3 | 21 | 26 | 2.5 | 1.9 | F vitality, OHPL, ST, recent branch failure | 2a |
| 442 | *Melaleuca quinquenervia* | M | 4 | 3 | 30 | 34 | 3.6 | 2.1 | G vitality, OHPL, ST | 2a |
| 443 | *Melaleuca quinquenervia* | M | 4 | 3 | 28 | 39 | 3.4 | 2.2 | G vitality, OHPL, ST | 2a |
| 444 | *Melaleuca quinquenervia* | M | 4 | 3 | 25 | 32 | 3.0 | 2.1 | G vitality, OHPL, ST, all canopy to street | 2a |
| 445 | *Melaleuca quinquenervia* | M | 4 | 3 | 23 | 28 | 2.8 | 1.9 | G vitality, OHPL, ST, all canopy to street | 2a |
| 446 | *Melaleuca quinquenervia* | M | 4 | 2 | 2 x 15 | 32 | 2.5 | 2.1 | G vitality, OHPL, ST, all canopy to street | 2a |
| 447 | *Melaleuca quinquenervia* | M | 4 | 2 | 24, 14 | 28 | 3.3 | 1.9 | G vitality, OHPL, ST | 2a |
| 448 | *Lophostemon confertus* | M | 4 | 4 | 2 x 13 | 18 | 2.2 | 1.6 | G vitality, OHPL, ST | 2a |
| 449 | *Lophostemon confertus* | M | 4 | 4 | 19 | 24 | 2.3 | 1.8 | G vitality, OHPL, ST | 2a |
| 450 | *Podocarpus elatus* | M | 12 | 12 | 80 | 92 | 9.6 | 3.2 | G vitality, OHPL, ST | 2a |
| 451 | *Podocarpus elatus* | M | 14 | 16 | 86 | 98 | 10.3 | 3.3 | G vitality, OHPL, ST | 2a |
| 452 | *Cupaniopsis anacardioides* | SM | 2 | 1 | 3 | 4 | 2.0 | 1.5 | G vitality, OHPL, ST | 5a |
| 453 | *Cupaniopsis anacardioides* | SM | 1.5 | 0.5 | 2 | 3 | 2.0 | 1.5 | G vitality, OHPL, ST | 5a |
| 454 | *Cupaniopsis anacardioides* | SM | 1.2 | 1 | 3 | 4 | 2.0 | 1.5 | F vitality, OHPL, ST, top snapped off | 5a |
| 455 | *Cupaniopsis anacardioides* | SM | 2 | 1 | 5 | 6 | 2.0 | 1.5 | G vitality, OHPL, ST | 5a |
| 456 | *Cupaniopsis anacardioides* | SM | 2.2 | 1 | 4 | 5 | 2.0 | 1.5 | G vitality, OHPL, ST | 5a |
| 457 | *Podocarpus elatus* | M | 7 | 8 | 38 | 45 | 4.6 | 2.4 | F - G vitality, OHPL, ST | 2a |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 458 | *Cupaniopsis anacardioides* | SM | 2.5 | 1.5 | 6 | 8 | 2.0 | 1.5 | G vitality, ST | 5a |
| 459 | *Cupaniopsis anacardioides* | SM | 2.5 | 2 | 9 | 12 | 2.0 | 1.5 | G vitality, ST | 5a |

**Terms used in Tree Survey & Report:**
**Age Class**
**(Y) – Young** refers to a well-established but juvenile tree. Less than 1/3 life expectancy
**(SM) – Semi-mature** refers to a tree at growth stages between immaturity and full size. A tree has reached First Adult Form i.e. displays adult characteristics. 1/3 to 2/3 life expectancy
**(M)- Mature** refers to a full-size tree with some capacity for future growth. Older than 2/3 life expectancy
**(OM) – Over-mature** refers to a tree approaching decline or already declining. Older than 2/3 life expectancy and showing signs of irreversible decline.

**Health** refers to a tree's vigour, growth rate, disease and/or insects.
**Vitality** summarises observations about the health and structure of the tree on a scale of: **(G) Good, (F) Fair, (P) Poor & (D) Dead.**
**Good:** Tree is generally healthy and free from obvious signs of structural weaknesses or significant effects of pests and diseases or infection;
**Fair:** Tree is generally vigorous although has some indication of being adversely affected by the early effects of disease or infection or environmental or mechanical damage. Appropriate tree maintenance can usually improve overall health and halt decline;
**Poor:** Tree in decline and is not likely to improve with reasonable maintenance practices or has a structural fault such as bark inclusion;
**Dead:** Tree no longer capable of sustained growth.
**Deadwood (DW)** – deadwood found in canopy as a percentage.
**Over Head Power Lines (OHPL)** – upper canopy pruned to accommodate power lines at a given height.

**Height** expressed in metres refers to estimated overall height of tree.

**Next Door tree (ND)** – tree located in the neighbour's property.

**Street Tree (ST)** – tree located in Councils footpath reserve.

**Spread** expressed in metres refers to estimated spread of crown at the drip line.

**(DBH) Diameter at Breast Height** expressed in millimetres refers to the trunk diameter at 1.4 metres above ground level. Where there are multiple trunks the combined diameter has been calculated in terms of Appendix A – AS 4970 – 2009, shown in brackets.

**(DRB) Diameter above Root Buttress** expressed in millimetres refers to the trunk diameter above root buttress.

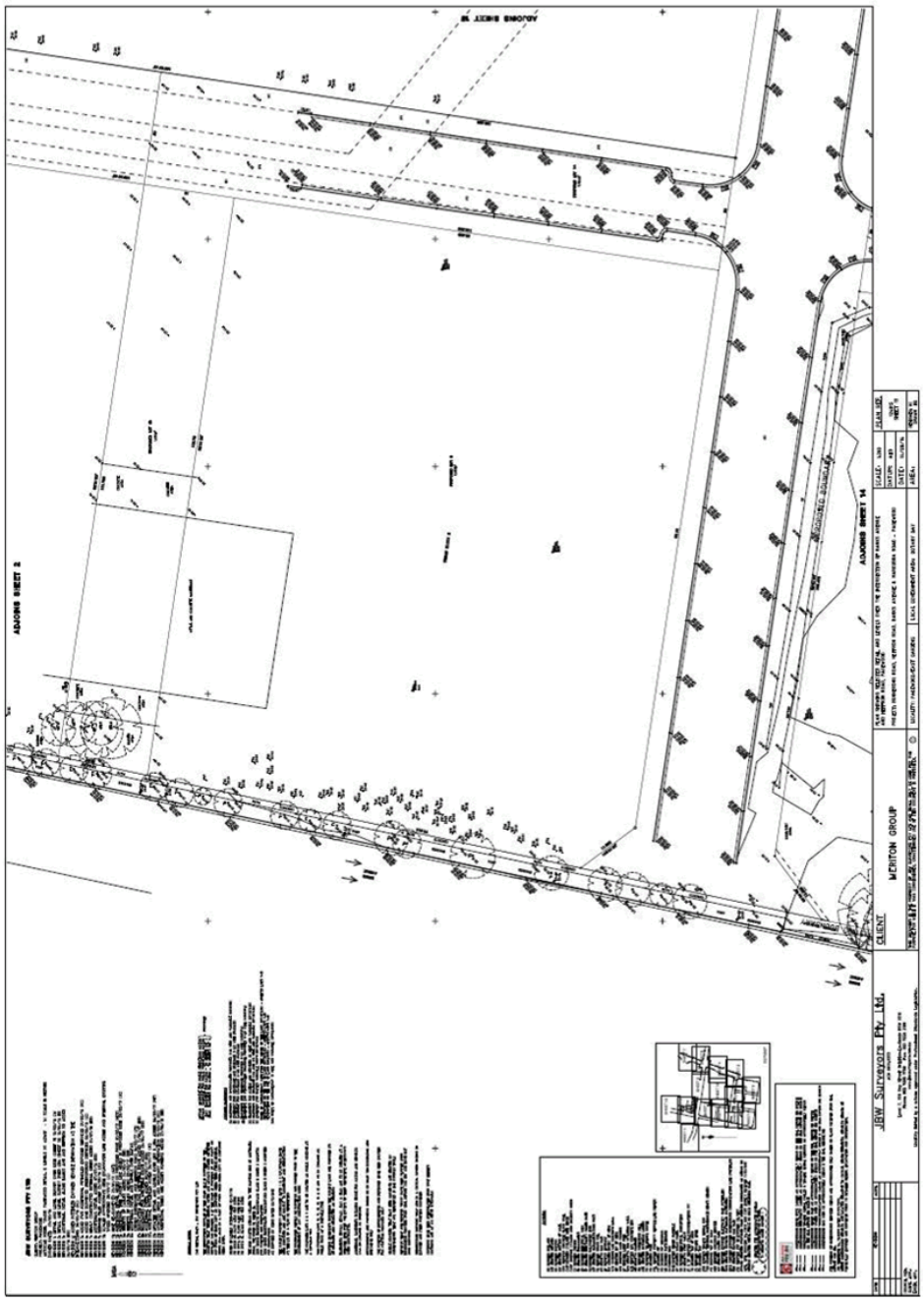
**(TPZ) Tree Protection Zone & Structural Root Zone (SRZ)** as defined by AS 4970 – 2009 Section 3

**(ULE)** The various ULE categories indicate the useful life anticipated for an individual tree or trees assessed as a group. Factors such as the location, age, condition and vitality of the tree are significant to the determination of this rating. Other influences such as the tree's effect on better specimens and the economics of managing the tree successfully in its location are also relevant to ULE (Barrell 1993, 1995, 2001).

**ULE RATING (UPDATED 1/4/01) BARRELL**

| **1.Long ULE:** Trees that appear to be retainable at the time of assessment for more than 40 years with an acceptable level of risk. | **2.Medium ULE:** Trees that appear to be retainable at the time of assessment for more than 15-40 years with an acceptable level of risk. | **3.Short ULE:** Trees that appear to be retainable at the time of assessment for more than 5-15 years with an acceptable level of risk. | **4.Remove:** Trees that should be removed within the next 5 years. | **5.Small, young or regularly pruned:** Trees that can be reliably moved or replaced. |
|---|---|---|---|---|
| (A) Structurally sound trees located in positions that can accommodate future growth | **(A)** Trees that may only live between 15 and 40 more years. | **(A)** Trees that may only live between 5 and 15 more years. | **(A)** Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. | **(A)** Small trees less than 5 Metres in height. |
| **(B)** Trees that could be made suitable for retention in the long term by remedial tree care. | **(B)** Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. | **(B)** Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. | **(B)** Dangerous trees because of instability or recent loss of adjacent trees. | **(B)** Young trees less than 15 years old but over 5 metres in height. |
| **(C)** Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention. | **(C)** Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. | **(C)** Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. | **(C)** Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. | **(C)** Formal hedges and trees intended for regular pruning to artificially control growth. |
| | **(D)** Trees that could be made suitable for retention in the medium term by remedial tree care. | **(D)** Trees that require substantial remedial tree care and are only suitable for retention in the short term. | **(D)** Damaged trees that are clearly not safe to retain. | |
| | | | **(E)** Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. | |
| | | | **(F)** Trees that are damaging or may cause damage to existing structures within 5 years. | |
| | | | **(G)** Trees that will become dangerous after removal of other trees for the reasons given in (A) to (F). | |
| | | | **(H)** Trees in categories (A) to (G) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review. | |

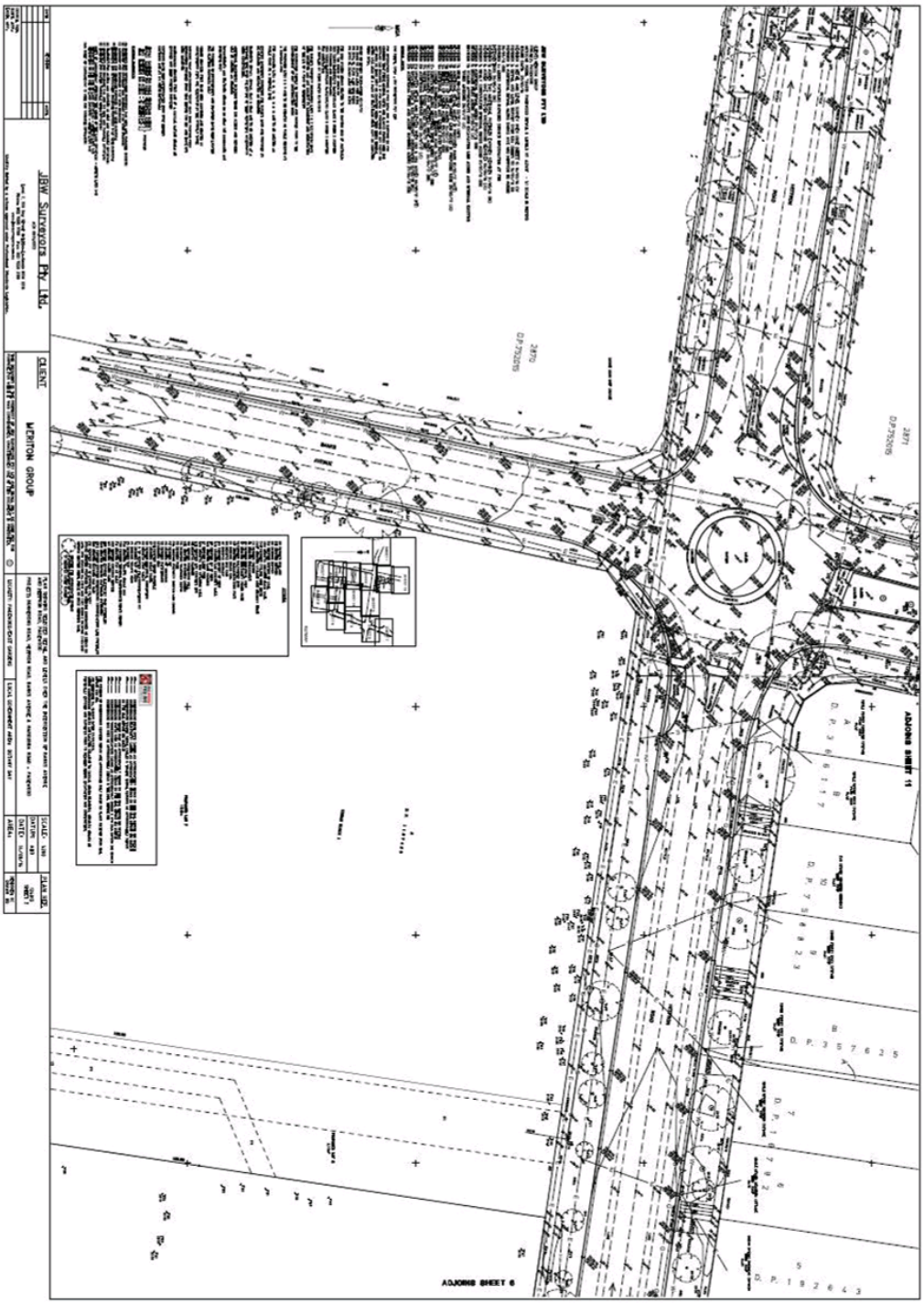
**Annexure B: Tree location plans**
**Sheet 13**



