

The logo for URBIS, featuring the word "URBIS" in a bold, white, sans-serif font. The text is positioned to the left of a white square frame that is partially open on the right side. The background of the entire page is a vertical gradient from dark purple at the top to bright yellow at the bottom, with a white L-shaped line intersecting the logo.

**URBIS**

# ROSEHILL WATERS STRUCTURE PLAN

West Parade, South Guildford

May 2024

**DEVELOPER**

RWM PROPERTIES PTY LTD ON BEHALF OF NOAHS ROSEHILL ESTATE PTY LTD  
(‘the proponent’)

**PROJECT TEAM**

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COTERRA ENVIRONMENT – Environmental

COTERRA ENVIRONMENT – Hydrology

PRITCHARD FRANCIS – Civil Engineering

URBIS – Landscape Design

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BUSHFIRE SAFETY CONSULTING – Bush Fire

DVC – Traffic & Transport

AMERGIN – Aboriginal Heritage Assessment

KAREN GREGORY COMMUNITY AND CONSULTATION – Community Advisor

MCMULLEN NOLAN GROUP – Land Survey



## **ENDORSEMENT PAGE**

This structure plan is prepared under the provisions of the City of Swan Local Planning Scheme No. 17.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

**09 FEBRUARY 2017**

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Date of Expiry:

**09 FEBRUARY 2027**

# TABLE OF AMENDMENTS

AMENDMENT NO.	SUMMARY OF THE AMENDMENT	AMENDMENT TYPE	DATE APPROVED BY WAPC
1	Change density of Lot 802 (Stage 5) from R20 to R30	Standard	4 July 2022
2	Modifications to reflect MRS Amendment 1396/57 and associated design amendments	Standard	2 July 2024

# EXECUTIVE SUMMARY

The Rosehill Waters Structure Plan (the Structure Plan) applies to the former Rosehill Golf Course and Country Club located in South Guildford, in the City of Swan. The subject site is positioned between the Palmer Barracks to the south-west and the Waterhall Estate to the north-east.

This Structure Plan promotes innovative and sustainable development and includes provisions for the built form and urban design, as well as environmental and community benefits. The planning of the site has been heavily influenced by the contemporary urban design principles of integration and permeability, enhancement of natural features, and an amenity for the residents and the surrounding community.

The development of the site provides a key opportunity for urban infill within Perth's northeast corridor, representing a logical and efficient delivery of urban development, consistent with the State Government's strategic vision and priorities as identified in Directions 2031 and Beyond and the North-East Sub-Regional Planning Framework. In addition, the Rosehill Waters Structure Plan celebrates the locality's history and natural assets through the retention and enhancement of the Helena River waterways and its foreshore and the existing historical and socially significant buildings and garden.

The Structure Plan proposes a highly progressive response to environmentally sensitive and sustainable design within the built form, density and mixed typologies. Rosehill Waters demonstrates how a challenging site can yield a great development in the hands of a committed developer who will also be responsible for influencing the built form product on the ground. Whilst limited in the range of residential densities provided, the Structure Plan allows for diversity in housing choice, as well as the creation of a robust community, with appropriate lot typologies and built form responses to open space areas, within proximity to the Helena River and to community centres.

The Structure Plan has the potential to deliver an overall housing density of 12 dwelling units per gross urban hectare. The Structure Plan allows for the creation of approximately 633 dwellings over approximately 51.51 hectares of Urban zoned land.

A focus has been given to the incorporation of water sensitive design principles, the retention of existing vegetation along key corridors and within open space areas, retention of natural drainage corridors and the enhancement of pedestrian linkages through to the Helena River. The Structure Plan supports the provision of approximately 5.25ha (4.95ha unrestricted and 0.3ha restricted) of creditable public open space, over the 10% requirement, achieving an appropriate amount of equitably distributed, useable and connected open space areas.

The proposed street and movement network within the Structure Plan results in a well - connected and permeable street network which connects and directs residents to key points of interest, public open space and the broader local area efficiently and safely. Improvements and expansions are delivered to the existing pedestrian and cycle networks which will connect people to Guildford and Hazelmere and offer alternative modes of transport to the local community. Inherent within the overall sustainable design strategy, the street network performs an integrated role with the drainage strategy, supporting the conveyance within the road reserves along several streets.

Following the adoption of the initial Structure Plan for Rosehill Waters, a visioning process was undertaken for the northern portion of the Estate, generally north of West Parade, to determine the future layout and land use for this area. This was prompted by a change to the Perth Airport ANEF noise contours in 2019 which resulted in approximately one third of the Estate no longer being affected by ANEF contours. This meant the portion of land north of the Estate was able to be considered for residential development, which subsequently prompted MRS Amendment 1396/57 (now approved) to rezone the land from 'Rural' to 'Urban'. The rezoning also tied in a land swap along the Helena River foreshore in order to simplify the alignment of the foreshore boundary.

The Structure Plan has been amended to reflect the outcomes of the visioning process by providing for the Rosehill Lodge to be repurposed as a landmark commercial and tourism site, and to reflect the additional 'Urban' zoned areas for residential development, inclusive of updated design and technical considerations.

As part of the preparation of the Structure Plan, the following technical and supporting documentation has been prepared and is summarised in this report. Full copies of these documents are provided in the technical appendices with relevant addendums to reflect the amended Structure Plan area where applicable.

- Local Water Management Strategy (Coterra).
- Environmental Assessment and Management Strategy (Coterra).
- Foreshore Management Strategy (Coterra).
- Transport Impact Assessment (DVC).
- Infrastructure & Servicing Report (Pritchard Francis / Development Engineering Consultants).
- Fire Management Plan (Bushfire Safety Consultant).
- Acoustic Report (Herring Storer Acoustics).
- Aboriginal Heritage Assessment (Amergin)
- Community Engagement Report (Karen Gregory)

#### STRUCTURE PLAN SUMMARY TABLE

ITEM	DATA	SECTION NUMBER REFERENCED WITHIN THE STRUCUTRE PLAN REPORT
Total area covered by the Structure Plan:	51.51 hectares	Part 2, Section 3.4
Area of specific land uses: <ul style="list-style-type: none"> <li>▪ Residential</li> <li>▪ Special Use</li> <li>▪ Public Purposes (Water Corporation)</li> <li>▪ Foreshore Reserve</li> </ul>	27.64 hectares 2.66 hectares 1.06 hectares 1.30 hectares	Part 2, Section 3.4
Estimated lot yield:	633 lots	Part 2, Section 6.4.1
Estimated number of dwellings:	633 dwellings	Part 2, Section 6.4.1
Estimated residential site density	12 dwellings per hectare	Part 2, Section 6.4.1
Estimated population	Approx 1,800	Part 1
Estimated area and percentage of public open space given over to: <ul style="list-style-type: none"> <li>▪ Neighbourhood parks</li> </ul>	5.25ha (11.52%)	Part 2, Section 6.6

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# PART ONE: IMPLEMENTATION

# **1. IMPLEMENTATION OF STRUCTURE PLAN**

## **1.1. STRUCTURE PLAN AREA**

The Rosehill Waters Structure Plan (the Structure Plan), once endorsed, will become the guiding document in the consideration of future subdivision and development for the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan Map as shown in Figure 1.

## **1.2. STRUCTURE PLAN OBJECTIVES**

The objectives of the Structure Plan are:

1. To provide guidance on the subdivision and development of the Structure Plan in a circumstance where the site has particular locational and developmental requirements.
2. To facilitate the orderly and proper planning of the Structure Plan within the context of the site's constraints relating to aircraft noise.
3. To adequately address the conditions of the Metropolitan Region Scheme (MRS) Amendment 1266/57 and the City of Swan's Local Planning Scheme No.17 (LPS17), Special Use Zone No.24.

## **1.3. STRUCTURE PLAN CONTENT**

This Structure Plan comprises:

- Part 1: Implementation Section
- Part 2: Explanatory Section
- Part 3: Technical Appendices

The Structure Plan should be read in conjunction with the City of Swan Local Planning Strategy and the LPS17.

Part 1 of this Structure Plan is the implementation component of the Structure Plan which contains the Structure Plan Map and outlines the purpose and intent of the Structure Plan.

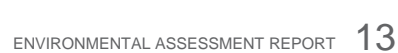
Part 2 of this Structure Plan is the explanatory section which contains the background information and explanation of the Structure Plan including design methodology, relevance and compliance with the planning framework. Part 2 also contains all supporting plans and figures.

Part 3 of this Structure Plan includes all of the relevant technical reporting which has been undertaken in support of the Structure Plan.

## **1.4. OPERATION**

The Rosehill Waters Structure Plan comes into effect on the date in which the Structure Plan is approved by the Western Australian Planning Commission (WAPC). An approved structure plan is a document to which planning decision-makers are to give due regard to when making decisions on the subdivision and development of land within the Structure Plan.

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## 1.5. STAGING

Due to the nature and size of the Structure Plan area, it is proposed that the development be undertaken within seven (7) stages. The staging of the Structure Plan is largely influenced by existing site levels and earthworks, rather than the delivery of required infrastructure.

Notwithstanding, upon the creation of the 300th lot, upgrades to Great Eastern Highway and Queens Road intersection are required to be undertaken in accordance with the Structure Plan and the Legal Agreement between the proponent and the City of Swan.

*Note: since the adoption of the original Rosehill Waters Structure Plan, and following negotiation between the proponent, City of Swan and MRWA, the proponent has paid to the City of Swan its contribution to the upgrade of the intersection. The City of Swan will determine when these works occur.*

## 1.6. SUBDIVISION AND DEVELOPMENT REQUIREMENTS

### 1.6.1. Land Use and Development

1. Land use and development within the Structure Plan is to be consistent with the prescribed zonings and reservations as detailed on the Structure Plan Map and as defined under LPS17.
2. Land use permissibility is to be in accordance with the relevant zone and the land use permissibility's of the Zoning Table and Special Use Zone No.24 of LPS17.
3. No unacceptable land uses, as detailed under State Planning Policy 5.1 (SPP 5.1) are to occur within the 25 ANEF contour area.

### 1.6.2. Precinct Requirements

1. Land use and development within the Structure Plan is to be in accordance with the City of Swan LPS17 Special Use Zone No.24. All subdivision and development is to be in accordance with the conditions of this zone.

### 1.6.3. Residential Density

1. The residential density for the Structure Plan is R20, other than where the land is not affected by ANEF contours, in which case density is to be in accordance with the Structure Plan. The density for those areas affected by ANEF contours has been restricted to an R20 maximum through the conditions of the Metropolitan Region Scheme (MRS) Amendment 1266/57 which applies to the Structure Plan.
2. Residential density targets were established in Directions 2031 and Beyond and require new areas to adhere to a target of 15 dwelling units per gross hectare of 'Urban' zoned land. Due to the restrictions to density imposed under MRS Amendment 1266/57, the Structure Plan delivers a density of 12 dwellings per hectare across the Structure Plan.

*Note: The detail as to how the Structure Plan addresses the conditions of MRS Amendment 1266/57 is outlined below.*

### 1.6.4. Public Open Space

1. The provision of a minimum of 10 per cent public open space (POS) being provided in accordance with the WAPC's operational policy, Liveable Neighbourhoods (2009).
2. Public open space is to be provided generally in accordance with Figure 1 (Rosehill Waters Structure Plan) and Table 4 and Figure 17 of Part 2. An updated public open space schedule is to be provided at the time of subdivision for determination by the WAPC, on advice from the City of Swan.

## 1.6.5. Local Development Plans

### (a) Residential Local Development Plan.

- (i) Prior to determination of an application for approval to commence development or as a condition of subdivision (whichever comes first) a Local Development Plan (LDP) is to be prepared and submitted to the City of Swan for approval for all land which directly abuts existing residential development. This LDP is to address the interface between existing and proposed dwellings and detail any required setbacks and interface treatments.
- (ii) An LDP may also be prepared for any other area within the Structure Plan which requires specific built form controls and/or any specific requirements to address bush fire constraints and to achieve sustainable design initiatives.

### (b) Precinct 2 Local Development Plan.

- (i) Prior to the determination of an application for approval to commence development or subdivision, (whichever comes first) a Local Development Plan (LDP) is to be prepared and submitted to the City of Swan for approval for all land within Precinct 2 of SUZ24. An LDP is not required prior to any change of use application.

### (c) A LDP is required, at a minimum to address the objectives and requirements of the Structure Plan as well as Part 5A of the LPS17 and include details relating to:

- Street network and street block boundaries.
- Notional location and distribution of land uses which demonstrate how the development of the location contributes towards the objectives of the Structure Plan.
- Built form controls including building height, setbacks, indicative servicing/ storage areas and any other building design feature considered relevant.
- Location, areas, and primary function/ roles of any public/private open space.
- Indicative landscape treatments within the public realm.
- Interface treatments with the adjoining Helena River foreshore.
- Any other information considered relevant by the City of Swan to address the requirements of the Structure Plan.

## 1.6.6. Additional Information

The following technical information is required to be undertaken at future planning stages:

**Table 1 Subdivision and Development Requirements**

ADDITIONAL INFORMATION	PURPOSE	APPROVAL STAGE	CONSULTATION REQUIRED
Foreshore Management Plan	To provide detailed guidance on the interface between the Helena River foreshore and the Structure Plan area including pedestrian and vehicular access.	Condition of subdivision approval for any part of the Structure Plan area abutting the Helena River foreshore.	Swan River Trust (if required)

Urban Water Management Plan	To detail drainage construction works, monitoring and maintenance arrangements in accordance with the WAPC's Better Urban Water Management Guidelines	Condition of subdivision approval.	Department of Water
Landscape and Public Open Space Management Plan	To detail the ongoing management and maintenance arrangements of landscaping and public open space areas.	Condition of subdivision approval	City of Swan
Traffic Management Plan	To provide technical specifications relating to the upgrading of Queens Road/Great Eastern Highway and construction management arrangements and broader traffic requirements.	To be submitted with subdivision application	City of Swan, Main Roads WA (if required)
Flora/Vegetation Management Plan	To provide detail of specific management, mitigation and tree retention methods to be implemented at construction stage.	Condition of subdivision approval	City of Swan, Department of Environment (if required)
Fauna Management Plan	To provide detail of specific management strategies for the protection of fauna habitats.	Condition of subdivision approval	City of Swan
Geotechnical Report	Detailing the specific design and construction recommendations and requirements.	Condition of subdivision approval.	City of Swan

# PART TWO: EXPLANATORY SECTION



# 1. INTRODUCTION AND PURPOSE

The Rosehill Waters Structure Plan (the Structure Plan) is prepared and lodged on behalf of the landowner, RWM Properties Pty Ltd. The Structure Plan encompasses former Lots 1, 57, 200 and 9000 West Parade, South Guildford (the site)(refer Figure 1).

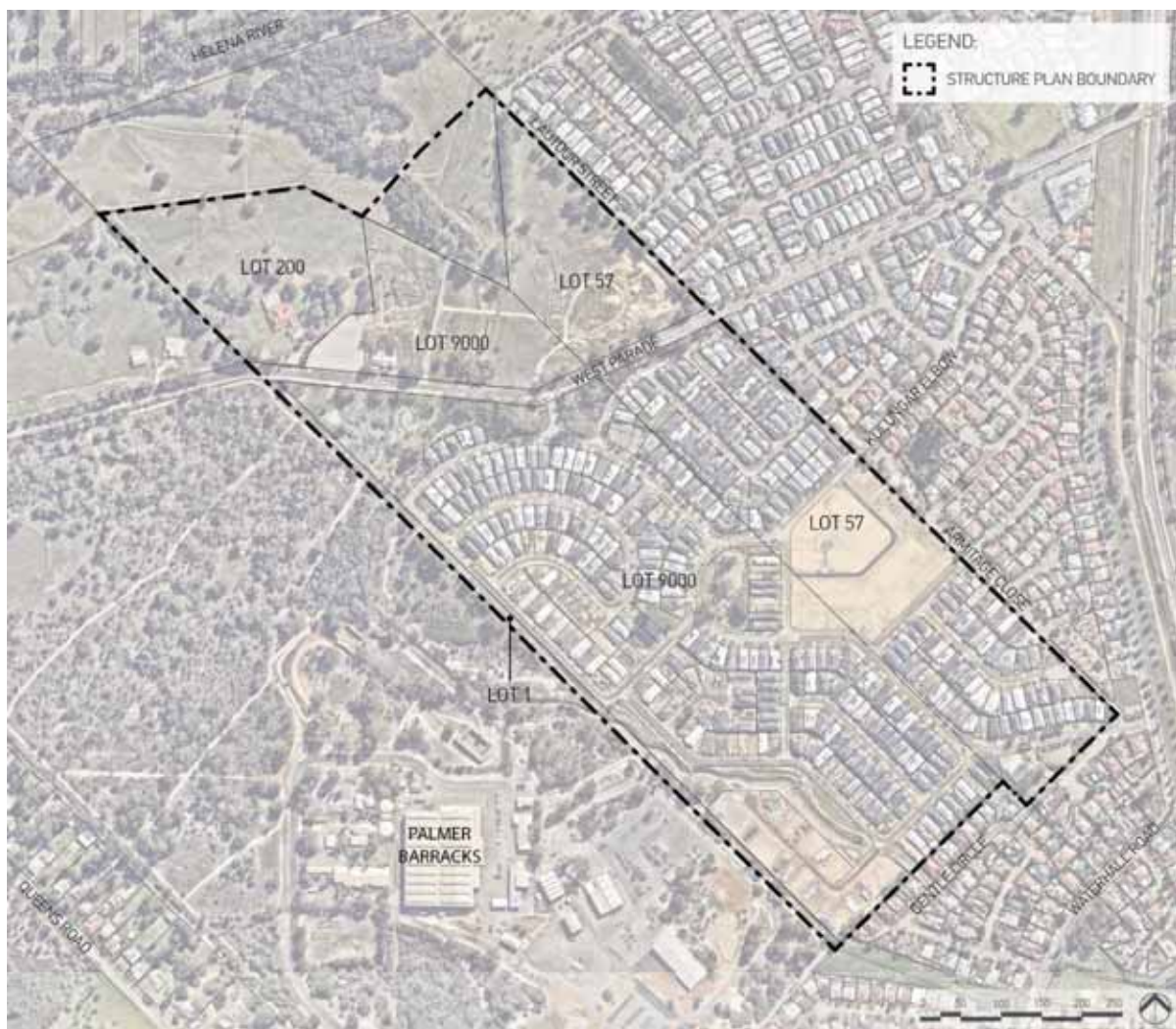
The purpose of the Structure Plan is to provide a broad framework to guide future subdivision, development and use of the land within the Structure Plan.

The Structure Plan will facilitate the establishment of an infill development of approximately 633 dwellings, contribute to an extensive open space network which integrates with the existing Helena River, connects to the established local and regional road network and expands on existing infrastructure.

Following the adoption of the initial Structure Plan for Rosehill Waters, a visioning process was undertaken for the northern portion of the Estate, generally north of West Parade, to determine the future layout and land use for this area. This was prompted by a change to the Perth Airport ANEF noise contours in 2019 which resulted in approximately one third of the Estate no longer being affected by ANEF contours. This meant the portion of land north of the Estate was able to be considered for residential development, which subsequently prompted MRS Amendment 1396/57 to rezone the land from 'Rural' to 'Urban'. The rezoning also tied in a land swap along the Helena River foreshore in order to simplify the alignment of the foreshore boundary.

This document provides all the necessary information and addresses the reporting requirements of the City of Swan's Local Planning Scheme No.17 (LPS17) and the requirements of the Planning and Development (Local Planning Scheme) Regulations 2015, including the Western Australian Planning Commission's Structure Plan Framework (August 2015).

**Figure 2 Aerial photograph**





## 2. LAND DESCRIPTION

The following section examines the context with respect to location, land use and ownership of the land the subject of the Structure Plan.

### 2.1. REGIONAL CONTEXT

The site is located within the City of Swan, approximately 13 kilometres north-east of the Perth Central Business District, within the South Guildford locality. The site is approximately 5 kilometres south-west of the Midland Strategic Regional Centre (refer Figure 3).

### 2.2. LOCAL CONTEXT

Locally, the site is approximately 1.5 kilometres south of the Guildford town centre and 2.5 kilometres north of Perth airport. The Structure Plan area is approximately 1 kilometre east of Great Eastern Highway, 1 kilometre south of James Street, 1.5 kilometres west of Bushmead Road and less than 1 kilometre north of Great Eastern Highway Bypass (refer Figure 3).

The site is traversed by West Parade, a key connector between Hazelmere to the east of the site. The site has frontage to the Helena River foreshore to the north. The site is located directly adjacent to the established residential area of Rosehill and the developing Waterhall Estate to the immediate east and the Palmer Barracks to the west.

The Structure Plan area is serviced by the Guildford and Woodbridge Primary School which are located approximately 1.5 kilometres to the north-west and north-east respectively.

From a retail and employment standpoint, the site is serviced by the Guildford town centre, Bassendean Shopping Centre and Midland Centrepont, and at a larger scale, Midland Gate. Swan Park Leisure Centre services the broader Guildford locality and is approximately 6 kilometres to the north-east.

Bus services currently run from Midland train station through Rosehill Waters and Waterhall Estate. The Guildford Train Station is located approximately 2.0 kilometres to the north-east.

### 2.3. POPULATION & DEMOGRAPHICS

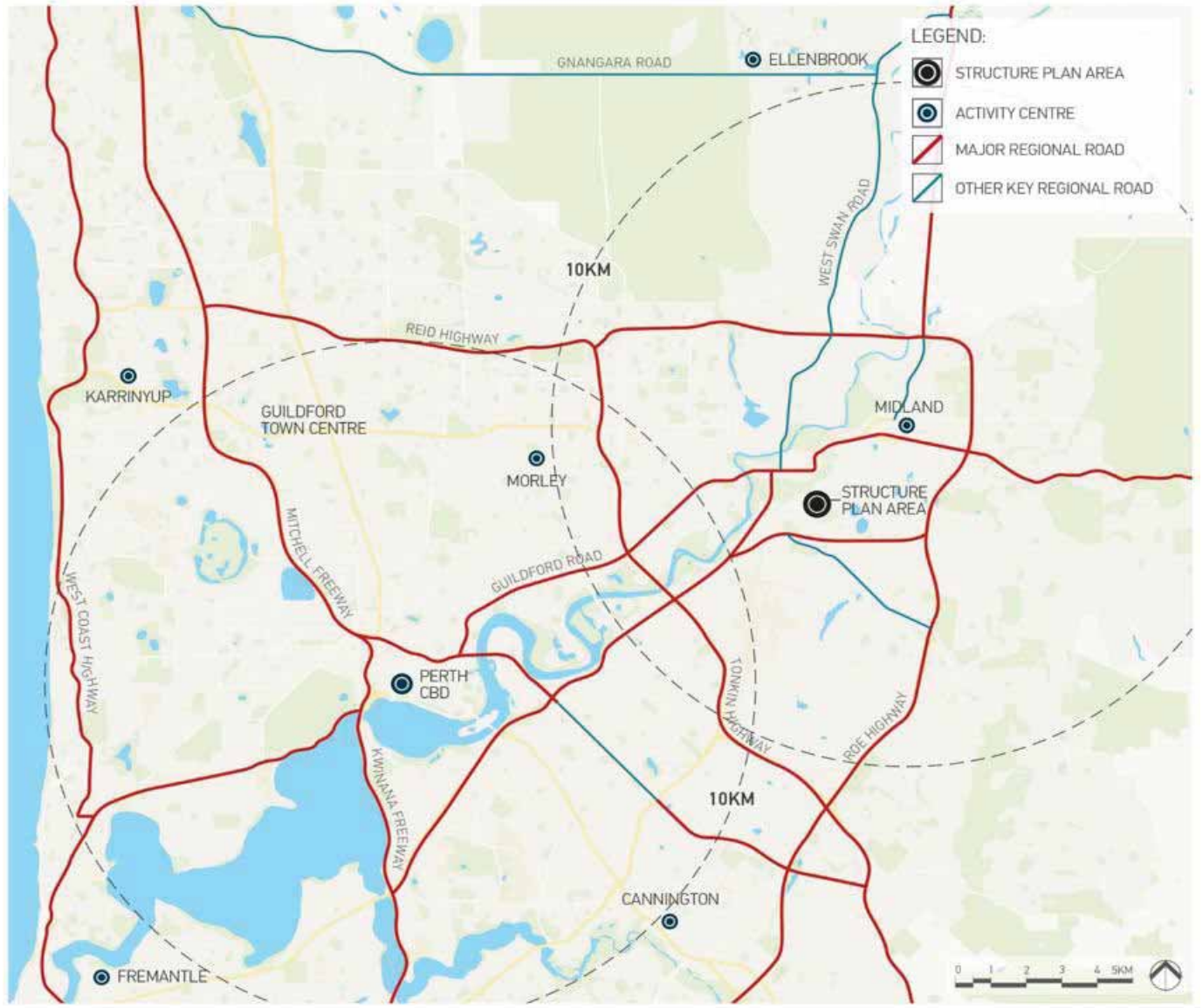
Guildford and South Guildford currently comprise approximately 5,821 residents (2021 ABS).

The South Guildford area comprises nearly 3,800 residents itself. Rosehill Waters will create dwellings to accommodate an additional 1,700 residents, bringing the total South Guildford community to 5,500 residents.

The demographic profile for the Structure Plan is likely to reflect the profile for the existing South Guildford community, which is currently characterised by:

- An average age of 37 years which is generally consistent with WA averages.
- An average household size of 2.6 persons which is consistent with WA averages.
- A higher proportion of young pre-school aged children and 35-45 year old adults.
- High mobility with an average of two vehicles per household.
- Low unemployment rates.
- High rates of full time employment.
- Income levels 20%-25% above the WA average.
- Separate dwellings – the Structure Plan will create more diversity and housing choice for the area.
- Houses developed mainly for owner occupiers rather than rental accommodation - suggesting a highly sought after area which is subsequently capable of creating stronger communities due to a less transient population.

**Figure 3 Regional Context Plan**

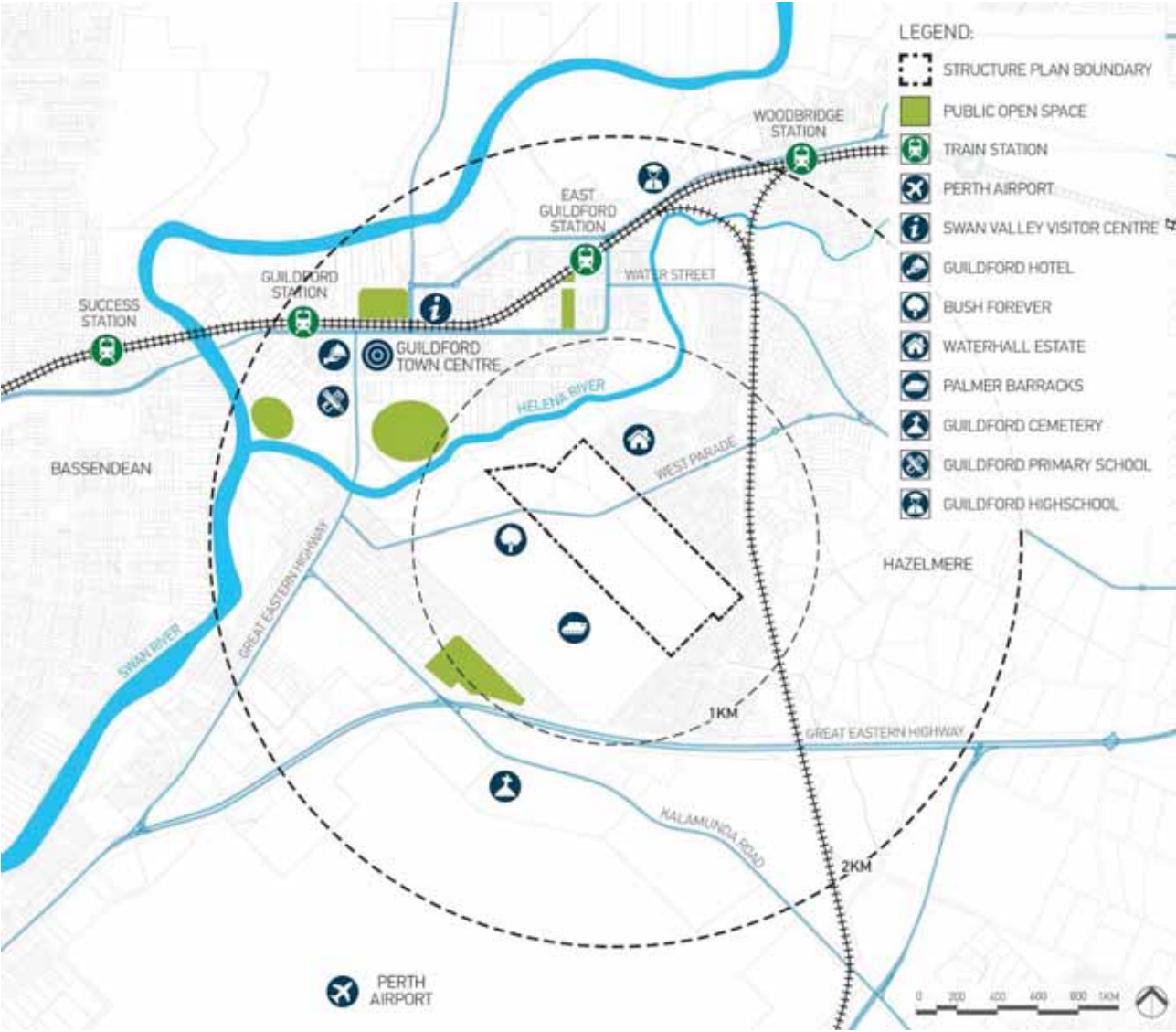


## 2.4. SITE DETAILS

The Structure Plan encompasses the lots formerly described as 1, 57, 200 and 9000 West Parade, South Guildford (the site), and since subject to further subdivision. The site occupies a total of 51.51 hectares of land, including a portion of West Parade which traverses the site. The site is largely vacant land with most of the land previously being occupied by a private golf course.

The site includes Lot 1 which includes a Water Corporation water main running in freehold land along the south-western boundary. Topography across the site is gently undulating. There is little remnant vegetation within the site, with most of the trees having been planted as part of the previous land use activity.

Figure 4 Local Context Plan





### 3. PLANNING FRAMEWORK

The following section provides an overview of the relevant planning framework as it relates to the Structure Plan.

### 3.1. ZONINGS & RESERVES

### 3.1.1. Metropolitan Region Scheme

The majority of the site has been rezoned to 'Urban' under the Metropolitan Region Scheme (MRS) (Refer Figure 5), as per MRS Amendment 1266/57 which was endorsed and gazetted in June 2015.

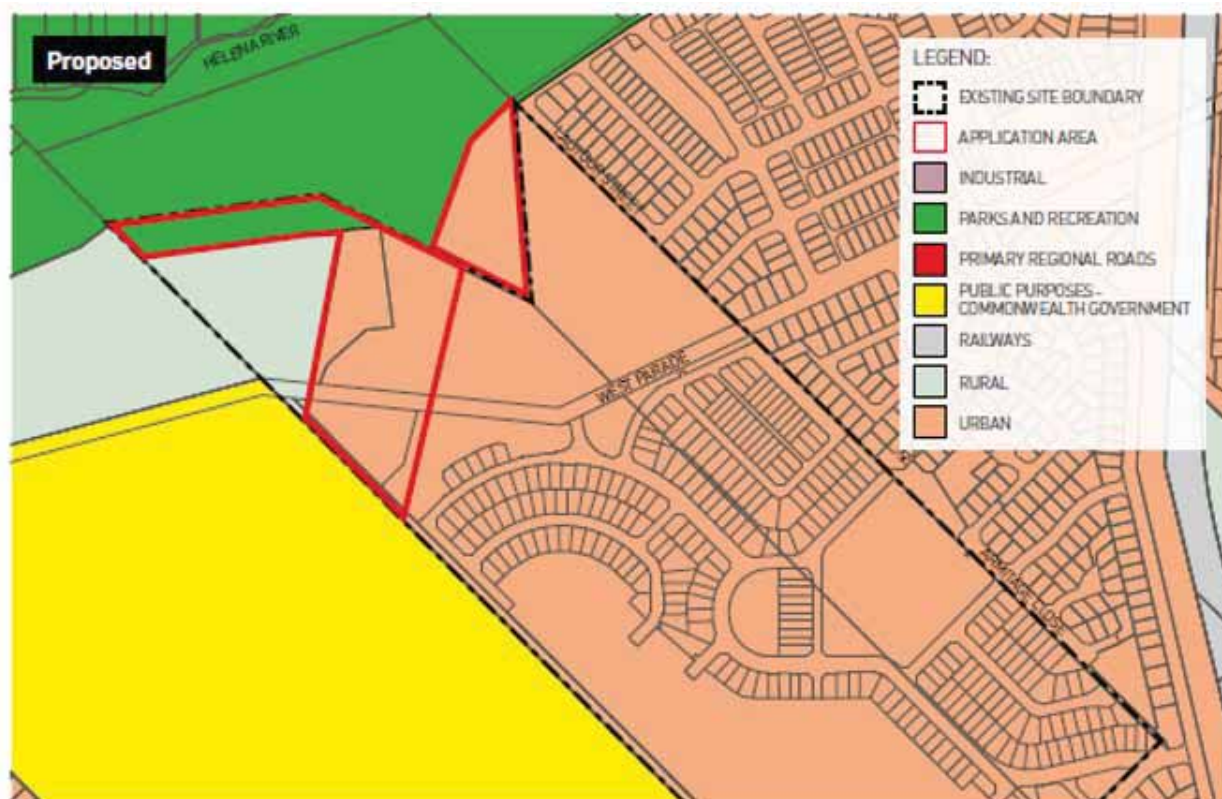
A subsequent MRS Amendment 1396/57 applying to the northern portion of the Estate for the following purpose, was endorsed and gazetted in May 2023:

- Facilitate a land exchange, with the western portion of land proposed to be reserved P&R from Rural, and the eastern portion proposed to be transferred from the P&R zone to the Urban zone.
- The land area to be ceded to the Crown for P&R is 1.32ha in area, and the area to be rezoned to Urban is 1.79ha. It is intended that the portion of Lot 82 being rezoned to Urban will be amalgamated with Lot 9002 West Parade where it will be developed for residential and public open space/drainage purposes.
- Rezone a portion of Lot 9002 from Rural to Urban due to a 2019 change in the alignment of the ANEF contours, which has resulted in an additional area of developable land being located within the 20-25ANEF contour.

Areas zoned 'Urban' provide for a range of activities including residential, commercial, recreational and light industrial. The remaining portion of the site, comprising a small triangle at the north-western end of the estate remains zoned 'Rural' under the MRS due to its inclusion within the 25+ANEF contour.

Areas zoned 'Urban' provide for a range of activities including residential, commercial, recreational and light industrial. The remaining portion of the site remains zoned 'Rural' under the MRS.

### Figure 5 MRS Zoning



### 3.1.2. City of Swan Local Planning Scheme No. 17 (LPS17)

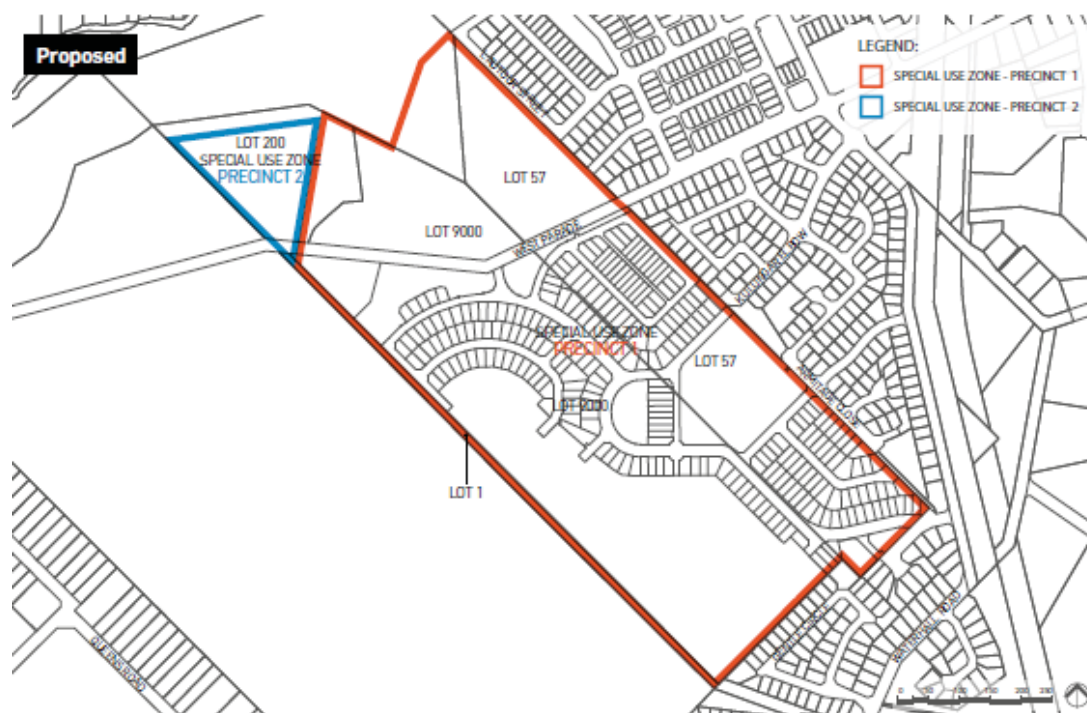
The site is currently zoned 'Special Use' Zone 24 (refer **Figure 6**) which assists in facilitating the implementation of the Structure Plan and provides the appropriate statutory framework to deal with unique site characteristics relating to aircraft noise, and the control over potential uses within the northern portion of the site affected by aircraft noise above the 25 ANEF contour.

Proposed Amendment No.217 seeks to amend the Special Use Zone 24 Precinct Map to reflect the changes in MRS Amendment No. 1396/57 (refer **Figure 7**).

**Figure 6 LPS17 Map**



Figure 7 Proposed Special Use 24 Precinct Plan



## 3.2. PLANNING STRATEGIES & POLICIES

The Structure Plan design has been shaped by the many State government considerations operating within the strategic planning environment. In reaching a holistic land use and urban outcome it is crucial that the relevant frameworks that apply to the land are carefully considered. This section summarises the relevance of these strategies/policies within the context of the Structure Plan.

### 3.2.1. State Planning Strategy

The State Planning Strategy (2007 as amended) was prepared by the WAPC as a whole of Government approach to guide sustainable land use planning throughout the State up until 2029. The Strategy is aimed at developing a land use planning system to help the State achieve a number of goals.

These include wealth, the protection of the environment and building and maintaining lively and safe communities for the enjoyment of future generations of Western Australians. The Structure Plan will ensure the alignment with the key objectives of the State Planning Strategy.

### 3.2.2. North-East Sub-Regional Planning Framework

The Perth and Peel@3.5 Million document provides strategic guidance to government agencies and local governments on land use, land supply, land development, environmental protection, infrastructure investment and the delivery of physical and community/social infrastructure for the Perth and Peel regions. It makes the case for change from a business-as-usual perspective to a more considered, connected, consolidated urban form. It links the four frameworks for each sub-region (North-West, North-East, Central and South Metropolitan Peel) and encourages the consideration of new urban growth opportunities.

The North-East Sub-Regional Planning Framework forms part of the Perth and Peel@3.5 Million strategic suite of planning documents. Future areas for urban and industrial development have been determined in conjunction with the Green Growth Plan, which is the State Government's Strategic Assessment of the Perth and Peel Regions, in order to avoid and protect areas which have significant environmental value.



The Framework identifies Rosehill Waters as Urban with the portion of Rural zoned land above the former 25+ANEF as Rural. The Minister's previous concerns about an earlier MRS proposal (1331/57) which proposed to rezone the entire balance area of the Estate to Urban, resulting in the Amendment not being finalised, have been addressed in the current proposal by the retention of the Rural land in the 2019 25+ANEF area, and the removal of retail development from the proposal. This matter is addressed in MRS Amendment 1396/57.

### **3.2.3. State Planning Policy No.3: Urban Growth and Settlement**

State Planning Policy No.3: Urban Growth and Settlement (SPP 3) applies to the whole of the State in promoting a more consolidated settlement pattern which is more aligned to sustainable design and development. The objectives and principles of Directions 2031 and Liveable Neighbourhoods are preserved in this policy.

SPP3 recognises the historical low density housing trend and urban sprawl which has occurred in metropolitan Perth, acknowledging that this form of development only intensifies pressure on valuable land and water resources, imposes additional costs of infrastructure and services, and increases the dependency on private vehicles as a mode of transport.

Accordingly, the Structure Plan provides a consolidated development response which builds upon existing communities and established local economies, resulting in a more liveable and sustainable development.

### **3.2.4. State Planning Policy No.5.1 – Land Use Planning in the Vicinity of the Perth Airport**

The purpose of State Planning Policy No.5.1 – Land Use Planning in the Vicinity of the Perth Airport (SPP 5.1) aims to protect the Perth airport from unreasonable encroachment by incompatible (noise-sensitive) land use and development and aims to minimise the impact the Perth airport has on the existing and future residential communities who may be impacted by noise.

SPP 5.1 provides guidance on the type of uses which can be entertained within the different noise exposure zones in accordance with Australian Standard 2021 (AS2021).

The Structure Plan area is affected by the 20-25+ ANEF contours, and since late 2019, approximately one third of the estate is no longer affected by any noise contours. Consistent with the recommendations of SPP 5.1 and the recently adopted Local Planning Scheme Amendment No.194, the use of the land will be consistent with those densities and uses contemplated as being either acceptable or conditionally acceptable within the relevant ANEF contour area.

### **3.2.5. State Planning Policy No.3.7 – Planning in Bushfire Prone Areas**

Version 1.4 of the Guidelines for Planning in Bushfire Prone Areas assist in the interpretation and implementation of State Planning Policy No.3.7 – Planning in Bushfire Prone Areas (SPP 3.7), where residential development is proposed within fire prone areas. Portion of the estate is subject to risk of bush fire due to the adjoining Bush Forever Site to the immediate west and vegetation located within the Helena River reserve to the north. A Bush Fire Management Plan was approved in 2018 with an addendum prepared in 2020 reflective of the modifications to the residential areas (Appendix F).

### **3.2.6. City of Swan Urban Housing Strategy**

The City of Swan's Urban Housing Strategy was adopted by Council in June 2012 in response to the State Government's Directions 2031 and Beyond. The strategy provides the basis for the consideration of higher residential density in suitable locations in a bid to address Perth's growing population. The Strategy only identified land for increased densities on land which was already zoned 'Urban' at that time, and therefore, did not include the site, despite its recognition for future expansion under Directions 2031 and Beyond.

### **3.2.7. Other Policies and Guidelines**

The following State policies are also directly relevant and applicable to the Structure Plan:

- Structure Plan Preparation Framework
- Liveable Neighbourhoods Operational Policy

- State Planning Policy No.7.3 – Residential Design Codes
- City of Swan Floodplain Management Development Local Planning Policy

The Structure Plan has been prepared to be consistent with the principles and requirements of the Western Australian Planning Commission's (WAPC) and City of Swan's operational policies and guidelines outlined above. Compliance with policy requirements is further demonstrated throughout Section 6 of this report.

*The existing version of Liveable Neighbourhoods (2009) has been utilised in the development of this Structure Plan.*

### 3.3. OTHER APPROVALS AND DECISIONS

#### 3.3.1. Metropolitan Region Scheme Amendment No.1266/57

The majority of the Rosehill Waters Estate was rezoned from 'Rural' to 'Urban' as part of the MRS Amendment No.1266/57. This amendment was approved subject to several WAPC and Ministerial 'conditions' which were required to be complied with as part of the subsequent planning stages. The way these have or are proposed to be addressed is outlined in **Table 2**.

The Western Australian Planning Commission (WAPC) and Department of Planning (DoP) have provided in-principle support to the preparation of a separate MRS amendment to rezone the remaining portion of 'Rural' zoned land to 'Urban', subject to further consideration of land uses and a demonstrated development capability. An MRS amendment will be progressed for this land in due course.

In accordance with the Local Planning Scheme Regulations 2015, the preparation and assessment of a future MRS amendment has no bearing on the ability for the Structure Plan to be progressed and the land developed. A structure plan may be prepared for any land (regardless of the underlying zone) where 'the Commission considers it necessary that a structure plan for the area is required for the purposes of orderly and proper planning' (Part 4, Clause 15 of the Deemed Provisions).

In the case of the approved 2015 Structure Plan, the WAPC provided consent to progress with the lodgement of the Structure Plan ahead of the land being rezoned under the MRS and the City of Swan LPS17. The letter from the WAPC Chairman to this effect is appended to this Structure Plan.

In progressing with a cohesive plan for the site, it is considered consistent with the orderly and proper planning for a structure plan to apply to the whole of the site, enabling a holistic approach to the planning for the area and to ensure the appropriate use of the land transpires.

Until such time as the remaining portion of the site affected by the 25+ ANEF contour is rezoned from 'Rural' to 'Urban' under the MRS, in the short term, the land within this area will be planned for and developed consistent with the objectives of the 'Rural' zone and its existing non-conforming use rights, acknowledging its future potential for Urban purpose.

**Table 2 Compliance with Conditions of MRS Amendment no. 1266/57**

CONDITION	COMPLIANCE
Residential development should be at a maximum density of R20.	Refer to Figure 1– Rosehill Waters Structure Plan. Following adoption of Amendment No.194, Special Use Zone No.24 (SUZ24) Condition 2 requires that residential density be at a maximum density of R20 except where land is below the 20ANEF exposure level, in which case density is to be in accordance with the Rosehill Waters Structure Plan.



A notification is to be included on all titles and within sale contracts, to be signed and acknowledged by all purchasers, which states as follows: "This land is subjected to aircraft noise at any time by the 24 hour a day, 7 day a week passenger and freight aircraft flight operations arriving and departing Perth Airport. The frequency of aircraft movements and the size of aircraft are forecast to increase indefinitely into the future. It is the responsibility of landowners to noise attenuate their property to ensure their amenity, as Perth Airport will remain curfew free."	This requirement is adopted via Condition 4 of SUZ24.
Noise insulation in accordance with AS2021-2000: Acoustics – Aircraft Noise Intrusion – Building Siting and Construction is required as a minimum for residential development within the 20 - 25 ANEF contour	This requirement is adopted via Condition 3 of SUZ24.
Existing residential development abutting the amendment area should be appropriately separated from new residential development in consideration of amenity impacts.	Refer to Part 2 of the Structure Plan.
Signage indicating "Aircraft Noise Area", similar to those in the vicinity of RAAF Base Pearce, should be erected and maintained to the east and west of the development on West Parade.	This requirement is adopted via Condition 5 of SUZ24.
An appropriate buffer should be provided along West Parade that retains the existing vegetation and maintains the visual amenity of West Parade.	Refer to Part 2 of this report.

### 3.3.2. Metropolitan Region Scheme Amendment No. 1396/57

MRS Amendment No.1396/57 was gazetted in May 2023. The amendment modified the following aspects of the MRS:

- Rezoning a portion of land within the Structure Plan area from 'Rural' to 'Urban' reflective of the changes to the ANEF contours in 2019.
- Rezoning a portion of land within the Structure Plan area from 'Rural' to 'Parks and Recreation' reflective of a land swap agreement.
- Rezoning of a portion of land previously within the Helena River foreshore reserve from 'Parks and Recreation' to 'Urban' reflective of a land swap agreement.

### 3.3.3. Local Planning Scheme No.17 – Amendment No.194

Amendment No.194 was approved by the Minister and gazetted on 4 March 2022. The Amendment applied to Condition 2 of SUZ24 in response to modifications to the ANEF contours for Perth Airport which resulted in approximately one third of the Estate no longer being subject to ANEF contours, and the north-east portion being less affected. The revised condition adopted via Amendment No.194 reads as follows:

*'Residential development shall be at a maximum density of R20, except where the land is below the 20ANEF exposure level, in which case the applicable density shall be in accordance with the Rosehill Waters Structure Plan.'*

### 3.3.4. Local Planning Scheme No. 17 – Amendment No. 217

Local Planning Scheme Amendment No. 217 is currently being considered by the City of Swan. Local Planning Scheme Amendment No.217 seeks to amend Local Planning Scheme No. 17 to reflect the zoning changes made under MRS Amendment No. 1396/57 and to amend the provisions relating to Precinct 2 of Special Use Zone. 24 to allow development reflective of the vision for the Rosehill Lodge precinct.

Figure 8 Staging Plan



## 4. SITE CONDITIONS & CONSTRAINTS

Based on the background and planning context outlined above, the following section describes the key site opportunities and constraints that have informed and impacted on the Structure Plan urban form and structure.

### 4.1. BIODIVERSITY AND NATURAL AREA ASSETS

An Environmental Assessment Report (EAR) has been prepared by Coterra Environment and is included in Appendix A. The following sections have been directly informed by this report.

The former golf course use of the site has informed the structure and composition of the sites environmental and landscape features, which consist primarily of large cleared areas of planted lawn and introduced and planted trees. This vegetation provides limited environmental value and visual amenity to the landscape.

There are no Bush Forever sites located within the Structure Plan, however there is Bush Forever Site No.311 located directly adjacent to the west of the Structure Plan (refer Figure 8). This site is under the management of the Department of Defence and is owned by the Commonwealth Government.

The City of Swan Biodiversity Strategy (2005) indicates that there are no local natural areas occurring within the site. A regional ecological linkage occurs to the west of the Rosehill Waters site, connecting the Swan River (and associated Bush Forever Site No.491), Bush Forever Site No.311 and Bush Forever Site No.386 to the south. This linkage narrowly intersects with the western boundary of the Structure Plan. A second ecological linkage has been identified as marginally intersecting with the most northern portion of the Structure Plan.

These linkages have been identified as being cleared for pasture and heavily degraded, therefore offering very little ecological benefit. As such, any potential impacts on ecological linkages and adjoining Bush forever sites, as a result of the urban development of the site are considered minimal.

#### 4.1.1. Flora & Vegetation

Original vegetation complexes occurring across the site include the Swan Complex (to the northern portion of the site), the Guildford Complex (to the north-western corner) and the Southern River Complex to the remainder of the site. The site has been largely altered from its original natural state due to the development of the Rosehill Golf Course in the 1950's, resulting in extensive clearing over years and very few examples of the above vegetation complexes remaining on site.

A Level 1 Flora and Vegetation Survey has been undertaken across the site in June 2012 (refer Appendix A). The survey confirms that very little remnant vegetation remains within the site, with the exception of a small area of remnant marri (*Corymbia calophylla*) woodland in the south-western corner of the site. The site does not contain any Threatened Ecological Communities or Priority Ecological Communities. Furthermore, no Threatened flora species as listed under the Environment Protection Biodiversity Conservation Act 1999 (EPBC Act) or Declared Rare or Priority Flora as listed by the Department of Parks and Wildlife (DPAW) were identified during the survey.

There were two 'true' (non-introduced) vegetation types identified within the site.

- Low forest A of *Melaleuca raphiophylla* over Tall Grass
- Forest of *Corymbia calophylla* over Low Heath C of *Hypocalymma angustifolium* or Open Dwarf Scrub C of *Xanthorrhoea brunonis* over Open Tall Sedges of *Mesomelaena tetragona* and *Tetraria octandra*

Various other vegetation units were identified across the site as detailed in Appendix A.

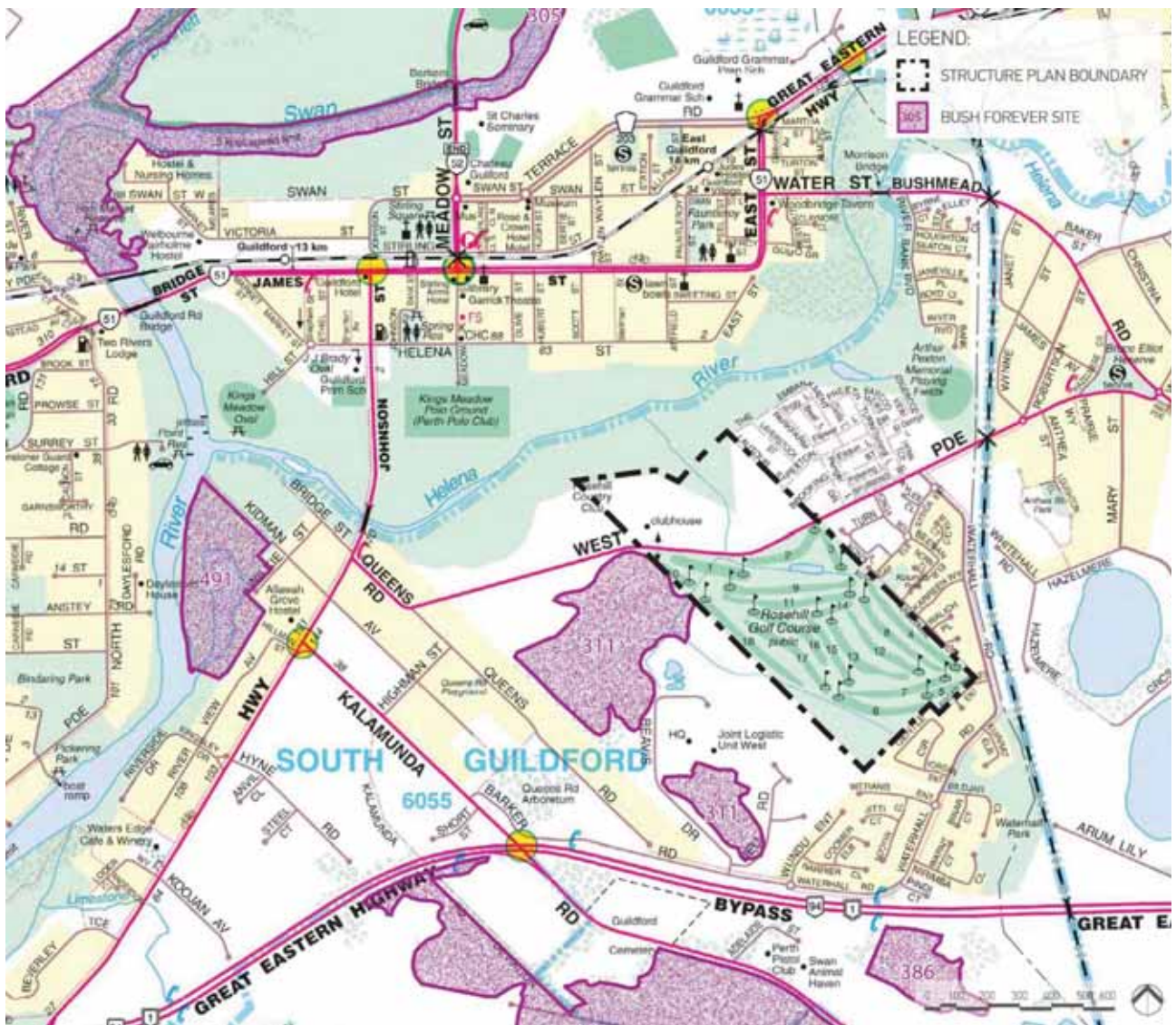
Most vegetation was recorded as being in a Completely Degraded condition, with the vegetation in the south-west corner varying between Very Good and Completely Degraded condition and the stand of *Eucalyptus rudis* subsp. *Rudis* along West Parade in a Degraded condition. There are a number of weed species which cover the site.

Any mature trees to be retained or transplanted will be identified and marked appropriately as part of the future Environmental Management Plan and Landscape Management Plan and prior to commencement of any pre-construction activities to ensure that they are provided with the appropriate tree protection zones.

No management practises are required for significant flora or TECs/PECs as there were none found on site.



Figure 9 Bush Forever Sites



**Figure 10 Areas of environmental significance**



Source: Coterra Environment

### 4.1.2. Fauna

An environmental assessment was conducted to identify potential fauna species that may inhabit the site. It was concluded that the native and planted mature trees and regrowth areas may be visited opportunistically by the native birds moving through the locality.

However, an assessment has considered it unlikely that the trees would be used exclusively by native fauna species on a permanent basis and there is no evidence of the Black Cockatoos nesting on the site.

There are 16 conservation significant species that could potentially be seen on the site. Of these species only three have been identified as potentially utilising the site for habitat. These are:

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo).
- *Calyptorhynchus banksia naso* (Forest Red-tailed Black Cockatoo).
- *Calyptorhynchus baudinii* (Baudin's Black Cockatoo).



A number of trees were identified as part of the fauna habitat tree survey as being potentially significant in providing habitat (feeding and/or roosting) for black cockatoos. These trees are identified in Appendix A. Where possible potential fauna habitat trees will be retained on site within public open space and road verges. A Landscape Management Plan and Fauna Management Plan will be required at subdivision stage which details those trees identified for retention.

The drain and ornamental pond also provide habitat opportunities to aquatic fauna (e.g. waterbirds, long-necked turtles and native fish). The rehabilitation and retention of these natural drainage lines will ensure that the opportunities for fauna habitats are maintained.

### 4.1.3. Waterways

The two tributaries of the Helena River flowing through the site form the key environmental features of the Structure Plan.

A biophysical assessment has been undertaken as part of the Local Water Management Strategy (refer Appendix B) to determine the biological and physical qualities of the waterways in accordance with relevant State Government policy.

The waterways traversing the site have been largely modified due to their historic use within the golf course and no rare and/ or endangered water-dependent flora or fauna have been identified. Notwithstanding there are still important local biological and hydrological functions of these waterways that require consideration in the future redevelopment, these include:

- Water quality treatment of surface water prior to discharge to the Helena River
- Support of aquatic, riparian and fringing vegetation
- Provision of localised aquatic habitat
- Water source for local terrestrial and avian fauna
- Flow regulation and flood risk management.

Significant efforts have been made to retain and enhance the biological and hydrological value of the watercourses and these natural assets have formed the foundation for the Structure Plan design response. However, some minor modifications to the existing systems will be required to facilitate functional urban form.

## 4.2. LANDFORM & SOILS

### 4.2.1. Topography

The site is gently undulating, with topography across the site ranging from approximately 10m AHD in the south-western portion of the site to approximately 5m AHD along the northern boundary (refer **Figure 10**).

Three high points of 13m AHD occurred in the central area of the site, the north-west and the north-east. From the high points there are uninterrupted views south-east to the hills and to the north towards Helena River. These viewpoints provide opportunities to capitalise on views from these naturally elevated areas from both development and public spaces.

Most of the site has been earth worked as per the subdivision approvals granted over the subject site. Stage 6A of the subject site is the most recent stage to commence earthworks, with the final two stages being 7 and 6B.

The low points of the topography provide opportunity to accommodate stormwater drainage into natural drainage and green corridors of public open space to maximise infiltration at source in line with the principles of water sensitive urban design, improving the amenity of the urban space and remaining sensitive to the existing environment.

**Figure 11 Topography prior to commencement of earthworks**



## 4.2.2. Soils & Geology

The site is characterised by the Guildford Formation – sand of varying depths over clay. The depth of the sand over the clay layer is less along the two tributaries and approaching the Helena River. The sub-systems contained within the site generally consist of minor sandy rises with moderately deep well-drained sand overlying gravelly mottled clay. The other sub-system comprises of seasonally inundated swamps with shallow very poorly drained grey siliceous sand over clay.

Generally, the site is capable of accommodating residential urban development which will include a balance of cut to fill site works. The soils and groundwater characteristics within the site pose some limitations however these limitations can be managed appropriately through engineering design and are therefore not considered to be serious constraints to the future development of the site. Structural fill which is required in certain areas, and where loose sand/uncontrolled fill currently exists will need to be reworked and applied in compact layers in order to sufficiently support buildings and infrastructure. The Geotechnical Report (included in Appendix D) provides engineering design recommendations which specifically address site preparation, foundation design, soil permeability, stormwater disposal and site drainage.

There are no known and/or registered contaminated sites within or adjacent to the site.

The soil types specified to the site, as detailed in the Geotechnical Report (refer Appendix D) are:

**Table 3 Soil types**

SOIL TYPE	CHARACTERISTICS
Topsoil	Grey-brown to black, sandy topsoil with some rootlets, from surface to a depth of 0.1 metres and 0.15 metres.
Sand	Generally loose to medium dense, yellow-brown, brown and grey, fine to medium grained sand to depths of between 0.6 metres and 6.0 metres underlying topsoil. The sand is loose to a depth of 2 metres at some test locations.
Clayey Sand/ Sandy Clay	Generally medium dense clayey sand and very stiff sandy clay, grey-green and orange-brown, medium to high plasticity, slightly gravelly in places, encountered underlying the sand from depths of between 0.2 metres to 6.0 metres.
Silty Sand	Generally loose, dark grey, black and grey brown silty sand with some clay underlying the topsoil to depths of between 0.2 metres and 0.5 metres.
Clayey Gravel/ Gravelly Clayey Sand	Medium dense, grey-green and brown with medium sized gravel ranging in depths of 0.4 metres – 1.6 metres.

### 4.2.3. Acid Sulfate Soils

The majority of the site is mapped by the Department of Environment Regulation (DER) as having a Moderate to Low risk of Acid Sulfate Soils occurring within 3 metres of the soil surface. It has been identified that a small area in the southern portion of the site is mapped as having a Low to Nil risk.

It is recommended that further detailed investigations be undertaken at detailed engineering design stage, at which point ground disturbing activities will be known.

## 4.3. GROUNDWATER AND SURFACE WATER

A Local Water Management Strategy (LWMS) has been prepared to support the Structure Plan, refer to Part 6 and Appendix B for more detailed information with respect to the management and conservation strategies proposed to be implemented as part of the more detailed planning stages.

An addendum to the LWMS has been prepared to address the changes at the northern end of the site – these stages are referred to as Stages 6 and 7 below. Refer to Part 6 and Appendix B for more detailed information with respect to the management and conservation strategies proposed to be implemented as part of the more detailed planning stages.

### 4.3.1. Groundwater

The Perth Hydrogeological Atlas (DoW) indicates that the site is located above the Superficial, the Leederville and the Yarragadee aquifers. The Structure Plan is not located within a Public Drinking Water Source Area.

The groundwater within the site generally flows in a north westerly direction towards the Helena River. Groundwater level data has been obtained from four bores across the site. Groundwater levels of approximately 10 metres AHD are found to the south-west of the site with levels reducing in depth towards the river at 6 metres AHD. Similarly, groundwater becomes more saline towards the river, however salinity levels remain below regional data levels. Maximum levels recorded are consistent with regional data (refer Appendix B for more detail).

Areas where there is potential for groundwater perching were monitored, with maximum groundwater levels ranging between 0.13 metres to 0.51 metres below ground level for the shallower nested bores. Perching has been observed during winter.



#### Stage 6 & 7:

Regional groundwater contours indicate a maximum groundwater level (MGL) across Stages 6 and 7 of 6mAHD to 8.5 mAHD. Predevelopment monitoring was undertaken in Stages 6 and 7 between 2012 and 2013.

Bores ROS01 and ROS02 are located within these stages. These are nested bores for monitoring the presence of perched water due to the clay layer, and the confined aquifer level. During predevelopment monitoring, the deep bores measured MGLs of 5.74mAHD at ROS01 (in the eastern side) and 5.01mAHD at ROS02 (in the western side). These levels may be representative of a potentiometric surface (release of confined or pressurised groundwater) of the confined aquifer, as the variation between maximum and minimum levels in these deep bores varies by approx. 3m-4m.

During the predevelopment monitoring, the shallow bores measured MGLs of 6.08mAHD at ROS01 (in the eastern side) and 4.74mAHD at ROS02 (in the western side). These levels are considered representative of a perched layer above the clay layer as these bores were dry during most of the year and only expressed water levels after winter rains in August.

The site has a groundwater licence to extract 139,815 kL per annum of groundwater from the Perth Superficial Swan aquifer until 2031. Once consumption levels for earthworks and irrigation of public open space areas are confirmed, the current licence will be reviewed.

### **4.3.2. Surface Water**

The site immediately abuts the Helena River foreshore, with the most northern boundary of the site being approximately 200 metres south of the river itself. A small tributary/ drain transects the site in a north-westerly direction. This tributary is highly modified, with long straight flow paths and uniform cross-sections. The tributary splits immediately upstream of West Parade. The EAR identifies that the culvert under West Parade and some small online ponds have hydraulic influence on the open channels.

The Structure Plan proposes to rehabilitate the highly modified drainage line into a 'living stream' multiple use corridor, forming part of the overall stormwater management of the Structure Plan. This will include vegetated banks and a more natural morphology that provides habitat opportunities for local fauna, aesthetic values to the local community and the conveyance of flood flows and water quality treatment.

Pre-development surface water flow and quality at the site has been measured since September 2012 (refer Appendix B). The quality of water flowing into and through the site was found to vary depending on its location along the drains. In particular, runoff entering from the adjoining urban area to the east exceeded general standards, largely as result of this estate not containing any Water Sensitive Urban Design (WSUD) features.

In addition, due to the sites historical use as a golf course (and agriculture prior to that) the site was subject to many years of fertiliser, herbicide and pesticide exposure. As a result, the change in land use will lend itself to a significant reduction in the application of chemicals.

#### Stage 6 & 7

The floodplain (1% AEP) associated with Helena River encroaches into the living stream/drainage line adjacent to the site. Approximately half the site is mapped as multiple use wetland.

There are two branches to the living stream within Stages 1 – 5, these converge at the culvert under West Parade. In Stages 6 and 7, there is one drainage line which currently discharges to the Helena River. This will be converted to the final part of the living stream post development.

Further details are provided in Section 5.13 of this report.

### **4.3.3. Floodways & Floodplains**

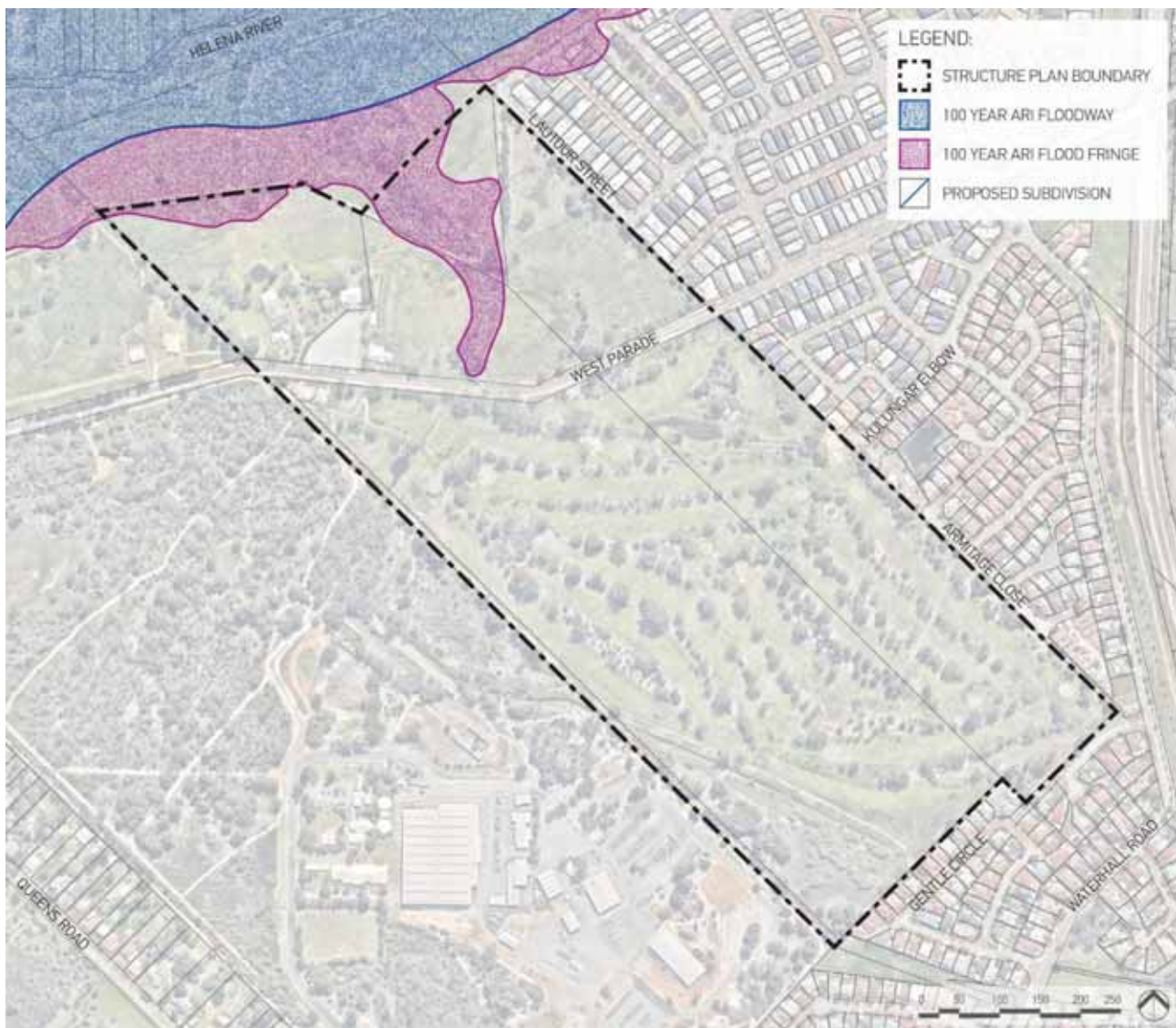
The site is subject to flooding from the Helena River and its tributaries which flow through the site. Floodways and floodplains are defined by the Department of Water and their implications on the site are shown in Figure 11. The northern portion of the site along the drainage channel downstream of West Parade is slightly impacted upon by the 100 Year ARI flood fringe.

It is important to consider the impact any flooding will have on the future residential development of the site and the impact any modifications to the existing system will have downstream. The flood flow route must be maintained to prevent risk to upstream or downstream communities.

Future urban development will be required to maintain appropriate minimum floor levels as determined by the Department of Water at the subdivision and development stages.

Further details with respect to flood mitigation and management are included in this report.

**Figure 12 Flood risk**



#### 4.3.4. Wetlands

A large portion of the site is shown in the DEC Geomorphic Wetlands of the Swan Coastal Plain dataset as being Multiple Use Wetland (MUW). MUW's are described as having few environmental attributes and have no statutory and limited policy protection. The wetland on the site fits the definition of a palusplain MUW along the northern edge and a dampland MUW extending into the southern and northern areas.

The use, development a management of the wetland should be considered in the context of ecologically sustainable development and best management practice catchment planning. There are no statutory buffers applicable to the wetland.

There are no mapped Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 (EPP) wetlands located within or immediately adjacent to the site.



## 4.4. BUSHFIRE HAZARD

A Bushfire Management Plan for Rosehill Waters Estate was adopted by the Department of Fire and Emergency Services (DFES) in 2018.

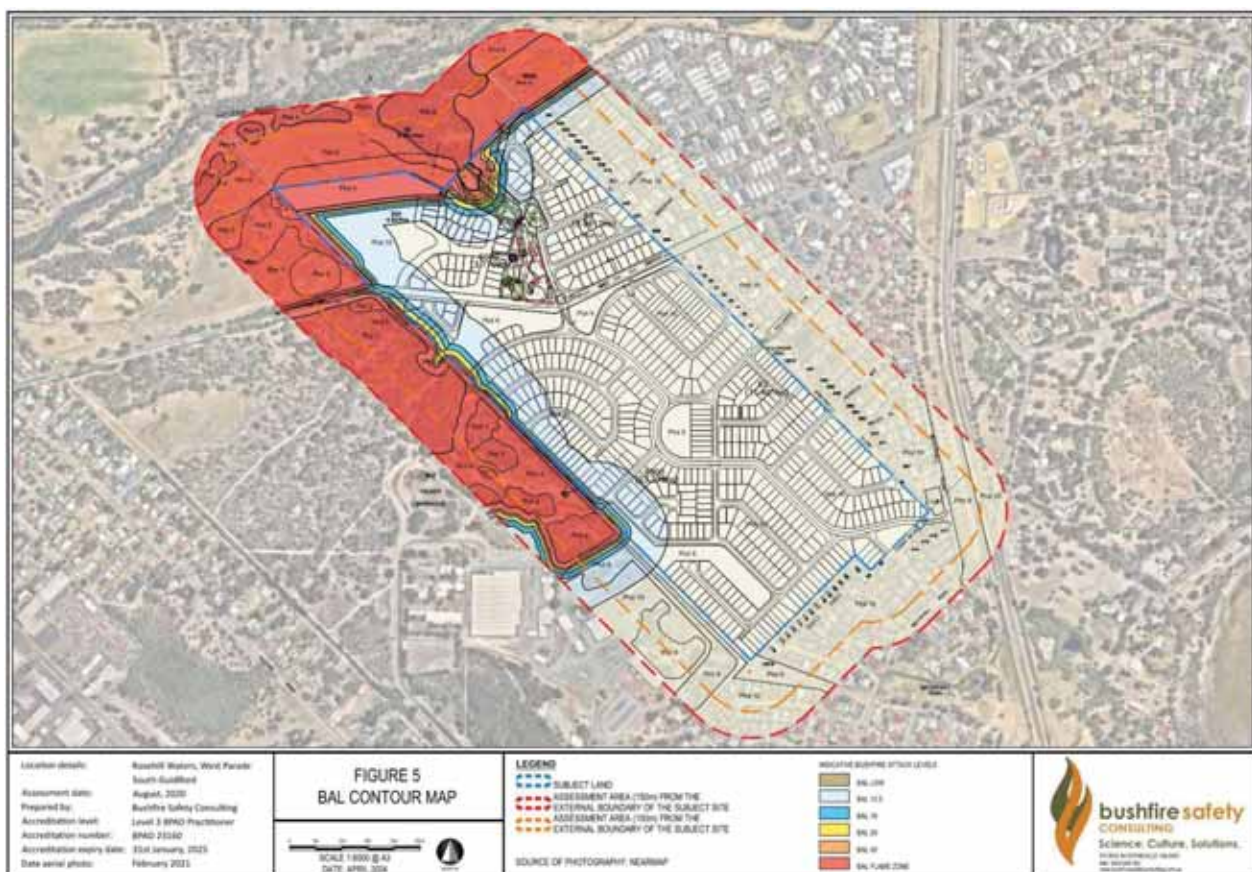
An addendum to this was undertaken in April 2024 reflective of the additional residential areas and design of the estate to date.

A Method 1 BAL assessment has been undertaken to determine predicted radiant heat flux levels on the northern and western interface which demonstrates that the residential lots can achieve a predicted radiant heat flux exposure of less than 29kW/m<sup>2</sup>.

The proponent is responsible for establishing the Asset Protection Zone until lots are sold. Fuel loads and responsibility for APZ standards then transfer to the new owners/occupiers of the land. The area is reticulated and there is good vehicular access.

The BMP addresses Policy measure 6.2, 6.3 and 6.9 of SPP 3.7 because it demonstrates that compliance with the Bushfire Protection Criteria in the Guidelines for Planning in Bushfire Prone areas can achieve compliance at subsequent planning stages. A further, more comprehensive Bushfire Management Plan complying with these policy clauses is required at future planning stages if the lots are still within the declared bushfire prone area.

**Figure 13 Bushfire Attack Level Assessment**



## 4.5. ABORIGINAL HERITAGE

The Heritage Inquiry System contains a number of Registered Aboriginal Sites and Other Heritage Places within and near to the site (refer **Figure 13**). These include:

- Bridge Camps – Aboriginal campsite (Site No. S02345)
- Helena River (ceremonial, mythological, repository /cache) (Site No.S02148)
- Bennett Brook Camp Area – plant resource, Aboriginal campsite, hunting place, water source (ceremonial, mythological, skeletal material / burial, man-made structure, fish trap, artefacts, scatter, historical) (Site No.S01997)

The watercourse/drain that traverses the site is mapped as part of the Helena River site (DAA Site ID 3758) and is a registered Aboriginal Site under Section 5 of the Aboriginal Heritage Act WA (AHA). Significance was attributed to the watercourse/drain as a result of movement of people, camping, ceremonial uses, hunting, fishing, gathering bush tucker and bush medicine.

An ethnographic and archaeological field survey has been carried out by Amergin Consulting (refer **Appendix H**) to assist in the preparation of the Structure Plan and to assist in determining the most appropriate design response for future subdivision and development, within the context of the existing cultural values. The key outcomes of the ethnographic study highlighted the significance of the Helena River, including the movement of people, camping, ceremonial uses, hunting, fishing, gathering bush tucker and bush medicine.

Similarly, the significance associated with the modified watercourse /drain which extends into the site and forms part of a registered site was highlighted. During consultation, concern was flagged around the realignment of the watercourse/drain with a preference that the drain returns to its former, natural course. The realignment of the drain along with its conversion to a “living stream” with associated public open space and indigenous planting was a favoured option.

Department of Aboriginal Affairs (DAA) has confirmed however, that the portion of the modified watercourse that extends into the Structure Plan is outside of the area reported as having heritage values. Therefore, no approvals under the Aboriginal Heritage Act 1972 are required. Notwithstanding, the design response has focussed around maintaining wherever possible a ‘living stream’ incorporated into a public open space green link centred around the retention of any trees. This will result in an integrated water management system that is sensitive to the existing cultural values and aligned with Water Sensitive Urban Design (WSUD) principles.

**Figure 14 Indigenous Heritage Sites map**



## 4.6. EUROPEAN HERITAGE

No recorded sites of European heritage significance have been found within the site.

## 4.7. OTHER LAND USE CONDITIONS AND CONSTRAINTS

### 4.7.1. Existing Road Network

There is one key movement network traversing the site, being West Parade, which runs in an east/west direction.

### 4.7.2. Contaminated Sites

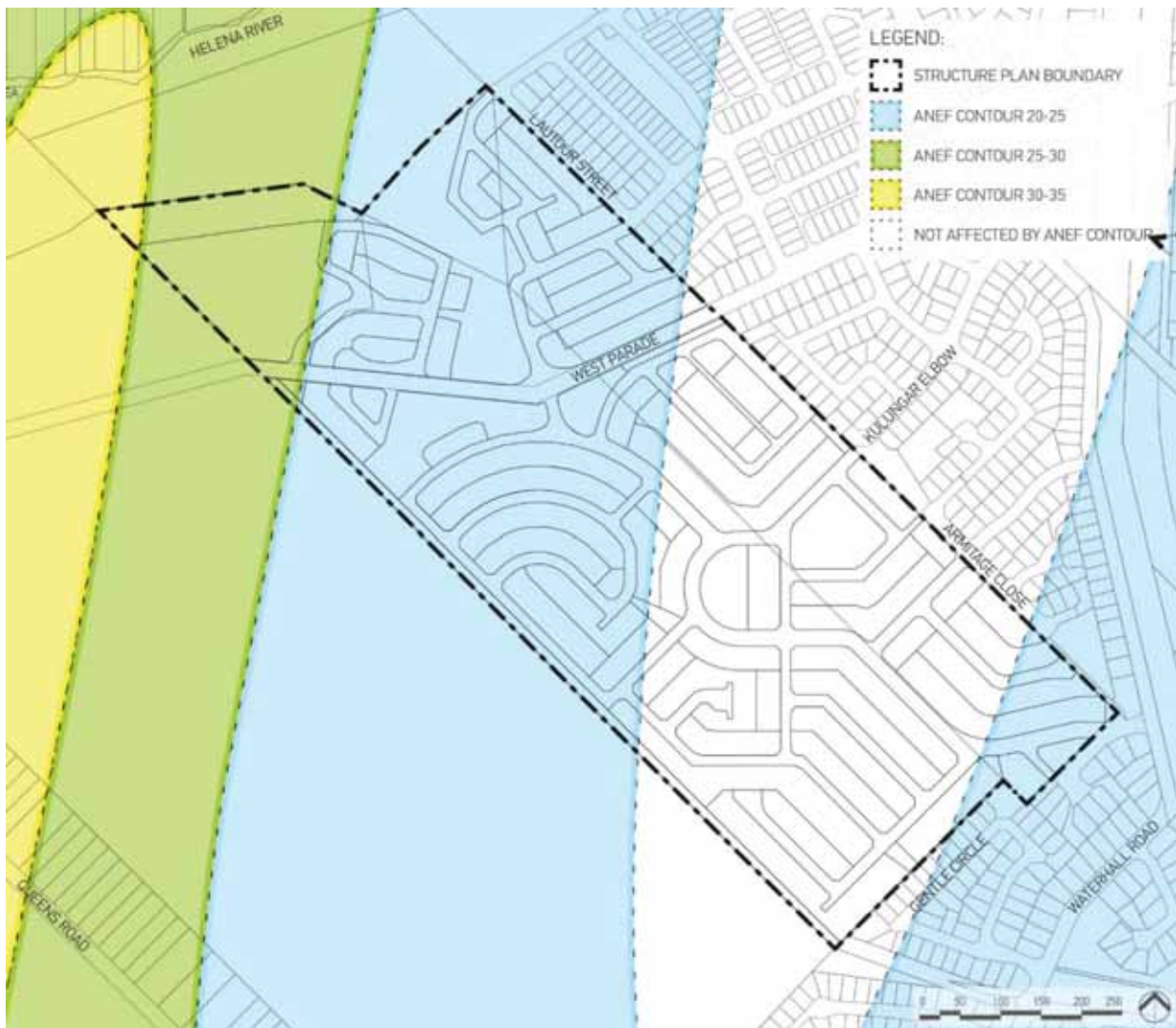
The DER's Contaminated Sites Data Base was searched and there are currently no known and/or registered contaminated sites within or adjacent to the site.

### 4.7.3. Aircraft Noise

The site is located within close proximity to the Perth airport and portion of the site is affected by aircraft noise. Approximately one third of the site is unaffected by aircraft noise contours, with the balance of the site being within the 20-25 and 30+ ANEF contour range as identified in the Perth Airport Master Plan 2020 and within DPLH mapping adopted in late 2019 (refer **Figure 14**).

Development within the Structure Plan is required to comply with the requirements of SPP 5.1 with respect to the use of land, density and standard of built form to mitigate the impacts of noise on future residents.

**Figure 15 ANEF Contours (2019)**





The Infrastructure & Servicing Report included in Appendix D provides a full overview of the preliminary engineering investigations that have been undertaken as part of the formulation of the Structure Plan. The report does not identify any constraints with respect to the sites ability to be provided with key infrastructure into the future.

### Figure 16 Opportunities and constrains map





## 5. DESIGN PHILOSOPHY, LAND USE & SUBDIVISION / DEVELOPMENT

The Structure Plan provides the framework for a robust, stand-alone urban development within the broader context of the South Guildford locality. The Structure Plan provides a level of detail that builds upon and refines the concept planning undertaken as part of the MRS Amendment process, whilst also remaining flexible in recognition of the more detailed stages of planning still to come. This section of the report provides the design philosophy and vision and articulates the land use and subdivision/development requirements for the land within the Structure Plan.

### 5.1. DESIGN VISION

There are a number of fundamental design principles that underpin the proposed Structure Plan, as summarised below:

- A strong overall philosophy focussed on a defined neighbourhood built upon simplicity, authenticity, connectivity, and creativity.
- Respect for the inherent features/ attributes of the land and its location.
- Strong pedestrian linkages focussed around key natural assets and topography, attractive and varied streetscapes and destinations which are well distributed, facilitating activity on the street.
- A design that responds to and recognises significant view corridors reflecting the heights of the hills to the south-east.
- Retention of mature trees where possible along key corridors (such as West Parade) and the Helena River to celebrate the rural qualities of the site.
- Celebration of water and the consideration and integration of the Helena River foreshore and its role within the urban fabric.
- Development of dwellings which offer a high level of amenity, affordability, and diversity, including limited medium density development
- A distinct identity and sense of place for future residents of the area which is both unique and recognisable.
- Retention of existing improvements such as the Reception Centre (Lodge), Stables and character gardens lending itself to adaptation into the future.
- Maintaining the existing character of the area through extensive open space provision along West Parade with strong linkages to the Helena River foreshore.
- A sound rationale for the development, including its context, constraints and opportunities to ensure that the future development is fully integrated with the existing surrounding residential development. Particular consideration has been given to the residential development to the immediate north-east and south-east of the Structure Plan area.
- To establish an environment which provides opportunities for public and active recreation that specifically seeks to promote improved liveability, health and well-being to future residents and the local community.
- To provide a low-key network of streets which reference parts of old Midland and Guildford.

Rosehill Waters will become a vibrant community comprising of residential, community and cultural activities to service the existing and future residents. Ultimately site considerations, combined with changing lifestyle demands, the need to address affordability, sustainable considerations and an objective to retain existing environmental assets has driven the urban structure.

An aesthetic which celebrates the rural qualities of old Guildford and Midland will be showcased in the tree lined streets, quality urban parks and accessibility to the Helena River foreshore.

The Rosehill Waters project vision has been developed around the following 6 key design principles:

- Green links
- Streetscape diversity
- Destination
- Unique identity
- Historical focus
- Accessible community

The following principles all link to each other to allow a succinct and cohesive concept through overarching elements of vegetation, user experience and site specificity. Each aspect aids the design in its entirety and is integral to the overall success and conceptual relevance of the project.

**Figure 17 Design philosophy**



Source: Urbis

## 5.2. VISION FOR ROSEHILL LODGE AND SURROUNDS

The original intent for the Rosehill Lodge area and surrounds was to accommodate a commercial/retail outcome over a significant portion of land located north of West Parade. This land use outcome was primarily due to the limitations to development placed on the land by the ANEF contours which limited land use outcomes. Following the changes in the ANEF contours in 2019, alternative development and land use outcomes for this land have been able to be explored.

In late 2020 the Rosehill Waters Project Team, led by the proponent, undertook a visioning process to explore potential design outcomes for the area generally north of West Parade, primarily around the Rosehill Lodge location.

The proponent's intention for the Lodge and surrounds arising from the visioning process and further commercial considerations is to develop the Lodge as a high quality, landmark mixed commercial/tourist operation with restaurant, café, reception centre, motel accommodation and complimentary activities (which does not include shop-retail). Proposed Scheme Amendment No.217 seeks to provide clarity on the specific land uses applicable to the Rosehill Lodge and Surrounds (Precinct 2 of Special Use Zone 24). These uses include café/restaurant, reception centre, motel, hotel, gallery, and tavern.

The development will be a drawcard and meeting place for residents in Rosehill Waters and surrounding development, along with the broader community. This Amendment and the associated modifications to the Structure Plan will enable the Lodge and its surrounds to realise this vision. Further, establishing this vision now, with the associated concept plans (below) and scheme provisions refined by this Amendment, will provide the community with a greater level of detail on the future intended development of the Rosehill Lodge and surrounds.

The retention and repurposing of the Rosehill Lodge will ensure the protection of this notable character building for the South Guildford and broader community, with views out to the Helena River, and providing a variety of activities and spaces, connected to the pedestrian and cyclist network and accessible by the broader road network.

Figure 18 Rosehill Lodge Concept



### 5.3. SUSTAINABLE RESPONSIVE DESIGN

Whilst housing diversity is somewhat limited with respect to density, there is the opportunity to improve the affordability and liveability of the dwellings through the provision of climate appropriate improvements to the dwellings which will make the home more affordable over its life span.

In this regard, considerable efforts have and will be made to achieve 6 leaves under the Urban Development Institute of Australia's EnviroDevelopment programme. Figure 16 outlines specific initiatives to be employed at Rosehill Waters as they relate to each EnviroDevelopment leaf. Design Guidelines will be employed and managed by the proponent to ensure built form related initiatives are delivered at the future stages of planning and development.

**Figure 19 Sustainable Responsive Design**



#### ECOSYSTEMS:

Reduction in water use and fertiliser application compared to the previous use of land.

Retention of existing trees and canopy cover maintained wherever possible, restoring of important local water systems and foreshore reserve.

Minimisation of cut and fill to achieve a net balance.



#### ENERGY:

30 per cent energy reduction through building envelope construction and energy efficiency.

Minimum of 7-star NatHERS from all residential buildings.

High efficiency street lighting and solar powered external lighting.

Energy awareness programs provided to residents.

Design features within each home to assist in achieving optimum energy efficiency and the installation of smart metres.

Installation of sufficient solar photovoltaic (PV) generation to cover the typical annual energy consumption of a single dwelling.



#### WASTE:

Declaration of a 'Smart Waste Zone' to achieve best practice in waste management.

'Reuse depot' during construction allowing potentially useful excess materials from one contractor to be used by another.



#### WATER

50 per cent potable water reduction through efficient hydraulic fittings and options for rain water tanks.

Efficient irrigation through mulching of landscaped areas and reticulated systems such as a community bore.

Sustainable stormwater management through integrated landscape and drainage systems.

Climate wise landscaping through irrigation, mulching, soil conditioning etc.



#### MATERIALS:

20 per cent embodied emissions reduction for concrete.

Reuse and recycling of content taken from the site.

Avoidance of toxic materials.



#### COMMUNITY:

Community gardens and improvement to public access to open space and the Helena River foreshore encourages residents to take advantage of the local assets.

Integrated movement networks including provision of public transport and walking and cycling infrastructure.

Retention and restoration of existing site improvements including the Rosehill Lodge, Padbury Stables and existing gardens.

Engaging with local community groups and provision of community education and information.

Source: Urbis



## 5.4. LAND USE

The Structure Plan indicatively demonstrates how subdivision and subsequent development may occur on the site, consistent with the WAPC Structure Plan Framework 2015 (refer Figure 1).

### 5.4.1. Residential

Development proposed within the Structure Plan is primarily residential, providing housing at a density of R20 where land is affected by aircraft noise, and as specified on the Structure Plan (Figure 1) in the case of land unaffected by aircraft noise.

Density was previously restricted to R20 due to the site's exposure to aircraft noise from the Perth Airport, in accordance with the MRS Amendment 1266/57. However, since late 2019, approximately one-third of the site is no longer affected by aircraft noise, resulting in some opportunity to provide medium density on Lot 802 to R30. This will provide for some limited housing diversity and choice to occur within the estate.

A total of 633 lots will be created. Most of the Structure Plan area has already been subdivided, with earthworks having just commenced in Stage 6A. The subdivision application for Stage 7 has just been lodged, and it's anticipated the final subdivision application for Stage 6B will be lodged towards the end of the year.

### 5.4.2. Special Use Zone

Special Use zoned land is located to the far north-west corner of the Structure Plan area. This land occupies a total of 2.66ha and primarily consists of the Rosehill Lodge and surrounding gardens. This zone and associated SUZ24 scheme provisions specifying land use permissibility will facilitate the use and development of the land for a range of commercial and tourist uses.

## 5.5. LOCAL RESERVES

### 5.5.1. Public Purposes

Lot 1, located within the Structure Plan boundary is owned by the Water Corporation and is currently utilised for drainage infrastructure. The use of this land is not envisaged to change under the Structure Plan and is therefore shown to be a local reserve, consistent with the City of Swan LPS17.

### 5.5.2. Public Open Space

The provision of public open space (POS) is distributed throughout the site to provide direct accessibility to residents whilst also responding to the existing drainage lines present at the site. The layout and form of the POS comprises of a mixture of linear parks, smaller areas of POS and larger active spaces centred around the retention of existing trees wherever possible. A total of 5.25 hectares of public open space is provided within the Structure Plan.

Further detail with respect to the provision of POS is included in **Figure 21**.

Figure 20 Density Plan

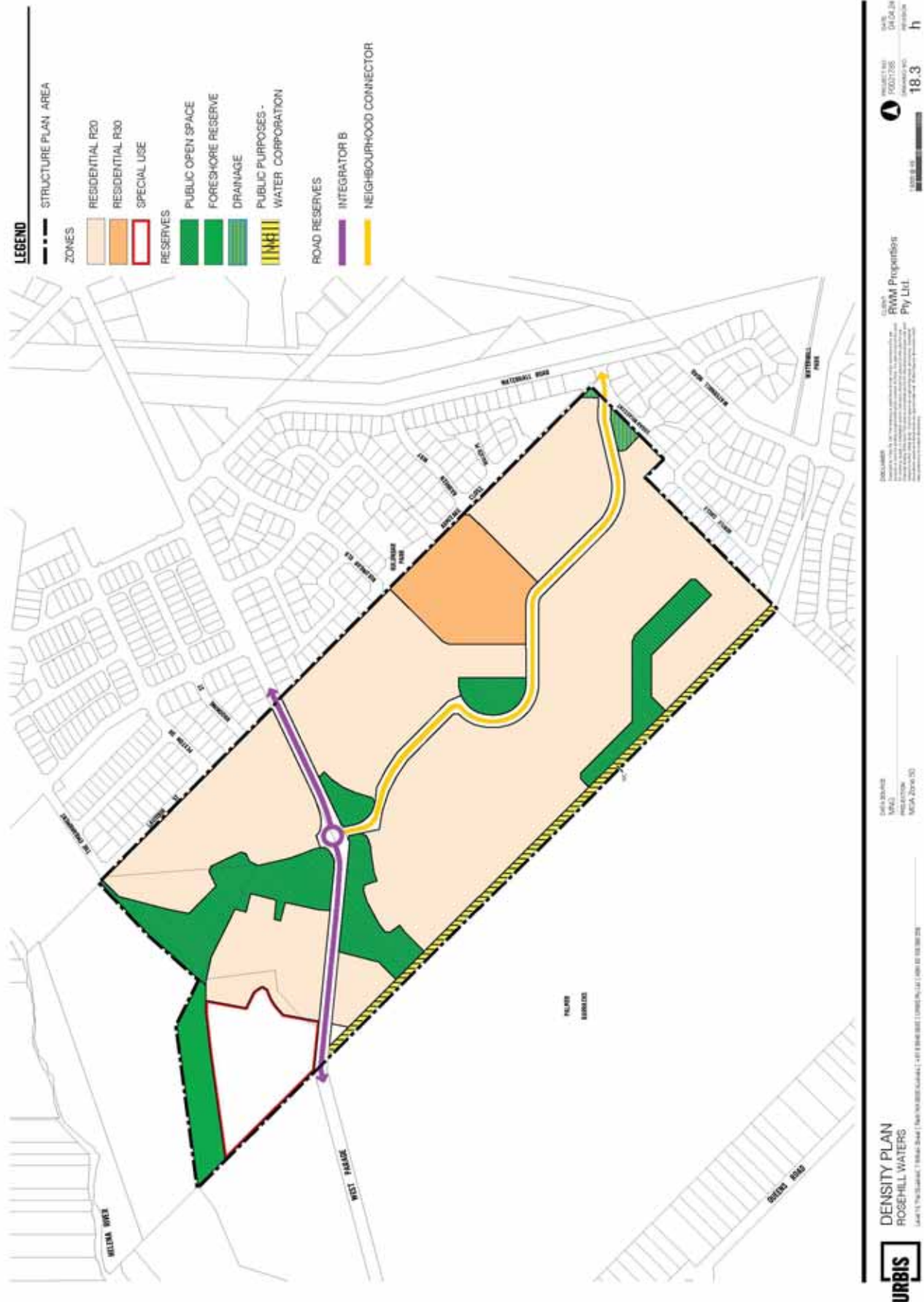


Figure 21 Public Open Space



## 5.6. OPEN SPACE

### 5.6.1. Open Space Distribution and Calculation

WAPC's Liveable Neighbourhoods requires a range of site responsive public open space in order to address the district, neighbourhood and local needs of residents. Public open space should be provided through a mix of both unrestricted and restricted spaces which are both functional and useable.