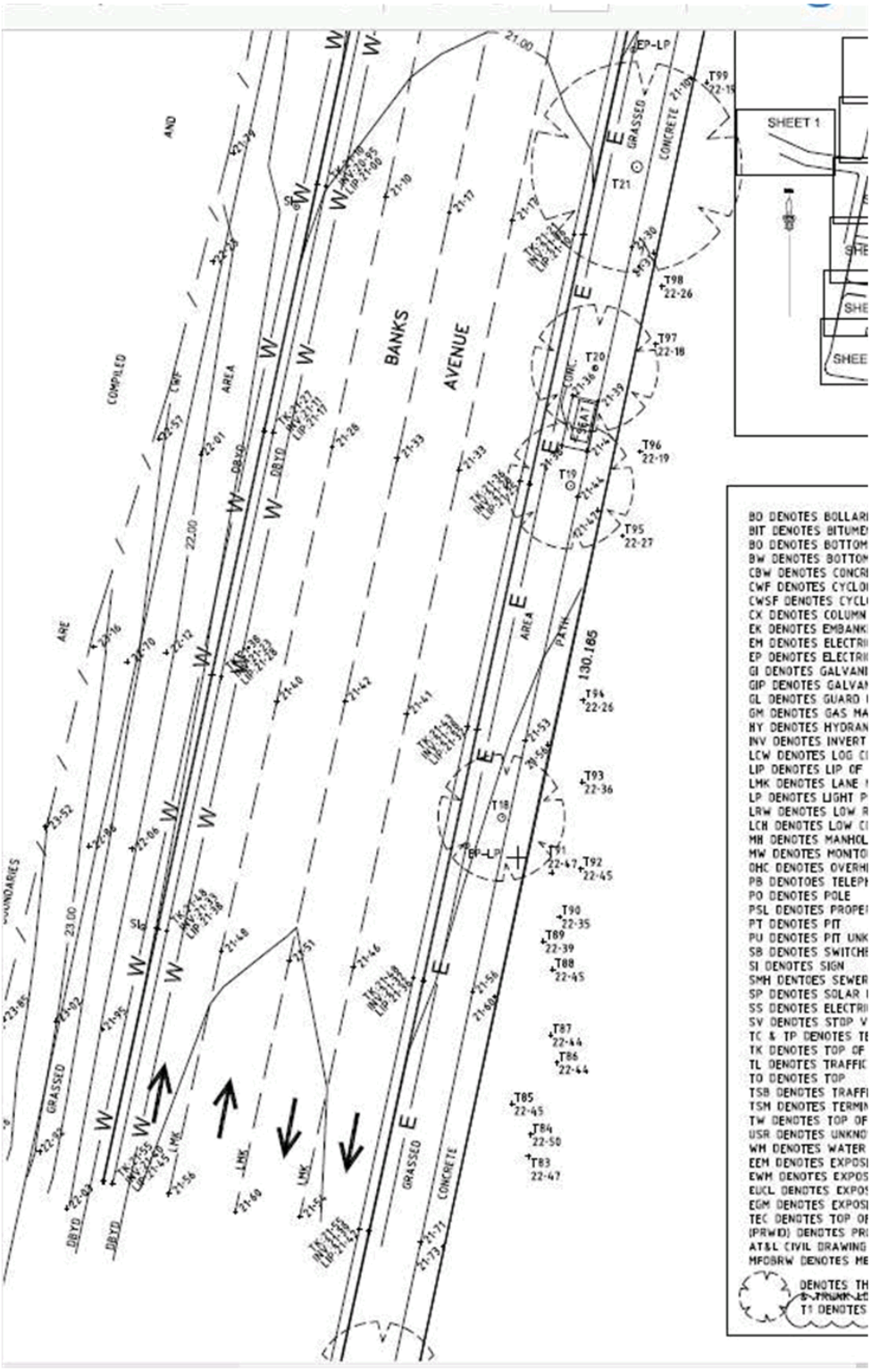


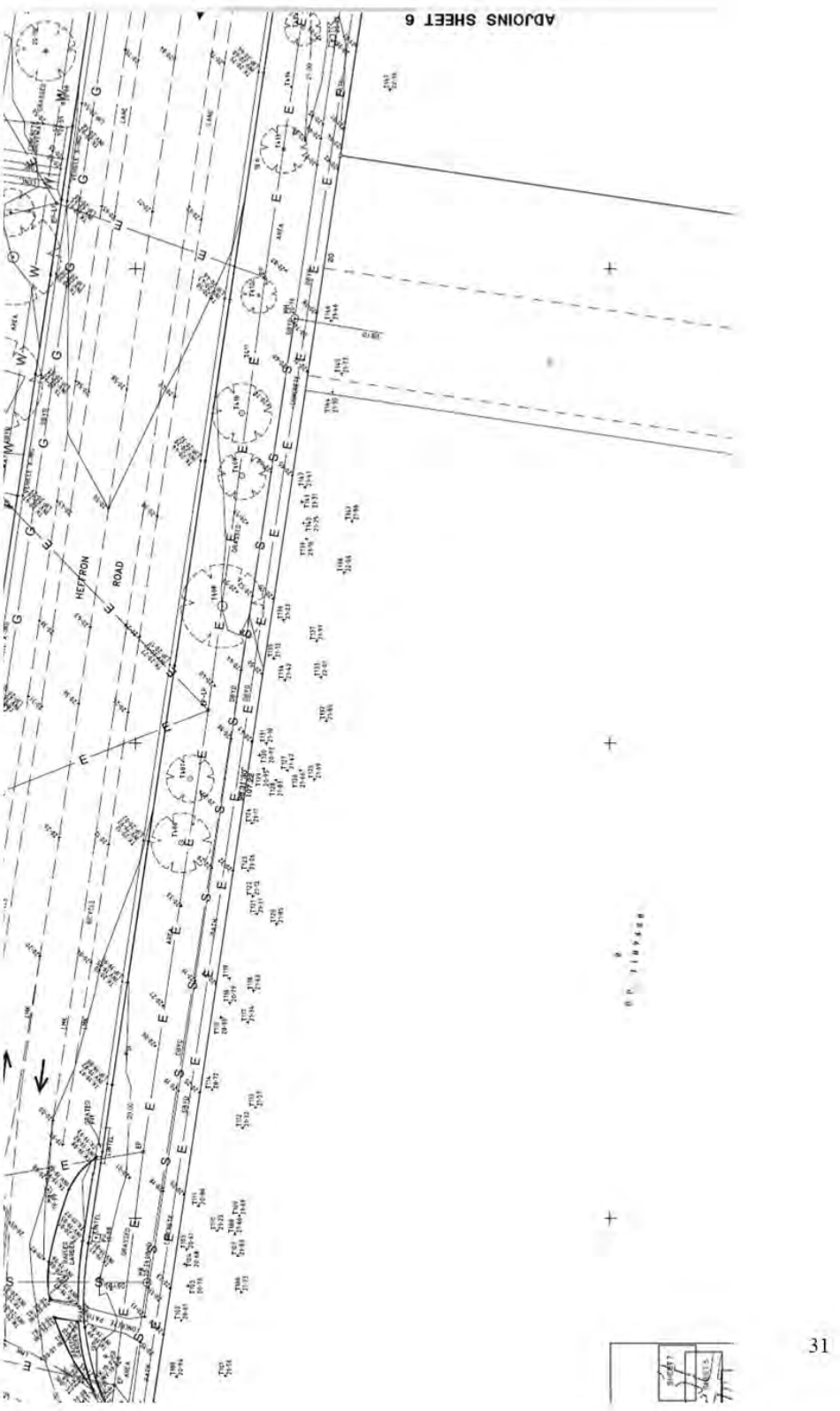

28

**Sheet 2**

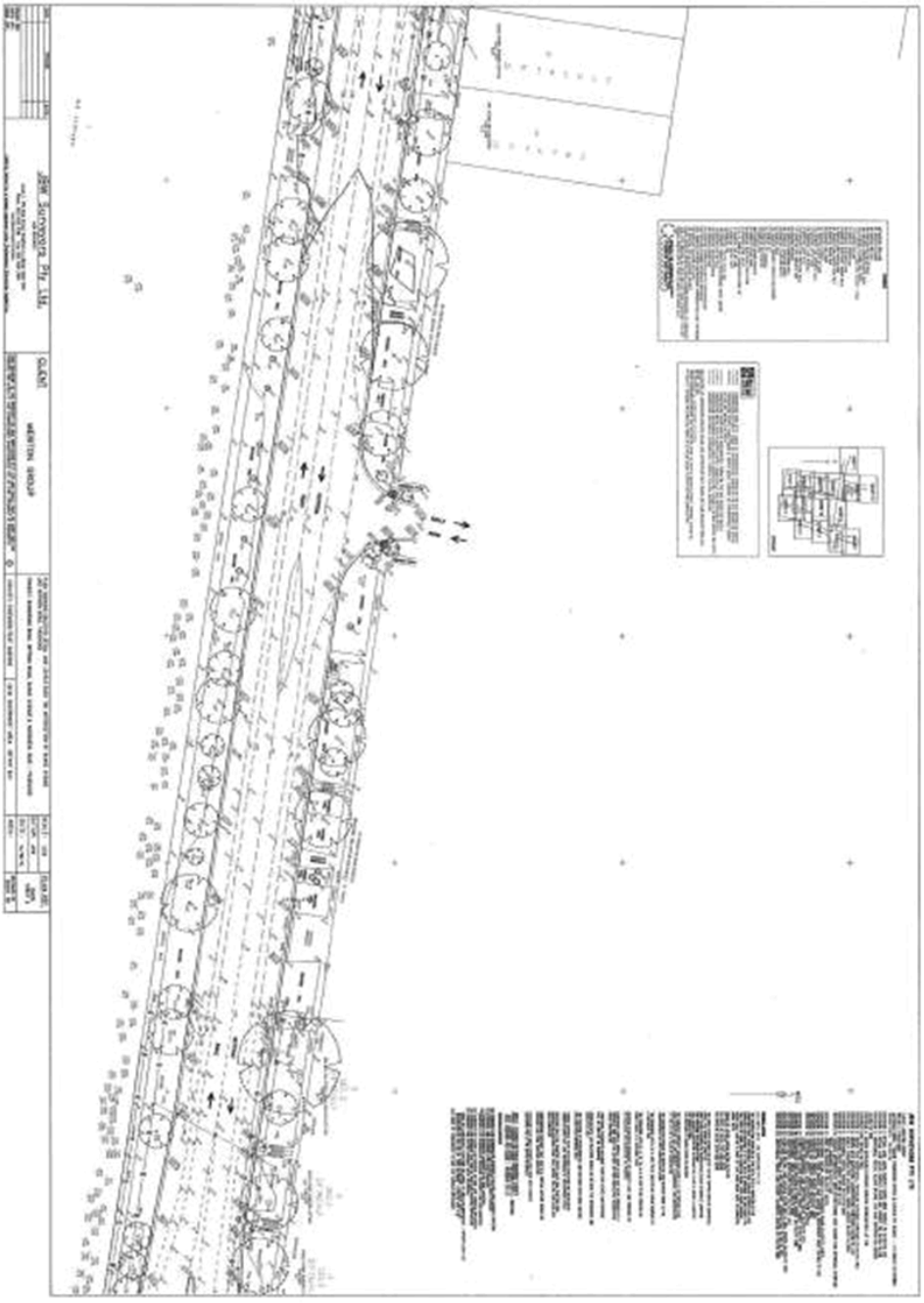

JBW Surveyors Pty Ltd.
CLIENT
MERITON GROUP
ADJOINS SHEET 11
ADJOINS SHEET 6

29


BANKS
AVENUE
SHEET 1
GRASSED
CONCRETE
AREA
PATH
130.185
BO DENOTES BOLLARI
BIT DENOTES BITUME
BO DENOTES BOTTOM
BW DENOTES BOTTOM
CBW DENOTES CONCR
CWF DENOTES CYCLO
CWSF DENOTES CYCL
CX DENOTES COLUMN
EK DENOTES EMBANK
EM DENOTES ELECTRI
EP DENOTES ELECTRI
GI DENOTES GALVANI
GIP DENOTES GALVAN
GL DENOTES GUARD
GM DENOTES GAS MA
HY DENOTES HYDRAN
INV DENOTES INVERT
LCW DENOTES LOG C
LIP DENOTES LIP OF
LMK DENOTES LANE
LP DENOTES LIGHT P
LRW DENOTES LOW R
LCH DENOTES LOW C
MH DENOTES MANHOL
MW DENOTES MONITO
OHC DENOTES OVERH
PB DENOTOES TELEPH
PO DENOTES POLE
PSL DENOTES PROPE
PT DENOTES PIT
PU DENOTES PIT UNK
SB DENOTES SWITCH
SI DENOTES SIGN
SMH DENTOES SEWER
SP DENOTES SOLAR
SS DENOTES ELECTRI
SV DENOTES STOP V
TC & TP DENOTES T
TK DENOTES TOP OF
TL DENOTES TRAFFIC
TO DENOTES TOP
TSB DENOTES TRAFF
TSM DENOTES TERMI
TW DENOTES TOP OF
USR DENOTES UNKNO
WM DENOTES WATER
EEM DENOTES EXPOS
EWM DENOTES EXPOS
EUCL DENOTES EXPO
EGM DENOTES EXPOS
TEC DENOTES TOP O
(PRWID) DENOTES PR
AT&L CIVIL DRAWING
MFOBRW DENOTES ME
DENOTES TH
T1 DENOTES


ADJOINS SHEET 6
HEYFRON ROAD
31

**Sheet 6**



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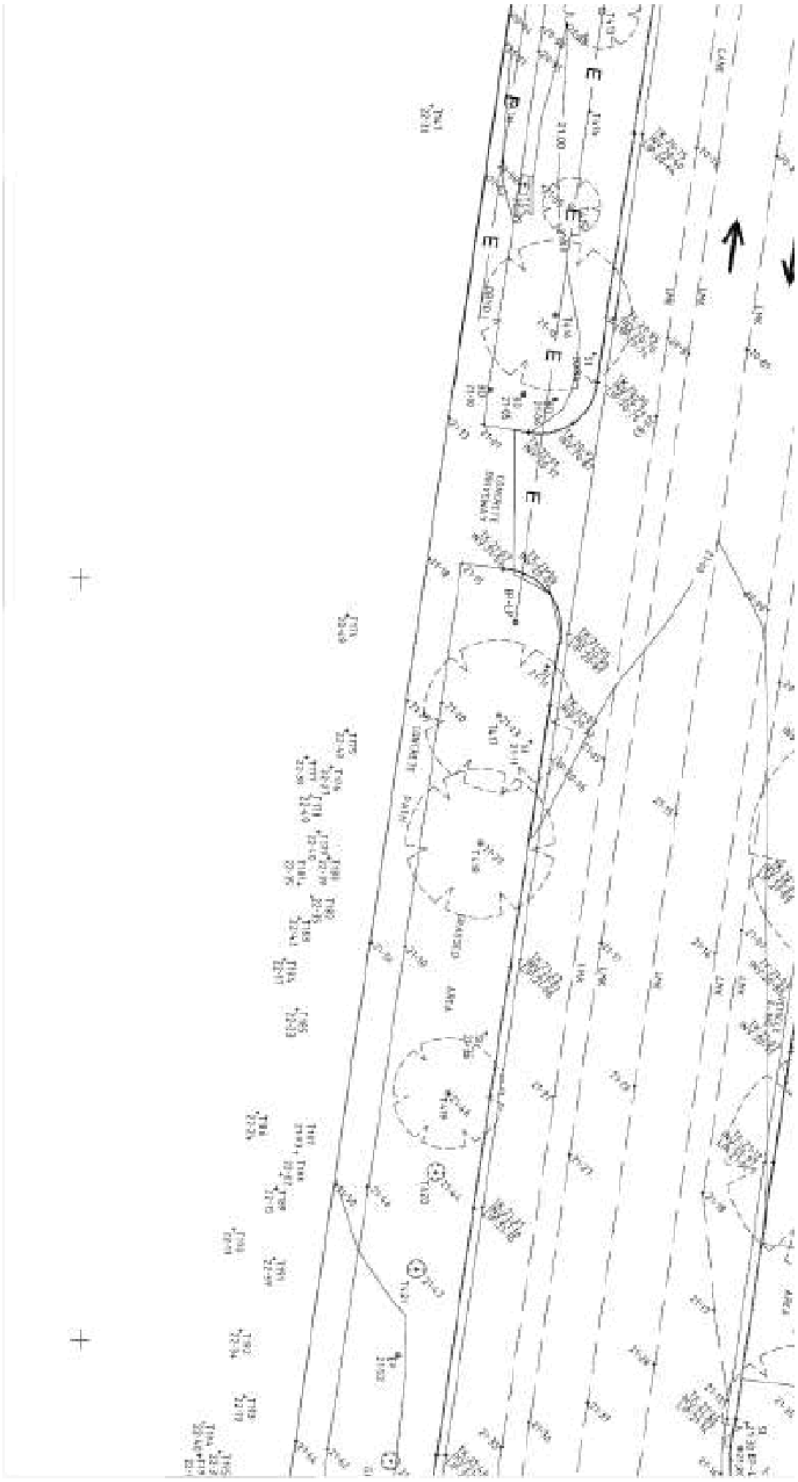

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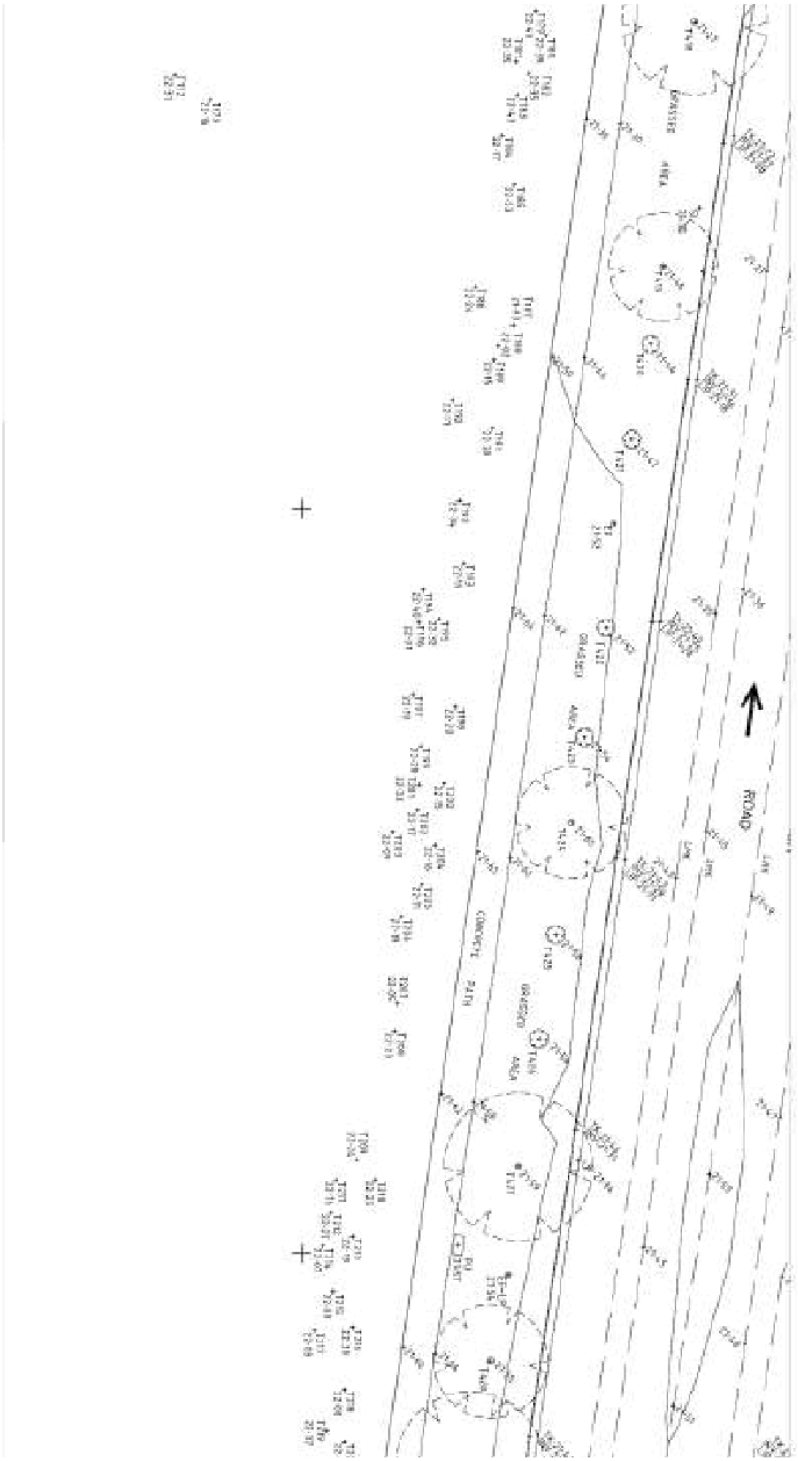

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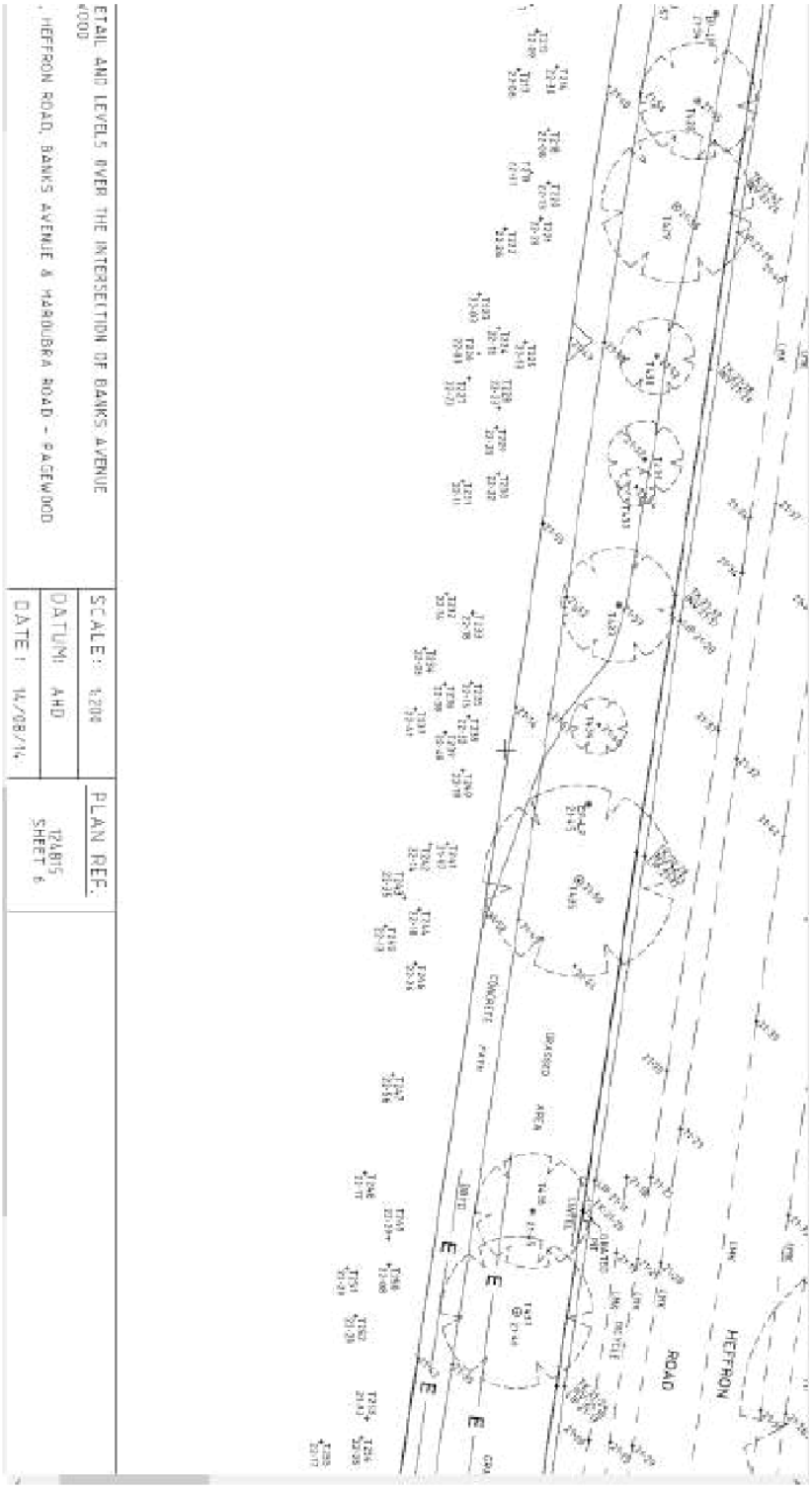
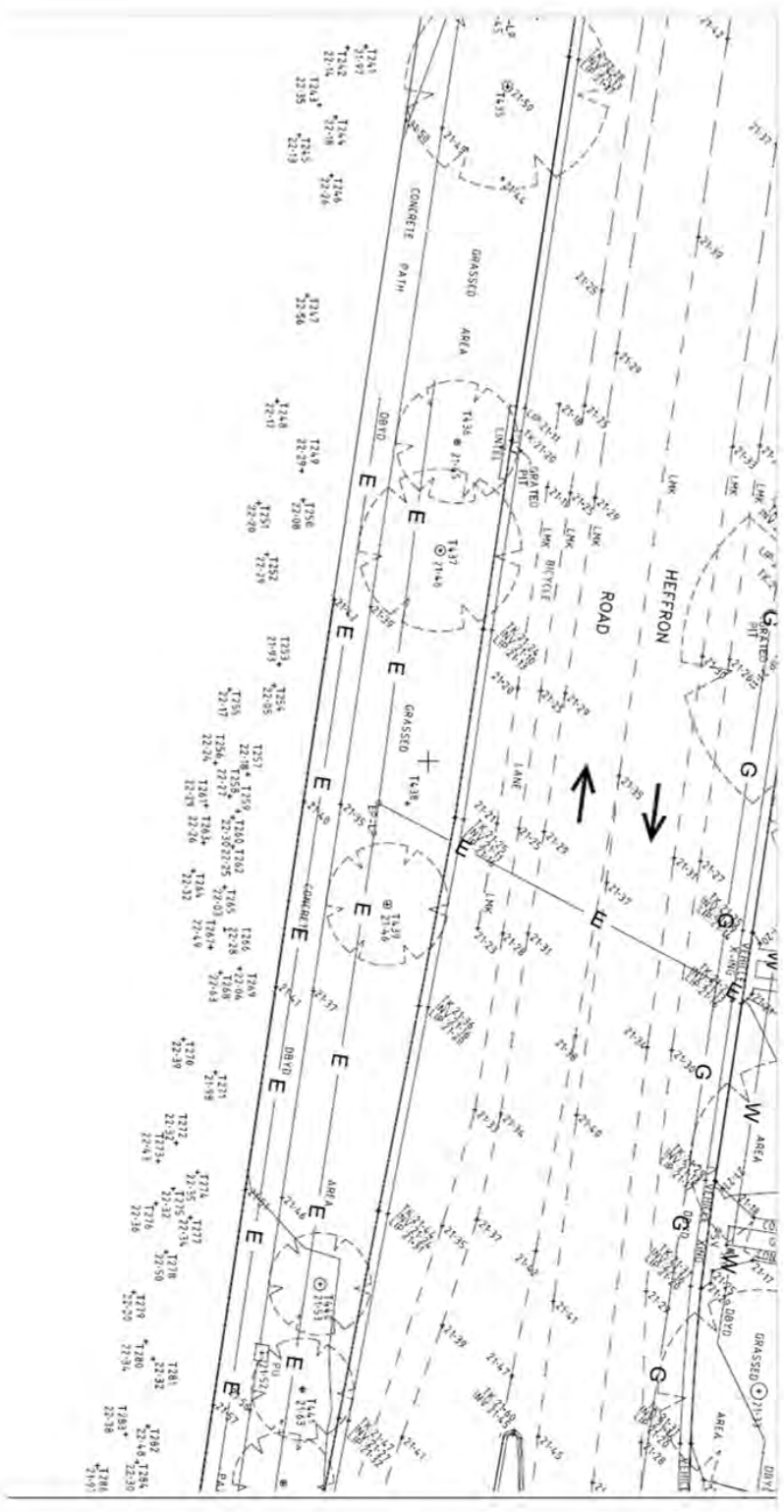
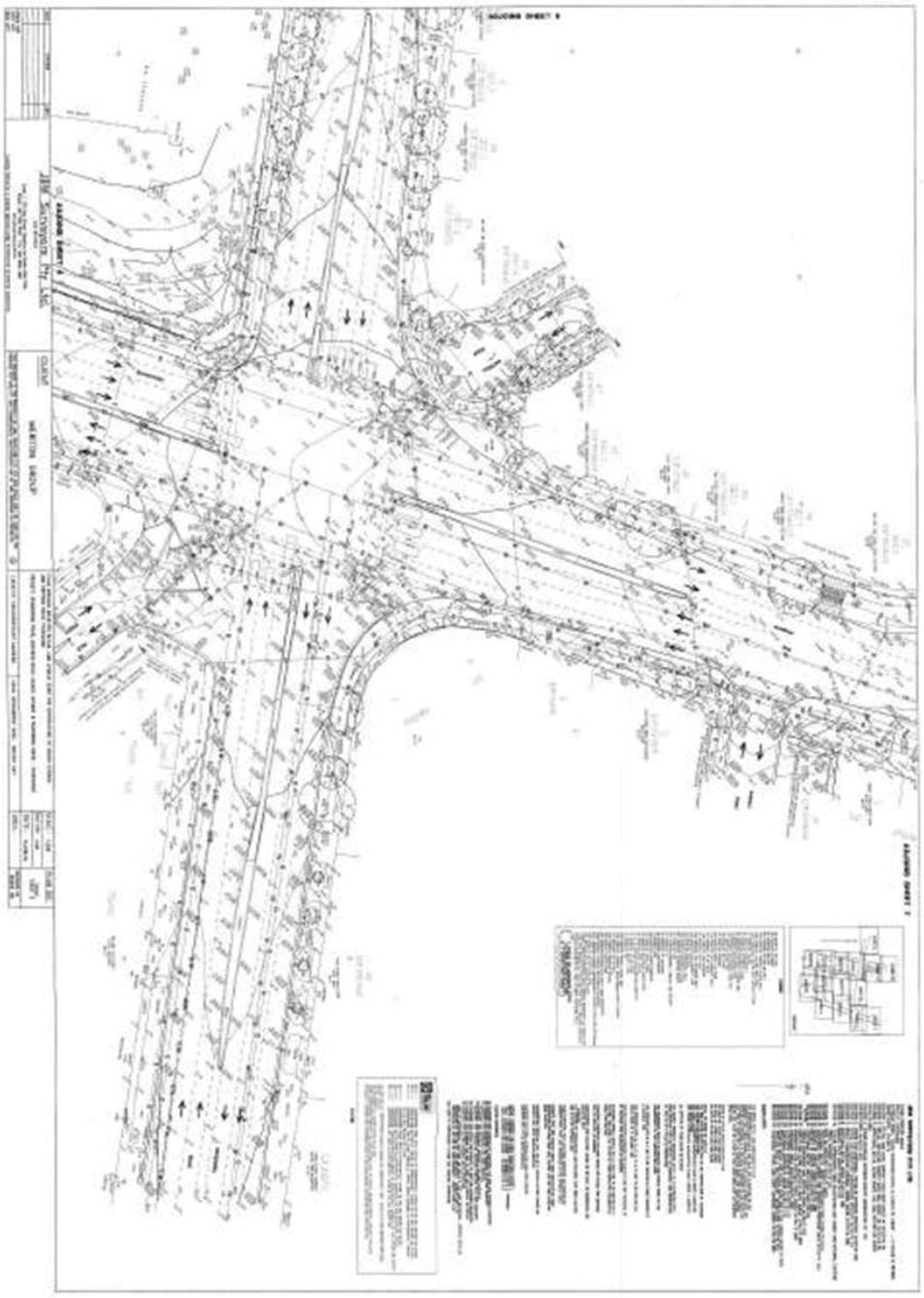

ETAIL AND LEVELS OVER THE INTERSECTION OF BANKS AVENUE
/OOD
, HEFFRON ROAD, BANKS AVENUE & HARBOURA ROAD - WOODCROFT
SCALE: 1:200
DATUM: AHD
DATE: 14/08/14
PLAN REF.
TP815
SHEET 6
HEFFRON
ROAD

35


HEFFRON
ROAD
CONCRETE PATH
GRASSED AREA
GRASSED
LANE
BICYCLE
GRATED PIT
DRYD
AREA

36

**Sheet 5**



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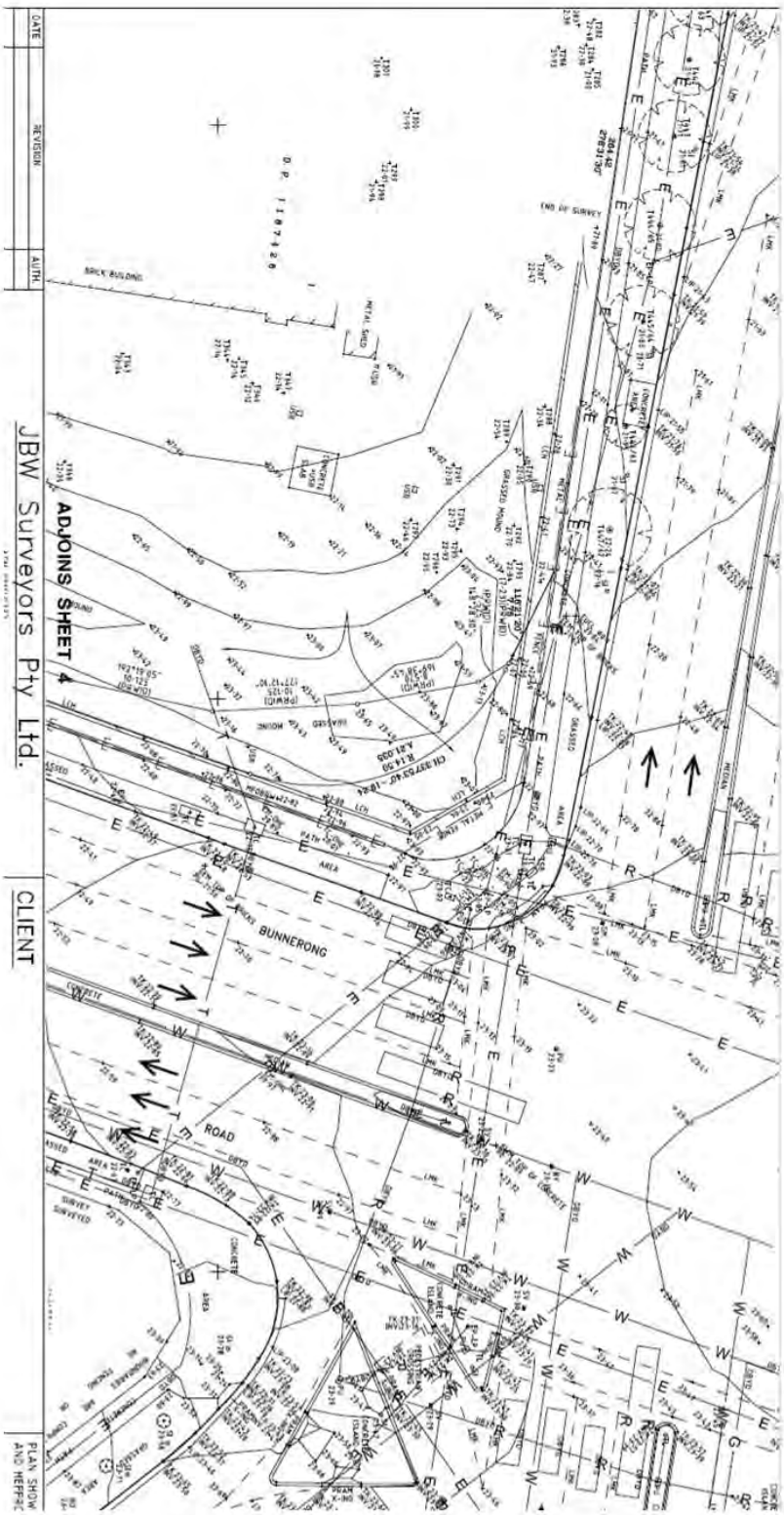
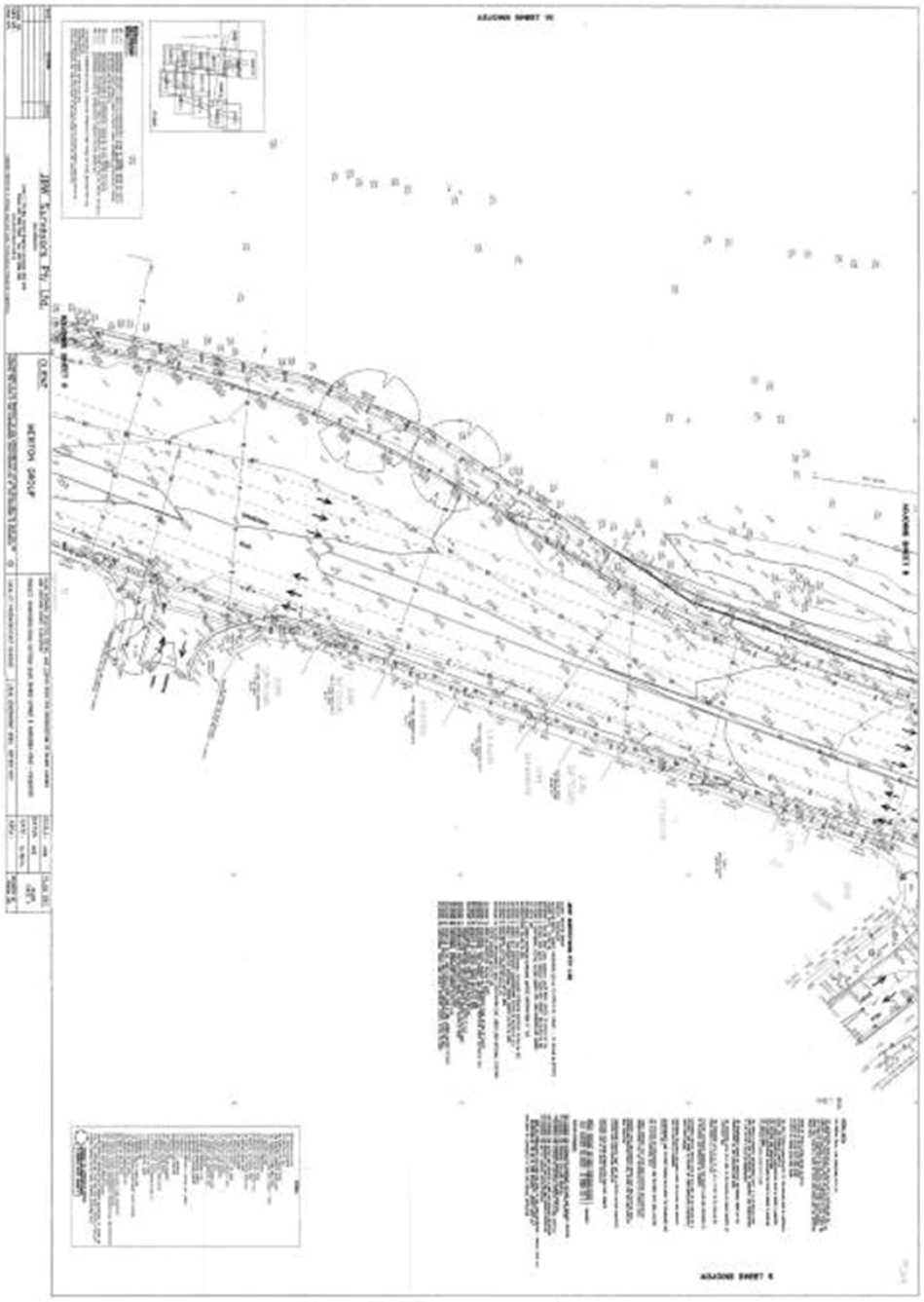

DATE
REVISION
AUTH
JBW Surveyors Pty Ltd.
CLIENT
PLAN SHOWING
ADJOINS SHEET 4
BUNNERONG
ROAD
BRICK BUILDING
END OF SURVEY
38

**Sheet 4**



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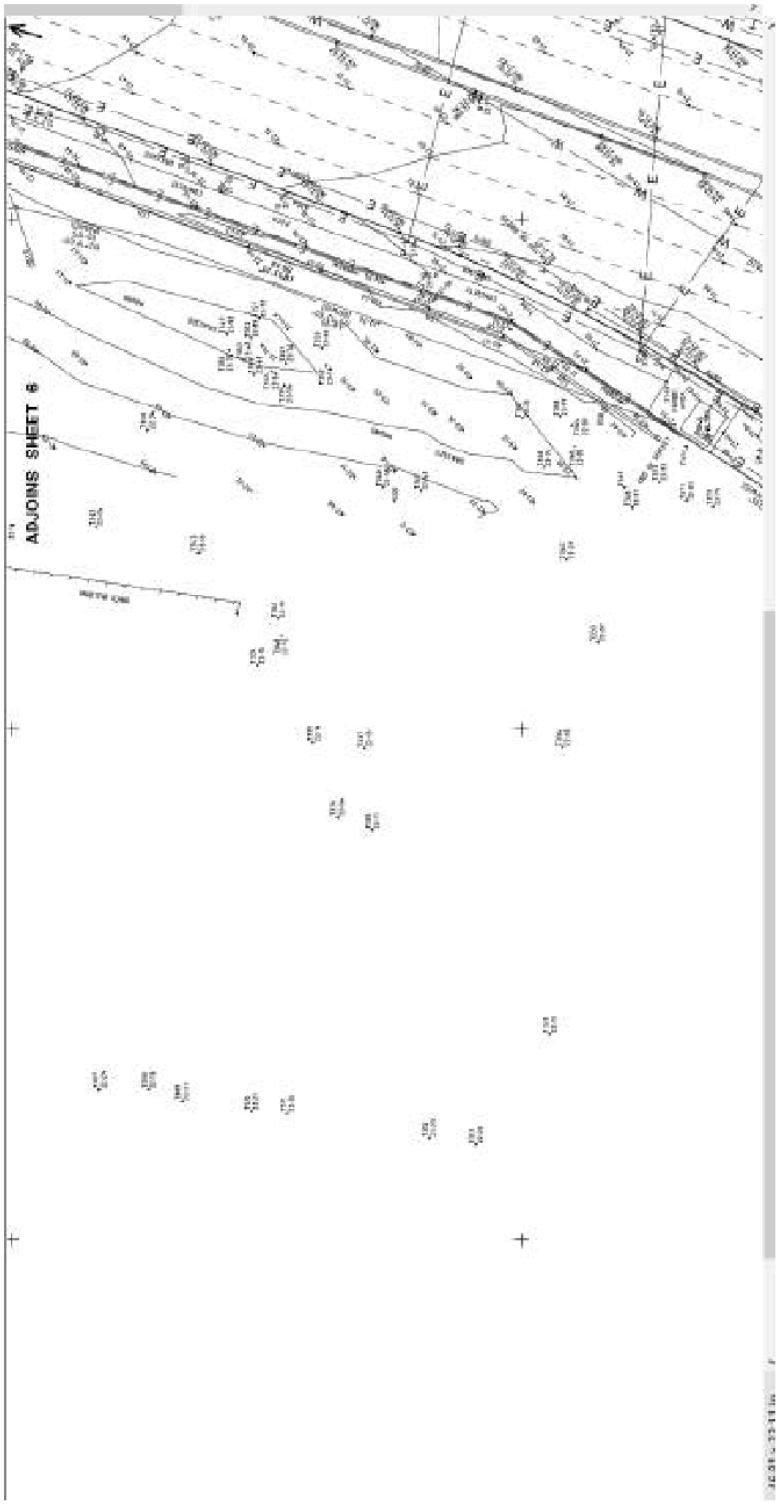


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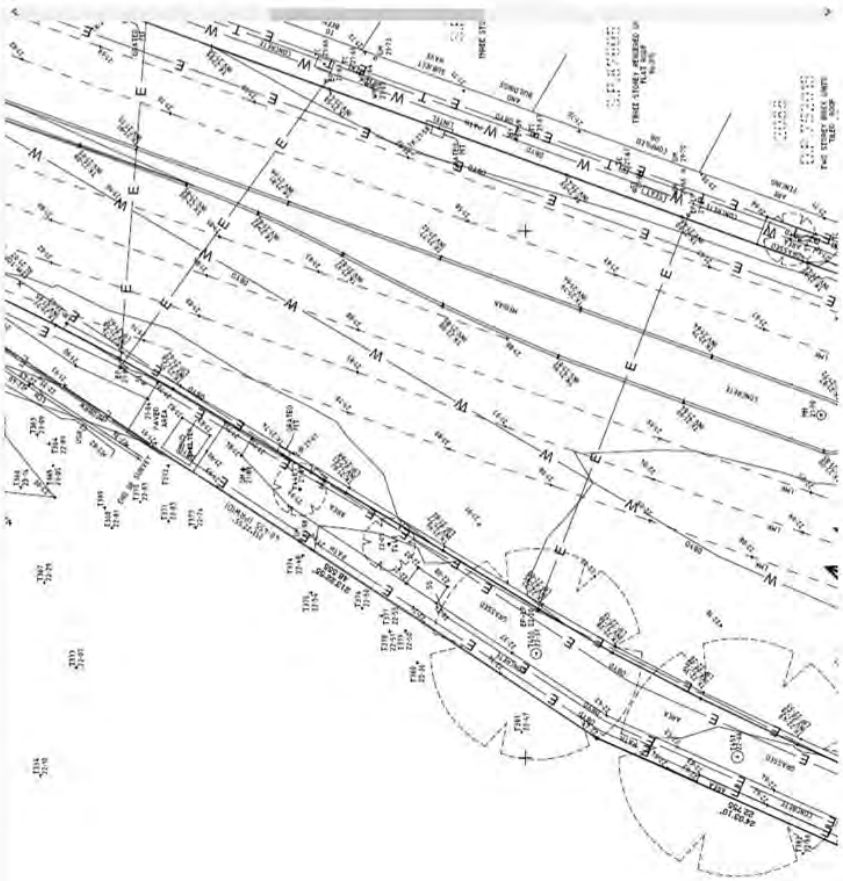

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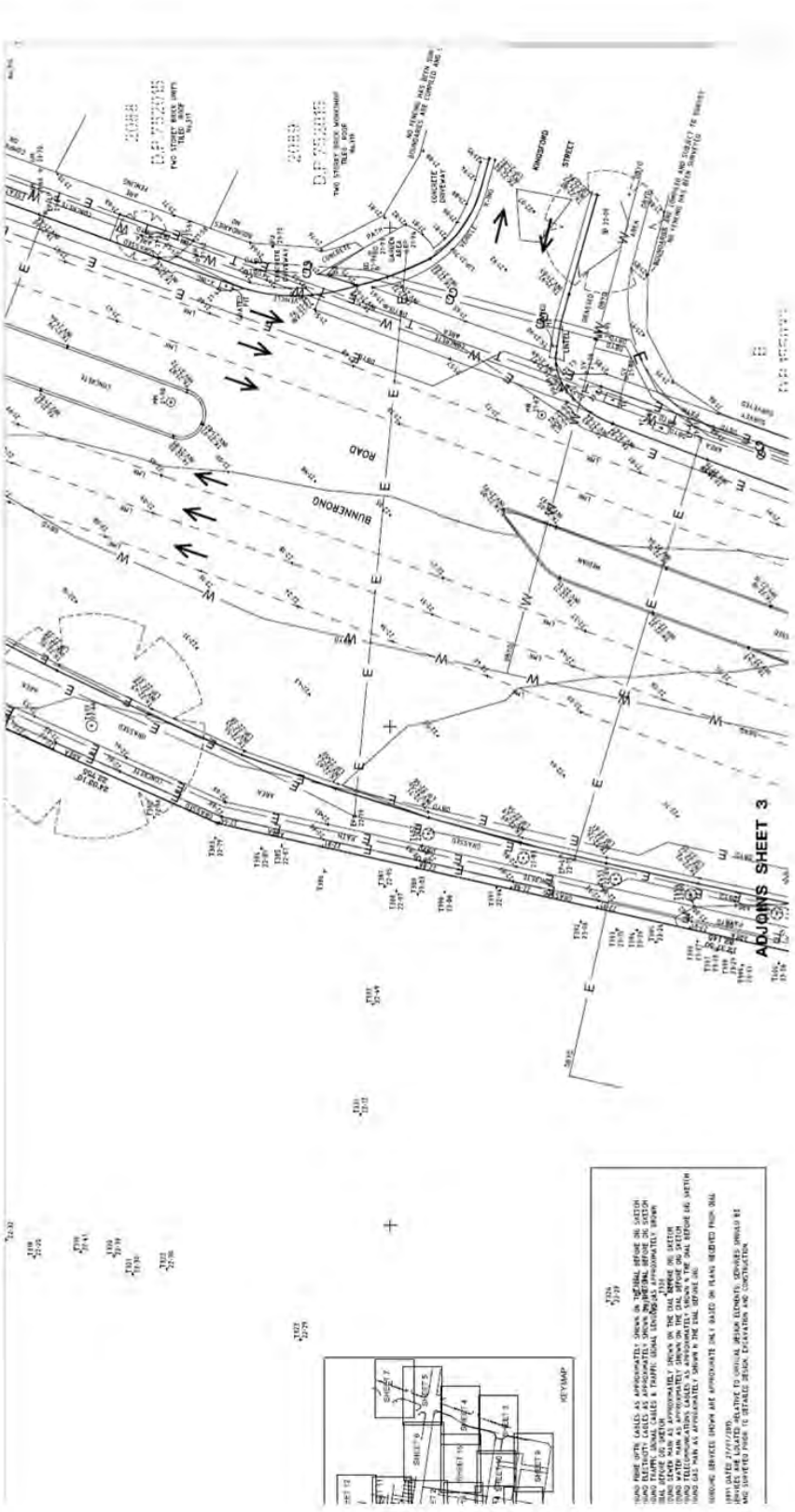
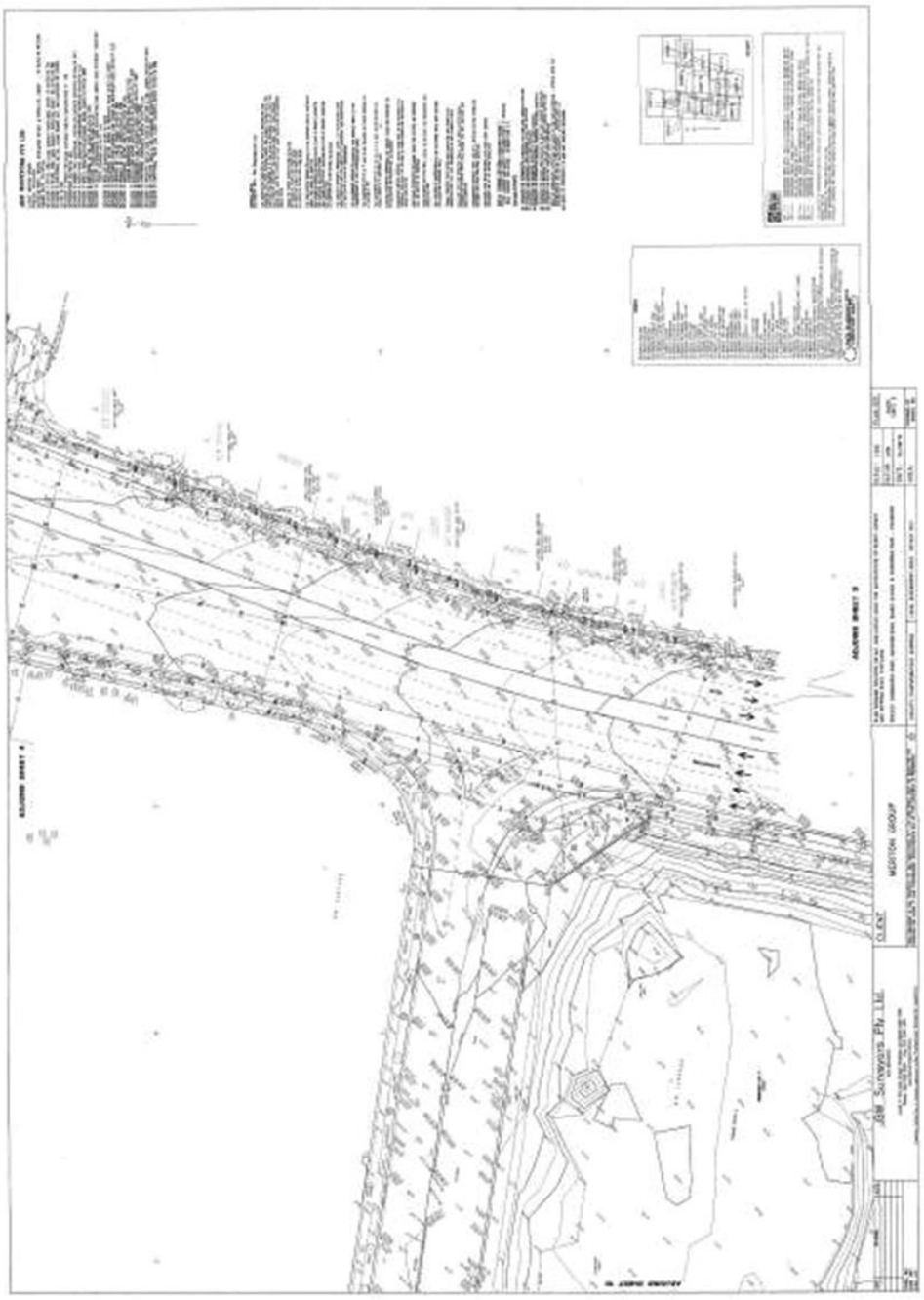
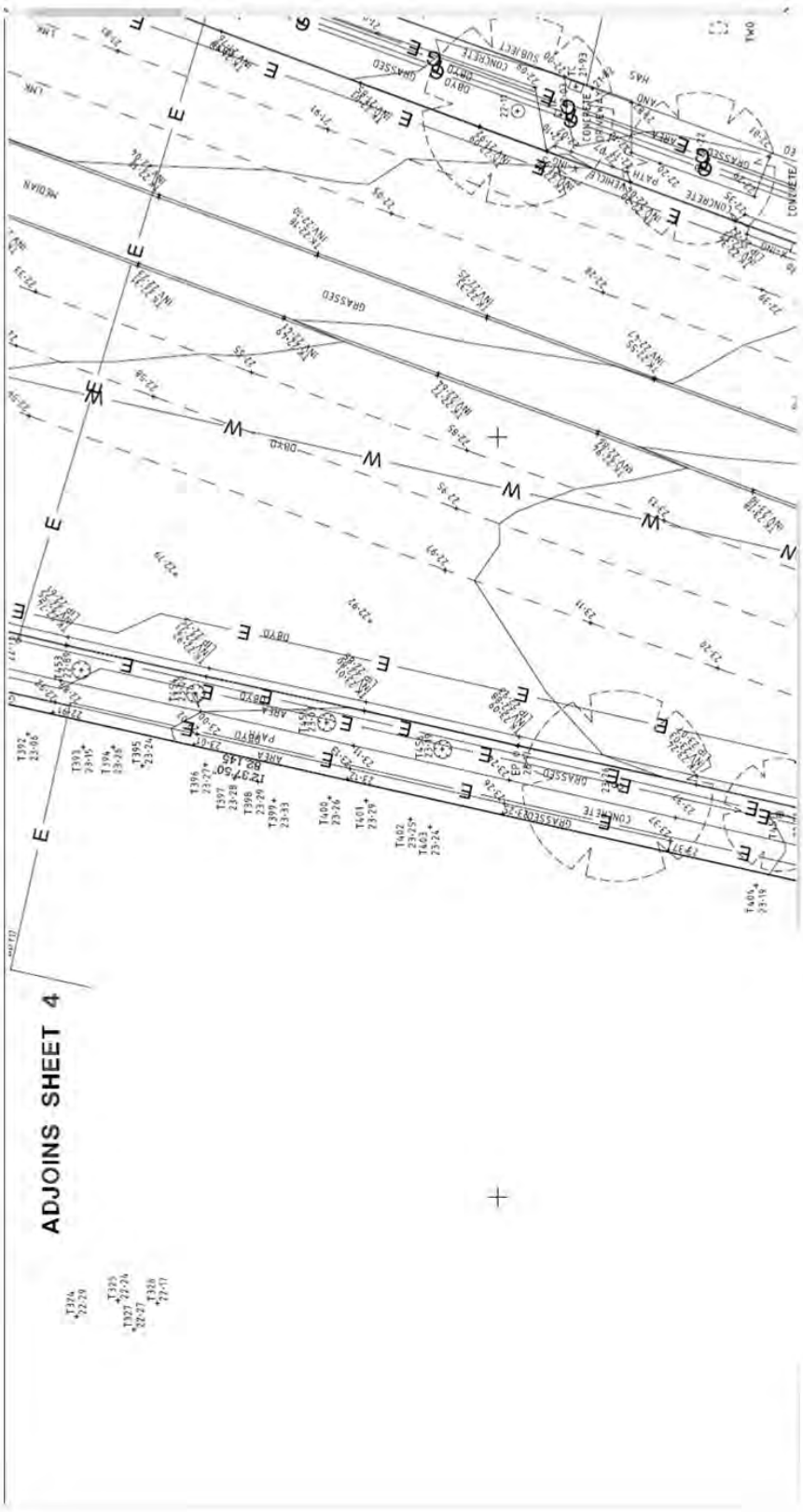