Table 4 provides a breakdown of the open space proposed in accordance with existing Liveable Neighbourhoods requirements.

A minimum of 10 per cent of the gross subdivisible area will be provided as POS in accordance with Liveable Neighbourhoods. Table 4 demonstrates that the minimum 10 per cent POS requirement can be achieved at subdivision stage with preliminary calculations indicating that a POS provision of 11.52 per cent is achieved.

The Local Water Management Strategy contains a drainage catchment plan (refer Appendix B) which depicts the indicative stormwater retention basins, similarly Figure 19 identifies the stormwater events associated with each POS area for the 1:1 year and 1:5 year storm event. Preliminary engineering calculations indicate that approximately 0.96ha of stormwater basins at the 1 in 1 year storm event (classified as excluded POS) and a total of 0.36ha which relates to the 1 in 5 year storm event (classified as restricted POS). Under Liveable Neighbourhoods (2009), a maximum of 2 per cent of the POS can be classified as restricted.

As the Special Use Zone (Precinct 2) will be held in private ownership, no public open space credit has been sought for this land.

The final public open space amount will be subject to detailed design at subdivision stage.

### 5.6.2. Tree Protection Zone

A key driver of the design has revolved around the desire to retain mature trees where possible. At the more detailed design stage (in particular when final levels are determined) those trees which are able to be retained within private landholdings, public open space and road reserves will be identified. The design intent is to utilise existing vegetation as a natural buffer to West Parade, to the foreshore reserve and between existing dwellings adjoining the Structure Plan. Tree protection zones will be identified to ensure the appropriate setbacks and the best opportunity for retention is provided.

### 5.6.3. Public Open Space (POS) Form & Function

The public open space proposed is a mix of smaller POS areas, multi-use corridors and larger centrally located public open space areas adjacent to residential development and the civic/community centre. The POS layout focusses on providing access to all residents within the area, encouraging the use of the space by the community.

The design and placement of public open space within the Structure Plan has been driven by the following key principles:

- Conservation of mature trees and the implementation of native planting.
- Multi-use drainage corridors which encompass existing drainage lines and offer opportunities for passive open space.
- Protection of flora and fauna habitat.
- Provision of functional parkland and walk trails connected to the Helena River foreshore.

The POS plan demonstrates the location and type of public open space across the Structure Plan. The following section outlines the key aspects of the proposed POS based on Liveable Neighbourhoods principles and objectives, with a detailed description of each open space type (P1-P6) provided.

Table 4 POS Calculations

**PUBLIC OPEN SPACE SCHEDULE - CALCULATIONS**

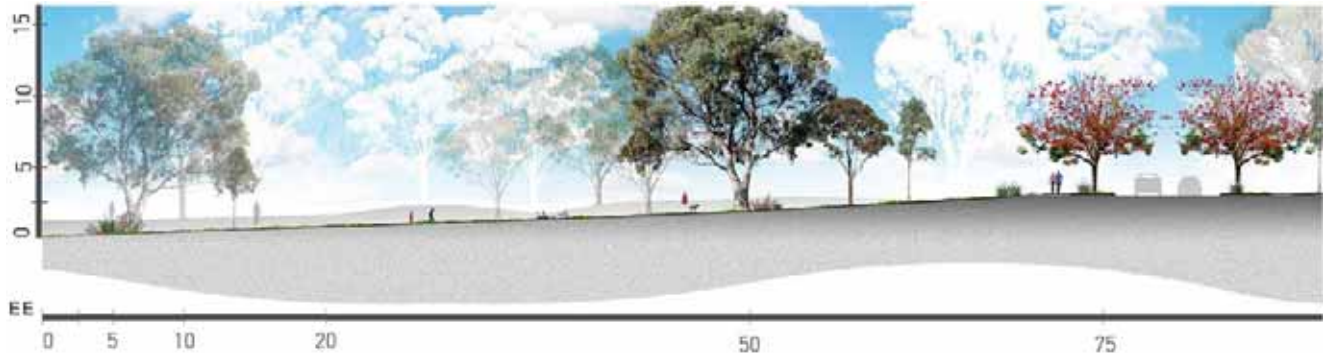
<b>Site Area ha</b>				<b>51.5054</b>
<b>Less ha</b>				
EPA Wetlands to be ceded	0.0000			
Protected bushland sites	0.0000			
Unrestricted POS sites not included in POS contribution	0.0000			
Restricted POS not included in POS contribution	0.0000			
Foreshore Reserves to be ceded	1.2994			
<b>Total</b>		<b>1.2994</b>		
<b>Net Site Area ha</b>				<b>50.2060</b>
<b>Deductions</b>				
Primary School and High School	0.0000			
Town Centres / Commercial	0.0000			
Dedicated Drainage	0.9279			
WaterCorp corridor	1.0565			
Other (Sewer pump station site)	0.0000			
Other (Special Use)	2.6607			
<b>Total Deductions</b>	<b>4.6451</b>			
<b>Gross Subdivisible Area</b>				<b>45.5609</b>
<b>Public Open Space @ 10%</b>				<b>4.5561</b>
<b>Public Open Space Contribution</b>				
May Comprise				
minimum 80% unrestricted POS	3.6449			
maximum 20% restricted POS	0.9112			
<b>Unrestricted POS sites</b>				
Area 1	2.4674			
Area 2	1.0299			
Area 3	0.2932			
Area 4	0.5122			
Area 5	0.6476			
<b>Unrestricted POS Total area</b>	<b>4.9503</b>	<b>10.87</b>	<b>percent</b>	
<b>Restricted Use POS sites (detention/inundation more often than 1:1 yr event, MUW, Buffers etc)</b>				
Area 1	0.0445			
Area 2	0.0252			
Area 3	0.0019			
Area 4	0.0000			
Area 5	0.2285			
<b>Restricted POS contribution</b>	<b>0.3001</b>	<b>0.66</b>	<b>percent</b>	
<b>Total Restricted Use POS able to contribute to POS (cannot exceed 2% of required 10%)</b>		<b>0.91</b>		
<b>Contributing POS</b>				
Unrestricted POS	4.9503			
Restricted POS	0.3001			
<b>Total Contributing POS</b>	<b>5.2504</b>	<b>11.52</b>	<b>percent</b>	
<b>Total POS provided</b>				<b>5.2504</b>
<b>Surplus unrestricted POS</b>				<b>1.3054</b>
<b>Surplus restricted POS</b>				<b>-0.6111</b>

Source: Urbis



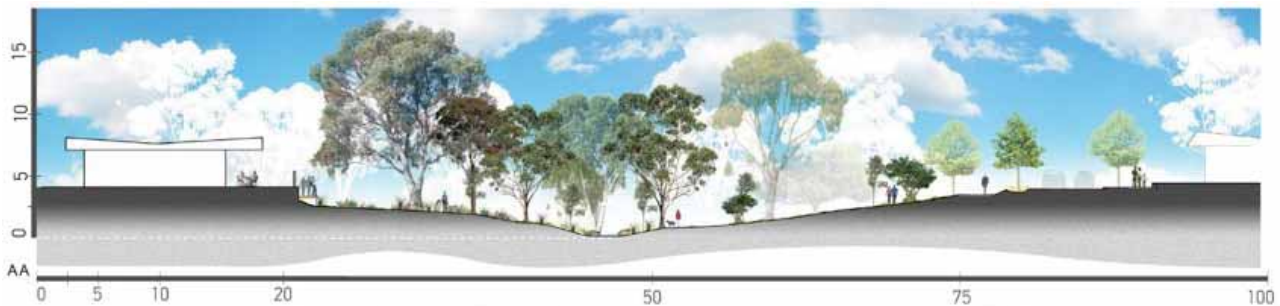
### P1 Homestead Park

'Homestead Park' is the interface between the Civic Centre and the Helena River Foreshore. A number of existing landscape elements, particularly the original orchard and driveway alignment will be retained as part of the broader circulation and community function of this area. The POS itself will act as a buffer between the development and the foreshore and will include rehabilitation of the pre-existing dampland environment to support both habitat creation, water management and a place of activation.



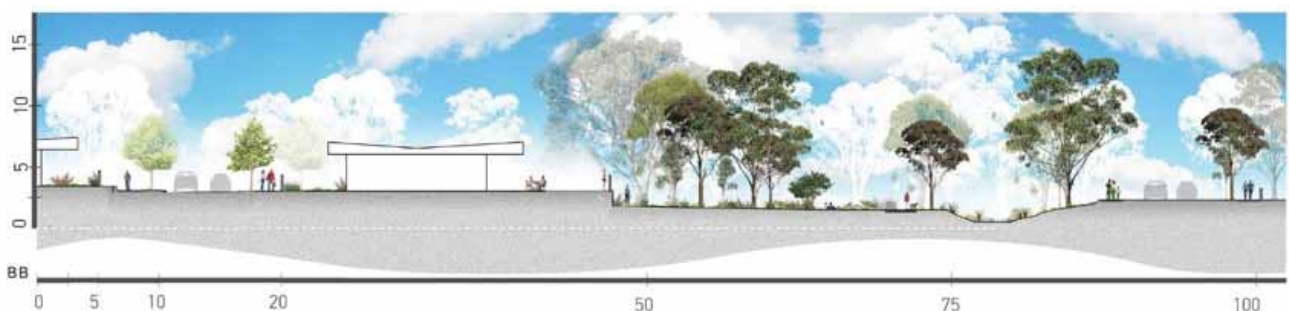
### P2 Padbury Park

Padbury Park' is "proposed as a passive green park that links through to the Helena River foreshore. This space is focused around the retention and celebration of the existing watercourse that traverses the site and will include a mix of open grassed parkland and native planting. This park will provide a transition between the urban environment and the natural environment through appropriate planting which is reflective of the rural landscape and encourages habitat creation along the waterway.



### P3/P4 Lockart and Berckelman Park

This linear parkland, located to the south of West Parade aims to enhance and celebrate the rural character of the area via an open, rural edge along West Parade. This will be realised through the retention of the existing landform, waterways and trees. A variety of informal passive grassed play areas will be developed along with walkways providing pedestrian access from the estate through to the civic/community hub.



## P5 Serpentine Park

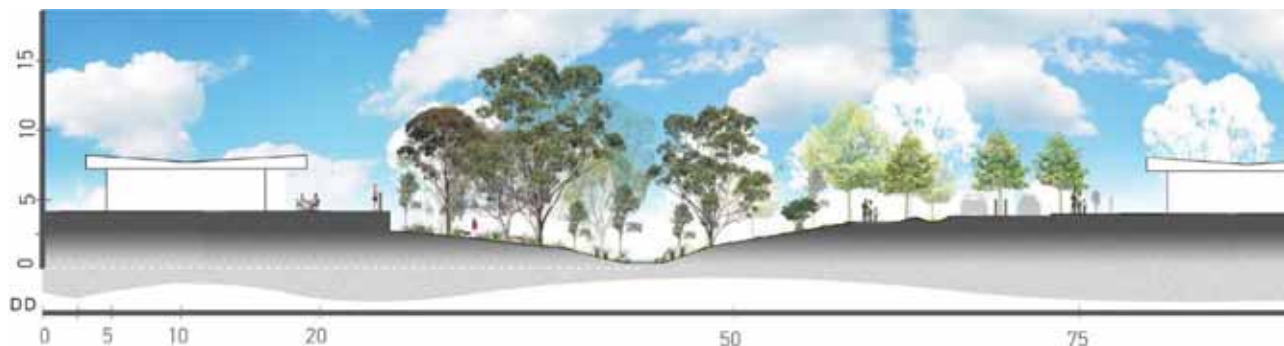
Serpentine Park is located centrally within the development and is located to provide an alternative experience for residents. The park is a visual focal point looking south from the entry road from West Parade and provides a semi-active central node for community gathering. The park is located along the central spine of the estate and provides commanding views, potentially extending to the Helena River. Due to the distinct character and unique locational advantages, this public open space will incorporate nature play, BBQ's, shelter and the retention of trees to create a distinct community outdoor space.

This park also serves as an intermediate destination for residents moving from the south eastern end of the development to the civic centre and Helena River. This park has been located to assist in encouraging pedestrian and cycle movement.



## P6 Nullagine Park

Nullagine Park follows the living stream located to the south-west of the Structure Plan to create a passive space for informal gatherings. This linear park will incorporate planting with a native focus and the retention of the ingress and egress levels of the existing stream. Retention of trees where possible and habitat creation through re-profiling and rehabilitation of the waterway will contribute to the rural character of the estate and ensure the existing water quality and habitat is improved.



## D1/D2/D3 Tone Park

Flanking the threshold of the subdivision to the east, at the intersection of Edgar Wilkes Entrance, these separate areas of public open space will provide small pocket parks which will serve as pause points for those traversing the site. The siting of the parks will also provide an opportunity to create a visual entry and buffer into the site transitioning from the existing developments into the leafy green streets of the Structure Plan area. Due to the natural topography levels, these parks will play a drainage function with the retention and planting of trees assisting in creating a visual entry statement into the estate from the south. A cross-section has not been provided for this POS area due to its primary drainage function. Due to the size and drainage function of these open spaces, no formal open space credit is sought for these areas.

## **Kulunga Park**

It is currently proposed that Kulunga Park, situated on the outside of the eastern boundary of the Structure Plan be upgraded as part of the subdivisional works for the Structure Plan. The upgrade will address the current grassed areas and planting as well as the potential improvement to the linkages and finishes within the public open space. The extent of the upgrade will be assessed in conjunction with the City of Swan and determined at the more detailed planning stages. Kulunga Park does not form part of any credited open space as it falls outside of the Structure Plan. A cross-section of this POS has not been provided as it sits outside of the Structure Plan and will be subject to further consideration and detailed design.

## **Water Corporation Corridor (Lot 1)**

Ownership of Lot 1 resides with the Water Corporation and as such, all management of this corridor will remain with the authority. The proposed interface with Lot 1 will vary pending the adjacent land use. POS areas will blend seamlessly with the lot and the streetscape interface will vary from at grade integration to landscape batters.

## **5.7. LANDSCAPE DESIGN**

To assist in creating a high quality public realm which contributes to the amenity of the residents and surrounding locality, a Landscape Master Plan has been prepared to accompany the Structure Plan.

The approach to landscaping has been strongly based on the overall philosophy of creating a defined neighbourhood built upon simplicity, authenticity, connectivity and creativity. Maintaining the existing character of the area which references history and heritage and celebrates the rural character of the site is intrinsic in the overarching landscaping design. On the ground, the landscaping will directly respond to the sites natural assets and ecological corridors with respect to tree and topography retention, wherever possible. The landscape approach will respond to EnviroDevelopment initiatives through the selection of native tree species and urban water sensitive design. The proposed landscape design is included in Figure 18.

### **5.7.1. Irrigation Strategy**

It is intended that the irrigation system will utilise the existing bore and the associated licence which was previously used to irrigate the former golf course and surrounds.

All landscape areas will be hydrozoned and designed to minimise water use through the appropriate selection of species and soil enhancements.

### **5.7.2. Landscape Management**

The industry accepted standard Developer funded and managed landscape and irrigation maintenance period is typically two (2) summers as outlined in Liveable Neighbourhoods. Following this period, the landscape and irrigation maintenance will be handed over to the City of Swan to manage, unless otherwise negotiated.



Figure 22 Indicative Landscape Masterplan



Source: Urbis

## 5.8. MANAGEMENT OF INTERFACES

The Structure Plan is bounded by existing residential development to the north-east and south-east boundaries. Local roads separate some areas of housing whilst other existing dwellings immediately abut the boundaries of the Structure Plan. Following feedback from the community, and as a direct response to the MRS Amendment No.1266/57 outcomes, the design seeks to create a more appropriate interface between the proposed development and the existing residential dwellings.

The conditions of the MRS Amendment No.1266/57 specifically require that;

*“Existing residential development abutting the amendment area should be appropriately separated from new residential development in consideration of amenity impacts”; and*

*“An appropriate buffer should be provided along West Parade that retains the existing vegetation and maintains the visual amenity of West Parade.”*

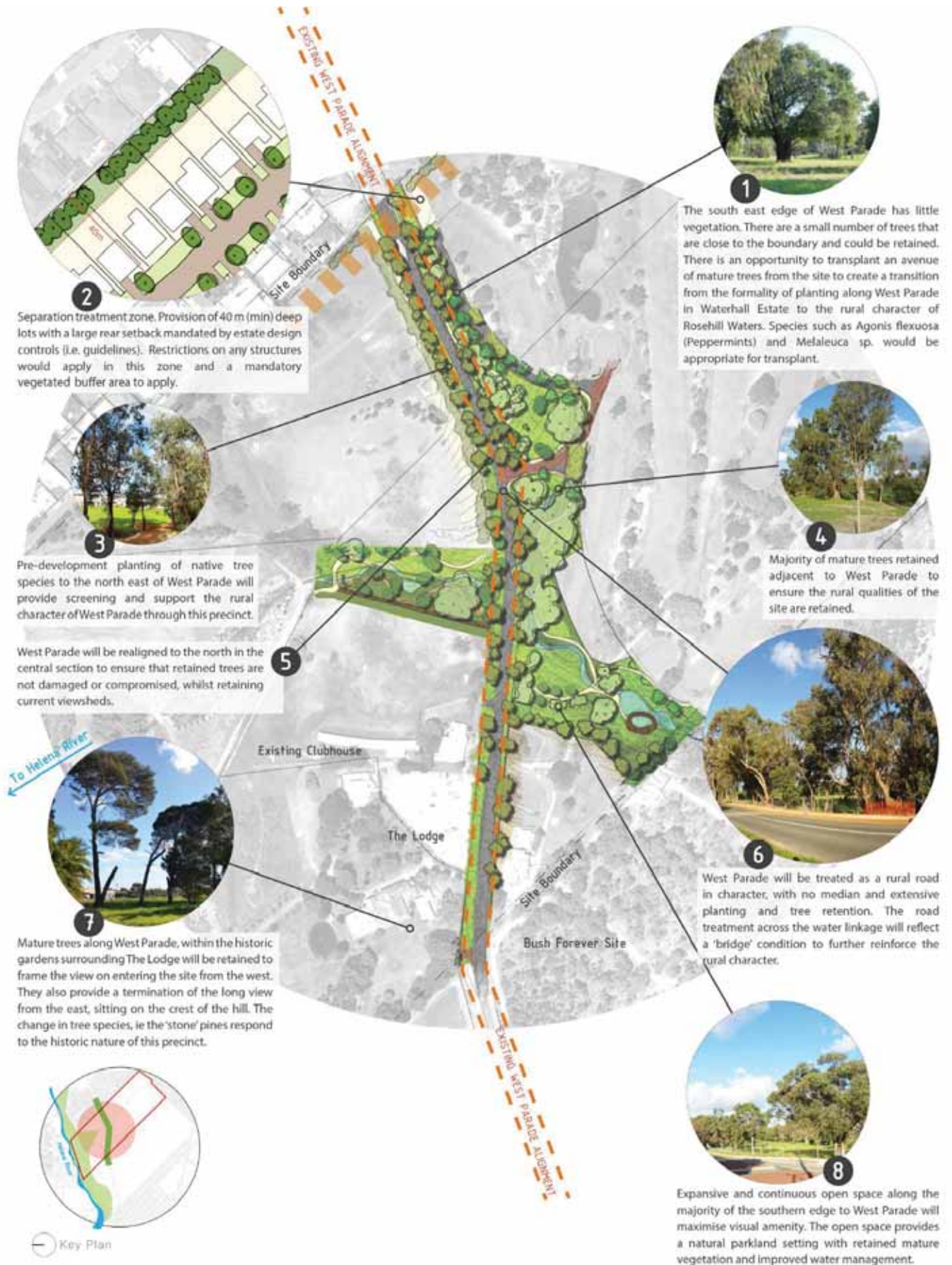
The Structure Plan design has been configured to ensure an appropriate interface and buffer has been provided to respond to the above requirements. Details of this design response is as follows:

- Deeper lots (i.e. 40 metre deep lots) will be provided to those lots immediately abutting existing residential development (refer Figure 20). The deeper lots will facilitate building footprints are appropriately setback from this boundary. These setback areas will be planted out (by the proponent) as part of the build out, with the exact type and nature of planting being determined through consultation with the community. Where a road interface is provided to existing residential development, the proponent will provide “over and above” landscaping to the verge treatments. The exact nature of these treatments will be determined in consultation with the City of Swan and the local community.
- The requirement for Local Development Plans to provide the detailed control over separation distances between all lots which are directly adjacent to existing residents. These LDPs will be required as a condition of subdivision and/or prior to any development.
- To the largest extent POS abuts West Parade, with mature trees being retained wherever possible. Pre-development planting of native tree species to the north east of West Parade will provide screening and support the rural character of the road. The road reserve will be widened to the south-east to allow for the transplantation of any mature trees from site (where possible) to create an avenue of mature trees along West Parade.
- Orienting lots on the northern side of West Parade to better interface with residential lots to the south, creating a more integrated outcome for the estate

The above along with the detail provided in Figure 23 demonstrates how the conditions of MRS 1266/57 have been considered within the preparation of the Structure Plan and how they will be delivered at the detailed design stage.



Figure 23 Buffer & Separation Treatments



## 5.9. MOVEMENT

This section has been directly informed by the Transport Impact Assessment undertaken by DVC (refer Appendix E) and highlights the key elements and details of the proposed and existing road networks, the road hierarchy classification and road cross-sections. This section also provides an overview of the pedestrian and cyclist network within the Structure Plan.

### 5.9.1. Existing Access & Movement

The Structure Plan is presently accessed from West Parade which transects the site in an east-west direction. The north-east boundary of the Structure Plan abuts some roads within the existing residential estate, namely Lautour Street and Armitage Close, with other residential roads terminating at the boundary. Edgar Wilkes Entrance forms part of the south-eastern boundary.

Major arterial roads within close proximity include Great Eastern Highway to the west and Great Eastern Highway Bypass to the south.

### 5.9.2. Movement Network Hierarchy

The Structure Plan provides for a District Distributor B (West Parade) and Neighbourhood Connector as well as key local access streets that connect to the existing street network. The road hierarchy is shown in Figure 21.

Arterial access to the Structure Plan will be provided predominately by West Parade which links to Great Eastern Highway in the west and to Bushmead Road to the east. Access to the Structure Plan from the south is afforded by the existing Waterhall Road a Local Distributor that passes in a north-south direction through the existing Rosehill estate. A planned SE – NE running Neighbourhood Connector ('main spine') will pass through the Structure Plan and connects traffic to either West Parade or Waterhall Road. Pexton Drive runs in an east-west direction and connects residential traffic to the future civic/cultural centre and will function as an Access Street – B.

The access system has been developed carefully to share traffic generated amongst the surrounding streets and intersections. The analysis undertaken by DVC (refer Appendix E) confirms that there is sufficient existing capacity within the arterial and local road network to accommodate the traffic generated from the Structure Plan. The traffic volumes forecast within the Structure Plan are comfortably within the acceptable limits as prescribed in Liveable Neighbourhoods (2009).

### 5.9.3. Street Types

Road reservation widths will range from 20 metres for the Neighbourhood Connector to 12 -15 metres for the local access streets, consistent with the ranges contemplated in Liveable Neighbourhoods (2009). The smaller reserve widths are generally for shorter, low volume and low parking demand streets, with larger reservation widths making allowance for median or verge features.

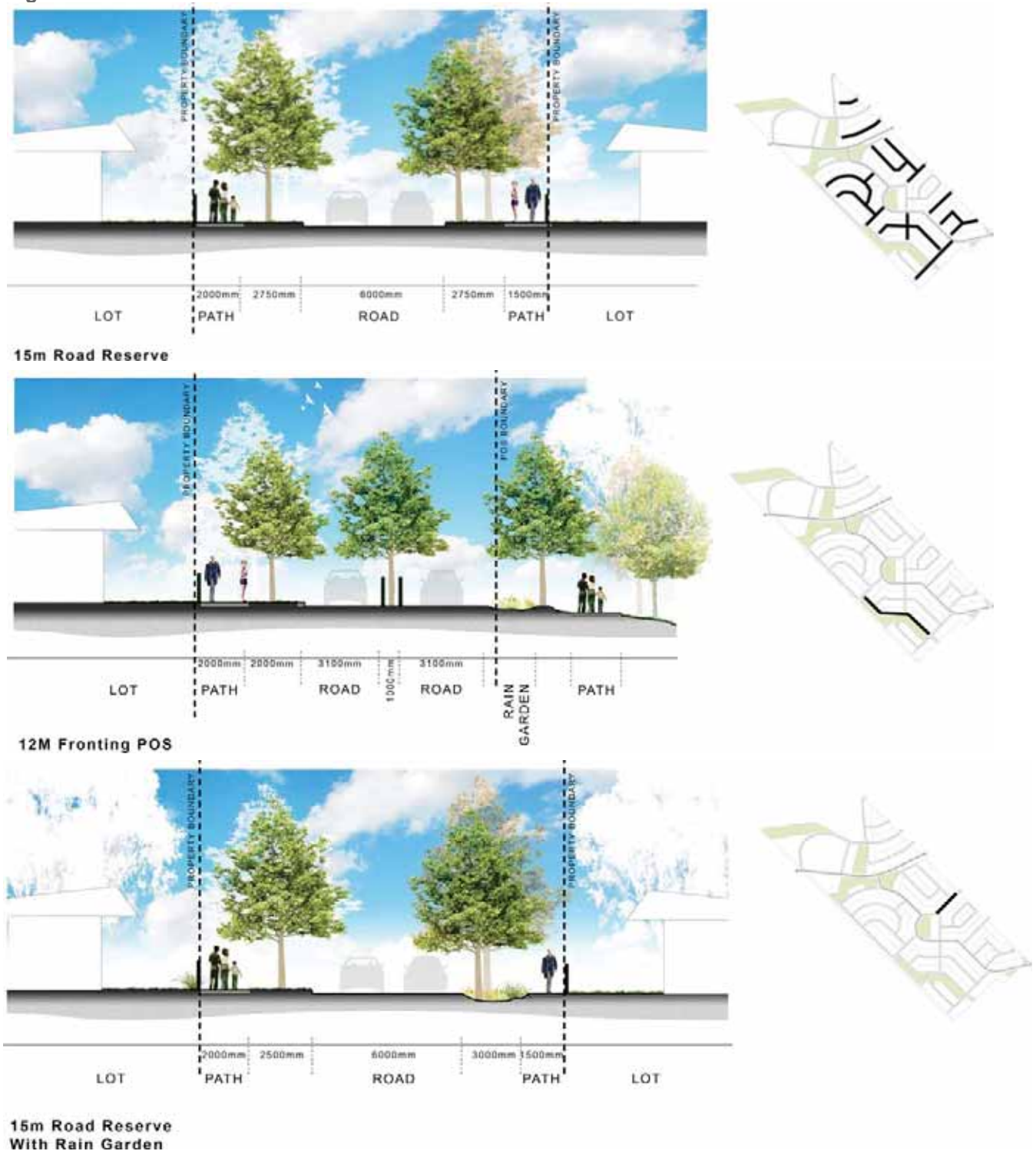
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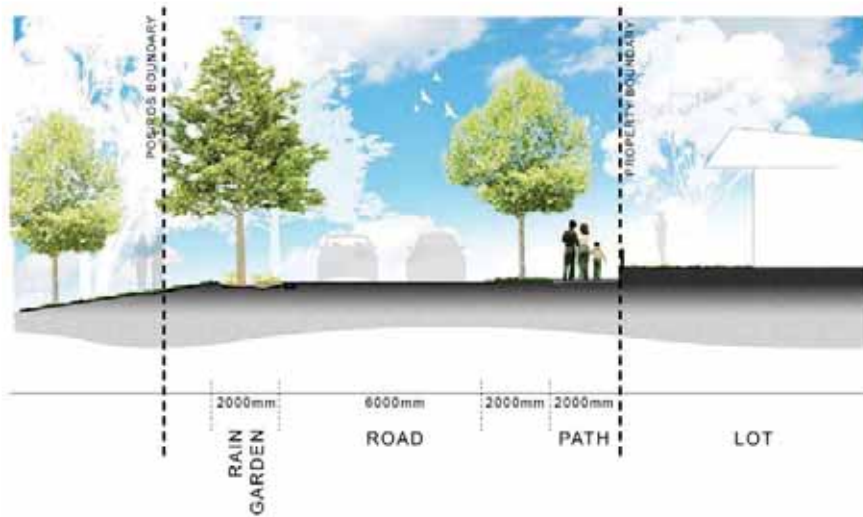


The street cross-sections at Figure 25 identify the proposed Structure Plan road network, including the identification of a hierarchy of local access streets within the Structure Plan. The design of the streetscapes has been largely driven by existing topography and the desire to retain trees within verges where possible. In some instances road pavement has been diverted to sit closer to the road reserve boundary to allow for tree retention. In some circumstances, multiple cross-sections have been provided for the same portion of road. This has been done to demonstrate the multiple options that may apply depending on site conditions and final detailed design.

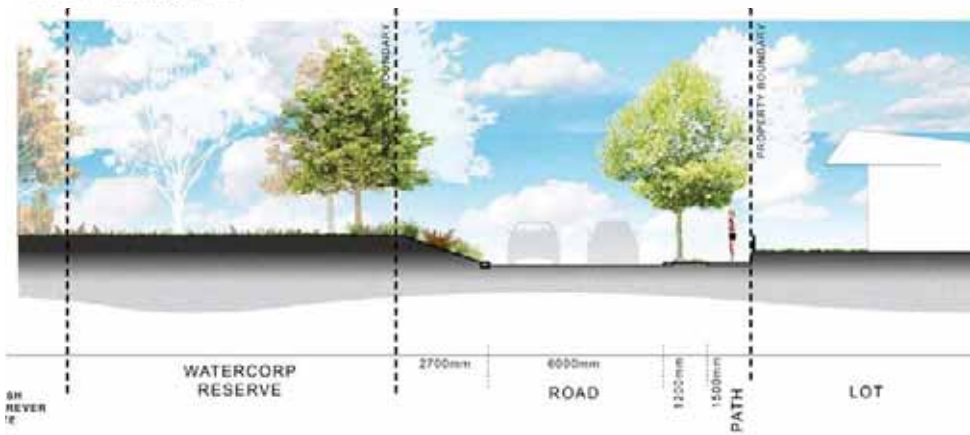
**Figure 25 Road Cross Sections**



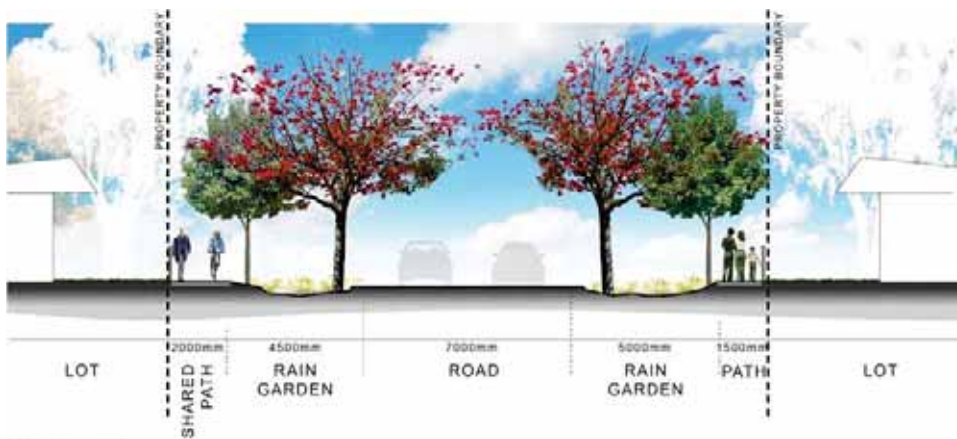




**12m Fronting POS**



**12m Adjacent Watercorp Reserve**



**20m Road Reserve With Drainage**



**West Parade**

Source: Urbis



There are a number of streets within the Structure Plan which will connect to the existing street network of the neighbouring estate, these include connections to:

- Pexton Drive
- Lautour Steet
- Brooking Street
- Kulungar Elbow
- Karreen Way
- Edgar Wilkes Entrance
- The Embankment

Connection to Pexton Drive is via a pedestrian accessway only, given the continuation of roads is adequately accommodated by The Embankment and Brooking Street north of West Parade, with a Pexton Drive connection being problematic given street numbering in this location which would cause confusion for emergency vehicles.

#### **5.9.4. Upgrades to Great Eastern Highway/Queens Road Intersection**

As part of earlier planning for Rosehill Waters, the impact the development will have upon the Great Eastern Highway and Queens Road intersection has been comprehensively analysed. This analysis has demonstrated that the current level of service at the intersection results in difficulties turning right out of Queens Road, with a level of service F (LoS F) currently experienced.

The primary concern raised was level of service at the intersection for those vehicles turning right out of Queens Road, and extensive discussions were held with the City of Swan and MRWA regarding required upgrades to the intersection. At the conclusion of the negotiations it was agreed that an extended left turn lane would be installed on the Queens Road approach, to reduce the amount to which drivers turning left are blocked by vehicles queuing to turn right.

*Note: Since adoption of the original Rosehill Waters Structure Plan, the developer has paid an agreed amount, as negotiated between the City of Swan, MRWA and the developer, to the City of Swan for the proponent's contribution to the upgrade of the intersection. The City of Swan will determine when these works occur.*

### 5.9.5. Pedestrian and Cycle Network

The pedestrian and cyclist network will provide a high level of accessibility and connectivity for pedestrians and cyclists within the Structure Plan to the surrounding neighbourhoods. Figure 26 demonstrates that almost all of the Structure Plan is located within an 800 metre radius from the Waterhall Local Centre and the Rosehill Lodge Precinct, with all land within the Structure Plan located within 800 metres of the future proposed bus route.

A key focus has also been placed on providing improved linkages to nearby services within the Guildford town centre, through the provision of a pedestrian linkage through the Helena River foreshore.

The existing cycle path along West Parade will be retained in its current form and cycling will be safe on all local streets within the Structure Plan where traffic flows are less than 3,000vpd. Similarly, the low traffic volumes on the existing surrounding and proposed street network will allow for pedestrians to safely and easily navigate through the Structure Plan as desired, with footpaths being provided to at least one side of the road to all streets.

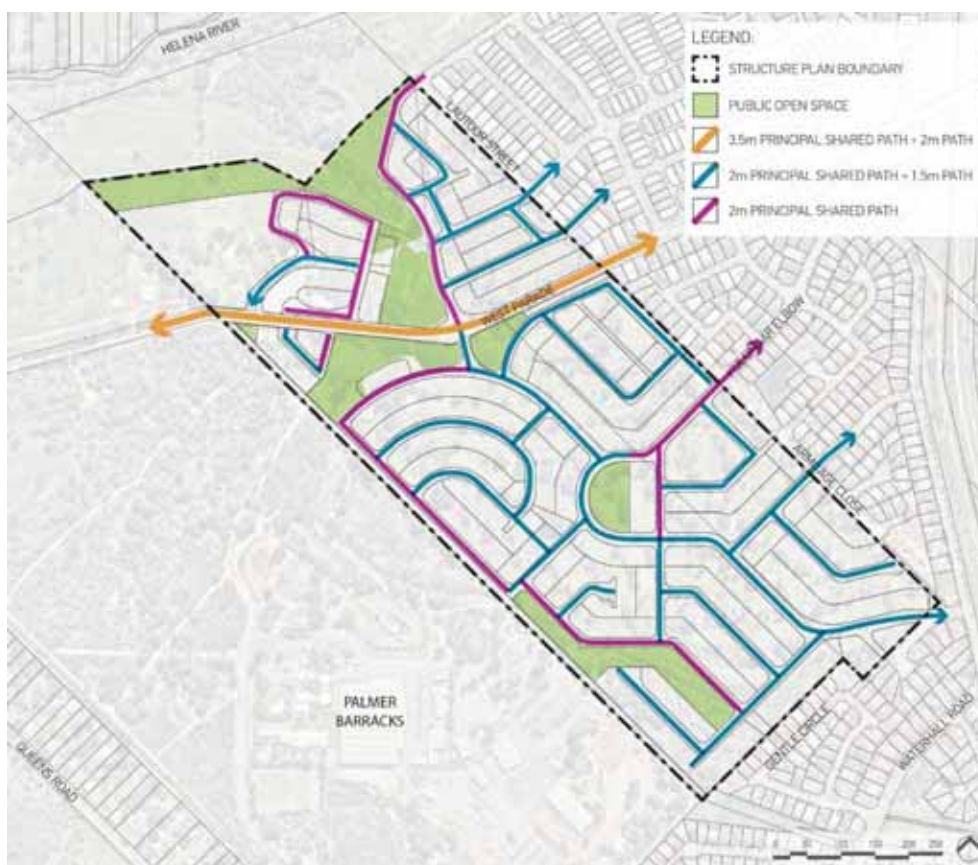
The hierarchy for pedestrian and cyclist facilities within the Structure Plan is consistent with Liveable Neighbourhoods and is demonstrated in Figure 27.

### 5.9.6. Public Transport

Midland Strategic Regional Centre is approximately 5 kilometres to the north- east of the subject site, where the metro rail line service from the Perth CBD currently terminates. Bus 304 currently services the neighbouring residential estates to the east of the Structure Plan and runs services to the Midland bus station. The nearest bus stop from the Structure Plan is located approximately 400 metres which is a comfortable 5 minute walking distance.

It is proposed that a bus route run through the 'main spine' of the development to improve access to public transport at the site, and in particular improve the accessibility to public transport for the elderly at the aged person's site. Preliminary consultation has been undertaken with the Public Transport Authority (PTA) with advice received providing in-principle support to the proposed route. The details as to the timing of the switch to the new alignment will be determined upon construction and in liaison with the PTA.

**Figure 26 Pedestrian and cycle network**





## 5.10. WATER MANAGEMENT

This section of the Structure Plan has been directly informed by the Local Water Management Strategy (LWMS) prepared by Coterra (refer Appendix B). The LWMS defines the surface water and groundwater management objectives and strategies including water quality management, water conservation and sustainability measures and the requirements for additional work at future planning stages.

In developing a water management strategy the intention is to incorporate Water Sensitive Urban Design (WSUD) through the implementation of Best Management Practices (BMP) in the management of surface water and groundwater, nutrient, flood, water use and wastewater. This will ensure that there is no undue impact on the existing local drainage infrastructure or the environment and that the site is adequately protected from flooding.

### 5.10.1. Water Conservation

As previously mentioned, a key design feature of the Structure Plan is the delivery of a more sustainable community. It is envisaged that the development will seek UDIA EnviroDevelopment accreditation as part of the detailed planning stages. A number of water conservation related elements of the development will be employed which will contribute to attaining the 6 leaves being sought.

The following conservation practices, subject to Council approvals, may be deployed at detailed design stage:

- Reduction of potable water usage with all homes fitted with AAA rated water fixtures (toilets, showers, taps etc.).
- Wastewater being disposed of via a Water Corporation regional system.
- Groundwater will be used for ongoing public open space irrigation.
- Promote the use of alternative water sources, water efficient appliances and efficient landscaping in private and outdoor spaces.
- Water harvesting and reuse where possible, soil amendment and mulching and water efficient sprinkler systems.
- Irrigation of landscaping will be minimised through a design which combines hard and soft-landscaping, the use of hydroplanting and the selection of low water use native species to meet irrigation demand. Where possible, existing native trees will be retained as part of the development proposals to reduce the establishment time and water demand.

### 5.10.2. Stormwater Management

The former use of the site as a golf course generated comparatively less amount of run off compared to an urban development, as proposed. The additional stormwater runoff generated on site will require stormwater retention and treatment infrastructure.

The drainage strategy centres around the conversion of an existing man-made drain into a living stream to provide for an integrated and more sustainable management of stormwater. The drainage catchment areas and stormwater runoff patterns are naturally driven by the topography of the land. Future earth working on the site to suit urban development has been considered in the management of runoff. To ensure that downstream environments are not impacted upon by development upstream, the development of the Structure Plan is required to ensure that peak pre-development flow rates are maintained. This is achieved through the use of detention storage areas spread throughout the development.

The drainage areas indicated within the LWMS (refer, Appendix B) are based on a minimum volume of storage of 3.20m<sup>3</sup> per lot. This is based on the 1 year 1 hour rainfall total (0.016m) being multiplied by the roof area (m<sup>2</sup>), based on a typical 200m<sup>2</sup> dwelling on a 450m<sup>2</sup> lot. Sufficient storage has been accounted for within the Structure Plan, as demonstrated in the LWMS.

Lot run off within the Structure Plan will be managed through the use of soak well systems to retain and infiltrate roof runoff within individual lots which are within sandy soils. Alternatively, runoff will be harvested in rainwater tanks. Those lots which sit on clayey soils will require lot connection pits which will be piped to the stormwater system designed to cater up to the 1 in 5-year average recurrence interval (ARI) events.



The pipe system will discharge via a bubble-up into a raingarden or swale sized to treat and infiltrate the first flush event. Greater events will overflow to the streets and ultimately to existing open drainage channels and new drainage areas created in public open space areas.

In almost all instances, stormwater runoff generated in events above 5-year ARI will be conveyed in the road reserves and discharged directly into the living stream. Stormwater from this area will be infiltrated via underground infiltration cells in this portion of the site with an overflow to Kulungar sump (refer Stage 2 and 3 UWMP's). The level and type of drainage and piping within the road reserves will be dependent on the road hierarchy.

#### Stages 6 and 7

The drainage strategy centres around the conversion of an existing man-made drain into a living stream to provide for an integrated and more sustainable management of stormwater. The drainage catchment areas and stormwater runoff patterns are naturally driven by the topography of the land. Future earth working on the site to suit urban development has been considered in the management of runoff. To ensure that downstream environments are not impacted upon by development upstream, the development of the Structure Plan is required to ensure that peak pre-development flow rates are maintained. This is achieved using water quality treatment areas spread throughout the development and online storage.

Lot run off will be managed using soak well systems to retain and infiltrate first flush from roof runoff. As Stage 6 and 7 has clayey soils, lots in this stage will require lot connection pits which will be piped to the stormwater system designed to cater up to the 20% AEP events. The pipe system will discharge to water quality treatment areas (WQTAs) to treat the first flush event. Stormwater runoff generated in events above 20% AEP will be conveyed in the road reserves via the WQTA and overflow into the living stream which will manage these larger events online.

Runoff from the first flush storm events will be retained and treated within the bioretention water quality treatment areas to ensure water quality objectives are met. There are two proposed adjacent to the foreshore in Stage 7 and 7. Road runoff generated in the 'first flush' event of the year generally contains the highest concentration of contaminants. All runoff from this event will be collected and treated prior to discharge into the living stream. The LWMS Addendum provides further information on the water quality treatment areas.

Runoff from any minor storm events will be retained and treated within bioretention systems in public open space areas to ensure water quality objectives are met.

Road runoff generated in the 'first flush' event of the year generally contains the highest concentration of contaminants. All runoff from this event will be collected and treated prior to discharge into the living streams, the foreshore or infiltrated to groundwater. Water quality treatment areas in the form of raingardens and biofiltration swales will be used through the development to undertake this treatment. The LWMS provides the indicative locations for the water quality treatment areas.

### **5.10.3. Living Streams**

The development of the site provides a key opportunity to improve the environmental and social value of the existing drains. As previously mentioned, the drains will be converted into living streams and integrated into public open space areas to provide for sustainable water management. The living streams will be designed to convey runoff from the proposed urban areas as well as runoff from upstream catchments.

Additionally, the drain will contribute significantly to the quality of water within the drain, resulting in overall ecological and sustainable improvements. Online storage will be provided to the drains to ensure that post-development flow rates do not exceed the pre-development conditions.

A conceptual design for the drain has been provided in the LWMS.

#### Stages 6 and 7

Online storage will be provided in the living stream to ensure that 1% AEP post-development flow rates do not exceed the post development flows as agreed in the Stage 3 UWMP and the drainage MOU with City of Swan (please refer to the Addendum for full modelling results and flow description).

#### **5.10.4. Groundwater Management**

No formal subsoil drainage system is proposed as part of the development, however some minor subsoil drains may be required upstream of retaining walls to manage localised conditions.

Due to the clayey nature of the soils, perching of groundwater can occur. Avoidance of perching will be addressed at detail design stage. Across the majority of the site sands have at least 1.2 metres of separation from the ground water level, however those areas to the north-east of the site adjoining the Helena River and the pocket to the south- west will require earthworks to ensure that a minimum of 1.2 metres separation is achieved. Re-contouring may also be required to provide a positive gradient towards the living stream.

##### Stage 6 and 7:

Due to the clayey nature of the soils, perching of groundwater can occur. Cut and fill of the underlying clay layer will occur as part of earthworks. A minimum of 1.2m of sand fill will be placed on top of the re-contoured clay layer to achieve adequate separation between lot levels and perched groundwater. Subsoil drainage will be required in Stages 6 and 7 to manage perched water on top of the clay layer. Subsoil drainage will discharge to the WQTAs to treat the discharge before eventual discharge to the living stream. Details of the subsoil drainage design will be presented in the UWMP.

#### **5.10.5. Flood Management**

As mentioned above, there is sufficient capacity within the existing drains on site to convey the pre-development 100 year ARI event. It will be important however that appropriate flood mitigation is provided through appropriate finish floor levels to all buildings. As a result it is recommended that finished floor levels to dwellings/buildings be constructed between 300-500mm above the 100 year ARI flood level, depending on the lots risk to flood.

##### Stage 6 and 7:

As mentioned above, there is sufficient capacity within the existing drains on site to convey the 1% AEP event in the post development living stream. It will be important however, that appropriate flood mitigation is provided through appropriate finished floor levels to all lots. It is recommended that finished floor levels to dwellings/buildings be constructed a minimum of 500mm above the 1% AEP flood level.

Stage 6 and 7 flood modelling has looked at two scenarios (with a free flowing outlet and a tailwater from the Helena River in a 1% AEP flood). As a worst case scenario, lot levels were assessed against the 1% AEP flood levels with a tailwater. All lots in Stage 6 and 7 have more than the 500mm clearance to 1% AEP flood levels in both the Helena River and in the living stream. Please refer to the LWMS addendum.

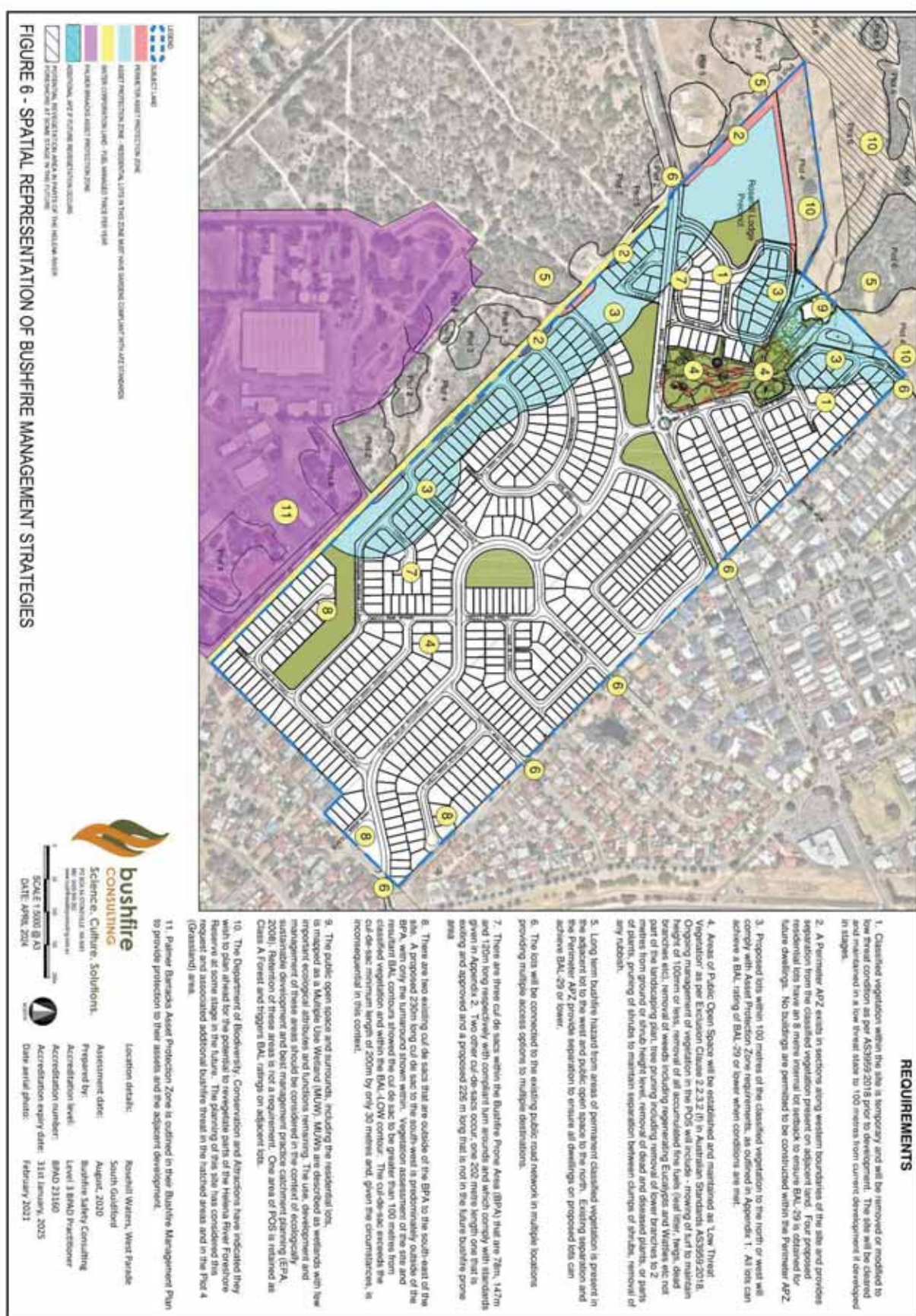
In accordance with the City of Swan LPS17, development within a flood prone area will be required to obtain planning approval. This includes the construction or extension of any building or earthworks. The City of Swan will be required to refer the application to the Department of Water for their advice with respect to finished floor levels.

### **5.11. BUSHFIRE MANAGEMENT**

A Bushfire Management Plan was approved for the Structure Plan area in 2018 and an updated Bushfire Management Plan has been prepared and appended to this report (refer Appendix F).

As outlined above and within Appendix F, various strategies are proposed to ensure bushfire risk is adequately mitigated. These include Asset Protection Zones and the management of newly planted vegetation in POS areas. A spatial representation of the management strategies is provided in Figure 26 below.

### Figure 27 Bushfire management strategies





## 5.12. NOISE MANAGEMENT

The purpose of State Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport (SPP5.1) aims to protect the Perth Airport from unreasonable encroachment by incompatible (noise-sensitive) development and aims to minimise the impact the Perth Airport has on existing and future residential communities that may be potentially impacted by noise.

SPP 5.1 provides guidance on the type of uses which can be entertained within the different noise exposure zones in accordance with Australian Standard 2021 (AS2021).

Residential development can be considered (as a conditionally acceptable use) up to the 25 ANEF contour, with noise sensitive land use and development generally not being supported in areas above 25 ANEF.

Notwithstanding there are a number of other non-sensitive land uses such as, but not limited to church, cinema, library, office, shop, showrooms and warehouse which have been deemed as being acceptable or conditionally acceptable within the 25-30 ANEF contour area under AS2021.

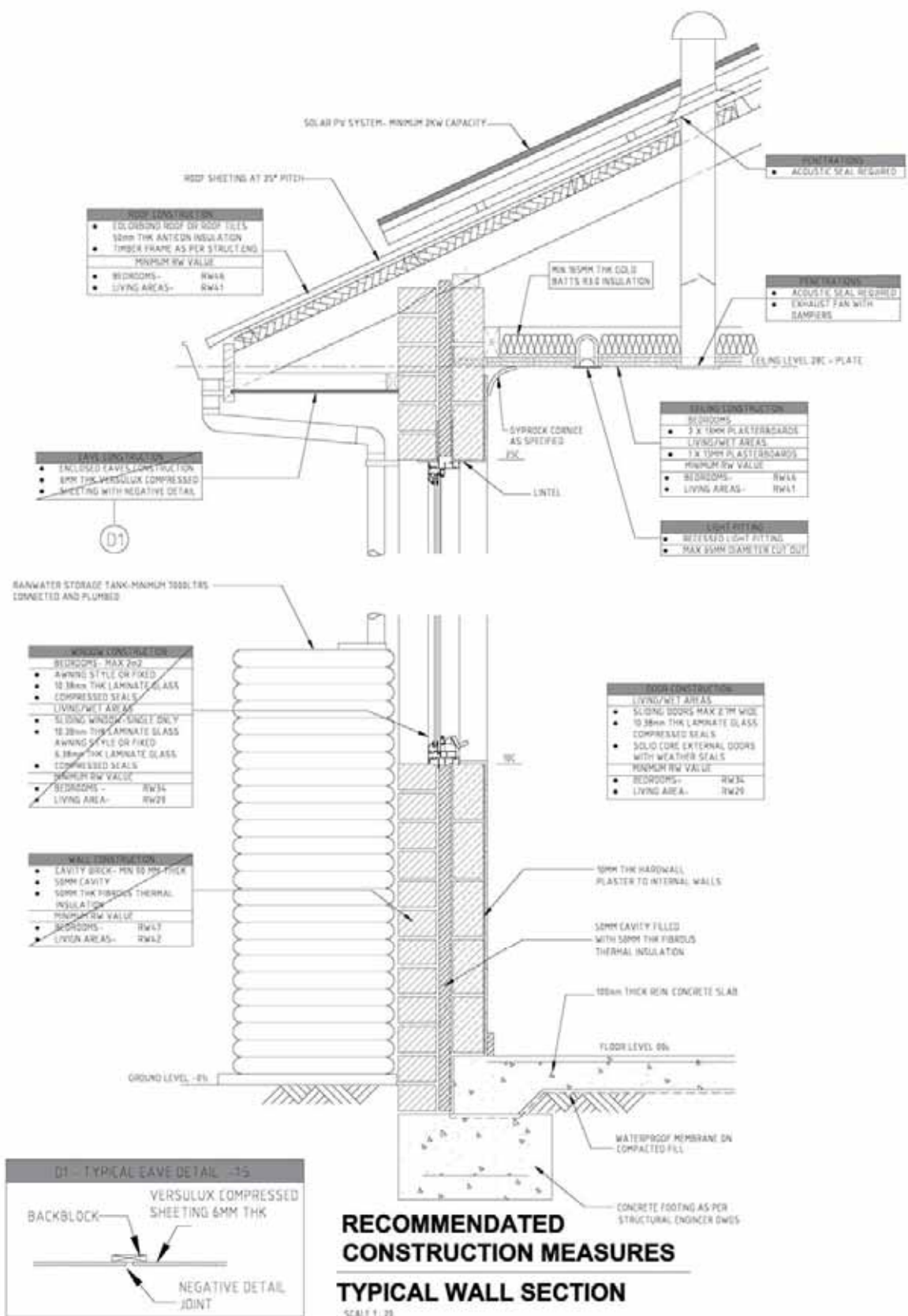
Approximately one-third of the Structure Plan is unaffected by aircraft noise, with the balance being affected by the 20-25 and 25-30 ANEF contour (as per the Perth Airport Master Plan 2014 and associated DPLH mapping referred to in SPP5.1 accordingly). Residential development will not encroach within the 25+ ANEF contour as provided under the conditions of the proposed 'Special Use' zone. Land uses able to be entertained within the 25-30 ANEF will be consistent with SPP 5.1 and will be informed by the structure planning for the site. Within the area unaffected by aircraft noise, limited density development to R30 on two sites is allowed as per the Structure Plan (Figure 1).

All residential development within the Structure Plan area will include noise insulation in accordance with AS2021-2015. Various noise mitigation methods will be included in the built form in terms of the finishing's and materials to roofs and ceilings, walls, windows and doors (refer Figure 29).

In addition to the above, and consistent with the conditions of MRS Amendment No.1266/77, notifications will be placed on all certificates of titles and within sale contracts notifying all prospective purchase that their land is subject to aircraft noise. Refer to Appendix G for more information with respect to noise management.



Figure 28 Acoustic construction measures



## **5.13. SERVICING & INFRASTRUCTURE**

### **5.13.1. Power**

The Structure Plan has access to a number of 22kV HV feeders, including one located along West Parade (south of Waterhall Road) another continues north of Waterhall Road and a third HV feeder runs along Beavis Drive. These feeders are fed from Hadfield Zone Substation, the Hazelmere Zone Substation and the Guildford Substation.

Western Power has indicated that there is capacity within the existing network of between 20-25MVA with the potential for capacity to increase in the future. As such, there is the capacity to supply the whole of the development, but network reinforcement will be required to transfer power to the site. The staging of the development will ensure that natural loading to individual feeders will ensure that the trigger for any major network upgrades is avoided.

It is possible to either install a dedicated feeder from the existing aerial HV feeders that service properties adjoining the Structure Plan, alternatively partial augmentation of the existing aerial HV feeder could be undertaken.

### **5.13.2. Sewer**

Some mechanical or other upgrades to the existing Waterhall pump station will be required to ensure that the projected flows from the development can be supported. The upgrades will require further consultation with the Water Corporation with respect to the funding and timing of delivery for the upgrades. In addition, adjusted catchment boundaries will need to be developed in conjunction with Water Corporation to cater to the change in land use and to ensure allocated flows are appropriate for the change of land use from the former golf course to residential development.

Refer Appendix D Infrastructure and Servicing Strategy.

### **5.13.3. Water**

The Water Corporation will need to undertake a review of the water planning in the South Guildford locality, however the timing of this is unknown. The nature and inherent flexibility of water reticulation is such that it will have minimal impact on the Structure Plan layout.

In the interim, the Structure Plan is capable of being serviced by the existing reticulated water infrastructure, subject to appropriate headworks charges and negotiations through the Water Corporation.

Refer Appendix D, Servicing and Infrastructure Strategy.

### **5.13.4. Gas**

ATCO Gas has indicated that the existing infrastructure is only capable of servicing approximately 100 dwellings. To service the whole Structure Plan area, a 250 metre extension of the existing main within the neighbouring Waterhall Estate will be required along West Parade. ATCO Gas have confirmed that the cost of pipework for the extension can be met, however all civil works including trenching, traffic management and reinstatement is to be met by the developer. ATCO Gas will provide pipework for standard servicing requirements to all lots, subject to a common trench system is prepared and backfilled by the developer.

Therefore, the Structure Plan is capable of being serviced by the existing gas supply infrastructure through the extension from the Waterhall Estate, subject to appropriate headworks charges and negotiations through ATCO Gas occurring at the subsequent detailed planning stages.

### **5.13.5. Telecommunications**

Existing communications to the site are currently provided by Telstra from the Bassendean exchange, approximately 4.4 kilometres from the site. Multiplexing equipment located at the western end of West Parade near Queens Street provides substantial capacity to the area.

It is understood that the development falls within the Australian Government's National Broadband yield criteria, which aims to reticulate communication assets to all new development of over 100 lots. Existing NBN Co fibre has already been installed to service the adjacent Waterhall development, it is understood that this fibre could be extended to service the Structure Plan.

The developer will be responsible for the cost of infrastructure. There may be specific easements required which will be considered at the detailed planning stage.

### 5.13.6. Earthworks

Due to the existing topography of the Structure Plan, significant earthworks will be required to prepare the site for residential development. The staging of development is largely driven by the approach to earthworks being the treatment of clay areas and the treatment of generally sandy areas. The site will be earth worked with the intent to minimise import fill requirements in the aim of achieving a cut to fill balance across the site, consistent with the EnviroDevelopment strategy.

Small areas of clearing will be required to remove existing trees where they have not been able to be retained within public open space or reserves and have been identified as having low retention value. Topsoil will be stripped and where possible reused on site.

Construction of retaining walls will be required to ensure level building sites, with specific planning and engineering techniques implemented to minimise walls of significant height. Allowances have been given near retaining walls to ensure appropriate drainage within clay soils.

A construction management plan required as part of subsequent detailed design stage will outline the intention and scope for the proponent to organise waste collections during the different stages of constructions. All earthworks will be undertaken to ensure compliance with the EnviroDevelopment initiatives.

Refer **Appendix D**, Servicing and Infrastructure Strategy.

## 5.14. BUILT FORM DELIVERY

The initial Estate design, local development plans and subdivisions for Rosehill Waters Estate have been undertaken by the developer RWM Properties. Upon the completion of the site establishment works lots within each stage of Rosehill Waters will be sold as individual lots providing buyers the opportunity to choose their builder.

Each buyer is required to comply with the proponent's *Rosehill Waters Design Guidelines* as part of their Contract of Sale. Designs are independently assessed by a Registered Architect to ensure consistent standard, resulting in houses and streetscapes being designed and delivered to a consistent quality. At the same time, buyers are able to choose their housing design and style which is a conventional expectation of the Western Australian property market.

The Design Guidelines are a set of design standards which are focused on ensuring a broad range of materiality including front facades, roof treatments and shading. These and other elements in the guidelines help to ensure buyers and their builders are focused on undertaking works in an appropriate manner.

Due to the restriction on density within the Structure Plan, the ability to provide diversity in built form is limited to R20 over the majority of the Estate, and R30 for two discrete sites.

Notwithstanding, it is recognised that Rosehill Waters will comprise of a broad demographic, with the mix of households requiring equally diverse housing choices. As such, the Structure Plan will include a mix of lot size, frontages and typologies.

# TECHNICAL APPENDICES



## **APPENDIX A**

## **ENVIRONMENTAL ASSESSMENT REPORT**



Our Ref: HABROS33  
Date: 22 April 2021

Attention: Sally Birkhead  
Senior Consultant

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Dear Sally

## **Addendum to the Rosehill Waters Environmental Assessment Report (March 2016)**

We are pleased to provide the following environmental information relating to the proposed development of Stages 6 and 7 at Rosehill Waters in South Guildford.

Stages 6 and 7 are generally located north of West Parade within the Rosehill Waters Estate. The location of this area is shown on Figure 1. This area was originally located within the 25-30 Australian Noise Exposure Forecast (ANEF) zone for Perth Airport, but the contours have recently been updated and the area now contains a reduced extent of the 25-30 ANEF contour zone. On this basis the Structure Plan for this precinct has been updated to reflect the new ANEF contour extent (Attachment 1).

## **Background**

### ***Planning and Environmental Approvals Overview***

The Rosehill Waters project site has undergone the following amendments to the Metropolitan Region Scheme (MRS) and City of Swan Local Planning Scheme No. 17 (LPS 17) to facilitate urban development of the site:

#### ***MRS Amendment 1266/57***

- MRS Amendment 1266/57 resulted in the majority of the former Rosehill Golf Course site being rezoned from 'Rural' to 'Urban'. Land within the 25-30 ANEF Contour was excluded from the Urban zone (WAPC, 2017).

#### ***LPS 17 Amendment 113***

- LPS 17 Amendment 113 was initiated to rezone the Rosehill Golf Course site from 'General Rural' to 'Special Use Zone' to facilitate residential development (CoS, 2016). The amendment consisted of Precinct 1 and Precinct 2 as shown on Plate 1.



**Plate 1: LPS 17 Amendment 113 Proposed Special Use Zones**

Source: CoS, 2016

*MRS Amendment 1331/57*

- MRS Minor Amendment 1331/57 proposed to rezone of portions of Lots 200 and 9000 West Parade, South Guildford from the 'Rural' to 'Urban' zone (Plate 2). The amendment also proposed to transfer a 1.3ha portion of Lot 200 West Parade from the Rural zone to the Parks and Recreation Reserve to facility a land exchange with a 1.68ha portion of Lot 82 West Parade, South Guildford (WAPC, 2017).



**Plate 2: MRS Amendment 1331/57 plan**

Source: WAPC, 2017

The above amendments were all referred to the Environmental Protection Authority (EPA) which on each occasions advised that the proposed scheme amendments should not be assessed under Part IV Division 3 of the *Environmental Protection Act 1986*.

### ***Rosehill Waters Structure Plan***

The Rosehill Waters Structure Plan shows the north western extent of the site as a Private Clubs and Institutions zone. The layout of the existing structure plan is shown on Plate 3.



Plate 3: Rosehill Waters Structure Plan

Source: Urbis, 2020

### ANEF Noise Contours

State Planning Policy (SPP) 5.1, updated in 2015, was developed to:

- protect Perth Airport from unreasonable encroachment by incompatible (noise sensitive) development, to provide for its ongoing development and operation; and
- minimise the impact of airport operations on existing and future communities with reference to aircraft noise.

The policy provides developers with information regarding the various ANEF zones surrounding the Perth Airport, and provides guidance with regard to acceptable land uses, associated zonings, density coding, building standards, noise insulation measures and notification on titles, etc (WAPC, 2015).

The northern portion of the site was originally mapped within the 25-30 ANEF contour zone. The contour locations were updated in 2020 which has resulted in a reduction in the extent of the 25-30 ANEF within the site (Plate 4).



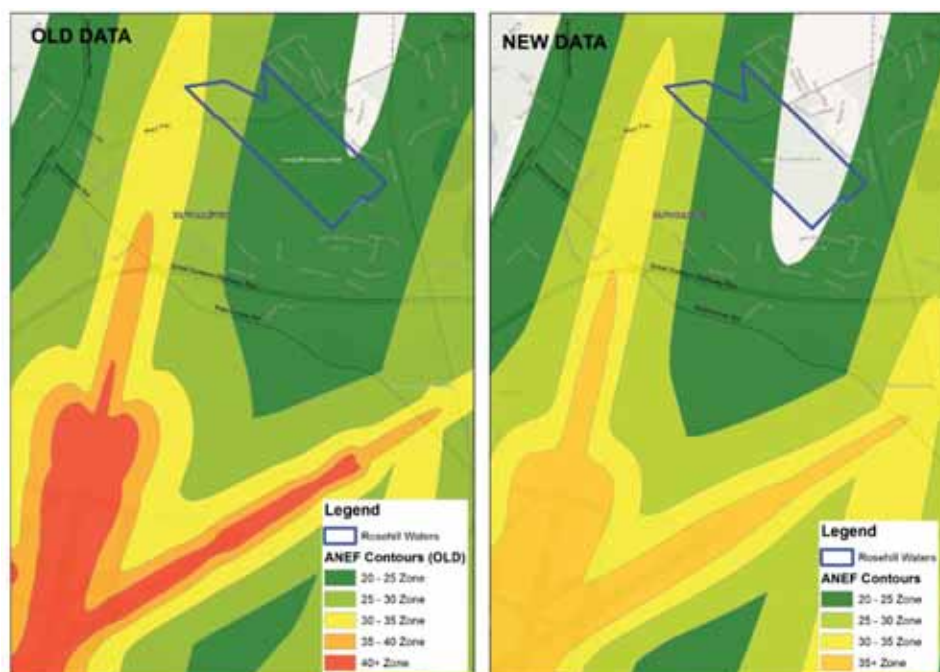


Plate 4: Previous and Updated ANEF Contours

Source: Urbis

## Key Environmental Features

The key environmental features of the Stages 6 and 7 area are summarised as follows:

- Topographic elevation ranges from approximately 5 to 13mAHD (Figure 2).
- Soils within this area comprise the following units (Figure 2) (Gozzard, 1986):
  - S10 - SAND: very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well-sorted, of Aeolian origin (majority of site).
  - Cm<sub>2</sub> – CLAY: dark strong brown, hard when dry, soft when moist, variable silt content, no sand, of alluvial origin (occurs within river and surrounds, in the northern portion of the site).
  - MgS<sub>1</sub> – PEBBLY SILT: Strong, brown silt with common, fine to occasionally coarse-grained, sub-rounded laterite quartz, heavily weathered granite pebble, some fine to medium-grained coarse sand, of alluvial origin (far southern portion of site).
- The site is mapped as having a Moderate to Low Acid Sulfate Soil (ASS) risk (Landgate, 2021).
- Maximum groundwater levels within the site are mapped by DWER as ranging from 6 to 8mAHD (Figure 3) (DWER, 2021).
- Pre development monitoring was undertaken in Stages 6 and 7 between 2012 and 2013. Key findings from the monitoring included (Coterra Environment, 2016a):
  - Perched groundwater appears to be present above the clay layer in Stages 6 and 7. Maximum groundwater levels recorded were between 4.74mAHD and 6.08mAHD.
  - The monitoring also indicated that a confined groundwater layer also appears to be present in this location.

For further information on groundwater at the site refer to the Stage 6 and 7 LWMS addendum (Urbaqua, 2021).

- A small area portion of the site is located within the mapped 100 Year ARI Flood Fringe, although this is contained within open space. The 100 year ARI Floodway do not extend into the site (Figure 3) (Landgate, 2021).
- A drainage line traverses the site, which connects to the Helena River. This feature is contained within an open space corridor (Figure 3).
- A multiple use wetland is present within northern and eastern areas of the site (Figure 3) (Landgate, 2021).
- The Helena River foreshore is located to the north of the site. A Foreshore Management Strategy (Coterra Environment, 2016b) has previously been prepared for this area.
- Vegetation to the north of the former golf clubhouse has been mapped as vegetation unit Cv (predominantly non-native vegetation species which have been planted at the site). A small area of Er vegetation was also noted to occur along the western site boundary (Figure 4). The descriptions of these two vegetation types are as follows (Bennett Environmental Consulting, 2012):
  - Cv - *Jacaranda mimosifolia* (Jacaranda), *Magnolia grandiflora* (Magnolia), *Ficus rubiginosa*, *Hibiscus* cultivars including several "Apple Blossom cultivars", *Bougainvillea* cultivars, *Washingtonia robusta* (Fan Palm), *Phoenix canariensis* (Canary Island Palm), *Schinus areira* (Peppercorn Tree), *Araucaria heterophylla* (Norfolk Island Pine), *Syzygium smithii* (Lily Pilly) and *Pinus radiata*. Understorey plants included *Rosa* cultivars (Roses), *Agapanthus praecox* (Agapanthus), *Monstera delicosa* (Monstera). Completely Degraded.
  - Er - Stand of large Jarrah (*Eucalyptus marginata subsp. marginata*) and Flooded Gum (*Eucalyptus rudis subsp. rudis*), including several seedlings. Completely Degraded
- Four Eucalyptus trees which could potentially provide Black Cockatoo breeding habitat were found within this zone (Coterra Environment, 2016c). Two of these trees were located within the residential zones on the current Structure Plan. Some planted pines also occur along the western boundary. The location of these features is shown on Figure 4.
- The two Eucalyptus trees within the proposed residential area (Figure 4) formed part of the site tree survey and with notes on their structure and health made as follows (Paperbark Technologies, 2020):
  - Western Tree: Good health and poor structural condition displaying a full coverage of foliage. Canopy consists of predominantly epicormic limbs due to previous distal reduction pruning.
  - Eastern Tree: Fair health and poor structural condition. Displays termite damage, previous structural limb failure, branch end cavities and secondary stem development.

## Changes Compared to Previous EPA Assessed Scheme, Potential Impacts and Proposed Management

The changes incorporated within the proposed Structure Plan (Plate 6 and Attachment 1) as compared to the current Structure Plan (Plate 5) can be generally described as follows:

- Incorporation of additional residential lots within areas which are now below the ANEF 25 contour.
- Realignment of the overland flow path drainage connection to the Helena River as shown below.
- Adjustment of the residential cell layout.

The Private Clubs and Institutions Zone will be replaced with a Special Use Zone with associated land use provisions to guide development and continue to ensure no sensitive uses occur within Precinct 2.



**Plate 5: Current Structure Plan**



**Plate 6: Proposed Structure Plan**

As noted above, the EPA has previously reviewed the development proposals for this site and has advised on all occasions that the development does not require assessment. The potential changes/impacts to environmental features within Stages 6 and 7 are noted as follows:

- Residential lots remain within areas with an ANEF contour of less than 25, but with an expanded footprint/number of lots based on the revised contour mapping.
- Overland flow path to Helana River is maintained.
- No impact to the Er vegetation unit which contains some native species.
- No additional removal of potential black cockatoo habitat trees compared to the previously approved Structure Plan.

## Conclusion

Based on the above it is concluded that the proposed changes to the Stages 6 and 7 development layout will not create any new environmental impacts compared to the previously approved schemes and as such are considered environmentally acceptable.

We trust this information addresses your current requirements. If you have any questions please do not hesitate to contact the undersigned.

Yours sincerely



Kristen Watts  
Director

### Figures

*Figure 1 – Site Location and Aerial Photograph*

*Figure 2 – Topography and Soils*

*Figure 3 - Hydrology*

*Figure 4 – Vegetation and Fauna Habitat*

### Attachments

*Attachment 1 – Rosehill Waters Structure Plan Amendment B*

## References

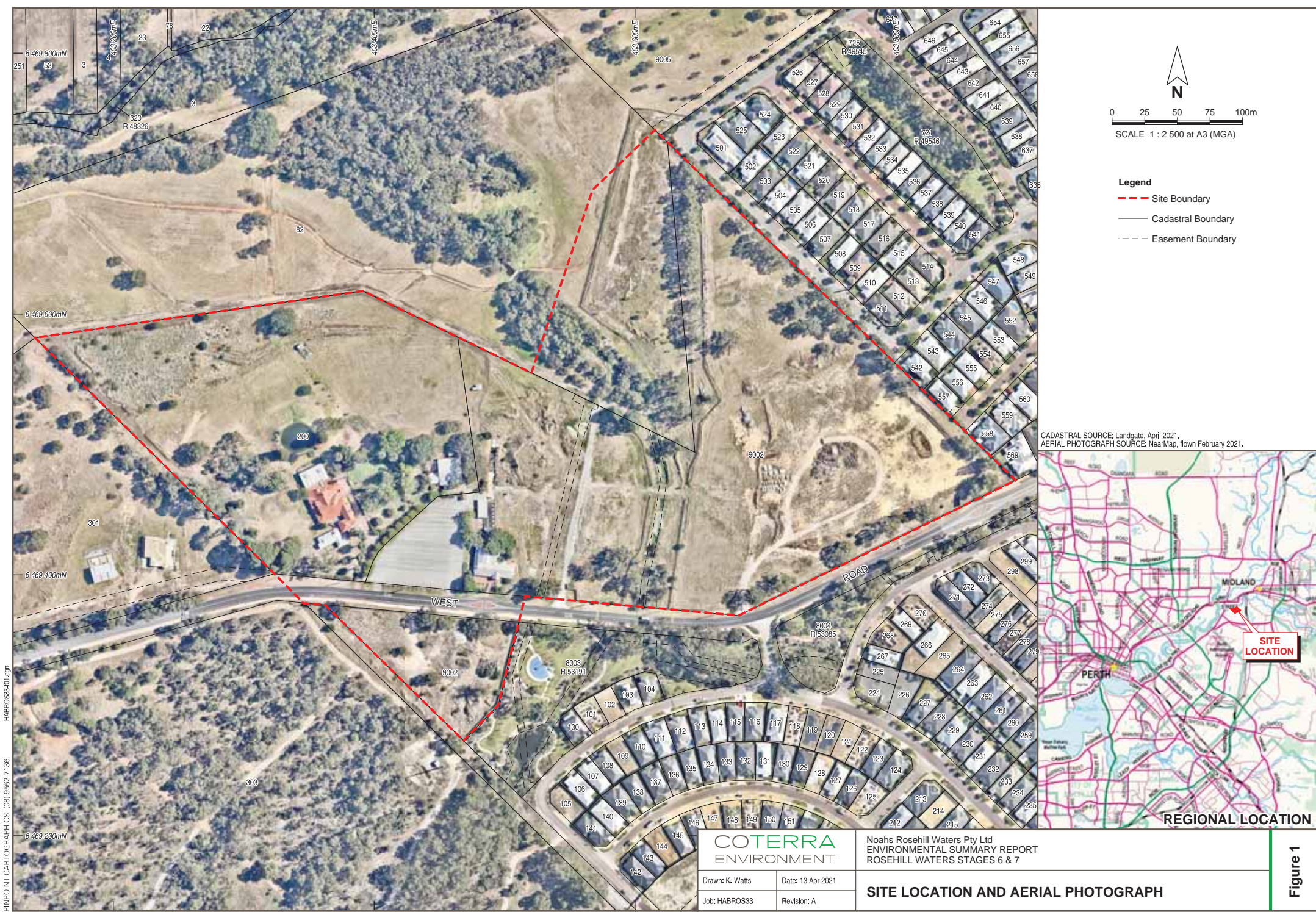
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## FIGURES

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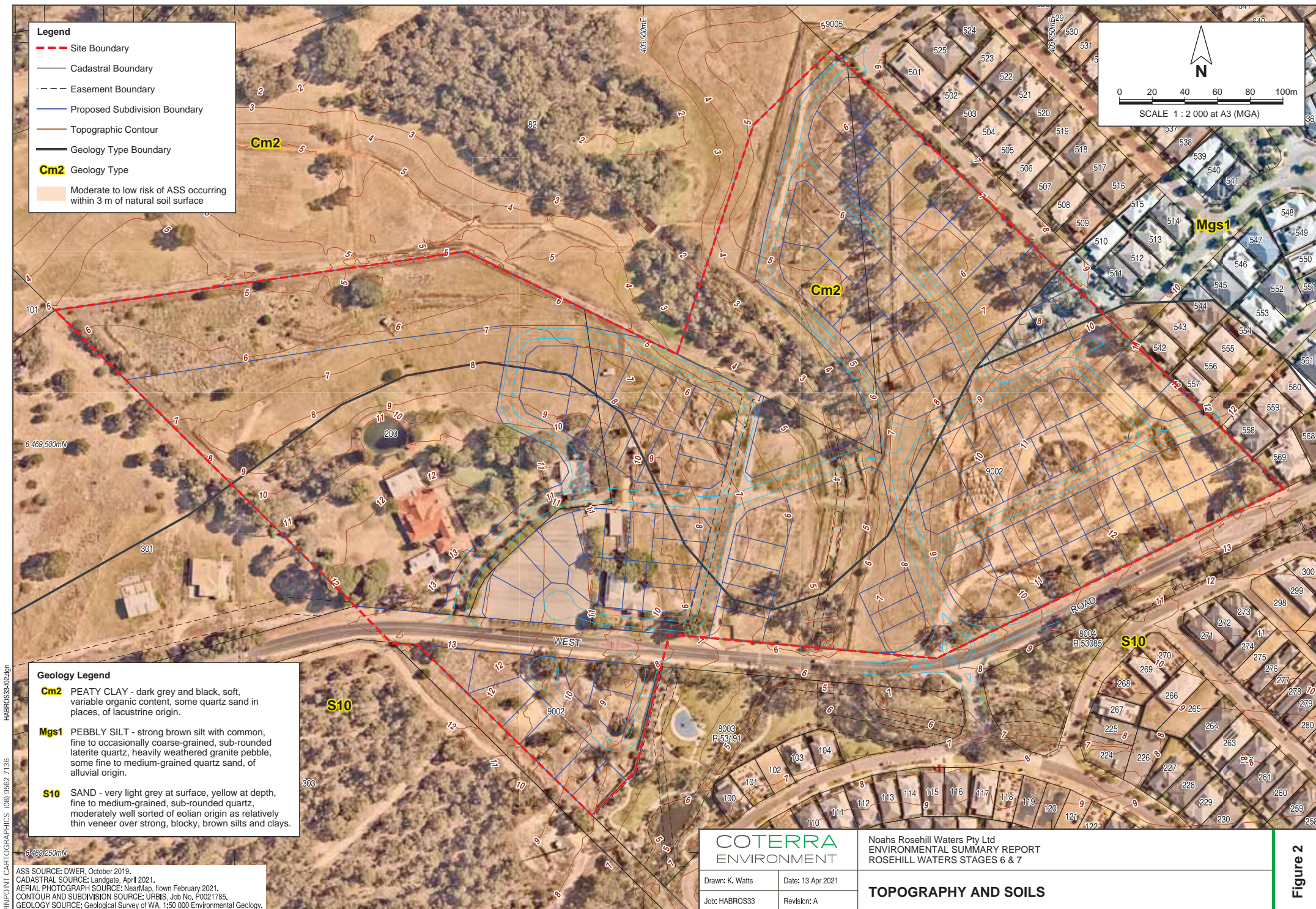




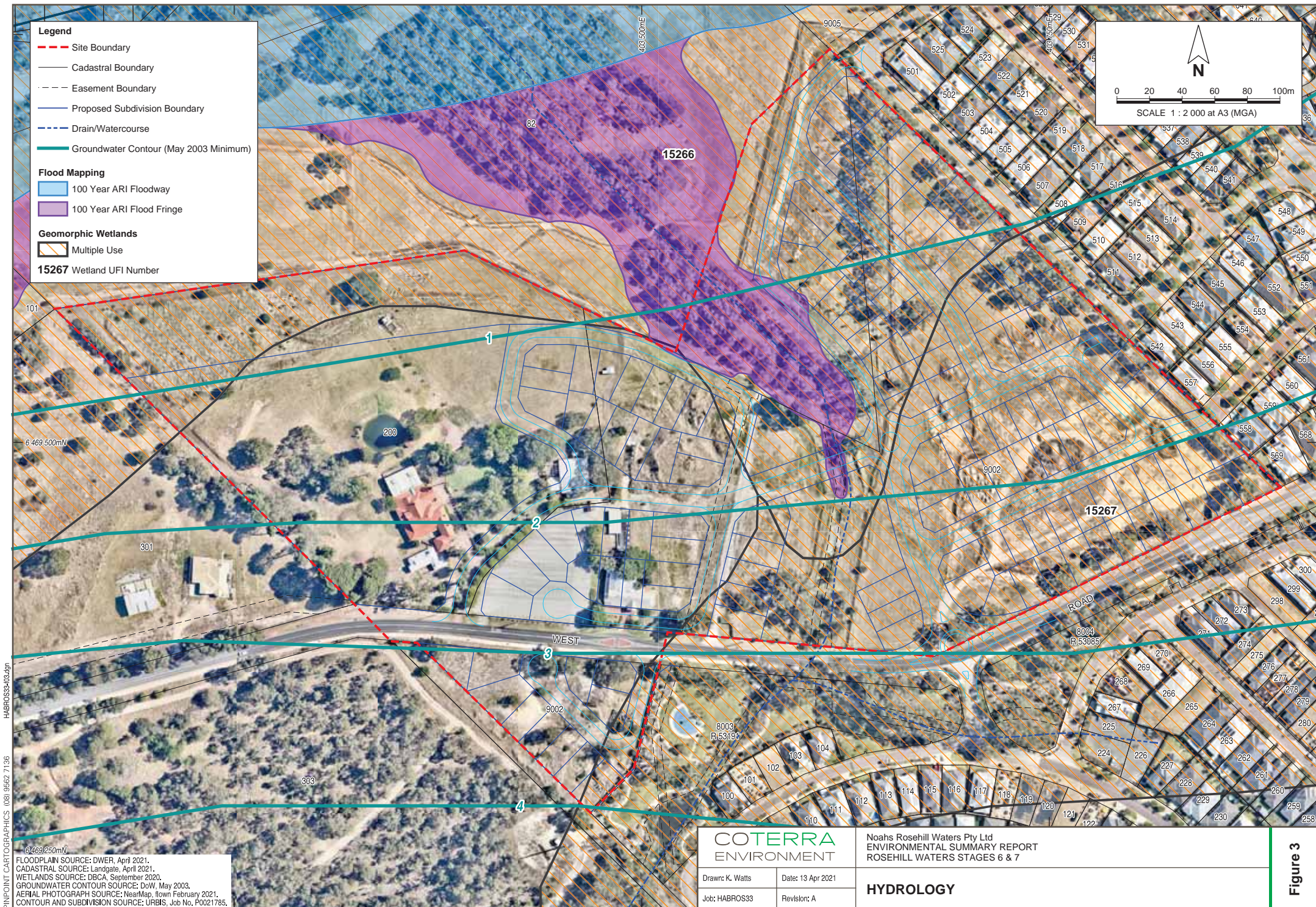
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AERIAL PHOTOGRAPH SOURCE: NearMap, flown February 2021.

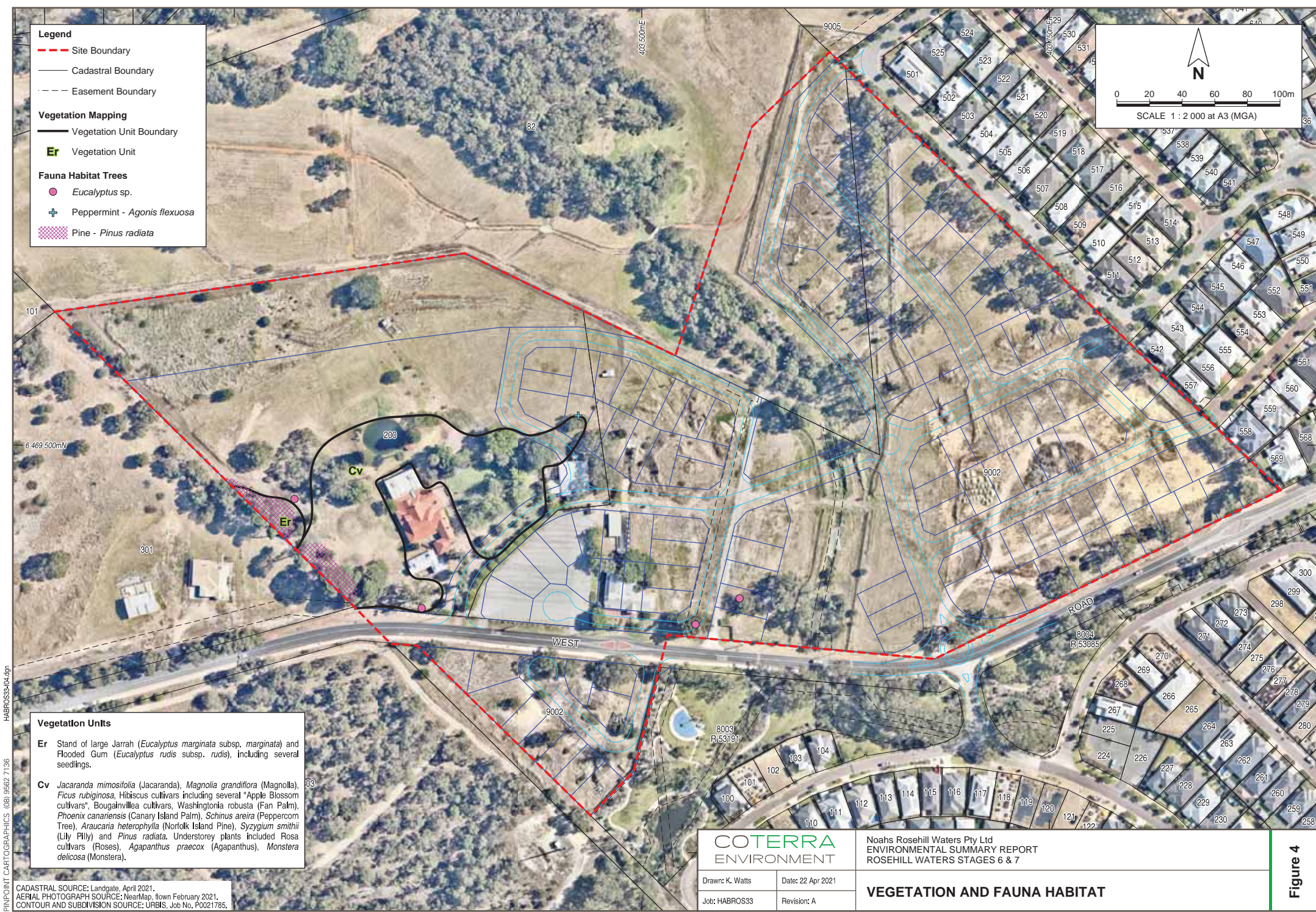




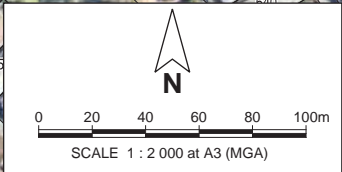








- Legend**
- Site Boundary
  - Cadastral Boundary
  - - - Easement Boundary
- Vegetation Mapping**
- Vegetation Unit Boundary
  - Er Vegetation Unit
- Fauna Habitat Trees**
- *Eucalyptus* sp.
  - + Peppermint - *Agonis flexuosa*
  - ▨ Pine - *Pinus radiata*



- Vegetation Units**
- Er** Stand of large Jarrah (*Eucalyptus marginata* subsp. *marginata*) and Flooded Gum (*Eucalyptus rudis* subsp. *rudis*), including several seedlings.
- Cv** *Jacaranda mimosifolia* (Jacaranda), *Magnolia grandiflora* (Magnolia), *Ficus rubiginosa*, Hibiscus cultivars including several "Apple Blossom cultivars", *Bougainvillea* cultivars, *Washingtonia robusta* (Fan Palm), *Phoenix canariensis* (Canary Island Palm), *Schinus areira* (Peppercorn Tree), *Araucaria heterophylla* (Nortolk Island Pine), *Syzygium smithii* (Lily Pilly) and *Pinus radiata*. Understorey plants included *Rosa* cultivars (Roses), *Agapanthus praecox* (Agapanthus), *Monstera delicosa* (Monstera).

COTERRA  
ENVIRONMENT

Noahs Rosehill Waters Pty Ltd  
ENVIRONMENTAL SUMMARY REPORT  
ROSEHILL WATERS STAGES 6 & 7

Drawn: K. Watts

Date: 22 Apr 2021

Job: HABROS33

Revision: A

**VEGETATION AND FAUNA HABITAT**

**Figure 4**

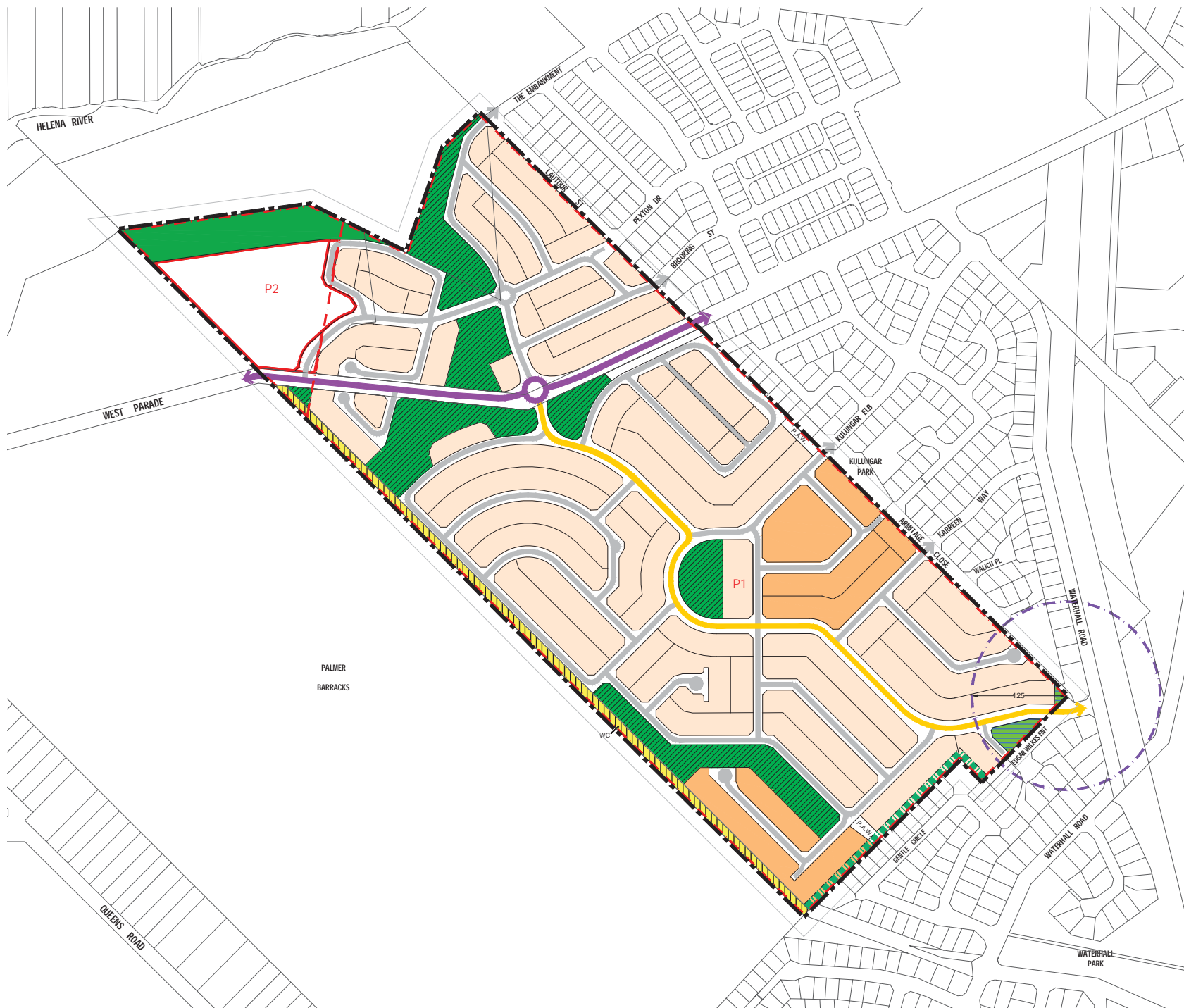
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CADASTRAL SOURCE: Landgate, April 2021.  
AERIAL PHOTOGRAPH SOURCE: NearMap, flown February 2021.  
CONTOUR AND SUBDIVISION SOURCE: URBIS, Job No. P0021785.