42

**Sheet 3**



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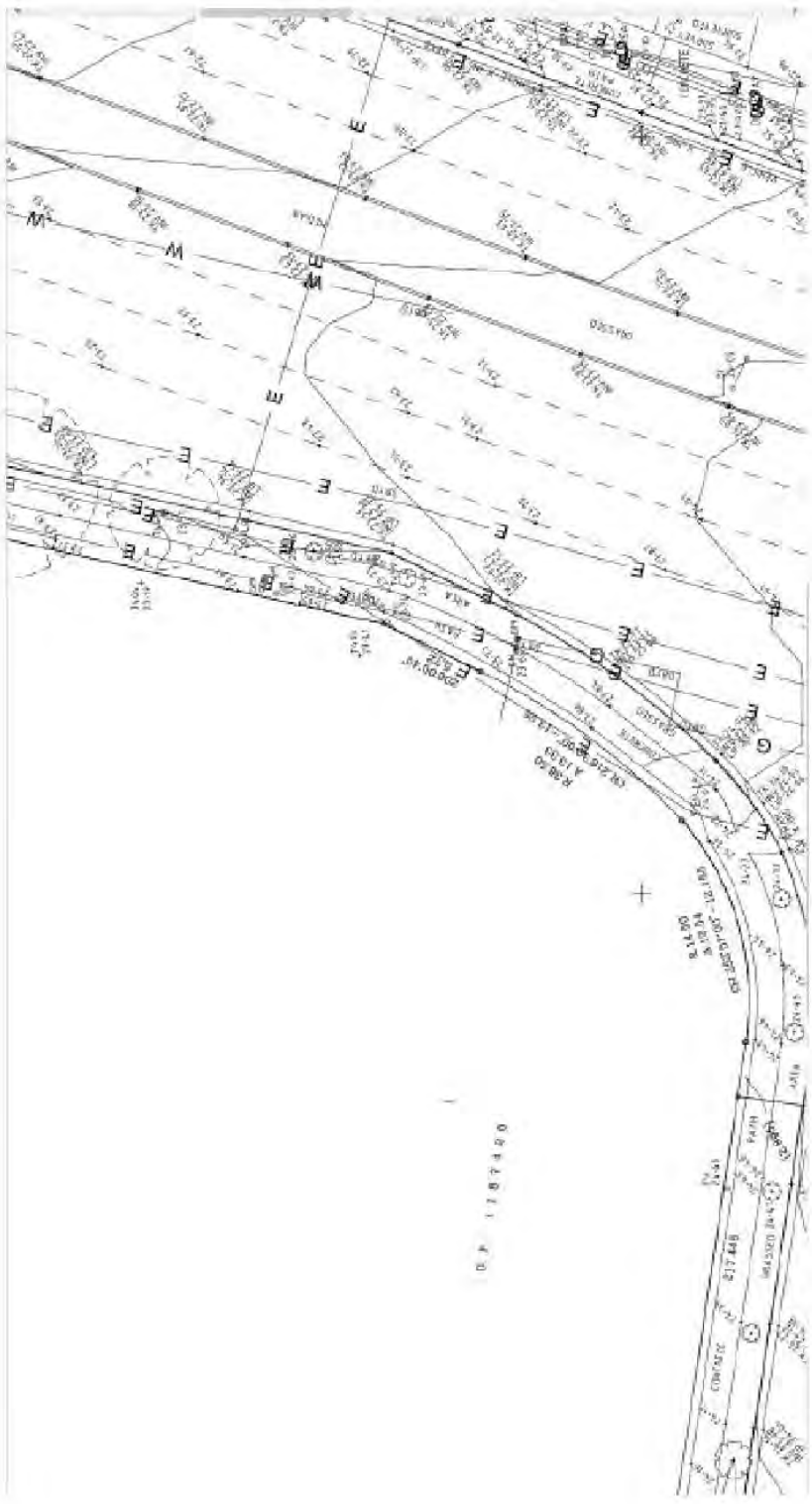

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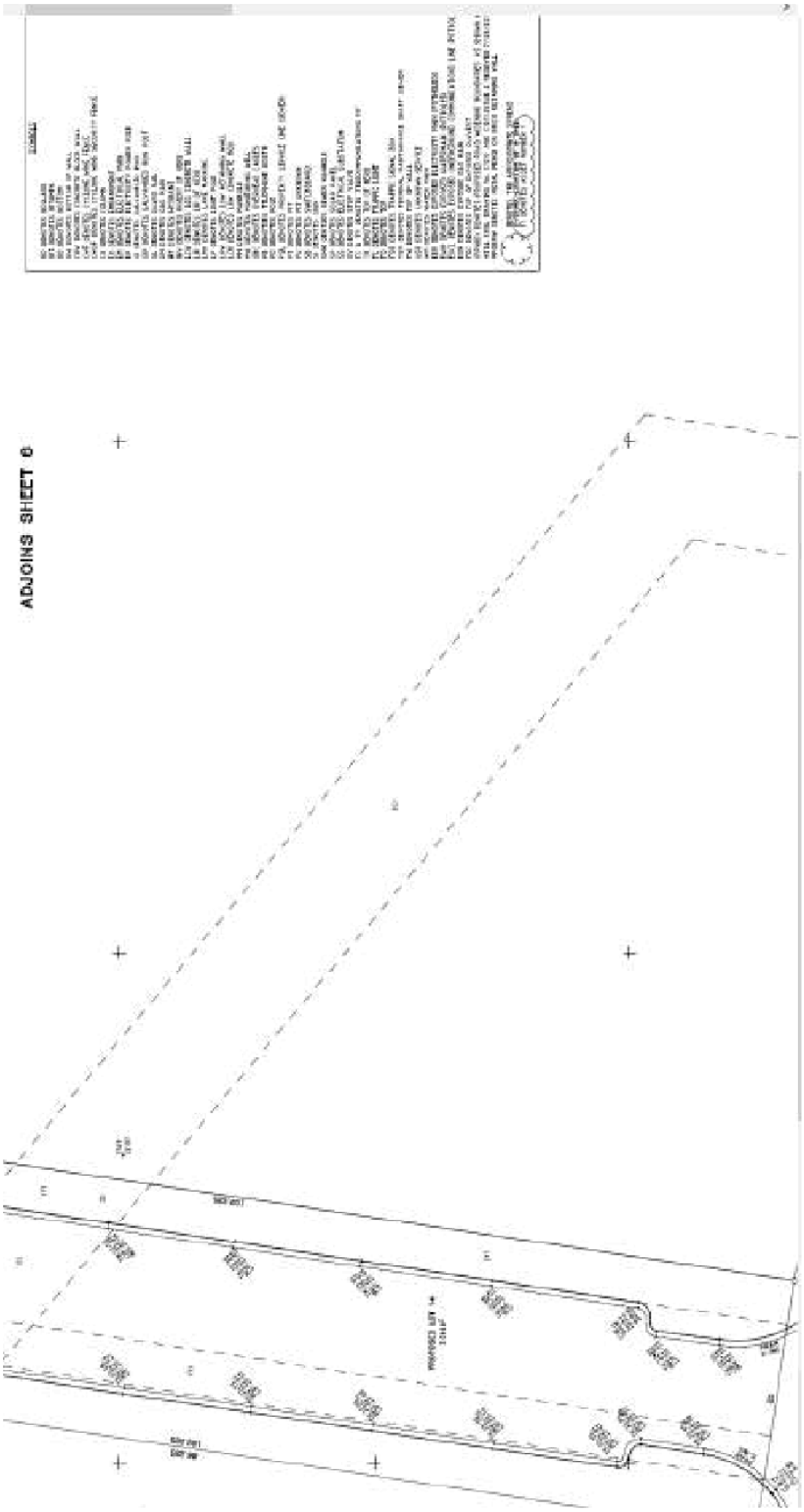
**Sheet 15**






47

**Annexure C: Site layout plan**




48

# APPENDIX H SURVEY PLAN




| DATE | REVISION | AUTH. |
|---|---|---|
| | | |
| | | |
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COUNCIL REF:
SUB'D. APP.:
ENGIN. APP.:

JBW Surveyors Pty Ltd.
ACN 001149373
Level 7, 376 Bay Street Brighton-Le-Sands NSW 2216
Phone: (02) 9335 9700 Fax: (02) 9556 3100
www.jbwsurveyors.com.au
Liability limited by a scheme approved under Professional Standards Legislation.

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PLAN SHOWING LOT 1 DP1187426 & LOT 24 1242288.

PROJECT: 'PAGEWOOD GREEN'

LOCALITY: EASTGARDENS

LOCAL GOVERNMENT AREA: BAYSIDE

SCALE: 1:800
DATUM: -
DATE: 20/11/2018

PLAN REF
124815-STAGE2-SITE

DESIGNED: WDT
DRAWN: MW

# APPENDIX I AERONAUTICAL IMPACT ASSESSMENT

# Aeronautical Impact Assessment

## Building Development
## Pagewood – Stage II

Meriton Group

LB00142

Final Version 1.0
25 July 2018

Landrum & Brown Worldwide (Aust) Pty Ltd, 2018

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| 001 | Draft report for submission to Client | PWW | 5 June 2018 | SK |
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# 1 Introduction

## 1.1 The Development

Meriton Group Pty Ltd has tasked Landrum & Brown Worldwide (Australia) Pty Ltd to prepare an Aeronautical Impact Assessment (AIA) for the north western section of a development at Bunnerong Road, Pagewood, referred to as Pagewood – Stage II.

The majority of this development site has been previously assessed under the following projects:

| Ambidji Report Number | Report Date | Site Address |
|---|---|---|
| **J0404** | 21 January 2014 | 128 Bunnerong Rd, Pagewood |
| **J0417** | 15 April 2014 | 128 Bunnerong Rd, Pagewood |
| **J0459** | 18 December 2015 | 128 Bunnerong Rd, Pagewood |
| **J0469** | 8 August 2016 | 130-150 Bunnerong Rd, Pagewood |

**Table 1:** Previous reports for Meriton development at Bunnerong Road

On 23 January 2017, the Department of Infrastructure, Regional Development and Cities (DIRD) issued an approval to Meriton Group for the above developments to permanently infringe Sydney Airport's Obstacle Limitation Surface (OLS) of 51 m AHD, up to a maximum height of 91 m AHD.

The approval includes buildings UB1, UB2, UB3, UB4, UB5W, UB5C, and UB5E, as shown in the extract of Bata – Concept Masterplan below.




**Figure 1:** Extract from the Bata – Concept Masterplan of 2015

A copy of the approval F17/87-03 is included in Appendix B.

This report seeks to clarify that the remaining section of the development, referred to in Figure 1 as 'Retained Bata Facility', designed to a maximum height of 91 m AHD, will not further impact prescribed airspace than the approved sites.

## 1.2 Location

Pagewood – Stage II is located 4.53 km from the Sydney Airport aerodrome reference point (ARP), on the north western quadrant of the Meriton development site, bordered by Heffron Road to the north and Bunnerong Road to the west. **Figures 2** and **3** provide an overview of the site location.




**Figure 2:** Distance from Sydney Airport ARP




**Figure 3:** Street location of Pagewood – Stage II as shown on Google Earth

# 2 Prescribed Airspace

## 2.1 Overview

Prescribed Airspace for an airport is the airspace above any part of an Obstacle Limitation Surface (OLS), a PANS OPS (Procedures for Air Navigation Services – Aircraft Operations) surface for the airport, or the Radar Terrain Clearance Chart (RTCC) protection surfaces.

The OLS are conceptual surfaces associated with runways that are designed to protect aircraft operations from unrestricted obstacle growth. The OLS comprises the following:

- outer horizontal surface (OHS);
- conical surface;
- inner horizontal surface (IHS);
- approach surface;
- inner approach surface;
- transitional surface;
- inner transitional surface;
- baulked landing surface; and
- take-off climb surface.

The PANS OPS surfaces are designed to guarantee an obstacle free path to and from a runway, with a prescribed minimum obstacle clearance above the obstacles or terrain, for the safety of aircraft operations in Instrument Meteorological Conditions (IMC).

The RTCC provides ATC with minimum heights at which they can provide surveillance services to aircraft in the area around major airports.

Infringement by a building or crane through the OLS requires the support of Sydney Airport Corporation Limited (SACL), the Civil Aviation Safety Authority (CASA) and the approval of the Department of Infrastructure, Regional Development and Cities (DIRDC) where the airport is on federally leased land.

Infringement of PANS OPS or RTCC protection surfaces are not supported by the aviation authorities.

## 2.2 Obstacle Limitation Surfaces

Obstacle limitation surfaces extend to a maximum distance of 15 km from the Aerodrome Reference Point (ARP) of relevant airports.

The development site is located within the Inner Horizontal Surface (IHS) of the Sydney Airport OLS, which at this location, is at a height of 51m AHD.

**Table 2** identifies the infringement of the development on the OLS of airports in the vicinity.

| Airport | Prescribed Airspace Surface | Height of surface (m AHD) | Infringement (metres) |
|---|---|---|---|
| Sydney | Inner Horizontal Surface | 51 | Up to 40 metres |
| Bankstown | All OLS | Laterally Outside | Nil |
| RAAF Richmond | All OLS | Laterally Outside | Nil |
| Western Sydney | All OLS | Laterally Outside | Nil |

**Table 2:** Infringement of development site on the OLS

**Figure 4** depicts the location of the development in relation to Sydney Airport's OLS.

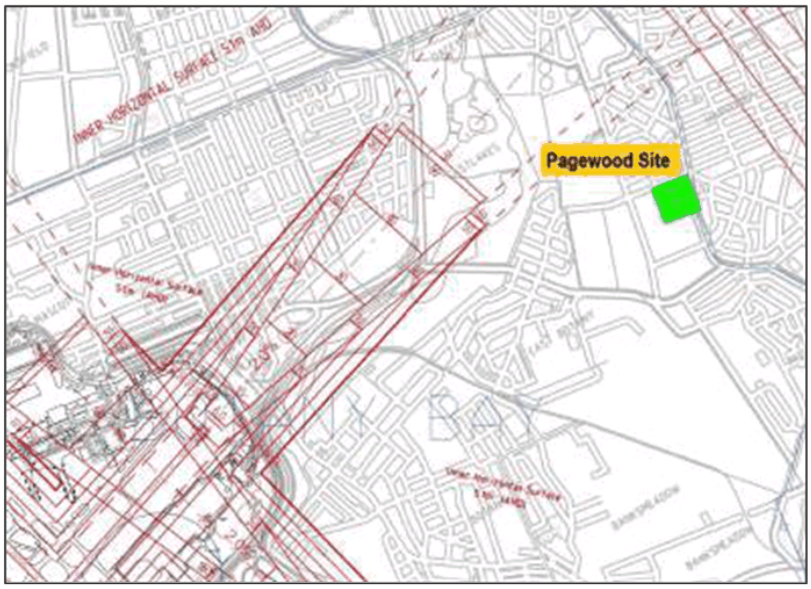


**Figure 4:** Development Location in relation to SY OLS (SACL Masterplan 2015)

### 2.2.1 Support for Infringement of the OLS

The Inner Horizontal Surface was originally established by ICAO to restrict obstacle growth in the vicinity of airports, and to protect the obstacle clearance of aircraft circling the airport in less than visual flight conditions prior to landing.

When these surfaces were initially established, instrument approaches were generally only provided to one runway at the airport, and aircraft were not equipped for straight in approaches with vertical guidance apart from the ILS. A circling approach from an instrument approach procedure was required when landing on other runways was necessary due to local winds or other conditions.

Studies by the Flight Safety Foundation found that a high number of aircraft accidents in the vicinity of airports occurred during the conduct of a circling approach.

The International Civil Aviation Organisation (ICAO) Assembly Resolution A33-16 ICAO Global Aviation Safety Plan (GASP) recognised the need to prevent controlled flight into terrain (CFIT) accidents by implementing a worldwide program whereby National Aviation Authorities provide a straight in approach to each runway used by airline aircraft. In Australia, this program is almost complete. At Sydney Airport, each runway is provided with a straight in approach with vertical guidance.

The promulgation of straight in instrument approaches has reduced the importance of restricting obstacle growth in areas where aircraft do not operate. ICAO has acknowledged the limitations imposed by the current OLS layout, and has formed the OLS TASK FORCE to review and update the OLS and align them with the PANS OPS surfaces.

ICAO recognises the economic balance required between terrestrial infrastructure requirements of growing cities and efficiency and safety of flight operations.

#### 2.2.1.1 Infringement of the Inner Horizontal Surface – ICAO Document References

ICAO Airport Services Manual Part 6 - Control of Obstacles states in Para 1.2.2.4:

> *In assessing the operational effect of proposed new construction, tall structures would not be of immediate significance if they are proposed to be located in:*
>
> *a) An area already substantially obstructed by terrain or existing structures of equivalent height*

*b) An area which would be safely avoided by prescribed procedures associated with navigational guidance where appropriate*

The Inner Horizontal Surface can be infringed in accordance with the recommendations of ICAO Doc ANNEX 14 Volume 1 Aerodrome Design and Operations, Para 4.2.20, which states:

> *New objects or extensions of existing objects should not be permitted above the Conical Surface and the Inner Horizontal Surface except when, in the opinion of the appropriate authority, an object would be shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect safety or significantly affect the regularity of operations of aeroplanes.*

#### 2.2.1.2 Existing Approvals

As Meriton hold DIRD approval for buildings on the adjacent parcels of land within this same development to infringe the OLS to a maximum height of 91 m AHD, these buildings will have a shielding effect on the Pagewood – Stage II development.

The remainder of the development, to the same maximum height of 91 m AHD, satisfies condition (a) of 2.2.1.1 above and will not pose any additional impact on the OLS.

## 2.3 PANS OPS

Sydney Airport's PANS OPS surfaces are the most relevant for this proposed development. PANS OPS surfaces related to other airports have been assessed to be well above the maximum proposed height of this development.

The development is situated beneath the Final Approach Surface (FAS) for the VNAV component of the RNAV-Z (GNSS) RWY 25 approach. The FAS height at the nearest point of the development is 108.8 m AHD. The development does not infringe the FAS.

An assessment of the remaining PANS OPS surfaces confirms that the development does not infringe any of the PANS OPS surfaces at Sydney Airport.

**Figure 5** depicts Sydney Airport's Master Plan 2015 diagram of the PANS OPS surfaces with the location of the development marked upon it.

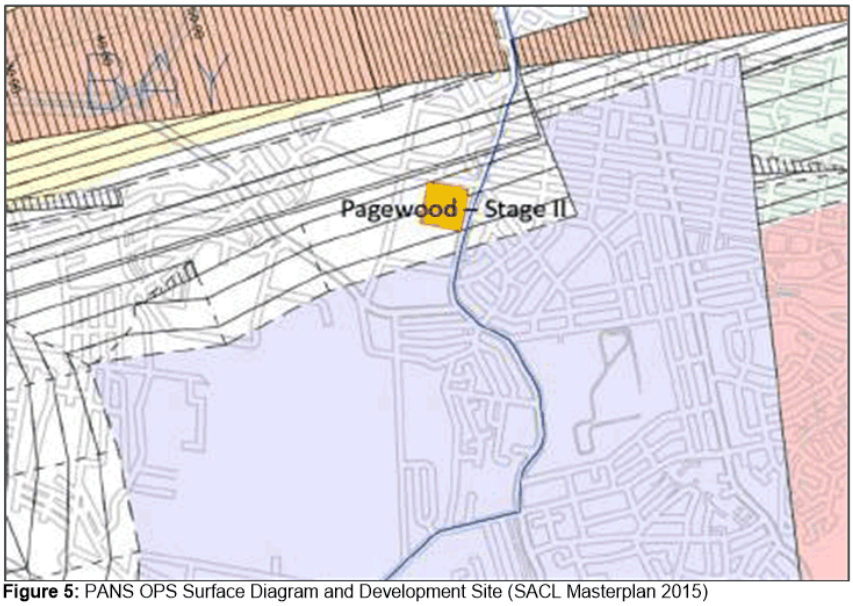


**Figure 5:** PANS OPS Surface Diagram and Development Site (SACL Masterplan 2015)

A Radar Terrain Clearance Chart (RTCC) protection surface exists above the site. This surface relates to the lowest level that aircraft are able to descend to whilst under the direction of ATC.