## Attachment 1 – Rosehill Waters Structure Plan Amendment B

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## LEGEND

- STRUCTURE PLAN AREA
- P.A.W. PUBLIC ACCESS WAY
- 10m WIDE LANDSCAPE STRIP

## ZONES

- RESIDENTIAL R20
- RESIDENTIAL R30
- SPECIAL USE

## RESERVES

- PUBLIC OPEN SPACE
- FORESHORE RESERVE
- DRAINAGE
- PUBLIC PURPOSES - WATER CORPORATION

## ROAD RESERVES

- INTEGRATOR B
- NEIGHBOURHOOD CONNECTOR
- LOCAL ACCESS STREET

## NOTES

- [P1/2]** PRECINCT AS DEFINED BY CITY OF SWAN LOCAL PLANNING SCHEME NO.17
- [125]** 125m NOISE BUFFER TO BE IN COMPLIANCE WITH STATE PLANNING POLICY 5.4 ROAD AND RAIL TRANSPORT NOISE AND FREIGHT CONSIDERATIONS IN LAND USE PLANNING AND IMPLEMENTATION GUIDELINES FOR SPP 5.4.

Subdivision design is indicative only and subject to further detailed survey, engineering and design.

## **APPENDIX B**

## **APPROVED LOCAL WATER MANAGEMENT STRATEGY (AND ADDENDUM)**



# Rosehill Waters LWMS Addendum

## Stages 6 & 7

Prepared for Noahs Rosehill Waters

By Urbaqua

April 2021

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Figure 7	Living Stream 1% and 10% AEP Flood Extent with Tailwater

## Appendices



Appendix 1	Soil Profile Summary (Douglas Partners, 2013)
Appendix 2	Surface Water Monitoring Results
Appendix 3	Groundwater Level and Quality Data
Appendix 4	Landscape Plans (LD Total, 2021)
Appendix 5	Earthworks Plans (DEC, 2021)
Appendix 6	1% AEP Flood Levels in mAHD
Appendix 7	Road Cross Sections during 1 % AEP Flood with Tailwater
Appendix 8	Engineering Servicing Report (DEC, 2021)

# 1 INTRODUCTION

## 1.1 Planning Background

Rosehill Waters is a 49-hectare development located in South Guildford, within the City of Swan. A Local Water Management Strategy (LWMS) (Coterra Environment, 2016) has been approved for the development (DWER reference number RF141118 PA6549), which outlines the water management strategy for the site. The development is being constructed in seven stages, with Stage 1 now complete and Stages 2 to 5 underway. Urban Water Management Plans (UWMPs) have been approved for the development to the south of West Parade. The stage numbering has since changed as a response to small infill areas. The approved urban water plans are identified below;

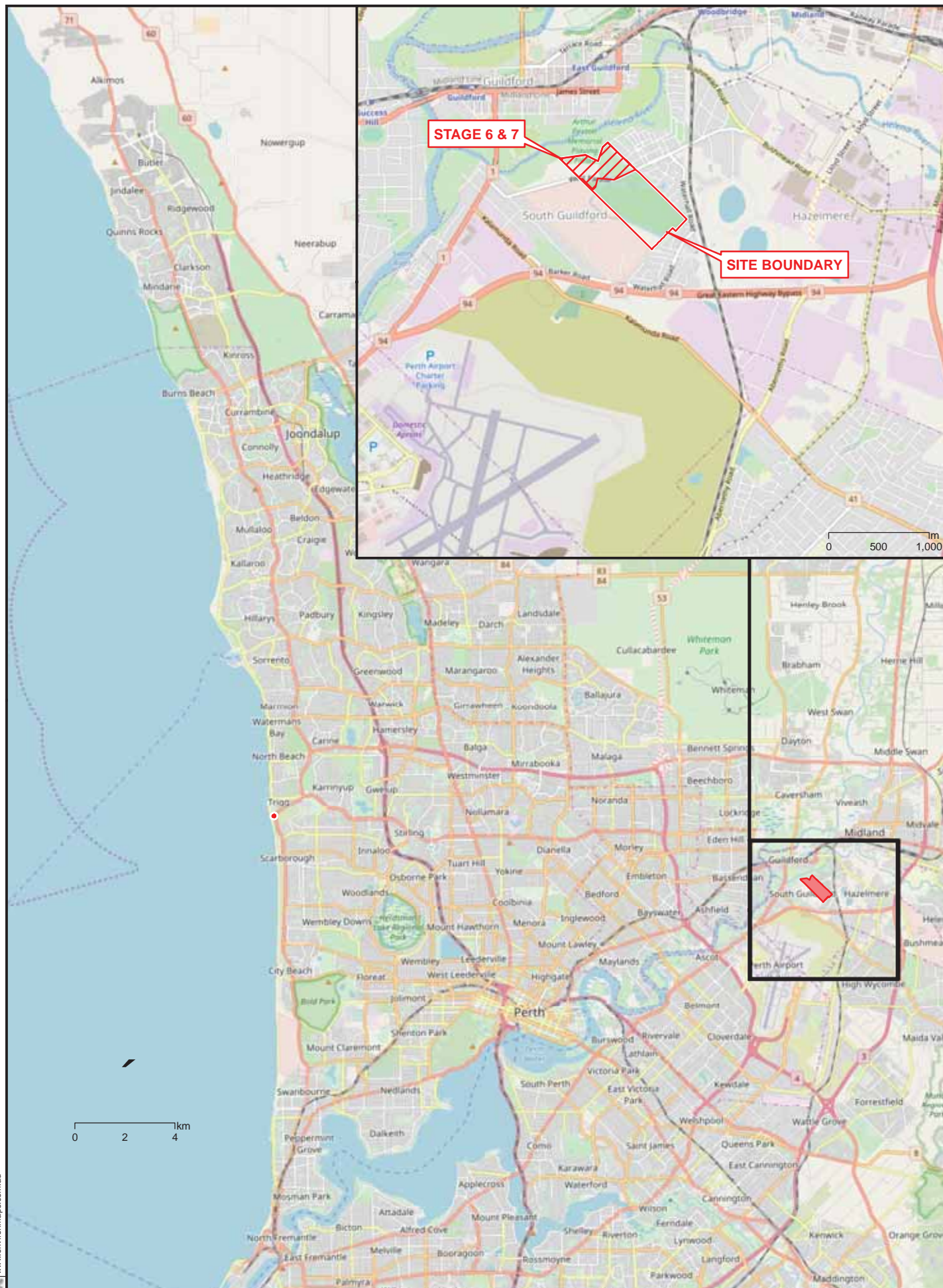
- District Water Management Strategy
- Local Water Management Strategy
- Stage 1 Urban Water Management Plan (remains as Stage 1).
- Stage 2 Urban Water Management Plan (now called Stage 2 and Stage 5).
- Stage 3 Urban Water Management Plan (now called Stage 3 and Stage 4).

This report is the Stage 6 and Stage 7 Local Water Management Strategy addendum. The site boundary has been provided in Figure 1.

Stage 6 and 7 have not yet been constructed but were part of the overarching 2016 LWMS. A change in the Australian Noise Exposure Forecast (ANEF) contours has triggered the potential rezoning of Stages 6 and 7, and as such this addendum has been prepared to support the rezoning and development. The proposed development in Stage 6 and 7 in general remains the same as proposed in the LWMS, with some minor reconfiguration. The development in Stage 6 and Stage 7 will consist of the following:

- Residential development north of West Parade – Stage 6 to the west and Stage 7 to the east of the living stream. Stage 6 also includes a small residential area south of west parade, bordering the existing Stage 1 POS.
- Rosehill Lodge to the west of the living stream, including a restaurant, café, event area, associated gardens and carpark, and possible motel accommodation (subject to ANEF contour requirements).
- The conversion of the existing man-made drain north of West Parade into a living stream between Stage 6 and Stage 7 to provide integrated water management. This will be within POS.

The concept plan has been provided in Figure 2.









## 1.2 Urban Water Management Background

The overall drainage design and strategy objectives within the Site Area remain the same as written in the LWMS. These include:

- Wastewater disposal and water supply methods.
- Water conservation methods (excluding the provision of a community bore which will no longer be progressing).
- Treatment mechanisms of the first flush event.
- Discharge of stormwater to the living stream, for further treatment and conveyance to the Helena River with 1% AEP post development flow rates equal to pre-development flow rates.
- The flood management strategy (and minimum levels) will remain the same as the LWMS.
- Post-development monitoring regime will follow the same quality monitoring parameters and locations (where predevelopment bores still exist).

Changes to the LWMS drainage strategy for Stage 6 and 7 include:

- The location and number of water quality treatment areas for the first flush (15mm) treatment.
- The sub-catchment configuration and numbers.
- Updates to the groundwater management for design purposes (because of post-development and during-development monitoring).
- Remodelling the lot density, catchment configuration, and culvert location within the living stream north of west parade to assess the inundation areas within the living stream in 20% AEP and 1%AEP events.

Section 3 identifies the aspects of the LWMS strategy that have remained unchanged, and Section 4 outlines the changes that have been made to the LWMS strategy for Stage 6 and 7.

## 2 SUMMARY OF STAGE 6 AND 7 SITE CHARACTERISTICS

**Table 1** Summary of Existing Site Characteristics

Element	Description
Size and Location	The Stage 6 and 7 proposed development is a portion within the wider 49 ha Rosehill Waters development. It is located north of West Parade and adjacent to the Helena River foreshore, with a small area of development to the west of the recently completed Stage 1.
Proposed change in land use	<p>The site has historically been used as a public golf course, featuring 18 holes, a club house, reception centre and associated infrastructure. The site boundary is located north of West Parade, which is the location of the Rosehill Country Club for the previous Rosehill Golf Course.</p> <p>The Stage 6 and 7 proposed development will include approximately 136 residential lots, roads, a living stream, water quality treatment areas and public open space.</p>
Planning Context	The site is currently zoned Urban within the Perth Metropolitan Regional Scheme and is zoned 'Special Use' in the City of Swan Local Planning Scheme No. 17 (LPS17).
Topography	<p>High points exist in the west and east, which generally slope down to the existing drainage line that runs through the middle of the proposed development (Figure 3). In summary:</p> <ul style="list-style-type: none"> <li>• The predevelopment topography sloped from 12.75 mAHD in the south-eastern corner (Stage 7) to the existing drainage line.</li> <li>• The predevelopment topography sloped from 13.25 mAHD in the south-western corner (Stage 6) to the existing drainage line.</li> <li>• The drainage line slopes towards the Helena River from approximately 4.50 mAHD in the south to 1.5 mAHD in the north of the development.</li> <li>• West Parade slopes from the east (13.00 mAHD) and west (13.25 mAHD) towards a low point in the middle of 6.1 mAHD above the existing drainage line/ living stream culvert.</li> </ul>
Geology and Soils	<p>A geotechnical investigation was undertaken by Douglas Partners in October 2013 for the wider Rosehill Waters development area. This investigation included approximately 36 pits within this site area (), and found:</p> <ul style="list-style-type: none"> <li>• Two soil units present – Area A in the south of proposed development, and Area B located along the northern boundary: <ul style="list-style-type: none"> <li>◦ Area A – soils are generally Topsoil followed by Sand above Clayey Sand/Sandy Clay. Some areas observed Filling (Sand) (mostly in Stage 6), and Filling (Clayey Sand).</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>o Area B – soils are generally Topsoil followed by Silty Sand, then Clayey Sand/Sandy Clay, sometimes followed by Clayey Gravel/Gravelly Clayey Sand (TP116 and TP127).</li> <li>• Soil profile logs of the test pits within the Stage 6 and 7 site area were also analysed for the presence of clay/clayey material. This indicates that most locations are underlain by clay or clayey soils, with TP117 underlain by coffee rock and dense material. Indicative cross sections through the soil profiles, showing the clay layer, are provided in Appendix 1 (Douglas Partners, 2013).</li> </ul>
Acid Sulphate Soils	<p>Most of the site is mapped as having moderate to low risk of Acid Sulphate Soils occurring within 3m of the natural surface. A small area in the east of the site has no mapped risk.</p>
Surface Water	<p>Approximately half the site is mapped as multiple use wetland.</p> <p>The floodplain associated with Helena River encroaches into the living stream/drainage line adjacent to the site. The Helena River flood plain is shown in Figure 4.</p> <p>There are two branches to the living stream within Stages 1 – 5, these converge at the culvert under West Parade. In Stages 6 and 7, there is one drainage line which currently discharges to the Helena River. This will be converted to the final part of the living stream post development.</p> <p>Surface water monitoring locations are shown in Figure 4 and monitoring results are provided in Appendix 2.</p>
Groundwater	<p>Regional groundwater contours indicate a maximum groundwater level (MGL) across Stages 6 and 7 of 6mAHD to 8.5 mAHD. These are shown in Figure 4.</p> <p>Predevelopment monitoring was undertaken in Stages 6 and 7 between 2012 and 2013.</p> <ul style="list-style-type: none"> <li>• Bores ROS01 and ROS02 (Figure 4) are located within the site area. These are nested bores for monitoring the presence of perched water due to the clay layer (ROS01 &amp; 02 shallow), and the confined aquifer level (ROS01 &amp; 02 deep).</li> <li>• During predevelopment monitoring, the deep bores measured MGLs of 5.74mAHD at ROS01 (in the eastern side) and 5.01mAHD at ROS02 (in the western side). These levels may be representative of a potentiometric surface (release of confined or pressurised groundwater) of the confined aquifer, as the variation between maximum and minimum levels in these deep bores varies by approx. 3m-4m. The full monitoring results are shown in Appendix 3.</li> <li>• During the predevelopment monitoring, the shallow bores measured MGLs of 6.08mAHD at ROS01 (in the eastern side) and 4.74mAHD at ROS02 (in the western side). These levels are considered representative of a perched layer above the clay</li> </ul>

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layer as these bores were dry during most of the year and only expressed water levels after winter rains in August.

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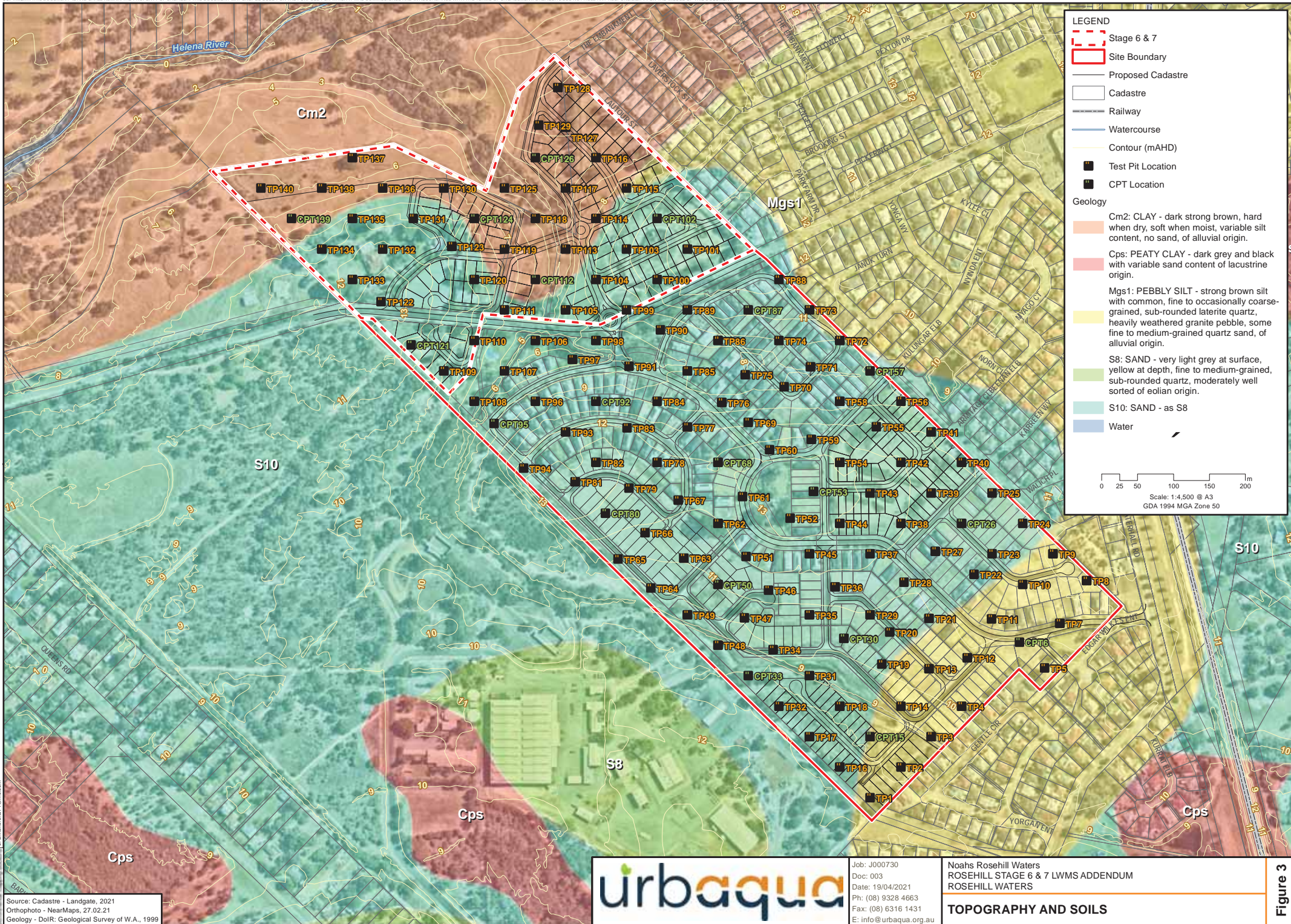
Contamination

The site has no contaminated sites located within boundaries.

---

Figure 3 and 4 below displays the most relevant existing environment features for the site. Please refer to the approved LWMS for all other figures displaying environmental characteristics of this site.





Source: Cadastre - Landgate, 2021  
Orthophoto - NearMaps, 27.02.21  
Geology - DoIR: Geological Survey of W.A., 1999



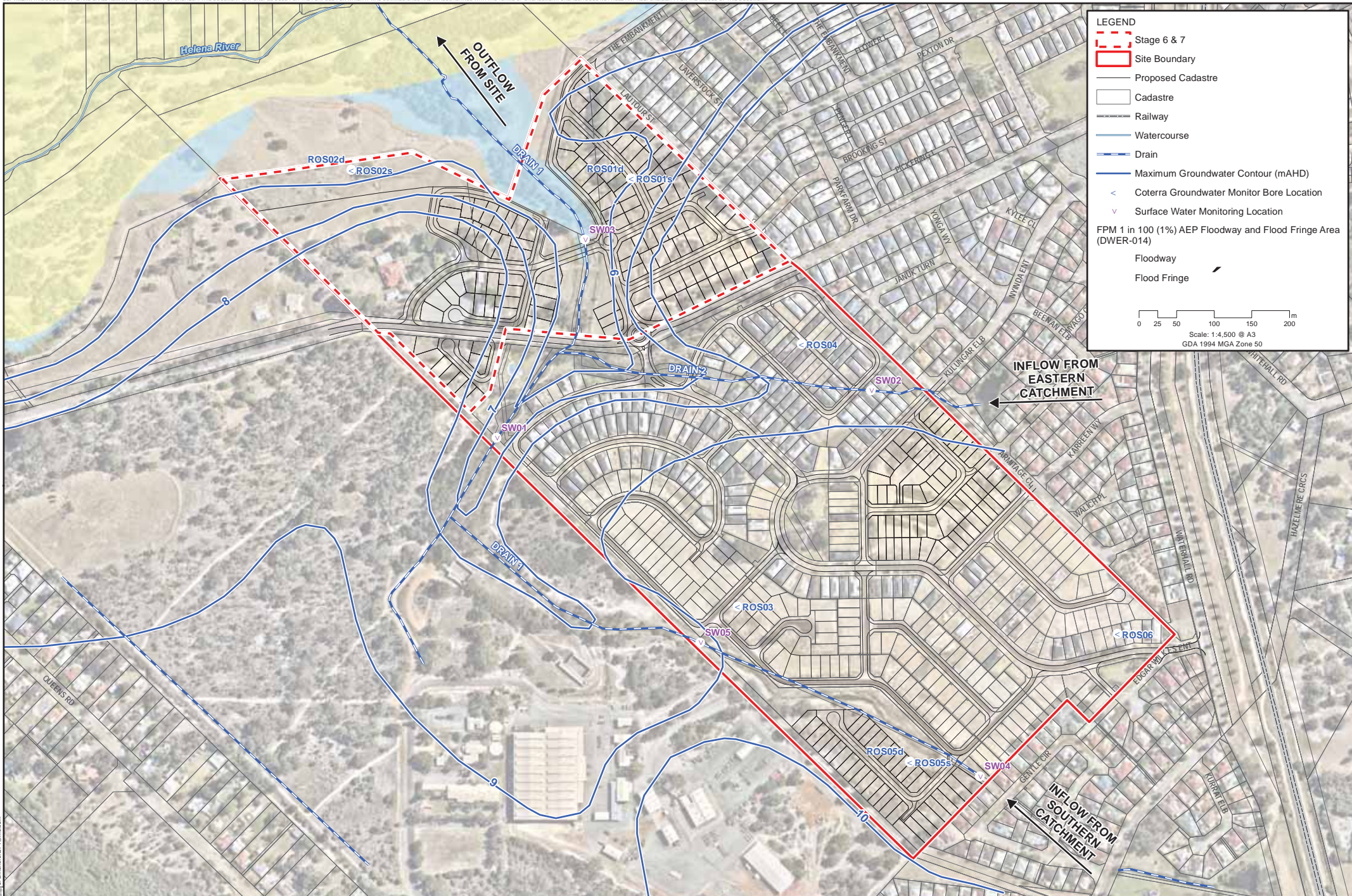
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Noahs Rosehill Waters  
ROSEHILL STAGE 6 & 7 LWMS ADDENDUM  
ROSEHILL WATERS

**TOPOGRAPHY AND SOILS**

**Figure 3**





Source: Cadastre - Landgate, 2021  
Orthophoto - NearMaps, 27.02.21  
Flood Mapping - DWER, 2021



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Doc: 004  
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ROSEHILL STAGE 6 & 7 LWMS ADDENDUM  
ROSEHILL WATERS

**SURFACE AND GROUNDWATER**

**Figure 4**



### 3 SUMMARY OF LWMS STRATEGY

Section 3 identifies the aspects of the LWMS strategy that have remained unchanged since the preparation of the LWMS but have been summarised below.

**Table 2 Summary of LWMS Strategy**

Design Element	LWMS Description for Stage 6 and 7 Design
Water Conservation	<ul style="list-style-type: none"> <li>• Potable water will be supplied by the Water Corporation.</li> <li>• All homes will be fitted with AAA rated water fixtures (toilets, showers, taps, etc.).</li> <li>• Wastewater will be disposed of via the Water Corporation regional system.</li> <li>• Irrigation of landscaping will be minimised through a design which combines hard and soft landscaping, the use of hydroplanting and the selection of low water use native species.</li> <li>• Groundwater will be used to irrigate POS areas.</li> <li>• Where possible, existing native trees will be retained as part of the development proposals to reduce the establishment time and water demand.</li> </ul>
Stormwater Management	<ul style="list-style-type: none"> <li>• Road runoff up to the 20% AEP event will be conveyed by a road pipe drainage network.</li> <li>• In larger events (up to the 1% AEP) road runoff will be conveyed in the road reserve.</li> <li>• The 'first flush' (15mm) event generated on the public road network will be treated in water quality treatment areas (WQTAs), raingardens and/or tree pits prior to discharge to the living stream. In Stage 6 &amp; 7, it will be two water quality treatment areas.</li> <li>• Larger storm events (greater than 1 EY) will be treated, conveyed, and managed in the living stream (online storage).</li> <li>• Post-development flow will be discharged offsite to the Helena River via the living stream, at pre-development rates.</li> <li>• Water quality treatment areas will infiltrate in less than 96 hours to manage disease vector and nuisance insects.</li> <li>• The finished floor levels of all buildings will be constructed at least 300mm above the 1% AEP stormwater flood level in the minor drainage system (WQTAs) throughout the development.</li> </ul>
Living Stream	<ul style="list-style-type: none"> <li>• The existing drainage line will be converted into a Living Stream to provide integrated stormwater management.</li> <li>• The conversion of the existing drain into a living stream will significantly enhance the environmental and social values of the drain.</li> <li>• The living stream will provide online storage and conveyance of runoff up to the 1% AEP event.</li> </ul>

	<ul style="list-style-type: none"> <li>• Road runoff from the first flush event will be treated prior to discharge to the living stream.</li> <li>• Lots will be raised at least 500mm above the 1% AEP TWL in the living stream.</li> </ul>
Flood Management	<ul style="list-style-type: none"> <li>• There is sufficient capacity within the existing drains on site to convey the pre-development 1% AEP event.</li> <li>• The development proposals include for the existing drains to be enlarged and reshaped to form living streams.</li> <li>• Lots will be raised at least 500mm above the 1% AEP TWL in the living stream and Helena River.</li> <li>• The finished floor levels of all buildings will be constructed at least 300mm above the 1% AEP stormwater flood level in the local road drainage network within the development.</li> </ul>
Groundwater Management	<ul style="list-style-type: none"> <li>• Recontouring the site topography to provide adequate separation distance from finished lot levels to maximum groundwater levels (MGL) or perched groundwater (as relevant) will occur.</li> <li>• Soil amendment layers will be used in the base of raingardens and water quality treatment areas to treat the 'first flush' event. In Stage 6 and 7 this will be in the base of the WQTAs.</li> </ul>
Management of Subdivision Works	<ul style="list-style-type: none"> <li>• Dust management, erosion, sediment controls and maintenance of infrastructure will all be implemented to ensure impacts of construction are minimised.</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• The predevelopment monitoring program included nine groundwater bores (at six locations) and five surface water locations.</li> <li>• Post-development monitoring will be undertaken for five years post development with a review after three years to demonstrate that the urban water objectives of the development are being met.</li> <li>• Post development monitoring will be undertaken quarterly for groundwater levels and quality, surface water flows and quality, and an annual inspection of the condition of the living stream.</li> <li>• If predevelopment bores are destroyed, these will be replaced as close as possible to the original location.</li> </ul>
Implementation	<ul style="list-style-type: none"> <li>• Implementation remains the same as the LWMS.</li> </ul>



## 4 STAGE 6 AND 7 WATER MANAGEMENT

### 4.1 Summary of Changes

A summary of the changes is outlined in the Table 3 and further details are provided in the section below.

**Table 3** Summary of Changes in Stages 6 & 7

	LWMS (Coterra, 2016)	LWMS amendment (Urbaqua, 2021)
Planning		
Green title lots		Increase in green title lots due to ANEF boundary contour changes.
Roads		Reconfiguration of road layout.
Lot boundary		Northern boundary altered.
Hydrological and Water Management in Stage 6 & 7		
Household irrigation	Community bore	Scheme water
Modelling changes due to road and lot areas	Detailed in Section 4.2	
Number of drainage sub catchments	4	2
Number of water quality treatment areas	4	2
Total volumes treated in water quality treatment areas (m3)	230	292.6
Culvert location	At existing culvert location	Moved further south to new road location
Subsoil drainage	Not proposed	Proposed

	LWMS (Coterra, 2016)	LWMS amendment (Urbaqua, 2021)
Lot drainage	Soakwells	Soakwells with piped overflow to road reserve

## 4.2 Stormwater Management Strategy

### 4.2.1 Lots

Lot stormwater will be managed onsite in soakwells for small events with a piped overflow to the road reserve in larger events. Each lot will provide an equivalent volume of approx. 2.7m<sup>3</sup> (two soakwells measuring 1.2m diameter x 1.2m depth).

Overflow from the soakwells in larger events (above the approx. 1 EY event) will enter the road reserve and be managed with the road drainage as detailed in Section 4.2.2 below. The soakwell storage capacity has been updated in the parameterisation of the hydrological modelling in XP SWMM to account for lot runoff in different rainfall events.

### 4.2.2 Roads

Stormwater from the roads will enter water quality treatment areas as per the original LWMS strategy. These will treat the first flush event (first 15mm). Stage 6 and 7 are divided into two catchments. The catchments and flow paths are shown in Figure 5. Each catchment has a dedicated water quality treatment area (WQTA) located at the low point in the catchment, adjacent to the foreshore. The footprints shown in Figure 5 are indicative sizes based on a shallow 0.3m depth.

As part of the changes to design, the existing culvert north of west parade within Stage 6 and 7 needs to be moved south to be in line with the new road proposed (Figure 2). For the purposes of the modelling, the culvert size was maintained at the same size as the exiting culvert underneath the new road to mimic predevelopment conditions (rectangular, 0.9m high x 0.48m wide). The results of the modelling are presented below.

### 4.2.3 Water Quality Treatment Areas

The volume requirements for the WQTAs are shown in Table 4 below.

**Table 4** WQTA Sizes

Design Element	Effective Impervious Area (sqm)	Volume requirement (m3)	Indicative top area (m2)	Slope	Depth (m)
WQTA1	10,500	158.2	636	1:6	0.3
WQTA2	9,000	134.4	540	1:6	0.3

Water quality treatment areas will have a soil amendment layer (0.3m) with a minimum PRI of 10 and contain nutrient stripping vegetation. This is in line with the LWMS, and further details are provided there. Beneath the soil amendment layer, a subsoil drain (surrounded by a drainage layer) will capture the treated stormwater and discharge to the foreshore/ overflow to the living stream. The landscape plans are presented in Appendix 4 which demonstrates how the WQTA interact with the landscape and surrounding area.

#### 4.2.4 *Living Stream*

The living stream is the main drainage management component of Rosehill Waters' water management strategy. The XP SWMM modelling was revised to adjust for the changes to the development layout, the changes to the small event management, and to update the model with the 2019 Australian Rainfall and Runoff (AR&R) design storms (the LWMS modelling was done with the 2000 AR&R design storms).

The LWMS required that the 1% AEP predevelopment flow rates be maintained post development. However, as part of the Stage 3 UWMP, there was a deviation from the original strategy objective regarding post development flows. The existing drain/living stream that flows through Stage 3 (now Stage 4) conveys runoff generated in upstream catchments (including the neighbouring Waterhall Estate). It featured a compensation basin immediately upstream (south) of Rosehill Waters to control runoff generated in the Waterhall Estate. The City of Swan advised that there was a flooding issue in the Waterhall Estate and one option to assist in alleviating the flooding issue was to remove the compensation basin, which would increase flow in the existing drain from the existing Waterhall Estate into Rosehill Waters (and to the Helena River). A Memorandum of Understanding (MOU) was agreed between the City of Swan, the Department of Defence and Noahs Rosehill Waters regarding this. The MOU agreed to the following amendment:

- The post-development runoff from the Rosehill Waters Stage 3 development can be discharged at higher than pre-development flow rates and that the control structure originally proposed in the Stage 3 design of a living stream can be removed.

The implications for this addendums' modelling therefore means that post-development flows from Stage 6 and 7 need to meet the post development flow rates at the Stage 6/7 outlet point (Link 48\_49/ Node 48) from the Stage 3 revision modelling. These flow rates are provided in Table 5 below. Please note: The pre-development and Stage 3 post development flows presented in their reports respective reports show different flow rates (2.44 m<sup>3</sup>/s LWMS, 2.76 m<sup>3</sup>/s Stage 3 UWMP) however this was using the old 2000 AR&R design storms. The three models were rerun using the updated 2019 AR&R data to ensure comparability and consistency. The revised flow rates using the updated 2019 design storms are presented in Table 5 below.

The modelling undertaken as part of this addendum indicates that predevelopment flow rates can be maintained at the Stage 3 post development flow rates, by maintaining the culvert size under the new road. The flow rates (with a free-flowing outlet) are presented in Table 5.



**Table 5** Pre and Post Development Flow Rates (2019 AR&R)

Stage 6 & 7 Outlet	Pre-development flow rate	Stage 3 model revision - post development flow rate	Stage 6&7 model revision - post development flow rate
	Link 48_49/ Node 48	Link 48_49/ Node 48	Link 48_49/ Node 48
1 EY peak flow (m3/s)	0.74	1.24	1.27
20% AEP peak flow (m3/s)	1.14	1.65	1.69
1% AEP peak flow (m3/s)	2.89	2.93	2.94



Source: Cadastre - Landgate, 2021  
Orthophoto - NearMaps, 27.02.21



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Noahs Rosehill Waters  
ROSEHILL STAGE 6 & 7 LWMS ADDENDUM  
ROSEHILL WATERS  
**STORMWATER MANAGEMENT 1EY EVENT**

**Figure 5**



### 4.3 Flood Management Strategy

#### 4.3.1 Separation distances – Lot Levels to 1% AEP Flood Top Water Levels (TWL) in the Helena River

The 1% AEP flood level in the Helena River is 4.3mAHD. The LWMS requires 500mm of separation from the 1% AEP level. This requires a minimum lot level of 4.8mAHD within Stage 6 and 7 to meet the separation distance requirement from the Helena River. The minimum lot level is 5.6mAHD (Appendix 5). This is greater than the minimum requirement.

#### 4.3.2 Separation distances – Lot Levels to 1% AEP Flood TWLs in the Living Stream

The addendum flood modelling assessed two options with regards to the 1% AEP TWL within the living stream. One with a free-flowing outlet (ie. Unrestricted flow into the Helena River) and one with a tailwater (ie. The Helena River in flood up to the 1% AEP flood level – 4.3mAHD).

##### 4.3.2.1 Living Stream with Free-Flowing Outlet

The minimum lot levels on both sides of the living stream, both upstream and downstream of the new road has been compared to the 1% AEP TWLs (flood level points in mAHD shown in Appendix 6) with a free flowing outlet (to the Helena River) in Table 6 below.

**Table 6 Separation to 1% AEP with free-flowing outlet to lot levels**

		Min. lot level (mAHD)	1% AEP TWL adjacent to min. lot (mAHD)	Separation distance (m)
Stage 6 (western side of living stream)	Downstream of new road	5.600	2.900	2.7
	Upstream of new road	7.450	5.047	2.4
Stage 7 (eastern side of living stream)	Downstream of new road	6.340	3.142	3.2
	Upstream of new road	8.190	5.047	3.1

The modelling results indicate that the separation distance to lots is easily met.

##### 4.3.2.2 Living Stream with Tailwater from Helena River

The second scenario (tailwater) has been assessed as a worst-case scenario. There is a low likelihood of the tailwater scenario occurring as this requires the catchment peak flow and the Helena River 1% AEP flood event to occur at the same time. The separation distance to lot levels have been assessed against these levels as a conservative estimate.



**Table 7** Separation to 1% AEP with tailwater to lot levels

		Min. lot level (mAHD)	1% AEP TWL adjacent to min. lot (mAHD)	Separation distance (m)
Stage 6 (western side of living stream)	Downstream of new road	5.600	4.343	1.3
	Upstream of new road	7.450	5.832	1.6
Stage 7 (eastern side of living stream)	Downstream of new road	6.340	4.373	2.0
	Upstream of new road	8.190	5.832	2.4

The modelling results indicate that the separation distance to lots is easily met even with a tailwater.

#### 4.3.3 Separation Distances – Lot Levels to Minor Drainage Top Water Levels

The LWMS requires that 300mm of clearance is required between the TWL in drainage systems and lot levels.

The top water levels of the WQTAs will be designed at UWMP/ detailed design, however, to ensure the 300mm clearance is met, the maximum TWL of each WQTA is provided below based on the closest minimum lot level to each WQTA.

- Min. lot level adjacent to WQTA1 is 5.60mAHD. The TWL is WQTA1 will therefore not exceed 5.30mAHD.
- Min. lot level adjacent to WQTA2 is 5.97mAHD. The TWL is WQTA2 will therefore not exceed 5.67mAHD.

#### 4.3.4 Road Flooding

The tailwater scenario (worst case) also assessed whether any flooding would occur over the roads crossing the living stream (West Parade and the new road) in a worst-case scenario. Cross sections of the two roads and their culverts at West Parade and the new road are presented in Appendix 7.

- Modelling showed that there was no overtopping at the new road.
- Modelling showed that there may be some minimal overtopping of West Parade (0.01m) above the West Parade level (6.1mAHD).

There is no road overtopping at either road in the free-flowing outlet scenario.



**LEGEND**

- Stage 6 & 7
- Site Boundary
- Proposed Cadastre
- Cadastre
- Watercourse
- 10% AEP Flood Area (free outfall)
- 1% AEP Flood Area (free outfall)

Scale: 1:2,000 @ A3  
GDA 1994 MGA Zone 50

Source: Cadastre - Landgate, 2021  
Orthophoto - NearMaps, 27.02.21

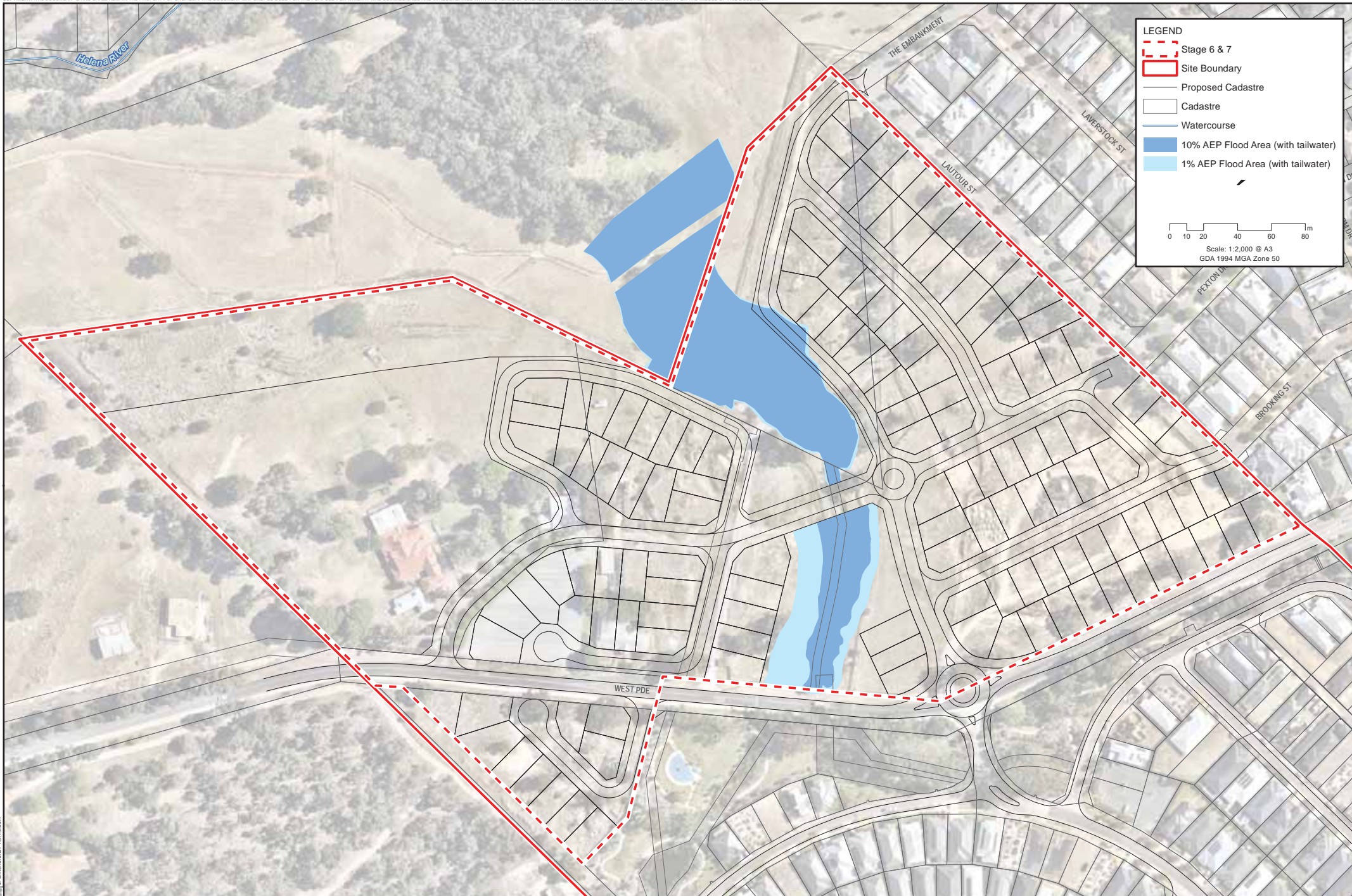


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Noahs Rosehill Waters  
ROSEHILL STAGE 6 & 7 LWMS ADDENDUM  
ROSEHILL WATERS  
**LIVING STREAM 1% AEP AND 10% AEP  
FLOOD EXTENT WITH FREE OUTFALL**

Figure 6





**LEGEND**

- Stage 6 & 7
- Site Boundary
- Proposed Cadastre
- Cadastre
- Watercourse
- 10% AEP Flood Area (with tailwater)
- 1% AEP Flood Area (with tailwater)

0 10 20 40 60 80 m

Scale: 1:2,000 @ A3  
GDA 1994 MGA Zone 50



## 4.4 Groundwater Management Strategy

### 4.4.1 Fill Management

The site will be cut and fill for earthworks' purposes. The earthworks plans are presented in Appendix 5. The clay onsite will be cut and filled to ensure there is a balance across the site.

Following cut and fill/ contouring the base clay layer, a minimum of 1.2m of sand will be established over the clay layer. The engineering servicing report is provided in Appendix 8.

### 4.4.2 Subsoil Drainage

Subsoil drainage will be installed to ensure that perched groundwater levels (above the clay layer) will be controlled. The subsoil drains will follow the piped drainage for the road drainage and will be directed to the WQTAs for treatment prior to infiltrating/ eventual discharge to the foreshore and living stream.

Details of the subsoil drainage including invert levels, spacing, locations etc will be provided in the UWMP in line with the requirements of the Better Urban Water Management guidelines.

### 4.4.3 Separation Distances – Lot Levels to Groundwater

As detailed above, there will be minimum of 1.2m from the clay layer to the lot levels. Any lots that have clay close to surface will have the clay cut out and removed and backfilled with clean sand fill with less than 5 % fines.

### 4.4.4 Separation Distances – WQTA Invert Levels to Groundwater

The closest Geotechnical test pit locations to WQTA1 and WQTA2 are TP129 (WQTA1) and TP130 (WQTA2). These are shown in Appendix 1.

- TP129 (closest to WQTA1) shows clay layer almost at surface (6mAHD\* surface level interpolated from a survey plan provided by client).
- TP130 (closest to WQTA2) shows a clay layer 1.3mbgl or at 5.8mAHD\*.

WQTA1 and WQTA2 will both need to have a minimum of 0.6 - 0.9m clay/natural soil removed beneath the area to accommodate for the WQTA layers (0.3m depth of swale (void), 0.3m soil amendment layer, 0.3m subsoil pipe and drainage layer). This detail will be confirmed at UWMP stage.

## 5 REFERENCES

Coterra Environment (2012). District Water Management Strategy – Rosehill Waters. Prepared for Rosehill Waters Pty Ltd.

Coterra Environment (2016). Local Water Management Strategy – Rosehill Waters. Prepared for Rosehill Waters Pty Ltd.

Coterra Environment (2017). Stage 1 Urban Water Management Plan – Rosehill Waters. Prepared for Noahs Rosehill Waters Pty Ltd.

Coterra Environment (2017). Stage 2 Urban Water Management Plan – Rosehill Waters. Prepared for Noahs Rosehill Waters Pty Ltd.

Coterra Environment (2019). Stage 3 Urban Water Management Plan – Rosehill Waters. Prepared for Noahs Rosehill Waters Pty Ltd.

Douglas Partners (2013). Geotechnical Investigation. Rosehill Waters.

WAPC (2008). Better Urban Water Management.

## Appendix 1 Soil Profile Summary (Douglas Partners, 2013)



### Summary of Clay Material Presence in Soil Profile Logs

Stage	Test Pit number	Clay material depth below GL (m)	Clay material elevation (mAHD)
7	104	2.3	6.4
7	105	1	5.4
7	113	1.6	2.9
7	114	1.4	6.6
7	115	1.5	6.8
7	116	1.1	4.7
7	117	0.3	5.1
7	125	1.3	2.1
7	127	0.2	5.9
7	128	0.2	5.7
7	129	0.1	5.9





Stage	Test Pit number	Clay material depth below GL (m)	Clay material elevation (mAHD)
6	109	2.1	6.9
6	110	2	4.7
6	111	2	5.1
6	118	1.5	3.2
6	119	2.6	4.8
6	120	2.6	6.8
6	130	1.3	5.8
6	134	2.5	7.7
6	135	0.3	9.3

# TEST PIT LOG

**CLIENT:** Noahs Rosehill Waters Pty Ltd  
**PROJECT:** Proposed Residential Development  
**LOCATION:** Rosehill Country Club, South Guildford, WA

**SURFACE LEVEL:** 6.0 m AHD\*  
**EASTING:** 403593  
**NORTHING:** 6469646

**PIT No:** 129  
**PROJECT No:** 82173  
**DATE:** 9/10/2013  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.1	TOPSOIL (SAND) - dark grey-brown, fine to medium grained sandy topsoil with some roots and a trace of silt, moist. SANDY CLAY - firm, grey-brown and brown, medium to high plasticity, sandy clay, moist.										
	0.6	GRAVELLY CLAYEY SAND - medium dense, grey-brown and light grey, fine to coarse sized gravelly clayey sand, moist.  - becoming loose from 0.9 m depth.			0.4		pp = 100					
	1.5	CLAYEY SAND - orange-brown and light grey, fine to medium grained clayey sand, moist.		D	1.2							
	2.5	SAND - red-brown, fine to coarse grained sand with some clay and some gravel of weakly cemented sand, saturated.		D	2.6							
	3.0	Pit discontinued at 3.0m (Target depth)										

**RIG:** 5 tonne excavator with a 650 mm wide toothed bucket.

**LOGGED:** YC

**SURVEY DATUM:**

**WATER OBSERVATIONS:** Groundwater observed at 2.7 m depth.

**REMARKS:** \*Surface level interpolated from a survey plan provided by the client.

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Noahs Rosehill Waters Pty Ltd  
**PROJECT:** Proposed Residential Development  
**LOCATION:** Rosehill Country Club, South Guildford, WA

**SURFACE LEVEL:** 7.1 m AHD\*  
**EASTING:** 403461  
**NORTHING:** 6469559

**PIT No:** 130  
**PROJECT No:** 82173  
**DATE:** 9/10/2013  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.1	TOPSOIL (SAND) - dark grey-brown, fine to medium grained sandy topsoil with a trace of silt and some roots, moist.  SAND - medium dense, orange-brown, fine to medium grained sand with a trace of silt, moist.										
	1											
	1.3	CLAYEY SAND - orange-brown and brown, fine to medium grained clayey sand, dry to moist.										
	1.7	- with some cobbles of weakly cemented clayey sand from 1.6 m depth.										
	2	SANDY GRAVEL - orange-brown and brown, fine to coarse sized slightly clayey sandy gravel with some cobbles, moist. Gravel and cobbles are coffee rock.										
	2.1			D	2.1							
	3	Pit discontinued at 3.0m (Target depth)										
	3.0											

**RIG:** 5 tonne excavator with a 650 mm wide toothed bucket.

**LOGGED:** YC

**SURVEY DATUM:**

**WATER OBSERVATIONS:** No free groundwater observed.

**REMARKS:** \*Surface level interpolated from a survey plan provided by the client.

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)





CADASTRAL SOURCE: Landgate, June 2012.  
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2012.  
CONTOURS SOURCE: McMullenNolan, Job No. 97989 Rev B.



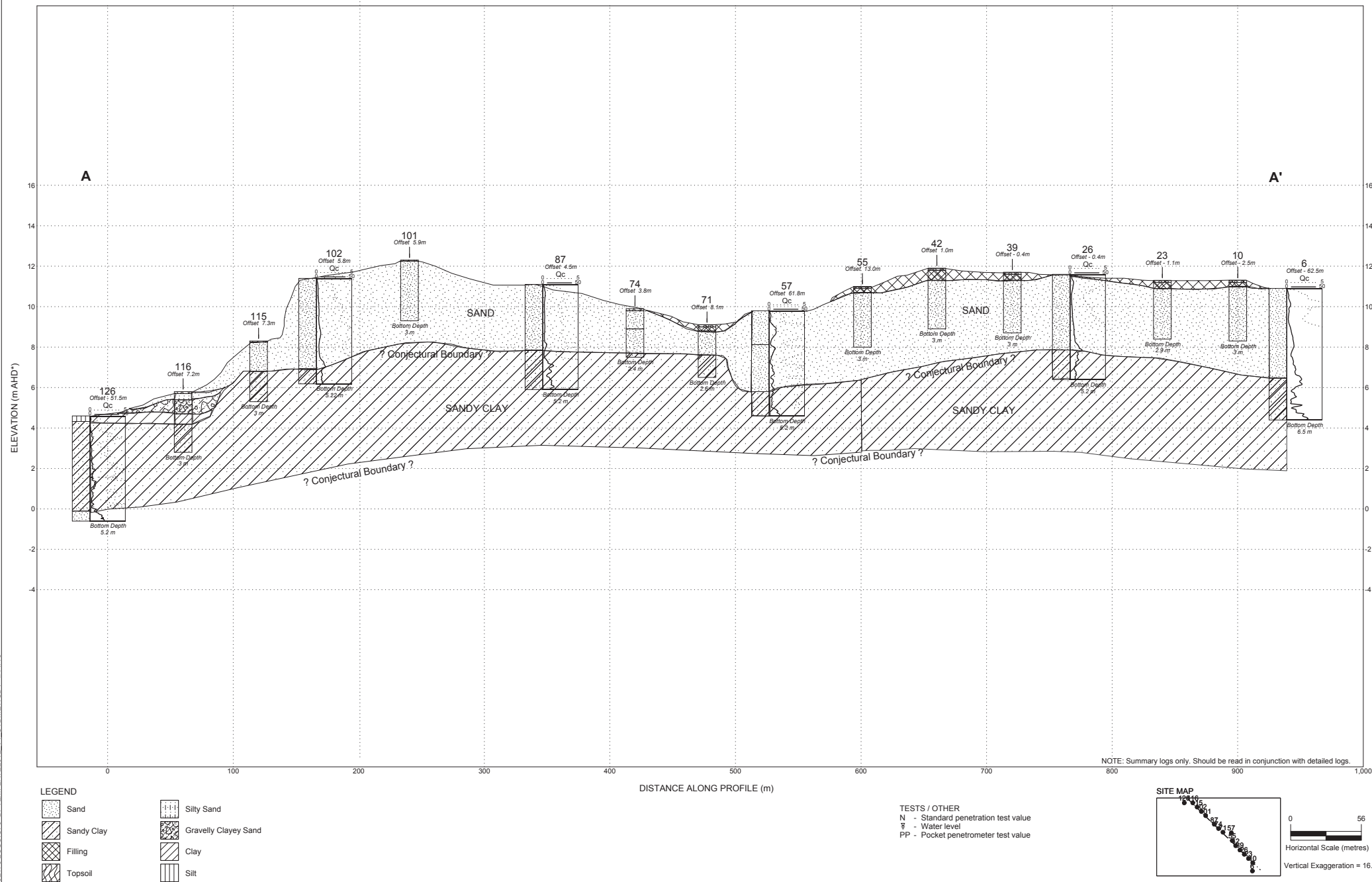
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OFFICE: Perth	DRAWN BY: Y. Chen
SCALE: As shown	DATE: 29 Nov 2013

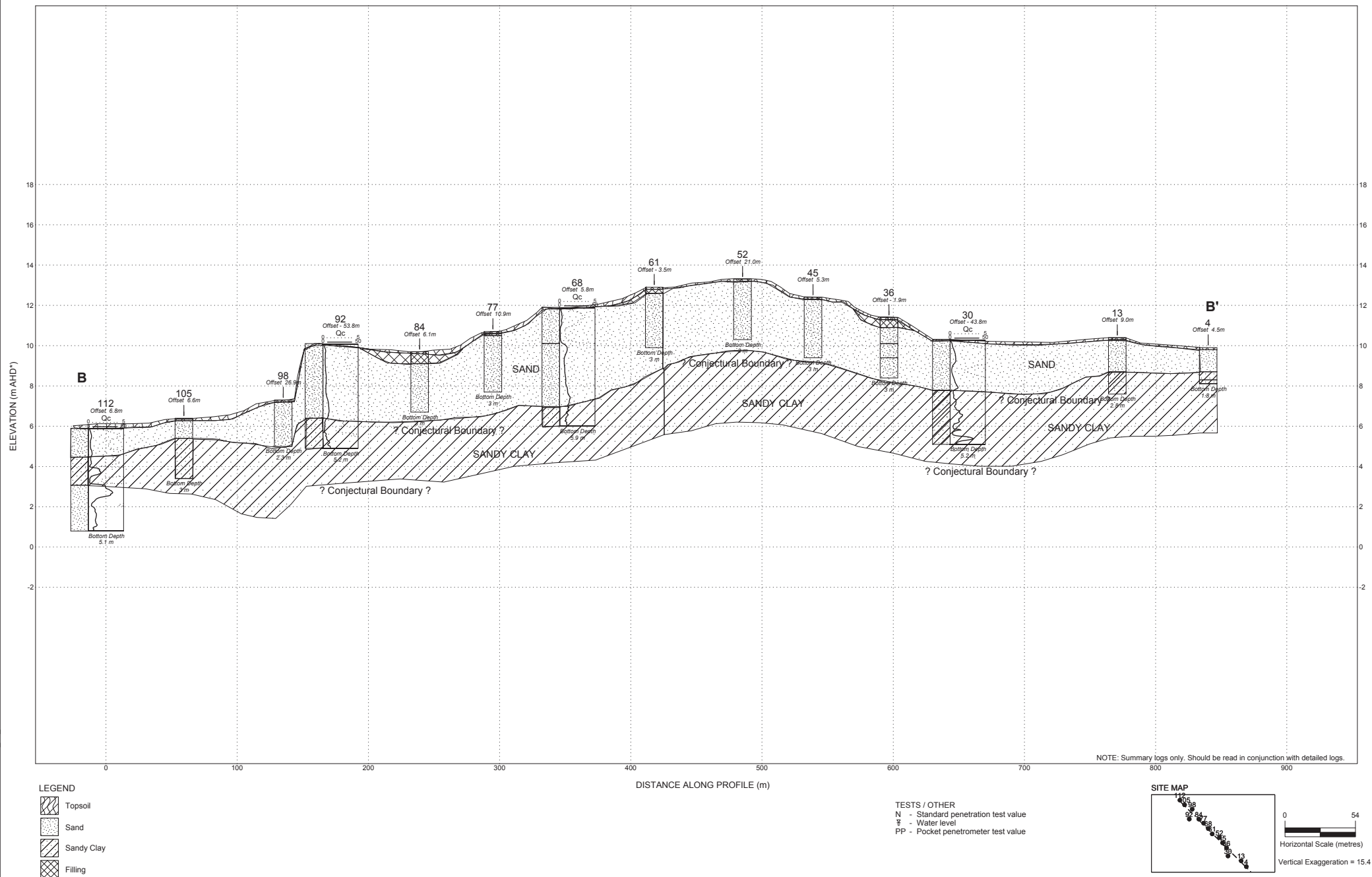
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**Proposed Residential Development**  
**Rosehill Country Club, South Guildford, WA**



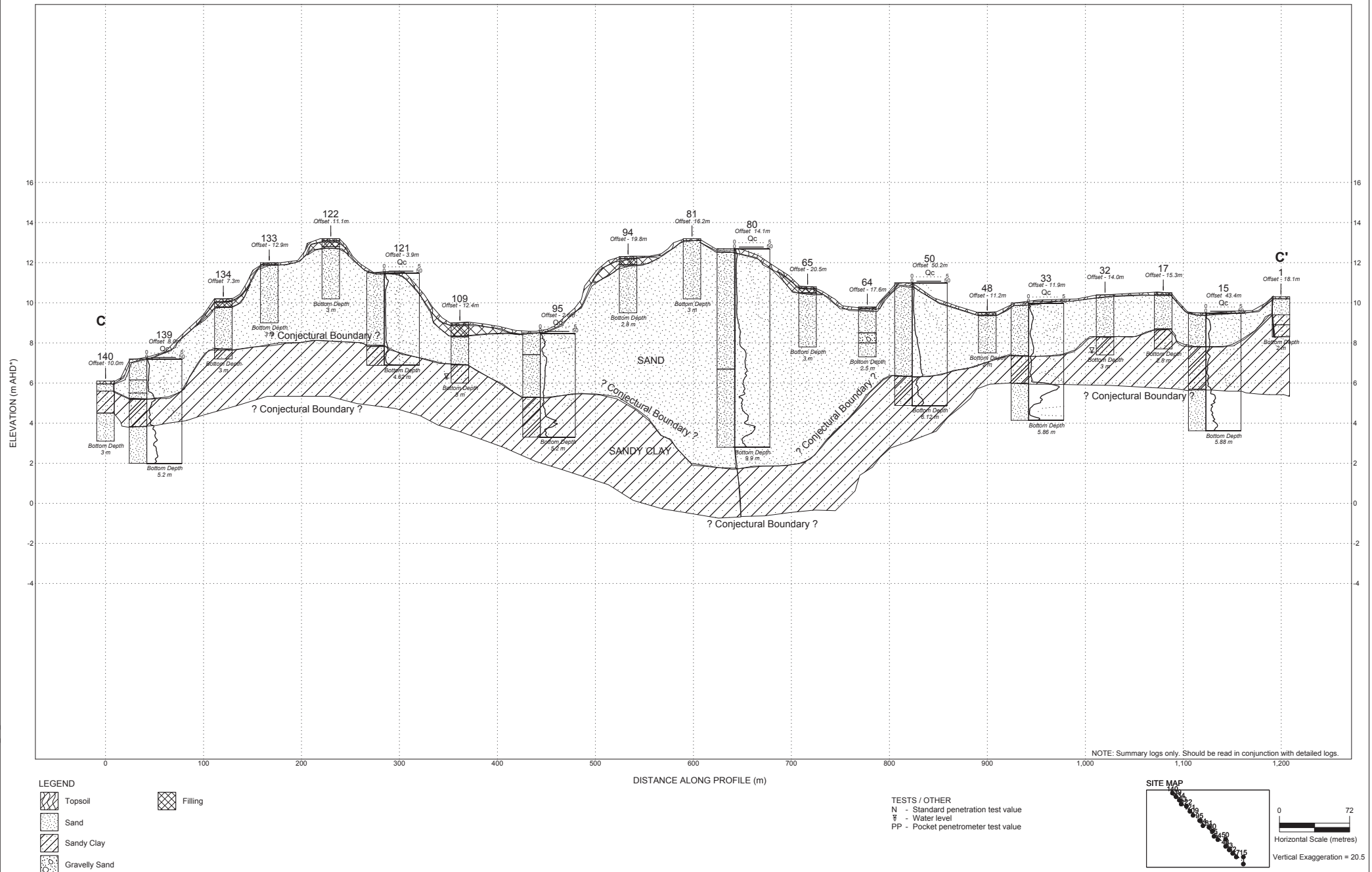
PROJECT No.: 82173
DRAWING No.: 2
REVISION: A











## Appendix 2 **Surface Water Monitoring Results**

## Predevelopment Flow and Quality Results

Sample Location	Date	Water Present?	Water Flowing?	Velocity Reading (m/s)	Physical Parameters						Nutrients					
					Temp	pH	EC	TDS	Redox	Dissolved Oxygen	Ammonia-N	NOx-N	Total Nitrogen	Reactive Phosphorus	Total Phosphorus	TKN
SW04	Oct-12	Yes	Yes	0.03	20.5	8.17	501	358	98.3	7.02	0.2	0.03	0.7	0.15	0.17	0.7
	Jan-13	Yes	Yes	0.11	28.3	8.1	551	393	124	8.85	0.4	<0.01	0.7	0.1	0.13	0.7
	Apr-13	Yes	Yes	0.1	21.4	7.82	686	481	109.2	5.46	0.2	0.2	1	0.07	0.3	0.8
	Jul-13	Yes	Yes	0.15	14.3	8.58	703	501	-32	8.27	<0.2	<0.01	1.3	0.04	0.13	0.9
	Oct-13	Yes	Yes	0.27	21.3	8.37	641	380	94.6	5.45	<0.2	0.06	0.5	0.04	0.13	0.4
SW05	Oct-12	Yes	Yes	0.07	23.4	8.89	592	397	42.2	10.71	0.2	<0.01	0.8	0.14	0.16	0.8
	Jan-13	Yes	Yes	0.01	29.8	8.65	836	560	8	10.55	0.3	<0.01	0.7	0.07	0.16	0.7
	Apr-13	Yes	Yes	0.05	22.9	8.46	732	494	18.3	6.85	<0.2	0.13	1.1	0.06	0.27	1
	Jul-13	Yes	Minimal	NA	16.4	8.36	621	418	7.5	10.4	<0.2	0.31	1.3	0.03	0.12	1
	Oct-13	Yes	Yes	0.05 - 0.15	21.9	8.24	487.7	285	-65.2	6.92	<0.2	<0.01	1	0.05	0.14	1
SW01	Oct-12	Yes	Yes	0.8	22	8.25	507	351	62.3	5.34	0.2	<0.01	0.6	0.1	0.14	0.6
	Jan-13	Yes	Yes	0.07	27.3	8.24	309	214	8	3.77	<0.2	0.01	0.7	0.12	0.16	0.7
	Apr-13	Yes	Yes	0.03	19.4	7.66	623	455	23.1	5.44	<0.2	0.13	0.8	0.08	0.28	0.7
	Jul-13	Yes	Yes	0.03	13.1	7.99	550	369	19.1	6.83	<0.2	0.21	0.9	0.03	0.13	0.7
	Oct-13	Yes	Yes	0.7	21	8.13	483.6	288	61.7	5.48	<0.2	2.7	0.3	0.04	0.12	0.3
SW03	Oct-12	Yes	Yes	0.4	21	8.62	670	475	52	10.38	0.2	0.04	0.8	0.09	0.16	0.8
	Jan-13	Yes	Yes	0.3	28.9	8.26	1106	783	137	7.57	0.4	0.01	0.8	0.12	0.16	0.8
	Apr-13	Yes	Yes	0.2	22.5	7.71	987	676	25	6.28	<0.2	0.18	0.8	0.08	0.25	0.6
	Jul-13	Yes	Yes	0.11	15.6	8.17	834	572	-12.3	11.73	<0.2	0.31	0.9	0.04	0.14	0.6
	Oct-13	Yes	Yes	0.35	21.3	8.02	546	325	112	5.16	<0.2	0.08	0.5	0.04	0.12	0.4
SW02	Oct-12	Yes	Minimal	0-0.01	22.6	8.03	432.2	294	37.9	8.35	0.3	0.69	1.5	<0.01	0.05	0.8
	Jan-13	No	No	n/a												
	Apr-13	Yes	Yes	0.1	22.2	8.09	383.3	263	154.6	5.43	<0.2	0.01	1.4	<0.01	0.11	1.4
	Jul-13	Yes	Yes	0.15	14.9	8.29	261.9	184	21.4	6.08	<0.2	0.63	0.9	<0.01	0.04	0.3
	Oct-13	Yes	Minimal	0.02	21.4	7.68	506	297	92.7	4.49	<0.2	2.4	2.5	0.02	0.07	<0.2



## Stage 1 Post-dev Water Flow and Appearance Results

Sample Location	Date	Water Present?	Water Flowing?	Velocity Reading (m/s)	Appearance
SW01	25-Jan-18	Yes	Yes	0.7	Clear water
	23-Apr-18	Yes*	No	n/a	Clear water, sampled from pond not inlet
	02-Aug-18	Yes	Yes	0.27	Turbid, light brown
	04-Oct-18	Yes	Yes	0.61	Clear slightly brown
	04-Feb-19	Yes	Yes	0.04	Clear, brown with lots of algae
	08-Apr-19	Yes	Yes	0.41	Clear, brown
	22-Jul-19	Yes	Yes	1.51-1.89	Clear, some algae at edges
	07-Nov-19	Yes	Yes	0.1, low	Clear, algae prevalent. Saw a long-necked turtle/tortoise
	19-Feb-20	Yes	No	n/a	Mostly clear, algae and some rubbish. Brownish green
	24-Apr-20	Yes	No	n/a	clear, brownish
	30-Jul-20	Yes	Yes	0.101	Brown, algae and a little murky
	20-Oct-20	Yes	Yes	0.1	Lots of algae, murky brown
SW02 (new)	25-Jan-18	Yes	Yes	0.4	Turbid slightly milky colour
	23-Apr-18	Yes	Yes	0.2	Very slightly turbid - brownish colour
	02-Aug-18	Yes	Yes	0.34	Very turbid, milky brown
	04-Oct-18	Yes	Yes	0.07	Clear slightly brown
	04-Feb-19	Yes	Yes	0.01	Clear with lots of algae
	08-Apr-19	Yes	No	-	Clear, brown
	22-Jul-19	Yes	Yes	0.141-0.201	Clear, some algae at outlet
	07-Nov-19	Yes	Yes	0.127	0.233
	19-Feb-20	Yes	Yes	too low for reading	Clearish, brown with flocc
	24-Apr-20	Yes	Yes	too low for reading	Brown with some floccs.
	30-Jul-20	Yes	Yes	0.01	Clear, Brownish
	20-Oct-20	Yes	Yes	0.01	Clear
SW06	25-Jan-18	Yes	Yes	0.3	Clear water - light brown
	23-Apr-18	Yes	Yes	0.3	Clear
	02-Aug-18	Yes	Yes	1.01	Turbid light brown and milky brown
	04-Oct-18	Yes	Yes	0.47	Clear slightly brown
	04-Feb-19	Yes	Yes	0.23	Clear, brown
	08-Apr-19	Yes	Yes	0.16-0.23	Clear, slightly brown
	22-Jul-19	Yes	Yes	1.13-2.40	Clear
	07-Nov-19	Yes	Yes	0.1, low	Clear, brown w algae
	19-Feb-20	Yes	Yes	too low for reading	Murky, brown with algae, flocc
	24-Apr-20	Yes	Yes	0.063-0.080	Clear and brownish. Some floccs mostly coming from SW02 direction
	30-Jul-20	Yes	Yes	0.755	Clear, brown
	20-Oct-20	Yes	Yes	0.25 to 0.35	Clarish, brown

## Stage 1 Post-dev Water Quality Results

Sample Location	Date	pH	Electrical Conductivity (µS/cm)	TDS (mg/L)	Redox (mV)	Dissolved Oxygen (%)	Ammoni a-N (mg/L)	NOx-N (mg/L)	TN (mg/L)	Reactive P (mg/L)	TP (mg/L)	TKN (mg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)
Guidelines	FW Guidelines	7-8.5	300-1500					0.1	1.5		0.06			
	LIW Guidelines	6-8.5							5		0.05			
SW01	25-Jan-18	7.51	851	627	-69.7	79.9	0.03	<0.01	1	0.05	0.09	1	<0.01	<0.01
	23-Apr-18	8.16	1605	1124	87.8	76.7	0.05	<0.01	2.1	0.01	0.11	2.1	<0.01	<0.01
	02-Aug-18	7.9	286	235	49.1	70.8	0.07	0.45	0.7	0.07	0.17	0.3	0.44	0.01
	04-Oct-18	7.61	598	436	83.2	72.9	<0.02	0.52	1.2	0.09	0.17	0.8	0.36	0.01
	04-Feb-19	8.29	811	566	-51.3	31.6	0.03	0.02	1.4	<0.01	0.21	1.4	0.02	<0.01
	08-Apr-19	8.46	852	611	-30	57.7	<0.02	<0.01	0.4	<0.01	0.05	0.4	<0.01	<0.01
	22-Jul-19	8.05	543.2	356	-108.4	82.6	0.16	0.31	1.2	0.04	0.11	0.9	0.31	<0.01
	07-Nov-19	7.98	552	364	4.8	88.6	<0.02	0.02	1	0.05	0.1	1	0.02	<0.01
	19-Feb-20	7.42	633	391	18.1	14.9	0.74	<0.01	3	0.19	0.51	3	<0.01	<0.01
	24-Apr-20	7.85	1715	946	-32.1	86	0.16	<0.01	2.2	0.12	0.37	2.2	<0.01	<0.01
	30-Jul-20	7.53	535.3	348	-44.8	51.5	0.02	0.16	0.9	0.06	0.12	0.7	0.16	<0.01
	20-Oct-20	7.77	737	501	72.8	99.2	0.03	<0.01	1	0.02	0.19	1	<0.01	<0.01
SW02 (new)	25-Jan-18	7.72	519	331	8.7	79.3	0.06	0.03	2.3	<0.01	0.1	1.1	1.2	0.03
	23-Apr-18	7.71	1360	923	108.1	59.8	0.67	1.1	2.7	0.09	0.43	1.6	1.1	0.04
	02-Aug-18	7.78	310	250	78.7	71.6	0.15	1.1	3.4	0.03	0.48	2.3	1.1	0.03
	04-Oct-18	7.4	605	442	85.2	89.8	0.52	3.3	4.6	<0.1	0.09	1.3	3.2	0.1
	04-Feb-19	7.63	878	572	-9.4	36.6	0.12	3.3	4.3	0.01	0.13	1	3.3	0.01
	08-Apr-19	7.88	912	631	-114.2	36.2	<0.02	2.1	7	0.03	0.46	4.9	2.1	0.03
	22-Jul-19	7.69	512.9	330	70.1	78.2	0.14	1.4	2	0.05	0.12	0.6	1.4	0.03
	07-Nov-19	7.47	679	442	-74.5	21.7	0.02	2.3	3.6	<0.01	0.67	1.3	2.2	0.08
	19-Feb-20	7.59	944	517	130	15.6	0.04	0.87	1.9	<0.01	0.15	1	0.87	<0.01
	24-Apr-20	7.08	769	424	-32.7	18.3	0.49	0.3	5.6	<0.01	1.4	5.3	0.25	0.05
	30-Jul-20	6.87	428	278	37.4	29.9	0.02	2.5	3	<0.01	0.36	0.5	2.5	0.02
	20-Oct-20	7.4	612	423	-8.4	92.9	0.26	3	3.3	<0.01	0.03	0.3	3	0.05
SW06	25-Jan-18	7.63	968	565	11.3	81.1	3.4	1.6	1.1	0.04	0.13	4.8	0.03	<0.01
	23-Apr-18	7.84	1413	968	72.2	68	0.33	1.1	2.2	0.09	0.28	1.1	1.1	0.05
	02-Aug-18	7.69	299	244	76.5	71.2	0.09	0.54	2.2	0.07	0.2	1.7	0.53	0.01
	04-Oct-18	6.77	609	442	66.6	119.6	0.02	0.37	1.7	0.07	0.15	1.3	0.35	0.02
	04-Feb-19	7.91	899	579	14	52	0.04	0.02	0.6	0.02	0.06	0.6	0.02	<0.01
	08-Apr-19	8.19	897	618	29.6	68	<0.02	0.03	0.5	<0.01	0.07	0.5	0.03	<0.01
	22-Jul-19	7.6	483.4	314	65.8	100.8	<0.02	0.62	1.2	0.04	0.13	0.6	0.61	0.01
	07-Nov-19	7.5	567	371	57.5	99.3	<0.02	<0.01	0.8	0.03	0.07	0.8	<0.01	<0.01
	19-Feb-20	7.73	3918	2156	119.8	47.7	0.11	0.18	1.8	0.01	0.24	1.6	0.17	0.01
	24-Apr-20	7.65	3420	1881	-32.4	55	0.16	0.08	1.9	0.03	0.44	1.8	0.06	0.02
	30-Jul-20	7.63	533.7	347	44.4	92.6	<0.02	0.16	1.1	0.05	0.11	0.9	0.16	<0.01
	20-Oct-20	7.26	786	546	-13.4	92.6	0.04	<0.01	0.9	0.02	0.21	0.9	<0.01	<0.01

## Appendix 3 Groundwater Level and Quality Data

**GROUNDWATER LEVELS AND QUALITY**

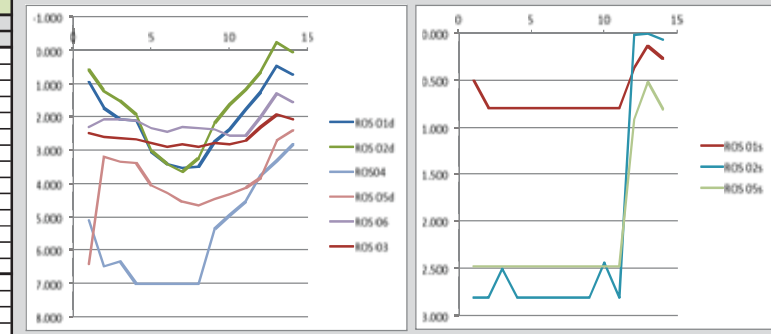
Job number:  
Job name:

TPGROS04  
Rosehill Country Club Water Monitorin

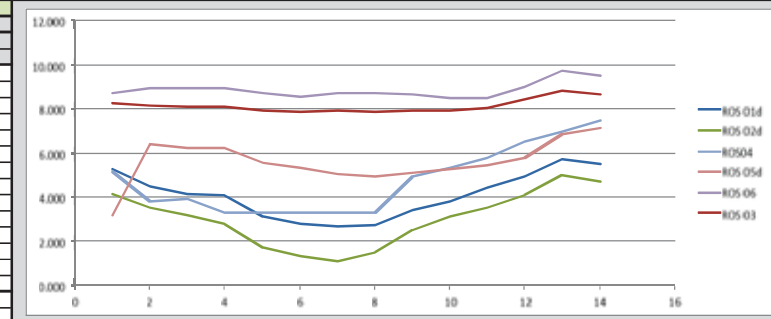
Metres below top of collar (mbtoc)									
Date	ROS 01d	ROS 01s	ROS 02d	ROS 02s	ROS 03	ROS04	ROS 05d	ROS 05s	ROS 06
2/10/2012 (installation)	1,420	1,050	1,100	DRY	2,960	5,700	6,900	DRY	2,950
30-Oct-12	2,226	DRY	1,702	*DRY	3,080	7,086	3,670	DRY	2,701
21-Nov-12	2,565	DRY	2,035	3,094	3,136	6,936	3,835	DRY	2,695
19-Dec-12	2,590	DRY	2,430	*DRY	3,140	**DRY	3,850	DRY	2,740
22-Jan-13	3,543	DRY	3,526	DRY	3,280	*DRY	4,535	*DRY	2,956
14-Feb-13	3,900	DRY	3,932	DRY	3,364	*DRY	4,750	*DRY	3,085
25-Mar-13	4,023	DRY	4,156	DRY	3,295	*DRY	5,020	*DRY	2,950
22-Apr-13	3,965	DRY	3,72	DRY	3,375	*DRY	5,12	*DRY	2,97
28-May-13	3,250	DRY*	2,700	DRY	3,280	5,940	4,960	*DRY	3,020
26-Jun-13	2,87	DRY	2,13	3,04	3,29	5,55	4,79	*DRY	3,18
23-Jul-13	2,25	DRY*	1,700	DRY*	3,19	5,11	4,62	DRY	3,18
01-Aug-13	1,74	0,92	1,15	0,61	2,77	4,35	4,31	1,36	2,65
27-Sep-13	0,97	0,68	0,25	0,6	2,399	3,9	3,2	0,96	1,93
01-Oct-13	1,2	0,81	0,555	0,671	2,565	3,392	2,913	1,255	2,179

~1,5m residual water in bore. Bailed out and then bore was dry. Left for 10mins and still no water  
 ~30cm of water - insufficient amount to get a recordable sample  
 ~5cm water at base, \*\*~12cm of water at base  
 \*Moist at base  
 \*Moist at base  
 \*Moist at base  
 \*Moist at base

Metres below ground level (mbgl)									
Date	ROS 01d	ROS 01s	ROS 02d	ROS 02s	ROS 03	ROS04	ROS 05d	ROS 05s	ROS 06
Stick Up (m)	0.5	0.55	0.52	0.6	0.5	0.6	0.5	0.45	0.65
2/10/2012 (installation)	0,920	0,500	0,580	2 800	2,460	5,100	6 400	2,470	2,300
30-Oct-12	1,726	0 800	1,182	2 800	2,580	6,486	3,170	2,470	2,051
21-Nov-12	2,065	0 800	1,515	2,494	2,636	6,336	3,335	2,470	2,045
19-Dec-12	2,090	0 800	1,910	2 800	2,640	7 000	3,350	2,470	2,090
22-Jan-13	3,043	0 800	3,006	2 800	2,780	7 000	4,035	2,470	2,306
14-Feb-13	3,400	0 800	3,412	2 800	2,864	7 000	4,250	2,470	2,435
25-Mar-13	3,523	0 800	3,636	2 800	2,795	7 000	4,520	2,470	2,300
22-Apr-13	3,465	0 800	3,200	2 800	2,875	7 000	4,620	2,470	2,320
28-May-13	2,750	0 800	2,180	2 800	2,780	5,340	4,460	2,470	2,370
26-Jun-13	2,370	0 800	1,610	2,440	2,790	4,950	4,290	2,470	2,530
23-Jul-13	1,750	0 800	1,180	2 800	2,680	4,510	4,120	2,470	2,530
23-Aug-13	1,240	0,370	0,630	0,010	2,270	3,750	3,810	0,910	2,000
27-Sep-13	0,470	0,130	-0,270	0,000	1,899	3,300	2,700	0,510	1,280
01-Oct-13	0,700	0,260	0,035	0,071	2,065	2,792	2,413	0,805	1,529
MIN DEPTH TO GW	0,470	0,130	-0,270	0,000	1,899	2,792	2,413	0,510	1,280
DEPTH OF BORE	5.88	0.80	5.68	2.80	5.20	7.00	7.66	2.47	4.35
DEPTH OF CLAY		0.25		0.00				1.00	0.00
DEPTH OF PERCHED WATER		0.12		0.00				0.49	3.00



Groundwater Level (mAHD)									
Date	ROS 01d	ROS 01s	ROS 02d	ROS 02s	ROS 03	ROS04	ROS 05d	ROS 05s	ROS 06
Stick Up (m)	0.5	0.55	0.52	0.6	0.5	0.6	0.5	0.45	0.65
Ground level (mAHD)	6.21	6.21	4.74	4.74	10.75	10.30	9.59	9.59	11.03
2/10/2012 (installation)	5.290	5.710	4.160	1.940	8.290	5.200	3.190	7.120	8.730
30-Oct-12	4.484	5.410	3.558	1.940	8.170	3.814	6.420	7.120	8.979
21-Nov-12	4.145	5.410	3.225	2.246	8.114	3.964	6.255	7.120	8.985
19-Dec-12	4.120	5.410	2.830	1.940	8.110	3.300	6.240	7.120	8.940
22-Jan-13	3.167	5.410	1.734	1.940	7.970	3.300	5.555	7.120	8.724
14-Feb-13	2.810	5.410	1.328	1.940	7.886	3.300	5.340	7.120	8.595
25-Mar-13	2.687	5.410	1.104	1.940	7.955	3.300	5.070	7.120	8.730
22-Apr-13	2.745	5.410	1.540	1.940	7.875	3.300	4.970	7.120	8.710
28-May-13	3.460	5.410	2.560	1.940	7.970	4.960	5.130	7.120	8.660
26-Jun-13	3.840	5.410	3.130	2.300	7.960	5.350	5.300	7.120	8.500
23-Jul-13	4.460	5.410	3.560	1.940	8.060	5.790	5.470	7.120	8.500
23-Aug-13	4.970	5.840	4.110	4.730	8.480	6.550	5.780	8.680	9.030
27-Sep-13	5.740	6.080	5.010	4.740	8.851	7.000	6.890	9.080	9.750
01-Oct-13	5.510	5.950	4.705	4.669	8.685	7.508	7.177	8.785	9.501
Maximum GW Level	5.740	6.080	5.010	4.740	8.851	7.508	7.177	9.080	9.750
AAMGL	5,515		4.160		8,488	6,354	6,799		9,368





Date	Bore	In Situ Parameters							Nutrients						
		Appearance	Colour	Temperature	pH	Electrical Conductivity	TDS	Redox	Dissolved Oxygen	Ammonia-N	NO <sub>3</sub> -N	Total Nitrogen	Filtered Reactive Phosphorus	Total Phosphorus	TKN
RCN004	Oct-17	Turbid	Brown	17.8	7.42	1302	1735.5	-53.4	2.47	0.5	0	1.3	0.03	8.9	1.3
	Nov-17	Turbid	Brown	18.5	6.62	2065	1538	-75.6	2.34	-	-	-	-	-	-
	Dec-17	Turbid	Brown	18.5	7.45	1400	1439	-62.2	1.5	-	-	-	-	-	-
	Jan-18	Turbid	Brown/Grey	21	6.7	1883	-	266	4.74	0.2	0	0.6	0	4.2	0.6
	Feb-18	Turbid	Light Brown/Grey	19.6	7.56	1848	1332.5	-63.6	2.29	-	-	-	-	-	-
	Mar-18	Turbid	Brown	19.4	7.56	1886	1372.5	-75.2	3.68	-	-	-	-	-	-
	Apr-18	Turbid	Brown	19.6	6.94	1792	1300	-95.9	6.77	0	0	0.5	0.02	7.9	0.5
	May-18	Turbid	Grey	19.6	7.51	1931	1384.5	-10.5	2.46	-	-	-	-	-	-
	Jun-18	Turbid	Dark Grey	18.9	7.16	1778	1116.5	-104.1	2.88	-	-	-	-	-	-
	Jul-18	Turbid	brownish	18.6	7.26	1737	1105.5	-100.7	1.57	0	0.05	0.5	0	2.3	0.5
	Aug-18	Turbid	brownish	17.6	6.97	1630	1255	-92.5	1.87	-	-	-	-	-	-
	Sep-18	Turbid	orange/brown	16.9	7.33	1675	1248	-79.1	2.14	-	-	-	-	-	-
RCN001	Oct-18	Slightly turbid	Light Grey	18	7.3	1721	1094	-95.4	1.98	0	0	0.05	0.03	1.9	0.2
	Nov-17	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dec-17	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jan-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Feb-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mar-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Apr-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	May-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jun-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jul-18	Insufficient amount to sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aug-18	Turbid	Black/grayish	-	-	-	-	-	-	-	-	-	-	-	-
	Sep-18	Very Turbid	Grey	16.6	6.2	258	199.55	-15.6	1.25	-	-	-	-	-	-
Oct-18	Turbid	Dark Grey	18.9	6.37	367.5	275.5	-49.8	2.98	<0.2	<0.01	8.8	0.35	1.4	8.8	
RCN004	Oct-17	Turbid	Orange/Brown	18.8	6.52	645	474.5	102.1	2.96	0.5	2.2	2.7	0.03	2.9	0.5
	Nov-17	Turbid	Pale Orange/Brown	19.1	6.87	818	604.5	51.8	2.51	-	-	-	-	-	-
	Dec-17	Turbid	Pale Orange/Brown	19	6.79	867	637	116.2	5.47	-	-	-	-	-	-
	Jan-18	Turbid	Pale Orange/Brown	20	6.58	963	-	134	3.59	0.9	1.6	2.9	0	2.2	1.8
	Feb-18	Turbid	Orange/Brown	20	7.48	1038	747.5	92.4	1.6	-	-	-	-	-	-
	Mar-18	Turbid	Orange/Brown	20.2	6.9	991	708.5	129.5	4.4	-	-	-	-	-	-
	Apr-18	Turbid	Orange/Brown	20.3	6.57	874	624	92.5	3.81	0	1.8	2	0.01	6.4	3.2
	May-18	Turbid	Orange/Brown	20.3	6.62	891	637	72.2	4.61	-	-	-	-	-	-
	Jun-18	Turbid	Brown	19	6.43	875	511.5	82	2.9	-	-	-	-	-	-
	Jul-18	Turbid	yellow/brown	19.2	6.35	905	506	108.1	2.47	0	1.9	2.6	0.02	1.8	0.2
	Aug-18	Turbid	brown	17.3	6.17	891	632.6	99.9	2.49	-	-	-	-	-	-
	Sep-18	Clear	Clear	17.1	6.22	821	630.5	159.4	2.37	-	-	-	-	-	-
RCN001	Oct-18	Slightly turbid	Clear	17.6	6.06	979	627	155.2	1.58	0	2.1	0	0.03	0.94	0
	Oct-17	Mod Turbid	Brown	17.6	7.07	4472	3447.5	100.1	5.28	-	-	-	-	-	-
	Nov-17	Insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dec-17	Insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jan-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Feb-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mar-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Apr-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	May-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jun-18	Insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jul-18	Insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aug-18	Slightly turbid	brownish	15	6.73	2395	1824	6.3	2.91	-	-	-	-	-	-
RCN001	Sep-18	Slightly Turbid	light brown	15.8	7.16	1540	1235.5	-5.8	2.35	-	-	-	-	-	-
	Oct-18	Slightly turbid	light brown	16.9	6.96	1521	1639	-80.5	2.05	0.2	0.25	8.8	0.03	2.3	1.8
	Oct-17	Turbid	W Grey/Brown	18.9	7.34	984	771.5	14.3	3.89	0.4	<0.01	6.2	<0.01	5.1	6.2
	Nov-17	Turbid	Brown/Grey	19.9	7.69	1122	806	-19.1	2.54	-	-	-	-	-	-
	Dec-17	Turbid	Brown	20.7	7.59	1235	877.5	-38.1	2.5	-	-	-	-	-	-
	Jan-18	Turbid	Grey/Brown	22.9	6.95	1143	-	18	8.49	1.2	<0.2	4.3	<0.01	6.8	6.3
	Feb-18	Turbid	Light Grey/Brown	22.9	7.13	1863	1294.5	-26.9	8.11	-	-	-	-	-	-
	Mar-18	Turbid	Light Grey/Brown	23.6	6.87	1663	1813.5	10.6	2.8	-	-	-	-	-	-
	Apr-18	Turbid	Pale Brown	22.1	6.85	1213	1436	1.6	3.27	0.3	0.02	2.8	<0.01	1.9	2.8
	May-18	Moderately Turbid	Brown	21.1	6.75	1726	1215.5	-5	8.37	-	-	-	-	-	-
	Jun-18	Turbid	Brown	19.6	6.91	1360	841.5	-21.1	2.21	-	-	-	-	-	-
	Jul-18	Turbid	brown	18.3	6.78	1290	764.5	6.1	2.95	<0.2	0.05	2.5	0.85	0.85	2.4
RCN004	Aug-18	Turbid	Light Grey	17.5	6.72	1400	1039.6	12	2.76	-	-	-	-	-	-
	Sep-18	Turbid	Light Brown	17.5	6.73	1313	994.5	92	3.00	-	-	-	-	-	-
	Oct-18	Turbid	Brown	18.6	6.72	1196	893	50.2	2.51	<0.2	0.08	2.3	<0.01	3.3	2.3
	Oct-17	Turbid	Pale Brown	20.1	7.91	3925	2980.5	134	2.47	<20	<1	82	<1	110	41
	Nov-17	Turbid	Pale Brown	20.5	7.27	2640	1893.5	81.5	2.18	-	-	-	-	-	-
	Dec-17	Insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jan-18	Insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Feb-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mar-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Apr-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	May-18	Turbid	Pale Brown	21.2	7.12	7389	5780.5	171.2	5.22	-	-	-	-	-	-
	Jun-18	Turbid	Pale Brown	20.9	6.97	8166	4917	67.4	5.14	-	-	-	-	-	-
Jul-18	Turbid	Pale G	19.8	7.4	3600	3377.4	49.9	6.1	<0.2	<0.1	2.6	0.01	8.3	2.6	
RCN001	Aug-18	Turbid	Light Brown	19.9	6.98	4930	3418.6	17.6	3.02	-	-	-	-	-	-
	Sep-18	Turbid	Brown/Orange	18.6	7.17	1532	994.5	105.1	1.6	-	-	-	-	-	-
	Oct-18	Clearish	Whitish	19	7.34	1196	872.5	119.7	3.13	<0.2	0.02	1.9	0.02	2.2	1.9
	Oct-17	Turbid	Grey/Brown	19.1	7.54	11112	8164	-62.4	2.62	1.3	0.06	4.5	0.02	5.8	4.4
	Nov-17	Turbid	W Grey/Brown	19.6	7.4	19744	4390	-41.5	3.88	-	-	-	-	-	-
	Dec-17	Moderately Turbid	Light Brown	19.3	7.06	21306	15993.5	-54.4	2.39	-	-	-	-	-	-
	Jan-18	Turbid	Grey	20.2	7.12	25400	-	40	5.36	0.9	0.12	1.2	<0.01	2.4	1.1
	Feb-18	Turbid	Light Grey	20.1	6.74	26349	18824	-45.8	3.47	-	-	-	-	-	-
	Mar-18	Turbid	Grey/Brown	20.2	6.97	16154	11517	-89.2	6.51	-	-	-	-	-	-
	Apr-18	Turbid	Grey	20.2	6.55	24139	20130	-89.7	5.56	1.3	0.5	8.3	0.01	1.7	2.8
	May-18	Moderately Turbid	Grey/Brown	20.1	6.76	28929	20388.6	-86.2	8.27	-	-	-	-	-	-
	Jun-18	Turbid	Grey	19.9	6.62	27399	6769	-47.1	3.02	-	-	-	-	-	-
Jul-18	Turbid	Grey	19.1	7.08	25623	15735.5	-62.2	3.99	<0.2	0.04	1.5	<0.2	0.34	1.5	
RCN004	Aug-18	Slightly Turbid	Clearish	19.1	6.78	24028	14419.5	94	6	-	-	-	-	-	-
	Sep-18	Clear	Clearish	18.6	6.82	15803	14546	124.2	3.36	-	-	-	-	-	-
	Oct-18	Clear	Clearish	18.9	6.89	20191	12567.5	110.9	3.08	0.16	0.15	8.2	0.01	4.6	3.2
	Oct-17	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nov-17	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dec-17	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jan-18	Insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-
	Feb-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mar-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Apr-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	May-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jun-18	DRN	-	-	-	-	-	-	-	-	-	-	-	-	-
Jul-18	Moist at base - insufficient water for sample	-	-	-	-	-	-	-	-	-	-	-	-	-	
RCN001	Aug-18	Turbid	Brown	16.6	6.05	474	367.25	-42.9	5.32	-	-	-	-	-	-
	Sep-18	Slightly Turbid	Light Brown	17.3	5.44	368	311.35	173.4	6.34	-	-	-	-	-	-
	Oct-18	Turbid	Light Brown	18.7	5.24	481.5	404.15	169.7	2.91	<0.2	0.06	4.2	0.1	1.2	6.1
	Oct-17	Turbid	Pale Brown	17.3											

## Appendix 4 Landscape Plans (LD Total, 2021)



**Stage 6 & 7**  
South Guildford

- 1 Helena River Foreshore managed in moved grass condition
- 2 The Rosehill Lodge incl. Reception Brasserie/Restaurant, Cafe, Motel accommodation, Gallery
- 3 The Lodge Formal Gardens with Morton Bay Fig and platform around the tree, shelters, long banquet tables by The Lodge, lounge chairs and seating areas
- 4 The Lodge Orchard
- 5 Tree Avenue - Erythrina Trees Driveway
- 6 Significant Trees Relocated to formalise tree avenue
- 7 Landscape Entry Statement
- 8 Relocated Rosehill Gate (renovated)
- 9 Event Concert Area with landscape amphitheatre

- 
- 10 Existing Pond Revitalised Area with shrub mounds, informal and formal paths and arbor
- 11 Riparian Vegetation managed in low fuel condition and mulch only area
- 12 Living Stream planted and turfed edge for maintenance access
- 13 Meandering Path Network through the proposed and existing trees
- 14 Secondary Path through trees and planted areas
- 15 Firebreak 3m limestone track
- 16 Firebreak 6m on WC land
- 17 Proposed Bridge
- 18 Open Turfed Area
- 19 Seating Node with bench seat
- 20 Seating node with picnic setting amongst existing trees
- 21 Proposed Planted Drainage - Basin 1
- 22 Proposed Planted Drainage - Basin 2
- 23 Foreshore Reserve - path networks by others Bike - friendly network and off lead dog area
- 24 Viewing Platform with Seating
- 25 Retaining Walls within POS area
- 26 Low Fuel Vegetation adjacent to the lots
- 27 POS feature deciduous trees away from LS
- 28 PAW with seating node amongst existing and proposed trees
- 29 Opportunity for Pedestrian Stream Crossing
- 30 Rosehill Lodge Visitor Parking & Overflow and Event Parking
- 31 Distinctive Fence







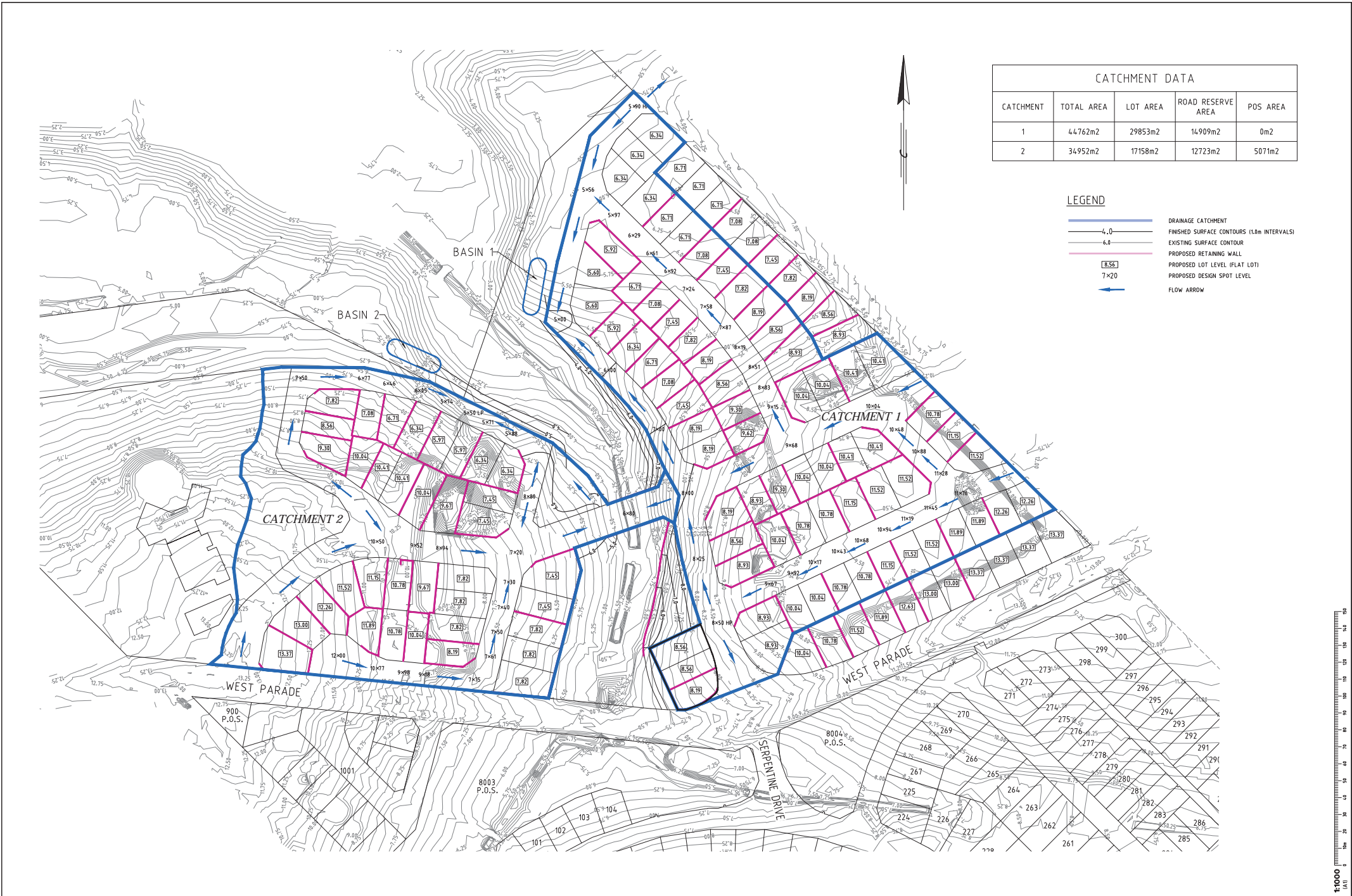


## Appendix 5 Earthworks Plans (DEC, 2021)









CATCHMENT DATA				
CATCHMENT	TOTAL AREA	LOT AREA	ROAD RESERVE AREA	POS AREA
1	44762m2	29853m2	14909m2	0m2
2	34952m2	17158m2	12723m2	5071m2

LEGEND

4.0

6.0

8.56

7x20

DRAINAGE CATCHMENT

FINISHED SURFACE CONTOURS (1.0m INTERVALS)

EXISTING SURFACE CONTOUR

PROPOSED RETAINING WALL

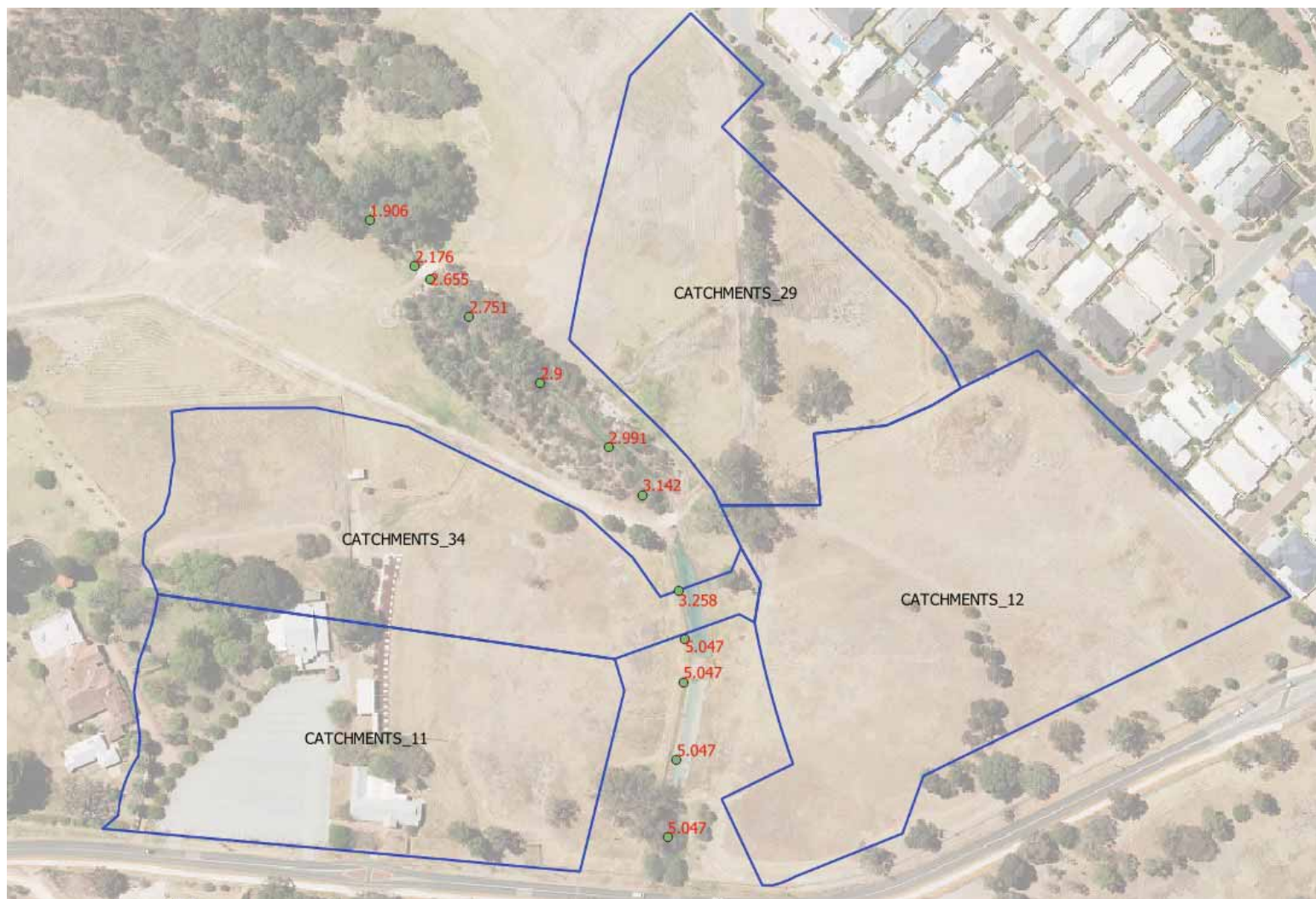
PROPOSED LOT LEVEL (FLAT LOT)

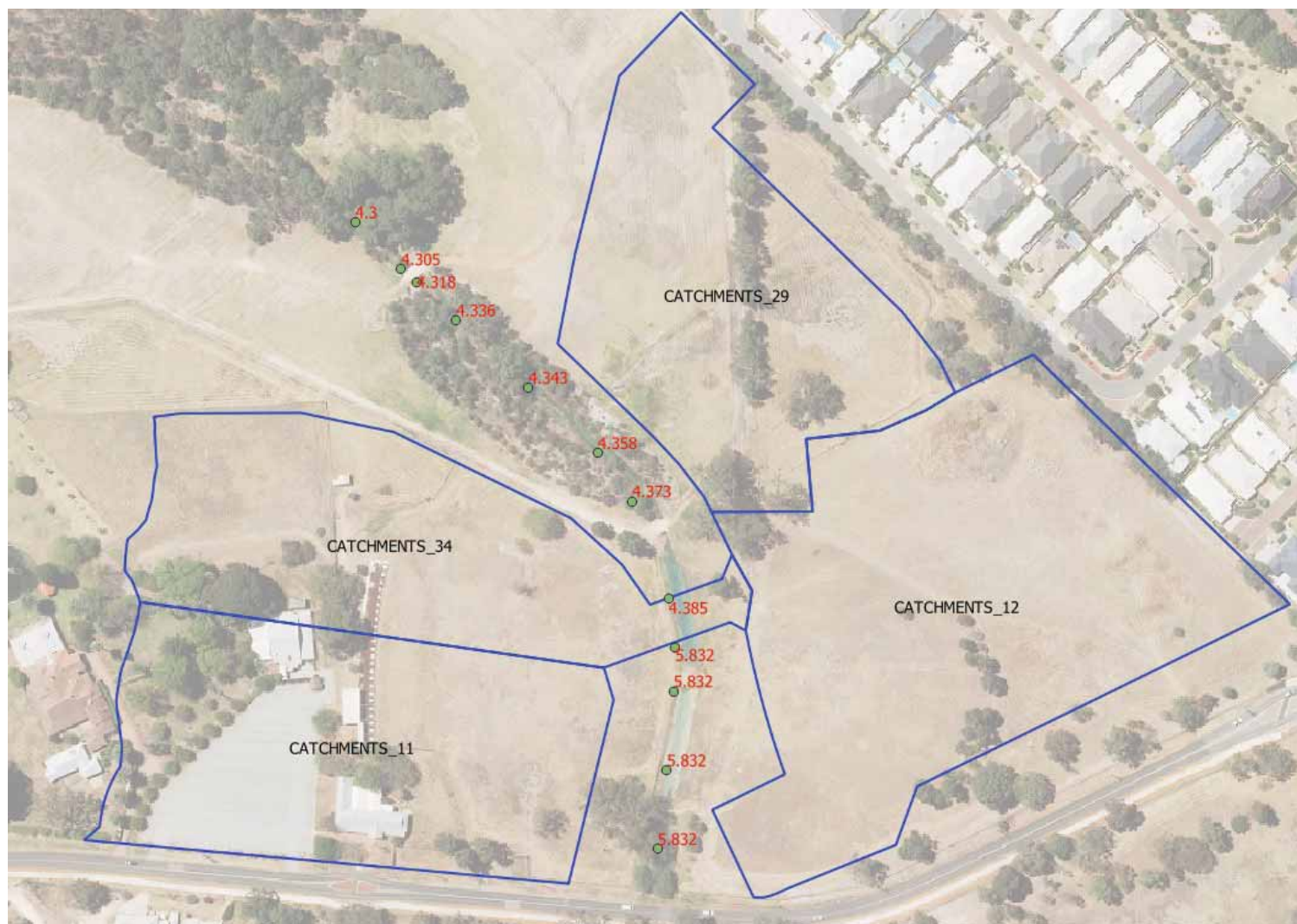
PROPOSED DESIGN SPOT LEVEL

FLOW ARROW



## Appendix 6 1% AEP Flood Levels in mAHD

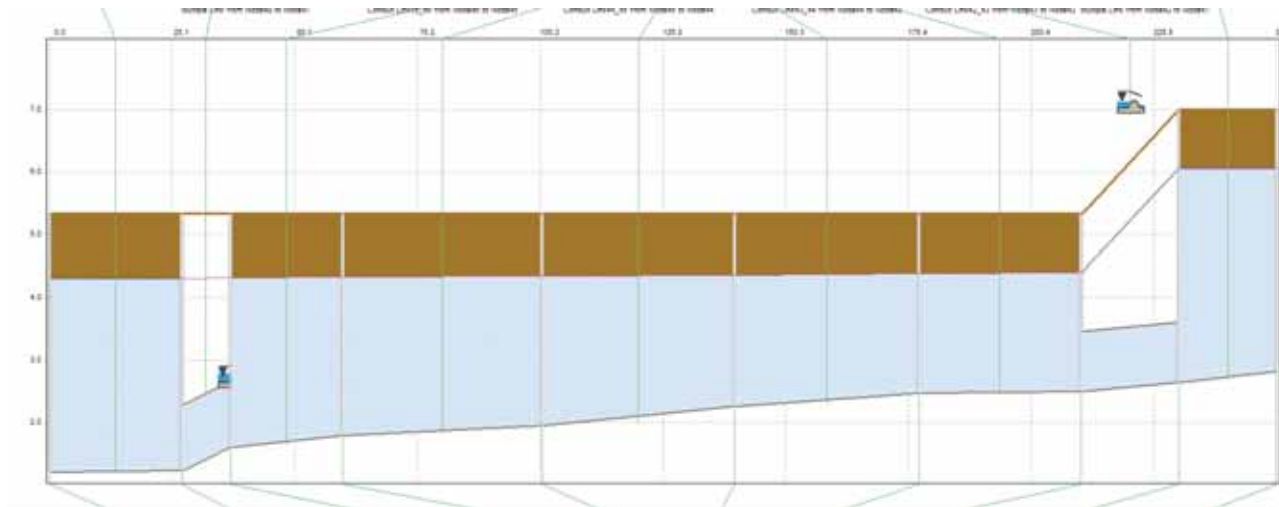




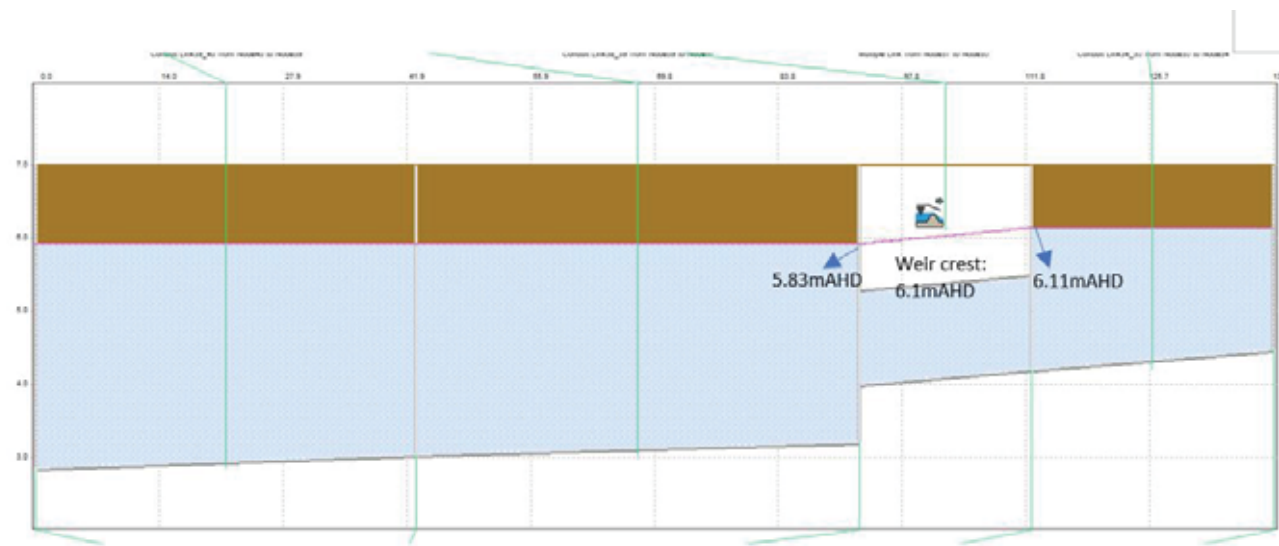


## Appendix 7 Road Cross Sections during 1 % AEP Flood with Tailwater

Cross section at the new road in 1% AEP with tailwater:



Cross section at the West Parade in 1% AEP with tailwater:



## Appendix 8 Engineering Servicing Report (DEC, 2021)





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**NOAHS ROSEHILL WATERS PTY LTD**  
**STAGES 6 AND 7 – AREA NORTH OF WEST PARADE AND REVISIONS TO**  
**STAGES 4 AND 5**  
**ENGINEERING SERVICES REPORT**

**1. General:**

The existing Rosehill Waters development is located on either side of West Parade in South Guildford some 1.2km east from Great Eastern Highway. The structure plan has been approved and development for the first three stages has been largely completed and it is proposed to alter the structure plan for Stages 4, 5 and 6 and 7 which is the areas in the South West of the site (Stage 4), the area on the eastern side of the site abutting Kulungar Park (Stage 5) and the area north of West Parade and in the north western corner of the site (Stages 6 and 7).

Stages 4 and 5 have had preliminary earthworks undertaken and are largely surrounded by completed development works and are really simply infill areas. Stage 6 and 7 include the abutting former golf club house to the west of the development and north of West Parade, which is proposed to be retained as a hospitality venue. The site area for Stage 4 is around 3.3ha (Including the POS area for the existing stream), Stage 5 is around 2.9ha and Stages 6 and 7 are around 12ha north of West Parade and 7,400sqm in the north west of the existing site.

The remaining development area and the subject of this report is ultimately proposed to be developed into around 241 residential lots; being 38 Lots in Stage 4, 67 Lots in Stage 5 and 136 Lots in Stages 6 and 7. In addition to this there is plus POS/Drainage abutting Stage 4 and in Stages 6 and 7 which incorporates the outlet creek line from the area and the club house site of some 2.6ha.

This report covers existing and proposed services, plus proposals for earthworks, retaining walls, roads, drainage, groundwater, water supply, sewerage, power supply, gas, telecommunication as required for current urban development standards.

**2. Executive Summary**

The land the subject of this report is located some 1.2km east of Great Eastern Highway abutting West Parade in the City of Swan. It can be easily developed immediately by extending all required services from abutting roads.

The land was formerly the Rosehill Golf Course and the first stages of the development abutting the southern side of West Parade has been developed in the past few years. The current development works has involved some sourcing of material and stockpiling in the subject site areas which will need to be incorporated within the earthworks for the development works.

The abutting West Parade is constructed to a rural road standard, sealed in good condition. This would need to be kerbed and drained as part of the required subdivision works. All the other abutting roads are recently constructed subdivisional roads in good condition and constructed to a kerbed urban standard and will not require upgrading.

The original basic land form is sand overlying Guildford Formation. The Environmental Geology map of the Geological Survey of Western Australia classifies this site as generally “S10” which is essentially a thin layer of Bassendean Sand overlying the Guildford Formation. This transitions to a “C<sub>m2</sub>” in the area abutting the Helena River some distance north of West Parade which is a heavy clay of alluvial origin.

The geotechnical investigations generally supported this although in the subject site areas, all good sand has been removed for filling previous stages and the remaining sand, although geotechnically sound for housing construction, has low permeability characteristics and it is proposed a minimum thickness of 800mm of free draining sand would be installed above this sand. Alternatively a minimum thickness of 1.2m of sand over clay would be provided.

The land can be connected to all services, either by extension and upgrading from existing infrastructure, or by provision of new infrastructure as set out below. Power, telephone, gas, sewer and water services already pass along the site frontage.

It is proposed that all road stormwater from the development up to and including the 1 Hour 1EY (15mm rainfall) event will be retained on site. Houses will discharge roof stormwater into on site soakwells which will have an overflow connected to the street drainage system.

### 3. Site

The subject site(s) is total around 19 hectares in size and consists of Stages 4, 5 and 6 and 7 which are the areas in the South West of the site (Stage 4), the area on the eastern side of the site abutting Kulungar Park (Stage 5) and the area north of West Parade and in the north western corner of the site (Stages 6 and 7). The land was formerly the Rosehill Golf Course and the first stages of the development abutting the southern side of West Parade has been developed in the past few years.

In general the area of Stage 4 falls from the western boundary of the site to an existing creek line that drains through the abutting site, then back into the development area, across West Parade and through Stages 6 and 7 to the Helena River. Stage 5 falls west to the existing development and Kulungar Park where there is drainage which in turn feeds into the creek line at West Parade. There is little vegetation in the Stage 4 and 5 and in Stages 6 and 7 there is some good trees and vegetation in the creek line between West Parade and the Helena River.

The majority of the site is underlain by clay and a minimum of 1.2m of sand will need to be installed over the clay to ensure an appropriate building site classification under AS2870.

The site is adjacent Water Corporation sewer and scheme water, as well as telephone, gas and power. Access is from the existing abutting sealed roads.

#### 4. Development Proposal

The remaining development area and the subject of this report is ultimately proposed to be developed into around 241 residential lots; being 38 Lots in Stage 4, 67 Lots in Stage 5 and 136 Lots in Stages 6 and 7. In addition to this there is plus POS/Drainage abutting Stage 4 and in Stages 6 and 7 which incorporates the outlet creek line from the area and the club house site of some 2.6ha.

#### 5. Earthworks & Retaining Walls

Earthworks will be carried out over the site to balance the existing clay soil and prepare a substrate layer some 1.2m below finished surface levels. This will involve cutting and filling of the clay soil to replicate the finished surface levels albeit 1.2m below. Where existing site sand (which does not have good drainage characteristics) can be used, this will be filled for a maximum of 400mm within the sand layer to provide the required separation between the clay and underside of footings. A minimum of 800mm of clean free draining imported sand is proposed over all lots.

Preliminary earthworks plans have been included in Attachment B which indicates the proposed development levels across the site.

Stage 4 Earthworks are proposed to be generally flat at around RL11.00mAD, being some 2.0m above the banks of the abutting stream. This provides a good outlook to the POS areas and sufficient depth of sand cover to ensure the required lower movement “S” Classification under AS2870. The access road off Nullagine Ave, will be constructed with a low point of around RL9.50mAHD to ensure the overland flow path for the upstream drainage system feeding to the stream will be honoured to minimize flooding in Gentle Circle during a major storm event.

Stage 5 earthworks fall from RL13.40mAHD at the intersection of Abba Lane and Serpentine Drive to around RL11.28 abutting Kulungar Park. The lots abutting the existing roads, Kulungar Elbow, Abba lane and Karreen Way have been set to be slightly above the existing roads, but still provide good access grades given the size of the lots. Lots abutting Kulungar Park have been set around 1.2m above to provide a good outlook and generally minimize the grades across the site.

Stages 6 and 7 earthworks have been set again to ensure some parity with the existing roads being West Parade and Lautour Street. The peak flood level for the abutting area of the Helena River is around RL4.40mAHD, meaning a minimum level of RL4.90m AHD can be for lots in the area. All lots are generally much higher than this given the high level of West Parade relative to the land.

The site area abutting the club house area has some challenges in terms of grades. West Parade falls very steeply in that area from around RL13.25mAHD at the intersection of the proposed new roadway to RL6.00m AHD at the low point of the creek crossing (A fall of around 5%). To ensure parity, lots have been set generally higher than West Parade, but stepping down the slope to ensure that lots near the stream are relatively not too high. Generally the area abutting West Parade has retaining walls around 1-1.5m with around a 2.0m retaining wall where lots abut the creek line.



The precinct further north requires significantly larger retaining walls to ensure the integrity of the interface with the surrounding areas is maintained. The clubhouse area is proposed to be maintained, hence the road levels abutting this area will need to be close to match into existing. This site falls from RL10.50m AHD to around RL5.00m AHD abutting the creek line. The creek line contains many well established trees. It is proposed to cut the higher road down a small amount to minimize the fall and fill the road abutting the creek and POS but this still results in retaining walls between the lots of around 4.5m in a worst case situation. Although this is higher than all other areas of the site, the steep grades provide very little alternative with the constraints of the existing roads, the clubhouse area and the heavily treed creek line.

All other lots will have medium sized retaining walls. All retaining walls will be subject to Council building approval.

## 6. Roads

All new subdivisional roads will be constructed to City of Swan standards and approval, including kerbing and piped drainage plus provision of footpaths as required. West Parade will require upgrading to an urban standard and a roundabout is proposed at the intersection of Serpentine Drive to facilitate access into the Stage 6 and 7 area.

Other abutting roads have been recently constructed to subdivisional standards and as such no further upgrading will be required other than intersection tie in works.

## 7. Drainage

Stages 4 and 5 have been encompassed into the UWMP for the existing development. Stage 4, 6 and 7 require the construction of some small drainage basins to capture the 1EY 1 hour storm. These basins will then overflow into the creek line. The developed land will respond to rainfall events more quickly than the predevelopment area which will facilitate a smaller earlier peak flow in the stream prior to the larger peak from the upstream catchment. As outlined within the Addendum to the LWMS, the spreading of the peaks means that the predevelopment and post development flows are the same.

Stage 4 drainage is proposed to be directed into the Kulungar Park drainage system which has been analysed in previous UWMP calculations to have excess capacity sufficient to cater for Stage 5 area.

Lot drainage will be in soakwells with overflow to lot connection points provided for each lot. Subsoil drainage will be installed in conjunction with piped street drainage to control the rise of perched groundwater below the sand layer.

Stormwater design will be done to the standards of the City of Swan and will be detailed in the Local Water Management Strategy (LWMS) submitted with the structure plan documentation, and the Urban Water Management Plan (UWMP) which will be done in conjunction with the detailed subdivision design.

## 8. Groundwater

Based on regional mapping in the 1995 Groundwater Atlas, the ambient groundwater level at the site is expected to grade from around RL9.0m AHD on the southern side of the Rosehill development to around RL5.0m AHD at the Helena River. This is

significantly contrasted by the 2004 Atlas which indicates groundwater grading from RL5.0mAHD on the southern side of the development to RL1.0mAHD at the Helena River.

As part of the UWMP investigations groundwater graded from between RL7.17mAHD at peak and 5.07mAHD at low on the southern boundary of the site to RL5.74 at peak and RL2.74 at low abutting the Helena River. The relatively high levels in combination with the significant difference between the peak and lows indicate that there is either perching or subsurface pressure from a confirmed aquifer which is affecting the groundwater levels. Given the clay encountered in geotechnical investigations and the poor drainage characteristics of the natural soil, it is unsurprising that groundwater does perch over the winter months.

As a result, it is indeed necessary to ensure a good subsoils drainage system is employed to control perching of water over the winter months.

## 9. Power

Sufficient power supply exists in the area to supply the development. Low and high voltage underground power is available along existing abutting roads.

Stages 4 and 5 are more or less infill developments and will be serviced by extension of the existing power infrastructure installed as part of abutting stages. It is unlikely additional transformers or HV extensions will be required.

On the other hand, Stages 6 and 7 will require extension of the high voltage power will be required together with the installation of a new transformer and switchgear to service the required development.

All subdivisional power reticulation lines and transformer installations will be constructed at the cost of the developer. Transformer sites will be determined at the detailed subdivision design stage.

## 10. Water Supply

Sufficient water supply exists in the area to service this development.

At present there is a 250mm reticulation water main along West Parade that will be used to service Stages 6 and 7. This will interlink with the existing 150mm main along Lautour Street.

Stages 4 has an existing 150mm main ready for connection and Stage 5 is surrounded by existing 100mm mains which will be interconnected through the proposed development.

## 11. Sewer

Similar to water reticulation, provision for sewer for Stages 4 and 4 has been made in the surrounding network.

For Stages 6 and 7, there is an existing deep DN225mm sewer (Some 4-6.0m depth) which links from the existing western development at the intersection of Lautour Street and The Embankment through to the western side of the Rosehill Waters frontage to West Parade. This has been laid to suit an outdated version of the planning, hence some

alterations to individual lot connections will need to be made, but the sewer has sufficient capacity and depth to enable the development of the area.

Internal sewers will allow for future extensions to abutting properties as required.

## 12. Telephone & NBN

The existing development is serviced by NBN and Stages 4 and 5 have infrastructure awaiting extension to service the new developments. Stages 6 and 7 will be extended from the existing infrastructure along West Parade and from the existing development south of West Parade.

In accordance with recent requirements, the developer is required to install NBN “pipe and pit” to allow for future installation of cables for the NBN. The design of the “pipe & pit” is the responsibility of the developer, and will be designed in conjunction with the underground power network, and installed during the construction phase of the development.

## 13. Gas

Gas mains are installed in the neighbouring developments to the east, but to date no gas has been installed within the Rosehill Waters development. As a result Stages 4 and 5 will not be provided with gas. The provision of gas to Stages 6 and 7, particularly with the proposed hospitality venue for the clubhouse is currently being considered given that there is a 160 medium pressure (MP) main on the eastern frontage of Rosehill Waters to West Parade and existing gas mains in the abutting development encompassing Brooking Street, Lautour Street and The Embankment.

In the event that it is decided to pursue this for Stages 6 and 7, it is expected that reticulated gas services will be extended into this development for residential lots by ATCO in the normal way, with trenching done by the developer.

DEVELOPMENT ENGINEERING CONSULTANTS PTY LTD

THIS REPORT IS DATED 15<sup>TH</sup> APRIL 2021.



## **APPENDIX C**

## **FORESHORE MANAGEMENT STRATEGY**



COTERRA  
ENVIRONMENT

# Foreshore Management Plan

## Rosehill Waters

Revision 2

May 2024



CALIBRE | COMMITMENT | COLLABORATION

**This report was prepared by:** Coterra Pty Ltd trading as COTERRA ENVIRONMENT  
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**Our Ref:** HABROS34  
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**Reviewer:** K. Watts  
**Report Version:** Revision 2  
**Date:** May 2024

**This report was prepared for:**  
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Figure 5 Vegetation and flora
Figure 6 Foreshore Concept Plan

## Appendices

Appendix 1                      Foreshore Weed Species (BEC, 2015)

# 1 Introduction

## 1.1 Rosehill Waters

The Rosehill Waters development is located at former Lots 1, 57, 200, 9000 West Parade, South Guildford, approximately 20 km from the Perth Central Business District. The development is bound by army barracks (Palmer Barracks Joint Logistics Unit) to the west, residential development to the east and south, and a foreshore reserve associated with the Helena River (the subject of this Foreshore Management Plan (FMP)) to the north (Figure 1).

## 1.2 Foreshore Reserve

The foreshore reserve is located between the boundary of the Rosehill Waters Estate and the Helena River (Figure 2). The area covers approximately 10.71 hectares (ha) and comprises grassed areas as well as retained and planted vegetation adjacent to the river and extending along the constructed drainage line which traverses the Rosehill Waters development area.

Both foreshore lots are under the management of the Department of Planning, Lands and Heritage (DPLH; Table 1-1).

**Table 1-1: Foreshore Reserve Lot Details**

Lot Number	Certificate of Title	Area	Owner
Lot 3	1540/368	1.74 ha	The Metropolitan Region Planning Authority (i.e. now Western Australian Planning Commission)
Lot 82	2213/992	8.97 ha	Western Australian Planning Commission

## 1.3 Background and Planning Context

The Rosehill Waters site has undergone a number of amendments to the Metropolitan Region Scheme (MRS) and City of Swan Local Planning Scheme No. 17 (LPS 17) to facilitate urban development. The most recent amendment was MRS 1396/57 for the Rationalisation of Rosehill Estate. The purpose of this amendment was to rezone approximately 6.02 ha in South Guildford from the Rural zone and Parks and Recreation reserve to the Urban zone in the MRS and 1.3 ha from the Rural zone to the Parks and Recreation reserve (Plate 1-1). The amendment formed part of a land exchange to facilitate public open space/drainage, conservation and residential development (WAPC, 2022), resulting in the realignment of the foreshore boundary (Plate 1-1).

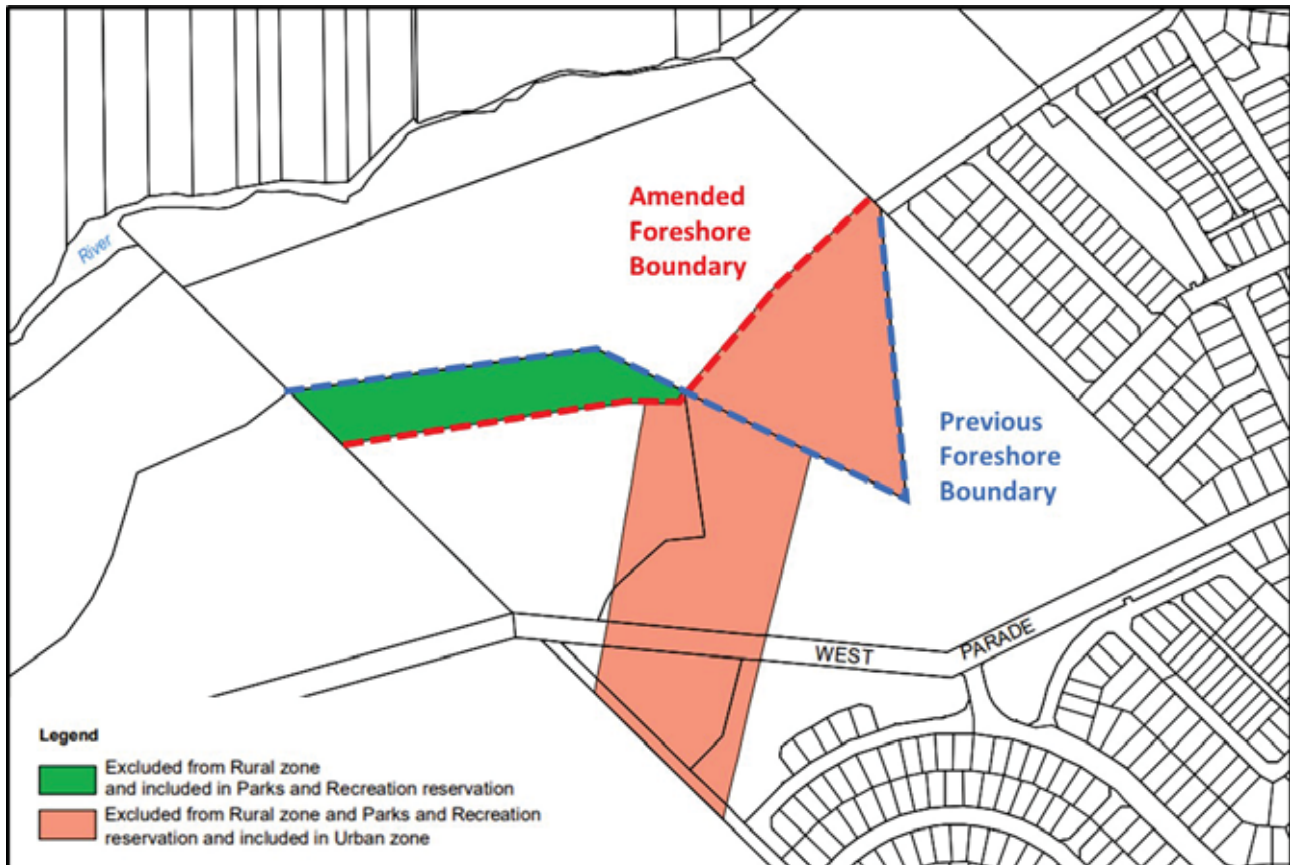


Plate 1-1: MRS Amendment 1396/57

Source: WAPC (2022)

## 1.4 Purpose

This FMP has been prepared to provide guidance on the interface between the Helena River foreshore and the development area including environmental management and access considerations.



## 2 Key Guidance and Policies

### 2.1 EPA Guidance Statement No. 33 – Environmental Guidance for Planning and Development

Environmental Protection Authority (EPA) Guidance Statement No. 33 – Environmental Guidance for Planning and Development (EPA, 2008) provides general advice on the environmental management recommendations near waterways. This guidance notes the following:

- Hard edges, for example, roads and pathways adjoining foreshore reserves, are recommended. These enable public surveillance, deter vandalism and help control the spread of weeds and grass.
- It is desirable to protect and enhance ecological linkages and to increase the buffer or foreshore reserve width in places to connect with remnant vegetation.
- Any clearing and construction activities that have the potential to drain into waterways, including works outside the buffer, should be timed and managed so as to minimise the risk of increasing stream sedimentation, turbidity and pollution.
- Waterway crossings should be located and designed so as not to cause any erosion to the riverbanks or degradation of the waterway buffer areas.
- Development near waterways may raise mosquito management issues. The EPA encourages adequate setbacks to minimise the need for chemical controls and physical alteration of foreshore areas.
- In floodplains mapped by the Department of Water and Environmental Regulation (DWER), avoiding development in the portion of the floodplain designated as the floodway is recommended.

### 2.2 DoW Operational Policy 4.3: Identifying and Establishing Waterways and Foreshore Areas

In 2012, the Department of Water (DoW) (now DWER) released Operational Policy 4.3: Identifying and Establishing Waterways Foreshore Areas. The policy aims to ensure that foreshore areas will maintain or improve the environment, social and economic values of waterways and adjoining land. When providing advice on activities within the foreshore area the DoW consider the following:

- The purpose of publicly owned foreshore reserves, which could be foreshore protection, or foreshore protection and public recreation
- Aims to protect the functions and services of the waterway
- Allows for future restoration where required.

Development activities may be supported within the foreshore area where they are beneficial to the waterway and/or appropriately located, designed and managed. For example, the formalisation of walking trails or access points for water-based recreation may allow for more direct and less damaging public access to a waterway (DoW, 2012).

The DoW generally does not support development activities within a foreshore area if they are not consistent with the purpose of the foreshore area (DoW, 2012).

Under this policy if a Foreshore Management Plan is required the following should be considered:

- Protecting the waterway and foreshore area by, for example installing fencing, waterways crossings and clearly marked access points to avoid trampling of riparian vegetation. Management of site works and erosion. Use of best environmental practices for land uses and activities.

- Designing and constructing restoration works in accordance with the river restoration manual: A Guide to the Nature, Protection, Rehabilitation and Long-term Management of Waterways in Western Australia (Water and Rivers Commission 1999–2003), where relevant.
- Fire, weed and pest management (where appropriate).

## 2.3 Draft State Planning Policy 2.9 Planning for Water Policy and Guidelines

### 2.3.1 Draft State Planning Policy 2.9 Planning for Water Policy

The intent of draft State Planning Policy 2.9 is to ensure planning and development considers water resource management, including appropriate management measures to achieve optimal water resource outcomes (WAPC, 2021a).

Draft SPP 2.9 consolidates multiple water-related policies and guidelines, with the overall objectives to:

- Protect and improve the environmental, social, cultural and economic values of the State's water resources
- Protect public health and the long-term supply of good quality and affordable drinking water
- Manage the risk of riverine flooding to people, property and infrastructure
- Ensure the secure and sustainable supply, use and re-use of water resources
- Ensure future development is resilient to the water related impacts of climate change
- Minimise future costs and protect public health by ensuring that appropriate wastewater infrastructure is provided.

Draft SPP 2.9 details specific management measures in relation to the Swan Canning River system are detailed as follows:

- Maintain and enhance the natural ecosystem and hydrological functions of the river system, and demonstrate detrimental impacts have been mitigated
- Demonstrate a benefit to the community and a functional need to be located within the river and/or foreshore reserves, where the proposal is located on public land
- Maintain and enhance public access to and along the rivers and its foreshores, including through the establishment of foreshore reserves
- Consider the importance of the river as a strategic water transport network for commercial and recreational use
- Maintain and enhance the natural landscape character and sense of place of the river system
- Maintain and enhance views to or from the Swan Canning River system from public places
- Identify and protect Noongar and other cultural heritage places and values
- Protect, maintain or increase vegetation coverage (preferably with endemic species)
- Maintain or establish ecological and public open space linkages to the Swan Canning River system for wildlife habitat and movement and natural water flows (WAPC, 2021).

### 2.3.2 Draft State Planning Policy 2.9 Planning for Water Guidelines

Draft SPP 2.9 guidelines (WAPC, 2021b) provide information relevant to the implementation of the draft SPP 2.9 policy (Section 2.3.1). The guidelines provide advice in:

- Determining appropriate land use planning practices in relation to water resources across Western Australia

- Specifying the requirements to be met at each stage of the planning process
- Ensuring that necessary water resource management measures are incorporated into land development.

Specific to the Swan Canning River system, SPP 2.9 states that proposals around the Swan Canning river system should protect and enhance the ecological health, community benefits, amenity and heritage value of the Swan Canning river system for the public benefit of Western Australia (WAPC, 2021b).

## 2.4 Swan Canning Development Control Area

The foreshore reserve lies within the Swan Canning Development Control Area (DCA). Provisions for this area are outlined within the *Swan and Canning Rivers Management Act 2006 (SCRMA)*, the *Swan and Canning Rivers Management Regulations 2007* and the associated policies, plans and guidelines manual (DBCA, 2024).

The functions of DBCA under the SCRMA include:

- To protect and enhance the ecological and community benefits and amenity of the DCA
- To control activities and development in that area.

Documents included within the policies, plans and guidelines manual (DBCA, 2024) include those discussed below.

### 2.4.1 Corporate Policy Statement 42 – Planning for land use, development and permitting affecting the Swan Canning development control area

Corporate Policy Statement No. 42 (DPaW & SRT, 2016) provides guidance on management of land uses, development and other permitted works, acts and activities in the Swan Canning DCA. The policy outlines the DBCA advice on matters including ecological health, landscape protection, recreation opportunities and public access, river foreshores, flood prone land and heritage.

### 2.4.2 Corporate Policy Statement 49 – Planning for stormwater management affecting the Swan Canning Development Control Area

Corporate Policy Statement No. 49 (DBCA & SRT, 2023) aims to ensure land use, development, and other permitted works, acts and activities that comprise, include, or use stormwater management systems in or affecting the Swan Canning DCA:

- Do not result in further water quality degradation of the Swan Canning river system, and where possible, improve water quality;
- Protect and enhance the ecological health of the river system; and
- Protect and enhance the community benefits and amenity of the DCA.

The policy notes that in relation to the *Planning and Development Act 2005*, the approval of a subdivision application (including the accompanying urban water management plan) by the WAPC, on the advice of the DWER, does not constitute approval for construction of stormwater infrastructure in the DCA, unless the land in the DCA is owned by the applicant and forms part of the subdivision application. In that instance, stormwater infrastructure in the DCA may be approved as part of the subdivision and subject to conditions, if adequate details of the works are included in the subdivision application and the works in the DCA are undertaken before the foreshore reserve is ceded (DBCA & SRT, 2023).

### 2.4.3 Draft Corporate Policy Statement – Planning for Localities along the Swan Canning Development Control Area

This Draft Corporate Policy Statement was prepared in 2022 with the objective being to ensure that land use, development and other permitted works, acts and activities in or affecting the Swan Canning DCA maintain

and enhance the ecological health, community benefits and amenity of the Swan Canning river system; and achieve consistent and integrated planning, decision-making and management outcomes in relation to the river system (DBCA & SRT, 2022a).

The key development principles outlined within this policy reflect those outlined within the Draft Helena River *Mandoon* Locality Plan (see Section 2.7).

## 2.5 Swan and Canning River Protection Strategy

The Swan and Canning River Protection Strategy outlines coordinated management arrangements to protect and enhance the ecological and community benefits of the Riverpark (DPaW, Swan Canning Riverpark & SRT, 2015). The strategy identifies the roles of the different agencies in contributing to management of the Riverpark. A strategic management program is also outlined within the report.

## 2.6 Swan and Helena Rivers Management Framework Report

The Swan and Helena Rivers Management Framework Report (Framework) was prepared for the Eastern Metropolitan Regional Council (EMRC) by Hassell (2007). This document was designed to provide a strategic framework to guide the ongoing management and development of the eastern reaches of the Swan River and the Helena River.

The site falls within Precinct 4 (Kings Meadow to Roe Highway) of the Framework. This site is identified within the SRT boundary and is shown to include:

- Indicative recreational trails
- Helena River floodway and flood fringe.

The Framework specifies the Helena River foreshore as follows:

*The Helena River foreshore refers to the entire river foreshore within the precinct boundary. The Helena River foreshore is different to that of the Swan River as much of the riverbed is dry and when wet is unnavigable. The significantly reduced flow due to damming has changed the ecological configuration of the area which is now subject to extensive weed colonisation. Major works are required for the area to have a better fit with the current flow regime. The foreshore area is also more difficult to access and is extremely narrow towards the eastern end of the study area. There is no regional recreation trail along for the foreshore and limited crossing points. The western end of the foreshore contains areas of larger open space with the Kings Meadow Polo Ground and Arthur Pexton Memorial Playing Fields.*

The Framework recommends that a management plan for Precinct 4 be prepared to address the following:

- Landscape master plan to improve quality of the foreshore, including the open space reserves, foreshore vegetation and recreation facilities
- Provision of appropriate recreation trails along the foreshore and investigate locations for a possible pedestrian crossing
- Provide interpretative signage to highlight the historical and cultural significance of the site
- Creation of trails (i.e. heritage) which connect the foreshore to the Midland Town Centre, Guildford and the Swan River
- Potential to reintroduce water into the river channel and via wetlands and water bodies
- Management requirements
- Potential for acquiring land within foreshore reserve for access and maintenance purposes.



## 2.7 Draft Helena River *Mandoon* Locality Plan

The Helena River *Mandoon* Locality Plan has been prepared to guide adjacent land use, civic design, and development to ensure that the value of the river and its setting to the community is maintained (DBCA & SRT, 2022b). The policy area covered by this plan includes the Rosehill Waters foreshore zone.

The development outcomes which the plan seeks to achieve include:

- Social Benefits
  - Maintaining the River System and its Setting as a Community Resource
  - Securing Public Access to the River System
  - Maintaining a Sense of Place
- Environmental Values
  - Increasing Climate Resilience
  - Protecting the Natural Environment
  - Protecting Fringing Vegetation
  - Creating and Maintaining Foreshore Reserves
  - Minimising Dredging and Channel Disturbance
  - Implementing Responsible Drainage Management Practices
  - Applying Appropriate Water Management Practices
  - Rehabilitating the River System
- Cultural and Natural heritage
  - Conserving the Cultural and Natural Heritage of the River System and its Setting
- Design and Development
  - Promoting Sensitive Design and Built Form to Complement the River Landscape
  - Creating Linkages and Greenways
  - Activating the Foreshores.

## 2.8 Swan and Canning Rivers Foreshore Assessment and Management Strategy

In 2008, the Swan River Trust completed the Swan and Canning Rivers Foreshore Assessment and Management Strategy. The document describes the Swan and Canning Rivers foreshores, their pressures and condition as well as providing a management strategy which summarises the foreshore issues, defines management responses and identifies priorities for action (SRT, 2008).

The Helena River lies within Zone 2 (Swan) of the strategy. The Rosehill Waters foreshore site is located within Management Area 12. The management recommendations for this zone include (SRT, 2008):

- Highest priority for management is to protect and extend the good condition vegetation within Ashfield Flats (214) and Swan River Backwater (491) Bush Forever sites.
- Across the management area, focus on increasing the fringing vegetation buffer, controlling high risk invasive species and providing access to the river foreshore with designated nodes for recreation activity to minimise impacts on vegetation.
- Within recreation reserves, contain grasses to avoid encroachment into native vegetation.

- Support opportunities to engage private landholders in foreshore management.

## 2.9 Guidelines for Developing Foreshore Management Plans in the Swan-Canning Riverpark

The Swan River Trust developed a set of guidelines to assist the preparation of Foreshore Management Plans in the Swan Canning Riverpark (SRT, 2012a & 2012b). The guidelines are presented in two parts:

- Part A – Guidelines for developing foreshore management plans
- Part B – Guidelines for developing foreshore restoration plans

Foreshore Management plans are recommended to include (SRT, 2012a):

- Site introduction, location and description
- Management commitment and purpose of the plan
- Cultural and social value and use
- Existing natural environment and management issues
- Proposed management

Foreshore restoration plans are recommended to include (SRT, 2012b):

- Introduction
- Landscape Plan
- Implementation of work schedule
- Management structures

## 2.10 Best Management Practices for Foreshore Stabilisation

The Swan River Trust has produced the Best Management Practices for Foreshore Stabilisation (SRT, 2009) document as a guideline for foreshore stabilisation. The guidelines have been produced to:

- Increase land managers knowledge regarding best management practices for foreshore stabilisation
- Improve the SRT's understanding of appropriate management responses for foreshore stabilisation and assisting the strategic allocation of Riverbank Grants Scheme funding

This document provides guidance of shore stabilisation techniques and approaches, approvals processes, and decision support framework.

## 2.11 City of Swan Policies

The City of Swan has several local planning policies of relevance to the proposed development, including:

- POL-C-084 Sustainable Environment – protection and maintenance of the natural environment through effective management strategies while balancing social and economic impact
- POL-C-104 Environmental Planning – expectations and minimum requirements for investigation and development of management plans to address natural environmental assets
- POL-E9.2 Floodplain Management and Development – to conserve environmental features of floodplain, and ensure development is compatible with flood management

## 3 Existing Environmental Characteristics

### 3.1 Climate

Guildford experiences a Mediterranean climate, with cool, wet winters from June to August and hot, dry summers from December to February. Mean annual temperatures at Perth Airport (Station 009021) range from 8.1°C to 18.0°C in winter, and 17.6°C to 32.0°C in summer (BOM, 2024). Annual average rainfall is higher than coastal areas in Perth, at 758.6 millimetres (mm) (BOM, 2024).

### 3.2 Topography, Landform and Soils

The site is generally flat, with topography in the foreshore reserve varying from approximately 4 mAHD along the southern boundary of the reserve to 2 mAHD adjacent to the river (Figure 3).

The soils comprise clay (Unit Cm2) – dark strong brown, hard when dry, soft when moist, variable silt content, no sand of alluvial origin (Gozzard, 1986) (Figure 3).

### 3.3 Hydrology

#### 3.3.1 Helena River and floodplain

The Helena River is located partly within Lot 3 as well as extending into the landholdings to the north (Figure 4). The 78-kilometre (km) river rises east of Mount Dale and flows in a north westerly direction to its confluence with the Swan River at Guildford (Coterra, 2016a).

The Helena River catchment covers approximately 58,095 ha and has three sub-catchments within the Shire of Kalamunda, Shire of Mundaring and the City of Swan (Eastern Hills Catchment Management Group, 2014):

- Upper Helena Catchment (UHC), above Mundaring Weir
- Middle Helena catchment (MHC), between Mundaring Weir and the Pipehead Dam
- Lower Helena catchment (LHC), 4,515 ha between the Pipehead Dam and the confluence with the Swan River in Guildford.

The Rosehill Waters foreshore zone lies within the Lower Helena catchment.

The Helena River floodway encompasses the northern portion of the foreshore reserve, with the 100-year ARI floodplain (flood fringe) extending into part of the remaining foreshore area (Figure 4).

#### 3.3.2 Surface water and wetlands

The foreshore reserve is mapped as a Multiple Use wetland (MUW) (Figure 4). MUWs are described as wetlands with few important ecological attributes and functions remaining. The use, development and management of these areas should be considered in the context of ecologically sustainable development and best management practice catchment planning (EPA, 2008).

A modified tributary (open drain) flows through the centre of the foreshore zone, connecting the adjacent development area to the river (Figure 4). The drain has been highly modified having long straight flow paths and uniform cross-sections. The 100-year ARI flood fringe extends along this drain (Figure 4).

#### 3.3.3 Groundwater

Regional groundwater data shows that groundwater in the vicinity of the foreshore reserve generally flows in a north westerly direction towards the Helena River (DWER, 2024). The regional scale groundwater contours indicate that the maximum groundwater levels are approximately 6 mAHD at the southern

boundary of the foreshore reserve (Figure 4), which equates to a separation distance of 0 to 1 m below ground level (mbgl) (DWER, 2024).

Site specific pre-development groundwater monitoring has been undertaken within the northern end of the development site (i.e. adjacent to the foreshore reserve) between 2012 and 2013 with findings as follows (Urbaqua, 2023):

- Bores ROS01 and ROS02 (Plate 3-1), located within the northern end of the development site, are nested bores for monitoring the presence of perched water due to the clay layer (ROS01 & 02 shallow), and the confined aquifer level (ROS01 & 02 deep).
- The deeper bores measured maximum groundwater levels of 5.74mAHD at ROS01 and 5.01mAHD at ROS02. These levels may be representative of a potentiometric surface (release of confined or pressurised groundwater) of the confined aquifer, as the variation between maximum and minimum levels in these deeper bores varies by approx. 3m-4m.
- The shallow bores measured maximum groundwater levels of 6.08mAHD at ROS01 and 4.74mAHD at ROS02. These levels are considered representative of a perched layer above the clay layer as these bores were dry during most of the year and only expressed water levels after winter rains in August.

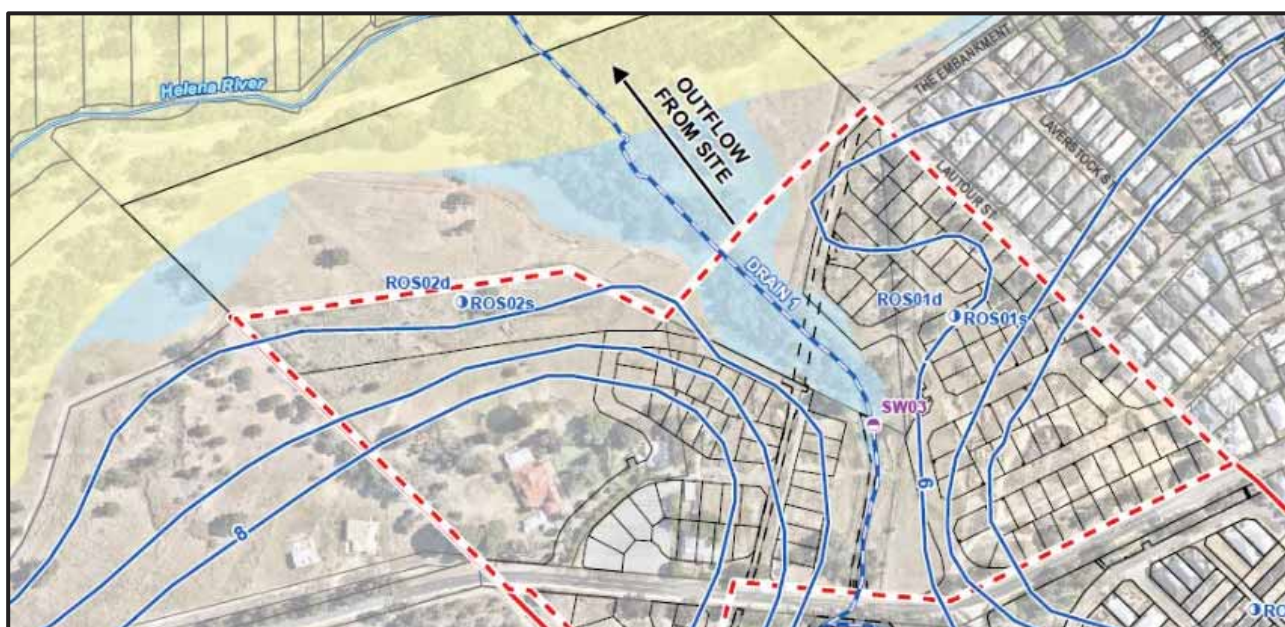


Plate 3-1: Groundwater Bore Locations

Source: Urbaqua (2023)

## 3.4 Vegetation and Flora

### 3.4.1 Vegetation complexes

Most of the foreshore reserve has been historically cleared, with only small areas of remnant vegetation remaining which are generally located adjacent to the Helena River.

The remnant vegetation is representative of the Swan and Guildford vegetation complexes (Heddl et al., 1980) (Figure 5). These complexes are described as follows:

- Swan Complex: Fringing woodland of *Eucalyptus rudis* and *Melaleuca raphiophylla* with localised occurrence of low open forest of *Casuarina obesa* and *Melaleuca cuticularis*. Other plants present include species of *Leptocarpus*, *Juncus*, *Cyperus*, *Shoenus* and *Scirpus*.



- Guildford Complex: A mixture of open forest to tall open forest of marri (*Corymbia calophylla*), Wandoo (*Eucalyptus wandoo*) and Jarrah (*Eucalyptus marginata*) with a small number of locations fringed by *E. rudis-M. raphiophylla* woodlands along streams. Occasional areas of *Eucalyptus lane-poolei* are also found within the Guildford complex, now restricted to an area between Cardup and Keysbrook in the Darling System. Other species in this complex include *Banksia grandis*, *Kingia australis*, *Xanthorrhoea preissii* and species of *Hardenbergia* and *Hibbertia*.

The remnant vegetation present within the foreshore reserve has been supplemented with additional plantings (Coterra, 2016a). Native vegetation planting has occurred along the drainage line within the centre of the foreshore reserve, and also along the river alignment and in other locations along the reserve, between which grassed areas have been established and are currently managed by DPLH (Coterra, 2016a). Historical landscape planting of large exotic tree species (Port Jackson fig, English oak, exotic palm, eastern Australian wattle) is evident along the former access track which extends from Lot 200 to the river edge (Coterra, 2016a).

The vegetation condition within the foreshore zone has been impacted by weed encroachment, historical clearing, and edge effect disturbance (Coterra, 2016a). The foreshore reserve is generally in a Degraded to Completely Degraded condition (Coterra, 2016a).

### 3.4.2 Species of conservation significance

No threatened or priority ecological communities were identified on site (Coterra, 2016b).

No Threatened flora species, as listed under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), or Declared Rare or Priority flora, as listed by the Department of Biodiversity, Conservation and Attractions (DBCA) (WA) were identified on site (Coterra, 2016b).

### 3.4.3 Weeds

A baseline weed survey identified 70 exotic species, with 28 different weed suites described for the site (Table 3-1, Appendix 1). Four declared pest plants were identified on site, including *\*Gomphocarpus fruticosus* (Narrow Leaf Cotton Bush), *\*Zantedeschia aethiopica* (Arum Lily), *\*Echium plantagineum* (Paterson's Curse) and *\*Solanum linnaeanum* (Apple of Sodom) (BEC, 2015).

**Table 3-1: Weed Species**

Area	Description	Dominant weed species
Open paddocks	Often non-endemic trees, including <i>Quercus robur</i> , several Eastern Australian Wattles, <i>Ficus rubiginosa</i> and Palms have historically been planted along the long disused original path from the Rosehill Lodge down to the Helena River.	<ul style="list-style-type: none"> <li>• Declared plant pest weeds <i>*Gomphocarpus fruticosus</i> (WS 2), <i>*Echium plantagineum</i> (WS 2, WS 4, WS 21, WS 28) and <i>*Solanum linnaeanum</i> (WS 2).</li> </ul>
Revegetation areas	Mulch and scattered weeds of varying density and species	<ul style="list-style-type: none"> <li>• Declared plant pest weeds <i>*Gomphocarpus fruticosus</i> (WS 24), <i>*Zantedeschia aethiopica</i> (WS 23, WS 25).</li> </ul>
Small creek	Variable weed density and species.	<ul style="list-style-type: none"> <li>• Dense <i>*Rorippa nasturtium-aquaticum</i> along most of its length</li> <li>• <i>*Polypogon monspeliensis</i> common</li> <li>• <i>*Typha orientalis</i> plants.</li> </ul>
Helena River banks	Variable weed species and density – some areas completely devoid of weeds.	<ul style="list-style-type: none"> <li>• Dense <i>*Cynodon dactylon</i> or <i>*Cenchrus clandestinus</i></li> </ul>

Area	Description	Dominant weed species
		<ul style="list-style-type: none"> <li>Occasional dense areas of <i>*Allium triquetrum</i> or <i>*Zantedeschia aethiopica</i> (WS 11, WS 13, WS 16)</li> <li>Recorded several plants of a <i>*Gladiolus</i> species, possibly <i>*Gladiolus undulatus</i></li> <li>Many plants of the declared plant pest weed <i>*Gomphocarpus fruticosus</i> (WS 12, WS 13, WS 16)</li> <li>Declared plant pest weeds <i>*Echium plantagineum</i> (WS 17, WS 26).</li> </ul>

Source: BEC (2015)

### 3.4.4 Ecological Linkages and Development Control Areas

A Regional Ecological Linkage is located to the north, west and east of the site, including areas associated with the foreshore reserve. The foreshore reserve is also currently identified as a Swan River Trust Parks and Recreation Reserve and DCA, although it is noted that an administrative change will take effect to modify the alignment of the DCA to reflect the outcomes of MRS Amendment 1396/57.

## 3.5 Fauna and Habitat

There are a number of large native trees naturally growing or planted along the Helena River and drainage line, particularly large flooded gums (Coterra, 2016a). Some of the flooded gums had large hollows that could provide fauna breeding opportunities. In some areas along the banks of Helena River, vegetation was well-established with understorey and canopy cover, which provides habitat to small mammals, amphibians and reptiles (Coterra, 2016a).

### 3.5.1 Conservation significant fauna

Coterra (2016b) undertook a fauna assessment in respect of significant fauna species that may occur at the site. Of these species, three black cockatoo species may utilise the site, including Carnaby's Black Cockatoo (*Zanda latirostris*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) and Baudin's Black Cockatoo (*Zanda baudinii*).

Quenda (*Isodon fusciventer*) are known to be present in this general area and are anticipated to be present in some areas of the foreshores reserve.

## 4 Foreshore Open Space

### 4.1 Proposed Design

The foreshore open space zone provides a link for residents and local community members between Rosehill Waters (and adjoining Estates), and the Helena River. This link extends into the development area via a Public Open Space (POS) network, including POS provided along the drainage line which has been progressively transformed into a living stream, with the portion within development stages 6 and 7 yet to be completed.

The existing network of informal pathways throughout the foreshore reserve are intended for retention and maintenance. Of these pathways, the most significant is the historic pathway lined by large oaks and Port Jackson fig trees, along with some orchard tree plantings linking the river to the Estate. This route is the original driveway which accessed the Rosehill homestead (now Rosehill Lodge) from Guildford, over the Helena River, in around 1910.

The foreshore reserve is intended to consist of a combination of recreation and conservation areas which include (Figure 6):

- Retention and targeted revegetation of existing remnant vegetation and revegetation areas
- Future revegetation of approximately 3.26 ha of the foreshore reserve currently comprising grassland
- Opportunities for use of grass zones for passive recreation

It is noted that existing vegetation and large trees will be retained throughout the foreshore reserve, unless considered to present a safety risk, or if impeding bank stability or drainage alignments.

The key environmental features of the site which have led this design response are as follows:

- Presence of mature trees within the foreshore reserve
- Lack of understorey throughout most of the foreshore reserve, aside from limited sections adjacent to the Helena River which would benefit from targeted revegetation
- Existing cleared areas located throughout the foreshore reserve which provide opportunities for utilisation as passive recreation spaces
- Presence of existing informal pathways, reducing the requirement for further disturbance to the environment to provide safe public access to the foreshore reserve
- Where residential lots are to be located adjacent to the foreshore reserve, a road interface has been provided to minimise additional impacts to the reserve.
- Additional revegetation is constrained to the east of the foreshore drainage line based on the presence of existing houses to the immediate east of the Rosehill Waters site which were constructed in early 2010s.

### 4.2 Recreation and Conservation Areas

Targeted areas of grassland will be retained with additional future revegetation areas identified and existing revegetation areas further supported through the funding and management measures proposed in this FMP.

Grassland areas to be retained have been assessed as 'Class G Grassland' (i.e. unmanaged grassland) within the Bushfire Management Plan (Bushfire Safety Consulting, 2024).

Future revegetation areas are further discussed below (Section 4.3).

Foreshore management works are intended to provide controlled access to the Helena River. They will also ensure the enhancement of a space where members of the public can walk along rural-style pathways and

utilise passive recreation areas, whilst also improving the biodiversity values of the river and associated vegetation.

### 4.3 Future Revegetation Areas

The Department of Biodiversity, Conservation and Attractions (DBCA) has identified that additional areas of the foreshore reserve may be revegetated in the future. The foreshore design (Figure 6) has identified the location and extent of these proposed areas taking into consideration bushfire protection requirements of existing dwellings to the east of Rosehill Waters and future uses of The Lodge precinct. These revegetation works would be funded and undertaken by DBCA at a future date.

These future revegetation areas have been classified as 'Group A Forest' within the Bushfire Management Plan (Bushfire Safety Consulting 2024).



## 5 Management Actions

The following management actions have been identified for the foreshore area.

### 5.1 Vegetation Retention

Existing native vegetation within the foreshore reserve will be retained. This includes vegetation along drainage lines and along the Helena River.

### 5.2 Future Revegetation

An area of approximately 3.26 ha has been identified as a future revegetation zone (Figure 6). Revegetation within this area is likely to comprise installation of upper, mid and lower storey vegetation layers which would be classed as a Group A Forest environment by Australian Standard 3959 – Construction of buildings in bushfire prone areas.

The specific details of the revegetation program would be identified by DBCA and DPLH as part of future planning and implementation of these works. Funding for these future works would be arranged through DBCA or DPLH.

### 5.3 Grassland Management

Targeted grassland areas to be retained are expected to be regularly mowed or slashed to manage grass growth. Grassland maintenance will remain the responsibility of DPLH.

The additional land to be added to the Parks and Recreation Reserve will be fenced, with existing fencing which no longer represents the reserve boundary being removed (see Section 5.8). The additional grassland area will be maintained by DPLH in a similar manner to existing grassland areas within the foreshore reserve.

### 5.4 Weed Control

Weed control activities within the foreshore reserve remain the responsibility of DPLH. It is recommended that targeted weed control be undertaken in areas of retained vegetation surrounding the existing drainage line to improve the quality and condition of vegetation. An initial targeted weed control program (2 weed control events) is recommended be implemented which would include:

- Spot-spraying of broad-spectrum herbicide application (i.e. Glyphosate Biactiveto, which is suitable for use in riparian areas) in late winter/spring, to allow for removal for weeds prior to flowering and seed propagation
- Broad-spectrum herbicide application (i.e. Glyphosate Biactiveto) in summer, to coincide with summer active weeds.

### 5.5 Contribution to Foreshore Revegetation

Funding to the value of \$10,000 will be provided from the developer to DPLH for to support additional revegetation works within this portion of the Parks and Recreation Reserve.

The allocation of the funding will be determined by DPLH in consultation with DBCA with the aim being to increase the native vegetation cover for areas lacking native vegetation along the Helena River and/or the drainage line between the Helena River and the development boundary.

## 5.6 Drainage Channel Flow

The drainage line will remain the responsibility of DPLH to maintain between the Rosehill Waters development site and the Helena River to ensure that the condition of the area provides for the required flow volumes to be accommodated. This may include weed removal, bank stabilisation and removal of blockages, as required.

## 5.7 Access Management

Whilst it is understood that DPLH has no plans to formalise paths within the foreshore reserve, these paths are expected to be maintained in line with current levels. Pedestrian access points between the development and the foreshore will be provided as shown on Figure 6.

Bollards or fencing will be placed at entry points to restrict unauthorised vehicle access to the foreshore reserve.

No bins will be installed within the foreshore reserve to encourage users to take rubbish with them. Signage will be posted at foreshore entry points from the development advising users of the responsibility of rubbish and pet-waste removal. The waste management strategy will involve:

- Bins and associated signage to be placed within POS areas at junctions of paths and roadways as shown on Figure 6 (not within the foreshore reserve)
- The signage will alert users there are no bins located within the foreshore area and to please dispose of waste responsibly and use pet waste bags as appropriate
- Waste collection to be undertaken by the City of Swan as part of the regular refuse collection program.

## 5.8 Private and Public Land Interface

### 5.8.1 Demarcation of Private and Public Land

The landholding containing the Rosehill Lodge represents the interface between the private and public (i.e. land exchange site) foreshore lands. All other interface areas with the foreshore connect to other areas of public land including road reserve and public open space.

This public and private realm interface will be demarcated through provision of fencing along the boundary, with a firebreak to be provided along the boundary within both landholdings.

The fencing is proposed to be in accordance with DBCA recommended conservation style fencing which comprises the following specifications:

- Onesteel Waratah Adjusta Stays 50mm
- Onesteel Waratah Ezy Slot Strainers (2.5mt)
- Onesteel Waratah Galstar Maxi Posts 210cm
- Onesteel Trellis Wire 3.15mm (Growire) HT Longlife
- 6mm Galvanised Wire Rope (G1570 grade)- 1000mt (Two strand)
- 8mm Galvanised Wire Rope (G1960 grade)- 1000mt (Top strand)
- Onesteel Waratah Galstar Plus 165cm

An example of this fencing style is shown on Plate 5-1.



**Plate 5-1: Steel Post and Galvanised Wire fencing style**

### **5.8.2 Visibility from the Foreshore Reserve**

No new structures are currently proposed within The Lodge private landholdings. Should any new structures be proposed in the future the amenity of the proposal will take into consideration using colour schemes which complement the surrounding environment. Any such proposals will be referred to the City of Swan for approval, with DBCA able to also provide comment through this approval process.

### **5.8.3 Access**

No direct pedestrian or vehicle access is provided along the private and public foreshore interface.

Access to the foreshore reserve will be provided at entry points to the foreshore reserve which connect to public land.

### **5.8.4 Landscaping**

No additional planting is proposed along the Rosehill Lodge and public land interface.

The Rosehill Lodge lot landscaping includes managed grassland in proximity to the foreshore interface. The area is expected to continue to be managed in the same manner for both aesthetic and bushfire management purposes.

## **5.9 Educational and Interpretative Signage**

The proponent will work with DBCA to create and install educational and/or interpretative signage within the foreshore reserve. It is envisaged that these signs could include information relating to:

- Environmental educational information which may include topics such as:
  - Riverine environment features and values
  - Fauna and habitat types within the foreshore zone
  - Flora and vegetation values of the foreshore zone
  - Revegetation program information
- Behavioural signed such as request to keep dogs on leash and access to avoid areas of native vegetation undertaken revegetation or management

- Directional information relevant to the location and nearby areas of interest

The specific signage detail and locations will be agreed with DBCA.

## 5.10 WAPC Land Access Approval Requirements

In order to facilitate the installation of signage as described above it is assumed that DPLH, as the landowner/manager, will arrange the required approvals for site access and carrying out the works identified in this plan.

## 5.11 Bushfire Risk Management

It is assumed that firesbreaks along the interface between the Parks and Recreation Reserve and the development site will be provided and maintained by DPLH as is currently the case. The presence of the existing firebreak is evident in aerial photography (Plate 5-2) with future firebreak locations shown on Figure 6.



**Plate 5-2: Firebreak presence within foreshore reserve**

*Source: MNG Maps (8 December 2023)*

It is envisaged that grassland maintenance including mowing and slashing will continue to be undertaken with the foreshore reserve as currently occurs. This action is undertaken as part of DPLH management works. As a precaution, the grassland areas have been classified as 'Class G Grassland' rather than 'Exclusion Clause 2.2.3.2 (f) – landscape parkland' within the BMP. This allow greater flexibility for the maintenance of these areas by not requiring vegetation to be maintained in a low threat condition.



## 6 Implementation Plan

This Foreshore Management Plan will be implemented by several responsible parties as detailed below (Table 6-1).

**Table 6-1: Implementation Plan**

Item	Management Action	Responsible Party	Timing
1	Existing vegetation to be retained	DPLH	ongoing
2	Future revegetation works are proposed within the foreshore reserve likely comprising establishment of upper, mid and lower storey vegetation layers. Planning, funding and implementation of these works would be undertaken by DBCA and/or DPLH.	DBCA and/or DPLH	Future, timing not yet defined
3	Mowing/slashing of grassed areas to be undertaken as currently occurs	DPLH	ongoing
4	New fencing to be installed along the boundary of the Parks and Recreation Reserve and the development site, with old fencing no longer representing the boundary to be removed.	Developer	To be undertaken once the Rosehill Waters Stage 7 landscape works commence
5	Targeted weed control (2 events) to be undertaken along drainage line between the development and the Helena River	DPLH	Late winter/spring & Summer
6	Funding to the value of \$10,000 will be provided from the developer to DPLH for to support additional revegetation works within this portion of the Parks and Recreation Reserve	Developer	Within 2 months of approval of this FMP
7	Maintenance of drainage line to maintain suitable flow conditions	DPLH	Ongoing
8	Maintenance of existing limestone paths	DPLH	As required
9	Bollards/fencing will be placed at strategic locations along the foreshore management boundary to prevent unauthorised vehicle access	Developer	To be undertaken once the Rosehill Waters Stage 7 landscape works commence
10	Provision of waste bins and associated signage at locations specified in Figure 6.	Developer	To be undertaken once the Rosehill Waters Stage 7 landscape works commence
11	Refuse collection from bins	City of Swan	Ongoing, as part of suburban refuse collection program
12	Public and private realm to be demarcated through installation of fencing and maintenance of firebreaks along the boundary	Developer (fencing and Lot Lodge firebreak)	To be undertaken in conjunction with the fencing proposed in Item 4 above.
13	Design and installation of 2 educational and/or interpretative signs in consultation with DBCA	Developer	To be undertaken once the Rosehill Waters Stage 7

Item	Management Action	Responsible Party	Timing
			landscape works commence
14	WAPC Land Access Approval to be arranged to facilitate signage installation actions	DPLH	Prior to the Rosehill Waters Stage 7 landscape works commencing
15	Maintenance of firebreaks along the foreshore/development interface	DPLH	Ongoing

## 7 References

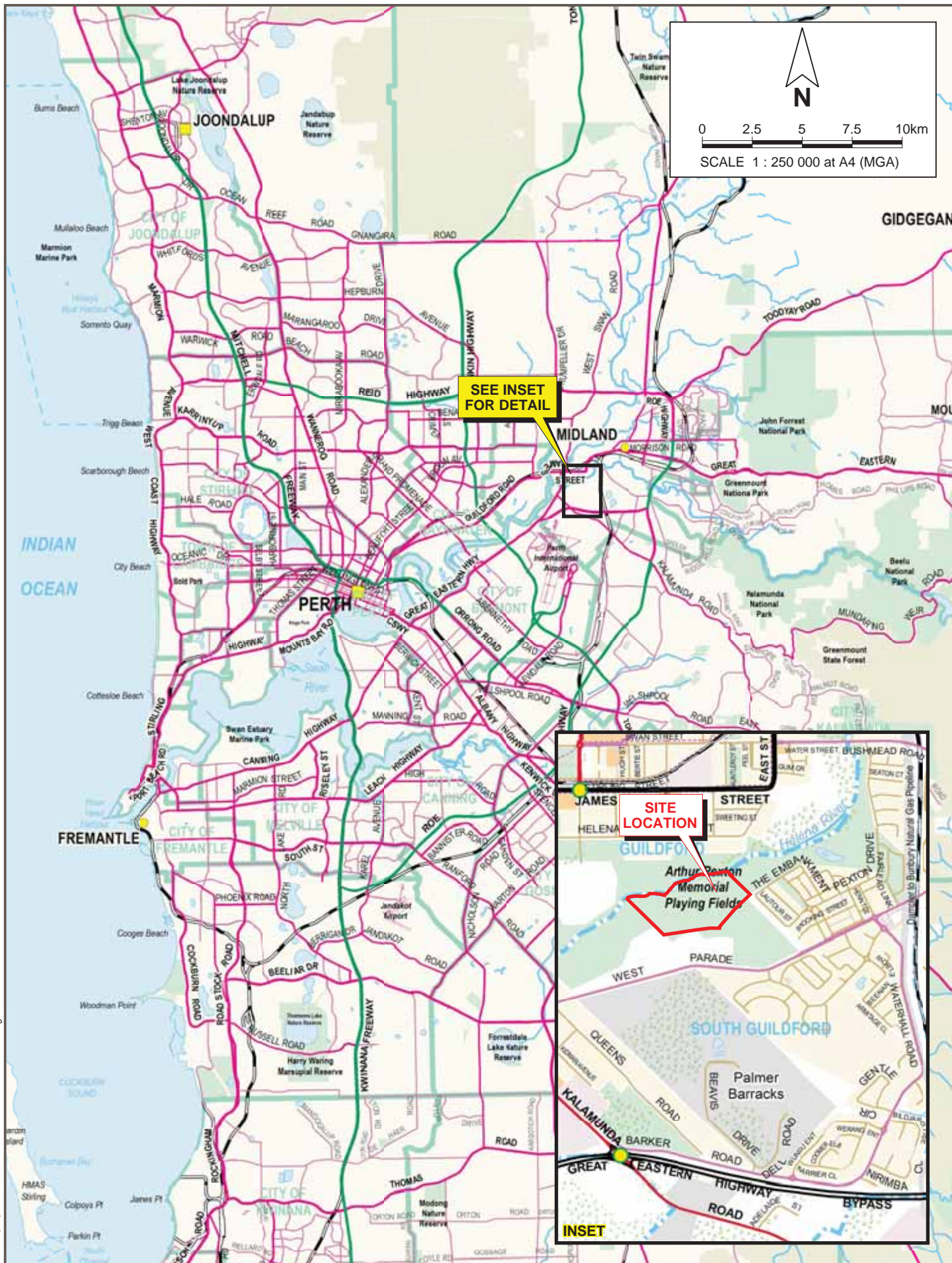
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- Department of Biodiversity, Conservation and Attractions (2024) *Policies, plans and guidelines manual*. <https://www.dbca.wa.gov.au/licences-and-permits/riverpark-development-and-planning/policies-plans-and-guidelines-manual>
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## Figures

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**COTERRA**  
ENVIRONMENT

RWM Property Pty Ltd  
FORESHORE MANAGEMENT PLAN  
ROSEHILL WATERS

Drawn: K. Watts

Date: 1 Feb 2024

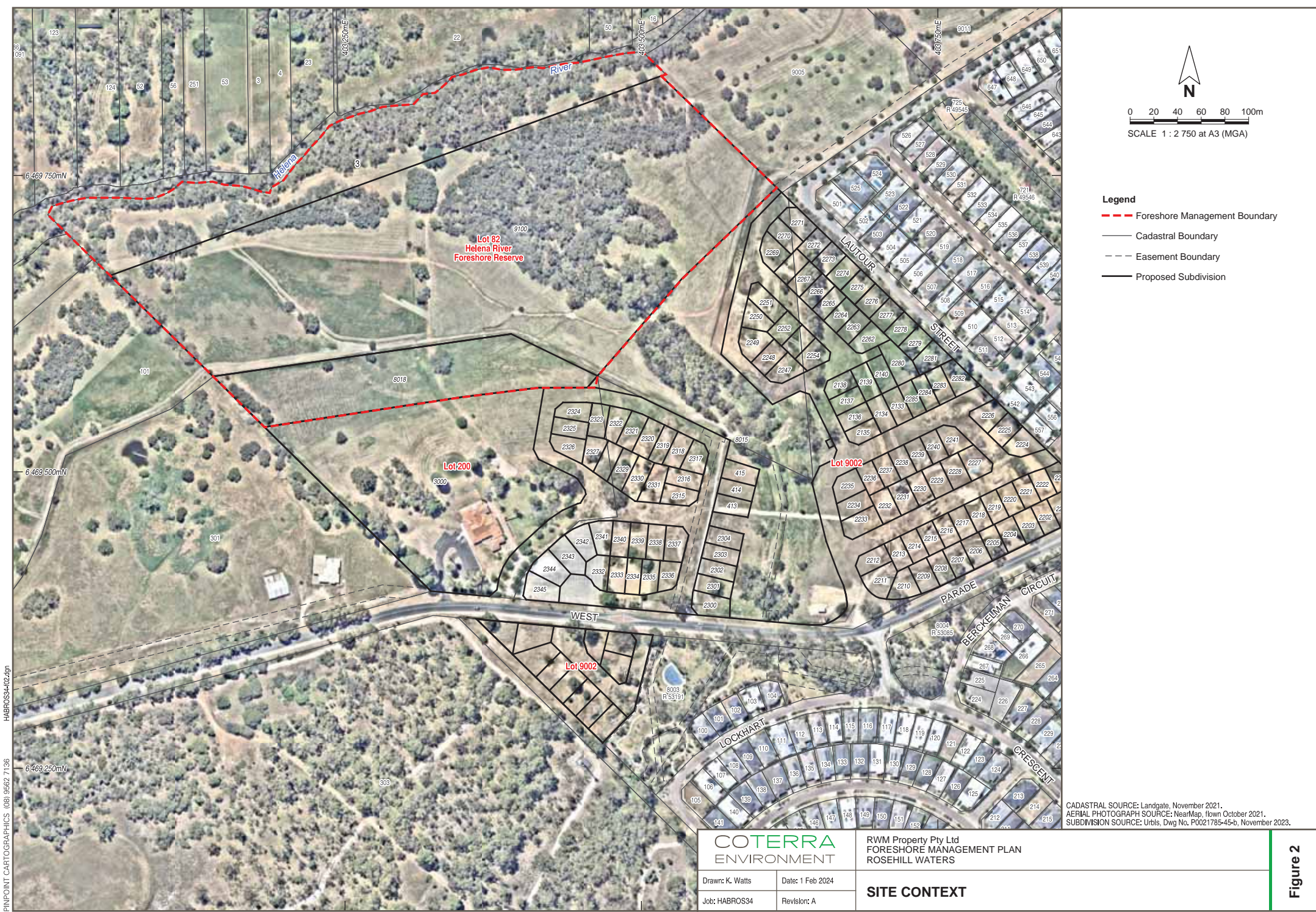
Job: HABROS34

Revision: A

## SITE LOCATION

**Figure 1**





- Legend**
- Foreshore Management Boundary
  - Cadastral Boundary
  - - - Easement Boundary
  - Proposed Subdivision

CADASTRAL SOURCE: Landgate, November 2021.  
AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2021.  
SUBDIVISION SOURCE: Urbis, Dwg No. P0021785-45-b, November 2023.

**COTERRA**  
ENVIRONMENT

RWM Property Pty Ltd  
FORESHORE MANAGEMENT PLAN  
ROSEHILL WATERS

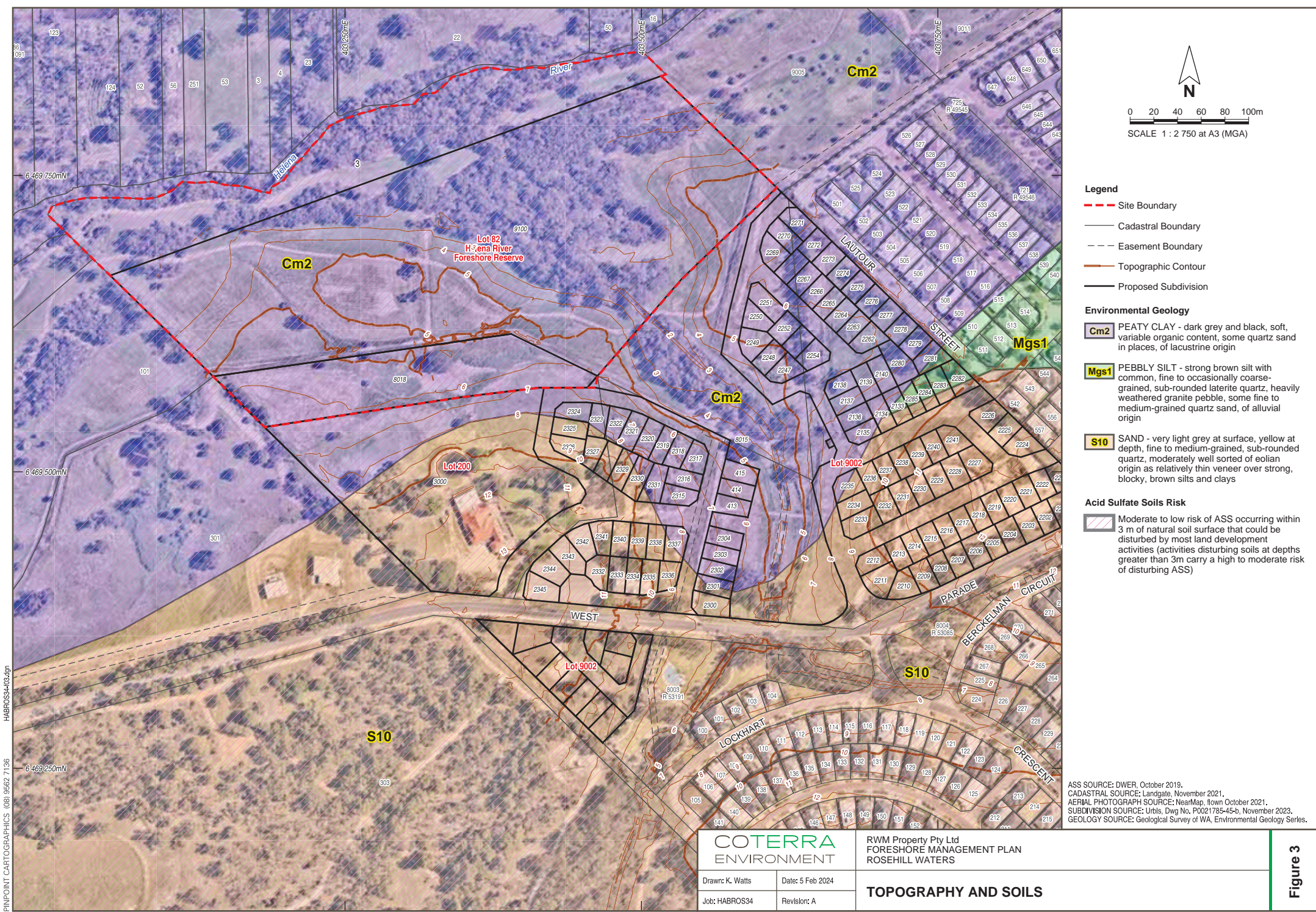
Drawn: K. Watts  
Job: HABROS34

Date: 1 Feb 2024  
Revision: A

**SITE CONTEXT**

**Figure 2**





**Legend**

- Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Topographic Contour
- Proposed Subdivision

**Environmental Geology**

**Cm2** PEATY CLAY - dark grey and black, soft, variable organic content, some quartz sand in places, of lacustrine origin

**Mgs1** PEBBLY SILT - strong brown silt with common, fine to occasionally coarse-grained, sub-rounded laterite quartz, heavily weathered granite pebble, some fine to medium-grained quartz sand, of alluvial origin

**S10** SAND - very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin as relatively thin veneer over strong, blocky, brown silts and clays

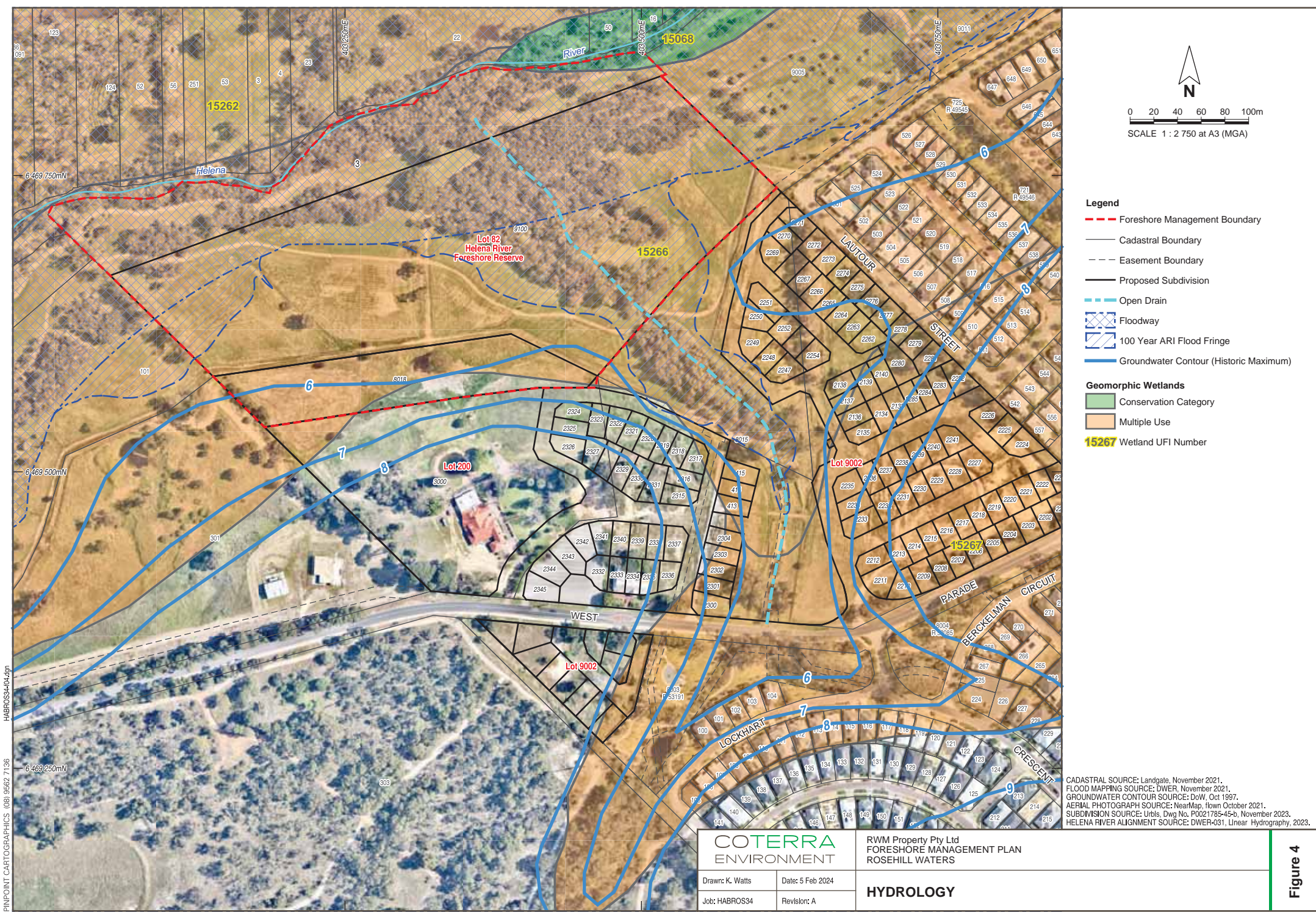
**Acid Sulfate Soils Risk**

Moderate to low risk of ASS occurring within 3 m of natural soil surface that could be disturbed by most land development activities (activities disturbing soils at depths greater than 3m carry a high to moderate risk of disturbing ASS)

ASS SOURCE: DWER, October 2019.  
 CADASTRAL SOURCE: Landgate, November 2021.  
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2021.  
 SUBDIVISION SOURCE: Urbis, Dwg No. P0021785-45-b, November 2023.  
 GEOLOGY SOURCE: Geological Survey of WA, Environmental Geology Series.

		RWM Property Pty Ltd FORESHORE MANAGEMENT PLAN ROSEHILL WATERS		<b>Figure 3</b>
Drawn: K. Watts	Date: 5 Feb 2024	<b>TOPOGRAPHY AND SOILS</b>		
Job: HABROS34	Revision: A			





CADASTRAL SOURCE: Landgate, November 2021.  
FLOOD MAPPING SOURCE: DWER, November 2021.  
GROUNDWATER CONTOUR SOURCE: DoW, Oct 1997.  
AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2021.  
SUBDIVISION SOURCE: Urbis, Dwg No. P0021785-45-5, November 2023.  
HELENA RIVER ALIGNMENT SOURCE: DWER-031, Linear Hydrography, 2023.