**Table 3** shows the lowest PANS OPS surface height above the development site for each airport and the clearance (in green) or infringement (in red) of the building on each surface.

| Airport or location | PANS OPS surface | Surface Height (m AHD) | Building 91 m AHD |
|---|---|---|---|
| Sydney | RNAV-Z (GNSS) RWY 25 | 108.8 | 17.8 |
| Bankstown | 10 nm Minimum Sector Altitude (MSA) | 457.1 | 366.1 |
| Camden | 25 nm MSA | 1341 | 1250 |
| RAAF Richmond | 25 nm MSA | 396 | 305 |
| Above development | RTCC | 152 | 61 |

**Table 3:** PANS OPS Surface Heights and result

### 2.3.1 Examination of Circling Approaches

The development site at the corner of Heffron Road and Bunnerong Road, Pagewood, is located beneath the CAT A/B and CAT C/D IFR circling areas for Sydney Airport. An assessment was conducted to confirm that there would be no changes required to the published circling minimum altitudes to accommodate an additional group of buildings to a maximum height of 91 m AHD.

The aircraft category (CAT) depends on a number of aircraft performance parameters, published in the ICAO PANS OPS.

**Table 4** depicts the applicable circling area protection surface height and the clearance (in green) or infringement (in red) of the building on each surface.

| Aircraft Category | Minimum Circling Altitude (feet AMSL) | Circling Area Limit from threshold (nautical miles) | Minimum Obstacle Clearance (feet) | PANS OPS Surface height (m AHD) | Building 91 m AHD |
|---|---|---|---|---|---|
| **A and B** | 710 | 2.66 | 295 | 126.5 | 35.5 |
| **C and D** | 1000 | 5.28 | 394 | 184 | 93.0 |

**Table 4:** Circling Area PANS OPS heights

Note: The Aeronautical Information Publication (AIP) publishes all distances in nautical miles, and altitudes in feet for instrument flight procedures. Displays to pilots are in the same format.

### 2.3.2 Result of Assessment

The proposed development at a maximum height of 91 m AHD:

- will not infringe the PANS OPS surfaces of Sydney Airport;

- will not infringe any PANS OPS surfaces at any other airport in the vicinity;
- will not affect the circling area for Sydney Airport; and
- will not infringe the RTCC protection surface.

# 3 ATC Surveillance System Performance

This assessment identified two radars in relative proximity to the Pagewood – Stage II development. These are the Sydney Airport Terminal Area Radar (TAR) and the Cecil Park TAR.

Cranes are considered not to affect the performance of ATC surveillance equipment.

**Table 5** depicts the impact of the development on the ATC Surveillance System Performance.

| Surveillance System | Distance from development | Distance in metres | Antenna Elevation (m AHD) | Plane Elevation at development site (m AHD) Distance x Tan 0.5° + TAR elevation | Infringement result for building height of 91 m AHD |
|---|---|---|---|---|---|
| **Sydney Airport TAR** | 4 km south | 3990 | 38.2 | 73.02 | 17.98 |
| **Cecil Park TAR** | 36 km W | 36365 | 200.51 | 517.86 | No infringement |

**Table 5:** Impact of development on ATC Surveillance System Performance

## 3.1 Result of Assessment

The proposed development will infringe the clearance planes for the Sydney Airport TAR by 17.98 m. Any impact from this infringement should be mitigated by the radar coverage of the Cecil Park TAR and the ADS-B receivers in the Sydney area.

The proposed development will not infringe the clearance planes for the Cecil Park TAR.

Airservices Australia will conduct an independent assessment to confirm that there will be no additional impact on the surveillance system equipment to that of the existing, approved, development on this site.

# 4 Navigation Aid Performance

There are a number of navigation aids installed at Sydney Airport, including ILS, GBAS and DME. An NDB is installed at Bankstown Airport and an ILS with a DME is planned for future installation.

The Building Restricted Areas (BRA) describes a sensitive zone that exists around the navigation aid antenna sites. The development limitations within the BRA are specified in the Airservices Australia document Navigation Aid Building Restricted Areas and Siting Guidance AEI-7.1613 Issue 2.

Table 6 describes the results of an assessment of the impact of the proposed development on the BRAs at Sydney Airport.

For the Localiser antenna, the BRA consists of an area with a lateral limit of 1000 m either side of the runway centerline and a slope of 2 degrees above the horizontal from the top of the antenna, along the runway centerline.

For the Glide path antenna, the BRA consists of an area with a lateral limit of 350 m and a slope of 2 degrees above the horizontal from the top of the antenna, along the runway centerline.

| Navigation Aid | BRA Lateral Dimensions (metres) | BRA Vertical Dimensions (degrees above the horizontal) | Distance to Development (m) | Result |
|---|---|---|---|---|
| **Sydney DME** | 1500 | 2 | 3620 | No infringement |
| **GBAS** | 3000 | 0.9 | 4200 | No infringement |
| **All ILS LOC** | 1000 | 2 | Beyond specified distance | No infringement |
| **All ILS Glide Paths** | 350 | 2 | Beyond specified distance | No infringement |

**Table 6:** Building Restricted Area Assessment

# 5 Roof Top Exhaust Plumes

Exhaust plumes in excess of 4.3 m/s can create sufficient turbulence to upset the stability of aircraft during the take-off and landing phases of flight. Roof top exhaust plume rises in excess of 4.3 m/s must be referred to CASA for their assessment of risk to aircraft operations.

# 6 Obstacle Lighting

Obstacle lighting for the building, if required by CASA, should be in accordance with the Manual of Standards Part 139 – Aerodromes, Chapter 9.4 *Obstacle Lighting*.

Suitable shields may be installed to prevent disturbance to the community, however the lights must remain visible above a horizontal plane.

# 7 Conclusion

Meriton has been awarded approval to construct buildings to a maximum height of 91 m AHD which will infringe Sydney Airport prescribed airspace to a maximum of 40 m.

Located in the same site as the approved development, the proposed additional buildings of Pagewood – Stage II, to a maximum height of 91 m AHD:

- will infringe the Inner Horizontal Surface of the Sydney Airport OLS by up to 40 m, however, due to the limited use of circling approaches, does not present a significant hazard to flight operations;
- will not infringe the OLS of any other airport;
- will not infringe the Sydney Airport PANS OPS surfaces, or the PANS OPS surfaces for any other airport in the vicinity;
- will not infringe the BRA for any navigation aid;
- will infringe the clearance plane for the Sydney Airport TAR by 17.98 m, however coverage from the Cecil Park TAR should mitigate any impact upon the ATC surveillance system by this building development; and
- will not infringe the RTCC protection surface above the site.

Subsequent to the grant of any approval for this development, a detailed application to CASA, Airservices Australia, and Sydney Airport will need to be made for the cranes (temporary obstacles) required during the building process.

## Appendix A: Building Site Layout



**Site Layout (Source: Meriton)**

## Appendix B

**Australian Government**
**Department of Infrastructure and Regional Development**

*File reference: F17/87-03*

| TO: | Cc: | FROM: |
|---|---|---|
| **Matthew Lennartz**<br>Meriton Group<br>matthew@meriton.com.au | **Sydney Airport**<br>airspaceprotection@syd.com.au<br><br>**Airport Relations**<br>Airservices Australia<br>airport.developments@airservicesaustralia.com<br><br>**Airspace Protection**<br>Civil Aviation Safety Authority<br>airspace.protection@casa.gov.au<br><br>**Bayside Council**<br>council@bayside.nsw.gov.au | **Flysafe**<br>Airspace Protection<br>flysafe@infrastructure.gov.au |

**DECISION UNDER THE AIRPORTS (PROTECTION OF AIRSPACE) REGULATIONS 1996:**

**Proposed Activity:** Building Construction: Multi-storey buildings

**Location:** 130-150 Bunnerong Road, Pagewood NSW

**Proponent:** Meriton Group

I refer to the application from City of Botany Bay, received by the Department on 6 July 2015 from Sydney Airport Corporation Ltd (SACL). This application sought an approval under the Airports (Protection of Airspace) Regulations 1996 (the Regulations) for a property development at 130-150 Bunnerong Road, Pagewood NSW, into airspace which, under the Regulations, is prescribed airspace for Sydney Airport. The Department approved the proposal on 19 November 2015, based on the masterplan for the project, with conditions.

However, Meriton Group has subsequently sought clarification of the scope of the 2015 approval in the context of detailed planning processes with Bayside Council for the buildings within the masterplan. The Department then sought clarification from the Civil Aviation Safety Authority (CASA) and it provided advice regarding the controlled activity and its recommendations regarding mitigation. CASA confirmed its previous recommendation that the four most prominent buildings must be lit, and clarified that all the other buildings within the masterplan area do not require lighting.

'Prescribed airspace' includes 'the airspace above any part of either an Obstacle Limitation Surface (OLS) or Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surface for the airport' (see subregulation 6(1)).

1

The Inner Horizontal Surface of the OLS above this site is at a height of 51 metres Australian Height Datum (AHD) and hence prescribed airspace above the site commences at 51 metres. At a maximum height of 91 metres AHD, the buildings will penetrate the OLS by up to 40 metres.

Accordingly, the proposed construction of the buildings would constitute a "controlled activity" under Section 182 of the *Airports Act 1996* (the Act). Section 183 of the Act requires that controlled activities cannot be carried out without approval. Details of the penetrations of prescribed airspace are provided in **Table 1**.

**Table 1:** Maximum height and location of the proposed buildings at the site that will intrude into prescribed airspace for Sydney Airport

| Activity | Location | Maximum height (AHD) | Penetration of prescribed airspace (AHD) |
|---|---|---|---|
| Buildings | 130-150 Bunnerong Road, Pagewood<br>Block Numbers set out in the Masterplan:<br>UB1<br>UB2<br>UB3<br>UB4<br>UB5W<br>UB5C<br>UB5E | Up to 91 metres | Up to 40 metres |

Regulation 14 provides that a proposal to carry out a controlled activity must be approved unless carrying out the controlled activity would interfere with the safety, efficiency or regularity of existing or future air transport operations into or out of the airport concerned. Paragraph 14(1)(b) provides that an approval may be granted subject to conditions.

Under the Regulations, the Secretary is empowered to make decisions in relation to the approval of controlled activities, and the imposition of conditions on approvals. I have been delegated the Secretary's powers under the Regulations.

**Decision**

In making my decision, I have taken into consideration the opinions of Meriton, advice from the Civil Aviation Safety Authority of 19 January 2017, Airservices Australia advice SY-CA-197 P2 and SACL.

In accordance with Regulation 14, **I approve** the controlled activity of the intrusion of multi-storey buildings at 130-150 Bunnerong Road, Pagewood NSW, within the blocks identified in Table 1, into prescribed airspace for Sydney Airport to a **maximum height of 91 metres AHD**.

2

In accordance with this Regulation 14(1)(b), I **impose the following conditions on my approval**:

1. The buildings must **not exceed** a maximum height of **91 metres AHD**, inclusive of all lift over-runs, vents, chimneys, aerials, antennas, lightning rods, any roof top garden plantings, exhaust flues etc.
2. Buildings B3 and B6 in Urban Block UB5C and buildings A3 and A6 in Urban Block UB5W **must** be obstacle lit by low intensity steady red lighting during darkness at the highest point of the building. Obstacle lights are to be arranged so as to at least indicate the points or edges of the building to ensure the building can be observed in a 360° radius as per subsection 9.4.3 of the Manual of Standards Part 139-Aerodromes (MOS Part 139). Characteristics for low intensity lights are stated in subsection 9.4.6 of MOS Part 139.
3. The proponent **must** ensure obstacle lighting arrangements have a remote monitoring capability, in lieu of observation every 24 hours, to alert SACL reporting staff of any outage. For detailed requirements for obstacle monitoring within the OLS of an aerodrome, refer to subsection 9.4.10 of the MOS Part 139.
4. Separate approval **must be sought** under the Regulations for any cranes required to construct the buildings. Construction cranes may be required to operate at a height significantly higher than that of the proposed controlled activity and consequently, may not be approved under the Regulations. Therefore it is advisable that approval to operate construction equipment (i.e. cranes) should be obtained prior to any commitment to construct.
5. At the completion of the construction of the buildings, a certified surveyor is to notify (in writing) the airfield design manager of the finished height of the buildings.

**Breaches of approval conditions are subject to significant penalties** under sections 185 and 187 of the Act.

Yours sincerely

Craig Downsborough
Director
Airspace Protection
Aviation Environment
Aviation and Airports Division

23 January 2017

3

# Appendix C

## Assessment Methodology

In preparing aeronautical impact assessments associated with airport safeguarding and protection, it is necessary to observe the requirements of the relevant aviation authorities including:

- The Department of Infrastructure and Regional Development (DIRD);
- The Civil Aviation Safety Authority of Australia (CASA);
- Airservices Australia (ASA);
- Airport Operators; and
- Department of Defence where appropriate.

The *Airports Act 1996* and *Airports (Protection of Airspace) Regulations 1996* prescribes the volumes of airspace surrounding Federally Leased Airports that protect aircraft operations into those airports, in order to ensure the safety and regularity of airline and other flight operations.

Sydney Airport's Prescribed Airspace comprises:

- Obstacle Limitation Surfaces (OLS) that restrict obstacle growth in the vicinity of takeoff and landing paths; and
- PANS OPS surfaces that provide a buffer between flight paths and terrain or obstacles.

Relevant Acts and Regulations applicable to developments near airports and air traffic routes were referenced during this assessment.

The major relevant documents include:

- The Airports Act 1996, Airports (Protection of Airspace) Regulations 1996;
- Civil Aviation Safety Regulation (CASR) Part 139 Manual of Standards – Aerodromes;
- Aeronautical Information Publication (AIP);
- Airservices Australia's Airways Engineering Instruction – Navigation Aid Building Restricted Areas and Siting Guidance (BRA);
- International Civil Aviation Organisation (ICAO) DOC 8168 Procedures for Air Navigation – Aircraft Operations (PANS OPS).

A Glossary of Aeronautical Terms and Abbreviations is shown at Appendix C.

# Appendix D

## Glossary of Aeronautical Terms and Abbreviations

To facilitate the understanding of aviation terminology used in this report, the following is a glossary of terms and acronyms that are commonly used in aeronautical impact assessments and similar aeronautical studies.

**AC** (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

**Aeronautical study** is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

**AIPs** (Aeronautical Information Publications) are publications promulgated to provide operators with aeronautical information of a lasting character essential to air navigation. They contain details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, AIP is issued by Airservices Australia on behalf of CASA.

**Air routes** exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under IFR.

**Airservices Australia** is the Australian government-owned corporation providing safe and environmentally sound air traffic management and related airside services to the aviation industry.

**Altitude** is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

**ATC** (Air Traffic Control) service is a service provided for the purpose of:

a. preventing collisions:
    1. between aircraft; and
    2. on the manoeuvring area between aircraft and obstructions; and
b. expediting and maintaining an orderly flow of air traffic.

**CASA (**Civil Aviation Safety Authority) is the Australian government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation safety standards. As Australia is a signatory to the ICAO *Chicago Convention,* CASA adopts the standards and recommended practices established by ICAO, except where a difference has been notified.

**CASR** (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework *(Regulations)* within which all service providers must operate.

***Civil Aviation Act 1988*** (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

**ICAO** (International Civil Aviation Organization) is an agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation. In addition, the ICAO defines the protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention*.

**IFR** (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR are established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. It is also referred to as, "a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying," such as an IFR or VFR flight plan. Pilots must hold IFR qualifications and aircraft must be suitably equipped with appropriate instruments and navigation aids to enable flight in IMC.

**IMC** (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

**LSALT** (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

**MOS** (Manual of Standards) comprises specifications (Standards) prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

**NOTAMs** (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.

**Obstacles.** All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

**OLS (**Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

**PANS OPS** (Procedures for Air Navigation Services - Aircraft Operations) is an Air Traffic Control term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under Instrument Meteorological Conditions (IMC) or Instrument Flight Rules (IFR). ICAO document 8168-OPS/611 (volumes 1 and 2) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS OPS may vary from country to country.

**PANS OPS Surfaces.** Similar to an Obstacle Limitation Surface, the PANS OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to infringe the OLS, they cannot be permitted to infringe any PANS OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

**Prescribed airspace** is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

**Radar Terrain Clearance Chart (RTCC)** is a chart that provides air traffic controllers with the lowest usable altitude that they can vector an aircraft using prescribed surveillance procedures within controlled airspace. There is a protection surface below this usable altitude which is shown in airport master plans.

**Regulations** (Civil Aviation Safety Regulations)

**VFR** (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use instrument flight rules. Pilots must be specifically qualified and aircraft specifically equipped to enable flight in IMC,

**VMC** (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal or better than specified minima.

## Abbreviations

Abbreviations used in this report, and the meanings assigned to them for the purposes of this report are detailed in the following table.

| Abbreviation | Meaning |
|---|---|
| AC | Advisory Circular (document support CAR 1998) |
| ACFT | Aircraft |
| AD | Aerodrome |
| ADS-B | Automatic Dependent Surveillance - Broadcast |
| AHD | Australian Height Datum |
| AIP | Aeronautical Information Publication |
| Airports Act | Airports Act 1996, as amended |
| AIS | Aeronautical Information Service |
| ALT | Altitude |
| AMSL | Above Mean Sea Level |
| APARs | Airports (Protection of Airspace) Regulations, 1996 as amended |
| ARP | Aerodrome Reference Point |
| AsA | Airservices Australia |
| ATC | Air Traffic Control(ler) |
| ATM | Air Traffic Management |
| BARO-VNAV | Barometric Vertical Navigation criteria |
| BRA | Building Restricted Area |
| CAO | Civil Aviation Order |
| CAR | Civil Aviation Regulation |
| CASA | Civil Aviation Safety Authority |
| CASR | Civil Aviation Safety Regulation |
| Cat | Category |
| DAP | Departure and Approach Procedures (charts published by AsA) |
| DER | Departure End of (the) Runway |
| DME | Distance Measuring Equipment |
| Doc nn | ICAO Document Number nn |
| DIT | Department of Infrastructure and Transport. (Formerly Dept. of Infrastructure, Transport, Regional Development and Local Government and Department of Transport and Regional Services (DoTARS)) |
| DOTARS | See DIT above |
| ELEV | Elevation (above mean sea level) |
| ENE | East North East |
| ERSA | Enroute Supplement Australia |
| FAF | Final Approach Fix |

| Abbreviation | Meaning |
|---|---|
| FAP | Final Approach Point |
| FAS | Final Approach Segment of a BARO-VNAV approach |
| ft | feet |
| GBAS | Ground Based Augmentation System (satellite precision landing system) |
| GNSS | Global Navigation Satellite System |
| GP | Glide Path |
| IAS | Indicated Airspeed |
| ICAO | International Civil Aviation Organisation |
| IHS | Inner Horizontal Surface, an Obstacle Limitation Surface |
| ILS | Instrument Landing System |
| ISA | International Standard Atmosphere |
| km | kilometres |
| kt | Knot (one nautical mile per hour) |
| LAT | Latitude |
| LLZ | Localizer |
| LNAV | Lateral Navigation criteria |
| LONG | Longitude |
| m | metres |
| MAPt | Missed Approach Point |
| MDA | Minimum Descent Altitude |
| MGA94 | Map Grid Australia 1994 |
| MOC | Minimum Obstacle Clearance |
| MOS | Manual of Standards, published by CASA |
| MSA | Minimum Sector Altitude |
| MVA | Minimum Vector Altitude |
| NASAG | National Airports Safeguarding Advisory Group |
| NDB | Non Directional Beacon |
| NE | North East |
| NM | Nautical Mile (= 1.852 km) |
| nnDME | Distance from the DME (in nautical miles) |
| NNE | North North East |
| NOTAM | NOtice to AirMen |
| OAS | Obstacle Assessment Surface |
| OCA | Obstacle Clearance Altitude |
| OCH | Obstacle Clearance Height |
| OHS | Outer Horizontal Surface |
| OIS | Obstacle Identification Surface |

| Abbreviation | Meaning |
|---|---|
| OLS | Obstacle Limitation Surface |
| PANS OPS | Procedures for Air Navigation Services – Aircraft Operations, ICAO Doc 8168 |
| PBN | Performance Based Navigation |
| PRM | Precision Runway Monitor |
| QNH | An altimeter setting relative to height above mean sea level |
| REF | Reference |
| RL | Relative Level |
| RNAV | aRea NAVigation |
| RNP | Required Navigation Performance |
| RPA | Rules and Practices for Aerodromes<br>— replaced by the MOS Part 139 — Aerodromes |
| RPT | Regular Public Transport |
| RTCC | Radar Terrain Clearance Chart |
| RWY | Runway |
| SFC | Surface |
| SID | Standard Instrument Departure |
| SOC | Start Of Climb |
| STAR | STandard ARrival |
| SGHAT | Solar Glare Hazard Analysis Tool |
| TAR | Terminal Approach Radar |
| TAS | True Air Speed |
| THR | Threshold (Runway) |
| TNA | Turn Altitude |
| TODA | Take-Off Distance Available |
| VNAV | Vertical Navigation Criteria |
| $V_n$ | aircraft critical Velocity reference |
| VOR | Very high frequency Omni directional Range |
| WAC | World Aeronautical Chart |
| | |

# APPENDIX J PROPOSED LEP MAPPING

J1Exhibition Material received from applicant (Meriton)_Appendix J1 Zone Map



J2Exhibition Material received from applicant (Meriton)_Appendix J2 - Proposed Height of Building Map



J3Exhihiition Material received from applicant (Meriton)_Appendix J3



# APPENDIX K COMPLYING DEVELOPMENT CERTIFICATE

# COMPLYING DEVELOPMENT CERTIFICATE

## NO.1423.92-01-2018-CDC

## 23 July 2018

| | |
|---|---|
| DESCRIPTION | *Demolition of existing industrial building* |
| PROPERTY | *128 Bunnerong Road, Pagewood* |

This certificate is issued by a Certifying Authority and gives the applicant permission to carry out the development in accordance with any conditions set out in the certificate and the plans and specifications that have been approved.