**COTERRA**  
ENVIRONMENT

RWM Property Pty Ltd  
FORESHORE MANAGEMENT PLAN  
ROSEHILL WATERS

Drawn: K. Watts  
Job: HABROS34

Date: 5 Feb 2024  
Revision: A

**HYDROLOGY**





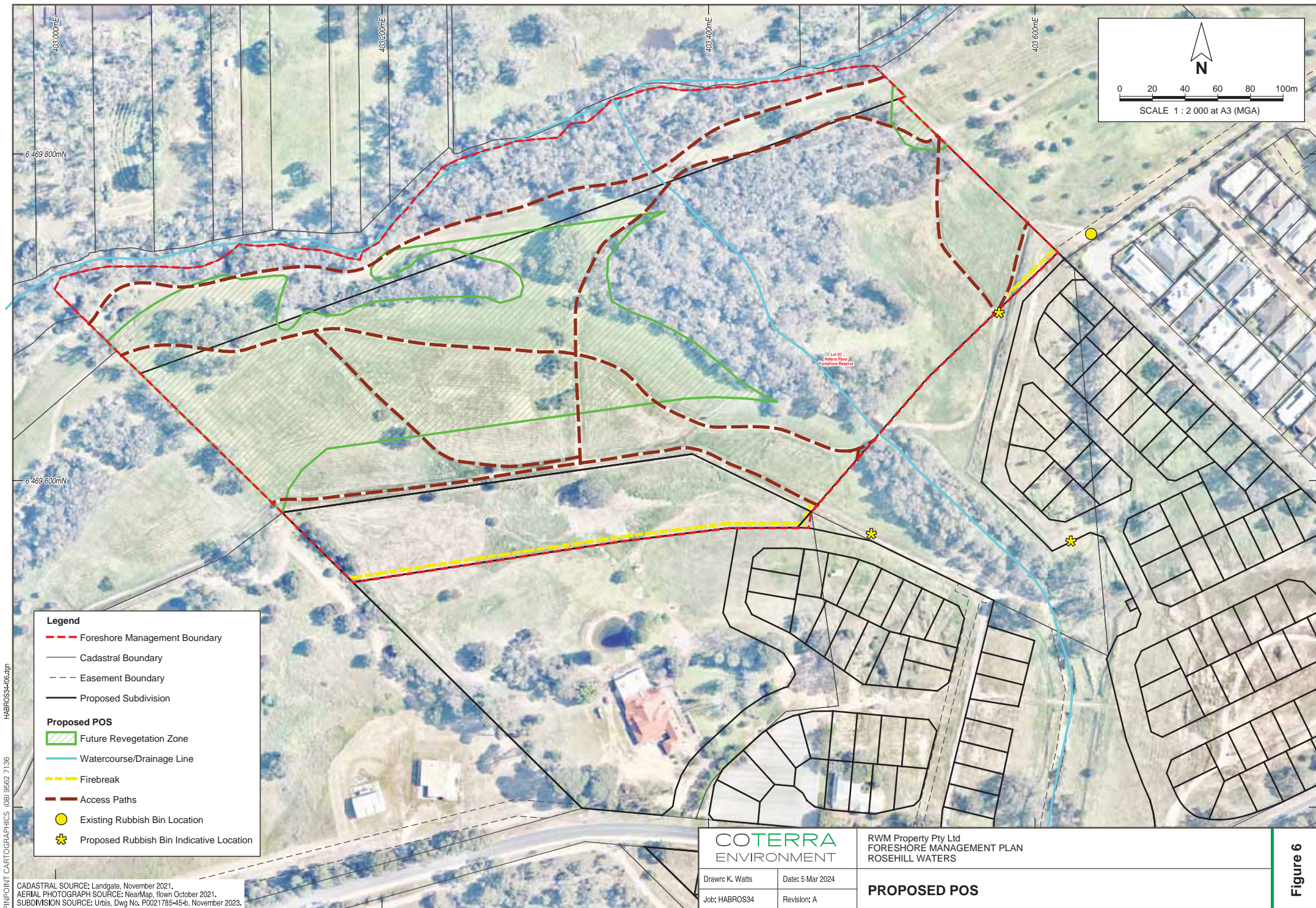
- Legend**
- Foreshore Management Boundary
  - Cadastral Boundary
  - - - Easement Boundary
  - Proposed Subdivision
  - Vegetation Complex Boundary
  - ▨ Bush Forever Site

CADASTRAL SOURCE: Landgate, November 2021.  
BUSH FOREVER SOURCE: DPLH, November 2021.  
VEGETATION COMPLEX SOURCE: Heddlie, et al. 1980.  
AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2021.  
SUBDIVISION SOURCE: Urbis, Dwg No. P0021785-45-b, November 2023.

<b>COTERRA</b> ENVIRONMENT		RWM Property Pty Ltd FORESHORE MANAGEMENT PLAN ROSEHILL WATERS	
Drawn: K. Watts	Date: 1 Feb 2024	<b>VEGETATION AND FLORA</b>	
Job: HABROS34	Revision: A		

**Figure 5**







## Appendix 1      Foreshore Weed Species (BEC, 2015)

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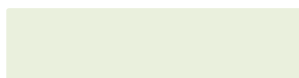
### Weed Species Recorded

#### KEY

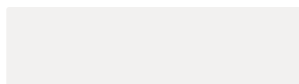
*	Denotes weed
x	Indicates plant is a hybrid
Hybrid	Indicates plant is a hybrid
?	Name of plant uncertain as not in flower or fruit
species	Name of plant uncertain as not in flower or fruit



Declared Plant Pest Weed



Eastern Australian species



Planted exotic tree

VASCULAR PLANT FAMILY	SCIENTIFIC NAME	COMMON NAME
<b>Apocynaceae</b>	<i>*Gomphocarpus fruticosus</i>	Narrow Leaf Cotton Bush
<b>Areaceae</b>	<i>*Zantedeschia aethiopica</i>	Arum Lily
<b>Areaceae</b> (Palm Family)	<i>*Phoenix canariensis</i>	Date Palm
	<i>*Syagrus romanzoffiana</i>	Queen Palm
<b>Asteraceae</b> (Daisy Family)	<i>*Conyza bonariensis</i>	Flaxleaf Fleabane
	<i>*Dittrichia graveolens</i>	Stinkwort
	<i>*Hypochaeris radicata</i>	Hairy Flat Weed
	<i>*Lactuca serriola</i>	Prickly Lettuce
	<i>*Sonchus asper</i>	Prickly Sowthistle
	<i>*Sonchus oleraceus</i>	Sowthistle
	<i>*Symphyotrichum subulatus</i>	Bushy Starwort
<b>Boraginaceae</b>	<i>*Echium plantagineum</i>	Paterson's Curse
<b>Brassicaceae</b>	<i>*Brassica tournefortii</i>	Wild Turnip
	<i>*Raphanus raphanistrum</i>	Wild Radish
	<i>*Rorippa nasturtium-aquaticum</i>	Water Cress
<b>Cannaceae</b>	<i>*Canna hybrid</i>	Canna
<b>Caryophyllaceae</b>	<i>*Corrigiola litoralis</i>	Strapwort
	<i>*Polycarpon tetraphyllum</i>	Fourleaved Allseed
	<i>*Stellaria media</i>	Common Chickweed
<b>Chenopodiaceae</b>	<i>*Atriplex prostrata</i>	Hastate Orache
<b>Cyperaceae</b>	<i>*Cyperus congestus</i>	Dense Flat Sedge
	<i>*Isolepis marginata</i>	Coarse Clubrush
<b>Euphorbiaceae</b>	<i>*Ricinus communis</i>	Castor Oil
<b>Fabaceae</b>	<i>*Acacia baileyana</i>	Cootamundra Wattle
	<i>*Acacia pycnantha</i>	Golden Wattle
	<i>*Erythrina x sykesii</i>	Coral tree
	<i>*Lotus subbiflorus</i>	Hairy Birdsfoot Trefoil
	<i>*Lupinus angustifolius</i>	Narrow-leaved Lupin
	<i>*Medicago polymorpha</i>	Burr medic
	<i>*Vicia sativa</i>	Common Vetch
<b>Fagaceae</b>	<i>*Quercus robur</i>	Oak
<b>Geraniaceae</b>	<i>*Erodium botrys</i>	Corkscrews

VASCULAR PLANT FAMILY	SCIENTIFIC NAME	COMMON NAME
<b>Iridaceae</b>	<i>*Gladiolus ? undulatus</i>	Gladiolus
	<i>*Sparaxis bulbifera</i>	Sparaxis
<b>Juncaceae</b>		
	<i>*Juncus bufonius</i>	Toad Rush
<b>Lamiaceae</b>		
	<i>*Mentha x piperita</i>	Eau de Cologne Mint
	<i>*Stachys arvensis</i>	Stagger Weed
<b>Lythraceae</b>		
	<i>*Lythrum hyssopifolia</i>	Hyssop Loosestrife
<b>Malvaceae</b>		
	<i>*Malva parviflora</i>	Marshmallow
<b>Moraceae</b>		
	<i>*Ficus rubiginosa</i>	Port Jackson Fig
<b>Oleaceae</b>		
	<i>*Olea europaea</i>	Olive
<b>Oxalidaceae</b>		
	<i>*Oxalis pes-caprae</i>	Soursob
<b>Papaveraceae</b>		
	<i>*Fumaria capreolata</i>	Climbing Fumitory
<b>Plantaginaceae</b>		
	<i>*Callitriche stagnalis</i>	Common Starwort
	<i>*Plantago lanceolata</i>	Ribwort Plantain
	<i>*Plantago major</i>	Great Plantain
<b>Poaceae (Grass family)</b>		
	<i>*Avena barbata</i>	Bearded Oats
	<i>*Bromus diandrus</i>	Great Brome
	<i>*Cenchrus clandestinus</i>	Kikuyu
	<i>*Cynodon dactylon</i>	Couch Grass
	<i>*Ehrharta calycina</i>	Perennial Veldt Grass
	<i>*Ehrharta longiflora</i>	Annual Veldt Grass
	<i>*Eragrostis curvula</i>	African Lovegrass
	<i>*Hordeum leporinum</i>	Barley Grass
	<i>*Lolium multiflorum</i>	Italian Ryegrass
	<i>*Lolium perenne</i>	Perennial Ryegrass
	<i>*Paspalum species</i>	Paspalum
	<i>*Poa annua</i>	Winter Grass
	<i>*Polypogon monspeliensis</i>	Coastal Beard Grass
	<i>*Vulpia bromoides</i>	Squirrel's Tail Grass
	<i>*Vulpia myuros</i>	Silver Grass
<b>Polygonaceae</b>		
	<i>*Persicaria ? lapathifolia</i>	Pale Knotweed
	<i>*Rumex crispus</i>	Curled Dock
<b>Primulaceae</b>		
	<i>*Lysimachia arvensis</i>	Pimpernel
	<i>*Samolus valerandi</i>	Brookweed
<b>Rosaceae</b>		
	<i>*Rosa chinensis</i> hybrid	Wild Rose

VASCULAR PLANT FAMILY	SCIENTIFIC NAME	COMMON NAME
Solanaceae	* <i>Solanum americanum</i>	Glossy Nightshade
	* <i>Solanum linnaeanum</i>	Apple of Sodom
	* <i>Solanum nigrum</i>	Black Berry Nightshade
Typhaceae		
	* <i>Typha orientalis</i>	Bullrush



# COTERRA ENVIRONMENT

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West Perth WA 6005

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[info@coterra.com.au](mailto:info@coterra.com.au)



## **APPENDIX D**

## **INFRASTRUCTURE AND SERVICING REPORT**



DEVELOPMENT  
ENGINEERING  
CONSULTANTS

Telephone: (08) 9481 1900  
Facsimile: (08) 9481 1700  
Ground Floor "The Atrium"  
Suite 3/123A Colin Street  
West Perth WA 6005  
Our Ref: SGFNRW05  
SgfNrw05ServRep060421

**NOAHS ROSEHILL WATERS PTY LTD**  
**STAGES 6 AND 7 – AREA NORTH OF WEST PARADE AND REVISIONS TO**  
**STAGES 4 AND 5**  
**ENGINEERING SERVICES – ADDENDUM REPORT**

**1. General:**

The existing Rosehill Waters development is located on either side of West Parade in South Guildford some 1.2km east from Great Eastern Highway. The structure plan has been approved and development for the first three stages has been largely completed. It is proposed to alter the structure plan for Stages 4, 5 and 6 and 7 which are the areas in the South West of the site (Stage 4), the area on the eastern side of the site abutting Kulungar Park (Stage 5) and the area north of West Parade and in the north western corner of the site (Stages 6 and 7).

Stages 4 and 5 have had preliminary earthworks undertaken and are largely surrounded by completed development works. Stage 6 and 7 include the abutting former golf club house to the west (Rosehill Lodge) and north of West Parade, which is proposed to be retained as a commercial/tourism venue. The site area for Stage 4 is around 3.3ha (including the POS area for the existing stream), Stage 5 is around 2.9ha and Stages 6 and 7 are around 12ha north of West Parade and 7,400sqm in the north west of the existing site.

Stages 4-7 comprise around 241 residential lots; being 38 Lots in Stage 4, 67 Lots in Stage 5 and 136 Lots in Stages 6 and 7. In addition to this there is a POS/drainage area abutting Stage 4 and in Stages 6 and 7 which incorporates the outlet creek line from the area and the Rosehill Lodge site of some 2.6ha.

This report covers existing and proposed services, plus proposals for earthworks, retaining walls, roads, drainage, groundwater, water supply, sewerage, power supply, gas, telecommunication as required for current urban development standards.

**2. Executive Summary**

The land the subject of this report is located some 1.2km east of Great Eastern Highway abutting West Parade in the City of Swan. It can be developed immediately by extending all required services from abutting roads.

The land was formerly the Rosehill Golf Course and the first stages of the development abutting the southern side of West Parade have been developed in the past few years. The current development works has involved some sourcing of material and stockpiling in the subject stages which will need to be incorporated within the earthworks for the development works.

The abutting West Parade is constructed to a rural road standard, sealed and in good condition. This would need to be kerbed and drained as part of the required subdivision works. All the other abutting roads are recently constructed subdivisional roads in good condition and constructed to a kerbed urban standard and will not require upgrading.

The original basic landform is sand overlying Guildford Formation. The Environmental Geology map of the Geological Survey of Western Australia classifies this site as generally “S10” which is essentially a thin layer of Bassendean Sand overlying the Guildford Formation. This transitions to a “C<sub>m2</sub>” in the area abutting the Helena River some distance north of West Parade which is a heavy clay of alluvial origin.

The geotechnical investigations generally supported this although in the subject site areas, all good sand has been removed for filling previous stages and the remaining sand, although geotechnically sound for housing construction, has low permeability characteristics and it is proposed a minimum thickness of 800mm of free draining sand would be installed above this sand. Alternatively, a minimum thickness of 1.2m of sand over clay would be provided.

The land can be connected to all services, either by extension and upgrading from existing infrastructure, or by provision of new infrastructure as set out below. Power, telephone, gas, sewer and water services already pass along the site frontage.

It is proposed that all road stormwater from the development up to and including the 1 Hour 1EY (15mm rainfall) event will be retained on site. Houses will discharge roof stormwater into on site soakwells which will have an overflow connected to the street drainage system.

### 3. Site

The subject site(s) is total around 19 hectares in size and consists of Stages 4, 5 and 6 and 7 which are the areas in the South West of the site (Stage 4), the area on the eastern side of the site abutting Kulungar Park (Stage 5) and the area north of West Parade and in the north western corner of the site (Stages 6 and 7). The land was formerly the Rosehill Golf Course and the first stages of the development abutting the southern side of West Parade has been developed in the past few years.

In general the area of Stage 4 falls from the western boundary of the site to an existing creek line that drains through the abutting site, then back into the development area, across West Parade and through Stages 6 and 7 to the Helena River. Stage 5 falls east to the existing development and Kulungar Park where there is drainage which in turn feeds into the creek line at West Parade. There is little vegetation in the Stage 4 and 5 and in Stages 6 and 7 there are some good trees and vegetation in the creek line between West Parade and the Helena River.

The majority of the site is underlain by clay and a minimum of 1.2m of sand will need to be installed over the clay to ensure an appropriate building site classification under AS2870.

The site is serviced by Water Corporation sewer and scheme water, as well as telephone, gas and power. Access is from the existing abutting sealed roads.



#### 4. Development Proposal

The remaining development area and the subject of this report is ultimately proposed to be developed into around 241 residential lots; being 38 Lots in Stage 4, 67 Lots in Stage 5 and 136 Lots in Stages 6 and 7. In addition to this there is POS/Drainage abutting Stage 4 and Stages 6 and 7 which incorporates the outlet creek line from the area.

#### 5. Earthworks & Retaining Walls

Earthworks will be carried out over the site to balance the existing clay soil and prepare a substrate layer some 1.2m below finished surface levels. This will involve cutting and filling of the clay soil to replicate the finished surface levels albeit 1.2m below. Where existing site sand (which does not have good drainage characteristics) can be used, this will be filled to a maximum of 400mm within the sand layer to provide the required separation between the clay and underside of footings. A minimum of 800mm of clean free draining imported sand is proposed over all lots.

Preliminary earthworks plans have been included in Attachment B which indicates the proposed development levels across the site.

Stage 4 Earthworks are proposed to be generally flat at around RL11.00mAD, being some 2.0m above the banks of the abutting stream. This provides a good outlook to the POS areas and sufficient depth of sand cover to ensure the required lower movement “S” Classification under AS2870. The access road off Nullagine Ave, will be constructed with a low point of around RL9.50mAHD to ensure the overland flow path for the upstream drainage system feeding to the stream will be honoured to minimize flooding in Gentle Circle during a major storm event.

Stage 5 earthworks fall from RL13.40mAHD at the intersection of Abba Lane and Serpentine Drive to around RL11.28 abutting Kulungar Park. The lots abutting the existing roads, Kulungar Elbow, Abba lane and Karreen Way have been set to be slightly above the existing roads, but still provide good access grades given the size of the lots. Lots abutting Kulungar Park have been set around 1.2m above to provide a good outlook and generally minimize the grades across the site.

Stages 6 and 7 earthworks have been established to ensure some parity with the existing roads being West Parade and Lautour Street. The peak flood level for the abutting area of the Helena River is around RL4.40mAHD, meaning a minimum level of RL4.90m AHD is suitable for lots in the area. All lots are generally much higher than this given the high level of West Parade relative to the land.

The site area abutting the Rosehill Lodge site has some challenges in terms of grades. West Parade falls very steeply in that area from around RL13.25mAHD at the intersection of the proposed new roadway to RL6.00m AHD at the low point of the creek crossing (A fall of around 5%). To ensure parity, lots have been set generally higher than West Parade, but stepping down the slope to ensure that lots near the stream are relatively not too high. Generally the area abutting West Parade has retaining walls around 1-1.5m with around a 2.0m retaining wall where lots abut the creek line.

The area further north requires higher retaining walls to ensure the integrity of the interface with the surrounding areas is maintained. The Rosehill Lodge site is proposed

to be maintained, hence the road levels abutting this area will need to be close to match into existing. This site falls from RL10.50m AHD to around RL5.00m AHD abutting the creek line. The creek line contains many well established trees. It is proposed to lower higher road to minimize the fall and fill the road abutting the creek and POS. This still results in retaining walls between the lots of a maximum height of 4.5m. Although this is higher than other areas of the site, the steep grades provide very little alternative with the constraints of the existing roads, the Rosehill Lodge and the heavily treed creek line.

All other lots will have medium sized retaining walls. All retaining walls will be subject to Council building approval.

## 6. Roads

All new subdivisional roads will be constructed to City of Swan standards and approval, including kerbing and piped drainage plus provision of footpaths as required. West Parade will require upgrading to an urban standard and a roundabout is proposed at the intersection of Serpentine Drive to facilitate access into the Stage 6 and 7 area.

Other abutting roads have been recently constructed to subdivisional standards and as such no further upgrading will be required other than intersection tie in works.

## 7. Drainage

Stages 4 and 5 have been encompassed into the UWMP for the existing development. Stage 4, 6 and 7 require the construction of some small drainage basins to capture the 1EY 1 hour storm. These basins will then overflow into the creek line. The developed land will respond to rainfall events more quickly than the predevelopment area which will facilitate a smaller earlier peak flow in the stream prior to the larger peak from the upstream catchment. As outlined within the Addendum to the LWMS, the spreading of the peaks means that the predevelopment and post development flows are the same.

Stage 4 drainage is proposed to be directed into the Kulungar Park drainage system which has been analysed in previous UWMP calculations to have excess capacity sufficient to cater for the Stage 5 area.

Lot drainage will be in soakwells with overflow to lot connection points provided for each lot. Subsoil drainage will be installed in conjunction with piped street drainage to control the rise of perched groundwater below the sand layer.

Stormwater design will be done to the standards of the City of Swan and as detailed in the Local Water Management Strategy (LWMS) and the Urban Water Management Plan (UWMP) which will be prepared in conjunction with the detailed subdivision design.

## 8. Groundwater

Based on regional mapping in the 1995 Groundwater Atlas, the ambient groundwater level at the site is expected to grade from around RL9.0m AHD on the southern side of the Rosehill development to around RL5.0m AHD at the Helena River. This is significantly contrasted by the 2004 Atlas which indicates groundwater grading from RL5.0m AHD on the southern side of the development to RL1.0m AHD at the Helena River.

As part of the UWMP investigations it was recorded that groundwater graded from between RL7.17m AHD at peak and 5.07m AHD at low on the southern boundary of the site to RL5.74 at peak and RL2.74 at low abutting the Helena River. The relatively high levels in combination with the significant difference between the peak and lows indicate that there is either perching or subsurface pressure from a confirmed aquifer which is affecting the groundwater levels. Given the clay encountered in geotechnical investigations and the poor drainage characteristics of the natural soil, it is unsurprising that groundwater does perch over the winter months.

As a result, it is necessary to ensure a good subsoil drainage system is employed to control perching of water over the winter months.

## 9. Power

Sufficient power supply exists in the area to supply the development. Low and high voltage underground power is available along existing abutting roads.

Stages 4 and 5 are more or less infill developments and will be serviced by extension of the existing power infrastructure installed as part of abutting stages. It is unlikely additional transformers or HV extensions will be required.

Stages 6 and 7 will require extension of the high voltage power together with the installation of a new transformer and switchgear to service the required development.

All subdivisional power reticulation lines and transformer installations will be constructed at the cost of the developer. Transformer sites will be determined at the detailed subdivision design stage.

## 10. Water Supply

Sufficient water supply exists in the area to service this development.

At present there is a 250mm reticulation water main along West Parade that will be used to service Stages 6 and 7. This will interlink with the existing 150mm main along Lautour Street.

Stage 4 has an existing 150mm main ready for connection and Stage 5 is surrounded by existing 100mm mains which will be interconnected through the proposed development.

## 11. Sewer

Similar to water reticulation, provision for sewer for Stages 4 and 4 has been made in the surrounding network.

For Stages 6 and 7, there is an existing deep DN225mm sewer (Some 4-6.0m depth) which links from the existing western development at the intersection of Lautour Street and The Embankment through to the western side of the Rosehill Waters frontage to West Parade. This has been laid to suit a former subdivision design, hence some alterations to individual lot connections will need to be made, but the sewer has sufficient capacity and depth to service the development of the area.

Internal sewers will allow for future extensions to abutting properties as required.

## 12. Telephone & NBN

The existing development is serviced by NBN and Stages 4 and 5 have infrastructure awaiting extension to service the new lots. Stages 6 and 7 will be extended from the existing infrastructure along West Parade and from the existing development south of West Parade.

In accordance with recent requirements, the developer is required to install NBN “pipe and pit” to allow for future installation of cables for the NBN. The design of the “pipe & pit” is the responsibility of the developer, and will be designed in conjunction with the underground power network, and installed during the construction phase of the development.

## 13. Gas

Gas mains are installed in the neighbouring developments to the east, but to date no gas has been installed within the Rosehill Waters development. As a result, Stages 4 and 5 will not be provided with gas. The provision of gas to Stages 6 and 7, particularly with the proposed commercial/tourism venue for Rosehill Lodge, is currently being considered. To provide this services, there is a 160 medium pressure (MP) main on the eastern frontage of Rosehill Waters to West Parade and existing gas mains in the abutting development encompassing Brooking Street, Lautour Street and The Embankment.

In the event that it is decided to pursue this for Stages 6 and 7, it is expected that reticulated gas services will be extended for residential lots by ATCO in the normal way, with trenching undertaken by the developer.

DEVELOPMENT ENGINEERING CONSULTANTS PTY LTD

THIS REPORT IS DATED 15<sup>TH</sup> APRIL 2021.



## **ATTACHMENT A: OVERALL CONCEPT PLAN AND PLANS OVER STAGES 4-7**



## LEGEND

- STRUCTURE PLAN AREA
- P.A.W. PUBLIC ACCESS WAY
- 10m WIDE LANDSCAPE STRIP

## ZONES

- RESIDENTIAL R20
- RESIDENTIAL R30
- SPECIAL USE

## RESERVES

- PUBLIC OPEN SPACE
- FORESHORE RESERVE
- DRAINAGE
- PUBLIC PURPOSES - WATER CORPORATION

## ROAD RESERVES

- INTEGRATOR B
- NEIGHBOURHOOD CONNECTOR
- LOCAL ACCESS STREET

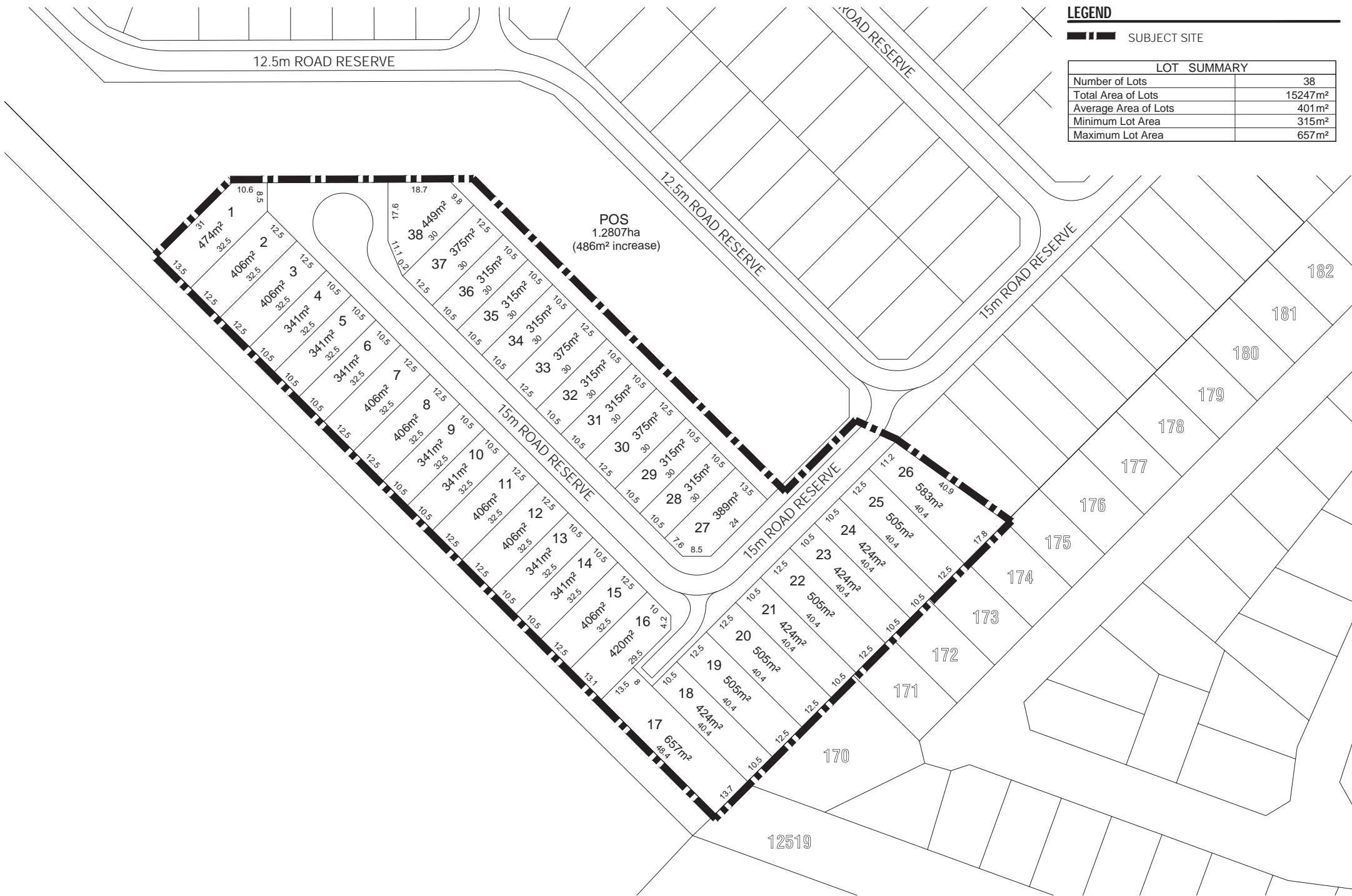
## NOTES

- [P1/2] PRECINCT AS DEFINED BY CITY OF SWAN LOCAL PLANNING SCHEME NO.17
- 125m NOISE BUFFER TO BE IN COMPLIANCE WITH STATE PLANNING POLICY 5.4 ROAD AND RAIL TRANSPORT NOISE AND FREIGHT CONSIDERATIONS IN LAND USE PLANNING AND IMPLEMENTATION GUIDELINES FOR SPP 5.4.

Subdivision design is indicative only and subject to further detailed survey, engineering and design.

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LEGEND	
	SUBJECT SITE
LOT SUMMARY	
Number of Lots	38
Total Area of Lots	15247m²
Average Area of Lots	401m²
Minimum Lot Area	315m²
Maximum Lot Area	657m²



Lot 9008 Concept Plan R30  
Rosehill Waters Estate

Level 14, The Quadrant, 1 William Street | Perth WA 6000 Australia | +61 8 9346 0500 | URBIS Pty Ltd | ABN 50 105 256 228

DATA SOURCE  
MNG  
PROJECTION  
PCG94

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RWN Property

1:1000 @ A3

PROJECT NO.  
P0021785  
DRAWING NO.  
09

DATE  
01.09.2020  
REVISION  
b



LEGEND	
	SUBJECT SITE
LOT SUMMARY	
Number of Lots	67
Total Area of Lots	25125m <sup>2</sup>
Average Area of Lots	375m <sup>2</sup>
Minimum Lot Area	312m <sup>2</sup>
Maximum Lot Area	791m <sup>2</sup>



Lot 802 Concept Plan R30  
Rosehill Waters Estate

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PROJECTION  
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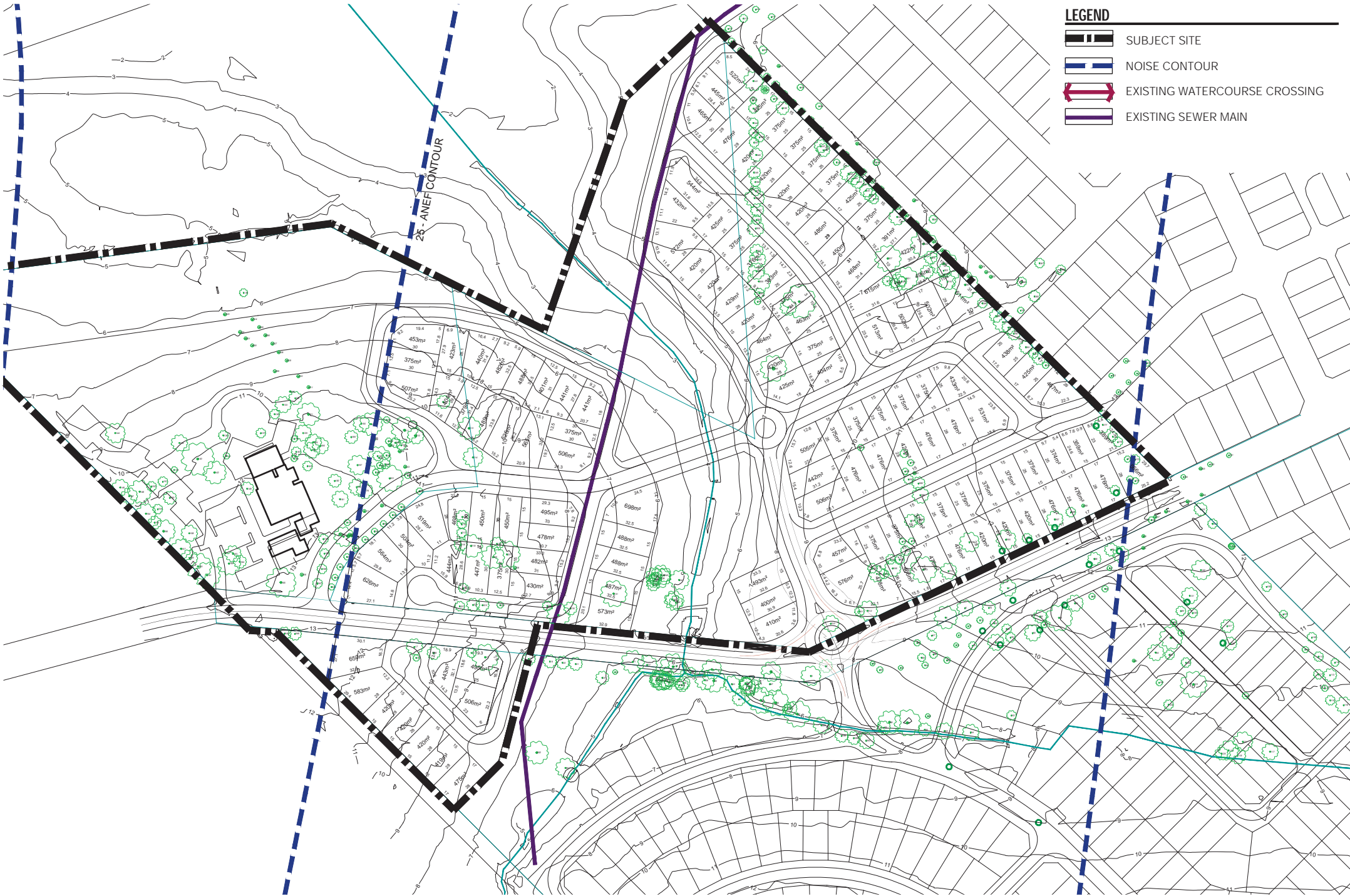
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RWN Property

1:1000 @ A3

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08  
DATE  
19.08.2020  
REVISION  
a





LEGEND

SUBJECT SITE

NOISE CONTOUR

EXISTING WATERCOURSE CROSSING

EXISTING SEWER MAIN



Preliminary Subdivision Layout - Stages 6 and 7

Rosehill Waters Estate

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PCG94

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RWN Property

1:2000 @ A3

PROJECT NO.  
P0021785

DRAWING NO.  
10

REVISION  
b

DATE  
16.10.2020

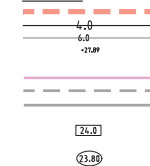
## **ATTACHMENT B: STAGE EARTHWORKS PLANS**







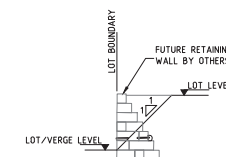
LEGEND



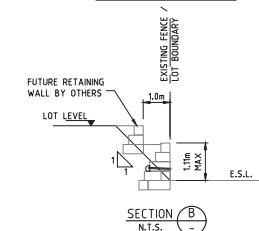
- EXTENT OF EARTHWORKS  
FINISHED SURFACE CONTOURS (0.50m INTERVALS)  
EXISTING SURFACE CONTOUR  
EXISTING SURFACE SPOT LEVEL  
  
PROPOSED RETAINING WALL  
FUTURE RETAINING WALL  
EXISTING RETAINING WALL  
  
PROPOSED LOT LEVEL (FLAT LOT)  
  
PROPOSED AVERAGE LOT LEVEL  
(SLOPING LOT)

## EARTHWORKS NOTES:

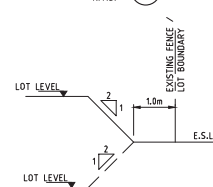
1. GENERAL
  - 1.1. LEVELS ARE REDUCED FROM A.H.D
  - 1.2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION
  - 1.3. DESIGN LEVELS SHOWN ON THIS DRAWING ARE THE FINISHED SURFACE LEVELS INCLUDING 100mm TOPSOIL IN LOTS
  - 1.4. WORKS ARE TO BE COMPLETED WITHIN THE DESIGNATED BOUNDARY ONLY AND BATTERED TO E.S.L. REFER SECTION A
2. TOPSOIL
  - 2.1. THE CONTRACTOR SHALL RETAIN ALL TREES WHERE POSSIBLE OR AS DIRECTED BY THE SUPERINTENDENT. CLEAR VEGETATION FROM THE EARTHWORKS AREA AND REMOVE TOPSOIL 100mm MIN TO A STOCKPILE
  - 2.2. FOLLOWING THE COMPLETION OF EARTHWORKS THE CONTRACTOR SHALL RESPREAD TOPSOIL OVER THE WORKS AREA
  - 2.3. EXCESS TOPSOIL SHALL BE REMOVED FROM SITE
3. EARTHWORKS
  - 3.1. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND MANPOWER TO THE MINIMUM AREA NECESSARY AND PROTECT ALL VEGETATION
  - 3.2. THE CONTRACTOR SHALL CUT AND FILL THE SITE AS SPECIFIED FOR DESIGN DETAILS OF EARTHWORKS WITHIN THE ROAD
  - 3.3. RESERVES REFER TO THE LONGITUDINAL AND CROSS SECTION DRAWINGS
  - 3.4. THE CONTRACTOR SHALL GRADE EVENLY BETWEEN THE DESIGN CONTOURS AND SPOT LEVELS SHOWN
  - 3.5. EXISTING ROAD VERGES ARE TO BE TRIMMED AT 2% FROM TOP OF KERB
4. DUST CONTROL
  - 4.1. THE CONTRACTOR SHALL ALLOW FOR DUST CONTROL MEASURES AS SPECIFIED
5. STABILISATION
  - 5.1. THE COMPLETED LOTS SHALL BE STABILISED WITH SEEDED HYDROMULCH AS SPECIFIED



TYPICAL SECTION  
THROUGH FUTURE WALL



SECTION B  
N.T.S. -



SECTION     A      
N.T.S.

1:500  
(A1)

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B	15/04/21	SW	STAGE 4 AMENDED TO STAGE 5						SRA
A	01/04/21	W/B	INITIAL ISSUE - PRELIMINARY DESIGN						SRA
C	No.	DATE	BY	REVISION					

CLIENT: **NOAHS ROSEHILL WATERS PTY LTD**



DEVELOPMENT  
ENGINEERING  
CONSULTANTS

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WESTERN AUSTRALIA  
Ph: (08) 9481 1900  
Fax: (08) 9481 1700

PROJECT: **ROSEHILL ESTATE  
SOUTH GUILDFORD  
STAGE 5**

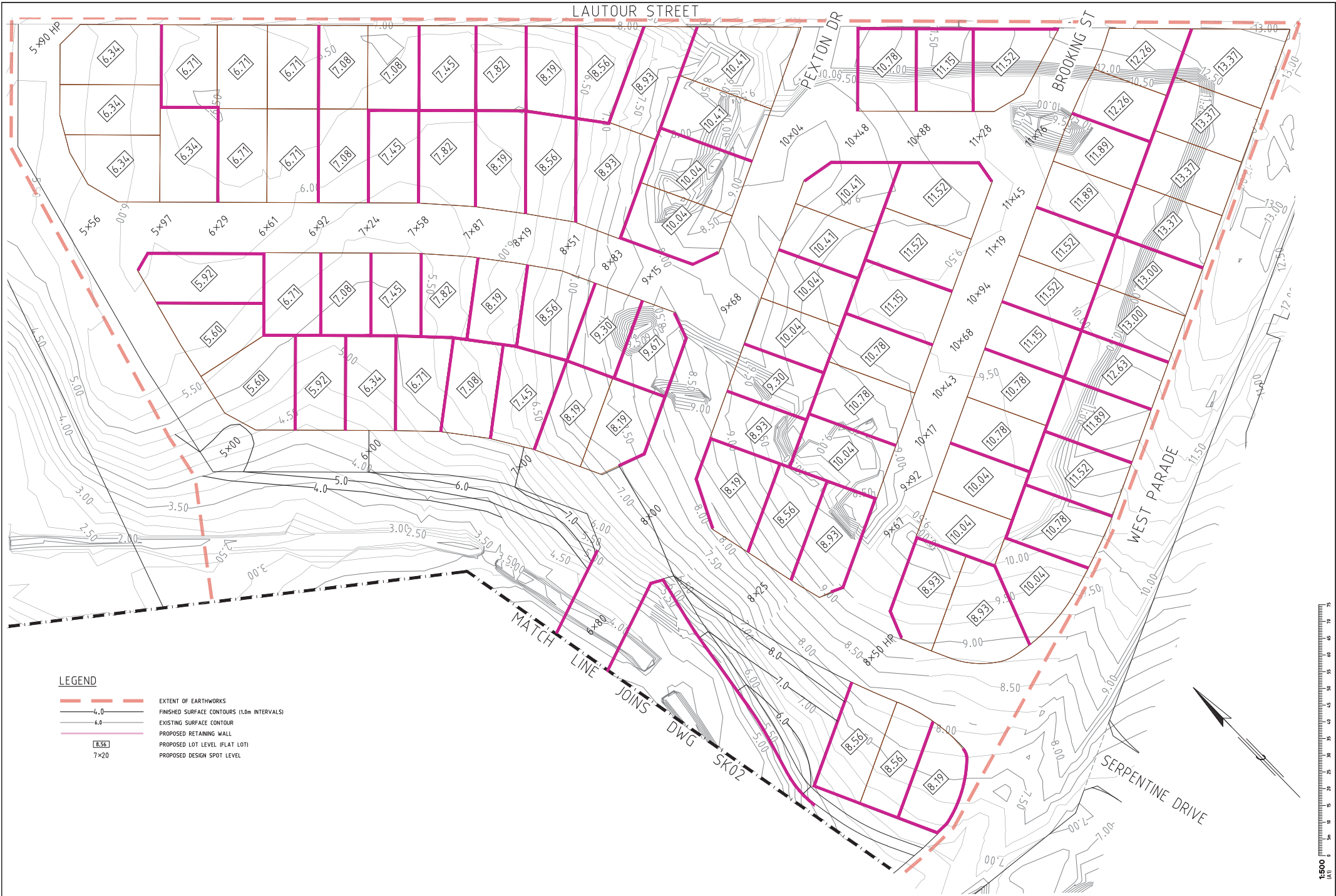
W.A.P.C. No. - 153831

DRAWING:  
**EARTHWORKS  
LAYOUT PLAN**

CAD DRAWING DO NOT MANUALLY ALTER

SCALE 1:500	DRAWN WJB	CHECK SRA	REV No.
DATE APR '21	DESIGNED WJB	APPROVED SRA	<b>B</b>
PROJECT NUMBER		DRAWING NUMBER	
<b>SGFNRW03E01</b>			
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**LEGEND**

- EXTENT OF EARTHWORKS
- FINISHED SURFACE CONTOURS (1.0m INTERVALS)
- EXISTING SURFACE CONTOUR
- PROPOSED RETAINING WALL
- PROPOSED LOT LEVEL (FLAT LOT)
- PROPOSED DESIGN SPOT LEVEL

8.56  
7x20



## **APPENDIX E**

## **TRAFFIC IMPACT ASSESSMENT (AND ADDENDUM – DENSITY)**



January 2022

Final Rev 2

Rosehill Waters Structure Plan  
Amendments A & B

Prepared For:  
Noahs Rosehill Waters Pty Ltd

Transport Impact Assessment  
Report





## DOCUMENT ISSUE AUTHORISATION

Issue	Rev	Date	Description	Author	Checked By	Approved By
0	0	29/03/2021	Draft TIA for SP Amendments A & B	SY	DNV	DNV
1	0	6/04/2021	Final Report	SY	DNV	DNV
1	1	17/08/2021	Revision 1	SY	DNV	DNV
1	2	28/01/2022	Revision 2	SY	DNV	DNV

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*Donald Veal Consultants Pty Ltd*

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# 1 INTRODUCTION

## 1.1 BACKGROUND

This Transport Impact Assessment (TIA) has been prepared by Donald Veal Consultants on behalf of Noahs Rosehill Waters Pty Ltd, with regard to the proposed Amendments A & B to the approved Structure Plan for Rosehill Waters, South Guildford.

The land was previously occupied by the Rosehill Country Club and Golf course. North of West Parade, the subject land comprises the Rosehill Lodge.

The approved Structure Plan comprised residential lots with a density of R20, some survey strata lots and an aged persons unit site. The development was also to continue a general civic/reception centre (some 1,000m<sup>2</sup>) which was located in the vicinity of West Parade and extended Pexton Drive. There were future plans to accommodate a local commercial centre within the ultimate community hub located on the north side of West Parade.

Due to changes in the airport noise contours (ANEF), two specific changes are now proposed to the original layout. These are known as Amendments A & B, and are the subject of this revised TIA.

It should be noted that during the approval process for the previous Structure Plan, and following extensive negotiations involving both the City of Swan and MRWA, agreement was reached regarding the required upgrades to the Great Eastern Highway / Queens Road intersection. Although the Developer subsequently provided the requisite funding to the City, this work has yet to be completed.

## 1.2 SCOPE OF ASSESSMENT

This TIA has been prepared in accordance with the Western Australian Planning Commission's (WAPC's) *Transport Assessment Guidelines for Developments Volume 2 Structure Plans* (2016). Its intent is to provide the approving authority with sufficient traffic information to confirm that the proponent has adequately considered the traffic aspects of the Structure Plan Amendments and that it would not have an adverse traffic impact on the surrounding area.

## 1.3 REFERENCES

The following documents are referred to in this report:

- *\*Liveable Neighbourhoods*, January 2009, WAPC and DOPI;
- *Transport Assessment Guidelines for Developments Vol 2 Structure Plans*, August 2016, WAPC;
- *Transport Assessment Guidelines for Developments Vol 4 Individual Developments*, August 2016, WAPC;
- *Guide to Traffic Generating Developments*, October 2002, Roads and Traffic Authority;
- *Residential Design Code (R-Codes) 2019*, WAPC; and
- *Austrorads Guide to Road Design Part 4A Unsignalised and Signalised Intersections*, 2017.



## 2 EXISTING SITE CONDITIONS

### 2.1 SITE LOCATION

The site lies within the City of Swan, in the suburb of South Guildford. It is located approximately 1 km directly south of Guildford, as the crow flies. Major arterial roads within close proximity include Great Eastern Highway (GEH) to the west, with GEH Bypass just to the south.

The site is mostly bounded to the north and southwest by open space and areas of bushland. Existing residential land uses lie to the northeast and southeast.

West Parade divides the site into two parts, separating the smaller northern section, including the Lodge area, from the main southern part, where most of the residential development will be located.

The northern part of the subject site is bordered by West Parade to the south and Lautour Street to the north east. Brooking Street terminates at the boundary.

The southern part of the subject site is bordered by West Parade to the north, and by Armitage Close and residential properties fronting Januk Turn to the north east, with other residential roads previously terminating at the boundary, but now extended to within the site. Edgar Wilks Entrance forms part of the south eastern boundary, as do residential properties fronting Gentle Circle.

**Figure 2.1** shows an aerial view of the subject site and puts its location into a local context.



**Figure 2.1: Existing Structure Plan Location in a Local Context**

*Source: Metromap*

## 2.2 CURRENT LAND USES

The southern portion of the site has now been cleared and subdivided, with a number of dwellings already occupied or currently under construction. Whilst the northern section has been partly cleared, the Lodge building remains.

Recent information suggests that dwellings have already been constructed on around 153 lots, with a further 40 dwellings currently under construction. There is no information available, however, regarding the occupancy rate of those completed dwellings.

## 2.3 EXISTING INTERNAL ROAD NETWORK

Several of the roads within the southern area have been at least partially constructed, including Serpentine Drive and Denmark Loop. There are no existing roads within the northern part of the site. A recent aerial view of the site is shown in **Figure 2.2**.



**Figure 2.2: Recent aerial of the Structure Plan area.**

*Source: Metromap*

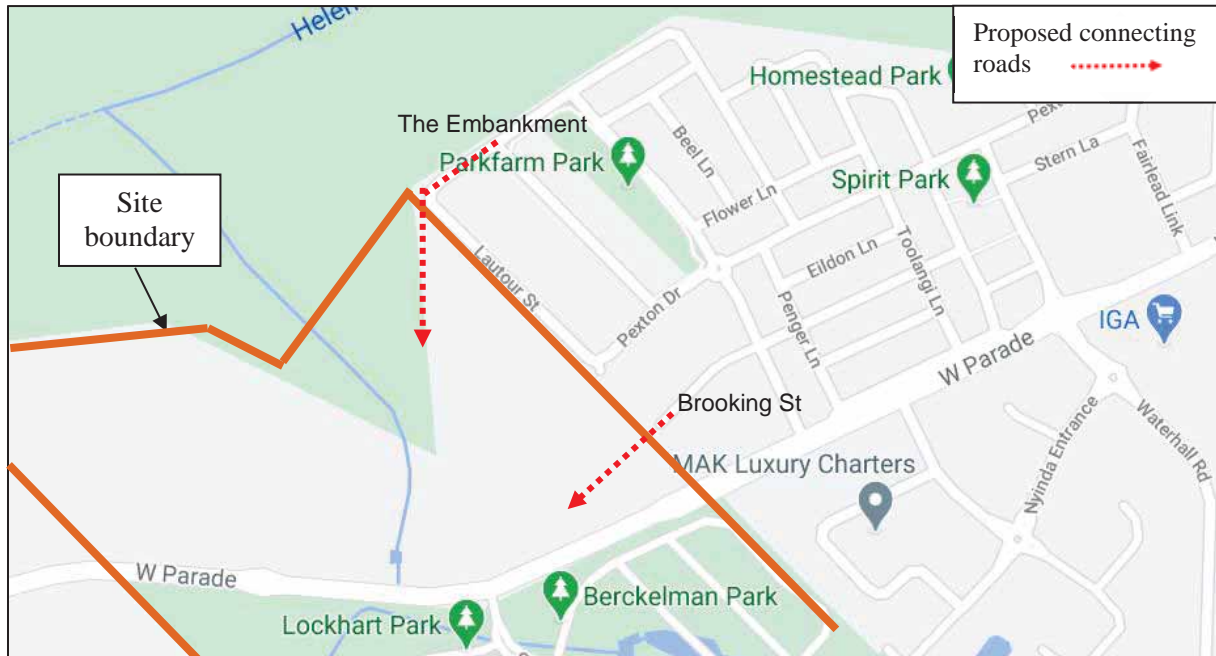
**Figures 2.3 & 2.4** show the existing roads adjacent and within the site, with some still under construction. Arrows in these diagrams show the intended points of access between the Structure Plan area's proposed internal road network and the existing adjacent networks.

In the northern part of the Structure Plan area, it is now intended that only The Embankment and Brooking Street be extended into the site. Pexton Drive will no longer be extended. Although the house numbering along Brooking Street can be readily extended, this cannot be done on Pexton Drive, and discontinuous road numbering relative to the street identity is likely to result in confusion for both visitors and emergency vehicles. Residential connectivity is nonetheless maintained through the "PAW".

A further advantage of the revised layout is that the less direct vehicular connections will reduce any potential for rat running along Pexton Drive.

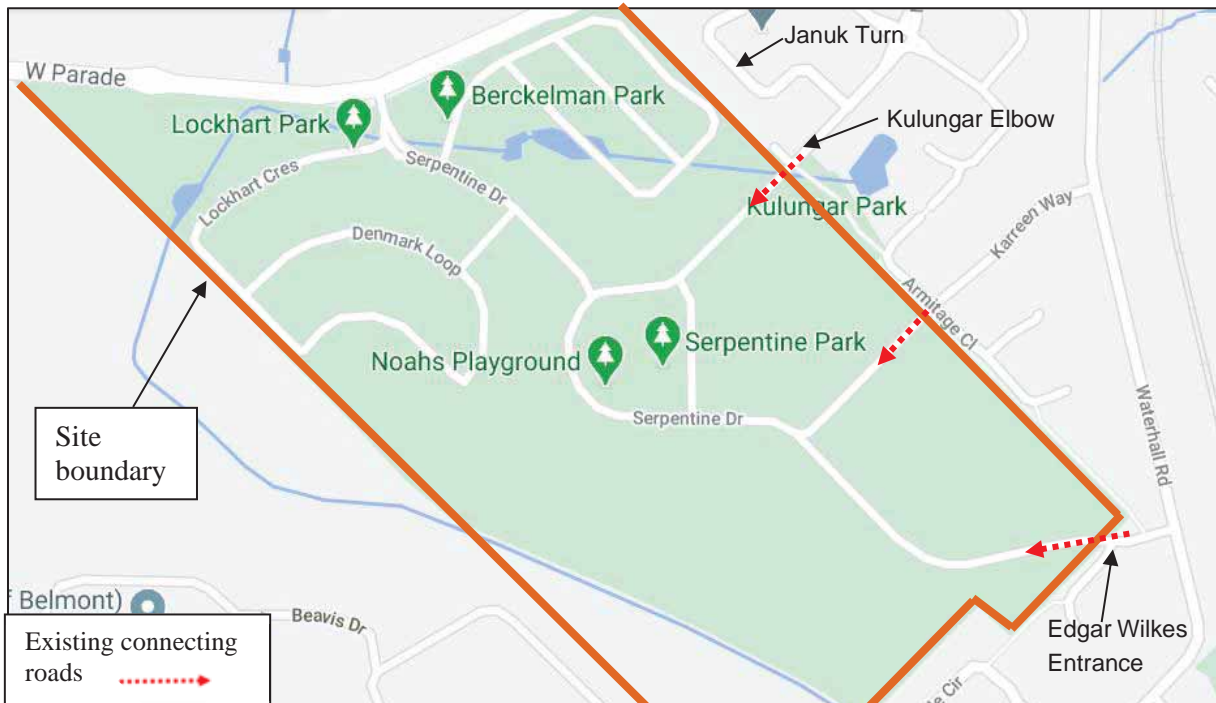


In the southern section of the site, the proposed links consist of extensions to Kulungar Elbow and Karreen Way, and the realignment of Edgar Wilkes Entrance to join Serpentine Drive. All three of these extensions into the site have already been constructed in accordance with the approved Structure Plan.



**Figure 2.3: Existing road network, north of West Parade**

*Source: Googlemaps*



**Figure 2.4: Existing road network, south of West Parade**

*Source: Googlemaps*

It should be noted that the changes associated with Structure Plan Amendment A do not generate sufficient additional trips to have any effect on the required road cross sections in the southern part of the site.

### **2.3.1 *Serpentine Drive***

Serpentine Drive has been built from Edgar Wilkes Entrance in the south, all the way through the site to West Parade in the north. The intersection with West Parade is currently constructed as a simple t-intersection, with priority given to vehicles on West Parade. However, once the northern part of the site is developed, this intersection will become a four-way and will be replaced with a roundabout.



**Photo 1: Serpentine Drive / West Parade is currently a t-intersection.**

Serpentine Drive is generally constructed as a kerbed single carriageway of approximately 7.5m in width. It has footpaths running along both sides for the most part.



**Photo 2: Typical section of Serpentine Drive.**



### **2.3.2 Kulunger Elbow**

Kulunger Elbow has been extended through into the Structure Plan area, where it intersects with Serpentine Drive. The extension has been constructed as a kerbed single carriageway of approximately 6.0m width, with a footpath running along its southern side.



**Photo 3: Kulunger Elbow now extends through into the structure plan area.**

### **2.3.3 Karreen Way**

Karreen Way has also been extended through into the Structure Plan area, where it too intersects with Serpentine Drive. It has also been constructed as a kerbed single carriageway of approximately 6.0m width, and has a footpath running along both sides.



**Photo 4: Karreen Way has also been extended through into the new development.**

### **2.3.4 Edgar Wilkes Entrance**

Edgar Wilkes Entrance has been modified to provide access to the Structure Plan area at the south eastern corner of the site. The road also continues to provide access to a number of existing residences to the south of the site, via a short cul-de-sac, whilst the main section of the road transitions into Serpentine Drive.



**Photo 5: Edgar Wilkes Entrance at its intersection with Waterhall Road.**

### **2.3.5 Other roads**

A number of other roads have also been built through the development, including Denmark Loop, Lockhart Crescent and Berkelman Circuit.



**Photo 6: Intersection of Denmark Loop with Lockhart Crescent.**

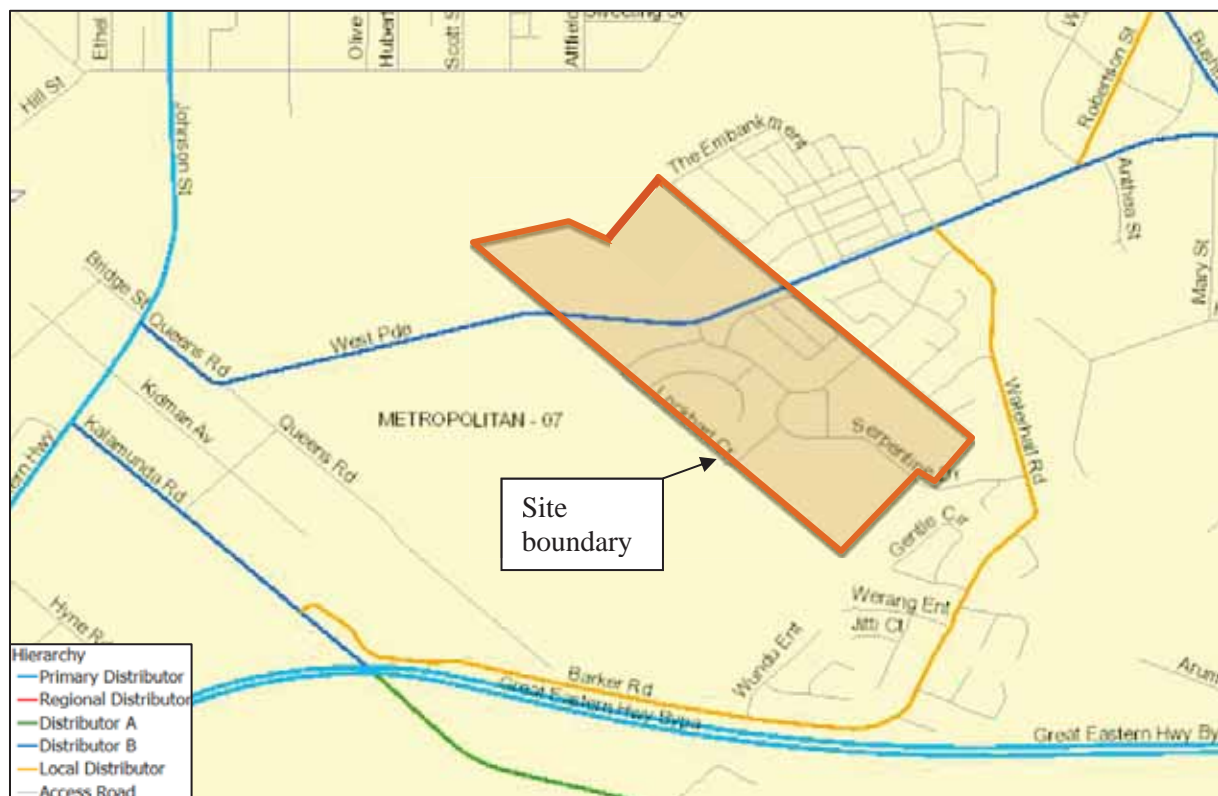




**Photo 7: Typical section of Berkelman Circuit.**

## 2.4 ROAD HIERARCHY CLASSIFICATION

**Figure 2.5** shows the road hierarchy classification of the surrounding road network.



**Figure 2.5: Road Hierarchy of surrounding road network** Source: MRWA Functional Road Hierarchy, Road Info Mapping

Great Eastern Highway is classified as a Primary Distributor road under Main Roads Western Australia's (MRWA's) Functional Road Hierarchy, whilst West Parade and Queens Road (north of West Parade) are classified as District Distributors B roads.

Waterhall Road is classified as Local Distributor under MRWA's Functional Road Hierarchy.

Other roads abutting or terminating at the site boundary are classified as *Access Roads*. These include Pexton Drive, Brooking Street, Kulunger Elbow, Karreen Way and Edgar Wilkes Entrance, whilst roads being built within the site, such as Serpentine Drive, will also be classified as Access Roads.

## 2.5 TRAFFIC VOLUMES

The latest available traffic counts for the surrounding road network were sourced from the City of Swan. These counts are used as a basis in Section 4 of this report to determine the extent to which the Rosehill Waters development traffic will impact on the operation of the respective roads.

Whilst these counts are the latest available, they are from 2017. However, the majority do show a slight decrease in weekday flows from those previously recorded in 2013.

**Table 2.1** summarises the most recent available data.

**Table 2.1: Existing Daily Traffic Flows for the Surrounding Road network**

Location	Date	AWT (vpd)	AM Peak		PM Peak	
			Hour	Volume	Hour	Volume
<b>Highman Street, North of Kalamunda Road</b>	07/2017	644	0700-0800	65	1600-1700	62
<b>Karreen Way, West of Waterhall Road</b>	11/2017	319	0800-0900	27	1600-1700	28
<b>Nyinda Entrance, West of Waterhall Road</b>	11/2017	434	0800-0900	33	1600-1700	38
<b>Pexton Drive, East of Parkfarm Drive</b>	11/2017	356	0800-0900	28	1700-1800	31
<b>Pexton Drive, West of Parkfarm Drive</b>	11/2017	296	0800-0900	26	1700-1800	31
<b>Queens Road, East of GEH</b>	07/2017	2,901	0800-0900	244	1700-1800	266
<b>Queens Road, East of West Parade</b>	07/2017	706	0700-0800	54	1600-1700	80



<b>Waterhall Road, South of Nyinda Entrance</b>	11/2017	1,873	0800-0900	141	1500-1600	183
<b>West Parade, East of Queens Road</b>	08/2017	3,016	0800-0900	254	1600-1700	294
<b>West Parade, West of Wynne Street</b>	12/2017	3,745	0800-0900	339	1600-1700	381
<b>West Parade, West of Waterhall Road</b>	11/2017	2,684	0800-0900	221	1700-1800	248

Source: City of Swan

Although the flows on some of the adjacent local roads, especially within the Waterhall Estate showed slight increases from the 2013 figures used in the previous TIA report, the flows on the more major roads have actually dropped by 2017.

The average daily flow on Queens Road, east of Great Eastern Highway fell by around 250 vehicles per day (vpd) in this period, whilst flows on West Parade, east of Queens Road dropped by almost 300 vpd.

## 2.6 DVC TRAFFIC SURVEYS

As the previous turning counts carried out at the intersections of Great Eastern Highway with Queens Road and Kalamunda Road were carried out in 2013 and 2016 respectively, DVC carried out new peak hour turning count surveys on Tuesday 2<sup>nd</sup> and Wednesday 3<sup>rd</sup> March, 2021.

As identified, a number of dwellings have at this time already been built and occupied within the Rosehill development, whilst the construction of others is also generating peak hour trips to and from the structure plan area. In order to quantify these trips, turning counts were also carried out at the intersection of Serpentine Drive with West Parade.

The results of these surveys are attached in **Appendix A**, and have been used in the calculations of trip generation and intersection operation.

### 2.6.1 Rosehill generated traffic

The traffic analysis undertaken in the previous TIA, which was completed in 2016, used background traffic levels and forecast levels of traffic growth that were based on the information available at that time. However, it is now necessary to update the predicted traffic flows using more recent data, and the latest forecasts regarding traffic growth over the coming years.

DVC carried out turning count surveys at a number of locations in March 2021, in order to obtain updated background traffic data. However, the background traffic at this time already includes the trips being generated by those lots within the Rosehill Waters development that have been constructed, and which are already occupied. In addition, a certain number of these trips can also be attributed to the construction process of those dwellings currently being built.

At the present time, the latest information indicates that 153 lots have already been built upon, although it is not expected that they will all be occupied. A further 40 are currently under construction.

Using the same trip generation rate of 9 trips per day per dwelling, it can be estimated that up to 1,377 trips per day might be generated at this stage, with around 122 occurring in each of the peak hours. A further 240 or so daily trips might be generated by the ongoing construction process. The latter trips, however, would mostly be either off-peak, or in the off peak direction.

The level of trip generation from the recently completed dwellings and the ongoing construction within Rosehill can be gauged to some extent by the surveys carried out at the Serpentine Drive / West Parade intersection.

The surveys showed that in the AM peak hour, 60 vehicles exited the development at this point, with 72% of these heading west along West Parade. 22 vehicles entered, with 77% coming from the west.

This total of 82 trips indicates that around two thirds of the likely peak hour trips, generated by the currently completed dwellings, are using the Serpentine Drive / West Parade access in the AM peak.

However, it should be noted that the directional split of those trips being generated by the initial stages of the development cannot be simply increased pro-rata to represent that of the completed development. The *percentage* of trips turning one way may change significantly as the development expands, and the resultant trip numbers increase. In the early stages, when only a few additional dwellings are generating trips, although the number of trips may be low, the *proportion* of them using the Queens / GEH may be quite high. But as more dwellings are occupied, and the number of trips increase, drivers will, as previously identified, begin to select alternative routes, and the *percentage* heading west will start to decline. The longer term percentage split will be affected still further by the opening of other alternative routes, such as the Lloyd Street extension.

In the previous TIA, 166 AM peak hour trips were forecast to be added to West Parade west of the development for the ultimate scenario. This was based on a total residential yield of 551 dwellings, not including the proposed aged persons units, which were not allocated any peak hour trips.

Thus, for 153 completed lots (assuming them all to be occupied), we would expect around 46 additional AM peak hour trips on West Parade west of Serpentine Drive. The surveys in fact show a total of 60 vehicles turning right in and left out of Serpentine Drive during this period.

This variation in the general distribution of trips, compared to that employed in the previous assessment of the completed development, is probably due to a number of factors. The first is as described above, whereby alternative routes are not yet necessary for most drivers. Second is the presence of construction traffic, although this would be expected to be mostly off peak, whilst another is that the majority of the completed dwellings are located in the northern part of the main section of the site, making access via this intersection more attractive. This should even up as more construction is completed in the southern parts.

### **2.6.2 West Parade background traffic**

The previous TIA established that once traffic flows on West Parade reach a certain level, it is likely that a proportion of drivers will begin to identify alternative route options, especially for accessing GEH. However, with the current levels of traffic and the relatively short delays and queuing seen at the intersection of Queens Road with GEH, it is reasonable to assume that most of the traffic entering and leaving Serpentine Drive to and from the west also uses the Queens Road intersection.

By removing the peak hour trips associated with the current Rosehill development, as identified at the intersection with Serpentine Drive, from those on West Parade and at the Queens Road / GEH intersection, we can arrive at a best estimate of the background flow, without the Rosehill development traffic. We can then use 2021 as the base year and then apply the growth factors for future years to the background traffic only.

### **2.6.3 Intersection of GEH with Queens Road**

DVC also carried out turning counts at the GEH / Queens Road intersection.

In addition to counting the turning movements, a record was kept of the queue lengths and delays throughout each peak period. This showed that whilst the average delay for right turners out of the side road was only around 105 seconds in the AM peak and 42 seconds in the PM, there were one or two outliers of up to 350 seconds, where a particular driver required a much longer gap. These events were rare, but had a knock on effect on other delays, to both left and right turners waiting behind in the queue.

## **2.7 PLANNED CHANGES TO THE ADJACENT ROAD NETWORK**

### **2.7.1 Intersection of GEH with Queens Road**

Prior to the approval of the previous Structure Plan, extensive negotiations were carried out, involving both the City of Swan and MRWA, regarding the required upgrades to the Great Eastern Highway / Queens Road intersection.

At the conclusion of the negotiations, it was agreed that an extended left turn lane would be installed on the Queens Road approach, to reduce the amount to which drivers turning left are blocked by vehicles queuing to turn right.

**The City received the required funds from the developer in 2017 to complete this upgrade, which it is understood will be carried out at the City's discretion.**

### **2.7.2 Helena River Bridge Duplication**

MRWA previously provided us with details of a long term planned upgrade to the GEH in the vicinity of the intersection with Queens Road. The improvement involves upgrading GEH to dual 2-lane configuration, with associated duplication of the river bridge.

The indicated treatments for the Queens Road intersection in the design concept include the closure of Bridge Street, the widening of the approach of Queens Road and the provision of a kerbed median along GEH, allowing a two-stage right turn out.

There is no current timetable to implement the improvement, but MRWA advises that the duplication is still likely to occur ‘at some stage in the future’.

### **2.7.3 Lloyd Street Extension**

The extension of Lloyd Street through to the GEH Bypass is being carried out in a number of stages, and is currently still under construction. A Media Statement released in February 2021 confirmed the appointment of the Greater Connect consortium to deliver the ‘Great Eastern Highway Bypass Interchanges project’.

The release identified that the project would include ‘.. *a new bridge over the Helena River completing the extension of Lloyd Street from Clayton Street to Stirling Crescent...*’, and that ‘..*completion (of the overall project) is expected by mid-2024..*’.

The planned route for the extension will cross Bushmead Road to the east of the Rosehill development.

Whilst some residents of the new development may well use this road in preference to the existing links via West Parade, depending on their destinations, the road should also take some traffic off the intersection of GEH with Queens Road, as drivers begin to use GEH Bypass or Kalamunda Road in preference. This has been confirmed by MRWA, but the full extent of the above redistribution has not been established.

## **2.8 CRASH HISTORY**

The MRWA CARS database was interrogated to identify the history of crashes occurring within 50m of the Great Eastern Highway / Queens Road intersection in the latest 5-year reporting period, 2016 – 2020.

The database returned only 11 crashes within this period. Of these, 7 involved a right turning vehicle, with two others being rear end crashes. One of the crashes required a hospital visit, whilst 3 more required medical attention. The remaining 7 crashes resulted in property damage only.

It is noted that only three of the right turning crashes occurred during weekday peak hour periods, with two occurring between 6 and 9 am, and the third between 3 and 6 pm.

According to MRWA’s Intersection Crash Ranking page, the intersection is ranked 1,773 in the State in terms of crash frequency, and 2,269 in terms of crash costs, although these figures are based on the 5 year period ending 31<sup>st</sup> December 2019. None of the crash details are marked as being higher than expected.



### 3 STRUCTURE PLAN AMENDMENTS

#### 3.1 STRUCTURE PLAN CONTEXT

Following changes in the airport noise contours (ANEF), two amendments have been proposed to the approved Structure Plan. These are known as Amendments A & B.

**Amendment A** consists of the rezoning of the Strata Lots in Stage 4 from R20 to R30 and the replacement of the previously proposed site for aged persons' units in Stage 5, again with R30 housing.

**Amendment B** clarifies the proposed development of the area to the north, around the Lodge, which will now consist of a number of hospitality and tourism related businesses, such as a function centre, restaurant, cafe and motel accommodation, together with some residential housing lots. Ten of these lots will be in the area immediately south of West Parade. As a part of the revised layout in the northern section, Pexton Drive will no longer be extended through into the site, for the reasons set out in section 2.3 above.

Following approval of the original Structure Plan, the site was mostly cleared, in preparation for development. A number of the roads within the southern section have now been built, with others under construction.

At the current time, some 270 lots have been sold. 153 of these have already been built upon, with a further 40 under construction.

The Lodge building associated with the former Rosehill Country Club and Golf course to the north of West Parade have been retained, and will be at least partially incorporated into the development identified in Amendment B.

*Note: Since preparation of the TIA, Stage 4 has been removed from the proposed recoding to R30, and will remain at R20.*

#### 3.2 PROPOSED LAND USES

The approved Structure Plan proposed a typical residential density of R20 with some survey strata lots, and some aged persons' units. This has been revised in accordance with Amendments A & B.

It should be noted that whilst the concept layout plan used in the original Structure Plan TIA only showed 616 lots, the ultimate number of lots was anticipated to be 642 - pending a future amendment to the Metropolitan Region Scheme (MRS) and local planning scheme to rezone the land as urban and land swap for the portion of land which was not included in the MRS Amendment (1266/57). Hence, the traffic analysis in that report was based on 642 lots.

As a result of the changes made in Amendments A & B, the total number of residential lots will now be 633. **Figure 3.1** shows the revised Concept Plan, incorporating those changes, as identified in Section 3.1 above.

**Figure 3.1: Concept Plan***Source: Urbis*

**Table 3.1** details the revised lot yields.

**Table 3.1: Rosehill Waters Structure Plan Revised Lot numbers**

Land Uses	Area	Lots
Residential R20	235,962m <sup>2</sup>	528
Residential R30	40,370m <sup>2</sup>	105
<b>Total</b>	<b>276,332m<sup>2</sup></b>	<b>633</b>

Source: Urbis Feb 2021

A concept layout of the Lodge development is shown in **Figure 3.2**.



**Figure 3.2: Concept layout for the Lodge development.**

**Table 3.2** shows the latest estimates of land use areas, staffing levels and parking requirements for the various elements of the Lodge development.



**Table 3.2: Rosehill Lodge proposed land uses**

<b>EXISTING LODGE</b>			
Room	Area	Area per person @1.5 sqm/ pp	Vehicle Parking Standards @1 space for every 4 person
Cafe	96 sqm	64 pax	16 bays
Sub-total	96 sqm	64 pax	16 bays
Room	Area	Area per person @4 sqm/ pp	Vehicle Parking Standards @1 space for every 4 person
Multipurpose Space	98 sqm	24.5 pax	6.125 bays
Sub-total	98 sqm	24.5 pax	6.125 bays
Room (BOH)	Area	Area per person (estimated)	Vehicle Parking Standards @1 space for every 4 person
Bar	11sqm	1 staff	0.25 bays
Kitchen	88 sqm	2 staff	0.5 bays
Waitstaff	n/a	2 staff	0.5 bays
Sub-total	99 sqm	5 staff	1.25 bays
Total (rounded)		89 pax 5 staff	22 customer bays 1 staff bay

<b>PROPOSED RESTAURANT</b>			
Room	Area	Area per person @1.5 sqm/ pp	Vehicle Parking Standards @1 space for every 4 person
Restaurant	231 sqm	154 pax	38.5 bays
Sub-total	231 sqm	154 pax	38.5 bays
Room (BOH)	Area	Area per person (estimated)	Vehicle Parking Standards @1 space for every 4 person
Bar	15 sqm	2 staff	0.5 bays
Chef	3 sqm	1 staff	0.25 bays
Kitchen	61 sqm	2 staff	0.5 bays
Waitstaff	n/a	3 staff	0.75 bays
Sub-total	79 sqm	8 staff	2 bays
Total (rounded)		154 pax 8 staff	39 customer bays 2 staff bays

<b>PROPOSED FUNCTION CENTRE</b>			
Room	Area	Area per person @1.5 sqm/ pp	Vehicle Parking Standards @1 space for every 4 person
Function Room	225 sqm	150 pax	37.5 bays
Sub-total	225 sqm	150 pax	37.5 bays
Room (BOH)	Area	Area per person (estimated)	Vehicle Parking Standards @ 1 space per employee
Bar	11 sqm	1 staff	1 bay
Kitchen	43 sqm	2 staff	2 bays
Waitstaff	n/a	2 staff	2 bays
Sub-total	54 sqm	5 staff	38 bays
Total (rounded)		150 pax 5 staff	38 customer bays 5 staff bays

<b>GRAND TOTAL</b>			
Patrons	Staff	Parking (customer)	Parking (staff)
393 pax	18 staff	99 bays	8 bays

Source: Fratelle Jan 2022



### 3.3 INTERNAL ROAD NETWORK – NORTHERN SECTION

The layout and road network in the northern section of the site is shown in **Figure 3.3**. This shows a number of changes to the layout included in the approved Structure Plan.



**Figure 3.3: Internal road network concept – northern section.** *Source: Urbis*

The main changes in terms of linking to existing roads will be the provision of a roundabout on West Parade, additional t-intersections onto West Parade to the west of the roundabout, and the removal of the Pexton Drive extension. The Embankment and Brooking Street will still be extended through into the site.

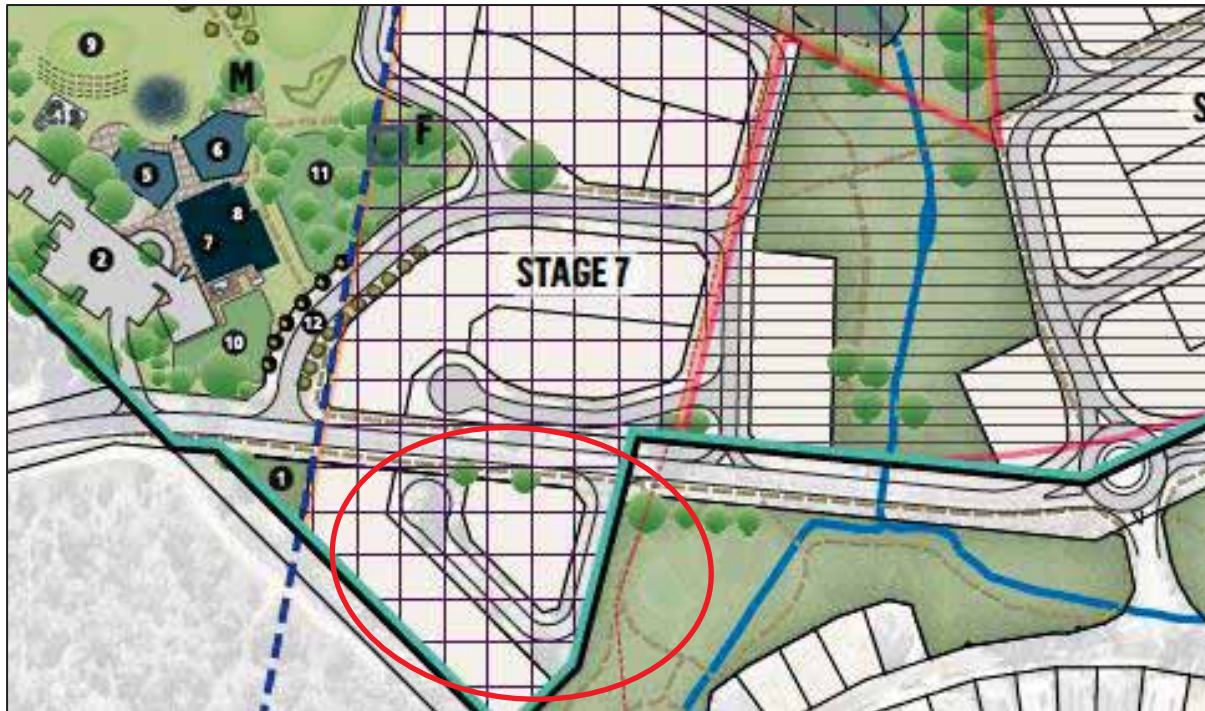
The road reserve widths for the revised and additional links resulting from Amendment B will be determined in the same manner as previously, with widths and cross sections generally based on Liveable Neighbourhoods.

### 3.4 INTERNAL ROAD NETWORK – SOUTHERN SECTION

Amendment A does not result in any major changes to the previously approved road reserves, cross sections or speed limits for the internal road network within the southern portion of the site.

The external roads providing links into the site within the southern section remain as previously identified, with Kulungar Elbow, Karreen Way and Edgar Wilkes Entrance all having already been extended.

Whilst the Lot configuration has been changed for the two Stages affected by Amendment A, the road network remains unchanged in these areas, other than slight changes to the short links within the affected stages. However, as shown in **Figure 3.4**, there will be an addition to the proposed road network as a result of the 10 residential dwellings to be located just south of West Parade, in the north western corner of the southern section, as part of Amendment B.



**Figure 3.4: Additional road link to the south of West Parade.**

### 3.5 WEST PARADE

The main revision to West Parade is at the intersection with Serpentine Drive. As can be seen, following revisions to the road network in the northern section, this intersection will become a four-way roundabout. The introduction of a roundabout will provide additional traffic calming along West Parade, and should facilitate movements in and out of the development more efficiently. It will also improve safety along this road, with a general reduction of speed and a significant reduction in the number of right turning movements across through traffic. A concept plan of the proposed roundabout is shown in **Appendix B**.

The existing central median islands to the west of this point, currently providing traffic calming, and previously used primarily by golfers crossing West Parade, will be removed to accommodate an additional intersection some 200m to the west of the Serpentine Drive roundabout, to service the 10 residential properties to be built on the southern side. A pedestrian crossing will be introduced to facilitate movements between the southern section and the Lodge area.

As can be seen in **Figure 3.4**, a left in-left out intersection will also be provided at Road C, primarily to provide a second bushfire access to this section of residential lots. This will be separated by a suitable distance from the intersection to the south. See **section 4.7** for further details.

## 4 ANALYSIS OF TRANSPORT NETWORKS

### 4.1 ASSESSMENT PARAMETERS

This transport assessment has been undertaken assuming full development of the Structure Plan including Amendments A & B. The latest estimated timeframes for the various elements of the development are as shown in **Table 4.1**.

**Table 4.1: Development Timeframe**

Development Stage	Estimated Timeframe
Residential Stage 1	June 2022
Residential Stage 2	Dec 2022
Residential Stage 3	June 2024
Residential Stage 4	June 2024
Residential Stage 5	July 2027
Residential Stage 6	July 2029
Residential Stage 7	July 2033
Lodge Stage 1 (Café)	Starting Operation June 2026
Lodge Stage 2 (Function & Brasserie)	Starting Operation June 2028
Lodge Stage 3 (Motel)	Starting Operation June 2030

Lot occupancy is forecast at 90%. (Not all houses will be occupied and not all lots will be built on). Unoccupied dwellings are assumed as 10% of housing stock. Note also a strong FIFO worker base exists within the area and hence not all owners are peak hour commuters.

Based on these timeframes, the SIDRA intersection analyses have been carried out for 2031 with full development. A 2041 ‘ten years after’ scenario has not been analysed, on the basis that there is insufficient data available regarding the effect of land use and network changes to accurately forecast flows in 20 years’ time.

However, it is thought unlikely that there will be significant growth in background traffic on West Parade during this subsequent period, whilst other infrastructure upgrades, such as the Lloyd Street extension, may cause a significant redistribution of some trips. In addition, the potential dualling of GEH and the Helena River bridge may also increase capacity in that area. Hence, the 1% per annum growth factor used can be considered a worst case scenario.



## **4.2 MAJOR ATTRACTORS AND GENERATORS OF TRAFFIC**

The Amendments to the approved Structure Plan will have no significant effect on the general distribution of peak hour trips. The residential lots will remain the major traffic generating land use within the Structure Plan area, creating commuter trips during both the morning and afternoon peak periods, as well as local trips throughout the day.

The Lodge area development will generate traffic primarily during off peak times, other than perhaps staff arrivals, with even these movements being in the non-peak direction. Whilst the function centre will be used by motel guests and vice versa, the café and restaurant are perhaps likely to attract a significant proportion of their visitors from the adjacent residential developments, including those of Rosehill and Waterhall.

Any additional morning peak hour commuter traffic generated by the structure plan Amendments would continue to be attracted to the major local employment centres of Midland and Guildford, as well as to Perth airport and Perth itself. Such commuter traffic would be spread over a number of roads on the adjacent network, including West Parade, Queens Road, Kalamunda Road, GEH, Waterhall Road and the GEH Bypass.

## **4.3 NON-SUBDIVISION TRAFFIC**

South of West Parade, the structure plan Amendments are not expected to have any significant effect on the very low number of previously identified potential movements between the Waterhall and Rosehill developments. North of West Parade, the revised road layout has reduced the connectivity between the existing and proposed developments, with Pexton Drive, previously the most likely link to be used, no longer connecting through.

The level of non-subdivision traffic expected to pass through the Structure Plan area therefore remains minimal and the resultant impact on the proposed intersections would be negligible.

## **4.4 TRIP GENERATION**

### **4.4.1 Trip Generation Rates**

In order to determine the traffic generation for the proposed development, trip generation rates for the residential lots were previously sourced from the *Guide to Trip Generating Developments*, NSW Road Traffic Authority (2002). The breakdown of inbound and outbound trips for the peak hours was taken from those suggested in the Western Australia Planning Commission (WAPC) *Transport Assessment Guidelines for Developments (2016) Volume 4*.

Despite the rate of 9 trips per day being relatively high for residential dwellings in this area, these same rates and sources have been applied to the revised land uses resulting from Amendments A & B.

It should be noted that whilst the approved Structure Plan included a total of 615 residential dwellings, the TIA was carried out on a formerly proposed land swap scenario (which was not subsequently approved) that would have resulted in 642 dwellings.



Thus, the analysis previously carried out already included sufficient additional trips to cover most of the increases resulting from Amendments A & B.

#### **4.4.2 Amendment A**

DVC has reviewed the proposed land use changes for Stages 4 and 5 of Rosehill Waters from R20 to R30 for two lots within the overall development.

The most recent Transport Impact Assessment report produced by DVC dates from October 2016 when these areas were designated as Strata (Stage 5) and aged persons' units (Stage 4), respectively. Hence, for the purposes of assessing traffic impacts of structure plan Amendment A we have replaced the proposal for 41 Strata dwellings and 91 aged persons units with 38 x R30 dwellings and 67 x R30 dwellings, respectively.

Although there is now a lower number of lots within these two areas, the trip generation rate previously applied to the proposed aged persons' units was much lower. Thus, although the change in Stage 4 (Strata Survey to R30) actually results in a drop of 27 daily trips, the change in Stage 5 (from aged persons units to R30) produces an additional 421 daily trips. These two changes therefore result in an overall increase in daily traffic of 394 trips. Similarly, increases of about 51 trips are forecast to occur in each peak hour (AM and PM).

The resulting additional trips have been distributed in the same manner as for the previously approved structure plan. This translates to approximately 15 additional trips on West Parade, to the west of the site, in each peak hour.

*Note: Since preparation of the TIA, Stage 4 has been removed from the proposed recoding to R30, and will remain at R20.*

#### **4.4.3 Amendment B**

Amendment B relates to Stages 6 & 7 of Rosehill Waters, located in the northern section of the site, primarily in the Lodge area. The revised land uses include a function centre, restaurant, cafe and motel accommodation, as well as areas of residential development both north and south of West Parade.

The residential portion of the approved layout, north of West Parade was previously known as Stage 3b, and consisted of 90 dwellings. The larger area now referred to as Stages 6 & 7, which includes a small triangle of land to the south of West Parade, will contain 135 dwellings, as well as the other land uses identified above, in the Lodge area.

However, the calculations carried out in the previous TIA also allowed for an additional 27 dwellings, as part of a proposed land swap scenario. Thus, the net increase in this area is 18 lots.

Amendment B would therefore generate in the region of an additional 162 daily trips from the additional 18 residential lots, including around 14 additional trips in each peak hour (AM and PM).

The resulting additional trips have been distributed in the same manner as for the previously approved structure plan. This translates to approximately 4 additional trips on West Parade, to the west of the site, in each peak hour, with 10 to the east.

The additional trips to be generated by the other identified land uses included in Amendment B will be irregular, and mostly off peak. Based on the operating times of the commercial elements, listed in **Table 3.2** above, only a small number of staff movements are expected to coincide with the residential peaks. However, even these, for the most part, will be moving in the off-peak directions.

#### 4.4.4 Full development

The residential element of the proposed development is estimated to generate up to 507 trips during the peak hour. Compared to the residential element of the previously approved structure plan layout, this is an increase of around 66 trips in each peak hour. These will be distributed onto the network in a similar pattern to that previously employed.

In addition, the development of the Lodge area will generate a number of additional daily trips, although it is not expected that these commercial elements will generate very many trips during the weekday AM and PM peak hours. The main activity is likely to be at weekends and in the evenings.

Some motel guests may leave in the morning peak and the café is scheduled to operate between 7am and 2pm and may therefore attract some AM peak hour customers. Some early evening (PM peak hour) traffic may be attracted by the restaurant and Function Centre.

These trips have been included in **Table 4.2**, which shows the total AM and PM peak hour trip generation for the full development, including Amendments A & B. However, it should be noted that a significant proportion of them will be local, as the patrons of the café are likely to be residents of the adjacent developments, while the restaurant / brasserie will primarily service the Motel / Function Centre clients. Even the staff movements will generally occur in the off peak direction.

The additional trips have been distributed onto the network in a similar manner to that employed previously and will again be distributed over a number of different routes and access points, resulting in only minor increases on any given road, or at any specific intersection.

**Table 4.2: Trip Generation Rates**

Land Use	Lots	Rates					Trips				
		Daily	AM In	AM Out	PM In	PM Out	AM In	AM Out	PM In	PM Out	Daily
R20	528	9	0.2	0.6	0.5	0.3	106	317	264	158	4752
R30	105	9	0.2	0.6	0.5	0.3	21	63	53	32	945
Other	-						24	30	50	10	1200
Totals	633	18	0.4	1.2	1.0	0.6	151	410	367	200	6897
							561		567		

#### **4.5 TRIP DISTRIBUTION & ASSIGNMENT**

Amendments A & B will have no significant impact on the distribution of trips, which will remain fundamentally unchanged from that used for the approved structure plan.

There may be some local changes to the trip assignment, due to the slight changes in the internal road links within the northern section of the site, however the numbers of additional trips generated by the amendments using these links are small, and the overall distribution in terms of the impact on external intersections will be largely unaffected.

As identified in DVC's *Technical Note 1 Final Rev 3, dated June 2014*, it was estimated that 50% of the traffic generated by the development would travel on the section of West Parade to the east of the development, while 30% would travel on the section of West Parade to the west of the development. The remaining 20% would travel on Waterhall Road to the south of the development. These directional splits were estimated based on the expected origins and destinations of trips generated by the development, and the available road network, whilst also taking into account the existing directional splits observed at the adjacent Waterhall development.

Of the predicted 30% of exiting traffic travelling west from the development on West Parade, it was envisaged that during off peak periods most will continue to the intersection of Queens Road with Great Eastern Highway, before turning either left or right, in approximately equal proportions.

However, in line with MRWA's advice at that time, it was acknowledged that as traffic increased, more and more drivers would choose to avoid the intersection and take alternative routes during the peak periods. The main alternative option for residents of Rosehill was identified as the signalised intersection of Great Eastern Highway with Kalamunda Road.

The additional trips generated by Amendments A & B have been distributed on the same basis. This means that of the 70 AM and 68 PM additional peak hour trips, around 21 would be assigned to West Parade, west of the development, in each peak period, with the majority of these being rerouted through the Kalamunda Road intersection.

#### **4.6 ROAD CAPACITIES**

The traffic forecast to be generated by the Structure Plan area will be distributed over the existing road network via a number of routes and access points. According to *Liveable Neighbourhoods, (WAPC 2009)*, the indicative maximum volume of traffic suitable for an access street varies from 3,000 vpd based on a pavement width of at least 7.2m to 1,000 vpd based on a pavement width of 5.5-6m.

Amendments A & B are only expected to add in the region of 10% more daily trips compared to the previous TIA. This means that the revised flows within the development are still well within the capacities of the roads as constructed.

The additional trips generated along Kulunger Elbow and Karreen Way as a result of the Amendments are minimal, and will have no effect on the capacity of these roads.

Similarly, Serpentine Drive has a theoretical capacity of 3,000 vpd and the addition of a maximum of 394 vpd will mean that the road remains well within capacity.

West Parade is classified as an Integrator B under *Liveable Neighbourhoods* and can therefore carry up to 15,000 vpd. The 2017 volumes (**Table 3.1**) on this road, east of Queens Road, were 3,016 vpd (down from 3,300 in 2013).

Average traffic flows on West Parade, west of Waterhall Road, were recorded as 2,684 in 2017, some 100 vpd less than in 2013. From the DVC surveys of February 2021, background flows just west of the Serpentine Drive intersection, without development traffic, are estimated to be around 3,150 vpd, based on 10% peak hour flows.

Allowing for the increases from Amendments A & B, the development is expected to generate in the region of 2,000 vpd on this section of West Parade, bringing the total daily flow with the additional development traffic to just over 5,000. Again this is well below the suggested upper limit in *Liveable Neighbourhoods*.

Traffic flows on Waterhall Road are not expected to be affected significantly by the structure plan Amendments, and should also remain well within capacity.

#### 4.7 ACCESS SEPARATION ALONG WEST PARADE

The revised layout will result in four access points to the west of the roundabout on West Parade. See **Figure 4.1**.



**Figure 4.1: Access points on West Parade**

*Source: Urbis*



The access furthest to the west will be into the Lodge area (not shown), on the north side of West Parade. This will be located as far to the west as possible, close to the site boundary, on the outside of the bend and some 370m to the west of the roundabout. This access will be full movement, but is not expected to attract many peak period trips.

The second access will be the intersection with 'Road D', again to the north of West Parade. This access will also be full movement.

The small access serving the 10 lots to the south of West Parade is located roughly halfway between the Lodge access and the roundabout, whilst the fourth will be a left in left out restricted access at Road C, again to the north of West Parade, and being primarily necessary to provide an alternative bush fire emergency access option.

The smallest separation distance will be between Road A to the south and Road C to the north, at approximately 40m. This complies with the requirements of Liveable Neighbourhoods, and should be more than satisfactory for a 50 or 60 km/h speed environment. As noted, turning volumes are not expected to be particularly high at either of these accesses.

The Serpentine Drive roundabout has been analysed below in **Section 4.10**.

## 4.8 INTERSECTION ANALYSIS

### 4.8.1 General

Austrorads *Guide to Traffic Management* provides advice on the capacity of unsignalised intersections. For minor roads where there are relatively low volumes of turning traffic, capacity considerations are usually not significant and capacity analysis is unnecessary. Intersection volumes, below which capacity analysis is unnecessary, are indicated in **Table 4.3**.

It is seen that for a two lane major road, when the flow on the major road is 650 vehicles per hour (vph), the crossroads would easily accommodate up to 100 vph. On this basis, as with the previous assessment, the revisions to the internal road network links will not require specific intersection analysis.