## 1. DETAILS OF THE APPLICANT

MR ☐ MS ☐ MRS ☐ DR ☐ COMPANY ☒ OTHER ☐

| | | | | | |
|---|---|---|---|---|---|
| APPLICANT | *Karimbla Constructions Services (NSW) Pty Ltd* | | | | |
| ADDRESS | *Level 11, Meriton Tower, 528 Kent Street* | | | | |
| SUBURB | *Sydney* | STATE | *NSW* | POSTCODE | *2000* |
| POSTAL | *As above* | | | | |
| MOBILE | *0477 991 805* | EMAIL | *eliasm@meriton.com.au* | | |

DATE APPLICATION RECEIVED *18/02/2016*

## 2. OWNERS DETAILS

MR ☐ MS ☐ MRS ☐ DR ☐ COMPANY ☒ OTHER ☐

| | | | | | |
|---|---|---|---|---|---|
| OWNER | *Karimbla Properties (No.39) Pty Ltd* | | | | |
| ADDRESS | *Level 11, Meriton Tower, 528 Kent Street* | | | | |
| SUBURB | *Sydney* | STATE | *NSW* | POSTCODE | *2000* |
| POSTAL | *As above* | | | | |

## 3. DETAILS OF THE LAND TO BE DEVELOPED

| | | | | | |
|---|---|---|---|---|---|
| ADDRESS | *128 Bunnerong Road* | | | | |
| SUBURB | *Pagewood* | STATE | *NSW* | POSTCODE | *2035* |
| LOT NO. | *1* | DP/MPS NO. | *1187426* | | |



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Sutherland Shire A: Suite 20, Level 1 Regus, 29 Kiora Road, Miranda NSW 2228
P: (02) 9571 8433 E: admin@aedconsulting.com.au
W: www.aedconsulting.com.au ABN: 15 149 587 495

FILE NUMBER: 1423.92-01-2018-CDC

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BCA CLASSIFICATION/s *N/A – demolition only* ASSESSED UNDER BCA *N/A – demolition only*

APPROVED USE *N/A* LAND USE ZONE *1N1 General Industrial*

APPLICATION MADE UNDER THE FOLLOWING PLANNING INSTRUMENT

*State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*

## 4. DESCRIPTION OF THE WORK PROPOSED

TYPE OF WORK PROPOSED:

☒ BUILDING

☐ SUBDIVISION

DESCRIPTION OF THE WORK:

*Demolition of existing industrial building*

ESTIMATED VALUE OF THE WORK:

*$500,000.00*

## 5. DECISION OF THE CERTIFYING AUTHORITY

☒ APPROVED

☐ REFUSED (if refused provide reason/s)

Works approved under this complying development certificate:

*Demolition of existing industrial building*

CERTIFICATE DATE: *23/07/2018*

DATE CERTIFICATE WILL EXPIRE: *24/07/2023*

This certificate is issued:

☒ subject to the conditions listed in **Attachment A**

Endorsement of Plans:

The issue of this certificate has been endorsed on the plans and specifications that were lodged with the application.



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Plan No/Specifications Approved

***AT&L***

| | Title | Drawing No. | Revision | Date |
|---|---|---|---|---|
| 1. | Marked up Demolition Plan | C003 | N | 10/12/15 |

## 6. INFORMATION ATTACHED TO THIS DECISION

| | Document | Issued By | | Date |
|---|---|---|---|---|
| 1. | Application for Complying Development Certificate | Karimbla Constructions Services (NSW) Pty Ltd | | 18/02/16 |
| 2. | Section 149 Planning Certificate No.2015/7434 | City of Botany Bay Council | | 04/01/16 |
| 3. | Existing Underground Services Plans Job No.6633715 | Dial Before You Dig | | 23/08/13 |
| 4. | Survey Plan Ref.124815 | JBW Surveyors P/l | | 08/09/14 |
| 5. | Existing Site Survey Plans | JBW Surveyors | | |
| | Title | Drawing No. | Revision | Date |
| | 1. Sheet 1 | A-101 | --- | 04/03/14 |
| | 2. Sheet 2 | A-102 | --- | 04/03/14 |
| | 3. Sheet 3 | A-103 | --- | 04/03/14 |
| | 4. Sheet 4 | A-104 | --- | 04/03/14 |
| | 5. Sheet 5 | A-105 | --- | 04/03/14 |
| | 6. Sheet 6 | A-106 | --- | 04/03/14 |
| 6. | Demolition Company's Demolition Statement re Conditions 7.1 & 7.3 | Earthworx Grop | | 19/07/18 |
| 7. | Sediment Control Plan No. E-3000-CS Rev.A | Karimbla Construction Services (NSW) P/L | | March 2017 |
| 8. | Record of Inspection – Pre-CDC | AED (Trenton Jones) | | 18/07/18 |

## 7. CERTIFICATION

*I, Trenton Jones, for AED,*

Certify that:

☒ The approved development is a complying development and (if carried out as specified in this certificate) will comply with all development standards applicable to the development and with such other requirements prescribed by the Environmental Planning & Assessment Regulation 2000.

COMPLYING DEVELOPMENT CERTIFICATE NO. ***1423.92-01-2018-CDC***

DATE ***23/07/2018***



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## 8. SIGNATURE

For this certificate to be valid, it must be signed by the certifying Authority.

SIGNATURE 

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NAME | *Trenton Jones, for AED* | | | | | | |
| ADDRESS | *Suite 3.04, 55 Miller Street* | | | | | | |
| SUBURB | *Pyrmont* | | STATE | *NSW* | POSTCODE | *2009* | |
| TELEPHONE | *(02) 9571 8433* | MOBILE | *0430 754 888* | | EMAIL | *trenton@aedconsulting.com.au* | |
| ACCREDITATION BODY OF THE CERTIFIER | *Department of Planning – Building Professionals Board (BPB)* | | | | | | |
| ACCREDITATION NO. OF THE CERTIFIER | *BPB0203* | | | | | | |



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**Required Inspections for this Project**

| INSPECTION NO. | REQUIRED ☒ | INSPECTION TYPE | TO BE INSPECTED BY |
|---|---|---|---|
| 1. | ☒ | **Prior to issue of CC/CDC**<br>(for existing buildings and all complying development) | AED (PCA) |
| 2. | ☒ | **Final inspection**<br>(after the building work has been completed and prior to occupation) | AED (PCA) |



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## Division 2A Conditions of complying development certificate

### 136A Compliance with Building Code of Australia and insurance requirements under the Home Building Act 1989 (cf clauses 78 and 78A of EP&A Regulation 1994)

(1) A complying development certificate for development that involves any building work must be issued subject to the following conditions:

(a) that the work must be carried out in accordance with the requirements of the *Building Code of Australia*,

(b) in the case of residential building work for which the *Home Building Act 1989* requires there to be a contract of insurance in force in accordance with Part 6 of that Act, that such a contract of insurance must be entered into and be in force before any building work authorised to be carried out by the certificate commences.

(1A) A complying development certificate for a temporary structure that is used as an entertainment venue must be issued subject to the condition that the temporary structure must comply with Part B1 and NSW Part H102 of Volume One of the *Building Code of Australia* (as in force on the date the application for the relevant complying development certificate is made).

(2) This clause does not limit any other conditions to which a complying development certificate may be subject, as referred to in section 4.28 (6) (a) of the Act.

(3) This clause does not apply:

(a) to the extent to which an exemption is in force under clause 187 or 188, subject to the terms of any condition or requirement referred to in clause 187 (6) or 188 (4), or

(b) to the erection of a temporary building, other than a temporary structure that is used as an entertainment venue.

(4) In this clause, a reference to the *Building Code of Australia* is a reference to that Code as in force on the date the application for the relevant complying development certificate is made.

*Note. There are no relevant provisions in the Building Code of Australia in respect of temporary structures that are not entertainment venues.*

### 136AA Condition relating to fire safety systems in class 2–9 buildings

(1) A complying development certificate for building work involving the installation, extension or modification of any relevant fire safety system in a class 2, 3, 4, 5, 6, 7, 8 or 9 building, as defined in the *Building Code of Australia*, must be issued subject to the condition required by this clause.

(2) The condition required by this clause is that the building work involving the installation, modification or extension of the relevant fire safety system cannot commence unless:

(a) plans have been submitted to the principal certifying authority that show:

(i) in the case of building work involving the installation of the relevant fire safety system—the layout, extent and location of key components of the relevant fire safety system, or

(ii) in the case of building work involving the modification or extension of the relevant fire safety system—the layout, extent and location of any new or modified components of the relevant fire safety system, and

(b) specifications have been submitted to the principal certifying authority that:

(i) describe the basis for design, installation and construction of the relevant fire safety system, and

(ii) identify the provisions of the *Building Code of Australia* upon which the design of the system is based, and

(c) those plans and specifications:

(i) have been certified by a compliance certificate referred to in section 6.4 (e) of the Act as complying with the relevant provisions of the *Building Code of Australia*, or

(ii) unless they are subject to an exemption under clause 164B, have been endorsed by a competent fire safety practitioner as complying with the relevant provisions of the *Building Code of Australia*, and

(d) if those plans and specifications were submitted before the complying development certificate was issued—each of them was endorsed by the certifying authority with a statement that the certifying authority is satisfied that it correctly identifies both the performance requirements and the deemed-to-satisfy provisions of the *Building Code of Australia*, and

(e) if those plans and specifications were not submitted before the complying development certificate was issued—each of them was endorsed by the principal certifying authority with a statement that the principal certifying authority is satisfied that it correctly identifies both the performance requirements and the deemed-to-satisfy provisions of the *Building Code of Australia*.

(3) In this clause:

relevant fire safety system means any of the following:

(a) a hydraulic fire safety system within the meaning of clause 165,

(b) a fire detection and alarm system,

(c) a mechanical ducted smoke control system.

### 136AB Notice to neighbours

(1) A complying development certificate for development on land that is in a category 1 local government area and that is not in a residential release area and that involves:

(a) a new building, or

(b) an addition to an existing building, or

(c) the demolition of a building,

must be issued subject to a condition that the person having the benefit of the complying development certificate must give at least 7 days' notice in writing of the person's intention to commence the work authorised by the certificate to the occupier of each dwelling that is located on a lot that has a boundary within 20 metres of the boundary of the lot on which the work is to be carried out.

(2) A complying development certificate for development on land that is in a category 2 local government area or a



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AE&D Pty Ltd A: Suite 3.04, 55 Miller Street, Pyrmont NSW 2009
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residential release area and that involves:

(a) a new building, or

(b) an addition to an existing building, or

(c) the demolition of a building,

must be issued subject to a condition that the person having the benefit of the complying development certificate must give at least 2 days' notice in writing of the person's intention to commence the work authorised by the certificate to the occupier of each dwelling that is located on a lot that has a boundary within 20 metres of the boundary of the lot on which the work is to be carried out.

(3) In this clause:

***category 1 local government area*** means any of the local government areas of Ashfield, City of Auburn, City of Bankstown, City of Blacktown, City of Blue Mountains, City of Botany Bay, Burwood, Camden, City of Campbelltown, Canada Bay, City of Canterbury, City of Fairfield, City of Hawkesbury, City of Holroyd, Hornsby, Hunter's Hill, City of Hurstville, City of Kogarah, Ku-ring-gai, Lane Cove, Leichhardt, City of Liverpool, Manly, Marrickville, Mosman, North Sydney, City of Parramatta, City of Penrith, Pittwater, City of Randwick, City of Rockdale, City of Ryde, Strathfield, Sutherland Shire, City of Sydney, The Hills Shire, Warringah, Waverley, City of Willoughby, Wingecarribee, Wollondilly or Woollahra.

***category 2 local government area*** means any local government area that is not a category 1 local government area.

***residential release area*** means any land within:

(a) an urban release area identified within a local environmental plan that adopts the applicable mandatory provisions of the Standard Instrument, or

(b) a land release area identified under the *Eurobodalla Local Environmental Plan 2012*, or

(c) any land subject to *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*, or

(d) any area included in Parts 6, 26, 27, 28 and 29 of Schedule 3 to *State Environmental Planning Policy (Major Development) 2005*.

**136B Erection of signs**

(1) A complying development certificate for development that involves any building work, subdivision work or demolition work must be issued subject to a condition that the requirements of subclauses (2) and (3) are complied with.

(2) A sign must be erected in a prominent position on any site on which building work, subdivision work or demolition work is being carried out:

(a) showing the name, address and telephone number of the principal certifying authority for the work, and

(b) showing the name of the principal contractor (if any) for any building work and a telephone number on which that person may be contacted outside working hours, and

(c) stating that unauthorised entry to the site is prohibited.

(3) Any such sign is to be maintained while the building work, subdivision work or demolition work is being carried out, but must be removed when the work has been completed.

(4) This clause does not apply in relation to building work, subdivision work or demolition work that is carried out inside an existing building, that does not affect the external walls of the building.

(5) This clause does not apply in relation to Crown building work that is certified, in accordance with section 6.28 of the Act, to comply with the technical provisions of the State's building laws.

(6) This clause applies to a complying development certificate issued before 1 July 2004 only if the building work, subdivision work or demolition work involved had not been commenced by that date.

*Note. Principal certifying authorities and principal contractors must also ensure that signs required by this clause are erected and maintained (see clause 227A which currently imposes a maximum penalty of $1,100).*

**136C Notification of Home Building Act 1989 requirements**

(1) A complying development certificate for development that involves any residential building work within the meaning of the *Home Building Act 1989* must be issued subject to a condition that the work is carried out in accordance with the requirements of this clause.

(2) Residential building work within the meaning of the *Home Building Act 1989* must not be carried out unless the principal certifying authority for the development to which the work relates (not being the council) has given the council written notice of the following information:

(a) in the case of work for which a principal contractor is required to be appointed:

(i) the name and licence number of the principal contractor, and

(ii) the name of the insurer by which the work is insured under Part 6 of that Act,

(b) in the case of work to be done by an owner-builder:

(i) the name of the owner-builder, and

(ii) if the owner-builder is required to hold an owner-builder permit under that Act, the number of the owner-builder permit.

(3) If arrangements for doing the residential building work are changed while the work is in progress so that the information notified under subclause (2) becomes out of date, further work must not be carried out unless the principal certifying authority for the development to which the work relates (not being the council) has given the council written notice of the updated information.

(4) This clause does not apply in relation to Crown building work that is certified, in accordance with section 6.28 of the Act, to comply with the technical provisions of the State's building laws.

**136D Fulfilment of BASIX commitments**

(1) This clause applies to the following development:

(a) BASIX affected development,

(b) any BASIX optional development in relation to which a person has made an application for a complying development certificate that has been accompanied by a BASIX certificate or BASIX certificates (despite there being no obligation under clause 4A of Schedule 1 for it to be so accompanied).

(2) A complying development certificate for development to which this clause applies must be issued subject to a condition that the commitments listed in each relevant



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AE&D Pty Ltd A: Suite 3.04, 55 Miller Street, Pyrmont NSW 2009
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BASIX certificate for the development must be fulfilled.

**136E Development involving bonded asbestos material and friable asbestos material**

(1) A complying development certificate for development that involves building work or demolition work must be issued subject to the following conditions:

(a) work involving bonded asbestos removal work (of an area of more than 10 square metres) or friable asbestos removal work must be undertaken by a person who carries on a business of such removal work in accordance with a licence under clause 458 of the *Work Health and Safety Regulation 2011*,

(b) the person having the benefit of the complying development certificate must provide the principal certifying authority with a copy of a signed contract with such a person before any development pursuant to the complying development certificate commences,

(c) any such contract must indicate whether any bonded asbestos material or friable asbestos material will be removed, and if so, must specify the landfill site (that may lawfully receive asbestos) to which the bonded asbestos material or friable asbestos material is to be delivered,

(d) if the contract indicates that bonded asbestos material or friable asbestos material will be removed to a specified landfill site, the person having the benefit of the complying development certificate must give the principal certifying authority a copy of a receipt from the operator of the landfill site stating that all the asbestos material referred to in the contract has been received by the operator.

(2) This clause applies only to a complying development certificate issued after the commencement of this clause.

(3) In this clause, ***bonded asbestos material***, ***bonded asbestos removal work***, ***friable asbestos material*** and ***friable asbestos removal work*** have the same meanings as in clause 317 of the *Occupational Health and Safety Regulation 2001*.

*Note 1. Under clause 317 removal work refers to work in which the bonded asbestos material or friable asbestos material is removed, repaired or disturbed.*

*Note 2. The effect of subclause (1) (a) is that the development will be a workplace to which the Occupational Health and Safety Regulation 2001 applies while removal work involving bonded asbestos material or friable asbestos material is being undertaken.*

*Note 3. Information on the removal and disposal of asbestos to landfill sites licensed to accept this waste is available from the Office of Environment and Heritage.*

*Note 4. Demolition undertaken in relation to complying development under the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 must be carried out in accordance with Australian Standard AS 2601—2001, Demolition of structures.*

**136F, 136G (Repealed)**

**136H Condition relating to shoring and adequacy of adjoining property**

(1) A complying development certificate for development must be issued subject to a condition that if the development involves an excavation that extends below the level of the base of the footings of a building, structure or work (including any structure or work within a road or rail corridor) on adjoining land, the person having the benefit of the certificate must at the person's own expense:

(a) protect and support the building, structure or work from possible damage from the excavation, and

(b) where necessary, underpin the building, structure or work to prevent any such damage.

(2) The condition referred to in subclause (1) does not apply if the person having the benefit of the complying development certificate owns the adjoining land or the owner of the adjoining land has given consent in writing to that condition not applying.

**136I Traffic generating development**

If an application for a complying development certificate is required to be accompanied by a certificate of Roads and Maritime Services as referred to in clause 4 (1) (j1) or (k) of Schedule 1, the complying development certificate must be issued subject to a condition that any requirements specified in the certificate of Roads and Maritime Services must be complied with.

**136J Development on contaminated land**

(1) If an application for a complying development certificate is required to be accompanied by a statement of a qualified person as referred to in clause 4 (1) (l) of Schedule 1, the complying development certificate must be issued subject to a condition that any requirements specified in the statement must be complied with.

(2) Subclause (1) does not apply to complying development carried out under the complying development provisions of *State Environmental Planning Policy (Three Ports) 2013* in the Lease Area within the meaning of clause 4 of that Policy.

**136K When complying development certificates must be subject to section 4.28 (9) condition**

(1) This clause applies if a council's contributions plan provides for the payment of a monetary section 7.11 contribution or section 7.12 levy in relation to development for a particular purpose (whether or not it is classed as complying development under the contributions plan).

(2) The certifying authority must issue the relevant complying development certificate authorising development for that purpose subject to a condition requiring payment of such contribution or levy, as required by section 4.28 (9) of the Act.

(3) Subclause (2) applies despite any provision to the contrary in the council's contributions plan.

**136L Contributions and levies payable under section 4.28 (9) must be paid before work commences**

(1) A complying development certificate issued subject to a condition required by section 4.28 (9) of the Act must be issued subject to a condition that the contribution or levy must be paid before any work authorised by the certificate commences.

(2) Subclause (1) applies despite any provision to the contrary in the council's contributions plan.

**136M Condition relating to payment of security**

(1) This clause applies to a complying development certificate authorising the carrying out of development if:

(a) the development is demolition of a work or building, erection of a new building or an addition to an existing building and the estimated cost of the development (as specified in the application for the certificate) is $25,000 or more, and

(b) the development is to be carried out on land adjacent to a public road, and



AEDGROUP
AE&D Pty Ltd A: Suite 3.04, 55 Miller Street, Pyrmont NSW 2009
Southern Highlands A: Unit 10, 19 Lyell Street, Mittagong NSW 2575
Sutherland Shire A: Suite 20, Level 1 Regus, 29 Kiora Road, Miranda NSW 2228
P: (02) 9571 8433 E: admin@aedconsulting.com.au
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(c) at the time the application for the certificate is made, there is specified on the website of the council for the area in which the development is to be carried out an amount of security determined by the council that must be paid in relation to:

(i) development of the same type or description, or

(ii) development carried out in the same circumstances, or

(iii) development carried out on land of the same size or description.

(2) A complying development certificate to which this clause applies must be issued subject to a condition that the amount of security referred to in subclause (1) is to be provided, in accordance with this clause, to the council before any building work or subdivision work authorised by the certificate commences.

(3) The security may be provided, at the applicant's choice, by way of:

(a) deposit with the council, or

(b) a guarantee satisfactory to the council.

(4) The funds realised from a security may be paid out to meet the cost of making good any damage caused to any property of the council as a consequence of doing anything (or not doing anything) authorised or required by the complying development certificate, including the cost of any inspection to determine whether damage has been caused.

(5) Any balance of the funds realised from a security remaining after meeting the costs referred to in subclause (4) is to be refunded to, or at the direction of, the person who provided the security.

**136N Principal certifying authority to be satisfied that preconditions met before commencement of work**

(1) This clause applies to building work or subdivision work that is the subject of a complying development certificate.

(2) A principal certifying authority for building work or subdivision work to be carried out on a site, and over which the principal certifying authority has control, is required to be satisfied that any preconditions in relation to the work and required to be met before the work commences have been met before the work commences.

## Schedule 9 Conditions applying to complying development certificates under the Demolition Code

(Clause 7.3)

*Note 1. Complying development under the Demolition Code must comply with the requirements of the Act, the Environmental Planning and Assessment Regulation 2000 and the conditions listed in this Schedule.*

*Note 2. Division 2A of Part 7 of the Environmental Planning and Assessment Regulation 2000 specifies conditions to which certain complying development certificates are subject.*

*Note 3. In addition to the requirements specified for development to be complying development under this Policy, adjoining owners' property rights, applicable common law and other legislative requirements for approvals, licences, permits and authorities still apply.*

*Note 4. If the development is in the proximity of infrastructure (including water, stormwater or sewer mains, electricity power lines and telecommunications facilities), the relevant infrastructure authority should be contacted before commencing the development.*

*Note 5. Under section 4.29 of the Environmental Planning and Assessment Act 1979 a complying development certificate lapses 5 years after the date endorsed on the certificate, unless the development has physically commenced on the land during that period.*

### Part 1 Conditions applying before works commence

**1 Protection of adjoining areas**

A temporary hoarding or temporary construction site fence must be erected between the work site and adjoining lands before the works begin, and must be kept in place until after the completion of works, if the works:

(a) could cause a danger, obstruction or inconvenience to pedestrian or vehicular traffic, or

(b) could cause damage to adjoining lands by falling objects, or

(c) involve the enclosure of a public place or part of a public place.

*Note. Clauses 2.67 and 2.68 of this Policy specify which scaffolding, hoardings and temporary construction site fences are exempt development and state the applicable standards for that development.*

**2 Toilet facilities**

(1) Toilet facilities must be available or provided at the work site before works begin, and must be maintained until the works are completed, at a ratio of one toilet plus one additional toilet for every 20 persons employed at the site.

(2) Each toilet must:

(a) be a standard flushing toilet connected to a public sewer, or

(b) have an on-site effluent disposal system approved under the Local Government Act 1993, or

(c) be a temporary chemical closet approved under the Local Government Act 1993.

**3 Waste management**

(1) A waste management plan for the work must be prepared before work commences on the site.

(2) The waste management plan must:

(a) identify all waste (including excavation, demolition and construction waste material) that will be generated by the work on the site, and

(b) identify the quantity of waste material, in tonnes and cubic metres, to be:

(i) reused on-site, and

(ii) recycled on-site and off-site, and

(iii) disposed of off-site, and

(c) if waste material is to be reused or recycled on-site—specify how the waste material will be reused or recycled on-site, and

(d) if waste material is to be disposed of or recycled off-site—specify the contractor who will be transporting the material and the waste facility or recycling outlet to which the material will be taken.

(3) A garbage receptacle must be provided at the work site before works begin and must be maintained until the works are completed.

(4) The garbage receptacle must have a tight fitting lid and be suitable for the reception of food scraps and papers.

**4 Adjoining wall dilapidation report**

(1) If a building to be demolished is within 900mm of a boundary, and there is a wall (the ***adjoining wall***) on the lot adjoining that boundary that is less than 900mm from that boundary, the person having the benefit of the complying development certificate must obtain a dilapidation report on the adjoining wall.



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AE&D Pty Ltd A: Suite 3.04, 55 Miller Street, Pyrmont NSW 2009
Southern Highlands A: Unit 10, 19 Lyell Street, Mittagong NSW 2575
Sutherland Shire A: Suite 20, Level 1 Regus, 29 Kiora Road, Miranda NSW 2228
P: (02) 9571 8433 E: admin@aedconsulting.com.au
W: www.aedconsulting.com.au ABN: 15 149 587 495

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(2) If the person preparing the report is denied access to the adjoining lot for the purpose of inspecting the adjoining wall, the report may be prepared from an external inspection of the adjoining wall.