**Table 4.3: Intersection Volumes below which Capacity Analysis is unnecessary (Austroads 2009)**

Type of road	Light cross and turning volumes maximum design hour volumes (vehicles per hour (two way))		
Four lane major road	1000	1500	2000
Crossroads	100	50	25
Two lane major road	400	500	650
Crossroads	250	200	100

### 4.8.2 Growth Rates

In the previous TIA analysis, a background traffic growth rate of 2% per annum was applied on existing traffic flows on West Parade in the vicinity of the subject site, for growth between 2013 and 2027. This was to allow for the latter stages of the Waterhall development, as well as other planned developments

along this road (including the planned Neighbourhood Centre with supermarket/specialty shops/medical centre at West Parade/Waterhall Road). This rate of growth equated to an overall increase of 8.2% by 2017, and 31.9% by 2027.

In fact, despite the Waterhall Shopping Centre opening in around 2016, the growth in traffic along West Parade has not reached the forecast levels, and 1% per annum growth, as applied to GEH, would appear to be a more reasonable rate.

#### **4.8.3 SIDRA**

SIDRA is an intersection-modelling tool commonly used by traffic engineers for all types of intersection analysis. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

**Degree of Saturation:** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.

**Level of Service (LOS):** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).

**Average Delay:** is the average of all travel time delays for vehicles passing through the intersection.

**95% Queue:** is the queue length below which 95% of all observed queue lengths fall.

### **4.9 GREAT EASTERN HIGHWAY/QUEENS ROAD**

#### **4.9.1 Proposed Improvements**

As identified in section 2.7.1, it has been agreed that an extended left turn lane will be installed on the Queens Road approach to its intersection with Great Eastern Highway, to reduce the amount to which drivers turning left are blocked by vehicles queuing to turn right.

Whilst the City received the required funds from the developer in 2017 to enable this upgrade, it is understood the timing as to when the works will be implemented will be at the discretion of the City.

#### **4.9.2 SIDRA Analysis ‘Existing flows including partial Rosehill traffic’**

The intersection of GEH with Queens Road was previously analysed using SIDRA for the existing traffic observed in 2013, prior to the construction of any lots on the Rosehill development. At that stage the right turns out of the side road already showed a poor level of service in both peak hour periods.

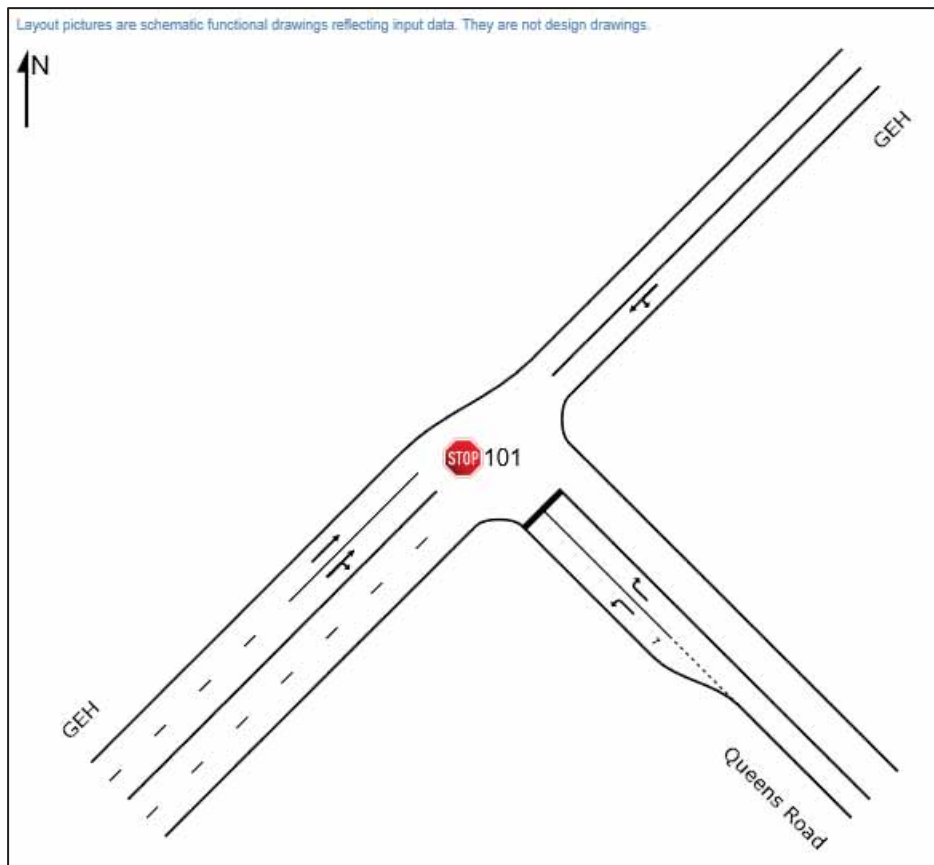
This intersection has now been reanalysed, using the turning count data collected during the recent DVC surveys. These turning movements now include not only 2021 background traffic (including trips from the Waterhall shopping centre), but also trips generated by the 154 dwellings already constructed on the Rosehill site.

The only heavy vehicles observed using Queens Road during the survey periods were rigid vehicles, with an average length of approximately 12.5m. These have been assigned as HVs in SIDRA. However, as some longer vehicles (up to 19m) were observed on GEH, although the difference in length is considered to have a minimal effect on through vehicle movements, all HVs in the SIDRA analyses have been calibrated as 19m trucks.

During the surveys, a record was also kept of the queue lengths and delays experienced by drivers on the Queens Road approach. The SIDRA analysis of the intersection was then calibrated to replicate the observed average delays by adjusting the Critical Gap and Following Headway factors, guided by Table 4-5 in MRWA's '*Operational Modelling Guidelines, V2.0*', dated January 2021.

A Peak Flow Factor of 100% was employed in SIDRA, as the input volumes are actual counts and it was noted from the count data that there were no discernible 'peaks within the peak hour'. It was also found that drivers appeared willing to accept different gaps depending upon the difficulty experienced in emerging from the side road, with the critical gap and headway figures required to calibrate to the observed delays differing between the two peak periods.

**Figure 4.2** shows the current intersection layout, whilst **Tables 4.4** and **4.5** summarise the results of the analysis for 2021 AM and PM peaks, respectively. A 7m left turn lane has been used in the analysis in order to reflect the fact that, although narrowing quickly to a single lane, the intersection is currently sufficiently wide to allow both a left and right turning vehicle to wait side by side at the Stop line.



**Figure 4.2: Existing layout GEH/Queens Road**

**Table 4.4: SIDRA results, 'Existing +partial' AM Peak Hour 2021 GEH/Queens Road**

MOVEMENT SUMMARY

STOP

Site: 101 [GEH & QR (Site Folder: BY-AM)]

Existing 2021 AM peak including partial rosehill traffic  
Site Category: (None)  
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queens Road														
21	L2	149	0.0	149	0.0	0.873	84.7	LOS F	6.3	43.9	0.98	1.54	2.81	16.0
23	R2	45	0.0	45	0.0	0.676	108.2	LOS F	2.3	16.3	0.98	1.11	1.41	16.6
Approach		194	0.0	194	0.0	0.873	90.1	LOS F	6.3	43.9	0.98	1.44	2.48	16.2
NorthEast: GEH														
24	L2	25	3.5	25	3.5	0.548	5.8	LOS A	0.0	0.0	0.00	0.01	0.00	56.7
25	T1	1028	2.0	1028	2.0	0.548	0.3	LOS A	0.0	0.0	0.00	0.01	0.00	59.4
Approach		1053	2.0	1053	2.0	0.548	0.4	NA	0.0	0.0	0.00	0.01	0.00	59.3
SouthWest: GEH														
31	T1	626	1.4	626	1.4	0.467	5.3	LOS A	4.5	31.8	0.45	0.12	0.68	52.7
32	R2	96	2.1	96	2.1	0.467	19.5	LOS C	4.5	31.8	0.63	0.17	0.96	44.5
Approach		722	1.5	722	1.5	0.467	7.2	NA	4.5	31.8	0.48	0.12	0.72	51.8
All Vehicles		1969	1.6	1969	1.6	0.873	11.7	NA	6.3	43.9	0.27	0.20	0.51	47.3

**Table 4.5: SIDRA results, 'Existing + partial' PM Peak Hour 2021 GEH/Queens Road**

MOVEMENT SUMMARY

stop

Site: 101 [GEH & QR (Site Folder: BY-PM )]

2021 PM Existing inc partial Rosehill traffic  
Site Category: (None)  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queen Rd														
21	L2	84	0.0	84	0.0	0.084	9.3	LOS A	0.4	2.9	0.47	0.85	0.47	40.6
23	R2	32	3.1	32	3.1	0.331	49.4	LOS E	1.0	7.1	0.96	1.03	1.07	26.0
Approach		116	0.9	116	0.9	0.331	20.4	LOS C	1.0	7.1	0.60	0.90	0.63	34.1
NorthEast: GEH														
24	L2	71	0.0	71	0.0	0.325	5.6	LOS A	0.0	0.0	0.00	0.07	0.00	56.8
25	T1	551	2.4	551	2.4	0.325	0.1	LOS A	0.0	0.0	0.00	0.07	0.00	59.0
Approach		622	2.1	622	2.1	0.325	0.7	NA	0.0	0.0	0.00	0.07	0.00	58.8
SouthWest: GEH														
31	T1	1318	1.1	1318	1.1	0.722	2.4	LOS A	6.8	49.0	0.38	0.10	0.68	55.8
32	R2	162	2.5	162	2.5	0.722	14.8	LOS B	6.8	49.0	0.49	0.12	0.87	49.8
Approach		1480	1.3	1480	1.3	0.722	3.8	NA	6.8	49.0	0.40	0.10	0.70	55.3
All Vehicles		2218	1.5	2218	1.5	0.722	3.8	NA	6.8	49.0	0.30	0.13	0.50	54.9

It can be seen that the right turn out of Queens Road remains the critical movement, although the left turn is also affected by blocking.

Average delays on the Queens Road approach were calculated from on-site observations as being 105 seconds for the right turn and 75 seconds for the left turn in the AM peak, and 42 seconds and 20 seconds respectively for the PM peak.



The calibration of SIDRA to these observed delays is limited somewhat by SIDRA's inability to effectively model the blocking effect with a short left turn lane, an issue which was confirmed by SIDRA during the 2014 analyses, and noted in DVC's Technical Note 1, but does not appear to have been resolved in subsequent versions of the software.

Nonetheless, the intersection is generally performing reasonably well, given that it has now had an additional 7 years of growth in background traffic, as well as the impact of around 150 completed dwellings within the Rosehill development.

#### **4.9.3 SIDRA Analysis 'Full development including Amendments A&B, 2031'**

The current timeframes for the various stages of the development are shown in **Table 4.1**. Whilst the hospitality and tourism elements may not be fully open, and Stage 7 of the residential may also be incomplete at that time, 2031 has been used as the year of opening for the purposes of this analysis. The analysis also assumes that the upgraded left turn pocket will be constructed by this time, although the effect on the SIDRA outputs is minimal.

Given that some lots have already been built on, the base turning movements at GEH / Queens Road for this 2031 scenario have been estimated by taking the traffic currently moving between Serpentine Drive and the western section of West Parade as being Rosehill generated traffic, and removing the corresponding movements from the GEH / Queens Road intersection for each peak period.

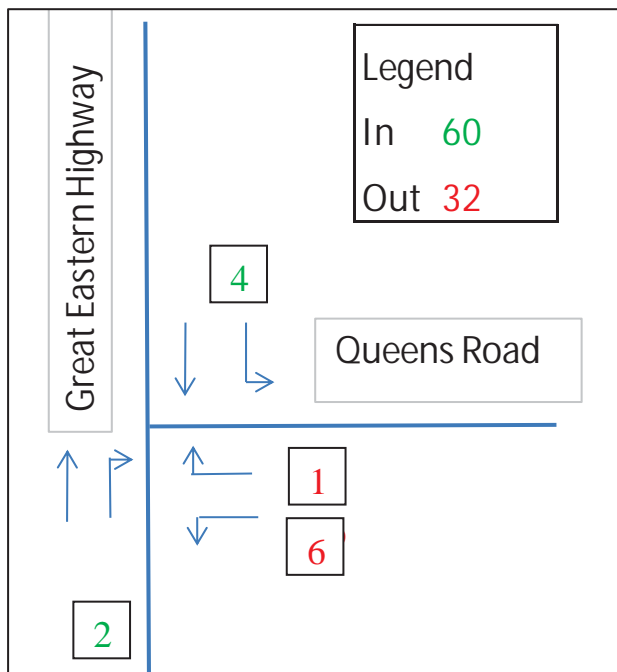
In the AM peak hour, the movements at the site access were 41 turning left out onto West Parade and 15 turning right into Serpentine Drive. In the PM peak hour, there were 30 turning left out onto West Parade and 31 turning right into Serpentine Drive. Given that the GEH / Queens Road intersection is not currently experiencing significant peak hour queuing, it was assumed that rerouting via Kalamunda Road has not yet become a significant factor, and that all of these trips were also passing through the GEH / Queens Road intersection. They were therefore removed from the left and right turns, pro-rata, in order to give base 2021 volumes.

These base volumes were then factored up to 2031, using a growth rate of 1% per annum overall. The forecast trips generated by the Structure Plan area, including those from Amendments A & B, were then added in, in accordance with the previously determined distribution.

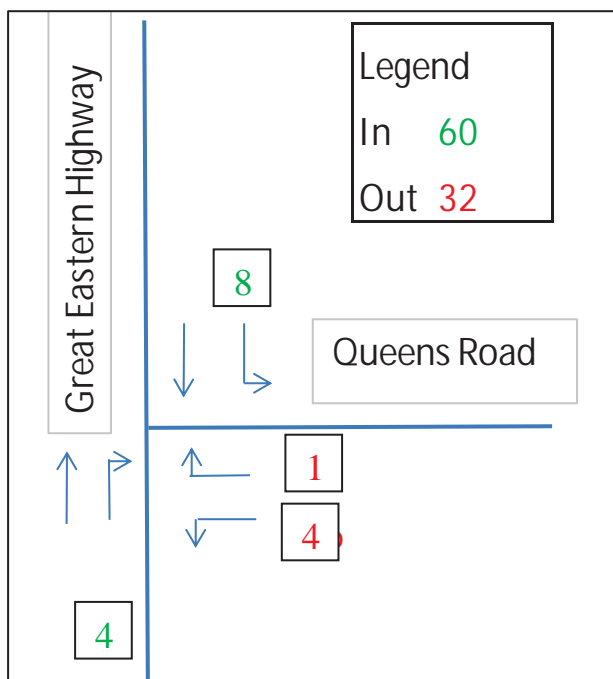
The development traffic was calculated using the peak hour trips from Table 4.2, assuming a 30% distribution to the western section of West Parade, and a subsequent 50% rerouting to Kalamunda Road on the outbound journey only. This resulted in 57 outbound and 39 inbound trips being added to the GEH / Queens Road movements, in accordance with previous splits, in the AM peak, and 29 and 95 trips, respectively, in the PM peak.

It should be noted that the purpose of this report is only to identify the transport impacts of the changes to the approved Development Application – i.e. the impact of Amendments A & B.

Of the 20 additional trips generated by Amendments A&B expected to be added to West Parade west of the site in each peak hour, 50% of outbound trips are assumed to reroute to Kalamunda Road. This results in the following additional turning movements at the GEH / Queens Road intersection.



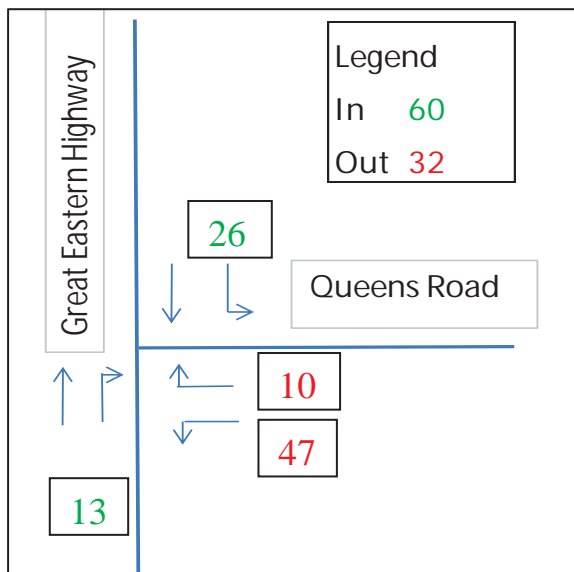
**Figure 4.3: Additional turning movements from Amendment A & B, AM peak 2031**



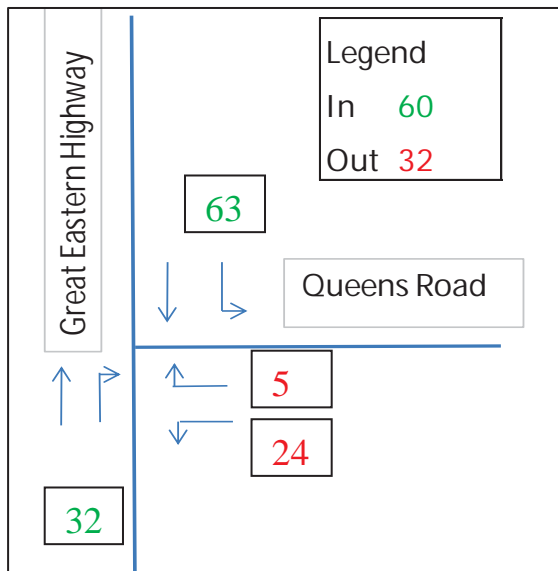
**Figure 4.4: Additional turning movements from Amendment A & B, PM peak 2031**

As can be seen in **Figures 4.3 & 4.4**, the resulting additional turning movements at this intersection, as generated purely by Amendments A&B, are almost negligible.

**Figures 4.5 & 4.6** show the total additional turning movements generated by the full development, including Amendments A&B.



**Figure 4.5: Additional turning movements for full development, AM peak 2031**



**Figure 4.6: Additional turning movements for full development, PM peak 2031**

Using these revised total volumes, a SIDRA analysis was then undertaken for each peak hour, to estimate the operational performance of GEH/Queens Road with the addition of the Rosehill Waters development traffic at full development (2031) including Amendments A & B. Note that a growth factor of 1% per annum has been applied to the background traffic on both GEH and Queens Road.

In the 2031 AM peak, using the same critical gap and headway factors as for the calibrated 2021 case, the average delays for right turning traffic from Queens Road, with full development, rise to around 13 minutes. See **Table 4.6**.

**Table 4.6: SIDRA results, 'Full development' AM Peak Hour 2031 GEH/Queens Road**

MOVEMENT SUMMARY

Site: 101 [GEH & QR + Dev traffic 2031 (Site Folder: 2031 - AM )]

Forecast 2031 AM peak full development

Site Category: (None)

Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queens Road														
21	L2	172	0.0	172	0.0	1.398	790.7	LOS F	67.6	473.0	1.00	5.40	16.55	2.3
23	R2	53	0.0	53	0.0	1.346	817.9	LOS F	21.3	149.2	1.00	2.52	7.02	3.0
Approach		225	0.0	225	0.0	1.398	797.1	LOS F	67.6	473.0	1.00	4.72	14.31	2.5
NorthEast: GEH														
24	L2	43	3.5	43	3.5	0.611	5.9	LOS A	0.0	0.0	0.00	0.02	0.00	56.5
25	T1	1131	2.0	1131	2.0	0.611	0.3	LOS A	0.0	0.0	0.00	0.02	0.00	59.1
Approach		1174	2.1	1174	2.1	0.611	0.5	NA	0.0	0.0	0.00	0.02	0.00	59.0
SouthWest: GEH														
31	T1	689	1.4	689	1.4	0.616	9.7	LOS A	9.2	66.6	0.65	0.15	1.08	48.7
32	R2	113	2.1	113	2.1	0.616	27.6	LOS D	9.2	66.6	1.00	0.23	1.65	37.8
Approach		802	1.5	802	1.5	0.616	12.2	NA	9.2	66.6	0.70	0.16	1.16	47.4
All Vehicles		2201	1.6	2201	1.6	1.398	86.2	NA	67.6	473.0	0.36	0.55	1.89	20.7

As previously seen with the calibration of the existing 2021 scenarios, slight changes were required in the critical gap and headway figures to reflect the necessary driver response to increased traffic at this intersection. In this case, by reducing the critical gap by only 0.25 of a second, the average right turn delay is reduced to under 7 minutes. See **Table 4.7**.

**Table 4.7: SIDRA results, 'Full development' AM Peak Hour 2031 GEH/Queens Road (revised gaps)**

MOVEMENT SUMMARY

Site: 101 [GEH & QR + Dev traffic 2031 - Rev gap (Site Folder: 2031 - AM )]

Forecast 2031 AM peak full development

Site Category: (None)

Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queens Road														
21	L2	172	0.0	172	0.0	1.208	459.1	LOS F	43.8	306.5	1.00	4.30	12.66	3.9
23	R2	53	0.0	53	0.0	1.084	398.9	LOS F	9.9	69.2	1.00	1.83	4.30	5.9
Approach		225	0.0	225	0.0	1.208	445.0	LOS F	43.8	306.5	1.00	3.72	10.69	4.3
NorthEast: GEH														
24	L2	43	3.5	43	3.5	0.611	5.9	LOS A	0.0	0.0	0.00	0.02	0.00	56.5
25	T1	1131	2.0	1131	2.0	0.611	0.3	LOS A	0.0	0.0	0.00	0.02	0.00	59.1
Approach		1174	2.1	1174	2.1	0.611	0.5	NA	0.0	0.0	0.00	0.02	0.00	59.0
SouthWest: GEH														
31	T1	689	1.4	689	1.4	0.616	9.7	LOS A	9.2	66.6	0.65	0.15	1.08	48.7
32	R2	113	2.1	113	2.1	0.616	27.6	LOS D	9.2	66.6	1.00	0.23	1.65	37.8
Approach		802	1.5	802	1.5	0.616	12.2	NA	9.2	66.6	0.70	0.16	1.16	47.4
All Vehicles		2201	1.6	2201	1.6	1.208	50.2	NA	43.8	306.5	0.36	0.45	1.52	28.5

Whilst the revised critical gap factors would remain well within the recommended ranges identified in MRWA's 'Operational Modelling Guidelines', such delays are clearly excessive and highly unlikely to be realised. The Lloyd Street extension is scheduled for opening significantly before this timeframe, and



this is likely to attract a lot of trips towards Midland, providing significant relief to the right turn at the Queens Road / GEH intersection.

In the 2031 PM peak, using the same critical gap and headway factors as for the calibrated 2021 case, the average delays for right turning traffic from Queens Road, with full development, remain below 2 minutes. See **Table 4.8**.

This being the case, it is likely that less than 50% of outbound trips will divert to Kalamunda Road in the PM peak.

**Table 4.8: SIDRA results, 'Full development' PM Peak Hour 2031 GEH/Queens Road**

MOVEMENT SUMMARY

Site: 101 [GEH & QR + Dev Traffic 2031 (Site Folder: 2031 - PM )]

2031 PM inc full development

Site Category: (None)

Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queen Rd														
21	L2	89	0.0	89	0.0	0.093	9.6	LOS A	0.5	3.2	0.49	0.85	0.49	40.5
23	R2	35	3.1	35	3.1	0.647	117.4	LOS F	1.9	14.2	0.99	1.08	1.28	15.7
Approach		124	0.9	124	0.9	0.647	40.0	LOS E	1.9	14.2	0.63	0.92	0.71	26.1
NorthEast: GEH														
24	L2	118	0.0	118	0.0	0.379	5.6	LOS A	0.0	0.0	0.00	0.10	0.00	56.5
25	T1	606	2.4	606	2.4	0.379	0.1	LOS A	0.0	0.0	0.00	0.10	0.00	58.7
Approach		724	2.0	724	2.0	0.379	1.0	NA	0.0	0.0	0.00	0.10	0.00	58.3
SouthWest: GEH														
31	T1	1450	1.1	1450	1.1	0.846	5.0	LOS A	15.7	112.8	0.77	0.15	1.49	52.8
32	R2	199	2.5	199	2.5	0.846	21.1	LOS C	15.7	112.8	1.00	0.19	1.93	45.2
Approach		1649	1.3	1649	1.3	0.846	6.9	NA	15.7	112.8	0.80	0.16	1.54	52.0
All Vehicles		2497	1.5	2497	1.5	0.846	6.9	NA	15.7	112.8	0.56	0.18	1.06	51.7

#### 4.10 INTERSECTION OF WEST PARADE AND SERPENTINE DRIVE

Currently a simple T-intersection, under give way control, the intersection of Serpentine Drive with West Parade will be upgraded to a four-way roundabout, once the northern section of the structure plan area is developed. The fourth leg of the roundabout is currently known as **Road E**, but is effectively an extension of The Embankment.

The intersection was initially analysed using SIDRA for the current flows, which include trips generated by the 150 or so dwellings already built within the southern section of the site. For this intersection, all HVs were again calibrated as 19m trucks, whilst a 95% Peak Flow Factor was incorporated, despite the use of actual count data, to allow for a slight 'peak within the peak'.

The intersection currently performs with LOS A, with virtually no queueing or delays in either peak hour.

See **Tables 4.9 & 4.10**.

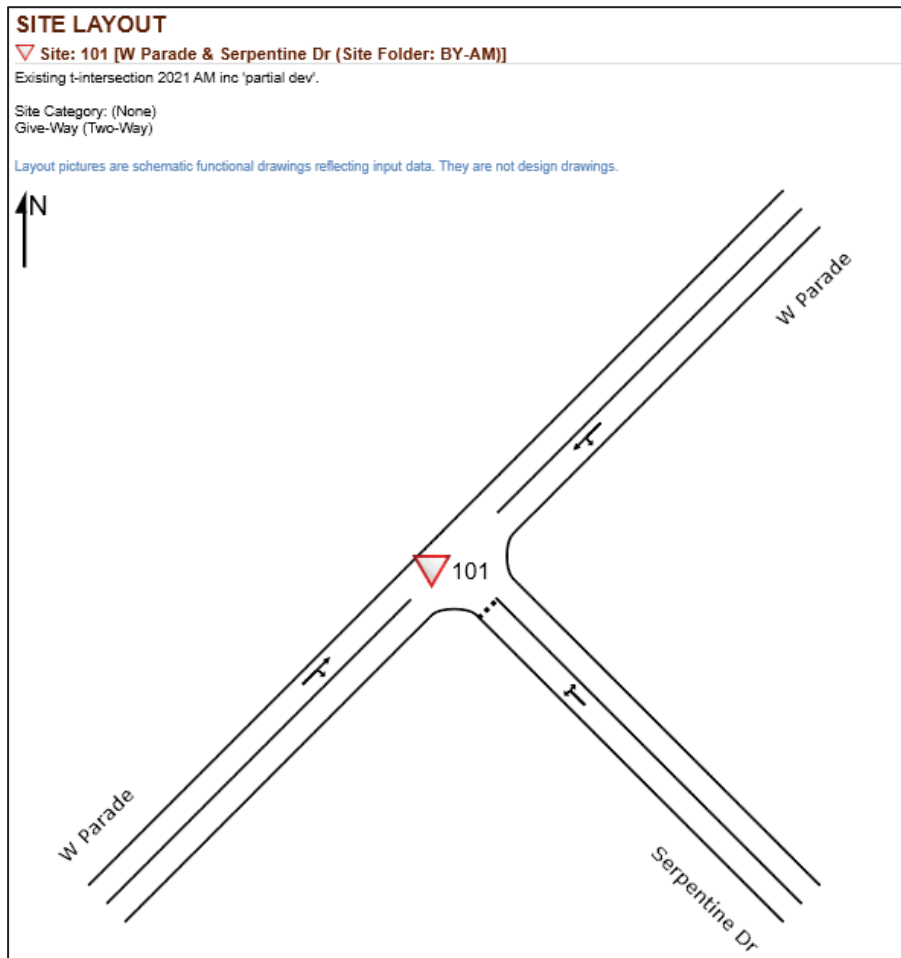


Figure 4.7: Existing Intersection Layout for West Parade/Serpentine Drive

Table 4.9: SIDRA results, 'Existing +partial' AM Peak Hour 2021 West Parade / Serpentine Drive

MOVEMENT SUMMARY

▼ Site: 101 [W Parade & Serpentine Dr (Site Folder: BY-AM)]

Existing t-intersection 2021 AM inc 'partial dev'.

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Serpentine Dr														
21	L2	41	5.0	43	5.0	0.051	5.3	LOS A	0.2	1.5	0.31	0.55	0.31	45.8
23	R2	15	13.0	16	13.0	0.051	6.3	LOS A	0.2	1.5	0.31	0.55	0.31	44.3
Approach		56	7.1	59	7.1	0.051	5.6	LOS A	0.2	1.5	0.31	0.55	0.31	45.5
NorthEast: W Parade														
24	L2	4	25.0	4	25.0	0.108	5.8	LOS A	0.0	0.0	0.00	0.01	0.00	56.3
25	T1	194	1.5	204	1.5	0.108	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach		198	2.0	208	2.0	0.108	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
SouthWest: W Parade														
31	T1	130	3.8	137	3.8	0.084	0.1	LOS A	0.1	1.0	0.08	0.06	0.08	58.9
32	R2	15	13.0	16	13.0	0.084	6.4	LOS A	0.1	1.0	0.08	0.06	0.08	56.3
Approach		145	4.8	153	4.8	0.084	0.8	NA	0.1	1.0	0.08	0.06	0.08	58.6
All Vehicles		399	3.7	420	3.7	0.108	1.1	NA	0.2	1.5	0.07	0.11	0.07	56.5

**Table 4.10: SIDRA results, 'Existing +partial' PM Peak Hour 2021 West Parade / Serpentine Drive**

MOVEMENT SUMMARY

▼ Site: 101 [W Parade & Serpentine Dr (Site Folder: BY-PM )]

Existing t-intersection 2021 PM inc 'partial dev'

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %	v/c	sec		[ Veh. veh	Dist ] m				km/h
SouthEast: Serpentine Dr														
21	L2	30	0.0	32	0.0	0.038	4.9	LOS A	0.1	1.0	0.22	0.53	0.22	46.1
23	R2	14	7.0	15	7.0	0.038	6.1	LOS A	0.1	1.0	0.22	0.53	0.22	44.6
Approach		44	2.2	46	2.2	0.038	5.3	LOS A	0.1	1.0	0.22	0.53	0.22	45.7
NorthEast: W Parade														
24	L2	15	0.0	16	0.0	0.069	5.5	LOS A	0.0	0.0	0.00	0.07	0.00	57.2
25	T1	111	1.0	117	1.0	0.069	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	59.2
Approach		126	0.9	133	0.9	0.069	0.7	NA	0.0	0.0	0.00	0.07	0.00	58.9
SouthWest: W Parade														
31	T1	187	2.0	197	2.0	0.124	0.1	LOS A	0.2	1.7	0.08	0.09	0.08	58.6
32	R2	31	3.0	33	3.0	0.124	5.9	LOS A	0.2	1.7	0.08	0.09	0.08	56.6
Approach		218	2.1	229	2.1	0.124	0.9	NA	0.2	1.7	0.08	0.09	0.08	58.3
All Vehicles		388	1.7	408	1.7	0.124	1.3	NA	0.2	1.7	0.07	0.13	0.07	56.5

For the 2031 full development scenario, including Amendments A&B, the intersection layout was changed to that of a four-way roundabout. Peak hour through traffic flows were obtained from DVC's 2021 surveys, with the partial development traffic removed, and the remaining through traffic factored up by 1% per annum to represent 2031 levels.

The AM and PM peak volumes from the development are based on those from the previous TIA, adjusted for Amendments A & B, including the realignment of the internal roads in the northern section.

There are approximately 126 lots to the north of West Parade, with 90 accessible via the proposed roundabout and a further 36 that will be linked to West Parade by intersections with either Road C or Road D. Although some trips to and from these 90 lots may well use internal links through the Waterhall Estate, there may equally be some additional trips in the opposite direction, so for the purpose of this analysis, we have assumed that they cancel out.

Thus, we have assumed that, of the trips generated by this northern section, around 18 inbound and 54 outbound trips in the AM peak and 45 inbound and 27 outbound trips in the PM peak may use the proposed roundabout.

From the south, we have used the full development trips identified in the previous TIA, with the trips from Amendment B added in, directionally pro rata. This gives the total flows shown in **Figures 4.8 & 4.9**.

**Tables 4.11** and **4.12** summarise the results of the analysis of the proposed turning volumes at the intersection of West Parade with Serpentine Drive.

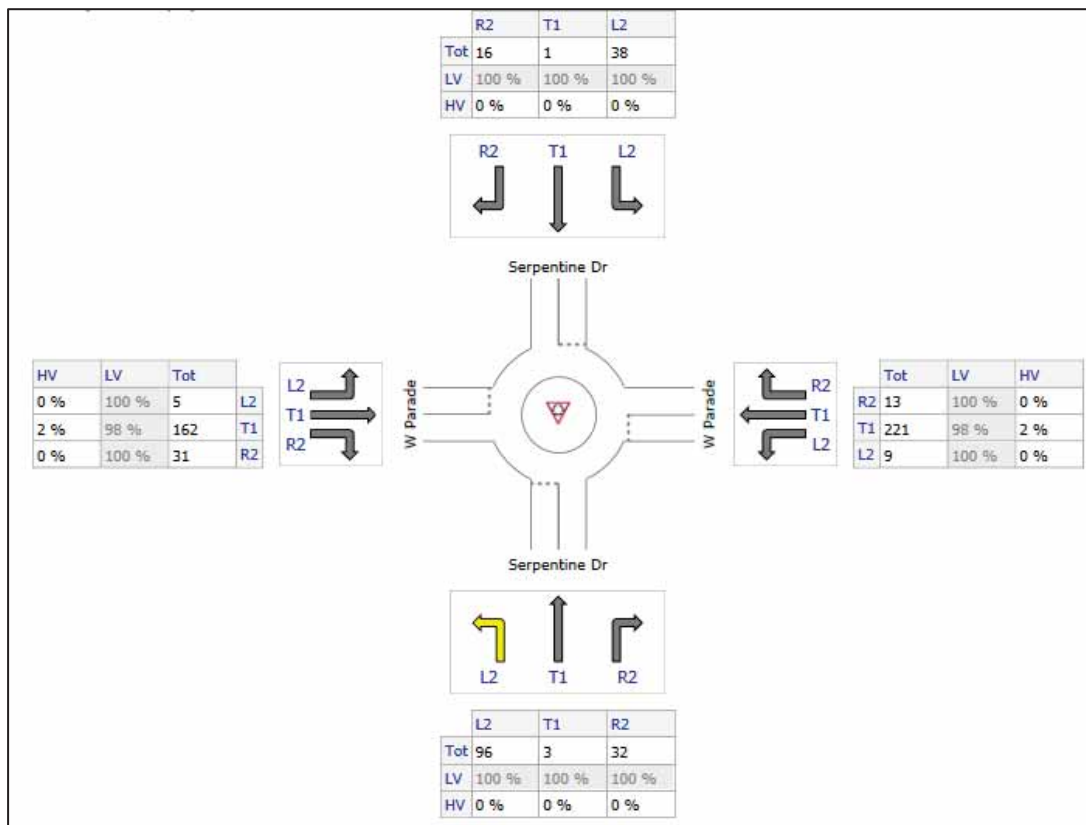


Figure 4.8: 2031 AM flows - full development including Amendments A&B.

Table 4.11: SIDRA results - AM Peak Hour 2031 – West Parade/Serpentine Drive

MOVEMENT SUMMARY

Site: 101 [Modification W Parade & Serpentine Dr (Site Folder: 2031 - AM)]

Roundabout 2031 AM full dev

Site Category: (None)

Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [ Total veh/h HV ] %		DEMAND FLOWS [ Total veh/h HV ] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [ Veh. veh Dist ] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h	
South: Serpentine Dr														
1	L2	96	0.0	101	0.0	0.122	5.1	LOS A	0.6	4.4	0.42	0.58	0.42	53.4
2	T1	3	0.0	3	0.0	0.122	5.4	LOS A	0.6	4.4	0.42	0.58	0.42	40.8
3	R2	32	0.0	34	0.0	0.122	10.0	LOS A	0.6	4.4	0.42	0.58	0.42	53.5
Approach		131	0.0	138	0.0	0.122	6.3	LOS A	0.6	4.4	0.42	0.58	0.42	53.2
East: W Parade														
4	L2	9	0.0	9	0.0	0.178	4.1	LOS A	1.0	7.0	0.18	0.42	0.18	53.4
5	T1	221	2.0	233	2.0	0.178	4.3	LOS A	1.0	7.0	0.18	0.42	0.18	54.9
6	R2	13	0.0	14	0.0	0.178	8.9	LOS A	1.0	7.0	0.18	0.42	0.18	26.9
Approach		243	1.8	256	1.8	0.178	4.6	LOS A	1.0	7.0	0.18	0.42	0.18	53.3
North: Serpentine Dr														
7	L2	38	0.0	40	0.0	0.050	4.9	LOS A	0.2	1.7	0.38	0.56	0.38	46.2
8	T1	1	0.0	1	0.0	0.050	5.1	LOS A	0.2	1.7	0.38	0.56	0.38	51.7
9	R2	16	0.0	17	0.0	0.050	9.8	LOS A	0.2	1.7	0.38	0.56	0.38	51.7
Approach		55	0.0	58	0.0	0.050	6.3	LOS A	0.2	1.7	0.38	0.56	0.38	48.2
West: W Parade														
10	L2	5	0.0	5	0.0	0.147	4.1	LOS A	0.8	5.9	0.18	0.45	0.18	51.1
11	T1	162	2.0	171	2.0	0.147	4.3	LOS A	0.8	5.9	0.18	0.45	0.18	54.5
12	R2	31	0.0	33	0.0	0.147	8.9	LOS A	0.8	5.9	0.18	0.45	0.18	55.5
Approach		198	1.6	208	1.6	0.147	5.1	LOS A	0.8	5.9	0.18	0.45	0.18	54.6
All Vehicles		627	1.2	660	1.2	0.178	5.3	LOS A	1.0	7.0	0.25	0.47	0.25	53.4



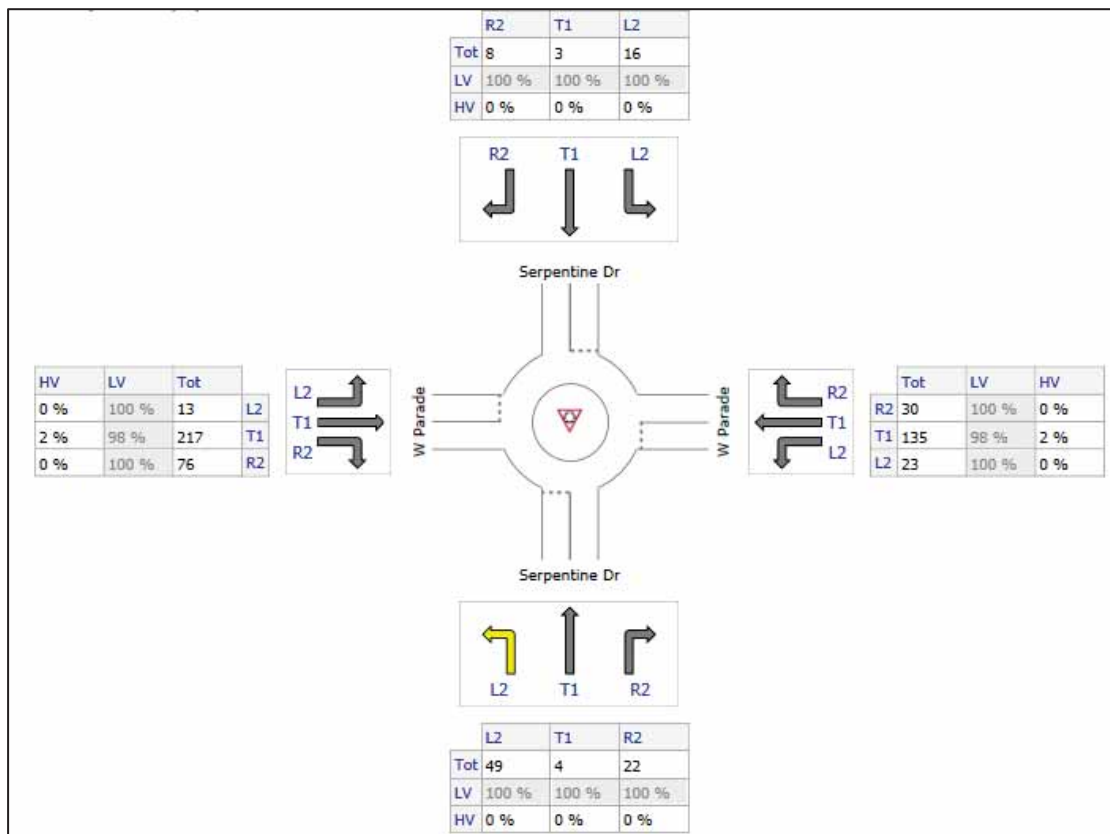


Figure 4.9: 2031 PM flows - full development including Amendments A&B.

Table 4.12: SIDRA results, PM Peak Hour 2031 – West Parade/Serpentine Drive

MOVEMENT SUMMARY														
Site: 101 [Modification W Parade & Serpentine Dr (Site Folder: 2031 - PM)]														
Roundabout 2031 PM - full dev														
Site Category: (None)														
Roundabout														
Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]	v/c	sec		[ Veh. veh ]	[ Dist ] m				km/h
South: Serpentine Dr														
1	L2	49	0.0	52	0.0	0.066	4.7	LOS A	0.3	2.3	0.34	0.54	0.34	53.4
2	T1	4	0.0	4	0.0	0.066	4.9	LOS A	0.3	2.3	0.34	0.54	0.34	40.9
3	R2	22	0.0	23	0.0	0.066	9.5	LOS A	0.3	2.3	0.34	0.54	0.34	53.6
Approach		75	0.0	79	0.0	0.066	6.1	LOS A	0.3	2.3	0.34	0.54	0.34	52.9
East: W Parade														
4	L2	23	0.0	24	0.0	0.149	4.3	LOS A	0.8	5.7	0.25	0.47	0.25	52.7
5	T1	135	2.0	142	2.0	0.149	4.6	LOS A	0.8	5.7	0.25	0.47	0.25	54.2
6	R2	30	0.0	32	0.0	0.149	9.1	LOS A	0.8	5.7	0.25	0.47	0.25	26.6
Approach		188	1.4	198	1.4	0.149	5.3	LOS A	0.8	5.7	0.25	0.47	0.25	49.4
North: Serpentine Dr														
7	L2	16	0.0	17	0.0	0.026	5.3	LOS A	0.1	0.9	0.44	0.56	0.44	45.7
8	T1	3	0.0	3	0.0	0.026	5.6	LOS A	0.1	0.9	0.44	0.56	0.44	51.3
9	R2	8	0.0	8	0.0	0.026	10.2	LOS B	0.1	0.9	0.44	0.56	0.44	51.2
Approach		27	0.0	28	0.0	0.026	6.8	LOS A	0.1	0.9	0.44	0.56	0.44	48.3
West: W Parade														
10	L2	13	0.0	14	0.0	0.225	4.1	LOS A	1.3	9.3	0.20	0.48	0.20	50.5
11	T1	217	2.0	228	2.0	0.225	4.4	LOS A	1.3	9.3	0.20	0.48	0.20	54.0
12	R2	76	0.0	80	0.0	0.225	9.0	LOS A	1.3	9.3	0.20	0.48	0.20	55.1
Approach		306	1.4	322	1.4	0.225	5.5	LOS A	1.3	9.3	0.20	0.48	0.20	54.2
All Vehicles		596	1.2	627	1.2	0.225	5.6	LOS A	1.3	9.3	0.25	0.49	0.25	52.3

As can be seen, with full development in 2031, all legs operate at a LoS of A or B in both the AM and PM peaks. Hence, the proposed roundabout has sufficient capacity to accommodate the ingress/egress from the development site.

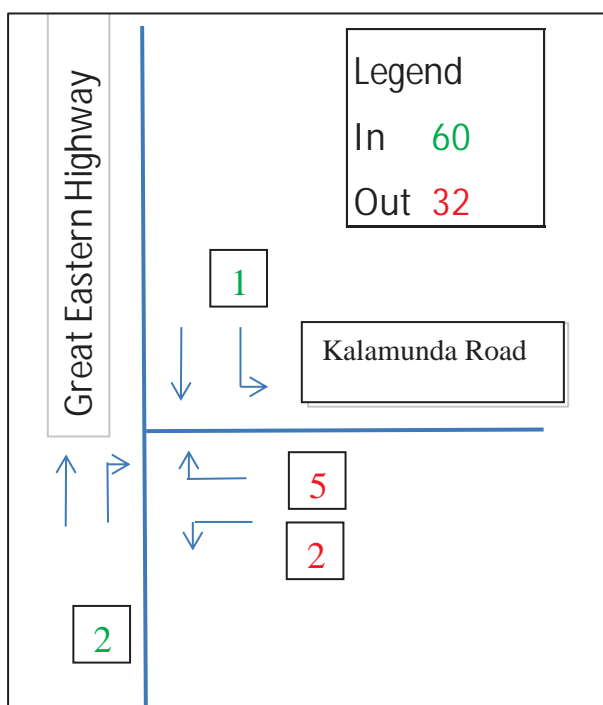
#### 4.11 IMPACT OF REDISTRIBUTED DEVELOPMENT TRAFFIC ON GREAT EASTERN HIGHWAY/KALAMUNDA ROAD

In the previous TIA, it was established that the AM peak is the critical peak period for this signalised intersection. The results were assessed by MRWA who noted that the development traffic only marginally increased the city bound queue lengths on GEH when compared with the 2027 traffic forecast volumes without development.

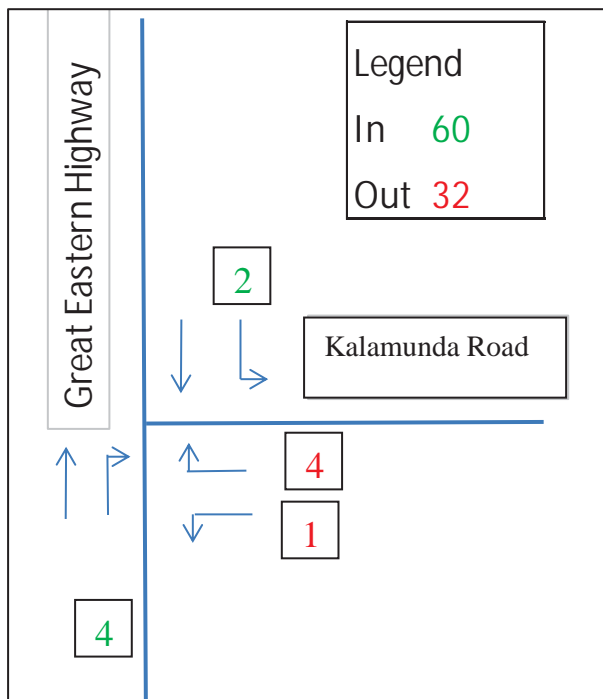
Hence the signalised intersection was assessed as having sufficient capacity to accommodate any potential diverted traffic from the development site.

Some 50% of the additional traffic (resulting from Amendments A&B) that might otherwise use the Queens Road intersection is assumed to divert to this signalised intersection. The estimated additional turning movements can be seen in **Figures 4.10 & 4.11**.

The number of additional trips is generally around 2 to 3% of the current flows, and will have no significant effect on the operation of the intersection.



**Figure 4.10: Additional turning movements from Amendment A & B, AM peak**



**Figure 4.11: Additional turning movements from Amendment A & B, PM peak**

#### 4.12 IMPACT OF REDISTRIBUTED DEVELOPMENT TRAFFIC ON HIGHMAN STREET

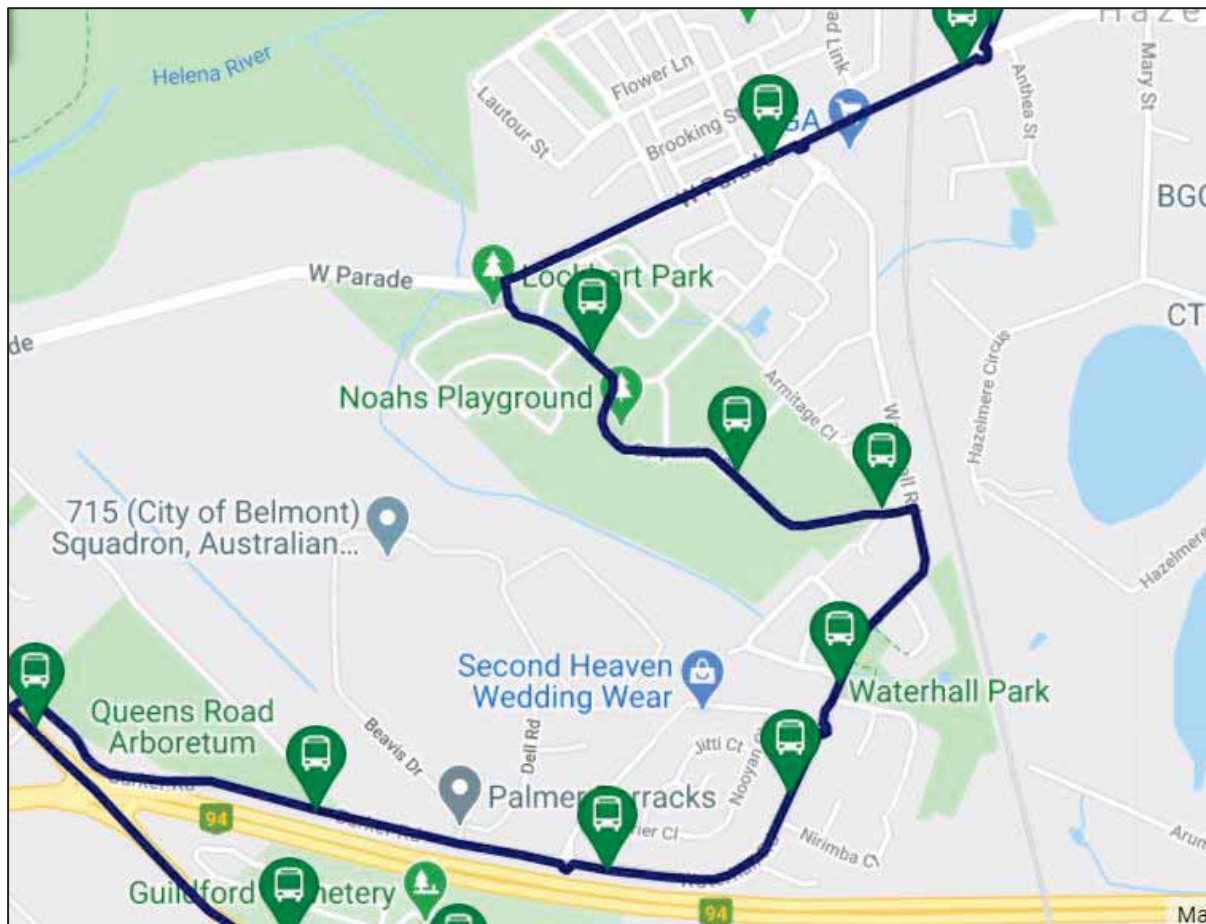
It was assumed in the previous TIA that due in part to potential queuing and delays at the GEH /Queens Road intersection, some of the development traffic would redistribute to the traffic signals at GEH/Kalamunda Road via Highman Street.

It was determined that Highman Street had sufficient spare capacity to readily accommodate the level of additional traffic that might be redistributed in this way. Clearly, this spare capacity would also be sufficient to cater for the small number of additional rerouted vehicles arising from Amendments A & B.

## 5 SUSTAINABLE TRANSPORT

### 5.1 BUS ROUTES

Since the previous TIA, Transperth Bus route 304, which runs from the Midland bus station to South Guildford (namely Hillview Village at the corner of Abernethy Road/Kalamunda Road), has been rerouted, and now runs along Serpentine Drive, providing excellent access through the development.



**Figure 5.1: Bus Route 304 between Midland and South Guildford**

*Source: Google maps/Transperth*

### 5.2 PEDESTRIAN AND CYCLE ACCESS FACILITIES

The Amendments to the approved structure plan do not result in any changes to the proposed cycling and pedestrian facilities within the southern part of the site as a whole.

The new layouts in the northern section will include the provision of footpaths on the same basis as to the south.



## 6 SUMMARY AND RECOMMENDATIONS

### 6.1 SUMMARY

This Transport Assessment has been prepared by Donald Veal Consultants on behalf of Noahs Rosehill Waters Pty Ltd, with regard to the proposed Amendments A & B to the approved Structure Plan for Rosehill Waters, South Guildford.

The approved Structure Plan comprised residential lots with a density of R20, some survey strata lots and a proposed site for aged persons' units. The development was also to continue a general civic/reception centre (some 1,000m<sup>2</sup>) which was located in the vicinity of West Parade and extended Pexton Drive. There were future plans to accommodate a local retail centre within the ultimate community hub located on the north side of West Parade. However, this proposal was not supported by the Hon. Minister for Planning in 2019.

Due to changes in the airport noise contours (ANEF), two specific changes have now been proposed to the original layout. These are known as Amendments A & B, and are the subject of this revised TIA.

**Amendment A** consists of the rezoning of the Strata Lots in Stage 4 from R20 to R30 and the replacement of the previously proposed aged persons' units in Stage 5, again with R30 housing.

*Note: Since preparation of the TIA, Stage 4 has been removed from the proposed recoding to R30, and will remain at R20.*

**Amendment B** clarifies the proposed development of the area to the north, around the Lodge, which will now consist of a number of hospitality and tourism related businesses, such as a function centre, restaurant, cafe and motel accommodation, together with some residential housing lots. Ten of these lots will be in the area immediately south of West Parade. As a part of the revised layout in the northern section, Pexton Drive will no longer be extended through into the site.

The volume of additional traffic expected to be generated by Amendments A&B is of the order of 550 vpd distributed over several access points, either directly into and out of the subject site via West Parade and Edgar Wilkes Entrance, or via the adjacent Waterhall Estate.

Assisted by updated background data and traffic surveys, DVC has analysed the effect of the structure plan Amendments on the intersection of GEH with Queens Road. Whilst the number of peak hour trips to be added to this intersection due to the amendments is minimal, the revised timeframe for full development of the site means that potential background traffic growth has also increased. However, the analysis shows that in keeping with the previous TIA, there is sufficient spare capacity at the signalised intersection of GEH with Kalamunda Road to cater for the likely level of rerouting of trips from Queens Road.

Prior to the approval of the previous Structure Plan, extensive negotiations were carried out, involving both the City of Swan and MRWA, regarding the required upgrades to the Great Eastern Highway / Queens Road intersection. At the conclusion of the negotiations, it was agreed that an extended left turn

lane would be installed on the Queens Road approach, to reduce the amount to which drivers turning left are blocked by vehicles queuing to turn right.

Whilst the City has already received the required funds from the developer to enable this upgrade, it is understood that the timing as to when the works are to be implemented will be at the discretion of the City.

Amendment B includes an increase in the number of residential lots in the northern part of the site, and hospitality and tourism uses in the Lodge area. As a part of this, some changes have been made to the connectivity of the road network, and a roundabout is proposed on West Parade. This will allow easy access to the development both north and south of West Parade. SIDRA analysis has confirmed that the roundabout will operate with an excellent level of service and minimal queueing or delays.

The development of the Lodge area will generate a number of additional daily trips, although it is not expected that these commercial elements will generate very many trips during the weekday AM and PM peak hours. The main activity is likely to be at weekends and in the evenings.

It should be noted that a significant proportion of the peak hour trips that are generated will be local, as the patrons of the café are likely to be residents of the adjacent developments, while the restaurant / brasserie will service both local residents and the Motel / Function Centre clients. Even the staff movements will generally occur in the off peak direction.

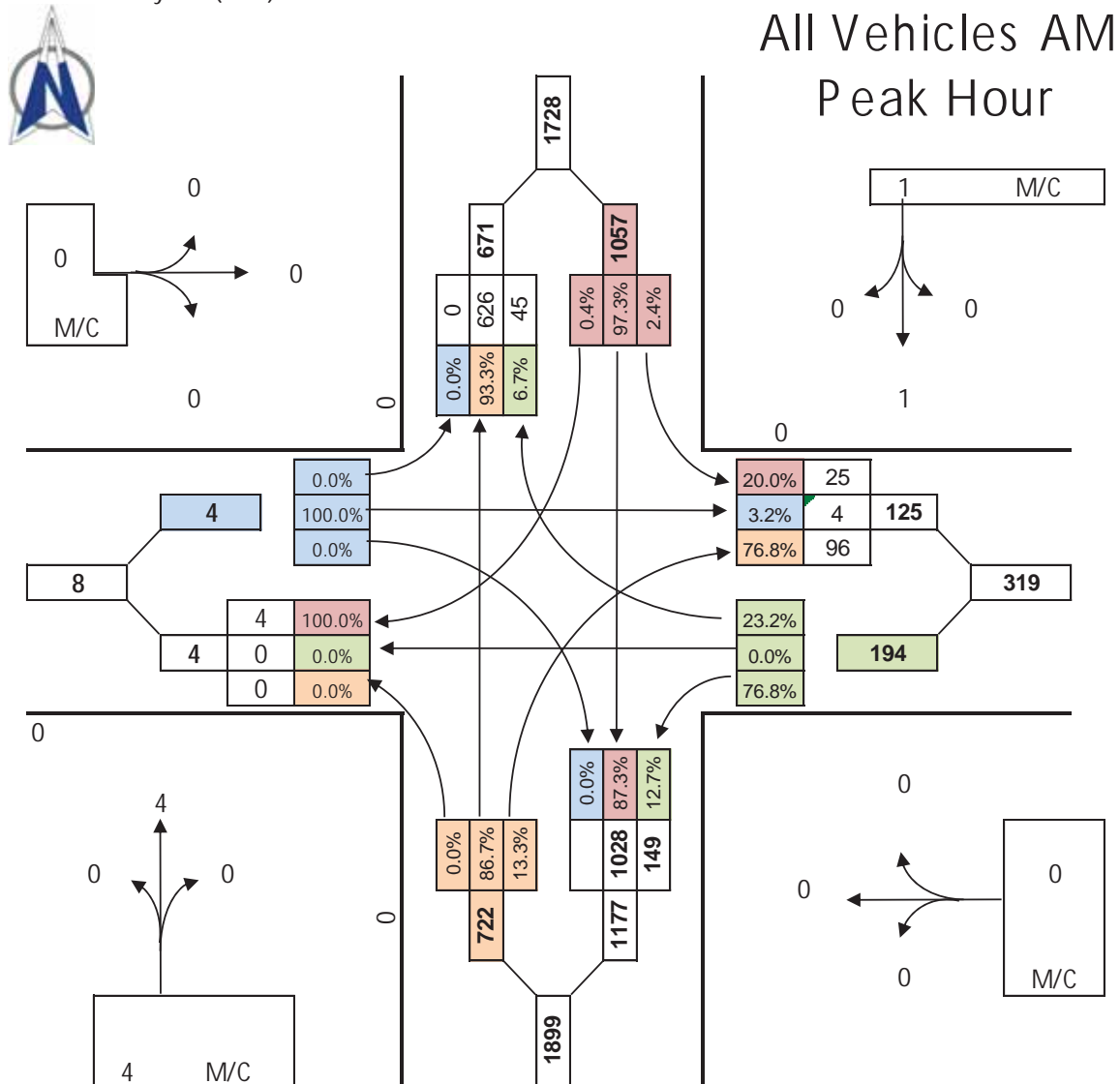
## **6.2 RECOMMENDATIONS**

The Structure Plan Amendments are supported by the findings of this Transport Impact Assessment and there are no identified traffic related issues to be addressed regarding the impact of Amendments A & B. We therefore recommend approval of the proposal from a traffic and transport perspective.

## **APPENDIX A: DVC TRAFFIC SURVEYS 2021**

Noahs Rosehill Waters Pty Ltd	DAY Wednesday	DATE 3/03/2021	WE AT H E R R a i n /Storm
Vehicle Volumes	Location Great Eastern Hwy, Bridge St & Queens Rd		SUBURB South Guildford
Staggered 4 - Way Intersection			
Site 1	Job No. Z792	INTERSECT ION T Y P E : Staggered 4 - Way	
DONALD VE AL C O N S U L T A N T S	DURATION: 730 - 0830		

Note: Motorcycles (M/C) are NOT in Motor Vehicle Totals



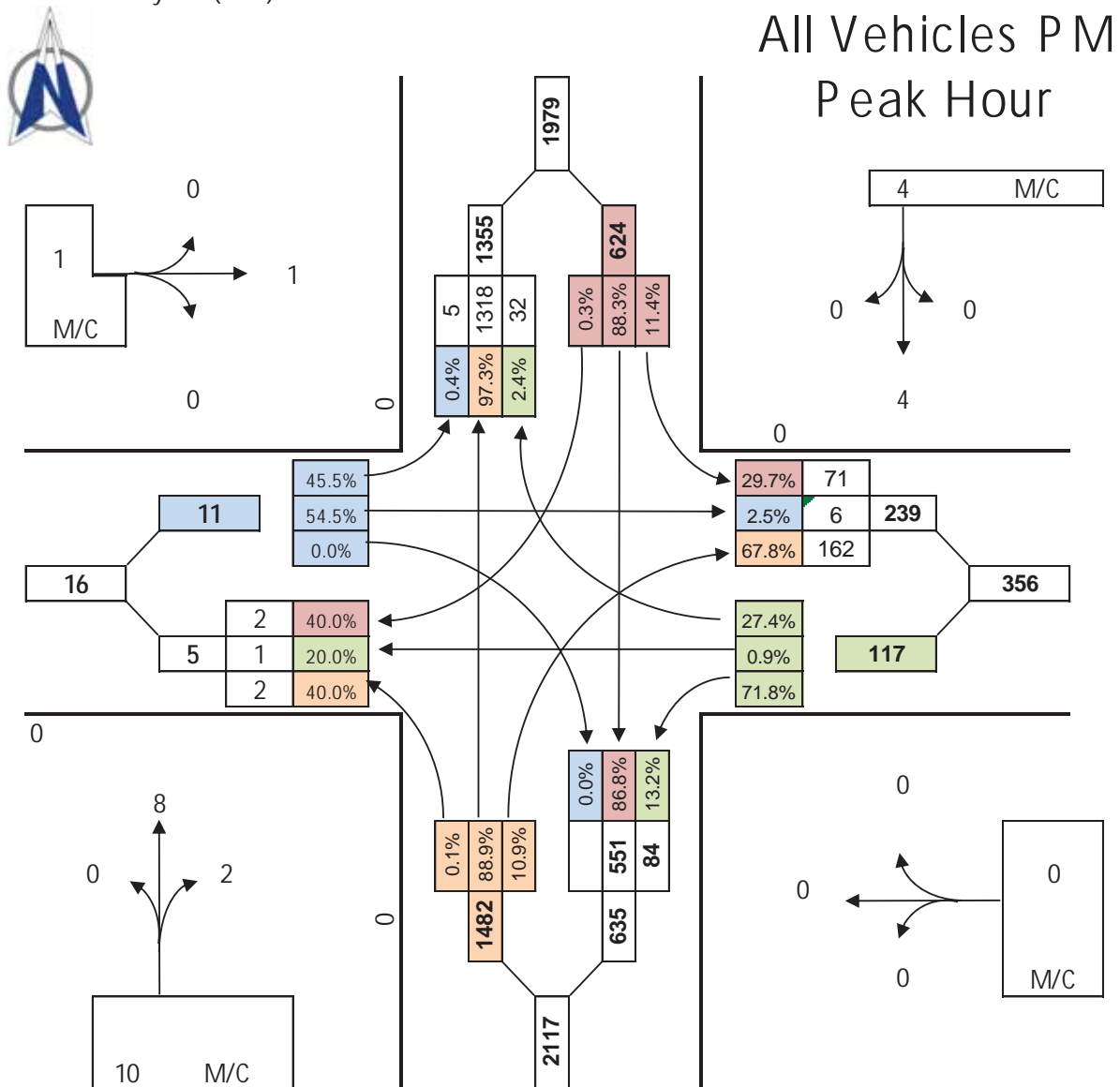
Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	25	1028	4	1057
From E	45	0	149	0	194
From S	626	96	0	0	722
From W	0	4	0	0	
Total	671	125	1177		1977

MC Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	1	0	
From E	0	0	0	0	
From S	4	0	0	0	
From W	0	0	0	0	
Total					



Noahs Rosehill Waters Pty Ltd	DAY	DATE	WE AT H E R
	Tues day	2/03/2021	R a i n / Storm
Vehicle Volumes	Location Great Eastern Hwy, Bridge St & Queens R d		SUBURB  South Guildford
Staggered 4 - Way Intersection			
Site 1	Job No.	INTERSECT I O N T Y P E : Staggered 4 - Way	
DONAL D V E A L C O N S U L T A N T S	Z792		
	DURAT I O N: 1615 - 1715		

Note: Motorcycles (M/C) are NOT in Motor Vehicle Totals



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	71	551	2	<b>624</b>
From E	32	0	84	1	<b>117</b>
From S	1318	162	0	2	<b>1482</b>
From W	5	6	0	0	<b>11</b>
Total	<b>1355</b>	<b>239</b>	<b>635</b>		<b>2234</b>

MC Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	4	0	
From E	0	0	0	0	
From S	8	2	0	0	<b>10</b>
From W	0	1	0	0	
Total					<b>15</b>

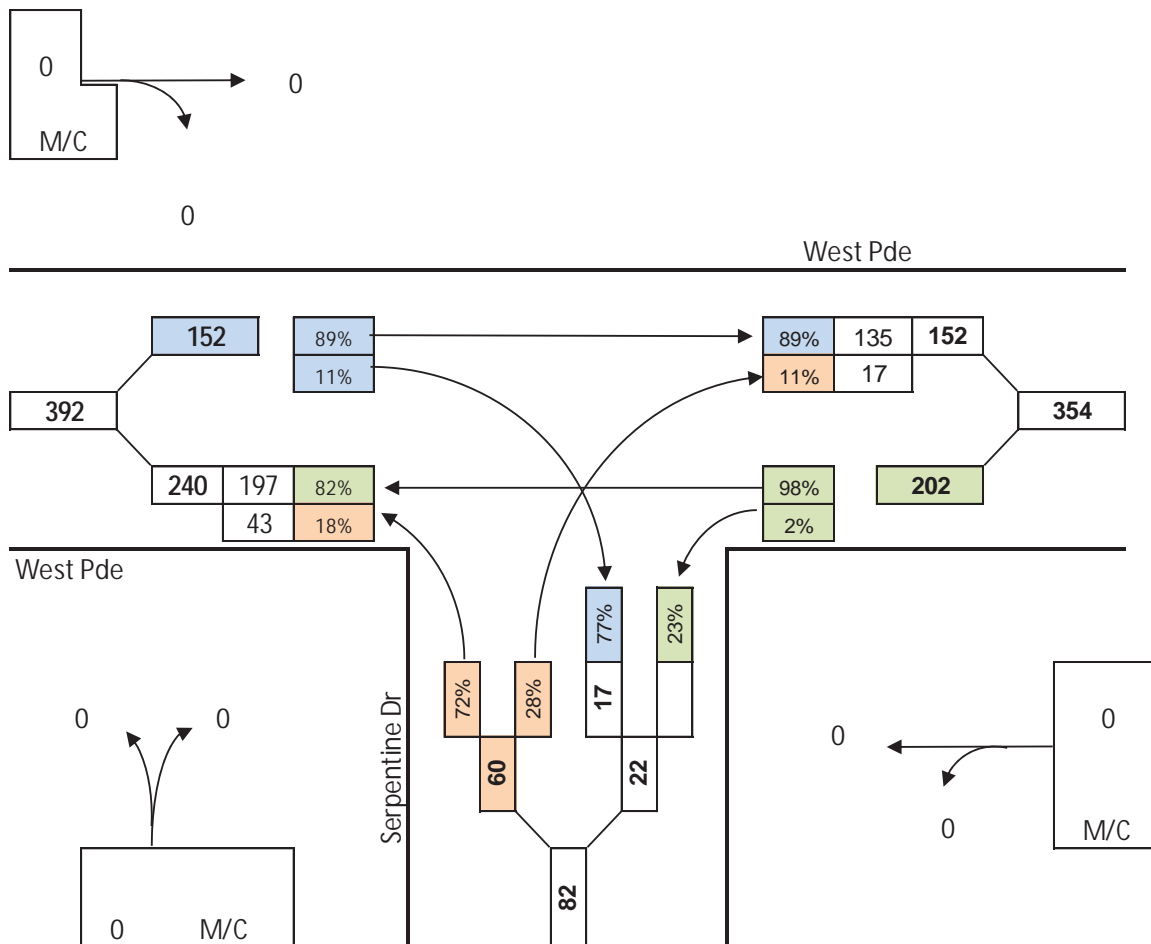
Queue Timings	Location		Suburb		
Staggered 4 - Way Intersection	Queens Road		South Guildford		
Site 1	Job No.	Intersection Type:			
DONALD VEAL CONSULTANTS	Z792	Staggered 4 - Way			
	Duration:		0700 - 0900 & 1600 - 1800		
Movement	Average Queued Time	Max Queued Time	Left	Right	Total
AM Left Turn	0:01:15	0:04:30	274		274
PM Left Turn	0:00:20	0:02:35	212		212
AM Right Turn	0:01:45	0:05:47		72	72
PM Right Turn	0:00:42	0:02:38		68	68
AM	0:01:23	0:05:47	274	72	346
PM	0:00:25	0:02:38	212	68	280

<b>Noahs Rosehill Waters Pty Ltd</b>	<b>DAY</b> Tuesday	<b>DATE</b> 2/03/2021	<b>WEATHER</b> Rain / Storm
<b>Vehicle Volumes</b>	<b>Location</b> Serpentine Dr & West Pde		<b>SUBURB</b> South Guildford
<b>3 - Way Intersection</b>			
<b>Site 2</b>	<b>Job No.</b> Z792	<b>INTERSECTION TYPE:</b> 3 - Way	
<b>DONALD VEAL CONSULTANTS</b>	<b>DURATION:</b> 0745 - 0845		

Note: Motorcycles (M/C) are NOT in Motor Vehicle Totals



## All Vehicles AM Peak Hour



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	
From E	0	1	5	197	202
From S	0	17	0	43	60
From W	0	135	17	0	152
Total		152	22	240	414

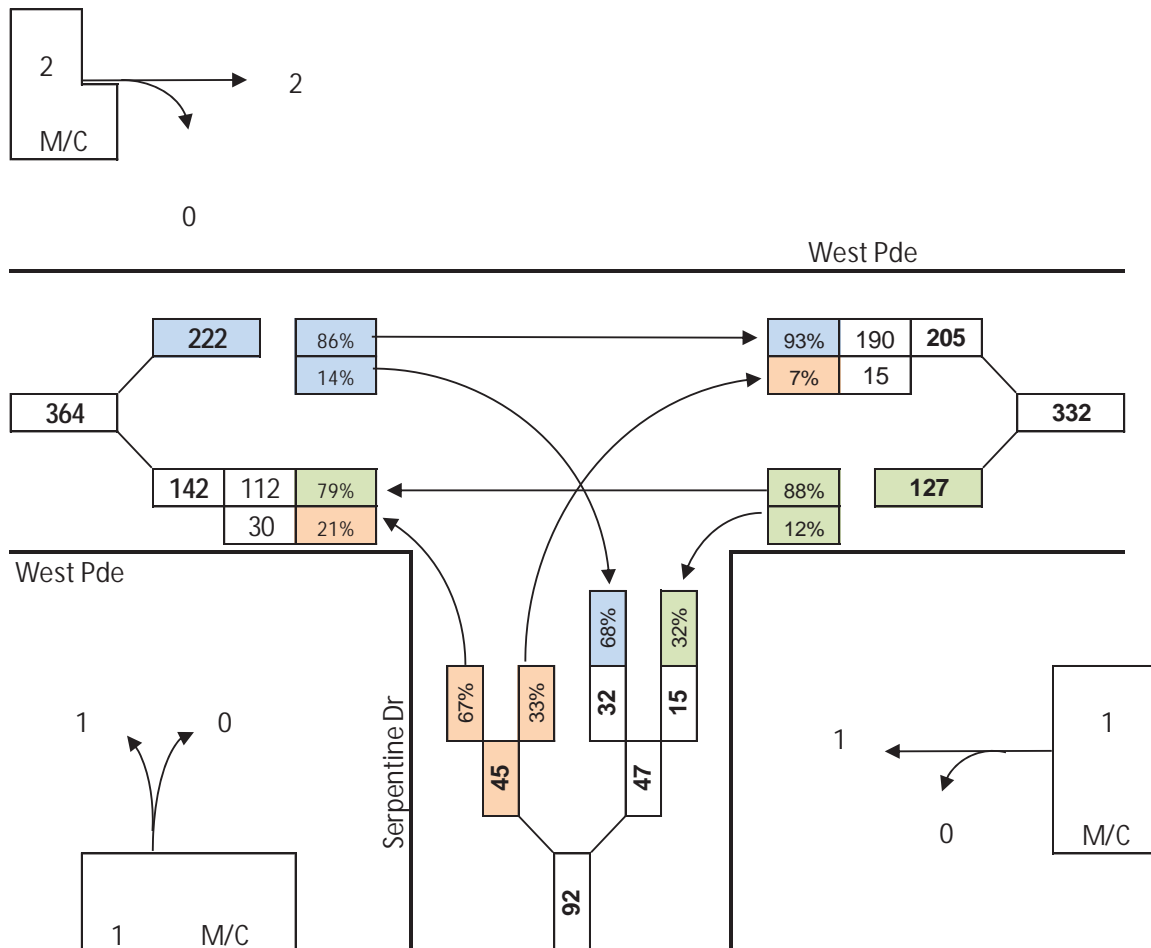
MC Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	
From E	0	0	0	0	
From S	0	0	0	0	
From W	0	0	0	0	
Total					

Noahs Rosehill Waters Pty Ltd	DAY Wednesday	DATE 3/03/2021	WEATHER Rain /Storm
Vehicle Volumes	Location Serpentine Dr & West Pde		SUBURB South Guildford
3 - Way Intersection			
Site 2	Job No. Z792	INTERSECTIONTYPE : 3 - Way	
DONALD VEAL CONSULTANTS	DURATION: 1615 - 1715		

Note: Motorcycles (M/C) are NOT in Motor Vehicle Totals



## All Vehicles PM Peak Hour

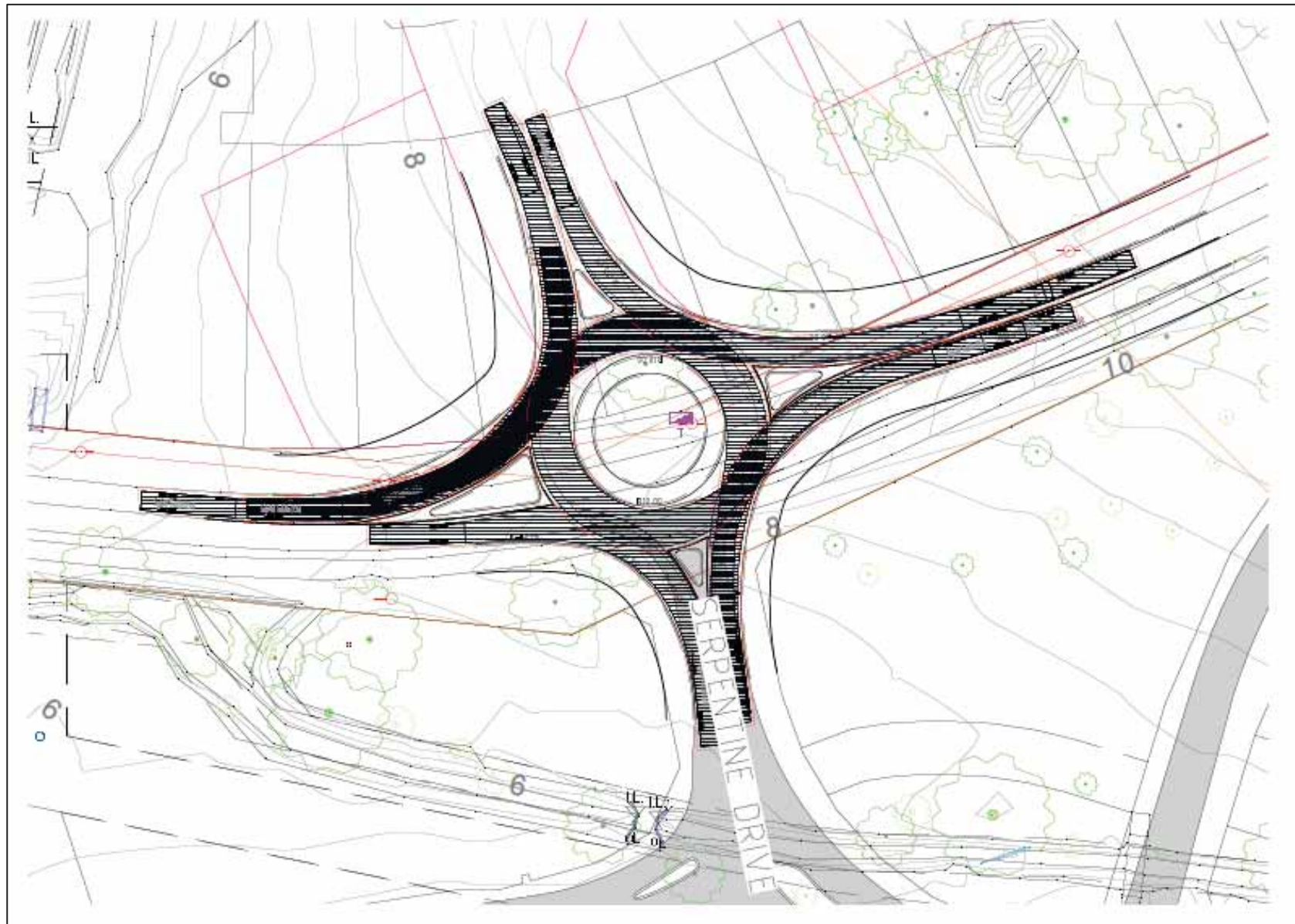


Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	
From E	0	0	15	112	127
From S	0	15	0	30	45
From W	0	190	32	0	222
Total		205	47	142	394

MC Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	
From E	0	0	0	1	
From S	0	0	0	1	
From W	0	2	0	0	
Total					



## **APPENDIX B: WEST PARADE ROUNDABOUT CONCEPT**



## **APPENDIX F**

## **APPROVED BUSHFIRE MANAGEMENT PLAN (AND ADDENDUM)**



# Bushfire Management Plan

---

## Rosehill Waters Estate

Lots 1, 57, 200 and 9000 West Parade  
South Guildford

City of Swan



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Prepared For:  
**RWM Properties**  
5 April 2024  
Version 6.0

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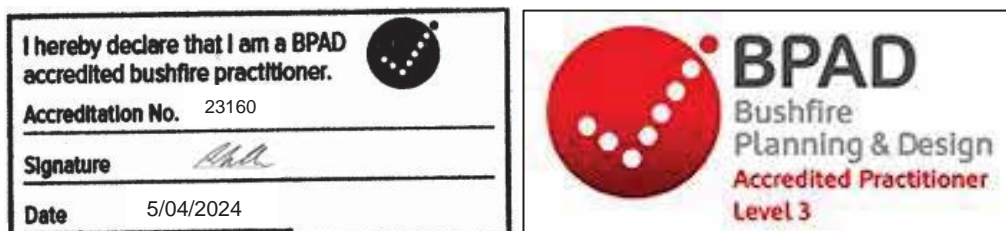
[bushfiresafetyconsulting.com.au](http://bushfiresafetyconsulting.com.au)



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## Document Information

Prepared for: RWM Properties  
Project Name: LPS Amendment, Rosehill Waters  
Address: Lots 1, 57, 200 and 9000 West Parade, South Guildford  
Prepared by: Rohan Carboon  
Dr Karen Brown  
Bushfire Safety Consulting Pty Ltd



## Document Control

Bushfire Management Plan – Rosehill Waters Estate, South Guildford			
REPORT VERSION	PURPOSE	AUTHOR/REVIEWER AND ACCREDITATION DETAILS	DATE SUBMITTED
V1	Draft for Review	Rohan Carboon Level 3 (BPAD 32160) Dr Karen Brown Level 1 (BPAD 48364)	22/04/2021
V2	Submitted for Approval	Rohan Carboon Level 3 (BPAD 32160)	28/04/2021
V3	Final for submission	Rohan Carboon Level 3 (BPAD 32160)	14/07/2021
V4	Updated mods to MRS Amendment	Rohan Carboon Level 3 (BPAD 32160)	8/02/2022
V5	Updated landscape	Rohan Carboon Level 3 (BPAD 32160)	28/02/2024
V6	Changes to foreshore vegetation	Rohan Carboon Level 3 (BPAD 32160)	5/04/2024

### Front cover photo: Structure Plan

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## EXECUTIVE SUMMARY

This Bushfire Management Plan (BMP) has been developed for Rosehill Waters Estate, West Parade, South Guildford ('the site'). It has been prepared to support amendments to the Metropolitan Region Scheme (MRS), the City of Swan's Local Planning Scheme (LPS) No. 17 and the structure plan. The amendments include an increase in urban residential lot density from R20 to R30 in areas yet to be developed, as a result of the removal of Aircraft Noise Exposure Forecast (ANEF) planning contours. The BMP also considers new landscape plans developed for the Rosehill foreshore and classified Multiple Use Wetland. A BMP was previously prepared for the rezoning of the site from 'Rural' to 'Urban' and a new BMP is now required for the proposed amendments. The site is approximately 49 hectares in size, is located one kilometre south-east of the Guildford Town Centre and 12 kilometres north-west of the Perth Central Business District (CBD).

Subdivision approval and the development of residential dwellings has already begun to occur within the site to the south of West Parade. The northern portion of the site, as well as the south-western corner, have yet to be developed and the amendments relate to these areas. Existing residential development exists to the east and south of the site. Palmer Barrack facilities are present adjacent to the site to the west, with the lot containing areas of managed Low Threat Vegetation (Exclusion Clause 2.2.3.2 (f) and (e)), as well as areas of Class A Forest, Class B Woodland, Class D Scrub and Class G Grassland. A regional reserve zoned 'Parks and Recreation' exists along the northern boundary of the site and consists predominately of slashed grassland and managed low threat vegetation adjacent to the site, with areas of Class A Forest along drainage lines.

A Method 1 BAL assessment has been undertaken to determine predicted radiant heat flux levels on the northern and western interface which demonstrates that the residential lots can achieve a predicted radiant heat flux exposure of less than 29kW/m<sup>2</sup>.

The proposed development can achieve all of the Acceptable Solutions and Performance Principles in the Guidelines for Planning in Bushfire Prone Areas V1.3 (2017). The developer is responsible for establishing the Asset Protection Zone until lots are sold. Fuel loads and responsibility for APZ standards then transfer to the new owners / occupiers of the land. The area is reticulated and there is good vehicular access.

The BMP addresses Policy measure 6.2, 6.3 and 6.9 of SPP 3.7 because it demonstrates that compliance with the Bushfire Protection Criteria in the Guidelines for Planning in Bushfire Prone areas can achieve compliance at subsequent planning stages. A further, more comprehensive Bushfire Management Plan complying with these policy clauses is required at future planning stages if the lots are still within the declared bushfire prone area.

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Appendix 6: Palmer Barracks Bushfire Prone Areas Map
Appendix 7: Confirmation of Water Corporation commitment to suitable vegetation management adjacent to site

## 1 PROPOSAL DETAILS

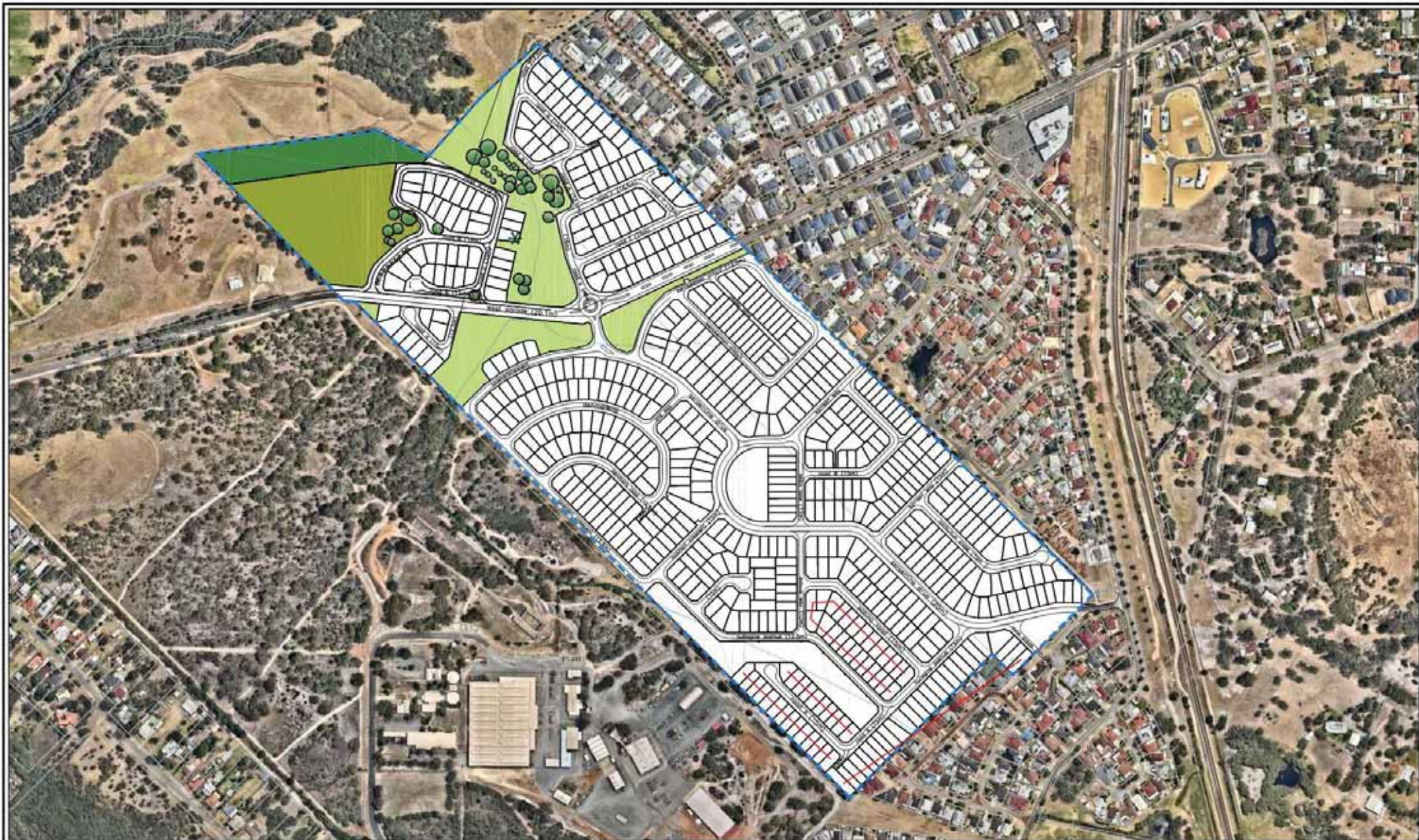
The proposal relates to a number of changes to the MRS, LPS (No.17) and the Structure Plan for Rosehill Waters Estate (herein referred to as 'the site'). A previous Bushfire Management Plan (BMP) was developed by Bushfire Safety Consulting for the Local Structure Plan for the site which was approved in 2016. The proposal includes 633 residential lots, as well as areas of Public Open Space and the development of hospitality and tourism land uses within the Rosehill Lodge precinct. The development of some urban residential lots and Public Open Spaces have already occurred on the site to the south of West Parade. This amendment also proposes an increase in the density of Stage 5 on the eastern boundary from R20 to R30, as a result in a change in the Aircraft Noise Exposure Forecast (ANEF) contours for the site (**Figure 1**).

The site is located approximately one kilometre south-east of Guildford Town Centre, and 12 kilometres north-west of the Perth Central Business District (CBD). It is approximately 49 hectares in size and is surrounded by existing residential development to the east and south (**Figure 2**). Areas of low threat vegetation (Exclusion Clause 2.2.3.2 (f)), Class A Forest and Class B Woodland are present to the west on land containing Palmer Barrack facilities, while predominately low-threat vegetation with some Class A Forest predominately along drainage lines occurs in Public Open Space zoned 'Parks and Recreation' to the north.

This BMP has been prepared to support amendments to the planning framework for Rosehill Waters. It addresses future subdivision conditions by providing responses to the performance criteria in the *Guidelines for Planning in Bushfire Prone Areas V1.3* (WAPC et.al. 2017).

If there is a bushfire within or near the site, implementing this BMP will reduce the threat to residents, property and emergency response personnel.





Location details: Rosehill Waters, West Parade  
 South Guildford  
 Assessment date: August, 2020  
 Prepared by: Bushfire Safety Consulting  
 Accreditation level: Level 3 BPAD Practitioner  
 Accreditation number: BPAD 23160  
 Accreditation expiry date: 31st January, 2025  
 Date aerial photo: February 2021

# FIGURE 1 AMENDED LOCAL STRUCTURE PLAN

SCALE 1:5000 @ A3  
 DATE: JANUARY 2024



## LEGEND

SUBJECT SITE

SOURCE OF PHOTOGRAPHY: NEARMAP



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
Location details: Rosehill Waters, West Parade  
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Accreditation number: BPAD 23160  
Accreditation expiry date: 31st January, 2022  
Date aerial photo: February 2021

**FIGURE 2  
SITE LOCATION PLAN**

0 200 400 600m  
SCALE 1:20,000 @ A4  
DATE: MARCH 2021



**LEGEND**

 SUBJECT LAND

Base mapping supplied by Nearmap  
& Google Maps

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## Policy and Guidelines

### 1.1 Application of SPP 3.7

The *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas (SPP 3.7)* provides the foundation for land use planning to address bushfire risk management in Western Australia. It is used to inform and guide decision makers, referral agencies and land owners/proponents to help achieve acceptable bushfire protection outcomes.

The policy contains objectives and policy measures as well as reference to the Bushfire Protection Criteria as outlined in the Guidelines for Planning in Bushfire Prone Areas (WAPC 2017 V1.3; the Guidelines). The policy applies to the Rosehill Waters Estate because the site is located in a designated bushfire prone area on the WA Map of Bushfire Prone Areas (**Figure 3**).

Policy measures that will need to comply with SPP 3.7 are given in **Table 1**.

*Table 1. Policy measures*

<b>Policy Measure 6.2</b>	The LSP amendment is located within a designated bushfire prone area (Figure 3) and will have a Bushfire Hazard Level above low and a Bushfire Attack Level rating above BAL-LOW.
<b>Policy Measure 6.3</b>	Policy 6.3 applies meaning that any strategic planning proposal be accompanied by: <ul style="list-style-type: none"> <li>- BAL Contour Map</li> <li>- Identification of relevant issues; and</li> <li>- Demonstration of compliance with the guidelines</li> </ul>
<b>Policy Measure 6.9</b>	When making decisions on strategic planning proposals, the advice of the State/relevant agencies/authorities responsible for biodiversity conservation management and environmental protection be sought if substantial clearing of locally significant native vegetation is proposed.

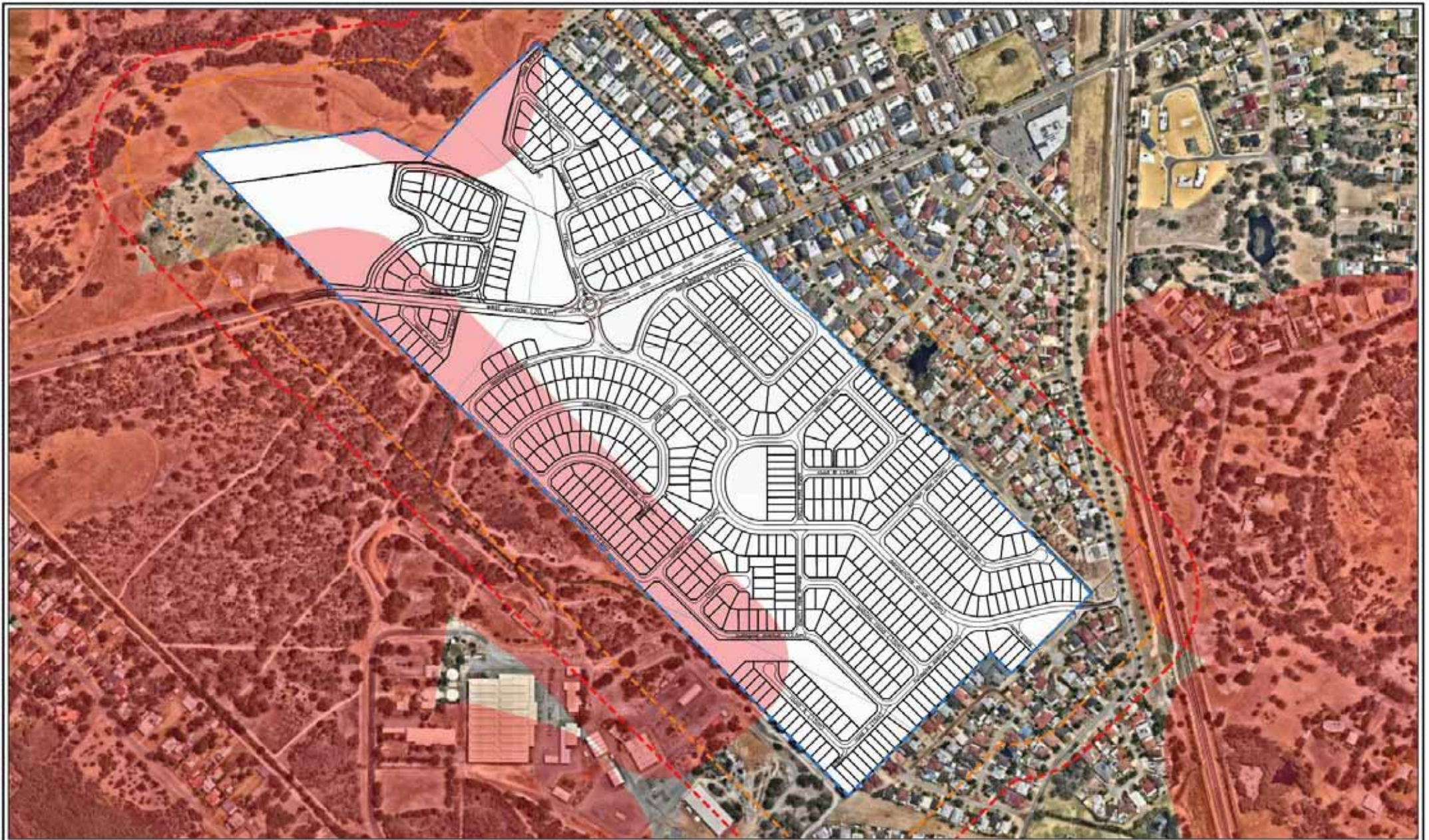
This proposal does not specifically create a zoning for a vulnerable development or a high-risk land use, however if any such land use is to be proposed, additional responses are triggered under *SPP 3.7* at future planning stages.

### 1.2 Guidelines for Planning in Bushfire Prone Areas V1.3 (2017)

The *Guidelines for Planning in Bushfire Prone Areas V1.3 (2017)* requirements are accommodated within this BMP.

The *Guidelines for Planning in Bushfire Prone Areas V 1.3(2017)* is intended to inform and guide decision makers, referral authorities and proponents to achieve acceptable bushfire protection outcomes, including expectations at the different stages of planning.





**FIGURE 3**  
**BUSHFIRE PRONE AREAS**

SCALE 1:5000 @ A3  
DATE: JANUARY 2024



**LEGEND**

- SUBJECT SITE
  - ASSESSMENT AREA (150m) FROM THE EXTERNAL BOUNDARY OF THE SUBJECT SITE
  - ASSESSMENT AREA (100m) FROM THE EXTERNAL BOUNDARY OF THE SUBJECT SITE
  - BUSHFIRE PRONE AREAS
- SOURCE OF PHOTOGRAPHY: NEARMAP

Location details: Rosehill Waters, West Parade  
South Guildford  
Assessment date: August, 2020  
Prepared by: Bushfire Safety Consulting  
Accreditation level: Level 3 BPAD Practitioner  
Accreditation number: BPAD 23160  
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Date aerial photo: February 2021



## 2 ENVIRONMENTAL CONSIDERATIONS

### 2.1 Native Vegetation – modification and clearing

Modification of native vegetation along a small area of draining line to the north will be required for development of a Public Open Space containing low threat vegetation as per AS3959:2018 under the proposed LPS amendments.

### 2.2 Revegetation/Landscape Plans

There is a Landscape Masterplan and Foreshore Management Plan prepared for the Estate which form part of the MRS Amendment documentation, which will be subject to approval at appropriate stages of the planning process. Public Open Space (POS) areas immediately south of West Parade have been developed and contain large areas of turf and maintained garden beds. Proposed POS areas including the living stream throughout the remainder of the site will be established and maintained to a low threat standard which complies with Exclusion Clause 2.2.3.2 (f) in the Australian Standard AS3959:2018.

The public open space and surrounds, including the residential lots, is mapped as a Multiple Use Wetland (MUW). MUWs are described as wetlands with few important ecological attributes and functions remaining. The use, development and management of these areas should be considered in the context of ecologically sustainable development and best management practice catchment planning (EPA, 2008). Retention of these areas is not a requirement.

The proposed landscaping includes irrigated and maintained turf, shade trees with lower branches pruned to 2 metres from ground height, and cultivated garden beds established and maintained in a low fuel condition. The landscape masterplan for stages 6 and 7 is shown in Appendix 4.

Ongoing POS management will include;

- Mowing, edging, whipper snipping.
- Removal of weeds (by hand and spraying including regenerating Eucalypts and Wattles etc not part of the landscaping plan), dead plant removal, pruning and checking and adjusting tree ties.
- Tree pruning for safety and amenity, including removal of lower branches to 2 metres from ground or shrub height level.
- Removal of dead and diseased plants, or parts of plants.
- Pruning of shrubs to maintain separation between clumps of shrubs.
- Removal of any rubbish.

### 2.3 Potential Future Revegetation in Helena River Foreshore Reserve

The Department of Biodiversity, Conservation and Attractions have indicated they wish to plan ahead for the potential to revegetate parts of the Helena River Foreshore Reserve at some stage in the future. The planning of this site has considered this request and associated additional bushfire threat in the hatched areas in Figure 4. In addition, the existing grassy areas in the foreshore that is slashed is assessed as unmanaged grassland in this report.

### 3 BUSHFIRE ASSESSMENT RESULTS

Bushfires are common in the City of Swan and local brigades respond to numerous bushfires in the district annually. Given the bushfire threat in the area, this BMP plays a critical role in ensuring that the re-zoning of the land and the inherent possibility of an increase in usage and intensity appropriately mitigates the risk from bushfire.

#### 3.1 Assessment Inputs


The methodology used to assess the site is outlined in the *Guidelines for Planning in Bushfire Prone Areas V1.3 (2017)*. A concept plan is provided for the proposed lots. More details will be assessed at future subdivision or development application stages. The future Structure Plan modifications proposed for the site will potentially introduce greater intensification of the site, resulting in a strategic level bushfire hazard assessment to assess the post development bushfire hazard rating and implications.





Assessing bushfire threat at the site-specific level accounts for the predominant class of vegetation on the site and surrounding area for a minimum of 150 metres, as shown in **Figure 4**.

##### 3.1.1 Vegetation Classification





The majority of the site to the east and south has been cleared of all classified vegetation. Some areas of the site to the north still contain disturbed Class G Grassland vegetation with a small area of Class A Forest, however this will be cleared or modified to low threat vegetation prior to development of this area. To the east and south of the site are existing residential low-threat areas, with the surrounding land to the north predominately existing low threat managed parkland in Public Open Space. Areas of Class A Forest, Class B Woodland and Class G Grassland are present to the north and on bushland areas in the Palmer Barracks site to the west of the site.

The post development vegetation plots are found in **Figure 4** with plot descriptions below.





<p><b>Photo ID:</b> 1</p> <p><b>Plot Number:</b> 1</p> <p><b>Vegetation classification or exclusion clause:</b> Class B Woodland</p> <p><b>Description/justification of classification</b> Allocasuarina and Melaleuca trees to 8 metres tall with canopy cover 10 to 30%. Separation of canopies and tree trunks separated by 10-20 metres Understorey consists predominately of grasses and herbaceous weeds.</p>	
---	--



<p><b>Photo ID: 2</b>  <b>Plot Number: 1</b>  <b>Vegetation classification or exclusion clause:</b>  Class B Woodland  <b>Description/justification of classification</b>  Allocasuarina and Melaleuca trees to 8 metres tall with canopy cover 10 to 30%. Separation of canopies and tree trunks separated by 10-20 metres  Understorey consists predominately of grasses and herbaceous weeds.</p>	 <p>SW W NW N  279°W (T) LAT: -31.910021 LON: 115.980907 ±10m ▲ 10m  18 Aug 2020, 14:03:23</p>
<p><b>Photo ID: 3</b>  <b>Plot Number: 2</b>  <b>Vegetation classification or exclusion clause:</b>  Class B Woodland  <b>Description/justification of classification</b>  Allocasuarina and Melaleuca trees to 8 metres tall with canopy cover 10 to 30%. Separation of canopies and tree trunks separated by 10-20 metres  Understorey consists predominately of grasses and herbaceous weeds.</p>	 <p>S SW W NW  260°W (T) LAT: -31.909576 LON: 115.980361 ±5m ▲ 15m  18 Aug 2020, 14:05:15</p>
<p><b>Photo ID: 4</b>  <b>Plot Number: 2</b>  <b>Vegetation classification or exclusion clause:</b>  Class B Woodland  <b>Description/justification of classification</b>  Eucalypt trees to 15 metres tall with 10 to 30% canopy cover. Understorey consists predominately of grasses and herbaceous weeds.</p>	 <p>SE S W NW  223°SW (T) LAT: -31.906323 LON: 115.976744 ±5m ▲ 9m  18 Aug 2020, 13:15:01</p>
<p><b>Photo ID: 5</b>  <b>Plot Number: 3</b>  <b>Vegetation classification or exclusion clause:</b>  Class D Scrub  <b>Description/justification of classification</b>  Large shrubs to 5 metres in height. Understorey consists of grasses and herbaceous weeds.</p>	 <p>SW W NW N  275°W (T) LAT: -31.910481 LON: 115.981450 ±5m ▲ 11m  18 Aug 2020, 14:09:50</p>







<p><b>Photo ID: 6</b>  <b>Plot Number: 3</b>  <b>Vegetation classification or exclusion clause:</b>  Class D Scrub  <b>Description/justification of classification</b>  Large shrubs to 5 metres in height. Occasional Eucalypt with less than 10% canopy cover. Understorey consists of grasses and herbaceous weeds. Class G Grassland shown in foreground and Class B Woodland in background of photo.</p>	
<p><b>Photo ID: 7</b>  <b>Plot Number: 4</b>  <b>Vegetation classification or exclusion clause:</b>  Class G Grassland  <b>Description/justification of classification</b>  Annual grasses to 0.5m in height. Occasional Eucalypt with canopy cover less than 10%.</p>	
<p><b>Photo ID: 8</b>  <b>Plot Number: 4</b>  <b>Vegetation classification or exclusion clause:</b>  Class G Grassland  <b>Description/justification of classification</b>  Perennial grasses and sedges to 0.5m in height. Occasional Eucalypt with canopy cover less than 10%.</p>	
<p><b>Photo ID: 9</b>  <b>Plot Number: 5</b>  <b>Vegetation classification or exclusion clause:</b>  Class G Grassland  <b>Description/justification of classification</b>  Perennial grasses and herbaceous weeds to 0.5m in height. Occasional Eucalypt or shrub with canopy cover less than 10%.</p>	







<p><b>Photo ID:</b> 10  <b>Plot Number:</b> 5  <b>Vegetation classification or exclusion clause:</b>  Class G Grassland  <b>Description/justification of classification</b>  Perennial grasses and herbaceous weeds to 0.5m in height. Occasional Eucalypt or shrub with canopy cover less than 10%.</p>	
<p><b>Photo ID:</b> 11  <b>Plot Number:</b> 6  <b>Vegetation classification or exclusion clause:</b>  Class A Forest  <b>Description/justification of classification</b>  Eucalypt and Banksia trees to 12 metres tall with canopy cover 30 to 70%. Understorey consists predominately of small shrubs, grasses, sedges and herbaceous weeds.</p>	
<p><b>Photo ID:</b> 12  <b>Plot Number:</b> 6  <b>Vegetation classification or exclusion clause:</b>  Class A Forest  <b>Description/justification of classification</b>  Dense regrowth Eucalypt trees to 8 metres tall with canopy cover 30 to 70%. Understorey consists predominately of small shrubs, grasses, sedges and herbaceous weeds.</p>	
<p><b>Photo ID:</b> 13  <b>Plot Number:</b> 7  <b>Vegetation classification or exclusion clause:</b>  Class A Forest  <b>Description/justification of classification</b>  Eucalypt trees to 15 metres tall with canopy cover 30 to 70%. Understorey consists of occasional large shrub with small shrubs, grasses, sedges and herbaceous weeds.</p>	




<p><b>Photo ID:</b> 14  <b>Plot Number:</b> 7  <b>Vegetation classification or exclusion clause:</b>  Class A Forest  <b>Description/justification of classification</b>  Eucalypt trees to 15 metres tall with canopy cover 30 to 70%. Understorey consists of occasional large shrub with small shrubs, grasses, sedges and herbaceous weeds.</p>	
<p><b>Photo ID:</b> 15  <b>Plot Number:</b> 8  <b>Vegetation classification or exclusion clause:</b>  Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>  Asset Protection Zone (APZ) as per Bushfire Management Plan for Palmer Barracks annually maintained in low threat condition.</p>	
<p><b>Photo ID:</b> 16  <b>Plot Number:</b> 8  <b>Vegetation classification or exclusion clause:</b>  Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>  Maintained Asset Protection Zone (APZ) as per Bushfire Management Plan for Palmer Barracks on adjoining lot.</p>	
<p><b>Photo ID:</b> 17  <b>Plot Number:</b> 9  <b>Vegetation classification or exclusion clause:</b>  Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>  Low threat vegetation – maintained turf and cultivated garden beds in public open space areas.</p>	



<p><b>Photo ID:</b> 18  <b>Plot Number:</b> 9  <b>Vegetation classification or exclusion clause:</b>                      Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>                      Low threat vegetation – slashed grass fuels and maintained turf in public open space areas by contractors. Always maintained in this condition.</p>	
<p><b>Photo ID:</b> 19  <b>Plot Number:</b> 9  <b>Vegetation classification or exclusion clause:</b>                      Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>                      Low threat vegetation – slashed grass fuels and maintained turf in public open space areas by contractors. Always maintained in this condition</p>	
<p><b>Photo ID:</b> 20  <b>Plot Number:</b> 4  <b>Vegetation classification or exclusion clause:</b>                      Class G Grassland  <b>Description/justification of classification</b>                      Existing Low threat vegetation – slashed grass fuels and maintained in the public open space areas by contractors. In this assessment the areas adjacent to the site are classed as Class g Grassland to ensure the threat of grass fire is considered.</p>	
<p><b>Photo ID:</b> 21  <b>Plot Number:</b> 9  <b>Vegetation classification or exclusion clause:</b>                      Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>                      Public Open Space area to be established and maintained as low threat vegetation containing maintained mowed grass and shade trees.</p>	

<p><b>Photo ID:</b> 22  <b>Plot Number:</b> 9  <b>Vegetation classification or exclusion clause:</b>  Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>  Low threat vegetation – maintained turf in public open space areas.</p>	
<p><b>Photo ID:</b> 23  <b>Plot Number:</b> 9  <b>Vegetation classification or exclusion clause:</b>  Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>  Low threat vegetation – maintained turf in public open space areas.</p>	
<p><b>Photo ID:</b> 24  <b>Plot Number:</b> 9  <b>Vegetation classification or exclusion clause:</b>  Exclusion Clause 2.2.3.2 (f)  <b>Description/justification of classification</b>  Low threat vegetation – maintained turf in public open space areas.</p>	
<p><b>Photo ID:</b> 25  <b>Plot Number:</b> 10  <b>Vegetation classification or exclusion clause:</b>  Exclusion Clause 2.2.3.2 (e)  <b>Description/justification of classification</b>  Non-vegetated areas including roads, footpaths and buildings.</p>	



<p><b>Photo ID:</b> 26</p> <p><b>Plot Number:</b> 10</p> <p><b>Vegetation classification or exclusion clause:</b> Exclusion Clause 2.2.3.2 (e)</p> <p><b>Description/justification of classification</b> Non-vegetated areas including roads and cleared mineral earth soon to be developed into residential dwellings.</p>	
<p><b>Photo ID:</b> 27</p> <p><b>Plot Number:</b> 10</p> <p><b>Vegetation classification or exclusion clause:</b> Exclusion Clause 2.2.3.2 (e)</p> <p><b>Description/justification of classification</b> Non-vegetated areas including roads and footpaths.</p>	
<p><b>Photo ID:</b> 28</p> <p><b>Plot Number:</b> 10</p> <p><b>Vegetation classification or exclusion clause:</b> Exclusion Clause 2.2.3.2 (e)</p> <p><b>Description/justification of classification</b> Non-vegetated areas including roads, footpaths and buildings.</p>	

### 3.1.2 Effective Slope

Effective slope to the north of the site generally ranges from downslope 2 to 4°. Along the western boundary the effective slope is generally flat or upslope, with a small section of downslope 5° in the centre. The topography and effective slope are shown in **Table 2** and **Figure 4**.

*Table 2. Summary of vegetation type and effective slope*

Vegetation Area/ Plot	Applied Vegetation Classification	Effective Slope under the Classified Vegetation (degrees)
1	Class B Woodland	Downslope 0-5°
2	Class B Woodland	Upslope/ Flat
3	Class D Scrub	Upslope/ Flat
4	Class G Grassland	Downslope 0-5°
5	Class G Grassland	Upslope/ Flat
6	Class A Forest	Downslope 0-5°
7	Class A Forest	Upslope/ Flat
8	Exclusion Clause 2.2.3.2 (f)	N/A
9	Exclusion Clause 2.2.3.2 (f)	N/A
10	Exclusion Clause 2.2.3.2 (e)	N/A

### 3.2 Assessment Outputs

A post-development BAL contour assessment was undertaken according to Appendix 3 of the Guidelines and the results are found in **Table 3** and **Figure 5**.

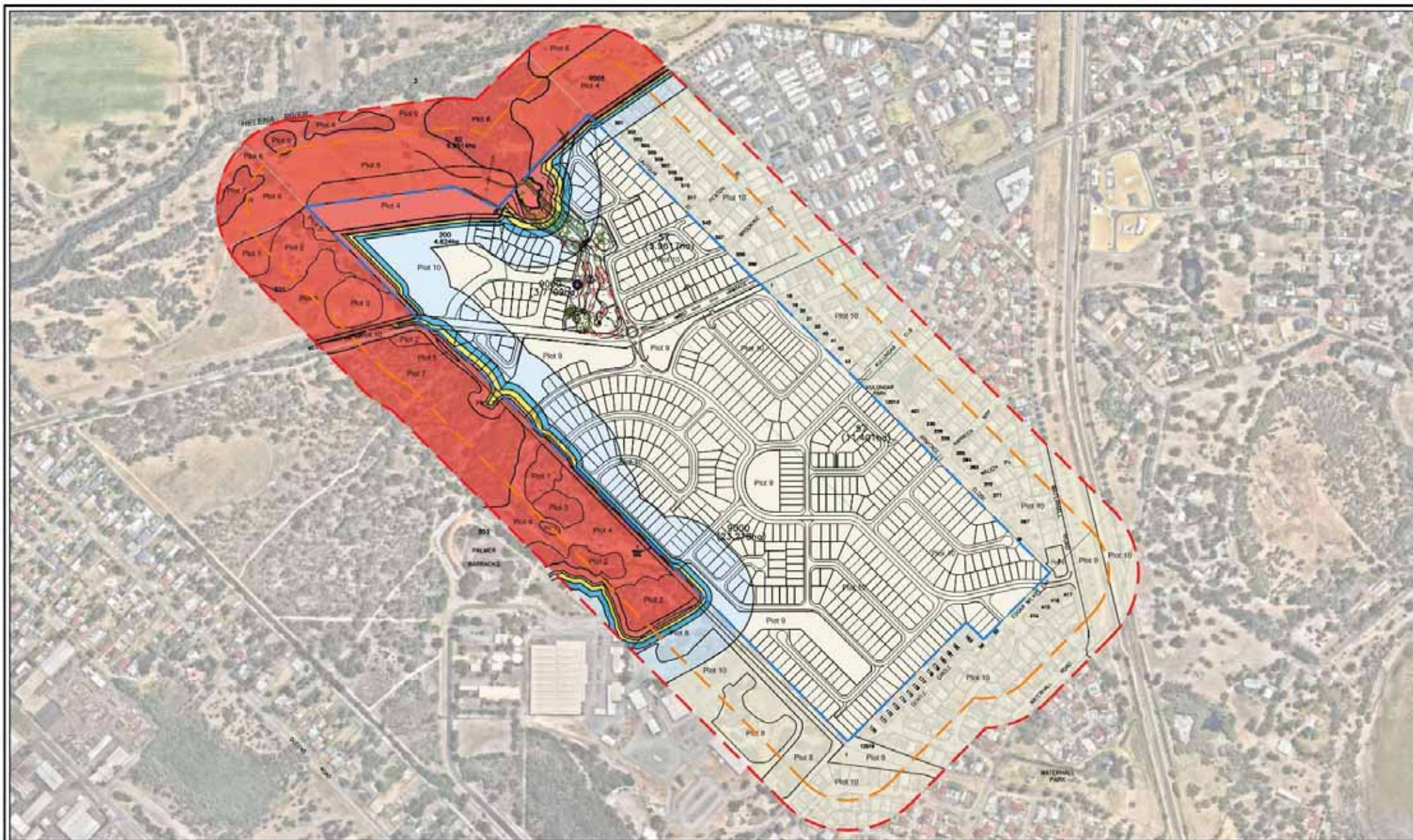
*Table 3. Summary of assessment outputs*

Lot Location	Applied Vegetation Classification	Plot No. & Effective Slope	Separation distance to Classified Vegetation	Highest BAL Contour
Northern Interface Lots	Class A Forest	Plot 6 – Downslope 0-5°	37m	BAL-19
	Class G Grassland	Plot 4 – Downslope 0-5°	12.5m	BAL-29
Western Interface Lots	Class G Grassland	Plot 5 - Flat	8m (with 8m internal lot setback to north-west)	BAL-29
	Class G Grassland	Plot 4 – Downslope 5 °	22.5m	BAL-12.5
	Class A Forest	Plot 7 - Across	21m (with 8m internal lot setback to west)	BAL-29
	Class B Woodland	Plot 1 – Downslope 5°	22.5m	BAL-29
	Class B Woodland	Plot 2 – Flat/ upslope	14m (with 14 metre internal setback to north-west)	BAL-29
	Class D Scrub	Plot 3 - Flat	48m	BAL-19









Location details: Rosehill Waters, West Parade  
South Guildford  
Assessment date: August, 2020  
Prepared by: Bushfire Safety Consulting  
Accreditation level: Level 3 BPAD Practitioner  
Accreditation number: BPAD 23160  
Accreditation expiry date: 31st January, 2025  
Date aerial photo: February 2021

**FIGURE 5**  
**BAL CONTOUR MAP**

SCALE 1:6000 @ A3  
DATE: APRIL 2024



**LEGEND**

- SUBJECT LAND
- ASSESSMENT AREA (150m) FROM THE EXTERNAL BOUNDARY OF THE SUBJECT SITE
- ASSESSMENT AREA (100m) FROM THE EXTERNAL BOUNDARY OF THE SUBJECT SITE

SOURCE OF PHOTOGRAPHY: NEARMAP

**INDICATIVE BUSHFIRE ATTACK LEVELS**

- BAL LOW
- BAL 12.5
- BAL 19
- BAL 29
- BAL 40
- BAL FLAME ZONE



## 4 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

The Class A Forest, Class B Woodland and Class G Grassland to the north and west of the site poses the greatest threat to the development, however all lots can achieve dwellings at predicted radiant heat flux levels of  $29\text{kw/m}^2$  (BAL-29) or below with establishment and maintenance of an Asset Protection Zone and, in the case of four residential lots to the south of West Parade, an internal lot setback of 6 metres to the west.

## 5 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA

This BMP outlines strategies for compliance with the Bushfire Protection Criteria based on the proposed subdivision plan as illustrated in **Figure 1**.

This report adopts an acceptable solution and performance-based system of control for each Bushfire Protection Criteria. This methodology is consistent with Appendix 4 of the *Guidelines for Planning in Bushfire Prone Areas, Version 1.3 (2017)*. The management issues are:

- Location of the development
- Siting and Design of Development
- Vehicular access.
- Water

### 5.1 Compliance Table

Acceptable solutions are proposed for all of the Bushfire Protection Criteria and each illustrates a means of satisfactorily meeting the corresponding performance criteria. Land use planning bushfire risk mitigation strategies are comprehensively detailed in the following sections by providing responses to the performance criteria that fulfil the intent of the bushfire hazard management issues outlined in the *Guidelines for Planning in Bushfire Prone Areas V1.3 (2017)*. The compliance checklist is shown in **Table 4** and spatial representation of the bushfire management strategies are illustrated in **Figure 6**.

*Table 4: Compliance Table*

Bushfire Protection Criteria	Method of compliance	Proposed bushfire management strategies
	Acceptable Solutions	
<b>Element 1: Location</b>	AQ1.1 Development Location	The Method 1 BAL Assessment in this report demonstrates the classified vegetation adjacent to the site does impact the proposed development along the western and northern interface, however all lots are able to achieve BAL-29 or lower, with the vast majority of lots at the site rated BAL-LOW. Four proposed residential lots to the south of West Parade require a 6 metre internal lot setback to the west to achieve BAL-29.
<b>Element 2: siting and Design</b>	A2.1 Asset Protection Zone (APZ)	The Asset Protection Zone (APZ) will occupy all Bushfire Prone Areas of the site along the western and northern boundaries, which ensures all buildings will be exposed to BAL-29. The APZ will be established and maintained as 'Low Threat Vegetation' as per Exclusion Clause 2.2.3.2 (f) of AS3959:2018 (See <b>Section 2.2</b> ). A Perimeter APZ will be established along the northern and western boundaries, including the drain managed by the Water Corporation running adjacent to the site to the west. This will ensure separation from long term bushfire hazards in the POS to the north and Army Barracks to the west. No buildings can be located with the Perimeter APZ (see <b>Figure 6</b> ).
<b>Element 3: Vehicular Access</b>	A3.1 Two access routes	All proposed lots have direct driveway access to a public road which leads to West Parade, an arterial road which runs through the site towards the north, as well as seven other public roads that adjoin the site to the east. West Parade provides good access to the east and west. Serpentine Drive provides access to Waterhall Road in the south-east corner of the site, with Karreen Way and Kulungar Elbow providing egress from the site to the east. Two other proposed public roads will provide egress from the site to the north-east (see <b>Figure 6</b> ). All proposed residential lots with the Bushfire Prone Area are provided with two internal access routes to the access roads which provide egress from the site either directly, or via a short cul-de-sac which meets standards. Therefore, two access routes are achieved.
	A3.2 Public Road	All proposed public roads within and surrounding the site comply with minimum public road standards outlined in Appendix 2.

<b>Element 3: Vehicular Access (cont)</b>	A3.3 Cul-de-sac	<p>There are five cul-de-sacs within the LSP. Two short (ie. &lt; 150 metres) cul-de-sacs heads are located immediately adjacent to other public roads, they are provided to limit vehicle access onto the road in normal circumstances and provide a suitable design interface for dwellings to the main road. One 78m and 202m cul-de-sac are already approved and existing as part of the current structure plan/subdivision approval as per the current BMP.</p> <p>The 226m cul-de-sac is unavoidable given the waterway constraints around this pocket of land. The previous arrangement was a large strata lot which limited the length of the cul-de-sac on plan but not in practicality. BAL contour plan demonstrates that the proposed cul-de-sac is 230 metres long, it is 120 metres from the nearest area of classified vegetation and is therefore not within a bushfire prone area as identified in this assessment. It exceeds the cul-de-sac minimum length of 200 metres by 26 metres and is inconsequential in this context.</p> <p>All cul-de-sacs contain compliant turn-around heads and comply with standards given in Appendix 2.</p>
	A3.4 Battle-axe	There are no battle axes proposed within the BPA at the site. Two battle-axe lots with short 22 metre long driveways are present to the east of the site outside of the BPA.
	A3.5 Private driveway longer than 50 m	There are no private driveways longer than 50m proposed.
	A3.6 Emergency Access Way	There are no Emergency Access Ways proposed.
	A3.7 Fire Emergency Access Ways	There are no Fire Emergency Access Ways proposed.
	A3.8 Firebreak width	Compliance will be achieved with the current City of Swan Fire Hazard Notice (Appendix 3), including the construction and maintenance of a firebreak adjacent to the northern boundary within the proposed POS.
<b>Element 4: Water</b>	A4.1 Reticulated areas	The development has access to a reticulated water supply. Hydrants will be spaced according to the Water Corporation's No. 63 Water Reticulation Standard.
	A4.2 Non-reticulated areas	Not applicable.
	A4.3 Individual lots	Not applicable.

## 5.2 Additional Management Strategies

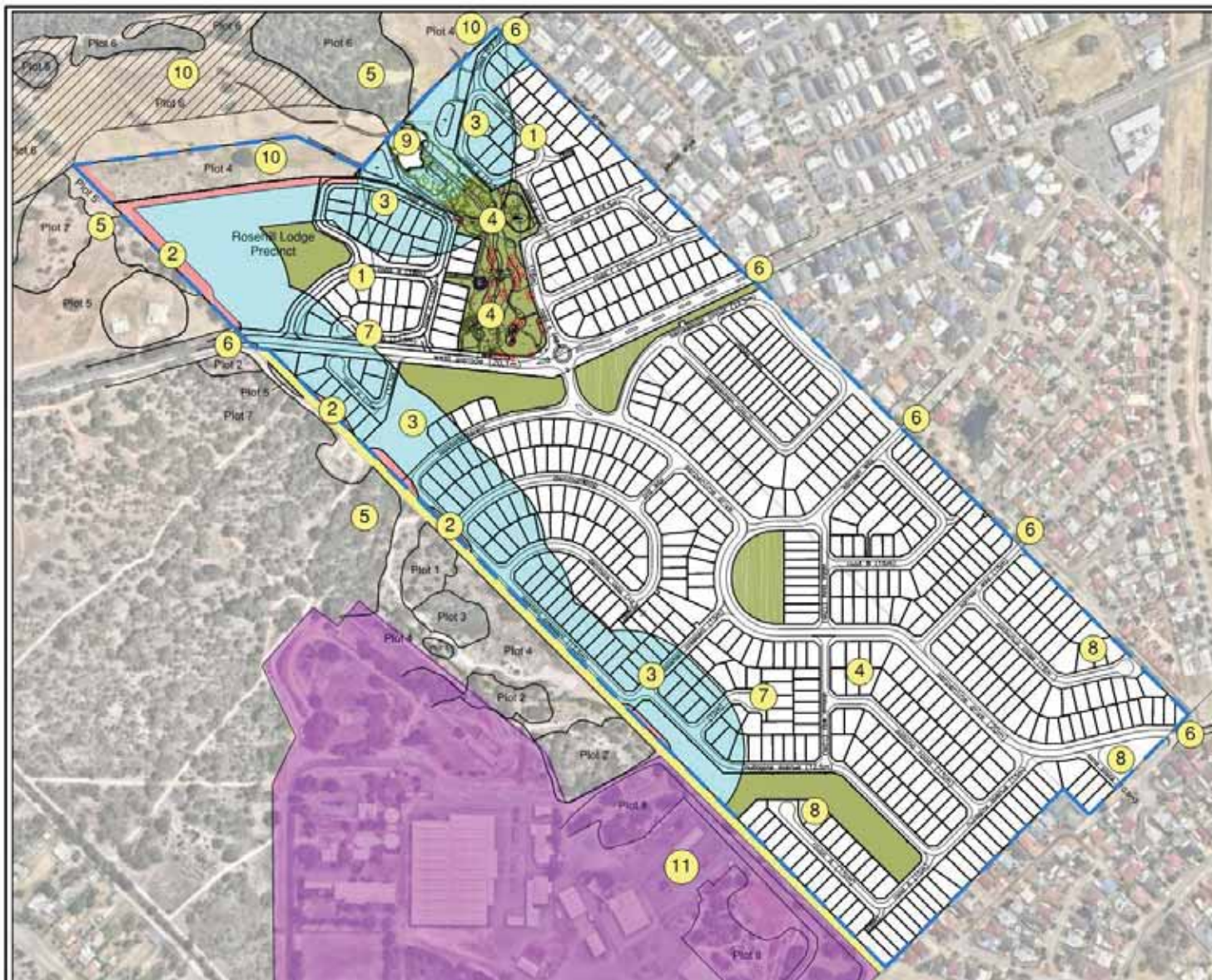
An Asset Protection Zone (APZ) will be provided which covers all Bushfire Prone Areas within the site, including residential lots with a BAL rating of BAL-12.5 or higher. Final internal design details will be provided at the next stage and will ensure BAL ratings on interface lots will achieve BAL-29 or lower. Asset Protection Zones within the site will be established and maintained in undeveloped areas if staging of the development of lots occurs. Lots will not be sold until such time as they are rated BAL-29 or lower.

All internal public roads provide access to an existing major public road (West Parade), which then gives provides egress to the east and west. Seven other public roads that adjoin the site along the eastern boundary provide additional egress from the site. A reticulated water supply will service all lots and hydrants will be spaced according to standards.

A summary of management strategies is outlined in **Figure 6**.

No specific Vulnerable or High-Risk Land Uses have been proposed at the site. Any specific applications will trigger the necessary requirements under State Planning Policy 3.7.





**FIGURE 6 - SPATIAL REPRESENTATION OF BUSHFIRE MANAGEMENT STRATEGIES**

## REQUIREMENTS

1. Classified vegetation within the site is temporary and will be removed or modified to low threat condition as per AS3959:2018 prior to development. The site will be cleared and maintained in a low threat state to 100 metres from current development if developed in stages.
2. A Perimeter APZ exists in sections along western boundaries of the site and provides separation from the classified vegetation present on adjacent land. Four proposed residential lots have an 8 metre internal lot setback to ensure BAL-29 is obtained for future dwellings. No buildings are permitted to be constructed within the Perimeter APZ.
3. Proposed lots within 100 metres of the classified vegetation to the north or west will comply with Asset Protection Zone requirements, as outlined in Appendix 1. All lots can achieve a BAL rating of BAL-29 or lower when conditions are met.
4. Areas of Public Open Space will be established and maintained as 'Low Threat Vegetation' as per Exclusion Clause 2.2.3.2 (f) in Australian Standards AS3959:2018. Ongoing management of vegetation in the POS will include - mowing of turf to maintain height of 100mm or less, removal of all accumulated fine fuels (leaf litter, twigs, dead branches etc), removal of weeds including regenerating Eucalypts and Wattlies etc not part of the landscaping plan, tree pruning including removal of lower branches to 2 metres from ground or shrub height level, removal of dead and diseased plants, or parts of plants, pruning of shrubs to maintain separation between clumps of shrubs, removal of any rubbish.
5. Long term bushfire hazard from areas of permanent classified vegetation is present in the adjacent lot to the west and public open space to the north. Existing separation and the Perimeter APZ provide separation to ensure all dwellings on proposed lots can achieve BAL-29 or lower.
6. The lots will be connected to the existing public road network in multiple locations providing multiple access options to multiple destinations.
7. There are three cul de sacs within the Bushfire Prone Area (BPA) that are 78m, 147m and 120m long respectively with compliant turn arounds and which comply with standards given in Appendix 2. Two other cul-de-sacs occur, one 202 metre length one that is existing and approved and a proposed 226 m long that is not in the future bushfire prone area.
8. There are two existing cul de sacs that are outside of the BPA to the south-east of the site. A proposed 230m long cul de sac to the south-west is predominately outside of the BPA, with only the turnaround shown within. Vegetation assessment of the site and resultant BAL contours showed the cul de sac to be greater than 100 metres from classified vegetation and within the BAL-LOW contour. The cul-de-sac exceeds the cul-de-sac minimum length of 200m by only 30 metres and, given the circumstances, is inconsequential in this context.
9. The public open space and surrounds, including the residential lots, is mapped as a Multiple Use Wetland (MUW). MUWs are described as wetlands with few important ecological attributes and functions remaining. The use, development and management of these areas should be considered in the context of ecologically sustainable development and best management practice catchment planning (EPA, 2008). Retention of these areas is not a requirement. One area of POS is retained as Class A Forest and triggers BAL ratings on adjacent lots.
10. The Department of Biodiversity, Conservation and Attractions have indicated they wish to plan ahead for the potential to revegetate parts of the Helena River Foreshore Reserve at some stage in the future. The planning of this site has considered this request and associated additional bushfire threat in the hatched areas and in the Plot 4 (Grassland) area.
11. Palmer Barracks Asset Protection Zone is outlined in their Bushfire Management Plan to provide protection to their assets and the adjacent development.



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SCALE 1:5000 @ A3  
DATE: APRIL 2024



Location details:	Rosehill Waters, West Parade South Guildford
Assessment date:	August, 2020
Prepared by:	Bushfire Safety Consulting
Accreditation level:	Level 3 BPAD Practitioner
Accreditation number:	BPAD 23160
Accreditation expiry date:	31st January, 2025
Date aerial photo:	February 2021



## 6 RESPONSIBILITIES FOR IMPLEMENTATION AND MANAGEMENT OF THE BUSHFIRE MEASURES

Table 5 outlines the broad ongoing responsibilities, actions and associated works that need to be undertaken by the future Developer / Proponent or Land Owner and the City of Swan. An accredited Bushfire Planning Practitioner will need to be engaged at Subdivision Application and/or Development Application stages to update the BMP and assess the development against all of the bushfire protection criteria and SPP 3.7.

*Table 5. Responsibility for bushfire measures*

<b>DEVELOPER / PROPONENT / LANDOWNER</b>	
<b>LSP, SUBDIVISION STAGE AND ONGOING MANAGEMENT</b>	
1	Outside of the retained forest area, ensure the POS areas are designed and established to a low threat condition with fuel loads and fuel structures managed as outlined in the landscape plans and section 2.2.
2	At subdivision stage, update the BMP and ensure compliance with SPP 3.7 and the guidelines.
3	At subdivision stage, ensure vegetation within the site is removed and managed in a low threat condition within 100 metres of the subdivision boundaries where possible and confirm BAL ratings for individual lots prior to the creation of titles.
4	At subdivision stage, install the public roads and water supply to standards outlined in Appendix 2.
5	Liaise with the Department of Defence (Palmer Barracks) and the Water Corporation annually to ensure they implement their Bushfire Management Plan and Asset Protection Works (in Appendix 5 & 7).
6	Ensure the site complies with the City of Swan's Fire Hazard Reduction Notice as published.
7	Ensure any future construction of buildings comply with AS 3959:2018 as and when required.
8	Update the Bushfire Management Plan as requested by the City of Swan if it has reason to believe site conditions have substantially changed, or new methodologies or practice are adopted as identified in future revisions of the "Guidelines".
<b>CITY OF SWAN – ONGOING MANAGEMENT</b>	
9	Maintain public roads to appropriate standards and ensure compliance with the City of Swan's Fire Hazard Reduction Notice.

10	Ensure ongoing liaison with the Department of Defence (Palmer Barracks) to ensure they implement their Bushfire Management Plan and Asset Protection Works annually (in Appendix 5 & 7).
11	Provide fire prevention and preparedness advice to landowners upon request, including the <i>Homeowners Bush Fire Survival Manual, Prepare, Act, Survive</i> (or similar suitable documentation) and the City of Swan's Fire Hazard Reduction Notice.

## 7 CONCLUSION

This Plan provides acceptable solutions and responses to the performance criteria that fulfil the intent of the bushfire hazard management issues outlined in the Guidelines for Planning in Bushfire Prone Areas (WAPC 2017 V1.3). However, community bushfire safety is a shared responsibility between governments, fire agencies, communities and individuals.

Rosehill Waters Estate is located in the bushfire prone area (i.e. within 100 m of classified vegetation) and risk is reduced via compliance with *AS 3959:2018* standards. The outcomes of the BMP are not envisaged to limit development within the Rosehill Lodge Precinct and that a BMP will be prepared at a future stage to accompany a DA for that site.

Future dwellings will be exposed to < 29 kW/m<sup>2</sup> when conditions are met. A minimum of two vehicular access options is achieved, and fire hydrant requirements for fire-fighting are met. The proposed development will fall within the acceptable level of risk.

## REFERENCES

Environmental Protection Authority (EPA) (2008). Environmental Guidance for Planning and Development. EPA Guidance Statement No. 33. Government of Western Australia, Perth, Western Australia.

Standards Australia, 2018, *Construction of buildings in bushfire-prone areas (Amendments 1-3)*, AS 3959-2018, Standards Australia International Ltd, Sydney.

Western Australian Planning Commission (WAPC), 2015, *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas (SPP3.7)*, December 2015, Western Australian Planning Commission and Department of Planning WA, Government of Western Australia.

Western Australian Planning Commission (WAPC), 2017, *Guidelines for Planning in Bushfire Prone Areas*, December 2017 V1.3, Western Australian Planning Commission and Department of Planning WA, Government of Western Australia.





## APPENDICES

Appendix 1: Asset Protection Zone Standards

Appendix 2: Vehicular Access Technical Requirements

Appendix 3: City of Swan Fire Hazard Reduction Notice

Appendix 4: Landscape Concept Plan for Stages 6 and 7 Rosehill Waters Estate

Appendix 5: Palmer Barracks Location of APZ and BAL Contour

Appendix 6: Palmer Barracks Bushfire Prone Areas Map

Appendix 7: Confirmation of Water Corporation commitment to suitable vegetation management adjacent to site

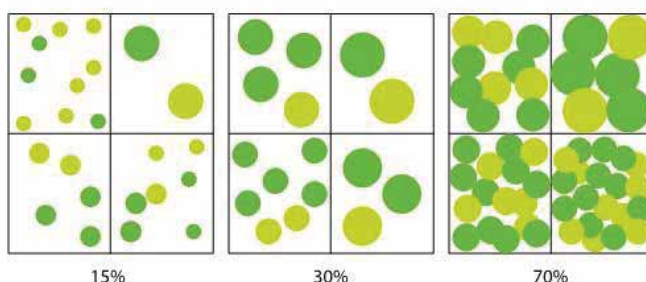
## Appendix 1: Guidelines for Planning in Bushfire Prone Areas - Asset Protection Zone Standards

### ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

#### SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

- **Fences:** within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.
- **Objects:** within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.
- **Fine Fuel load:** combustible dead vegetation matter less than 6 millimetres in thickness reduced to and maintained at an average of two tonnes per hectare.
- **Trees (> 5 metres in height):** trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy.

Figure 18: Tree canopy cover – ranging from 15 to 70 per cent at maturity

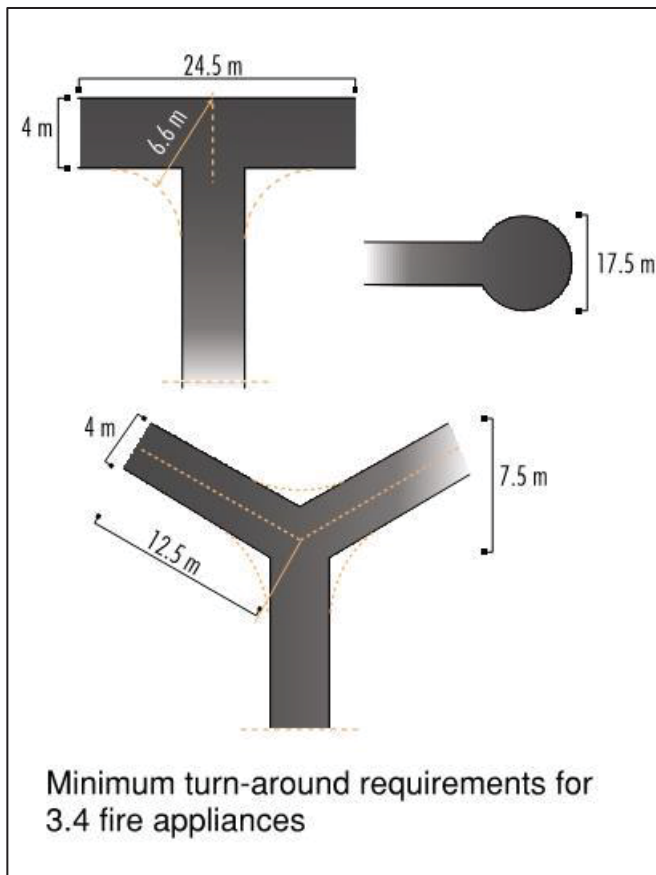


- **Shrubs (0.5 metres to 5 metres in height):** should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m<sup>2</sup> in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.
- **Ground covers (<0.5 metres in height):** can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 millimetres in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.
- **Grass:** should be managed to maintain a height of 100 millimetres or less.

## Appendix 2: Vehicle Access Technical Requirements

TECHNICAL REQUIREMENTS	1 Public road	2 Cul-de-sac	3 Private driveway	4 Emergency access way	5 Fire service access routes
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	N/A	4.5	4.5	4.5
Maximum grade <50 metres	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum crossfall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5

\*Refer to E3.2 Public roads: Trafficable surface



## Appendix 3 – City of Swan Fire Hazard Reduction Notice

### **Bush Fires Act 1954** **City of Swan** **Fire Hazard Reduction Notice (Firebreak Notice)**

Notice to Owners and/or Occupiers of land situated within the City of Swan.

To assist in the control of bush fires, and pursuant to Section 33 of the Bush Fires Act 1954, all owners and occupiers of land within the City of Swan are required on or before the 1st day of November, 2020, or within 14 days of becoming an owner or occupier of land after that date, must meet the fire hazard reduction conditions described in this notice and maintain these conditions up to and including the 30th day of April, 2021.

- 1. All land up to 5,000m<sup>2</sup> (0.5 Hectares or 1.2 Acres)**
  - 1) Install and maintain an asset protection zone in accordance with the requirements specified in clause 13 of this notice.
  - 2) Maintain all grass to a height of no greater than 10cm.
  - 3) Areas of natural vegetation to be maintained at or below 8 tonnes per hectare.
  - 4) Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in this notice and with any additional requirements outlined within that plan.
- 2. All land between 5,000m<sup>2</sup> and 25,000m<sup>2</sup> (0.5 - 2.5 Hectares) or (1.2 - 6.2 Acres)**
  - 1) Install and maintain an asset protection zone in accordance with the requirements specified in clause 13 of this notice.
  - 2) Install firebreaks immediately inside and adjacent to all external property boundaries. Firebreaks need to be 3 metres wide with a 4 metre vertical height clearance free from flammable materials and overhanging branches (see section 10 in this notice for further details).
  - 3) Maintain all grass to a height of no greater than 10cm.
    - a) If the land is stocked, the grass must be reduced and maintained to a height of no greater than 10cm by the 1st day of December.
  - 4) Natural vegetation within 100 metres of buildings including attached and adjacent structures and essential infrastructure shall be maintained at or below 8 tonnes per hectare, by passive methods of fuel reduction that does not permanently remove or reduce the quantity or occurrence of the native plants, shrubs and trees within the subject area.
  - 5) Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in this notice and with any additional requirements outlined within that plan.
- 3. All land with an area greater than 25,000m<sup>2</sup> (2.5 Hectares or 6.2 Acres)**
  - 1) Install and maintain an asset protection zone in accordance with the requirements specified in clause 13 of this notice.
  - 2) Install firebreaks immediately inside and adjacent to all external property boundaries. Firebreaks need to be 3 metres wide with a 4 metre vertical height clearance free from flammable materials and overhanging branches (see section 10 in this notice for further details).
    - a) Properties over 100 hectares require additional firebreaks to divide the land into areas not exceeding 100 hectares.
  - 3) Slash or mow grass to a height no greater than 10cm immediately adjacent to firebreaks to a minimum width of 3 metres.
    - a) If the land is stocked, this grass must be reduced and maintained to a height of no greater than 10cm by the 1st day of December.
  - 4) Natural vegetation within 100 metres of buildings including attached and adjacent structures and essential infrastructure shall be maintained at or below 8 tonnes per hectare, by passive methods of fuel reduction that does not permanently remove or reduce the quantity or occurrence of the native plants, shrubs and trees within the subject area.
  - 5) Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in this notice and with any additional requirements outlined within that plan.



**4. Plantations**

- 1) Install and maintain external and internal firebreaks, firebreaks that form compartments (cells), firebreaks and hazard reduction measures that protect neighbouring communities and essential infrastructure in accordance with the requirements of a fire management plan approved in writing by the City; or
- 2) Where no such approved fire management plan exists,
  - a) Unless the City approves an alternative plan in writing in accordance with clause 4(2)(b), install and maintain external and internal firebreaks and firebreaks that form compartments (cells), and carry out all other firebreaks and hazard reduction measures which are required in accordance with the requirements and specifications within the Department of Fire & Emergency Services 'Guidelines for Plantation Fire Protection' 2011 publication; or
  - b) If it is considered impractical for any reason to carry out the plantation requirements outlined above in clause 4 (2)(a), plantation owners and managers may apply in writing to the City to implement an alternative plan or measures in accordance with clause 4 of this notice. A Fire Management Plan may be required to be developed and submitted as part of the application.

**5. Application to Vary Firebreak and Hazard Reduction Requirements**

- 1) If it is considered impractical for any reason to clear firebreaks in a manner or location required by this notice, or to carry out any fire hazard reduction work or measures required by this notice, you may apply in writing on or before the 15th day of October, for approval to provide firebreaks in alternative positions or to take alternative measures to abate fire hazards on the land. Alternative firebreak application forms can be downloaded from the City of Swan website.
- 2) If permission is not granted in writing by the City prior to the 1st day of November, you shall comply with the requirements of this notice.
- 3) When permission for alternative firebreaks or fire hazard reduction measures has been granted, you shall comply with all conditions on the endorsed permit and maintain the land to the required standard throughout the period specified by this notice.
  - a) Where a property is affected by an approved bushfire management plan, property owners must comply with any additional requirements and responsibilities outlined within that plan.

**6. Fuel Dumps and Depots**

Remove all flammable material within 10 metres of fuel dumps, fuel ramps or where fuel drums, whether containing fuel or not, are stored.

**7. Hay Stacks**

Clear and maintain a firebreak completely surrounding any haystack on the land, within 60 metres of the haystack.

**8. Fire Service Access (Strategic Firebreaks)**

- 1) Where under a written agreement with the City, or where depicted on an approved bushfire management plan Fire Service Access (Strategic Firebreaks) are required on the land, you are required to clear and maintain the Fire Service Access (Strategic Firebreaks) a minimum of 6 metres wide along the agreed alignment to provide restricted vehicular access to emergency services and authorised vehicles.
- 2) Fire Service Access (Strategic Firebreaks) must be free from flammable material and unimpeded by obstructions including boundary fences and gates unless approved in writing by the City.
- 3) Gates may only be secured with City of Swan Fire Service padlock.
- 4) Fire Service Access (Strategic Firebreaks) shall be graded to provide a continuous 4 wheel drive trafficable surface a minimum of 4 metres wide with a 1 metre shoulder on either side.
- 5) All branches must be pruned and obstacles removed to maintain a 4 metre vertical height clearance above the full 6 metre width of the trafficable surface.

**9. Emergency Access Ways**

- 1) Where under a written agreement with the City, or where depicted on an approved bushfire management plan, Emergency Access Ways are required on private land, you are required to clear and maintain a vehicular access way to a minimum of 6 metres wide along the agreed alignment.
- 2) Emergency access ways must be free from flammable material and unimpeded by obstructions including boundary fences and gates unless approved in writing by the City.
- 3) Gates on Emergency Access Ways must remain unlocked at all times.
- 4) Emergency Access Ways shall be graded and have suitable drainage to provide a minimum 6 metre wide continuous trafficable surface suitable for all types of 2 wheel drive vehicles.

- 5) All branches must be pruned and obstacles removed to maintain a 4 metre vertical height clearance above the full 6 metre width of the trafficable surface.

**10. Firebreak Construction**

- 1) Firebreaks are to be developed and maintained clear of all obstacles and flammable materials to create a minimum of 3 metres wide trafficable surface suitable for 4 wheel drive vehicles.
- 2) Overhanging branches must be pruned to provide a 4 metre vertical clearance above the full width of the firebreak surface.
- 3) Boundary firebreaks must be aligned immediately inside and adjacent to the external property boundaries.
- 4) Alternative Firebreaks that are approved in writing by the City, or as depicted within a bushfire management plan approved in writing by the City, are to be constructed to the same standard as general firebreaks and must be constructed along the specified alignment.
- 5) Firebreaks must not terminate in a dead end.
- 6) Firebreaks may be constructed by ploughing, grading, raking, burning, chemical spraying or any other approved method that achieves the required standard.

**11. Driveways**

Where building sites are situated more than 50 metres from a public road,

- 1) Driveways must be maintained clear of all permanent obstacles and flammable materials to create a minimum 3 metre wide trafficable surface suitable for all types of 2 wheel drive vehicles.
- 2) Overhanging branches must be pruned to provide a 4 metre vertical clearance above the driveway.

**12. Fuel Reduction – Natural Vegetation**

- 1) Available bushfire fuels must be maintained at or below:
  - a) Asset Protection Zones - 2 tonnes per hectare
  - b) Hazard Separation Zones - 8 tonnes per hectare

\*This requirement only applies where HSZs are depicted within a Fire Management Plan approved in writing by the City.

  - c) Natural Vegetation - 8 tonnes per hectare for areas of natural vegetation within 100 metres of buildings, attached and adjacent structures and essential infrastructure
- 2) Passive Fuel Reduction within natural vegetation may be achieved by burning, raking, pruning, weed management, removal of dead materials and any other approved method.
- 3) Permanent removal or partial clearing of natural vegetation including individual or groups of native grasses, shrubs or trees may only be carried out to meet the minimum requirements of this notice.
- 4) Permanent clearing of natural vegetation structures including individual plants, shrubs or trees, that exceeds the requirements of this notice or the specifications outlined within a bushfire management plan approved in writing by the City, is only permitted in accordance with the provisions and exemptions outlined within the Environmental Protection Act 1986, or with the approval of the Department of Water and Environmental Regulation and the City of Swan.

Note: Advice and resources on how to measure and manage native vegetation fuel loads are available from the Department of Fire and Emergency Services or the City of Swan.

**13. Asset Protection Zones Specification**

Asset protection zones for habitable buildings and other assets must meet the following requirements:

- 1) Extend 20 metres out from any external walls of the building, attached structures, or adjacent structures within 6 metres of the habitable building, unless varied under an approved bushfire management plan.
- 2) On sloping ground the asset protection zone distance shall increase with 1 metre for every degree in slope on the sides of the building/ structure that are exposed to down slope natural vegetation.
- 3) Asset protection zone requirements only apply within the boundaries of the lot on which the asset is located and cannot be enforced across boundaries.
- 4) Recommendation Only - Asset protection zones predominantly consist of non-flammable managed vegetation, reticulated lawns and gardens and other non-flammable features.
- 5) All grass is maintained to or under 10cm.
- 6) Fuel loads must be reduced and maintained at 2 tonnes per hectare or lower.
- 7) The crowns of trees are to be separated where possible to create a clear separation distance between adjoining or nearby tree crowns. The separation distance between tree crowns is not required to exceed 10 metres. Clearing or thinning existing trees to create distances greater than 10 metres separation between tree crowns within an asset protection zone is not required or supported by this notice and requires approval from the Department of Water and Environmental Regulation and the City of Swan.



- 8) A small group of trees within close proximity to one another may be treated as one crown provided the combined crowns do not exceed the area of a large or mature crown size for that species.
- 9) Trees are to be low pruned (or under pruned) to at least a height of 2 metres from ground.
- 10) No tree, or shrub over 2 metres high is planted within 2 metres of a building, especially adjacent to windows.
- 11) There are no tree crowns or branches hanging over buildings.
- 12) Clear and prune scrub to reduce to a sparse density (able to walk through vegetation with relative ease with minimal deviation around trees and shrubs).
- 13) Install paths or clear flammable or dry vegetation, debris and materials immediately adjacent to the building.
- 14) Wood piles and flammable materials stored a safe distance from buildings.

#### 14. Burning

All burning must be carried out in accordance with the relevant provisions of this notice and the Bush Fires Act 1954, Health Act 1911 and the City's Consolidated Local Laws 2005.

**Prohibited Period:** All burning, including garden refuse and camping fires are prohibited.

**Restricted Period:** All burning requires a permit except for the burning of garden refuse and camping fires which are subject to the following conditions:

- 1) The fire must not be lit if the Fire Danger Rating is Very High or above, or if a Total Fire Ban or a Harvest and Vehicle Movement Ban is declared.
- 2) Only one fire is allowed at any time and it does not exceed 1 cubic metre in size.
- 3) No flammable material within 5 m of the fire.
- 4) The fire is only lit between 6 pm and 11 pm and completely extinguished by midnight.
- 5) At least one person capable of controlling the fire is in attendance at all times with adequate means of extinguishing the fire.

#### 15. Cooking Fires

Fires for the purpose of cooking are exempt from burning period restrictions subject to the following conditions:

- 1) The fire must not be lit if the Fire Danger Rating is Very High or above, or if a Total Fire Ban or a Harvest and Vehicle Movement Ban is declared.
- 2) The fire is contained in a purpose built appliance and
  - a) at a person's home; or
  - b) an area is set aside for that purpose by the State Authority or City of Swan
- 3) No flammable material within 5 m of the fire.
- 4) At least one person capable of controlling the fire is in attendance at all times with adequate means of extinguishing the fire.

#### 16. Compliance

- 1) In addition to the requirements of this notice, further works which are considered necessary by an Authorised Officer of the City may be required as specified in writing in a subsequent notice addressed to the land owner.
- 2) Where the owner or occupier of the land fails or neglects to comply with the requirements of this notice or a subsequent notice addressed to the land owner, the City of Swan may enter onto the land with workmen, contractors, vehicles and machinery to carry out the requisitions of the notice at the expense of the land owner.
- 3) Failure to comply with this notice and subsequent written notices may result in a penalty not exceeding \$5,000, or the issue of a \$250 infringement notice and liability for any costs incurred by the City in relation to works undertaken on behalf of the land owner.
- 4) Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in this notice and with any additional requirements outlined within that plan.

#### 17. Definitions

**'Alternative Firebreak'** is a firebreak that is in an alternative position or alignment to the external boundaries of a property.

**'Alternative Firebreak Application'** is an application that may be made by a land owner to install firebreaks in an alternative position, or to carry out alternative measures in lieu of general firebreaks.

**'Available Fuel'** is the bush fuel consisting of live and dead vegetation such as stubble, mulch, leaf litter, twigs, trash, scrub and other vegetation less than 6mm in diameter capable of carrying a running fire and will actually burn under prevailing conditions.

**'City'** means the City of Swan.

**'Buildings, Attached and Adjacent Structures'** means habitable buildings that are used as a dwelling, workplace, place of gathering or assembly, a building that is a carpark, or a building used for the storage

or display of goods or produce for sale by whole sale in accordance with classes 1-9 of the Building Code of Australia. The term building includes attached and adjacent structures like garages, carports, verandas or similar roofed structure(s) that are attached to, or within 6 metres of the dwelling or primary building.

**'Asset Protection Zone (APZ)'** is a low fuel area that is reduced of flammable vegetation and materials surrounding buildings and essential infrastructure to minimise the likelihood and impact that direct flame contact, radiant heat or ember attack may have on buildings and assets in the event of a bushfire. This area must extend out from the external walls of a building or asset a minimum of 20 metres.

**'Bushfire Management Plan'** or 'Fire Management Plan' is a comprehensive plan that may be placed on the certificate of title(s) of land that has been developed as a condition of development or subdivision. Bushfire Management Plans may become out dated and it's the responsibility of the property owner to review and keep them current. Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in the Annual Fire Hazard Reduction Notice and with any additional requirements outlined within that plan.

**'Emergency Access Way'** is a two wheel drive trafficable, 6 metre wide access route to provide local residents, general public and emergency services alternative links to road networks at the end of cul-de-sacs or areas where access is limited during an emergency incident.

**'Essential Infrastructure'** or **'Critical Infrastructure'** means assets, infrastructure, systems and networks that provide essential services necessary for social and economic wellbeing and is typically public infrastructure. Assets and infrastructure, usually of a public nature, that generate or distribute electricity, water supply, telecommunications, gas and dams are typical assets that are essential to society and are often located in, or traverse areas that are prone to bushfires.

**'Firebreak'** is an area of land cleared of flammable material (see available fuel above) to minimise the spread of a bushfire and to provide access for firefighting services. For the purpose of this notice the term firebreak is a strip of land at minimum 3 metres with a 4 metres vertical clearance, constructed to provide a 4 wheel drive trafficable surface for access by emergency and authorised vehicles. Boundary firebreaks are installed immediately adjacent the external boundaries of a property.

**'Fire Hazard'** means accumulated fuel (living or dead) such as leaf litter, twigs, trash, bush, dead trees and scrub capable of carrying a running fire, but excludes standing living trees and isolated shrubs.

**'Hazard Separation Zone (HSZ)'** means an area extending out from an asset protection zone a distance of 80 metres unless otherwise specified, to create a graduated fuel reduction and separation from natural vegetation.

**'Natural Vegetation'** means natural areas of forest, woodland, shrubland, scrub, mallee or mulga.

**'Passive Fuel Reduction'** means lowering the amount of available fuel that will burn under prevailing conditions by means that will not permanently reduce or modify the structure or life cycle of plant, shrub, scrub or tree communities within an treated area. This is typically achieved by undertaking a cool, controlled burn of an area during cooler, damper months, or by physical removal of built up leaf litter, dead materials, weeds and slashing long dry grasses without damaging live native plants within the area.

**'Plantation'** is any area of native or exotic planted trees that exceeds three hectares in a gazetted town site, or elsewhere a stand of trees of 10 hectares or larger that has been planted and managed intensively for their commercial and environmental value. A plantation includes roads, firebreaks and small areas of native vegetation.

**'Fire Service Access (Strategic Firebreaks)'** is a firebreak that is 6 metres wide established to provide strategic access and links to road networks whilst providing a wider control/containment line to protect town sites, estates and similar exposures during bushfire operations.

By order of the Council,

MJ Foley

Chief Executive Officer

City of Swan



## Appendix 4: Landscape Concept Plan for Stages 6 and 7 Rosehill Waters Estate





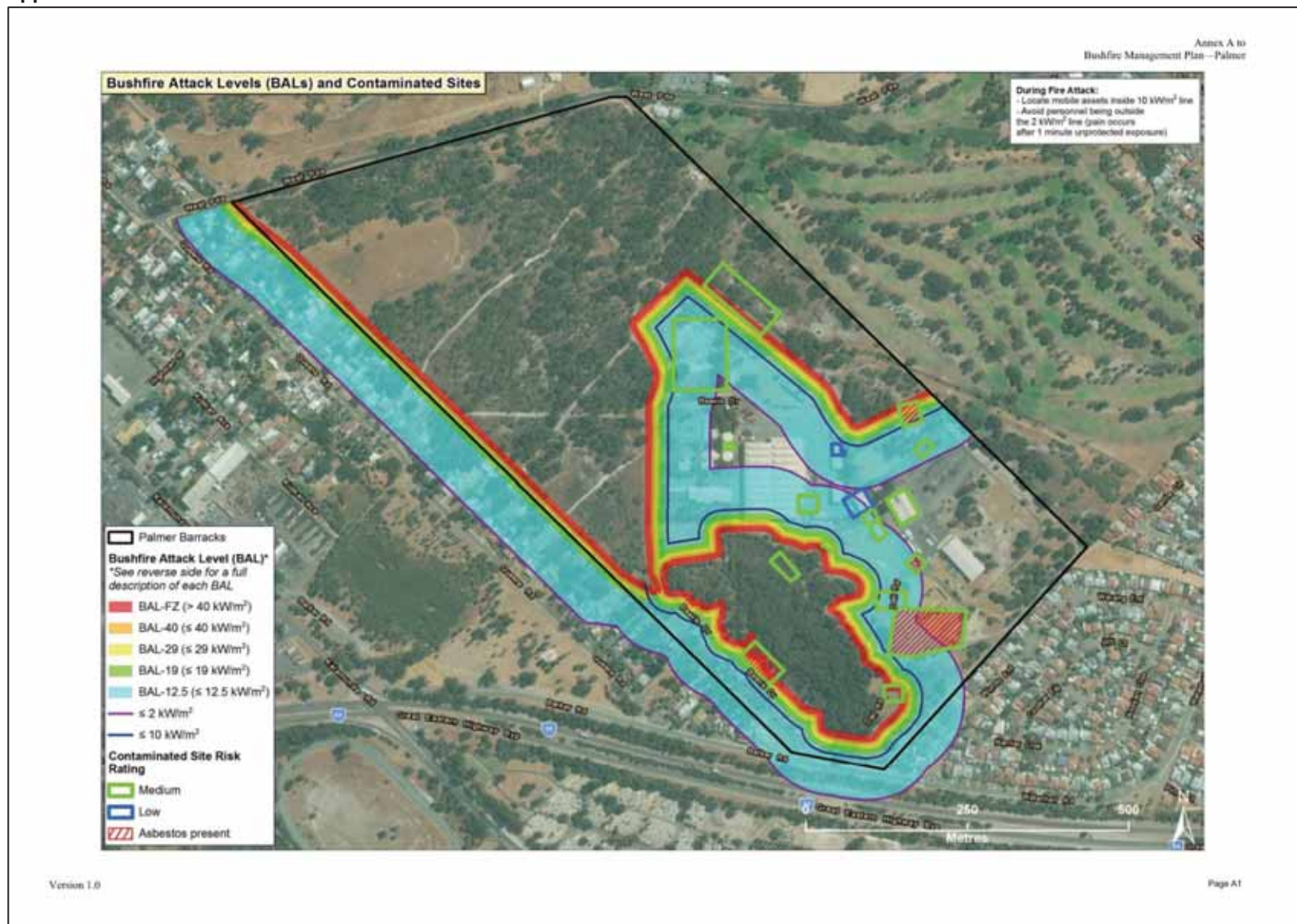
## Appendix 5: Palmer Barracks Location of APZ and BAL Contour

Bushfire Mitigation Works Program						
Work Type	Location	Fire Management Zone	Standard	Timing	Procedures	Responsibility / Monitoring
Access and firebreak maintenance	Map 1	All	<ul style="list-style-type: none"> <li>City of Swan Firebreak notice</li> <li>DFES Maintenance Guideline</li> </ul>	Prior to Oct (annually), and as required in Fire Season	<ul style="list-style-type: none"> <li>Access &amp; Firebreak:                             <ul style="list-style-type: none"> <li>34 m x 4 m (horizontal and vertical)</li> <li>Cleared of all vegetation e.g. grating, slashing, herbicide, ploughing</li> </ul> </li> <li>Hardening of access routes (10m before and after) all of the access gates, turnaround points and other 'pull-over' areas</li> <li>Signpost fire trails fire breaks as per Map 1 below</li> </ul>	EMOS Base Support & Envo
APZ Maintenance	All areas marked as APZ on Map 4	APZ	<ul style="list-style-type: none"> <li>DFES APZ Standard</li> </ul>	Prior to Oct (annually), and as required in Fire Season	<ul style="list-style-type: none"> <li>ground fuel load &lt; 2 (ha leaf litter areas)</li> <li>grass height &lt; 5cm</li> <li>Tree canopies have a clear separation (thin or prune as required)</li> <li>prune lower tree branches &lt; 2 m</li> <li>no tree &lt; 3m from building and no canopy or branches overhanging building</li> <li>shrubs separated from buildings by &gt; 3 times the height (at maturity) of the shrub. No shrubs abutting windows, glass doors or vulnerable building components</li> <li>Trees or shrubs cleared of dead material</li> </ul>	EMOS Base Support & Envo
LMZ Maintenance	LMZ on Map 4	LMZ	<ul style="list-style-type: none"> <li>Fire intervals 10-20 years</li> <li>For successive fires vary interval, month, intensity</li> <li>70-80% burn coverage</li> </ul>	Apr to Sep (annually)	<ul style="list-style-type: none"> <li>Strategic mosaic of burning across site (see Map 5). Amend if wildfires occur.</li> <li>Do not light full perimeter of a 'block'</li> <li>Burn plan to achieve required LMZ standard</li> <li>Implement prepost burn weed control</li> <li>Wetland LMZ &lt; 30% burned in any fire, burn plan to consider latest fire regime specifications for the community/species</li> </ul>	EMOS Base Support & Envo
Water Supply Maintenance	See Map 1	All	<ul style="list-style-type: none"> <li>See Regional BMP</li> </ul>	Prior to Oct (annually)	<ul style="list-style-type: none"> <li>Inspect/maintain operability of all hydrants</li> <li>Ensure signage is visible</li> <li>Clear 6 m around bushland hydrants to APZ standard</li> </ul>	EMOS EFS Compliance
Building maintenance	Entire site	APZ	<ul style="list-style-type: none"> <li>See Regional BMP</li> </ul>	Prior to Oct (annually), and as required in Fire Season	<ul style="list-style-type: none"> <li>Roof and gutters free of debris</li> <li>Painted surfaces in good condition, delaying timbers fixed to prevent ambers entry in gaps</li> <li>Fix broken tiles or dislodged roofing and gaps in the roof</li> <li>Damaged window/door screens fixed</li> <li>Drought excluders are functioning</li> <li>All combustible materials located well away from buildings/assets</li> </ul>	EMOS EFS Compliance
Power line Maintenance	Entire site	All	<ul style="list-style-type: none"> <li>Prescribed Safety Structure</li> </ul>	Prior to Oct (annually)	<ul style="list-style-type: none"> <li>Maintain vegetation clearance of 2.5 m (minimum) from poles and conductors</li> <li>Determine responsibility for maintenance of wetland conductors &amp; poles</li> </ul>	EMOS EFS Compliance
Fire Danger Rating & TFS notification	Front entrance / Bushland entrance	All	<ul style="list-style-type: none"> <li>See RBMP</li> </ul>	Daily @ 0900 during Oct to Apr	<ul style="list-style-type: none"> <li>Fire danger signs set as per DFES Bush website</li> <li>DFES website</li> <li>Bush website</li> </ul>	Wilson / EMOS JLU-W / EFS Compliance
Plan	Entire site	All	<ul style="list-style-type: none"> <li>See RBMP &amp; National Bushfire Guidelines</li> </ul>	Apr (annually)	<ul style="list-style-type: none"> <li>Review using National Bushfire Guidelines (and update accordingly)</li> <li>Major revision required in 2020</li> </ul>	Envoes & Base Support BSM





## Appendix 5: Palmer Barracks Location of APZ and BAL Contour





## Appendix 6: Palmer Barracks Bushfire Prone Areas Map



## Appendix 7: Confirmation of Water Corporation commitment to suitable vegetation management adjacent to site

**From:** Binod Kadariya <Binod.Kadariya@watercorporation.com.au>

**Sent:** Tuesday, 25 January 2022 5:27 PM

**To:** rohan@bushfiresafetyconsulting.com.au

**Subject:** RE: Rosehill Estate ni South Guildford & Water Corporation Bushfire Risk works

Hello Rohan,

Thank you for your email.

On behalf of WC, I can confirm that we have 52W firebreak Maintenance plan to comply with LGA's annual bushfire notice as well as Bushfire Act 1954. Firebreak maintenance plan is done each year in Oct and Nov.

In addition, we may have another 1 round of ground maintenance depending on the criticality rating of the site and budget availability. Criticality rating is reviewed every year based on the development of nearby lands.

If this email is not sufficient and you must have a letter on letterhead, then I will need to direct you to another business unit who looks after customers.

Hope this helps.

Thank you,

Kindest Regards,

**Binod Kadariya**

Snr Eng – Civil

Perth Region Field Services

*NB: If you receive an e-mail from me outside normal business hours, please do not feel obliged until normal business hours resume.*

**E:** [binod.kadariya@watercorporation.com.au](mailto:binod.kadariya@watercorporation.com.au)

**T:** (08) 9424 8438

**M:** 0436 632 269

MENTAL HEALTH CHAMPION



**W:** [watercorporation.com.au](http://watercorporation.com.au)

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**From:** rohan@bushfiresafetyconsulting.com.au <rohan@bushfiresafetyconsulting.com.au>

**Sent:** Friday, 26 February 2021 4:53 PM

**To:** Binod Kadariya <Binod.Kadariya@watercorporation.com.au>; Rob Annells <Rob.Annells@watercorporation.com.au>

**Cc:** Mavis Webb <Mavis.Webb@watercorporation.com.au>

**Subject:** RE: bushfire clean up - Lot 1 West Parade South Guildford

Thanks Binod,

Can you please just clarify if this means the works are consistent with my attached diagram (which we agreed to previously).

Thanks for your assistance, it is appreciated.

Regards

Rohan

Rohan Carboon B. App. Sci. (Environmental Management) G Dip (Bushfire Protection)  
Managing Director  
Bushfire Safety Consulting Pty Ltd  
BPAD Practitioner Level 3 – BPAD 23160  
M: 0429 949 262

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**From:** Binod Kadariya <Binod.Kadariya@watercorporation.com.au>

**Sent:** Friday, 26 February 2021 4:46 PM

**To:** Rob Annells <Rob.Annells@watercorporation.com.au>; rohan@bushfiresafetyconsulting.com.au

**Cc:** Mavis Webb <Mavis.Webb@watercorporation.com.au>

**Subject:** RE: bushfire clean up - Lot 1 West Parade South Guildford

Good day Rob and Rohan,

I confirm that we have 2x 52 weekly preventative maintenance plans for this site as below:

	S	Maintenance item	Maintenance Plan	Strategy	Maintenance item description	Purchase order	S	Functional Location
		50008	1067165	FIXT_W	52W FIREBREAK MTCE WDM TALBOT GUILDFORD		P	W2000997
		50009	1091455	FIXT_W	52W GROUNDS MTCE TALBOT/WEST SV735-607		P	W2000997

Thank you,

Kindest Regards,

**Binod Kadariya**

Spclst – Civil Engineer

Perth Region Field Services

**E:** binod.kadariya@watercorporation.com.au

**T:** (08) 9424 8438

**M:** 0436 632 269

**W:** [watercorporation.com.au](http://watercorporation.com.au)

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**From:** rohan@bushfiresafetyconsulting.com.au <rohan@bushfiresafetyconsulting.com.au>

**Sent:** Tuesday, 23 February 2021 1:02 PM

**To:** Rob Annells <Rob.Annells@watercorporation.com.au>

**Subject:** bushfire clean up - Lot 1 West Parade South Guildford

Hi Rob

Thank for the chat, I am back working at Rosehill Estate in South Guildford and the site is bordered by Lot 1 West Parade which is a 10m wide lot owned / managed by Water Corporation between the site and the Palmer Barracks

Back in march 2018, Mavis Webb supervised a crew to clean it up and it was done to a very high standard. See attached plan we worked to in 2018.

Can I please have some correspondence from you that confirms this work schedule is ongoing and is undertaken annually?

Thanks again,  
Rohan Carboon B. App. Sci. (Environmental Management) G Dip (Bushfire Protection)  
Managing Director  
Bushfire Safety Consulting Pty Ltd  
BPAD Practitioner Level 3 – BPAD 23160  
M: 0429 949 262

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## **APPENDIX G**

## **ACOUSTIC ASSESSMENT (2015)**

## AIRCRAFT NOISE

### Acoustic Consultants Reports

Herring Storer Acoustics was engaged by Rosehill Waters to monitor aircraft noise over the site. This was carried out August 2013 during a school holiday period that was considered to be a period of heavy air traffic. The monitoring was done over a two weeks period. As a result of monitoring noise from a Boeing 747-400 taking off the recorded emissions were between 70 and 87 dB(A). We have subsequently adopted 87dB(A) as our base noise level from which we determine our final internal noise levels as per the below charts;

#### ROSEHILL WATERS ESTATE – AIRCRAFT NOISE

NOISE EMISSIONS RATING FOR THIS SITE AS DETERMINED BY HERRING STORER ACOUSTICS – RANGE 70 TO 87 Db(A). THIS DETERMINATION TAKES INTO ACCOUNT THE PROPOSED 3<sup>RD</sup> RUNWAY.

BASE NOISE LEVEL ADOPTED OF 87 dB(A) TO DETERMINE Rw RATINGS FOR BUILDING CONSTRUCTION ELEMENTS.

#### AS2021-2000 RECOMMENDS:

House/Home Unit/Flat	Less than ANEF 20	20 to 25 ANEF	Greater than 25 ANEF
	"Acceptable"	"Conditionally Acceptable"	"Unacceptable"

FURTHERMORE AS2021-2000 RECOMMENDS THE BELOW AS A GUIDELINE FOR NOISE REDUCTION IN THE HOME:

RESIDENCE	ROOMS	NOISE LEVEL
	SLEEPING	50 dB(A)
	LIVING	55 dB(A)
	OTHER	60 dB(A)

**PS: THE MAJORITY OF HOMES BUILT WITHIN EXISTING WATERHALL AND ROSEHILL ESTATES WILL HAVE NO OR LIMITED NOISE ATTENUATION BUILT IN AND WOULD NOT ACHIEVE THE ABOVE MINIMUM RECOMMENDED NOISE LEVELS**

**HOMES WITHIN ROSEHILL WATERS ESTATE WILL BE CONSTRUCTED USING INNOVATIVE BUILDING SYSTEMS TO ACHIEVE THE BELOW NOISE LEVELS:**

RESIDENCE	ROOMS	NOISE LEVEL
	SLEEPING	45 dB(A)
	LIVING	50 dB(A)
	OTHER	55 dB(A)

Please find attached the original Herring Storer's monitoring report.

## HERRING STORER ACOUSTICS

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# ROSEHILL COUNTRY CLUB WEST PARADE, SOUTH GUILDFORD

## AIRCRAFT NOISE MEASUREMENT

AUGUST 2013

OUR REFERENCE: 16675-1-12081-01



DOCUMENT CONTROL PAGE

**AIRCRAFT NOISE MEASUREMENT**  
**WEST PARADE, SOUTH GUILDFORD**

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## 1. INTRODUCTION

Herring Storer Acoustics (HSA) was commissioned by Habitat International, on behalf of Green Top Nominees (Handle Property Group) to undertake a noise level assessment for the proposed rezoning of the Rosehill Country Club Site. The purpose of this assessment was to determine, by measurement, noise levels associated with aircraft movements from the Perth Airport.

Previously an assessment has been conducted by HSA, reference 15784-2-12081 on this site to determine suitability of the proposed development for residential land use. One of the findings of that assessment was to quantify noise levels at various locations throughout the development land.

This report provides the measured noise levels at three locations across the proposed development for a period of 9 days.

## 2. SUMMARY

Assessment of the suitability of residential development at the Rosehill Country Club in regards to noise emissions from aircraft using the Perth Airport has been undertaken by way of measurement.

Generally, measured noise levels correlate with both the ANEF contours location and design noise levels stipulated by the WAPC.

## 3. CRITERIA

AS2021: Acoustics – Aircraft Noise Intrusion-Building Siting and Construction, provides guidelines for determines the type of building construction necessary to provide a given noise reduction, given that external windows and doors are closed.

Additionally, guidance has been sort from *Statement of Planning Policy No. 5.1 - “Land Use Planning in the Vicinity of Perth Airport”* (SPP 5.1).

### 3.1 BUILDING SITE ACCEPTABILITY

AS2021:2000 lists the building types compared to the acceptable ANEF contour in Table 2.1 of AS2021:2000. The applicable building types are reproduced in Table 1 below.

**TABLE 1 – ANEF ACCEPTABILITY FOR SITING AND CONSTRUCTION**

Building Type	ANEF zone of Site		
	Acceptable	Conditionally Acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF

AS2021:2000 “Acoustics – Aircraft Noise Intrusion-Building Siting and Construction” provides guidelines for determining the type of building construction necessary to provide a given noise reduction, given that external windows and doors are closed.

Indoor design sound levels for determination of aircraft noise reductions are given as follows:

Sleeping areas	-	50 dB(A)
Other habitable spaces	-	55 dB(A)

For commercial buildings:

Private offices	-	55 dB(A)
Open offices	-	65 dB(A)
Shops, showrooms etc.	-	75 dB(A)
Industrial	-	75 dB(A)

We note that the above noise levels are maximum noise levels.

#### 4. MEASUREMENT

To quantify noise levels of current aircraft movements, continuous noise level measurement was conducted from 5<sup>th</sup> to 14<sup>th</sup> July 2013.

Three locations were used to conduct simultaneous noise level monitoring. These locations were approximate positions for the 20, 25 and 30 ANEF contour which are located on the proposed development site. Figure 1 contains the monitoring locations.



Figure 1 Monitoring Locations

Data from the monitored noise levels was analysed and the  $L_{Amax}$  parameter used for the assessment. Results of the monitoring are presented as follows:

- Location 1 – Time History Noise Level  $L_{Amax}$  and  $L_{Amin}$
- Location 2 – Time History Noise Level  $L_{Amax}$  and  $L_{Amin}$
- Location 3 – Time History Noise Level  $L_{Amax}$  and  $L_{Amin}$

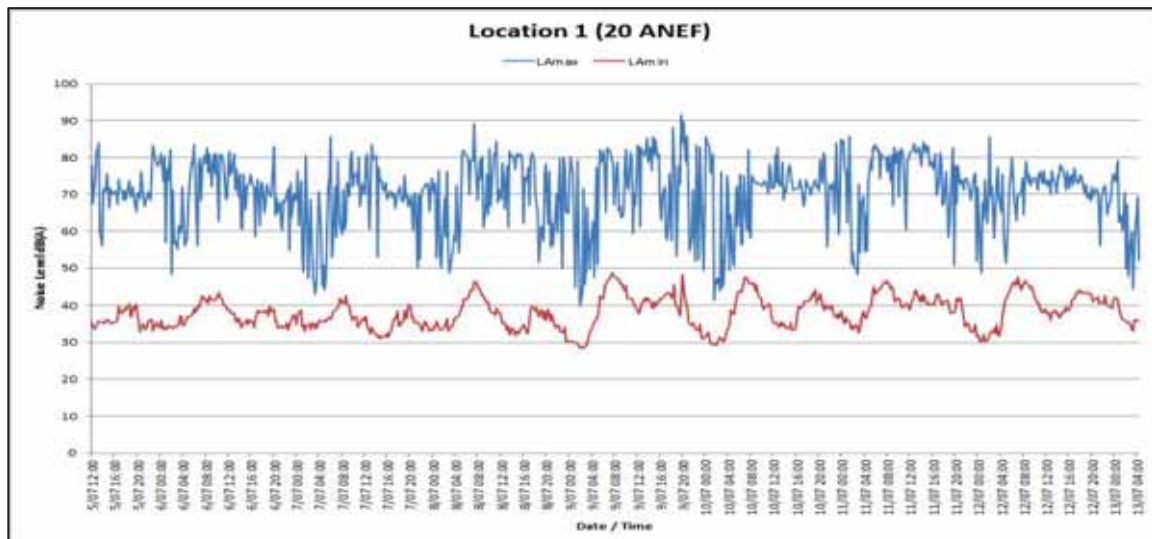


Figure 2 Location 1 Noise Level

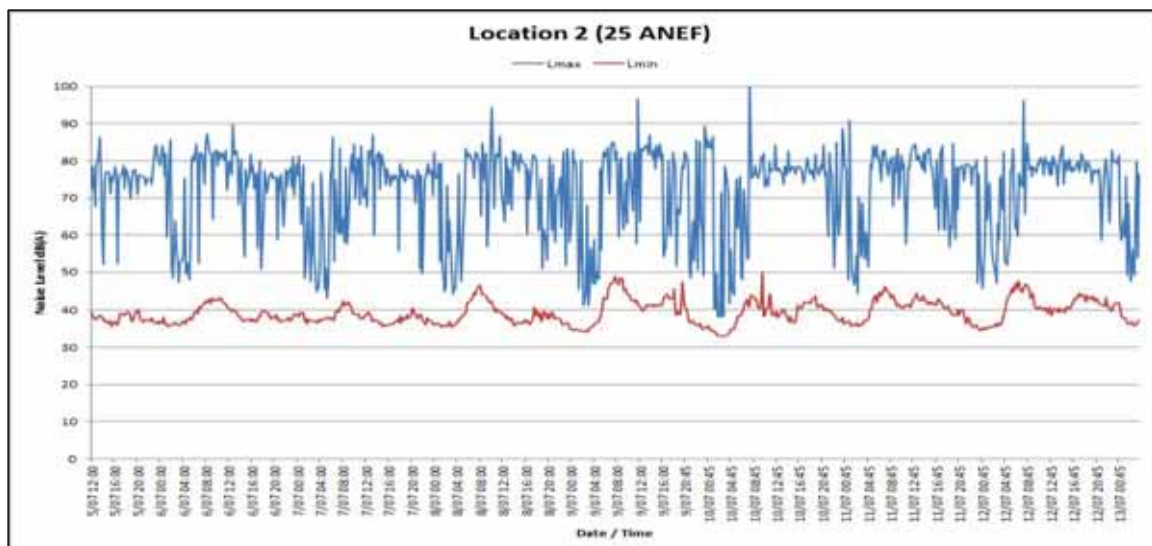


Figure Location Noise Level

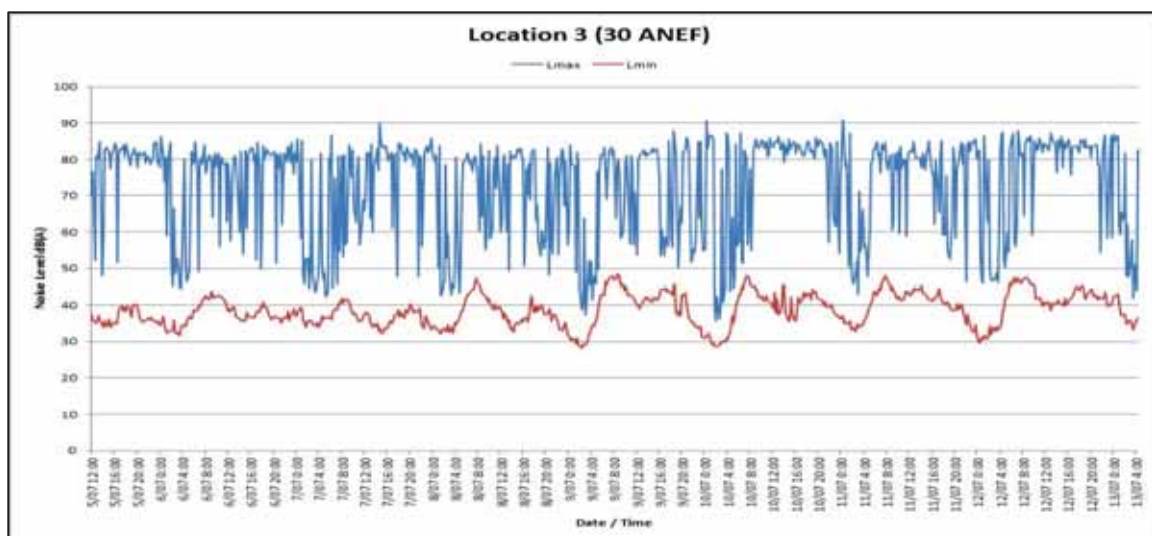
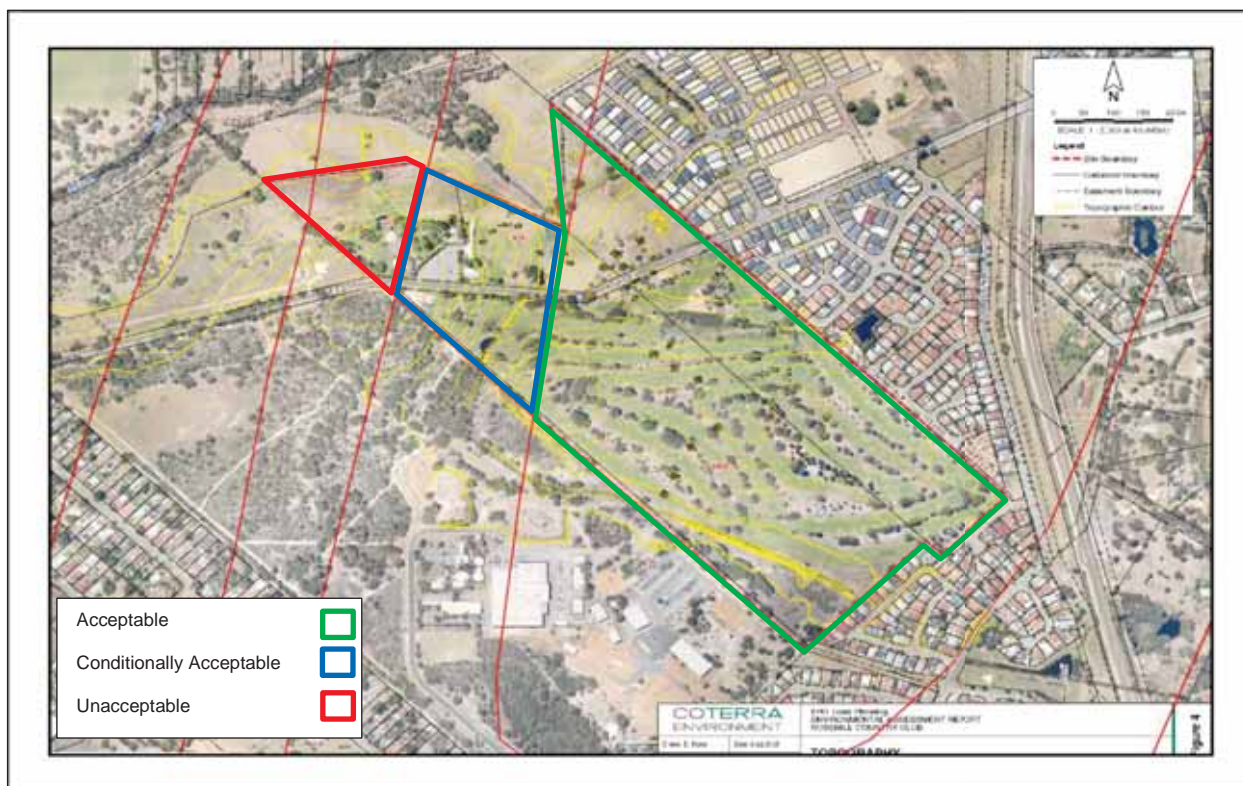


Figure Location Noise Level



## 5. ASSESSMENT

The previous assessment established approximate locations of the ANEF contours onto the proposed site. This was used to determine appropriate land use for various sections of the development. The acceptability of different land use is shown in Figure 5.



**Figure 5 Areas of Acceptability**

To establish the maximum noise level, calculations were based on the statistical analysis of the measured noise levels at each monitoring location. As aircraft noise assessment is against the “maximum” noise level event, correlation of the data was made for the  $L_{Amax(15minute)}$  at each location. This entailed the “count” or “number of events” at each appropriate land use section within the development, with Table 2 detailing the measured levels and Figure 6 showing this as a graphical plot.

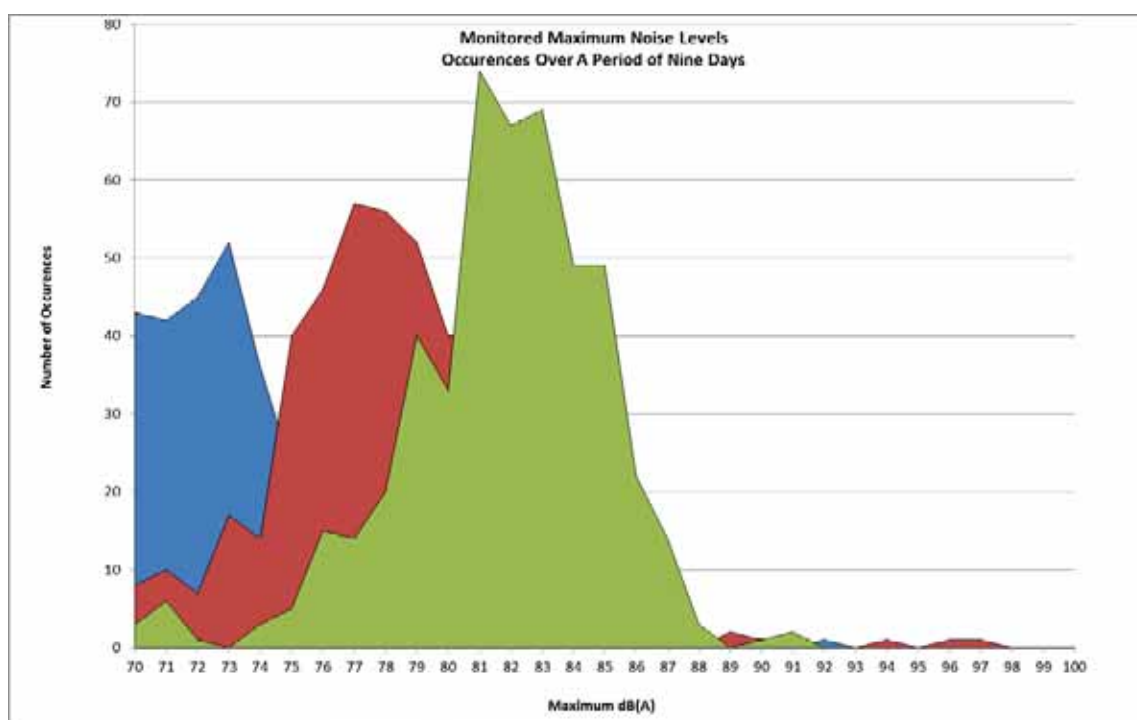


Figure 6 Comparison Noise Level

\*\* Grey shading represents the highest occurrence of a noise level, while the red shading represents the “maximum” noise level.