**5 Run-off and erosion controls**

Run-off and erosion controls must be implemented to prevent soil erosion, water pollution or the discharge of loose sediment on the surrounding land by:

(a) diverting uncontaminated run-off around cleared or disturbed areas, and

(b) erecting a silt fence and providing any other necessary sediment control measures that will prevent debris escaping into drainage systems, waterways or adjoining properties, and

(c) preventing the tracking of sediment by vehicles onto roads, and

(d) stockpiling top soil, excavated materials, construction and landscaping supplies and debris within the lot.

## Part 2 Conditions applying during the works

*Note. The Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (Noise Control) Regulation 2008 contain provisions relating to noise.*

**6 Hours for demolition**

Demolition may only be carried out between 7.00 am and 5.00 pm on Monday to Saturday and no demolition is to be carried out at any time on a Sunday or a public holiday.

**7 Compliance with plans**

Works must be carried out in accordance with the plans and specifications to which the complying development certificate relates.

**8 Demolition**

Any demolition must be carried out in accordance with AS 2601—2001, *The demolition of structures*.

**9 Maintenance of site**

(1) All materials and equipment must be stored wholly within the work site unless an approval to store them elsewhere is held.

(2) Waste materials (including excavation, demolition and construction waste materials) must be managed on the site and then disposed of at a waste management facility.

(3) Copies of receipts stating the following must be given to the principal certifying authority:

(a) the place to which waste materials were transported,

(b) the name of the contractor transporting the materials,

(c) the quantity of materials transported off-site and recycled or disposed of.

(4) Any run-off and erosion control measures required must be maintained within their operating capacity until the completion of the works to prevent debris escaping from the site into drainage systems, waterways, adjoining properties and roads.

(5) During construction:

(a) all vehicles entering or leaving the site must have their loads covered, and

(b) all vehicles, before leaving the site, must be cleaned of dirt, sand and other materials, to avoid tracking these materials onto public roads.

(6) At the completion of the works, the work site must be left clear of waste and debris.

**10 Aboriginal objects discovered during excavation**

If an Aboriginal object (including evidence of habitation or remains) is discovered during the course of the work:

(a) all excavation or disturbance of the area must stop immediately, and

(b) the person making the discovery must advise the Chief Executive (within the meaning of the *National Parks and Wildlife Act 1974*) of the discovery in accordance with section 89A of that Act.

*Note. If an Aboriginal object is discovered, an Aboriginal heritage impact permit may be required under the National Parks and Wildlife Act 1974.*



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AE&D Pty Ltd A: Suite 3.04, 55 Miller Street, Pyrmont NSW 2009
Southern Highlands A: Unit 10, 19 Lyell Street, Mittagong NSW 2575
Sutherland Shire A: Suite 20, Level 1 Regus, 29 Kiora Road, Miranda NSW 2228
P: (02) 9571 8433 E: admin@aedconsulting.com.au
W: www.aedconsulting.com.au ABN: 15 149 587 495

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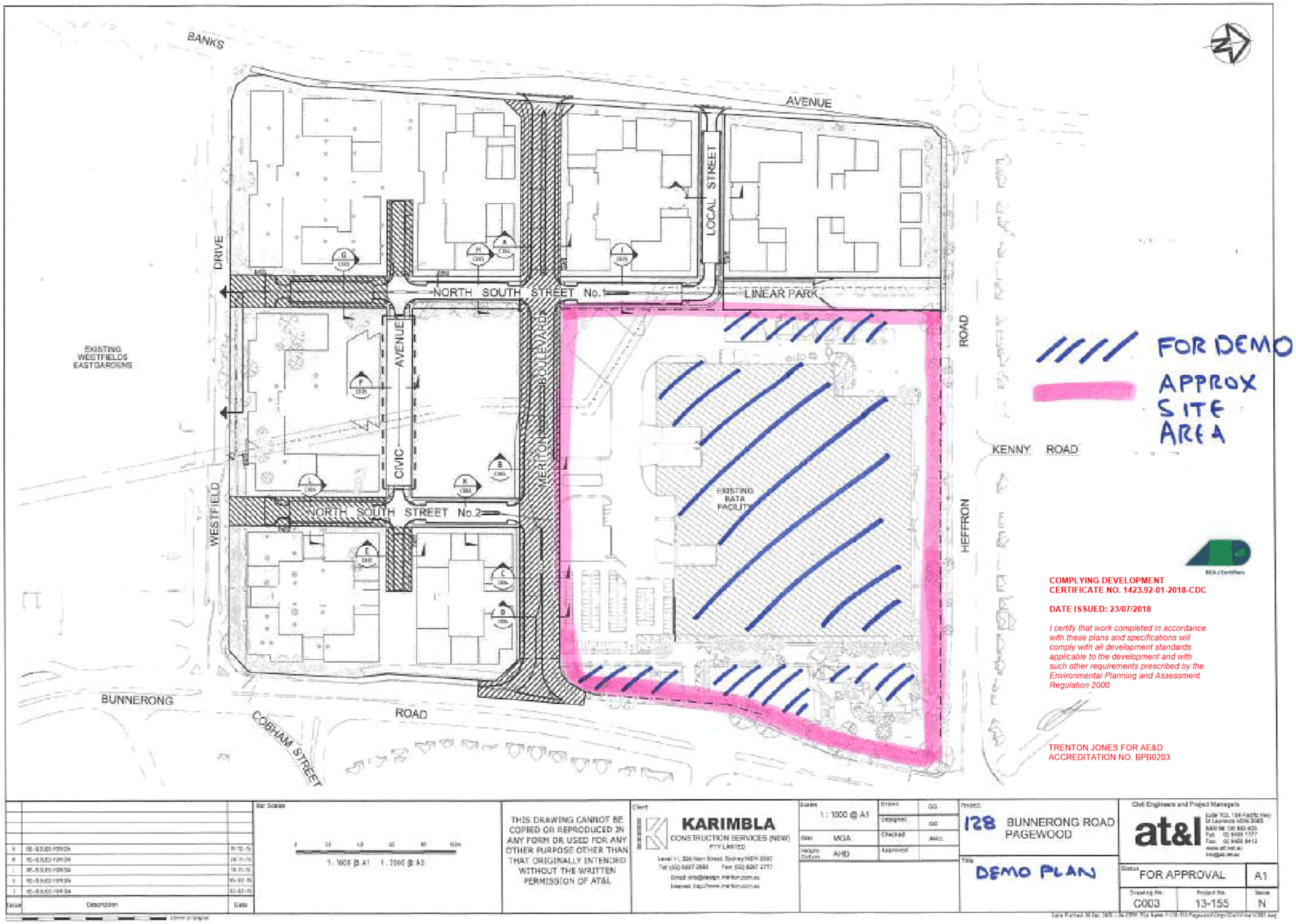
BANKS
AVENUE
DRIVE
NORTH SOUTH STREET No.1
LOCAL STREET
LINEAR PARK
ROAD
EXISTING WESTFIELDS EASTGARDENS
AVENUE
CIVIC
BOULEVARD
MERITON
WESTFIELD
NORTH SOUTH STREET No.2
EXISTING BATA FACILITY
HEFFRON
KENNY ROAD
BUNNERONG
ROAD
COBHAM STREET
FOR DEMO
APPROX SITE AREA
COMPLYING DEVELOPMENT
CERTIFICATE NO. 1423.92-01-2018-CDC
DATE ISSUED: 23/07/2018
I certify that work completed in accordance with these plans and specifications will comply with all development standards applicable to the development and with such other requirements prescribed by the Environmental Planning and Assessment Regulation 2000
TRENTON JONES FOR AE&D
ACCREDITATION NO. BPB0203
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# APPENDIX L HERITAGE IMPACT STATEMENT

# HERITAGE IMPACT STATEMENT

## 128 & 130-150 BUNNERONG ROAD, PAGEWOOD

URBIS

19 NOVEMBER 2018
PREPARED FOR KARIMBLA CONSTRUCTIONS

**URBIS STAFF RESPONSIBLE FOR THIS REPORT WERE:**

| | |
|---|---|
| Director, Heritage | Kate Paterson, B Arch, B Arts (Architecture), M.ICOMOS |
| Senior Consultant | Alexandria Barnier, B Des (Architecture), Grad. Dip. Heritage Conservation |
| Heritage Consultant | Gavin Patton, Dip PMgt, M HRMgt, M URP (Heritage) |

| | |
|---|---|
| Report Number | 01 Final to client – 30.10.18<br>02 Final to client – 08.11.18<br>03 Final to client – 19.11.18 |

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# EXECUTIVE SUMMARY

Urbis has been engaged by Karimbla Constructions to prepare the following Heritage Impact Statement for the subject site, 128 Bunnerong Road, Pagewood. Condition 1 (g) of the *Alteration of Gateway Determination* (ref PP_2017_BSIDE_007_00), dated 9 October 2018, requires an updated Heritage Impact Statement assessing the revised proposal.

The site previously formed part of a larger site which was constructed for General Motors Holden then from the 1980s was occupied by British American Tobacco Australasia (BATA) facility. BATA have since vacated the site and most of the site has been zoned and is under construction for a residential/mixed use precinct, in line with prevailing planning strategies.

The subject site has no associated heritage listings. The site is located in the general vicinity of Jellicoe Park (Item 155) and Harris Reserve (Item 66), both items of local heritage significance listed within Schedule 5 of the *Botany Bay Local Environmental Plan 2013 (LEP)*.

A comprehensive Heritage Impact Statement was completed by Urbis (March 2017) for the original planning proposal and it concluded that there would be no negative heritage impacts on the items in the nearby vicinity. This remains unchanged with the modified proposal.

The previous HIS also identified a number of built elements remaining on the site that have a degree of local heritage significance. These elements include the former Administration Building and the remnant original and distinctive fabric associated with the plant building pillars.

Subsequent to the above the client has liaised with Bayside Council who have no objection to the demolition of all buildings on the site. The site has subsequently received approval under complying development for the demolition of all existing buildings located on the site. A number of other modifications to the original planning proposal have also been approved.

This Heritage Impact Statement has been prepared to assess the potential heritage impact of the *revised proposal* on the site which does not retain any of the existing buildings on the site.

Due to the identification of heritage significance in the previous HIS, the below recommendations and mitigation measures are proposed for the revised proposal.

**Recommendations:**

To mitigate the heritage impacts on the site it is recommended that the following be undertaken prior to demolition:

1. Photographic archival of the Administration Building, Canteen Building and general vistas incorporating the remaining buildings and elements collectively.

2. Salvage Report, completed by a suitably qualified heritage specialist, to identify building materials, decorative elements and other items which should be salvaged for re-use prior to demolition.

An Interpretation Plan should be developed as part of the future development application which interprets the former industrial use of the site and specifically its connection to the Australian car manufacturing industry. Elements, salvaged from the site may be utilised in this interpretation plan.

It is recommended that the above recommendations and mitigation measures are implemented to mitigate heritage impacts on the site.

# 1. INTRODUCTION

## 1.1. BACKGROUND

Urbis has been engaged by Karimbla Constructions to prepare the following Heritage Impact Statement for the updated planning proposal for the subject site at 128 Bunnerong Road, Pagewood.

The site previously formed part of a larger site which was constructed for General Motors Holden and from 1980 was occupied by British American Tobacco Australasia (BATA) facility. BATA have since vacated the site and most of the site has been zoned and is under construction for a residential/mixed use precinct, in line with prevailing planning strategies.

The area in blue in Figure 1 below is the subject of this assessment.

The subject site has no associated heritage listings. The site is located in the general vicinity of Jellicoe Park (Item 155) and Harris Reserve (Item 66), both items of local heritage significance listed within Schedule 5 of the *Botany Bay Local Environmental Plan 2013 (LEP)*.

Therefore, this heritage impact statement has been prepared to assess the potential heritage impact of the revised proposal.

## 1.2. SITE LOCATION

The site is located at 128 and 130-150 Bunnerong Road, Pagewood. It is legally described as the whole of Lot 1 in DP 1187426 and Lot 24 DP 1242288, respectively. It has frontages to Bunnerong Road to the east, Heffron Road to the north and Banks Avenue to the west. It is located within the Bayside LGA.

Figure 1 – Aerial imagery showing the approximate boundaries of the subject site (blue boundary).



Source – Nearmaps.com

## 1.3. METHODOLOGY

This Heritage Impact Statement has been prepared in accordance with the NSW Heritage Branch guideline 'Assessing Heritage Significance' (2001). The philosophy and process adopted is that guided by the *Australia ICOMOS Burra Charter* 1999 (revised 2013).

Site constraints and opportunities have been considered with reference to relevant controls and provisions contained within the *Botany Bay Local Environmental Plan 2013* and the *Botany Bay Development Control Plan 2013*.

Please note that the canteen building and the boilerhouse were not able to be accessed on the day of the site visit.

This report only addresses the *revisions to the planning proposal*. For the assessment on the original planning proposal (including rezoning) please refer to the Heritage Impact Statement completed in March 2017.

## 1.4. AUTHOR IDENTIFICATION

The following report has been prepared by Alexandria Barnier (Senior Consultant) and Gavin Patton (Heritage Consultant). Kate Paterson (Director, Heritage) has reviewed and endorsed its content.

Unless otherwise stated, all drawings, illustrations and photographs are the work of Urbis.

## 1.5. THE PROPOSAL

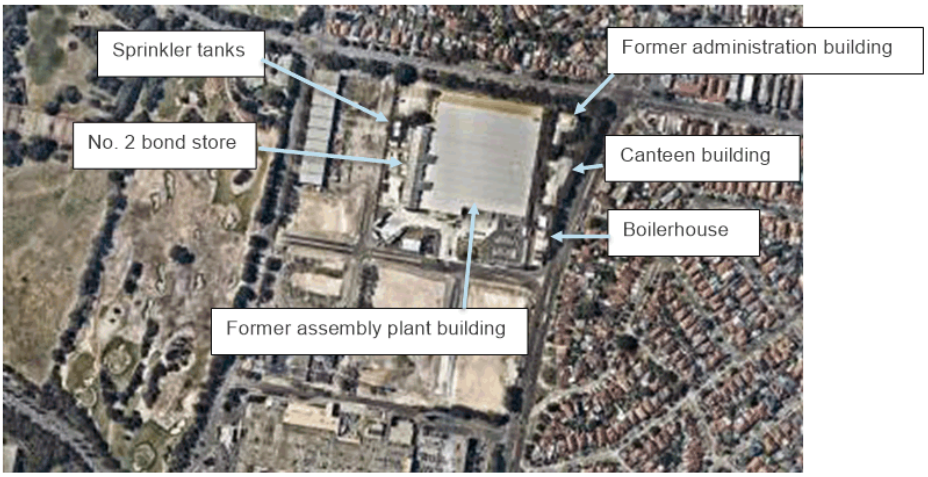
The revised approved proposal specifically includes:

- The demolition of the existing industrial buildings on the site (under complying development);
- A requirement for the inclusion of a minimum of 5,000 square metres of gross floor area for commercial premises and/or other permitted non-residential land uses;
- An update to the land use zoning of the site to include commercial premises, service apartments and recreation facilities (indoor); and
- A number of other administrative amendments to the Gateway Determination approval.

# 2. SITE DESCRIPTION

The site is bounded by Heffron Road along the northern boundary and Bunnerong Road to the east. The western side is bounded by a former service road. An access road extends west from Bunnerong Road and defines the southern boundary of the site. It is one of three vehicular access points to the site. Vehicle access was formerly also from the northern boundary and from the north-west corner, however these have since been closed. A description of the individual structures is set out below.

Figure 2 – Location of individual structures on the subject site.




**Administration Building**

There are two original buildings to the north-east corner of the site. The most distinctive is the two storey administration building which was built in the Inter War Functionalist Style (completed 1940). This building has some presence from the adjacent intersection (Bunnerong and Heffron Road) largely characterised by its clock tower with inset teal tiles. The horizontality of the building is emphasised by its rhythmic fenestration pattern and the pronounced string courses which run at the window sill height and the ceiling height of both floors. There is also a string course running along the top of the parapet.

There have been some changes to the primary façade of the administration building. A number of doors and small windows have been added which have had some impact on the legibility of the original design intent of the façade. There is also a large yellow bulkhead and ground floor ceiling height running part way along the façade. There is a WWI memorial tree and plaque in the setback from Bunnerong Road adjacent to the building.

Internally, the building appears to largely retain its original layout. It also retains its original timber office partitions. Otherwise, it appears that the building has largely been refit in line with its use by BATA and now comprises largely unremarkable fabric. Further investigation should be undertaken to determine whether original finishes are present under the existing.

Figure 3 – External images of the administration building.



Picture 1 – View west towards the principal eastern façade.



Picture 2 – Clocktower to the north-eastern corner.



Picture 3 – View towards the southern façade.

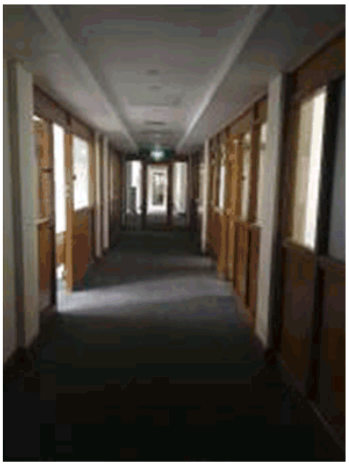


Picture 4 – View towards the southern western corner.



Picture 5 – View of the eastern facade

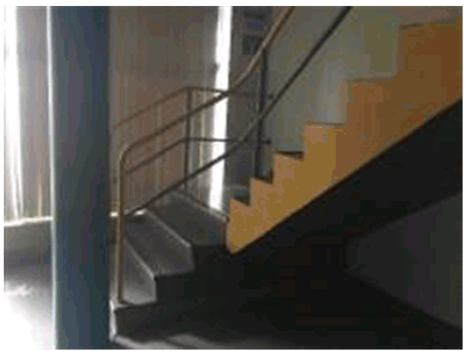
Figure 4 – Internal images of the former administration building.



Picture 6 – View north up ground floor hallway.



Picture 7 – View across ground floor office space.



Picture 8 – Original stairs from ground floor.



Picture 9 – View across northern space. Assumed to be former showroom.

**The Canteen Building**

The Canteen Building is located to the immediate south of the administration building. It was constructed in 1940 in the same style as the aforementioned however it is a single storey. The face brick building originally had a double storey entry feature element halfway down its eastern façade however this was removed in the 1950s when the building was expanded eastward towards Bunnerong Road. It was also extended to the north towards the administration building. There are unsympathetic awning structures to the northern and western facades. The building is therefore less remarkable than it originally was and makes a lesser contribution to the setting of the distinctive building described above.

Access to the internal spaces within this building was not possible on the day of the site inspection. It appears from looking through the windows that the building has been refit, similar to that above. Access should be gained and further investigation undertaken to determine extent of original finishes.

Figure 5 – External images of the canteen building.



Picture 10 – View towards northern façade of 1950s extension to the canteen building.



Picture 11 – View to the north-western corner.



Picture 12 – View along the western façade.



Picture 13 – View along part of the northern façade.



Picture 14 – View down eastern façade (1950s extension).

**The Boiler House**

The Boiler House building is located to the south of the Canteen Building. It postdates the earlier buildings, first appearing in historic aerials in 1950. The building is largely utilitarian in character with few qualities representative of an identifiable period. The building has a gable ended roof form. The fenestration is

multipaned warehouse style and there are four vehicle entries along the western façade. There are a number of service risers from the roof. Access to this building was no permitted on the day of the site inspection.

Figure 6 – External images of the Boiler House.



Picture 15 – View east towards the boilerhouse.



Picture 16 – View to the north west corner.



Picture 17 – View towards the south west corner.



Picture 18 – View along the western façade.



Picture 19 – View of the ancillary structures to the north of the Boiler House.

**Former Assembly Plant Building**

This building was originally a sawtooth structure marked at the corners by a face brick pillar with inset teal tiles. The sawtooth structure was added to considerably throughout the history of the site however much has now been removed, with less than half remaining. Much of the early structure has been removed with less than half the sawtooth bays remaining. The two original pillars on the northern boundary are extant. The original fenestration along all facades has been replaced with contemporary fabric.

Internally it appears that the original sawtooth structure is relatively intact however the cladding over may have been replaced. Further investigation should be undertaken to determine if any machinery associated with General Motors has been retained, none was identified during the site visit.

Figure 7 – External images of the plant building.



Picture 20 – View along eastern façade.



Picture 21 – Existing presentation of the assembly plant to the north-east



Picture 22 – View to the north-west corner.

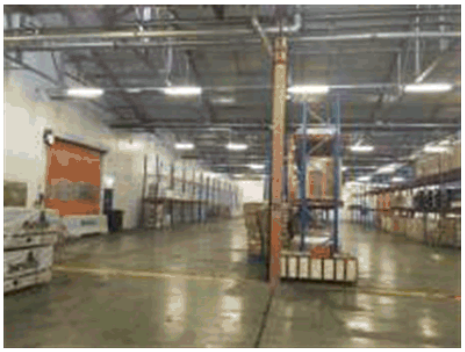


Picture 23 – View along northern facade.

Figure 8 – Internal images of the assembly plant building.



Picture 24 – View east across plant building.



Picture 25 – View north across plant building.

**No 2. Bond Store**

To the west of the main factory building is the no. 2 Bond Store. The bond store dates from the 1940s and retains an original northern façade. However, the store has been substantially expanded south and the rear façade has been removed and replaced with contemporary wall sheeting. The northern façade is constructed of brick and is of the same character as the pillars on the building adjacent. It features face brick with inset tiles. The internal roof structure appears original and constitutes a series of steel trusses.

Figure 9 – External images of the No. 2 Bond Store.



Picture 26 – Remnant northern façade.



Picture 27 – View towards the north west corner.

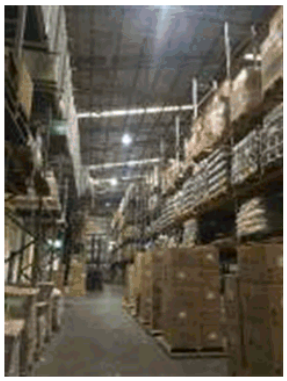


Picture 28 – View along western façade.

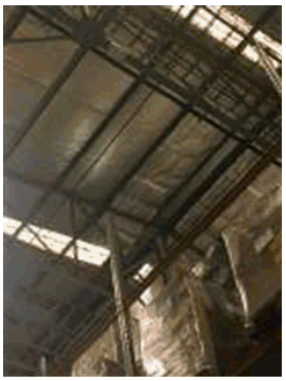


Picture 29 – View toward north west corner.

Figure 10 – Internal images of the no. 2 bond store.



Picture 30 – View across bond store.



Picture 31 – Original roof structure.



Picture 32 – View north towards inside of original façade.



Picture 33 – View north towards inside of original façade.

**Sprinkler Water Tanks**

To the immediate west of the No.2 Bond Store is located two sprinkler water tanks. These appear to be of standard construction and were built between 1954 and 1963. The tanks are partly visible from Heffron Road as seen in the images below.

Figure 11 – Images towards the sprinkler water tanks.



Picture 34 – View south from Heffron Road.



Picture 35 – View south from Heffron Road.

*Source: Google Earth*

# 3. HISTORICAL OVERVIEW

## 3.1. AREA HISTORY

Pagewood was originally planned as a garden suburb, similar to neighbouring Daceyville. However, it was developed to provide housing after World War I when there was a shortage of land. The new suburb began developing in 1919 as an estate called Monash Gardens. The suburb was named Pagewood in 1929 to honour Alderman F.J. Page of Botany Council.[1]

## 3.2. EARLY DEVELOPMENT OF THE SUBJECT SITE

The plant occupies an original site which comprised an area of 25 acres at the corner of Bunnerong and Maroubra Bay Roads. The ground formation before the construction of the subject buildings was described as consisting of sand to an unknown depth with a stratum of 'Waterloo' rock typical of the area.

Development on the subject site appears to have been slow. The early map of the Parish of Botany in Figure 12 below indicates that there was no development on the subject site by this time and that it was not subdivided. It is possible that it had some agricultural uses, however ownership of the land was not formalised until the 1930s. Refer to Table 1 which sets out the original land grants which eventually comprised the General Motors Holden site.

Figure 12 – 1916. Botany Parish Map indicating the approximate extents of the subject site (circled blue).



*Source: Land and Property Information*

1

Table 1 – Early land grants which comprised the eventual General Motors Holden site.

| Name of Portion | Area of Portion | Name of Grantee | Date of Grant | Reference |
|---|---|---|---|---|
| 2463 | 18 and ¼ perches | Emily Martha Seabrook | 22/8/1930 | Vol.4429 fol. 147 |
| 2457 | 18 and ¼ perches | Ellen Eliza Rhodes | 12/6/1931 | Vol. 4486 fol. 143 |
| 2456 | 18 and ¼ perches | Robert Rhodes | 12/6/1931 | Vol. 4486 fol. 144 |
| 2435 | 7 and ¼ perches | Raymond Stubbs | 1/9/1933 | Vol. 4590 fol. 113 |
| 2445 | 9 perches | Horace Beeton | 17/10/1933 | Vol. 4594 fol. 174 |
| 2433 | 7 and ¼ perches | Frederick John Hillman | 26/7/1934 | Vol. 4636 fol. 116 |
| 2454 | 7 and ¾ perches | Henry Collen Wheelen | 30/9/1935 | Vol. 4716 fol. 135 |
| 2455 | 17 and ¼ perches | Angus Nugent | 13/10/1936 | Vol. 4795 fol. 218 |
| 2460 | 18 and ¼ perches | Alma Vera Abassden | 27/7/1937 | Vol. 4859 fol. 130 |
| 3497 | 25 acres | General Motors Holden | 31/3/1939 | Vol. 5028 fol. 158 |

## 3.3. GENERAL MOTORS HOLDEN

Land for GMHs Pagewood Plant, was purchased by the company in July 1939[2]. However, newspaper records indicate that construction had already began on the plant by June 3rd 1939.[3] The plant cost 270,000 pounds with only around 10,000 pounds being used outside the Commonwealth.[4] The plant was constructed in a record 7 and a half months. It used 1,000 tons of Australian steel and had heat absorbing windows covering an area equal to one and a half acres. The existing General Motors Holden (GMH) factory was officially opened on February 15th 1940 by then Prime Minister Robert Menzies.[5]

[2] Certificate of Title Vol. 5056 Fol. 10
[3] Cootamundra Herald, 8/1939
[4] Cootamundra Herald, 8/1939
[5] Truth, 2/1940

Figure 13 – March 1939. Empty site before construction of the plant.



*Source: Construction, 3/1940*

Figure 14 – March 1940. Construction of the roof of the plant.



*Source: Building, 3/1940*

Figure 15 – Undated. Construction of the warehouse building.



*Source: Building, 3/1940*

The consulting engineer for the Company was a Mr Gibson, while the builders were Concrete Constructions Pty. Ltd. At this time, it was one of a group of factories associated with the company, one in each State capital city except Hobart.

The foundations had industrial reinforced concrete foundations for each structural steel column. All exposed brick work in all buildings, fences, retaining walls and elsewhere was supplied by Wunderlich's "Colortex" texture bricks, of a specially selected buff colour. Over 50 types of specially moulded texture bricks were supplied for the works.

Around 320 contractors and sub-contractors were engaged in the construction of the plant. Some companies involved in the construction of the plant included:

- Roofing - James Hardie & Co. Pty. Ltd. Fibrolite and Wunderlich Limited's Durasbestos.
- Concrete flooring – Melocco Bros. Pty. Ltd.
- Slagwool insulation – Bradford Insulation Pty. Ltd.
- Ceiling plaster – Art. Plasto Pty. Ltd.
- Paints and varnishes – Sherwin-Williams Co. (Aust).
- Lighting brackets – British General Electric Co. Pty. Ltd.

Administration Building

The two storey Administration building at the corner of Heffron Road and Bunnerong Road was constructed with 18,267 square feet of floor space and housed Manufacturing, Sales, Finance, Audit, IDEC, Service and Traffic personnel. The roof comprised structural steel trusses and purlins, with cement asbestos corrugated roofing and box gutters. The tower to the north-east corner of the administration building was described in the March 1940 Building magazine as follows:

> *"Rising like a gigantic modern sentinel, the tower at the corner of the Administrative Building indicates the presence of the new General Motors-Holden's assembly plant from afar. Clear cut in design and silhouetting against the sky the tower symbolises the progressiveness of the organisation which it dominates. Wunderlick Limited's Colortex bricks of a buff tone were employed, while Agee glass bricks constitute the vertical panels."*

The arrangement of the windows and internal columns was designed to allow the subdivision of the internal offices in units of three feet in width between cross partitions. All windows to offices on the west side were in Coldlite non actinic glass, other office windows were in sheet glass and windows to the showroom was polished plate glass. The concrete ground floor was covered with Tasmanian Oak, marbled buff linoleum on a bituminous felt underlay was provided in all offices. Internally there was a dado to window sill height carried out in Queensland Maple veneer panels, nailed to Oregon timber grounds.

The structure was specifically designed for the future installation of complete air conditioning and a concrete tunnel was constructed under the roadway between the building and the Assembly Plant where the necessary equipment would be installed.[6]

The administration building featured a showroom in the north-east corner which had main stairs accessing the first floor where the executive offices were accommodated. A turn table was included in the showroom floor. The facing of the walls of the main stairs opening out to the Showroom is in Scagliola by Melocco Bros. Pty. Ltd. with Verona marble skirtings, stringers, trims and to the ends of the treads and risers. Special ceiling lighting was provided in the showroom for the illumination of the cars displayed on the first floor to be viewed from the outside by the public at night.

A servery was provided on the first floor. Lavatories and cloakroom accommodation for males was located on the ground floor and for females on the first floor. A projection room for the showing of cinematograph films was provided on the first floor, with accommodation for approximately 50 people.[7]

Club House/Canteen Building

Also, constructed in the initial phase was the club house/canteen building to the south. The club house was erected at a cost of 75,000 pounds and was designed specifically for the welfare and comfort of the staff and employees. It comprised a gas meter room, gardener's store, sports store, library, cloakrooms, lavatories, office for social secretary, dining room and kitchen. Accommodation for 300 was provided and the building could be employed for concerts, recreational purposes and social functions in addition to its function as a cafeteria. The tables were of Queensland Maple, with sheet leather tops. The library was equipped with pressed steel shelving.

The ground floor throughout was of concrete laid on the solid, with hardwood joists embedded at 16" centres. The floor was of tallow wood, sanded and wax polished. The internal wall finish was of setting plaster with Queensland Maple veneer dado 6' high in the dining room and passages. The ceiling over the offices and kitchen was of similar construction to those over the first floor in the administration building.

Tennis courts were provided adjacent. A concrete pergola was erected to connect this building with the administration building and a similar one was erected at the southern end of the structure. On three sides of the building, the paving of the paths and terrace was done in flagstone paving.

Additions to the Canteen building to the south in 1952 (cost 109,000 pounds) increased its floor area and seating capacity. [8]

Assembly Plant and Warehouse Building.

The main plant with distinctive corner pillars and the no. 2 bond store (original warehouse building) were also constructed in the original phase of development. Offices in the main factory building housed the personnel department, supply and engineering in addition to manufacturing personnel. The structural steel frame of the main factory building consists of sawtooth construction, 500'x520', with a warehouse annexe 360'x65' 6' centre to centre measurements -total area was 283,400 square feet. The structural steelwork throughout was bolted, with the exception of certain heavy girders adjacent to the warehouse. Erection was carried out by two steam railway cranes.[9]

[6] Building, 3/1940
[7] Ibid.
[8] Ibid.
[9] Ibid.

Figure 16 – c1940. GMH plant nearing completion viewed from south west.



*Source: http://www.hrc.org.au/memories/photographs.html*

Figure 17 – 1940. GMH (General Motors Holden) viewed from the north-east.



*Source: GMH People Volume 15 Number 7 1963*

Figure 18 – c1940. GMH (General Motors Holden) viewed from the north.



*Source: http://www.hrc.org.au/memories/photographs.html*

Figure 19 – 1940. First official photo taken after the completion of the plant.



*Source: http://www.hrc.org.au/memories/photographs.html*

The first car was completed in the new plant on January 19th 1940.[10] For a brief period the plant assembled Vauxhall, Chevrolet, Pontiac and Bedford Vehicles before it was converted for defence needs. One of the first jobs for the plant was producing equipment for military use such as 25 pounder field pieces, wings for De Havilland Mosquito and munitions.

After the war the plant manufactured Frigidaire refrigerators and resumed the assembly of GMH vehicle products. Holden assembly started at Pagewood with the introduction of the all Australian Car in November, 1948. The Pagewood plant was one of the first plants to produce Holdens.

[10] Construction, 3/1940

In 1956, Frigidaire operations were transferred to Dandenong and the body and vehicle assembly activities were further expanded.

Between the 40s and 60s the headquarters grew from a small 98,000sq. ft. Assembly Plant on a 6 ½ acre site to the largest GMH body and vehicle and assembly plant. During the 1950s and 1960s Pagewood was expended with new and bigger buildings. Specifically, the primary sawtooth structure was expanded in 1952, 1955[11] and again in 1959[12]. The expansion in 1952 saw the plant expanded from 283,000sq ft to 447,745 sq ft under an 11-million-pound expansion programme.[13] By 1954 the rear (southern) façade of the no. 2 bond store had been removed to allow for the expansion of the factory.

By 1963 the plant covered a built area of 15.65 acres on a 34 acre site and an additional 19 acres had been acquired adjacent for further development. At that time, it had the yearly capacity to assemble, paint and trim 65,280 bodies and produce 55,680 complete vehicles.

In 1980 the plant was closed during Holden's restructuring and rationalisation of plants throughout Australia. The Pagewood plant produced the 1,500,000 and 3,000,000th Holdens.

## 3.4. CLOSURE OF THE PLANT

A total of 1,200 workers lost their jobs when the plant was closed. They were offered work at three other plants in Australia. The decision was made as the plant was considered outdated and the upgrade costs were estimated to have been over $100 million.[14]

## 3.5. BRITISH AMERICAN TOBACCO AUSTRALIA

Since 1982 the plant has been used to manufacture tobacco products for British American Tobacco Australia (BATA). The site was sold by BATA in April 2015 for $90 million.[15]

## 3.6. DATE OF CONSTRUCTION

The original section of the plant was opened in February 1940. Later additions are as set out below.

## 3.7. ALTERATIONS AND ADDITIONS

The following table constitutes a record of the development applications relevant to the site which are held by Bayside Council and which are evident from the graphic evidence.

Table 2 – Record of applications for alterations and additions.

| DATE | WORKS | REFERENCE |
|---|---|---|
| 1952 | Extension of the sawtooth structure south from the original. | |
| 1952 | Extension of the canteen in the administration building. Cost of 190,000 pounds. | |
| 1955 | Extension of the sawtooth structure south. | |
| 1959 | Extension of the sawtooth structure south. | |

[11] The Inverell Times, 8/1954
[12] The Cumberland Argus, 4/1958
[13] The Sunday Herald, 6/1953
[14] State Library of South Australia, GMH Pagewood Plant closure (video recording) transcript
[15] RPdata.

| DATE | WORKS | REFERENCE |
|---|---|---|
| 2000 | Internal modifications to existing commercial and industrial buildings. | 00/404 |
| 2002 | Change of use to part of the existing factory building from a tobacco production area to be a tobacco storage area. | 02/147 |
| 2003 | Replacement of existing hot and cold servery equipment and erection of new partition wall to existing staff cafeteria. | 04/226 |
| 2011 | Development Application for alterations and additions to the existing industrial development including:<br>• Partial demolition of the existing factory buildings and structures to facilitate the reduction of the existing tobacco manufacturing operations to the north-east portion of the site;<br>• External alterations and additions and the internal fitout of the remaining factory buildings;<br>• Subdivision of the subject site into two (2) lots; and<br>• Construction of an internal road to connect to Bunnerong Road, at 128 Bunnerong Road, Pagewood. | 11/272 |

# 4. HERITAGE SIGNIFICANCE

The following statement of significance has been taken from the previous comprehensive HIS completed by Urbis in March 2017.

## 4.1. STATEMENT OF SIGNIFICANCE

The subject site is historically associated with General Motors Holden. The plant represents a significant phase of growth in the history of the company and is an exemplar of the growth of the Australian vehicle manufacturing industry generally.

The administration building in the north-east corner of the site is the most intact building (despite changes to internal fitout) and the most prominent from the public domain. The building is also a fine example of the Functionalist style. Characteristics of the style comprised in the building include a predominant horizontality offset by a prominent vertical element (clocktower), pronounced string courses and rhythmic fenestration.

Further, the plant building is indicative of the former function of the site and the remnant Functionalist corner pillars are indicative of the quality associated with the plant.

It is considered that while the site generally has historic significance, the most significant fabric on the site constitutes the former administration building, and the remnant original and distinctive fabric associated with the plant building.

# 5. IMPACT ASSESSMENT

## 5.1. HERITAGE LISTING

The subject property is not a listed heritage item under the Botany Bay LEP, nor is it located within a heritage conservation area. It is noted that the previous HIS identified that the administration building in the north-east corner of the site has elements that have been assessed as having historic, associative and aesthetic significance at a local level.

The site is also located in the general vicinity of Jellicoe Park (Item 155) and Harris Reserve (Item 66), items of local heritage significance. As such, the below assessment has considered the heritage impact of the Planning Proposal on the identified significance of the site and the proximate heritage items.

Figure 20 – Heritage map indicating the extents of the subject site (blue).




Source – Botany Bay LEP 2013 Heritage Map Sheet 4.

Figure 21 – Heritage map indicating the extents of the subject site (blue).



Source – Botany Bay LEP 2013 Heritage Map Sheet 5.

## 5.2. STATUTORY CONTROLS

### 5.2.1. Local Environmental Plan

It is important to note that the subject site is NOT an item or state or local heritage significance. The below impact assessment assesses the revised proposal on the items of local heritage significance within the vicinity. As elements of the site had previously been identified as having heritage significance, the assessment below includes mitigation options which would enable this significance to be acknowledged and reinterpreted.

The proposed works are addressed in the table below in relation to the relevant clauses in the Botany Bay LEP 2013.

Table 3 – Local Environmental Plan

| CLAUSE | DISCUSSION |
|---|---|
| **5.10 Heritage conservation**<br><br>Note.<br><br>Heritage items (if any) are listed and described in Schedule 5. Heritage conservation areas (if any) are shown on the Heritage Map as well as being described in Schedule 5.<br><br>(1) Objectives The objectives of this clause are as follows:<br><br>(a) to conserve the environmental heritage of Botany Bay,<br><br>(b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views, | This report has been prepared in order to consider the revised Planning Proposal in relationship to the heritage conservation objectives set out in the Botany Bay LEP 2013.<br><br>In summary, it is considered that the revised planning proposal does not impact on the heritage significance of the items within the vicinity. Furthermore, the previous comprehensive HIS identified elements of the site as having heritage significance. This assessment includes mitigation recommendations which would also for this significance to be acknowledged and reinterpreted. |

| | |
|---|---|
| (c) to conserve archaeological sites,<br><br>(d) to conserve Aboriginal objects and Aboriginal places of heritage significance. | |
| (2) Requirement for consent Development consent is required for any of the following:<br><br>(a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):<br><br>(i) a heritage item,<br><br>(ii) an Aboriginal object,<br><br>(iii) a building, work, relic or tree within a heritage conservation area,<br><br>(b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item,<br><br>(c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,<br><br>(d) disturbing or excavating an Aboriginal place of heritage significance,<br><br>(e) erecting a building on land:<br><br>(i) on which a heritage item is located or that is within a heritage conservation area, or<br><br>(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,<br><br>(f) subdividing land:<br><br>(i) on which a heritage item is located or that is within a heritage conservation area, or<br><br>(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance. | The subject property is not a listed heritage item under the Botany Bay LEP, nor is it located within a heritage conservation area.<br><br>The site is located in the vicinity of two heritage items as identified above.<br><br>As such, this assessment has considered the heritage impact of the planning proposal on the proximate heritage items and the historic elements on the site which were previously assessed as having some heritage qualities. |
| (4) Effect of proposed development on heritage significance | The planning proposal is generally considered to respect the identified heritage significance of the |

| | |
|---|---|
| The consent authority must, before granting consent under this clause in respect of a heritage item or heritage conservation area, consider the effect of the proposed development on the heritage significance of the item or area concerned. This subclause applies regardless of whether a heritage management document is prepared under subclause (5) or a heritage conservation management plan is submitted under subclause (6). | items of local heritage significance within the vicinity. |
| (5) Heritage assessment<br><br>The consent authority may, before granting consent to any development:<br><br>(a) on land on which a heritage item is located, or<br><br>(b) on land that is within a heritage conservation area, or<br><br>(c) on land that is within the vicinity of land referred to in paragraph (a) or (b),<br><br>require a heritage management document to be prepared that assesses the extent to which the carrying out of the proposed development would affect the heritage significance of the heritage item or heritage conservation area concerned. | This report has been prepared in order to fulfil this condition. |

## 5.3. IMPACT ASSESSMENT

The earlier comprehensive HIS acknowledged that the rezoning of the site will include the change of use from industrial to residential. While this will end the general historic use, it is appreciated that an industrial use on the site is no longer feasible or required. Further, it should be noted that the significant historic industrial use is specifically the car manufacturing/assembly industry. This industry has not been associated with the site since the 1980s.

The site has had a continuous industrial use since it was developed at the start of the 20th century. However, the character of the area generally is changing and the existing industrial use is no longer required in the now suburban area.

The Planning Proposal (and revised proposal) will facilitate development in the area currently occupied by the original buildings associated with General Motors Holden. However, it is understood that the retention of all early elements on site would not provide for the practical redevelopment of the site for residential use. Further, much of the fabric on site has been highly altered and its original character diminished.

There is no statutory requirement to retain any of the fabric on the site, from a heritage perspective, as the site has no statutory heritage listing.

Notwithstanding this, the earlier HIS did identify a number of the built elements on the site as having a degree of heritage significance. These elements include the former Administration Building and the remnant, original and distinctive fabric associated with the plant building pillars.

It was understood that these building elements were, at that point, to be retained. This revised proposal and complying development approval confirm that these built elements are now to be removed.

To mitigate the loss of this heritage significance it is considered that the following be undertaken prior to demolition:

1. Photographic archival of the Administration Building, Canteen Building and general vistas incorporating the remaining buildings and elements collectively.
2. Salvage Report, completed by a suitably qualified heritage specialist, to identify building materials, decorative elements and other items which should be salvaged for re-use prior to demolition.

An Interpretation Plan should be developed as part of a future development application which interprets the former industrial use of the site and specifically its connection to the Australian car manufacturing industry. Elements salvaged from the site may be utilised in this interpretation plan.

# 6. CONCLUSION AND RECOMMENDATIONS

The subject site, 128 Bunnerong Road, Pagewood, previously formed part of a larger site which was constructed for General Motors Holden and from 1980 was occupied by British American Tobacco Australasia (BATA) facility. BATA have since vacated the site and most of the site has been zoned and is under construction for a residential/mixed use precinct, in line with prevailing planning strategies.

The subject site has no statutory heritage listings. The site is located in the general vicinity of Jellicoe Park (Item 155) and Harris Reserve (Item 66), both items of local heritage significance listed within Schedule 5 of the *Botany Bay Local Environmental Plan 2013 (LEP)*.

The client has liaised with Bayside Council who have advised they have no objection to the demolition of all buildings on the site. The site received approval under complying development for the demolition of all existing buildings located on the site. A number of other modifications to the original planning proposal have also been approved.

The comprehensive Heritage Impact Statement completed by Urbis (March 2017) for the original planning proposal concluded that there would be no negative heritage impacts on the items in the nearby vicinity. This remains unchanged with the modified proposal.

The earlier HIS also identified a number of built elements remaining on the site that have a degree of local heritage significance. These elements include the former Administration Building and the remnant original and distinctive fabric associated with the plant building pillars.

As outlined above the local council do not object to the demolition and a complying development certificate for demolition of all existing buildings has been issued for the site.

**Recommendations:**

To mitigate loss of identified heritage significance on the site it is recommended that the following be undertaken prior to demolition:

1. Photographic archival of the Administration Building, Canteen Building and general vistas incorporating the remaining buildings and elements collectively.

2. Salvage Report, completed by a suitably qualified heritage specialist, to identify building materials, decorative elements and other items which should be salvaged for re-use prior to demolition.

An Interpretation Plan should be developed as part of a future development application which interprets the former industrial use of the site and specifically its connection to the Australian car manufacturing industry. Elements salvaged from the site may be utilised in this interpretation plan.

It is recommended that the above recommendations and mitigation measures are implemented to mitigate heritage impacts on the site.

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*[Note: Some government departments have changed their names over time and the above publications state the name at the time of publication.]*

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URBIS

**BRISBANE**
Level 7, 123 Albert Street
Brisbane QLD 4000
Australia
T +61 7 3007 3800

**MELBOURNE**
Level 12, 120 Collins Street
Melbourne VIC 3000
Australia
T +61 3 8663 4888

**PERTH**
Level 14, The Quadrant
1 William Street
Perth WA 6000
Australia
T +61 8 9346 0500

**SYDNEY**
Level 23, Darling Park Tower 2
201 Sussex Street
Sydney NSW 2000
Australia
T +61 2 8233 9900

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APPENDICES

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**BRISBANE**
Level 7, 123 Albert Street
Brisbane QLD 4000
Australia
T +61 7 3007 3800

**GOLD COAST**
45 Nerang Street,
Southport QLD 4215
Australia
T +61 7 5600 4900

**MELBOURNE**
Level 12, 120 Collins Street
Melbourne VIC 3000
Australia
T +61 3 8663 4888

**PERTH**
Level 14, The Quadrant
1 William Street
Perth WA 6000
Australia
T +61 8 9346 0500

**SYDNEY**
Tower 2, Level 23, Darling Park
201 Sussex Street
Sydney NSW 2000
Australia
T +61 2 8233 9900

**CISTRI - SINGAPORE**
*An Urbis Australia company*
#12 Marina View
21 Asia Square, Tower 2
Singapore 018961
T +65 6653 3424
W cistri.com

**URBIS.COM.AU**