TABLE 2 MAXIMUM NOISE LEVEL EVENTS

Max dB(A)	Location 1 (20 ANEF)	Location 2 (25 ANEF)	Location 3 (30 ANEF)
70	43	8	3
71	42	10	6
72	45	7	1
73	52	17	0
74	36	14	3
75	23	40	5
76	31	46	15
77	20	57	14
78	24	56	20
79	31	52	40
80	23	40	33
81	36	41	74
82	24	39	67
83	19	30	69
84	10	23	49
85	4	10	49
86	6	5	22
87	0	5	14
88	1	0	3
89	1	2	0
90	1	1	1
91	0	1	2
92	1	0	0
93	0	0	0
94	0	1	0
95	0	0	0
96	0	1	0
97	0	1	0
98	0	0	0
99	0	0	0
100	0	0	0

Based on the measured noise levels, the following table summarises the maximum noise levels for each area within the proposed development.

**TABLE 3 - CALCULATED MAXIMUM NOISE LEVEL dB(A)**

Area	ANEF Contour	Highest Occurrence Maximum Noise Level, dB(A)	Maximum Noise Level, dB(A)
Acceptable (Green)	Less than 20	73	Less than 84
Conditionally Acceptable (Blue)	20 to 25	74 to 77	85 to 88
Unacceptable (Red)	Greater than 25	78 to 81	89 to 91

## 6. DISCUSSION

Reference to the appropriate criteria (WAPC noise insulation) states noise levels having a maximum range of 85 – 91 dB(A) for the 25 – 30 ANEF contour within this area(South Guildford). This is the maximum range for design of noise ingress. Measured noise levels for the locations of the 25 – 30 ANEF contour were 89 – 91 dB(A).

Measured noise levels correlate to the stipulated range of maximum levels set by WAPC for design criteria. As monitoring was conducted at an actual point based on geographical locations direct reference can be drawn between the monitoring points and reference of the ANEF contours.

Given the assessable noise levels:

- Noise levels measured are less than the “worst case” situation for the 747-200B which is stated in AS2021. Therefore, within the 20 – 25 ANEF, design criteria for buildings will be less stringent and based on a realistic noise level.
- It is unlikely that the positioning of the current 25 ANEF could be contested and therefore no residential development within. Also, given the quantity of higher maximum events within the 25 – 30 ANEF, there is likely to be a great deal of dissatisfaction with residents, and likely to be complaints.
- With regard to the location of the actual ANEF, it would be based on information provided by a Government body such as WAPC. Reference to the monitoring locations can be made to aid in the definitions of the land use.
- Design criteria for residential buildings within the “conditionally acceptable area (20-25 ANEF) has been previously provided as a general design guideline. Once a sub-division plan has been provided to identify lots, the design criteria can be updated with more detail.

## 7. CONCLUSION

Assessment of the suitability of a residential development at the Rosehill Country Club, in regards to noise emissions from aircraft using the Perth Airport, has been undertaken by way of measurement.

Generally, measured noise levels correlate with both the ANEF contours location, and design noise levels stipulated by the WAPC.

## **APPENDIX H**

## **ABORIGINAL HERITAGE ASSESSMENT**





AMERGIN CONSULTING (AUSTRALIA) PTY LTD

ABORIGINAL HERITAGE • PROJECT MANAGEMENT

**Report of an Aboriginal Ethnographic Survey of the Rosehill  
Golf Course and Country Club, West Parade, South Guildford,  
Western Australia**

**DRAFT**

**Prepared for Noahs Rosehill Waters Pty Ltd**

November 2013

## Disclaimers

The results, conclusions and recommendations contained within this report are based on information available at the time of its preparation. Whilst every effort has been made to ensure that all relevant data has been collated, the authors can take no responsibility for omissions and/or inconsistencies that may result from information becoming available subsequent to the report's completion.

**This report contains references to people who have passed away. Please be careful when reading this report or showing it to others.**

© Amergin Consulting (Australia) Pty Ltd and Noahs Rosehill Waters Pty Ltd 2013. Intellectual property resides with individuals who contributed their cultural knowledge.

## Acknowledgements

Amergin Consulting wishes to thank and acknowledge the following individuals who assisted with this assessment:

- Alison Gatti and the staff of the Rosehill Golf Course and Country Club;
- Ashlee Bunney, Department of Aboriginal Affairs;
- Dr Edward McDonald, Ethnoscience;
- Jan Zuideveld, Habitat International;
- Karen Wright and Shannon O'Loughlin, Urbis;
- Kim Brewster, South West Aboriginal Land and Sea Council;
- Margaret Jeffrey, Swan Valley Nyungah Community; and
- The Aboriginal survey participants listed in Table 1.

## Acronyms and Definitions

Aboriginal Site	A place to which the <i>Aboriginal Heritage Act (1972)</i> applies
ACMC	Aboriginal Cultural Material Committee
AHA (or "the Act")	<i>Aboriginal Heritage Act (1972)</i> as amended
AHIS	Aboriginal Heritage Inquiry System
AHR	<i>Aboriginal Heritage Regulations (1974)</i>
Amergin	Amergin Consulting (Australia) Pty Ltd
DAA	Department of Aboriginal Affairs (formerly Department of Indigenous Affairs)
POS	Public Open Space
Study Area	Rosehill Golf and Country Club (Lots 200, 9000 and 57 West Parade, South Guildford) as shown in Figure 2
SAAS	Swan Area Archaeological Survey
SRP	Swan River People 2 Native Title Claimants

SWALSC

South West Aboriginal Land and Sea Council

TPG

The Planning Group (WA) Pty Ltd

## Executive Summary

Amergin Consulting was engaged by Noahs Rosehill Waters Pty Ltd to carry out an ethnographic survey of the Rosehill Golf Course and Country Club in South Guildford in advance of proposed residential development. The ethnographic survey follows a due diligence desktop assessment completed in June 2013 and an archaeological survey carried out by Tempus Archaeology on 1 July 2013.

The ethnographic survey/consultations were carried out by Bryn Coldrick of Amergin Consulting on 21 October 2013. A total of twenty (20) Aboriginal consultants participated in the survey, including representatives of the Whadjuk Native Title Claimants, the Ballaruk Aboriginal Corporation, the 'Swan River People 2' Native Title Claimants (SRP) and others with knowledge of the area's Aboriginal heritage values. All of those consulted can be considered 'relevant Aboriginal people' as defined by the DAA's current *Aboriginal Heritage Due Diligence Guidelines* (DIA 2013:9).

No previously unidentified ethnographic sites were reported inside the Study Area as a result of the ethnographic consultations. However, significance was attributed to the area along the Helena River in general as a result of movement of people, camping, ceremonial uses, hunting, fishing, gathering bush tucker and bush medicine, and so on. As a result of this activity, a number of people expressed the view that there could be artefacts scattered throughout the land, both above and below the surface, and a number of requests were made in relation to the identification and management of archaeological material.

As anticipated as a result of the desktop research, the watercourse/drain which traverses the land was a key point of discussion. This watercourse/drain is connected to the Helena River and by extension the Swan River, both of which are registered sites and considered by many to be "sacred". Some people raised concerns about the proposed realignment of the watercourse/drain and would prefer it to remain on its current course unless the realignment is returning it to a former, natural course.

The main concerns raised during the consultations related to the potential cumulative environmental impacts of further residential development in the area, in particular the risk of increased pollutants entering the watercourse/drain and therefore the river system. Two of the three groups consulted requested further information and consultations to clarify the potential environmental impacts and other issues, and for the opportunity to have further input into the planning of the development. The SRP and representatives of the Whadjuk Native Title Claim



stated that they could not support a Notice under Section 18 until more detailed information is provided.

Based on the information provided, it is our conclusion that apart from the watercourse/drain which is already mapped as part of the Helena River site (DAA Site ID 3758), no new places that would meet the definition of an Aboriginal Site under Section 5 of the *Aboriginal Heritage Act 1972 (AHA)* were reported during the survey. A drain in and of itself would also be highly unlikely to meet the Department's current criteria for a sacred site under Section 5(b) of the AHA, even if it was originally a natural watercourse.

Based on the findings of the overall assessment, the following recommendations are made:

1. It is recommended that the proponent note the concerns raised by the Aboriginal consultants with respect to the potential environmental impacts of the proposed development and consider their requests for further information and consultation on these issues;
2. It is recommended that the proponent note the concerns raised and requests made by the Swan River People Native Title Claimants in relation to the archaeological investigations;
3. It is recommended that impacts to the watercourse/drain, which currently forms part of the Helena River site (DAA Site ID 3758), be avoided unless Ministerial approval under Section 18 of the *Aboriginal Heritage Act 1972 (AHA)* and/or Regulation 10 of the *Aboriginal Heritage Regulations 1974 (AHR)* is obtained in advance;
4. It is recommended that the isolated artefact RH-ISO/001 be left *in situ* and that the area around it be preserved in POS if possible, or that the artefact be temporarily stored and returned to an agreed-open area of POS following completion of earthworks;
5. It is recommended that the proponent engages further with the Aboriginal community in the development and installation of heritage interpretation and public artworks to acknowledge Aboriginal connections with the area and that other forms of recognition also be considered (e.g., naming of streets); and
6. It is recommended that the recommendations of the archaeological report (Tempus 2013) be implemented, including development of an Aboriginal Heritage Management Plan (AHMP) and strategic monitoring of initial ground disturbing works.

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# 1. INTRODUCTION

Amergin Consulting (Australia) Pty Ltd (Amergin Consulting) was engaged by Noahs Rosehill Waters Pty Ltd to carry out an ethnographic survey of the Rosehill Golf Course and Country Club in South Guildford in advance of acquisition and proposed residential development of the land. The land is currently zoned "Rural" under the Metropolitan Region Scheme (MRS) and "General Rural" under the City of Swan's Local Planning Scheme No. 17 (Coterra 2013:1). An MRS amendment to allow development, including associated uses such as commercial, Public Open Space (POS), roads, drainage and so on, is currently before the Western Australian Planning Commission (WAPC).

The Rosehill land (hereafter referred to as the 'Study Area'), which was developed as a country club and golf course prior to 1965 (Coterra 2013:1), is located on Lots 200, 9000 and 57 West Parade, South Guildford, approximately 15km northeast of the Perth CBD (Figure 1 & Figure 2). The Study Area is bounded by the Australian Army's Palmer Barracks to the west and by existing housing developments to the east and south. West Parade travels through the northern portion of the Study Area and there is a modified drainage feature/watercourse which traverses the Study Area in the southwest, west and north before discharging into the Helena River which lies outside the Study Area to the north. Under the current "Vision Plan" for the proposed development, this drainage feature would be realigned more centrally through the land within POS (Figure 3).

In June 2013, Amergin Consulting was commissioned to carry out a due diligence desktop assessment of the land and provide advice on the known and potential Aboriginal heritage constraints and requirements. The desktop assessment found that the drainage feature/watercourse is currently mapped by the Department of Aboriginal Affairs (DAA) as forming part of the registered Helena River site (DAA Site ID 3758). Amergin advised that Section 18 consent would likely be required in order to modify or otherwise impact the drain. Although no other registered Aboriginal Sites or 'other heritage places' were listed within the Study Area on the Register of Aboriginal Sites, it was noted that no previous Aboriginal heritage surveys of the land had been identified. Amergin therefore recommended that archaeological and ethnographic field surveys be carried out to assist with subdivision and development planning and ensure that the proponent's obligations under the *Aboriginal Heritage Act 1972* (AHA) are met (Amergin 2013:26–28).

No archaeological sites were identified during the archaeological survey, which was carried out by Tempus Archaeology on behalf of Amergin Consulting on 1 July



2013. One isolated artefact (designated RH-ISO/001) was located in a highly disturbed context, and as such is not considered to constitute a place of importance and significance as set out in Section 5(a) of the AHA. Consequently, no further management of the object is legally required. The archaeologists determined that “there is little potential for intact archaeological residues to be present within the *developed* portions of the Study Area”, but recommended strategic archaeological monitoring and the implementation of an Aboriginal Heritage Management Plan (AHMP) to ensure that any as yet unrecorded archaeological material is dealt with in a timely and appropriate manner (Tempus 2013:1).<sup>1</sup>

This report presents the findings of the final stage of the assessment, the ethnographic survey and consultations, which were carried out by Bryn Coldrick of Amergin Consulting on 21 October 2013 with ‘relevant Aboriginal people’ as defined by the DAA’s current *Aboriginal Heritage Due Diligence Guidelines* (DIA 2013:9).

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<sup>1</sup> Refer to the archaeological report (Tempus 2013) for full details of the archaeological survey.

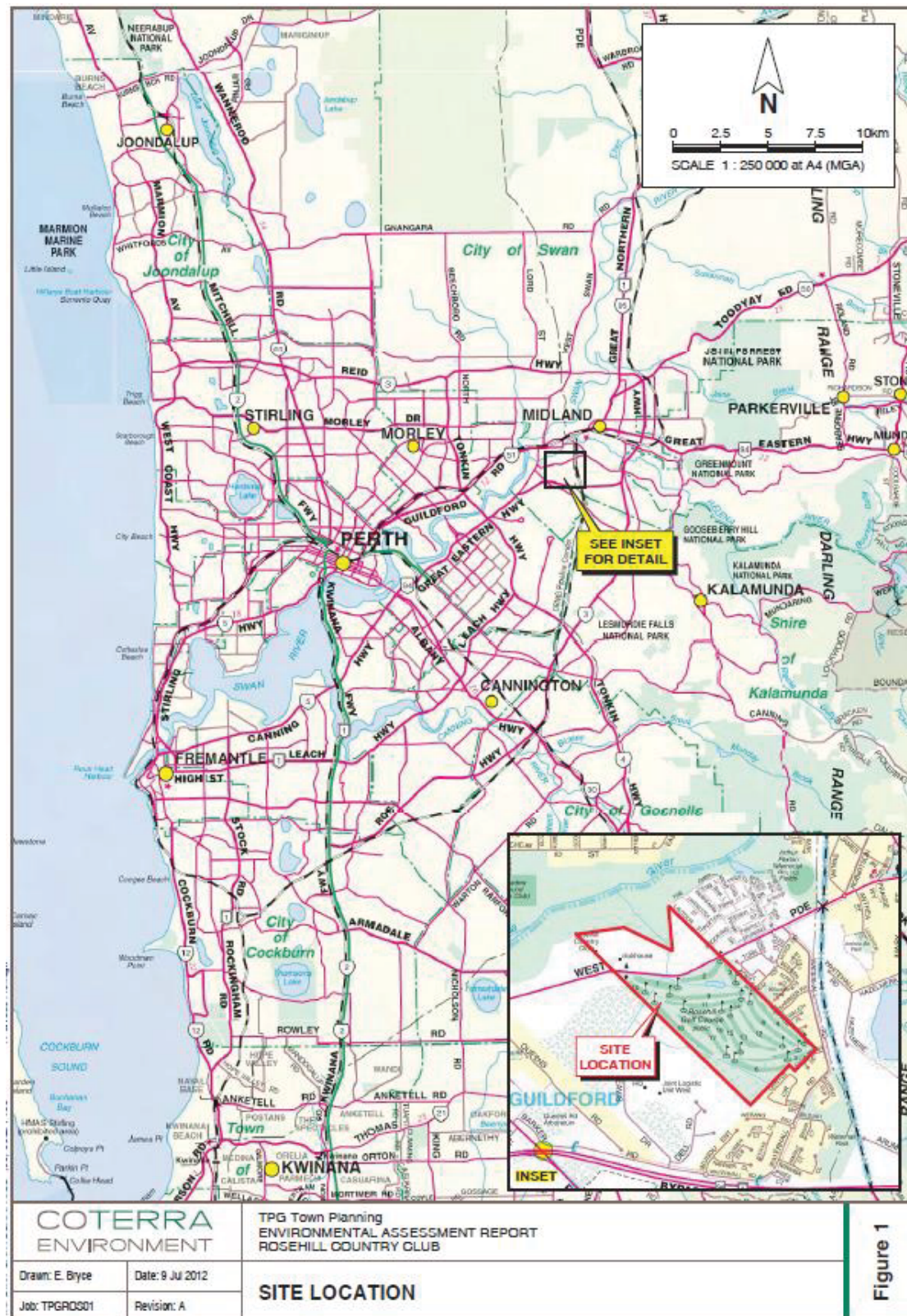
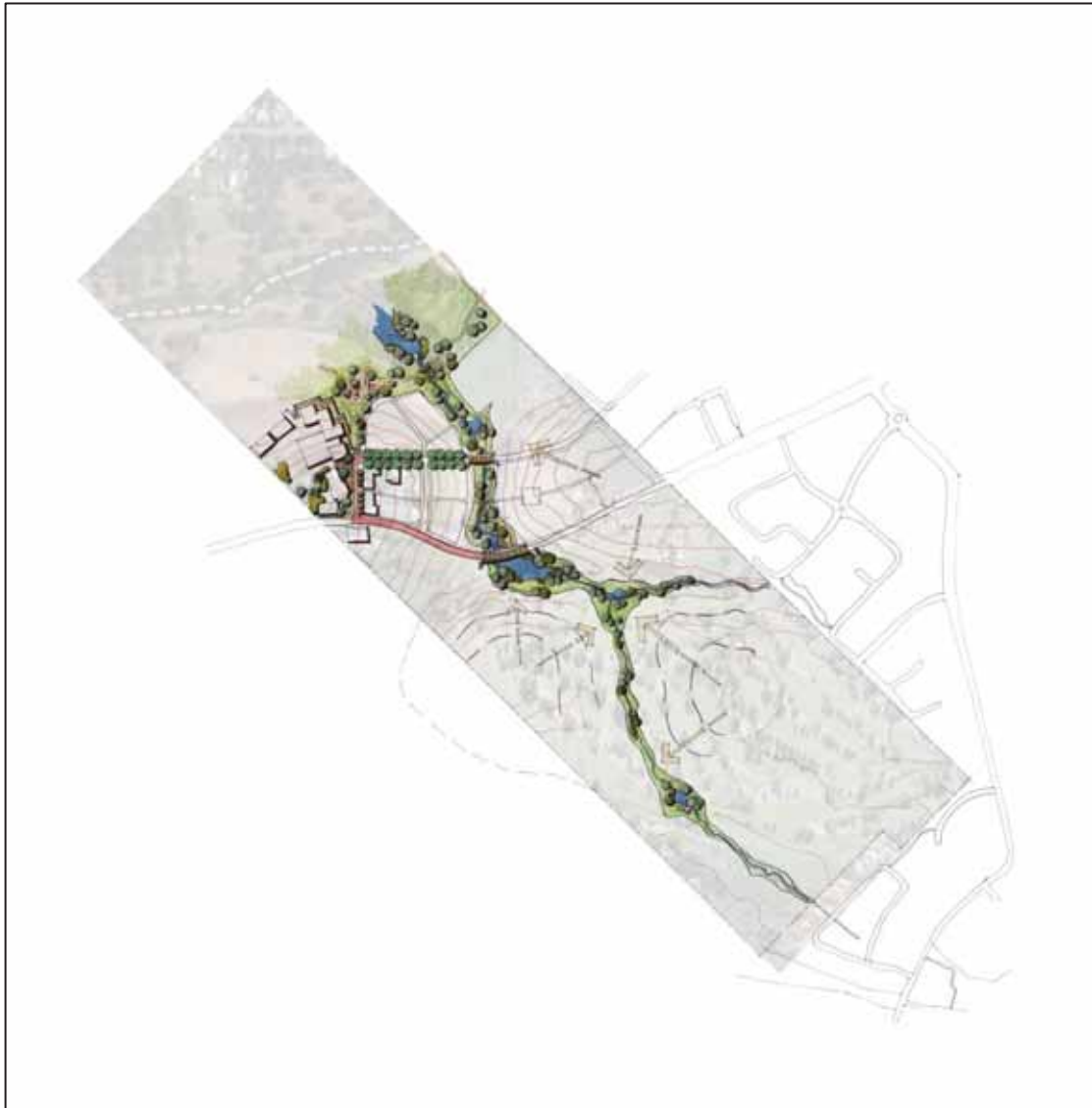


Figure 1: Study Area location plan (Source: TPG/Coterra Environment)





Figure 2: Aerial plan (Source: TPG/Coterra Environment)



**Figure 3: Vision Plan showing a conceptual realignment of the modified drain/watercourse (Source: Urbis)**





Figure 4: Detail of RH-ISO/001. The arrow indicates the location of the striking platform (Source: Tempus 2013:26)

## 2. ETHNOGRAPHIC SURVEY METHODOLOGY

The ethnographic survey was carried out broadly in line with guidelines published by the Department of Aboriginal Affairs (formerly the Department of Indigenous Affairs) (DIA 2003; 2013) and involved the following components:

- Desktop research;
- Preliminary consultation and selection of survey participants;
- On-site ethnographic consultations; and
- Report preparation.

### 2.1 Desktop Research

The desktop research involved in the first instance an examination of the Register of Aboriginal Sites using the Department of Aboriginal Affairs' (DAA's) online Aboriginal Heritage Inquiry System (AHIS) followed by a review of relevant site files and reports at the DAA's head office in East Perth. A range of other published and unpublished ethnohistorical literature relating to the area was also reviewed.

The purpose of the desktop assessment was to determine whether the Study Area contains any registered Aboriginal sites or other Aboriginal heritage places that might be impacted by development of the land, and to assess the potential for currently unknown sites or other values to be present. The assessment also aimed to determine what further investigations, approvals or other measures are likely to be required in order to ensure that the proponent's obligations under the *Aboriginal Heritage Act (1972)* (AHA) are met.

### 2.2 Preliminary Consultations

The DAA's current *Aboriginal Heritage Due Diligence Guidelines* advise that information about the Aboriginal heritage of a particular area is best obtained through consultation with "the relevant Aboriginal people" (DIA 2013:9).<sup>2</sup> The DAA and Aboriginal Cultural Material Committee (ACMC) also require evidence of consultation to be provided with Notices submitted under Section 18 of the AHA to use land containing Aboriginal Sites.

The current Due Diligence Guidelines identify four categories of 'relevant Aboriginal people' who should be consulted where there is a possibility that an Aboriginal Site will be affected. They are:

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<sup>2</sup> While this is certainly the case with ethnographic sites, it needs to be understood that identification of archaeological material requires relevant skills and experience. As McDonald has pointed out based on the work of Goodwin (2006), Goodwin & Goodwin (1998), Edgeworth (2003, 2006) and others, 'seeing' artefactual and other archaeological material in the field or through excavation is not a transparent 'natural' ability that either Aboriginal people or archaeologists bring to their practice.

1. Determined Native Title Holders;
2. Registered Native Title Claimants;
3. Persons named as informants on Aboriginal site recording forms held in the Register at DIA [now DAA]; and
4. Any other Aboriginal people who can demonstrate relevant cultural knowledge in a particular area (DIA 2013).

### 2.2.1 Native Title Claimants

There are currently no determined Native Title Holders in the Perth metropolitan area or the South West more broadly. However, the Study Area is encompassed by one registered Native Title Claim, namely the 'Whadjuk People' Native Title Claim (WC2011/009) which is represented by the South West Aboriginal Land and Sea Council (SWALSC). The Study Area is also encompassed by one unregistered claim, 'Swan River People 2' (WC11/2; SRP), which comprises the key families of the former Combined Metropolitan Native Title Working Group (i.e., the Bropho, Wilkes, Corunna, Garlett and Warrell families).

Amergin Consulting contacted SWALSC and provided them with background information on the proposals and Aboriginal heritage research, and requested the names of appropriate Aboriginal spokespeople to participate in the ethnographic consultations. Based on their internal genealogical research, SWALSC nominated representatives of families from the Whadjuk claim and others understood to have associations with the area including key spokespeople of four of the five families that now make up the SRP claim.

All of the SWALSC-nominated consultants, or members of their families, were contacted initially by telephone. Letters were then sent out to the nominated people along with background information prior to the ethnographic consultation itself. In some cases, requests were made for additional family members to attend the consultation, primarily to assist elderly representatives in getting to and from site. These requests were accommodated where possible within the constraints of the available budget.<sup>3</sup>

The 'Swan River People 2' claimants (SRP) are officially represented by Mr Albert Corunna. The Corunna family was also initially contacted via email and provided with background information. Telephone discussions were subsequently conducted with the senior spokespeople of each of the five families, and information was provided by letter. Further assistance in facilitating their

---

<sup>3</sup> It should be noted that all of the people nominated by SWALSC participated in the consultations apart from Esandra Colbung, Cedric Jacobs and Danny Kickett. Esandra Colbung did not respond to the invitation to attend; Rev Jacobs was overseas at the time of the survey but was represented by his daughter Karen; and Danny Kickett could not be contacted as no contact details were provided by SWALSC.

involvement was provided by Ms Margaret Jeffrey of the Swan Valley Nyungah Community.

### **2.2.2 Site Informants**

During the desktop research, the DAA was contacted and asked to provide the listed informants for the Helena River site (DAA Site ID 3758). The DAA provided the following names:

- Iva Hayward-Jackson;
- Corrie Bodney;
- Bibbulman [sic – Bibbulmun] Tribal Group: Ken Colbung (deceased);
- Independent Aboriginal Environmental Group (IAEG): Patrick Hume;
- William (Willie) Worrell (deceased); and
- Fred Collard (deceased).

Iva Hayward-Jackson is associated with the 'Swan River People 2' claimants and his participation was arranged through them. Mr Bodney (who is the key spokesman of the Ballaruk Aboriginal Corporation) was nominated by SWALSC and also participated in the consultations. The Warrell (Worrell) family was also involved, with the late William Warrell's role in cultural matters now undertaken by his brother Victor.

Background information was also sent to Ms Esandra Colbung, who is the daughter of the late Ken Colbung, along with an invitation to participate in the consultations. Similarly, letters and invitations were sent to the IAEG's key spokespeople, Patrick (Sullivan) Hume and his daughter Rebecca. However, no response was received from the Colbung or Hume representatives and the invitations were not taken up. These individuals have previously declined Amergin's invitations to participate in ethnographic consultations for reasons relating to methods of payment.

### **2.2.3 Other Aboriginal People who can Demonstrate Knowledge**

Members of the Harris-Kickett family have been involved in previous research in the Guildford area and they have demonstrated their knowledge of the area's history and Aboriginal heritage values (see, for example, Amergin 2011a, 2011b; AIC 2009). They were therefore invited to participate in the current consultations as people who may have relevant cultural knowledge. When contacted, Ms Shirley Harris reported that her mother used to work at the lodge for the Padbury family in the 1920s and went on to demonstrate her knowledge of the Aboriginal social history of the area.



#### 2.2.4 Conclusions

Table 1 below lists the Aboriginal consultants who participated in the on-site ethnographic survey/consultations. Although there may be other Aboriginal people who can demonstrate relevant cultural knowledge, it is our view that the DAA's guidelines with respect to "relevant Aboriginal people" are adequately reflected in this list and that a broad cross-section of interests was represented, while keeping the budget for Aboriginal consultation within reasonable limits. It is also our view that reasonable opportunity was provided to the representatives of the Bibbulmun Tribal Group and the IAEG to participate in the consultation.

No concerns were raised about the proposals by any of those consulted during the preliminary consultation phase of the project.

### 2.3 Ethnographic Consultations

The ethnographic consultations were conducted on site by Bryn Coldrick on 21 October 2013 with the participation of the Aboriginal consultants listed in Table 1.

The consultations were conducted in three sessions: the first session comprised representatives of the 'Swan River People' (SRP) Native Title Claimants (that is, the Bropho, Wilkes, Garlett, Corunna and Warrell families) and Iva Hayward-Jackson who, as stated above, is a listed informant for the Helena River site (DAA Site ID 3758). The second session involved the remainder of those nominated by SWALSC, including the Ballaruk representatives. The third and final session involved representatives of the Harris-Kickett family.

All three sessions followed the same basic format. Following preliminaries, the ethnographer (Bryn Coldrick) outlined the purpose of the consultations and the proposals to the Aboriginal consultants with the aid of maps and plans, and interviewed the Aboriginal consultants with respect to the ethnographic values of the land. He also sought their views about the proposed development and the upcoming Section 18 Notice. The results are summarised below in Section 5.

As the golf course was operational at the time of the survey, the consultations mainly took place in the grounds of Padbury Stables for safety reasons. From here, good views over the driving range and the northern portion of the Study Area north of West Parade were obtained. The golf course, including the modified drain, was also viewable from the car park and surrounding streets and roads (see Plate 1–Plate 5). The Aboriginal consultants were also sufficiently familiar with the area to be able to report and discuss the ethnographic values of the land without directly accessing it. However, as we report below, some of the Aboriginal

consultants requested the opportunity to return to inspect the isolated artefact and look for additional surface archaeological material.

## **2.4 Report Preparation**

This report was prepared by Bryn Coldrick and Dr Edward McDonald.

<b>Name</b>	<b>Session</b>
<b>Albert Corunna</b>	1
<b>Bella Bropho</b>	1
<b>Brett Parfitt</b>	2
<b>Corrie Bodney</b>	2
<b>Dorothy Getta</b>	2
<b>Greg Garlett</b>	1
<b>Gregory Ugle</b>	2
<b>Gwen Corunna</b>	1
<b>Iva Hayward-Jackson</b>	1
<b>Jarred Garlett</b>	1
<b>Jeremy Kickett</b>	3
<b>Justin Warrell</b>	2
<b>Karen Jacobs</b>	2
<b>Kathleen Penny</b>	1
<b>Olive Wilkes</b>	1
<b>Richard Wilkes</b>	1
<b>Ron Gidgup</b>	2
<b>Shirley Harris-Kickett</b>	3
<b>Victor Warrell</b>	1
<b>Violet Bodney</b>	2

Table 1: List of Aboriginal consultants, Rosehill, 21 October 2013

### 3. ETHNOGRAPHIC BACKGROUND

#### 3.1 Ethnohistorical Context

Daisy Bates (1985, 1992 and n.d.) was the first researcher to systematically collect information regarding the social organisation, language and customs of the Indigenous people of the South West region of Western Australia.

Bates (1985:39) referred to the Aboriginal people occupying the South West from around Jurien Bay in the north to a point just east of Esperance as the 'Bibbulmun Nation'. She (1985:46–54) reported that the Bibbulmun were comprised of a number of local groupings with similar customs and beliefs though regional differences, including forms of descent and dialect, were evident. Bates (1985:52–54) also reported that the local group in the Perth/Swan River area was called the *Illa kuri wongi* [*Illa kuri* = coming directly; *wongi* =speech/talk] or the *Yabbaru Bibbulmun* [i.e., northern Bibbulmun].

Later researchers, however, provide a different perspective to that of Bates. Berndt (1979), following Tindale (1974), for example, suggested that at the time of British colonisation the South West was occupied by thirteen 'tribes' or socio-dialectal groups that formed a discrete socio-cultural bloc similar to what Bates refers to as the 'Bibbulmun Nation'. Tindale (1974) and Berndt (1979) reported that the group occupying the region in which the current study area is located were the *Whadjuk* (*Whadjug*) (Tindale 1974; Berndt 1979:82). Tindale (1974) describes this group's territory as extending:

*[From the] Swan River and northern and eastern tributaries inland to beyond Mount Helena; at Kalamunda, Armadale, Victoria Plains, south of Toodyay, and western vicinity of York; at Perth; south along the coast to near Pinjarra.*

Berndt (1979a & 1979b), following Radcliffe-Brown (1930–31) who in turn drew on Bates' earlier research (McDonald & Christensen 1999), categorised the South West socio-dialectal groups as comprising four main types of social organisation, these being Perth, *Bibelman*, *Wudjari* and *Nyaginyagi*. The *Whadjuk*, according to Berndt (1979b), were of the 'Perth' type of social organisation and in common with other 'Perth' type groups have been described as having matrilineal moieties with two exogamous clans. The *Whadjug* moieties were *Manitjmat* (white cockatoo) and *Wardangmat* (crow). Bates (1985) concludes that the names of the four matrilineal clans were *Ballarruk*, *Nagarnook*, *Tondarup* and *Didarruk* (see Figure 5). The names of these clans had totemic associations connecting them



with the physical and biological environments in which they existed. However, ritual affiliations to sites occurred through an individual's father.

Berndt (1979a and 1979b) adds that there may have been local patrilineal descent groups which focussed on particular totemic sites in defined stretches of country. At birth, each individual in Nyungar society was assigned to a moiety, clan, and usually, an individual, family and/or district totem (Bates 1985). These totemic associations placed Aboriginal people in special spiritual relationships with features of the natural environment. For example, Radcliffe-Brown (1930–31) suggests that the name *Ballarok* (Ballaruk) or *Palarop* is probably derived from the word for a species of possum (*balard*). According to Bates (1985:193), particular tree species within the South West's timbered localities were nominated totems belonging to Nyungar moieties. For example, peppermint, jarrah and bluegum were totems of *Wardangmat* and paperbark, spearwood and white-flowered acacia were totems of *Manitchmat*. Bates (1985:193) also refers to the crest and other feathers of the white cockatoo as frequently worn at ceremonial gatherings (1985:193).

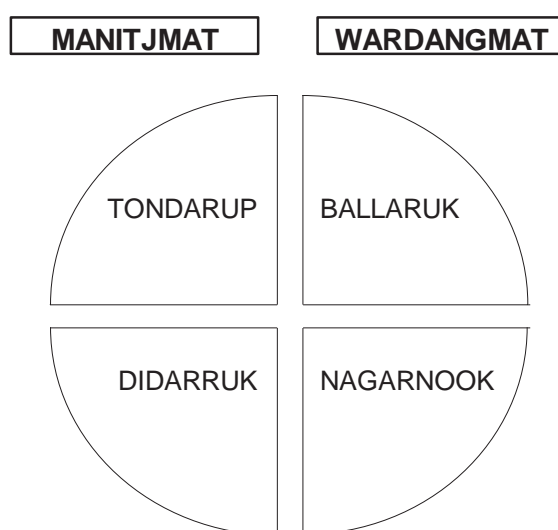


Figure 5: Matrilineal moieties and clans of the *Whadjuk* (courtesy of Ethnoscience)

The basic unit of traditional Nyungar social organisation was the family while the land-using unit in Nyungar society was the band or horde. The band comprised one or more families and typically numbered twenty to thirty persons, although its actual size varied according to social conditions and seasonal factors. Larger groups formed on the coastal plain during summer and dispersed into smaller groups that moved east into upland areas in the colder seasons. The Whadjuk were divided into a number of identifiable bands. However, while each band had a

specific territory (range), kin affiliations and ritual connections allowed for considerable freedom of movement and rights to resources in more than one locality (Hallam 1975).

Early settlers quite often referred to these bands as 'tribes' and imposed further European concepts in describing both territorial affiliations and Aboriginal 'leaders'. Various 'territories' have been described in which these social units were principally located and moved. The current survey area is situated in what was, according to Lyon (1833, cited in Green 1979:177), *Beeloo* country which in Lyon's time was led by Munday (or Monday). It is important to note, however, that local groups did not have impermeable boundaries, nor did they have sole rights to the areas they occupied. The historic and ethnographic evidence suggests that individuals and families moved between territories (see Bates n.d. (i) and Hallam & Tilbrook 1990). Individuals were part of a matrix of rights and obligations to land and sites which were obtained through patri-filial and matri-filial links, marriage and the location of their conception and birth (Hallam 1984; Tilbrook 1983). Consequently, individuals and families from other groups would have utilised resources in Beeloo.

Lyon described Munday's territory as extending south to the Canning River, north to the Upper Swan and Ellen's Brook and east into the mountains (i.e., the forested uplands east of the Darling Scarp (Hallam & Tilbrook 1990:234). Hallam and Tilbrook (1990:234) note that "Monday seems usually to be found south of Guildford on the Helena River, moving between west and east of the Swan". Bates (n.d. (i) and (ii)) reports that the Study Area was part of Joobaitch's run, inherited from his father and uncles. She (ibid) notes that the area around "Hamersley house" was called *Kajjimburra* and that the adjacent land to the west and along the Swan River towards Perth was part of Fanny Balbuk's run.

Bates (n.d. iii; 1992:20) reports that the main camp in the Guildford area (*Bebo*) was *Koondela* or *Koondelup* and was located where the "Woodbridge Show Ground" or "Mr Gull's place" was situated (see also Brown 1983:15). She (1985:159) also mentions a camp near the junction of the Swan River and Blackadder Creek called *Wardawardong* [DAA Site ID 3796 'Blackadder Ck & Swan River'] from where some Swan River boys commenced their *moolyeet* or *beedawong* (initiate) journey on the *Yabbarroo* (northern) route. Bates also refers to a number of Waugal sites or *woggalguttuk* [possessing Woggal/Waugal] places in the area. For example, she (n.d. ii) reports the existence of *Moorajjin* at Gull's

place near the Guildford station and *woggalguttuk* places at Success Hill and the Chinese market gardens on Hamersley's property.<sup>4</sup>

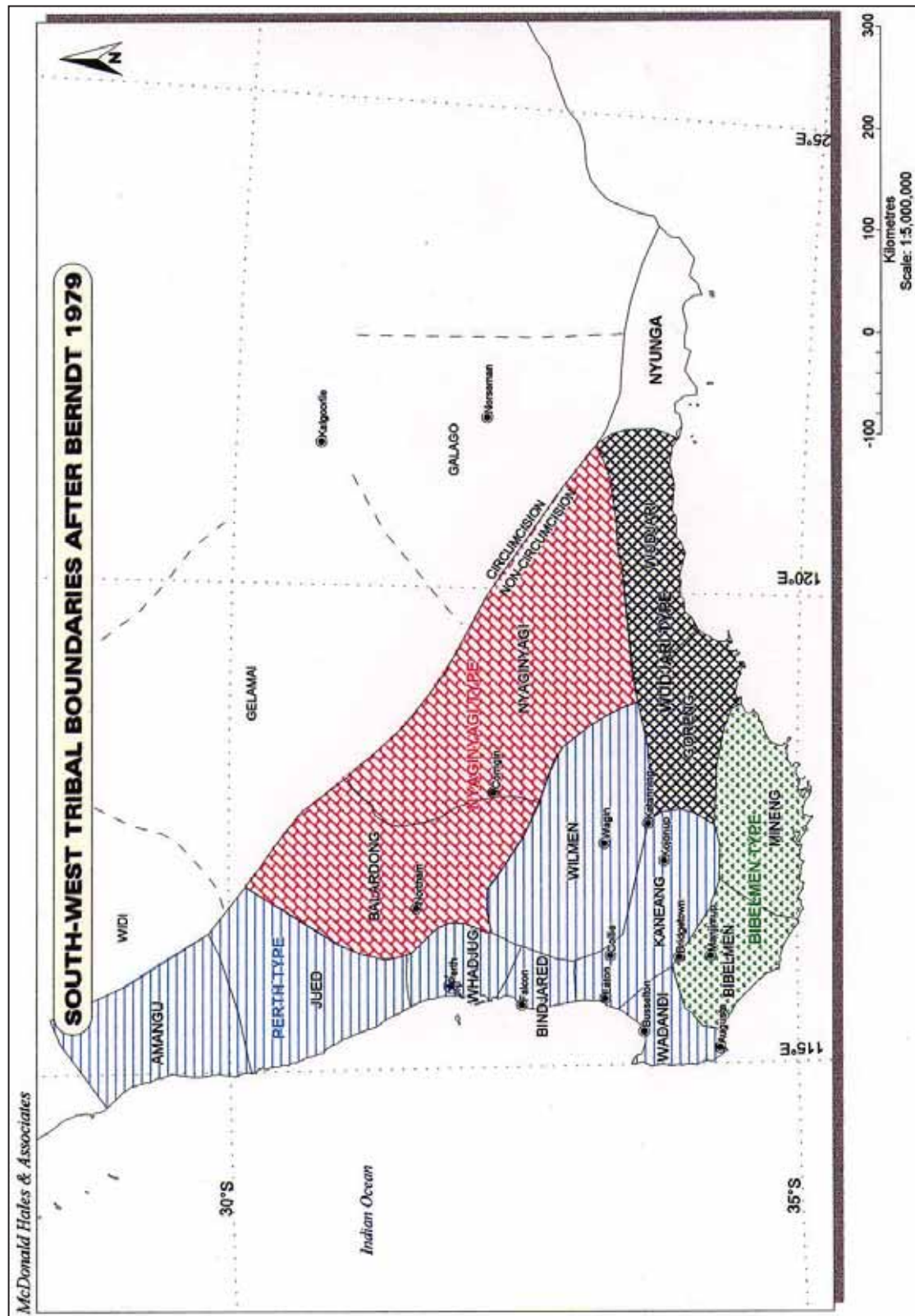
During his journey of exploration along the Swan River in March 1827, Captain Stirling noted many traces of 'natives' and kangaroos and describes an encounter with a group of approximately 30 'natives' along the bank of the river which, according to Bourke's calculations (Bourke 1987:320, Appendix A), would appear to be around South Guildford. As subsequent European settlement was originally focused on the rich floodplains of the Swan and Helena Valleys, and therefore encroached upon traditional hunting grounds and food resources, disputes arose between Aborigines and the settlers which led to conflict and deaths on both sides (Venz 2002:6). As Biskup (1973), Haebich (1988) and other researchers have shown, British colonisation not only resulted in the usurpation of Nyungar land around Perth but also the destruction of Aboriginal social organisation that spread subsequently throughout the South West. The various socio-dialectal groups which had previously occupied the region disappeared as distinct entities (Berndt 1979a). However, the colonisation process engendered a sense of commonality between those who survived from the various traditional groupings into a strong 'Nyungar' identity.

Although displacement of Aboriginal groups resulted in major changes to traditional activities, Nyungars continued to use areas along the Swan River and adjacent localities for camping, hunting and rural and urban based employment. In part, this situation was enhanced by the area's rural status while being on the urban fringe. Rural based employment included Aboriginal seasonal involvement on the vineyards (Bourke 1987; McDonald 1976) while a number of Nyungar men were also employed in woodcutting (Bropho 1980; Bourke 1987), the wood being used to fire the kilns for local brick manufacture utilising the river clays. Aboriginal men were also employed on the Bassendean sanitary depot (Carter 1986; Bropho 1980) and at various other enterprises in the area (Carter 1986). Camps were located convenient to these employment sources (see for example, McDonald 1976). Aboriginal women were also employed in domestic service in the area (Bourke 1987; Carter 1986; Hamersley 1990) as attested to during the current consultations (see Section 5 below).<sup>5</sup>

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<sup>4</sup> Nyungar oral tradition records that Bates camped on Hamersley's property during her fieldwork. There is support for this proposition in the historical record (Carter 1986), though the impression that she camped there for two years (see Bates 1940:68) not would seem to be supported by other sources.

<sup>5</sup> For further discussion of the historical and ethnohistorical aspects of the area, see Biskup (1973), Hallam (1975), Bourke (1987), Green (1979), O'Connor, Bodney & Little (1985) and Carter (1986). For discussion of Nyungar camps, settlements and housing in the Swan/Bassendean areas, see J.



Wilson (1958), K. Wilson (1958), Robinson (1976), McDonald (1976), d'Abbs (1979) and Carter (1986) among others.



### 3.2 The Significance of Water

The ethnohistorical evidence shows that rivers, creeks and wetlands in the Perth metropolitan region were most intensively occupied by Aborigines given the availability of fresh water and food resources (see, for example, Hammond 1980/1933 and Hallam 1975). Wetlands and rivers were connected by a series of pads (*bidj*) that extended from the present-day Perth area south to Mandurah and Pinjarra on the Murray River and north to Cockleshell Gully (Jurien Bay) and beyond. In particular, the alluvial plains and the associated *warran* or native yam grounds were of crucial importance to Aborigines (Hallam 1975). This conclusion is supported by the archaeological data.<sup>6</sup>

As Strang (2002, 2004), Langton (2006) and others note, water is also central to Aboriginal cosmologies and the close social, spiritual and cultural associations between Aboriginal people and groundwater resources carry with them an obligation to protect such resources for the future. Aboriginal culture, identity, spirituality and history are intertwined with waterscapes which are, in Langton's terms, 'jural spaces' that exist within a system of rights and responsibilities; that is, rights to control access and responsibilities for the protection of human, animal and vegetable life — the physical and metaphysical worlds (Langton 2002). This notion also applies to the water itself: Aboriginal people had a responsibility to look after water and the spiritual beings that controlled it. Both Rose (2004) and Keen (2004) argue that exclusive control of water was a key factor in Aboriginal survival; however, exclusivity was traditionally balanced with an emphasis on flexibility; on the social organisation of sharing (Estill 2005:34).

Given these cultural obligations, proposals that have the potential to adversely impact on waterways and waterscapes are often resisted by Aboriginal groups, while conversely proposals that seek to restore their health and vitality are usually given support. As McFarlane (2004:11) notes, each Indigenous group has its own specific issues and priorities, though a number of broad themes are apparent with respect to asserted rights to have spiritual relationships to water resources respected; have sites of significance protected; and decisively participate in the better management of water resources (cited in Estill 2005:80). Many of these themes were clearly apparent throughout the current consultations.

Water metaphorically frames social and environmental relationships and is an important source of cultural identity. Metaphors of blood and other bodily fluids figure centrally in Nyungar conceptualisations of water and its flow, and notions

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<sup>6</sup> See Tempus 2013 for a more detailed discussion of the area's archaeological profile.

such as “water is life” and “water is the birth of everything” underpin Nyungar concerns about waterscapes (rivers and other watercourses, lakes, wetlands and so on) (see Estill 2005 and McDonald, Coldrick & Christensen 2008). Indeed, Nyungars and other Aboriginal groups typically do not distinguish between landscapes and waterscapes (Langton 2002; Rose 1996, 2004). Moreover, landscapes and waterscapes are not ‘natural’ — they are culturally constructed (Hirsch & O’Hanlon 1995) and their creation features strongly in the various Dreamtime stories that are central to Aboriginal culture. Hydrological systems, surface and groundwater, are understood to be part of the Dreaming-ordained natural order. As Langton (2006) notes, in Aboriginal Australia waterscapes are construed as not only physical domains, but also as spiritual, social and jural spaces according to the same fundamental principles as places in the landscape.

In the South West, the Dreaming or spiritual aspects of water are generally framed in terms of the *Waugal* (or *Wagyl*, *Woggal*, etc) or more generally the Rainbow Serpent. Many waterscapes in the Perth metropolitan region, including the Swan River (DIA Site ID 3536) and Helena River (DIA Site ID 3758), are listed as mythological sites based on *Waugal* and other mythological associations, though these are often and increasingly generalised. In Australia’s South West, the *Waugal* in its various guises reflects the centrality of water and its transformative powers (see McDonald, Coldrick & Christensen 2008).

Bates (1985, 1992 and n.d.ii) refers to a number of *Waugal* sites or *woggalguttuk* [possessing Woggal/Waugal] places in the Perth area, including “deep (permanent) pools” and other places in the landscape (hills, valleys and other nature features). Her observations are confirmed by others. As Radcliffe–Brown (1926:22) noted:

*I have been able to trace the belief in the rainbow-serpent living in **deep permanent waterholes** through all tribes from the extreme south-west at least as far north as the Ninety Mile Beach and eastwards into the desert. In certain tribes around Perth ... **certain waterholes** are pointed out as being each the abode of a wogal ...* (emphasis added).

Bates (1985) reports that the *Waugal* was the only mythic being to whom propitiatory offerings were made and notes (1985:219–21) that all of the places the *Waugal* (*woggal*) stopped/camped (i.e., metamorphosed and was present) were *winnaitch*, which she glosses as “forbidden”, avoided or sacred (Bates 1985; n.d.).

However, the *Waugal* was not the only ancestral being associated with water and water sources. For example, the ancestral dog/dingo [*dwert* or *doorda*] was the creator of an important water source in New Norcia, *Nyeerrgu*, and laid down laws

associated with the use of the water (Bates 1992/1927:177–79). However, it is fairly rare now for ancestral beings other than the Waugal to be mentioned in relation to water in the context of heritage surveys.

Further, the Waugal's relationship to particular aspects of a local hydrological system may now only be understood and expressed in a general sense. In other words, specific mythological and locally-contexted narratives are generally absent, in contrast to the former, traditional situation. Increasingly, the Waugal is now reported as being in 'everyplace' water is found, rather than in specific contexts (Estill 2005 and McDonald, Coldrick & Christensen 2008), or no longer existing in places where water has disappeared. Moreover, in some cases, it is water itself, unmediated by the Waugal or other ancestral beings, that is seen as being of cultural and spiritual importance. Indeed, it is becoming increasingly common for Nyungars to make statements such as: "We believe in the spiritual aspects of water as part of the soul and being of Aboriginal culture and it should not be disturbed"; "It's the water that's ... significant"; "spirit is in the water – that's the rainbow snake" (Parker, Parker & Lantzke 2004:14)<sup>7</sup>; or more simply: "we worship *gabi*, the water".<sup>8</sup>

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<sup>7</sup> This statement was made by a senior Nyungar Elder in reference to the water in a manmade drain in the City of Stirling (DIA Site ID 21538) which has been assessed by the APMC as "not a site" under the AHA.

<sup>8</sup> McDonald, Coldrick & Christensen (2008) have observed that this increasing pattern at least to some extent reflects attenuated knowledge about the Dreaming, with discontinuities evident in the way significance is increasingly being read in *everyplace* rather than in specific 'story places'.

## 4. DESKTOP RESEARCH RESULTS

### 4.1 Register of Aboriginal Sites

The findings of the desktop assessment are reported and discussed in detail separately (Amergin 2013). In short, the search of the Register of Aboriginal Sites using the online AHIS found that there are three registered Aboriginal Sites overlapping the Study Area *as shown on the DAA's public mapping system* (Figure 7). They are:

- DAA Site ID 3608 Bridge Camps (Camp);
- DAA Site ID 3758 Helena River (Ceremonial, Mythological, Repository/Cache); and
- DAA Site ID 3840 Bennett Brook: Camp Area (Ceremonial, Mythological, Skeletal Material/Burial, Manmade Structure, Fish Trap, Artefact Scatter, Historical etc.).

However, the desktop research demonstrated that the only registered site actually extending into the Study Area is DAA Site ID 3758 'Helena River' where it forms part of the drainage feature/watercourse referred to above, and this was confirmed by the DAA following a search of their internal database at Amergin's request (Ashlee Bunney *pers. comm.* 29 May 2013; see Appendix 1).

DAA Site ID 3758 Helena River is registered as a ceremonial and mythological site and repository/cache. It appears to have been first registered based on the work of O'Connor, Bodney and Little who refer to its mythological, ceremonial and other associations (O'Connor, Bodney & Little 1985:100–02). However, they note that "The most important parts of this Aboriginal site were in the valleys inundated after the construction of Mundaring Weir" (O'Connor, Bodney & Little 1985:145). Indeed, much of the early reports about the significance of the Helena River appear to have concerned the Mundaring area and other *specific places* along the Helena Valley, in addition to myths reportedly associated with the river itself. Specific places referred to include a corroboree ground said to have once been located near the confluence of the Swan and Helena Rivers, the exact location of which is no longer known (O'Connor, Bodney & Little 1985:102).

Daisy Bates also recorded a number of myths associated with places in the Helena Valley and Mundaring Weir district, many of which cannot now be relocated, including a site now covered by the dam lake. Interestingly, Bates recorded a number of versions of a myth in which two pregnant women escape the Waugal's punishment for wrong-doing by the flooding of *Doweringup* (Lake Bannister?), and floated to the Helena River where they were metamorphosed into *Balga* (grass trees). Ironically, according to Bates, this site was inundated



when the Mundaring Weir was constructed (see Bates 1992: 55, 173–77, ‘Legend of Doweringup Water’; see also Bates n.d. (i) and (ii)).

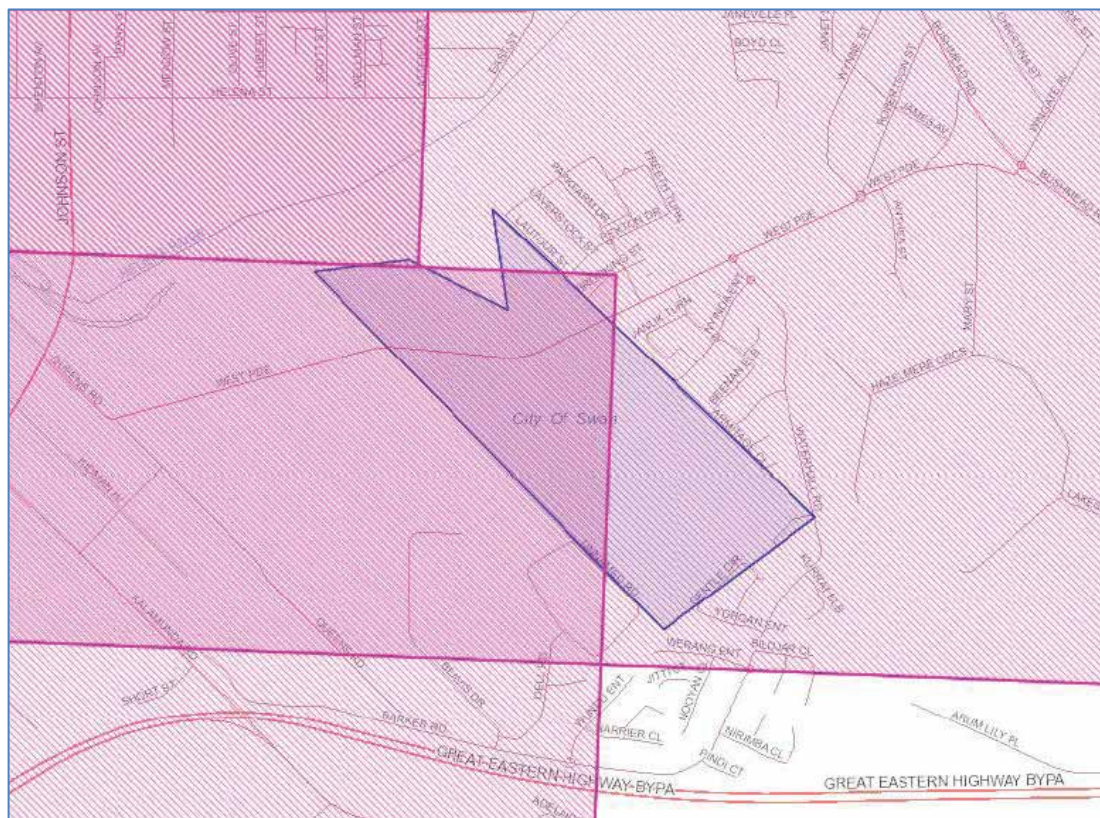
DAA Site ID 3758 ‘Helena River’ is a Closed site, though senior departmental staff have previously recommended internally that this file be made ‘Open’ as “much of the information about the site is publicly available through various articles and reports” (internal DIA memo, dated 01/05/02). Amergin has previously been granted access to the file based on letters of consent obtained from the majority of the surviving listed ‘informants’, including senior Nyungar Elders or their descendants. However, the Department refused to grant access for this assessment until the permission of the remaining ‘informants’ has been obtained.<sup>9</sup> Based on previous research, however, it is known that the site file — which extends to two volumes — contains a large quantity of information drawn mainly from reports of previous surveys and the majority of the references describing the extent of DAA Site ID 3578 focus on the river itself. However, like DAA Site ID 3536 (Swan River), there are various interpretations about the extent of its significance and therefore the boundary of the site, with some reporting that it should extend to the 100-year flood level and even to its floodplains.

The site boundary depicted on the public AHIS is a large polygon 65km in length and up to 14km wide in places that completely covers the Study Area, which in part is due to its Closed status. However, it is understood from the previous review of the file and other publicly available data that the official site boundary in the South Guildford area at least corresponds to the river itself and that it includes the drainage feature/watercourse that traverses the Study Area in the southwest, west and north. The boundary following this drain extends to approximately 30m either side of the drain’s centre line. Section 18 approval may therefore be required prior to carrying out any work on the drain that might be considered a disturbance of the Helena River site under Section 17 of the AHA.

There are no other registered Aboriginal sites or ‘other heritage places’ currently listed within the Study Area on the AHIS. However, there are other listings and registered sites in the surrounding area that reflect a high level of past Aboriginal land use and occupation (see Amergin 2013 for further discussion).

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<sup>9</sup> It is current DAA policy that the written permission of “all” listed “informants” is required before access to Closed site files can be granted (Shaye Hayden, *pers. comm.*, telephone 5 June 2013; email 6 June 2013).



**Figure 7: Registered Aboriginal Sites overlapping the study area as depicted on the public AHIS (Source: AHIS)**

## 4.2 Previous Heritage Surveys

The search of the AHIS survey database did not identify any previous Aboriginal heritage surveys carried out within the Rosehill Golf Land specifically.

The AHIS identifies three Aboriginal heritage surveys covering land to the east and south of the Study Area. These surveys related to the Rosehill Park Estate (Baines 1993; Schwede 1993); the Guildford Village (Waterhall) housing development (O'Connor 2002; Hart 2002; Quartermaine 2002) and the Dampier to Bunbury Natural Gas Pipeline (Hames 2003) and these surveys are summarised in the desktop report (Amergin 2013). The South Guildford area has also been covered by a number of regional-scale studies including the Ballaruk Site Recording Project (Machin 1994/95) and Hallam's Swan Area Archaeological Survey (SAAS).

As far as can be ascertained, other than the Helena River (DAA Site ID 3578), no ethnographic sites have been reported inside the current Study Area as a result of this previous research.

## 5. ETHNOGRAPHIC CONSULTATION RESULTS

### 5.1 Swan River People Native Title Claimants

The representatives of the 'Swan River People' (SRP) Native Title Claimants (Bropho, Wilkes, Garlett, Corunna and Warrell families and Iva Hayward-Jackson) described the area in which the Study Area is located as a "gateway" for Nyungars who "camped all along the rivers" including the Helena which they reported to be known as *Marndoon*. They described the area as "a highly popular spot for Nyungar people" with camps and ceremonial areas located all along.

They also described aspects of the area's more recent Aboriginal social history including relations with Padbury family; getting rations vouchers from the Police station in Guildford; seasonal employment such as grape-picking in the area; camping under bridges and collecting bush tucker and bush medicine (which they reported continues into the present); and people staying at the nearby Allawah Grove Hostel. As one of the senior spokesmen put it, "All those things were in place when we were around".

As a result of this known activity, they stated that there could be artefacts scattered throughout the Rosehill land, both above and below the surface. When the findings of the archaeological survey carried out by Tempus were reported to the group, some scepticism was raised about the survey findings given the absence of Aboriginal participants and they requested that the land be resurveyed with their participation.<sup>10</sup> If this is not possible, Albert Corunna requested the opportunity to come back with one or two of the other SRP elders to inspect the isolated artefact and have a look around. The SRP representatives also requested an excavation of the area around the artefact and that it is left where it is so they can show it to their young people.<sup>11</sup>

The watercourse/drain, which is connected to the Helena River and by extension the Swan River (both of which are registered sites), was a key point of discussion.

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<sup>10</sup> There are a number of reasons why the archaeological survey was carried out without Aboriginal participation, a number of which were outlined to the SRP representatives during the consultation. First, there are a range of competing families/groups in the Perth metropolitan area that claim heritage interests and for a one-day survey such as that undertaken at Rosehill, it is not possible to equitably involve each of these. Second, archaeological surveys are physically demanding and require people to be physically fit, healthy and have appropriate PPE. Third, as pointed out above in Footnote 2, identification of archaeological material requires people to be appropriately enskilled in survey work. Finally, involving additional people has inevitable financial as well as practical considerations. So while we acknowledge that Aboriginal people should be involved in managing their heritage, it is not always practicable to involve people in archaeological surveys in this area. However, there may be further opportunities for involvement — including monitoring — at a later date.

<sup>11</sup> As stated in the archaeological report, it is highly unlikely that the artefact is in its original context and the land is highly modified. The archaeologist has determined that no further management of this object is necessary (Tempus 2013).

Iva Hayward-Jackson reported that he had been involved in having the Helena River registered and he described the area as “a very important sacred area”. He said he was particularly concerned that additional residential development could lead to increased pollution entering the river system via the modified drain and he stated that because of this the group would “need to be heavily involved” in the planning of the development to ensure that this risk is properly dealt with. Preliminary suggestions put forward included installing rubbish traps, planting native vegetation to naturally filter the water, and implementing measures to minimise residents’ use of fertilizers and other chemicals. They also requested that the watercourse be protected within vegetated POS with a 30m buffer either side.

As a result of their concerns, the SRP concluded that they do not support a Section 18 Notice at this stage and requested further consultation when more detailed plans are available.

## **5.2 Whadjuk People Native Title Claimants/Ballaruk Group**

The representatives of the Whadjuk Native Title Claimants and Ballaruk Aboriginal Corporation (Bodney family) provided similar ethnographic information, and raised similar issues, to the SRP.

Corrie Bodney reported that his father-in-law, Alfie Mippy, used to work for Padbury and that the land in the area was commonage before it was granted to white settlers. He reported that the Helena River area was a “very important place” with people camping all along. He said that people used to come up here for hunting and fishing in the river for cobbler, mullet and so on. When the abattoir was operating, Nyungars often got meat for free and they would then return to the large camps such as those at Lockridge and Caversham. A number of the other representatives also recalled being in the area during their childhood and that their parents worked in the area grape-picking. Mr Bodney requested that this social history be acknowledged in the form of plaques and other interpretation in order to let people know that “this is blackfella country”. One of the Whadjuk representatives stated that the development should also include recognition that this was Munday’s territory.

The Whadjuk and Ballaruk representatives appeared satisfied with the findings of the archaeological survey. With respect to the isolated artefact, one of the elders suggested that the object may have been traded from elsewhere. They requested that monitoring take place to account for the possibility that additional material, including subsurface artefacts, could be encountered during earthworks.



The biggest concerns raised related to the proposed realignment of the watercourse/drain. One of the Whadjuk representatives stated she would prefer the drain to remain on its current course unless the realignment is returning it to a former, natural course as a realignment could in her view have adverse consequences for wetlands, flora and fauna relying on the existing alignment. One of the elders supported this view, stating "If it's a natural watercourse they shouldn't touch it". He seemed less concerned if the existing drain was not following a natural alignment.

The same Whadjuk representative stated that the "vision plan" (Figure 3) lacked sufficient detail to make an assessment of the proposals and that more detailed plans and information (including a determination of the natural alignment of the watercourse/drain and the results of environmental investigations) would need to be provided before they could "consent" to a Section 18 Notice. She stated that the proponent needed to "build our confidence that they're doing the right thing" with respect to the environment and heritage which, she pointed out, are closely linked for Aboriginal people. She also requested that the proponent consider providing financial assistance to the Nyungar community through any prescribed body corporates that may be established under the anticipated Native Title agreement with the State.

### **5.3 Harris-Kickett Family**

Shirley Harris reported that her mother, Kathleen Ryder, used to work at the lodge inside the Study Area for the Padbury family in the mid-1920s and she remembered her mother telling her stories about more traditional Aboriginal people living in the area at the time. She also reported that the Helena River had important mythological and ceremonial associations but said she could not discuss these for cultural reasons.

The Harris-Kickett family representatives were satisfied with the findings of the archaeological survey and stated that the isolated artefact should be left where it is under the tree with a plaque. However, they were concerned that it could be stolen if it was left in a conspicuous position.

They supported the notion of a rehabilitated "living stream" if the proposed realignment of the modified drain involves putting the watercourse back to the way it was, and as long as sufficient setback is provided so people can walk along and enjoy it. They also requested it be planted with native species and kept clean and free of pollution. No major concerns were raised.



**Plate 1: Looking north towards the Helena River from inside the northern portion of the Study Area (Photo: Coldrick, October 2013)**



**Plate 2: Looking east towards the Waterhall development from inside the northern portion of the Study Area (Photo: Coldrick, October 2013)**





Plate 3: View south over the driving range (Photo: Coldrick, October 2013)



Plate 4: The modified drain inside the golf course (Photo: Coldrick, October 2013)





Plate 5: The culverted drain and pond inside the golf course (Photo: Coldrick, October 2013)



## 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusions

This report has presented the findings of an Aboriginal ethnographic survey of the Rosehill Golf Course and Country Club in South Guildford in advance of proposed residential development. The ethnographic survey follows a desktop assessment and an archaeological survey, both of which are reported upon separately (Amergin 2013; Tempus 2013).

The ethnographic survey/consultations were carried out by Bryn Coldrick of Amergin Consulting on 21 October 2013. A total of twenty (20) Aboriginal consultants participated in the survey, including representatives of the Whadjuk Native Title Claimants, the Ballaruk Aboriginal Corporation, the 'Swan River People 2' Native Title Claimants (SRP) and others with knowledge of the area's Aboriginal heritage values. All of those consulted can be considered 'relevant Aboriginal people' as defined by the DAA's current *Aboriginal Heritage Due Diligence Guidelines* (DIA 2013:9).

No previously unidentified ethnographic sites were reported inside the Study Area as a result of the ethnographic consultations. However, generalised significance was attributed to the area along the Helena River including movement of people, camping, ceremonial uses, hunting, fishing, gathering bush tucker and bush medicine, and so on. As a result of this activity, a number of people expressed the view that there could be additional artefacts scattered throughout the land, both above and below the surface, and a number of requests were made in relation to the identification and management of archaeological material. These requests included another survey with Aboriginal involvement, inspection of the isolated artefact found during the archaeological survey by Tempus, and monitoring. Aspects of the area's more recent Aboriginal social history were also described and requests were made that this history be acknowledged in the form of plaques and other forms of interpretation.

As anticipated as a result of the desktop research, the watercourse/drain which traverses the land and is connected to the Helena River and by extension the Swan River (both of which are registered sites and considered by many to be "sacred"), was a key point of discussion. Some people raised concerns about the proposed realignment of the watercourse/drain and would prefer it to remain on its current course unless the realignment is returning it to a former, natural course. Others supported the notion of a rehabilitated "living stream" if the proposed realignment involves putting the watercourse back to the way it was

and as long as sufficient setback is provided so people can walk along and enjoy it. They also requested it be planted with native species and kept clean and free of pollution.

The main concerns raised by all groups related to the potential cumulative environmental impacts of further residential development in the area, in particular the risk of increased pollutants entering the watercourse/drain and therefore the river system. Two of the three groups consulted (the SRP and representatives of the Whadjuk Native Title Claim) requested further information and consultations to clarify the potential environmental impacts and other issues and allow them to have further input into the planning of the development. They stated that they could not support a Notice under Section 18 until more detailed information is provided.

Based on the information provided, it is our conclusion that apart from the watercourse/drain, which is already mapped as part of the Helena River site (DAA Site ID 3758), no new places that would meet the definition of an Aboriginal Site under Section 5 of the *Aboriginal Heritage Act 1972 (AHA)* have been reported. A drain in and of itself would also be highly unlikely to meet the Department's current criteria for a sacred site under Section 5(b) of the AHA, even if it was originally a natural watercourse.

## 6.2 Recommendations

Based on the findings of the assessment, the following recommendations are made:

1. It is recommended that the proponent note the concerns raised by the Aboriginal consultants with respect to the potential environmental impacts of the proposed development and consider their requests for further information and consultation on these issues;
2. It is recommended that the proponent note the concerns raised and requests made by the Swan River People Native Title Claimants in relation to the archaeological investigations;
3. It is recommended that impacts to the watercourse/drain, which currently forms part of the Helena River site (DAA Site ID 3758), be avoided unless Ministerial approval under Section 18 of the *Aboriginal Heritage Act 1972 (AHA)* and/or Regulation 10 of the *Aboriginal Heritage Regulations 1974 (AHR)* is obtained in advance;
4. It is recommended that the isolated artefact RH-ISO/001 be left *in situ* and that the area around it be preserved in POS if possible, or that the artefact be temporarily stored and returned to an agreed-open area of POS following completion of earthworks;
5. It is recommended that the proponent engages further with the Aboriginal community in the development and installation of heritage interpretation and public artworks to acknowledge Aboriginal connections with the area

and that other forms of recognition also be considered (e.g., naming of streets); and

6. It is recommended that the recommendations of the archaeological report (Tempus 2013) be implemented, including development of an Aboriginal Heritage Management Plan (AHMP) and strategic monitoring of initial ground disturbing works.

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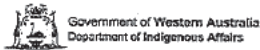
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## APPENDIX 1: DAA REGISTER SEARCH





## REGISTER OF ABORIGINAL SITES AND HERITAGE PLACES

RPGSR

Reference No: AUID-1021959



### Search Criteria

Easting: 404451mE; Northing: 6468960mN; Zone: 50  
 Easting: 404057mE; Northing: 6468664mN; Zone: 50  
 Easting: 403136mE; Northing: 6469582mN; Zone: 50  
 Easting: 403384mE; Northing: 6469615mN; Zone: 50  
 Easting: 403643mE; Northing: 6469488mN; Zone: 50  
 Easting: 403601mE; Northing: 6469750mN; Zone: 50

### Assessment Status ("Status")

**L = Lodged:** Lodged with Registrar, placed on Register, not assessed.  
**I = Insufficient Information:** Lodged with Registrar, placed on Register, has insufficient information to complete assessment in terms of section 5 of AHA.  
**R = Registered Site:** Lodged with Registrar, placed on Register, lodged information assessed as meeting terms of section 5 of AHA.  
**S = Stored Data:** Lodged with Registrar, placed on Register, lodged information assessed as not meeting terms of section 5 of AHA.

### Legend

### Access ("Acc")

**C = Closed:** Access to site file requires the written consent of persons recorded in the site file as primary Aboriginal informants. Contact DIA for details.  
**O = Open:** Access to site file is open to the public.  
**V = Vulnerable:** The current physical condition of the site may prevent access to the site.

### Restriction ("Res")

**N = No restriction:** No restrictions are placed on viewing the information in the site file.  
**M = Male access only:** Access to the site file is restricted to males.  
**F = Female access only:** Access to the site file is restricted to females.

**Copyright** - Copyright in the information contained herein is and shall remain the property of the State of Western Australia. This includes, but is not limited to, information from the Register of Aboriginal Sites established and maintained under the Aboriginal Heritage Act 1972 (AHA).

**Disclaimer** - The AHA protects all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some sites that appear on the register may no longer physically exist. Consultation with Aboriginal people is on-going to identify additional sites or changes to registered sites.

**Spatial Accuracy** - Map coordinates (Easting/Northing) listed in this report only represent indicative locations of sites. They should not be interpreted as the centre of a site. All sites on the Sites Register have an area and should not be represented as points. The coordinates are based on the GDA94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map in this report, i.e., '5000000.Z50' means Easting=5000000, Zone=50.

### Coordinate Accuracy.

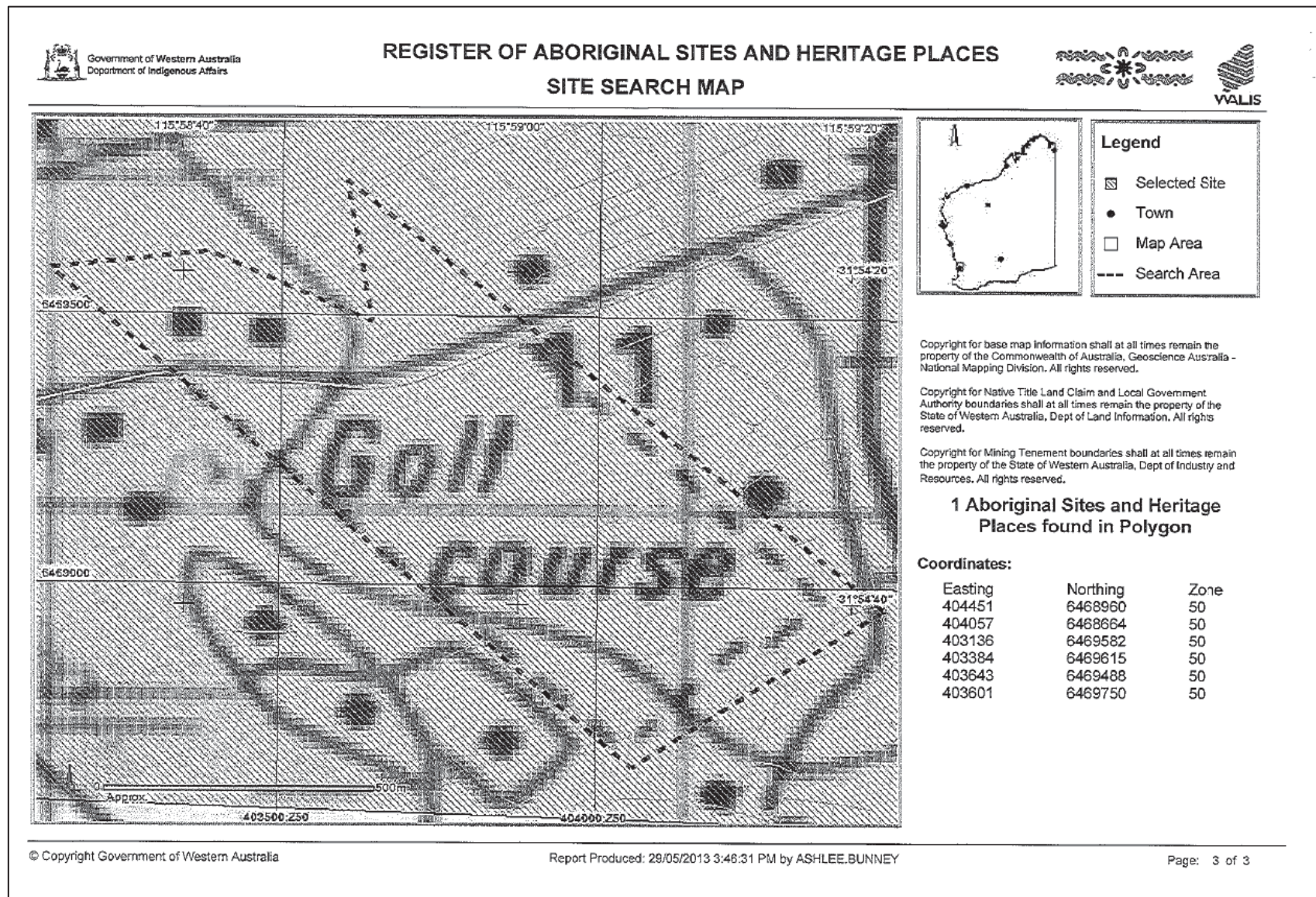
[Reliable] or "RE": The spatial information recorded in the site file is deemed to be reliable due to the methods of capture.

[Unreliable] or "U": The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Site ID	Site Name	Acc	Res	Status	Resolution	II/NA	05	39	Site Type	Additional Information	Informants	Recorders	Easting Northing	Field Code Site No.
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Site ID	Site Name	Acc	Res	Status	Resolution	II/ NA	05	39	Site Type	Additional Information	Informants	Recorders	Easting Northing	Field Code	Site No.
3758	HELENA RIVER	C	N	R	2012/049 (Mult resolns exist)	B	B	C	Ceremonial, Mythological, Repository / cache		Date: 03/12/2004 Primary: [Hayward-Jackson, Iva (Mr)] Date: 03/12/2004 Primary: [[Independent Aboriginal Environmental Group] Date: 03/12/2004 Primary: [Name Withheld (Deceased)] Date: 03/12/2004 Primary: [Bodney, Corrie (Mr)] Date: 01/01/1983 Primary: [Collard, Fred (Mr)] [Name Withheld (Deceased)]	Date: 03/12/2003-[Name Withheld (Deceased)], Date: 15/06/1985-[O'Connor, Rory (Mr)]	Not available for closed sites	1.11	S02148











Government of **Western Australia**  
Department of **Aboriginal Affairs**

ENQUIRIES: Ryan Crawford 08655 18091  
OUR REF: 14/0053  
YOUR REF: Rosehill/DAA Re: Section 18

Mr Jan Zuideveld  
Project Director  
Habitat International  
P.O. Box 527  
Applecross WA 6953

Dear Mr Zuideveld,

**RE: NOAHS ROSEHILL WATERS, SOUTH GUILDFORD**

I refer to your letter, dated 5 March 2014, requesting advice on the proposed development of the former Rosehill Country Club and Golf Course on West Parade, South Guildford.

As you describe in your letter, the area of proposed works has been subject to major modifications in the past, having been developed and landscaped as a country club and golf course before 1965. As you also note, a modified watercourse extending into the area of proposed works is currently part of Registered Aboriginal site DAA 3758 (Helena River).

I understand that you have commissioned Amergin Consulting (Australia) Pty Ltd to undertake a heritage assessment of the area of proposed works as part of due diligence considerations. I understand that you have also provided the Department with the three heritage survey reports that resulted from Amergin Consulting's assessment.

The Department has had an opportunity to review the information provided with your letter and the Register of Aboriginal Sites and can advise that although the portion of the modified watercourse that extends into the area of proposed works is part of a Registered site, the overlap area is outside of the area of reported heritage values for this Registered site. In this case no approvals under the *Aboriginal Heritage Act* (1972) will be required.

In the future, when proposals for development of land are occurring we suggest that you advise developers to use the Aboriginal Heritage Due Diligence Guidelines for assistance in identifying the risk that proposed activities may have on adversely impacting Aboriginal heritage values. The Guidelines can be located online through the following link:

Ground Floor, 151 Royal Street, East Perth, Western Australia, 6004  
PO box 3153, East Perth, Western Australia, 6892  
Telephone 1300 651 077 Facsimile (08) 6551 8088  
[www.daa.wa.gov.au](http://www.daa.wa.gov.au)

<http://www.daa.wa.gov.au/Documents/HeritageCulture/Heritage%20management/AH A Due Diligence Guidelines.pdf>

If you have any questions in regard to the above, please contact Ryan Crawford on 6551 8091.

Kind regards,

A handwritten signature in blue ink, consisting of a stylized 'C' followed by a wavy line.

Cesar Rodriguez  
Manager Approvals and Advice - Government

19 March 2014

## **APPENDIX I**

## **COMMUNITY ENGAGEMENT REPORT**

# ROSEHILL WATERS COMMUNITY ENGAGEMENT

## OVERVIEW

In June 2013, Handle Property Group applied to re-zone the former Rosehill Golf Course from rural to urban to facilitate residential subdivision.

The residential development is being designed to further include commercial and community amenities, including a neighbourhood centre with shopping facilities. Existing buildings on the golf course, while not heritage listed, have social significance and will be retained for community benefit.

In November 2013, Karen Gregory (KG Community & Communication) was appointed to the Project Team as Community Advisor with the task of developing a community engagement and information process.

An extensive community engagement process was carried out up to and including the gazettal of re-zoning. Contact with the community has continued to be maintained via the Rosehill Waters website and the Community Advisor has been briefed to begin a new process of engagement when the Structure Plan is advertised for public submission.

### Community Engagement Process prior to re-zoning

The application to re-zone the land to urban was lodged in June 2013. The public submission period opened on 27th May 2014. Until the submission period began, commercial and contractual confidentiality meant the proponent was not free to begin engaging openly with the community. The engagement process was undertaken immediately the public submission period opened.

## Methodology

Tools used to engage and inform the community included:

- Sample survey
- Brochure drop
- flyer drop – open day sessions
- 1:1 information sessions
- Group information sessions
- Media/Advertising
- Media monitoring and response
- Website with Q and As, plus feedback line
- Two half day Community information sessions



## ROSEHILL WATERS COMMUNITY ENGAGEMENT

- Doorknock in surrounding suburbs/streets
- Shopping Centre display
- Stakeholder briefings and information packages
- Response to questions received via email, website and by telephone

### Sample survey

In November 2013, a sample survey of 350 homes was carried out over a two week period within a 1km area of the Rosehill land. The South Guildford Residents' Satisfaction Survey looked at why people chose to live in the area, what facilities the area might lack and whether noise of any kind was an issue for them.

There was a 20% response to the survey and the biggest single comment from residents was that they have no disturbance at all, with 30% not bothered by anything at all in the area and love living there.

The majority of complaints about noise centred on trains, with others annoyed by the noise of trail bikes and the Roe Highway. Concrete work dust was also a prominent complaint.

SOUTH GUILDFORD RESIDENTS SATISFACTION SURVEY - RESULTS							
	Planes	Trains	Lack of Services	Noise from Barracks	Trail Bikes, crime, Roe Highway, Dogs, Concrete works	No disturbance	
Waterhall Estate		II			II	IIII I	10

## ROSEHILL WATERS COMMUNITY ENGAGEMENT

Kareen Way/Armitage Close (Rosehill)		IIII III	I		II	II	13
Gentle Circle (Rosehill)	I	II			IIII	III	10
Wundu Entrance (Rosehill)	I	I	II	III	III	IIII	15
Waterhall Rd (Rosehill)	III	II			III	III	11
Queens Road	IIII				IIII	II	11
<b>TOTAL</b>	<b>9</b>	<b>15</b>	<b>3</b>	<b>3</b>	<b>19</b>	<b>21</b>	<b>70</b>

### Brochure drop

Over 11<sup>th</sup> and 12<sup>th</sup> June 2014, 1995 brochures providing details of the proposed redevelopment of Rosehill Golf Club were delivered to homes in South Guildford, Hazelmere and streets in Guildford between James Street and the Helena River.

### Flyer drops

Between 23<sup>rd</sup> June and 4<sup>th</sup> July approximately 2000 flyers advising the dates, time and place of Community Information Sessions and also offering 1:1 information sessions were delivered to homes in South Guildford, Hazelmere and streets in Guildford between James Street and the Helena River.

## **1:1 information sessions**

These were held during late June and early July for anyone who wanted the opportunity to individually put questions to members of the Project Team outside the community information sessions. The sessions were held on site at the Golf Course. Only three 1:1 sessions were taken up by residents, even though they were extensively advertised (media advertisement, website and letter drop).

## **Group information sessions**

Invitations to briefings were sent to groups and organisation with an interest in Rosehill Waters. The Lower Helena River Catchment Area Landcare Group accepted the invitation and attended a briefing on Thursday 10<sup>th</sup> July at The Lodge, Rosehill. The group indicated an interest in working with the Rosehill Waters project team to enhance and improve the lower Helena River should the re-zoning be approved.

## **Media/Advertising**

- An advertisement with dates, time and place of the Community Information Sessions was placed in The Midland Echo newspaper on Saturday 27<sup>th</sup> June.
- A four page wrap-around was published in The Midland Echo Newspaper on Saturday 5<sup>th</sup> July
- Three further Page 3 Advertisements correcting misinformation were placed in the Midland Echo on 12<sup>th</sup>, 19<sup>th</sup>, and 26<sup>th</sup> July respectively.
- Media statements correcting misinformation were issued to the West Australian and The Midland Echo.

## **Media Monitoring and Response**

A considerable amount of inaccurate information appeared in early media reports which the proponent was not at liberty to correct until the submission period began. As indicated above, during the submission period, media statements correcting misinformation were issued to the West Australian and The Midland Echo.

The social media site Facebook was particularly active, after a "Save Our Golf Courses" Facebook page was set up on 23<sup>rd</sup> February 2014 and a Guildford News Facebook page was established some weeks later.

Both pages contained considerable supposition and rumour concerning the Rosehill Waters development and on one occasion the proponent was compelled to post a response to these Facebook inaccuracies, on the Save Our Golf Courses Facebook page.

## **Website**

A website was established and went live during the first week in June 2014, [www.rosehillwaters.com.au](http://www.rosehillwaters.com.au). The website contains details of the proposed rezoning, a concept plan, community benefits, a Q and A page and a contacts form inviting feedback and further questions.

## **Two half day community information sessions**

The sessions were held at The Lodge, Rosehill from 3.30pm to 7.30pm on Wednesday 9th July and from 10am-2pm on Thursday 10th July 2014, providing a broad time berth to enable people to attend.

30 people attended the sessions over the two day period. Questions were mainly about road lay-out, type of housing, block size, price and the ANEF contours. No clear pattern emerged over the two sessions. Attendees had mixed views – some wanted to register their interest in purchasing, some were opposed, some supported the commercial and community facilities and some were interested in finding out more about the noise mitigation measures going into the Rosehill Waters building program.

## **Doorknock in surrounding suburbs/streets**

From 23<sup>rd</sup> June to 16<sup>th</sup> July approximately 2,000 homes within a 1km radius of the Rosehill site were doorknocked to contact residents directly. The doorknocking was carried out during the day, early evening and at weekends to gather as many opinions as possible.

The doorknockers carried information brochures, plus two petitions, one in support of the re-zoning and one which indicated that residents, irrespective of any re-zoning, would like to have a shopping centre and community amenities which the area currently lacked.

125 signatures were collected on a petition supporting the re-zoning. A further 32 signatures were collected on the petition calling for more facilities and amenities for South Guildford.

## **Shopping Centre display**

Rosehill Waters mounted a shopping centre display at Midland Gate from 17th July to 20th July inclusive. Over this four day period, approximately 100+ people stopped at the display to seek information. The overwhelming majority of those who stopped either supported the development or registered an interest in purchasing a property.



### **Stakeholder briefings and information packages**

More than 15 individual and team briefings were provided to City of Swan staff and councillors, State and Federal MPs. Two packages of information were delivered to nearly 100 stakeholders.

### **Response to questions received via email, website and by telephone**

The majority of phone calls, emails and website contact to the Community Advisor were in relation to registering interest in finding out more about lot layout, block size, price range and when the house and land packages would be available to purchase.

They indicated their support for the re-zoning and their details were passed to the HPG sales team.

Two local residents not interested in purchasing called directly to voice their support for the re-zoning. Three asked for 1:1 Briefings, three enquired whether State housing would be included in the development, and four wanted an explanation of the Blue Sky plan on the brochure. Three raised questions regarding the proposed road layout.

The remainder of the contacts related to general information regarding dates of community information sessions, site layout, type of housing, proximity to the airport and noise contours, development timeframe and what plans were in hand for the existing buildings.

## ROSEHILL WATERS COMMUNITY ENGAGEMENT

Means of contact			Area of Interest							
Direct call to Community Advisor	Email to Community Advisor	Via Website Feedback	General info	Registration of interest in purchasing	Dates of community info sessions	Request for 1:1 Briefing	Blue sky plan on brochure	Road layout/Traffic management	Public Housing	Expressing support
X			X							
		X	X							
		X			X					
X						X				
		X					X			
		X				X				
X	X	X				X	X			
X							X			
		X						X		
		X					X			
		X		X						X
		X	X		X					
		X							X	
		X			X					
		X		X						X
		X							X	
	X		X					X		
		X		X						X
		X	X							
		X								X
X										X

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X				X						X
		X		X						X
X										X
X				X						X
	X			X						X
	X			X						X
		X		X						X
X				X						X
		X		X						X
	X							X		x
		X		X						X
		X							X	
		X	X							
	X									X
	X			X						X
		X		X						X
	X			X						X
	X		X							
X				X						X

## Structure Plan engagement process

HPG is committed to continuing to engage with the community through information sharing and ongoing meetings with individuals and interest groups. During the Structure plan public comment period, it will:

- ✓ Organise drop-in sessions for interested parties.
- ✓ Provide updated information material
- ✓ Provide briefings for stakeholders as and when required

## Drop-in sessions

Two sessions will be held on site to allow the community to discuss plans for Rosehill Waters and identify measures which may be able to be incorporated to enhance the development. The sessions will be widely advertised via the local media, by email to HPG's database of those who have expressed interest in the development and via the Rosehill Waters website.

The feedback link on the Rosehill Waters website will also be open throughout to assist anyone with questions or who is seeking additional information.

**Karen Gregory Community & Communication**

E: [karengregory5@bigpond.com](mailto:karengregory5@bigpond.com)

M: 0431 154 158

29/10/2015



## **APPENDIX J**

## **OUTCOMES OF PRELIMINARY CONSULTATION**

DATE	KEY ISSUES	AGENCY CONSULTED WITH	METHOD OF CONSULTATION	OUTCOMES	STATUS OF ISSUE
21/8/15, 28/8/15	Timing of Watercourse - Permit to interfere with bed and banks	Department of Water	Email	Permit takes 10-12 weeks to obtain	Resolved
21/8/15	Timing of Watercourse, Main Roads Drain - Native Vegetation Clearing Permit	Department of Environmental Regulation	Email	Permit takes 60 – 90 days to obtain	Resolved
21/8/15, 31/8/15	Timing of Watercourses – ASS Management Plan	Scott Jenkinson - Department of Environmental Regulation	Email and call	Approvals take about 45 days.  Note new guidelines issued dated June 2015.	Resolved
16/9/15	E-titles timing	Lisa Gibson – MNG Survey	Phone	E-titles timeframe allowances:  <ul style="list-style-type: none"> <li>• Once you have PC add 4-6 weeks for clearances</li> <li>• 2-3 weeks for Landgate and WAPC endorsement</li> <li>• 1 week for titles</li> </ul> <p><b><i>But</i></b> we are in City of Swan...so this means that (first stage always having issues), and there being lots of legal works required, and they have had some examples recently where clearances have taken 2-4 months, they recommend being conservative with our estimates for this – i.e. instead of a 10 week process, this becomes a 16 – 20 week process...</p>	Resolved
22/9/15	DET Contributions	Mal Parr - Department of Education and Training	Phone	The Department of Education does not require financial contribution from the developer.	Resolved
27/10/15, 2/11/15	Main Roads Drain Realignment - Combining Q100	Laura Alderslade – Main Roads	Email	<ul style="list-style-type: none"> <li>- In certain situations with mitigating circumstances, they may allow it.</li> <li>- Minimum conditions and requirements as per City of Swan's requirements.</li> </ul>	Unresolved.

	from our trap lows into MRWA realigned drain.			<ul style="list-style-type: none"> <li>- Must be in accordance with MRWA guidelines for working within a road reserve.</li> <li>- Must supply engineering construction drawings, geotech, hydrologic and hydraulic calcs/flow paths, etc., pit and pipe data, soakwell volume calculator as applicable, pollutant treatment, max as per pre-development levels and in accordance with UWMP, safe overland flood route, detention system design, etc. for assessment.</li> <li>- Anthony La Spada is the Road Reserves Access Manager and he can be contacted if you need further information. Anthony's contact details are –</li> </ul> <p>Email <a href="mailto:anthony.laspada@mainroads.wa.gov.au">anthony.laspada@mainroads.wa.gov.au</a></p> <p>Phone 9323 4009</p>	
15/7/13, 21/8/15, 26/8/15, 1/9/15	Water and sewer planning capacity	Brett Coombes – Water Corporation	Email and phone	<ul style="list-style-type: none"> <li>- Sewer – pump stations may need to be upgraded depending on catchment size and timing.</li> </ul>	Unresolved, to be determined as part of detailed design and does not impact on consideration of structure plan.
25/8/15, 31/8/15, 22/10/15	<ul style="list-style-type: none"> <li>- DA timing</li> <li>- Display homes timing and feasibility</li> <li>- Road design</li> <li>- Verge layout</li> <li>- Drainage design</li> </ul>	Yoon-Kah Wong / Daniel Beresford – City of Swan	Email	<ul style="list-style-type: none"> <li>- Awaiting response.</li> </ul>	Unresolved, to be resolved as part of detailed planning stages and does not impact on consideration of structure plan.
19/11/13	<ul style="list-style-type: none"> <li>- Drainage</li> <li>- Roads</li> <li>- Earthworks</li> </ul>	Yoon-Kah Wong; Grant Mackinnon; Steven Tan; John Elliot; Wendy Griffiths – City of Swan	Meeting	<ul style="list-style-type: none"> <li>- Refer to meeting minutes.</li> </ul>	Unresolved
13/11/15	<ul style="list-style-type: none"> <li>- Sewer and waer capacity</li> <li>- Lot 1</li> <li>- Deep sewer/forward works</li> </ul>	Water Corporation	Meeting	<ul style="list-style-type: none"> <li>- Refer to email summary</li> </ul>	Unresolved

04.06.13	Proposed scheme amendment  Environmental factors	Department of Environment and Conservation	Meeting	Meeting held with Michael Roberts to discuss proposed development of the site and associated environmental considerations. No major concerns were noted in relation to the proposed development.	Resolved
14.06.13	Proposed scheme amendment  Environmental factors	Office of the Environmental Protection Authority	Meeting	Meeting held with Gary Williams and Angela Coletti to discuss the proposed development of the site and associated environmental considerations. No major concerns were noted in relation to the proposed development. OEPA were requested to provide written correspondence in response to the WAPC request confirming their view.	Resolved
17.06.13	Proposed scheme amendment  Water management	Department of Water	Meeting	The Department of Water had no major concerns over the proposed rezoning. However made the following recommendations: <ol style="list-style-type: none"> <li>1. Retain the watercourse downstream of West Parade as a 'living stream.'</li> <li>2. Use of 'online storage' for stormwater management.</li> <li>3. Biophysical assessment to be undertaken for the two tributaries of the Helena River to inform the LSP.</li> </ol>	Resolved
02.08.13	Proposed scheme amendment  Environmental factors	Office of the Environmental Protection Authority	Written correspondence	OEPA provided written correspondence to WAPC confirming that the proposed amendment does not raise any significant environmental issues that cannot be adequately managed through the detailed planning process. A copy of the correspondence was provided to Coterra Environment.	Resolved
27.08.13	DWMS	Department of Water	Written correspondence	The Department of Water made the following comments regarding the DWMS (Rev 1): <ol style="list-style-type: none"> <li>1. The Department would prefer to retain the portion of the drains north of West Parade as living streams.</li> <li>2. A biophysical assessment should be undertaken along the drains to determine appropriate foreshore areas.</li> </ol>	Resolved
26.09.13	Proposed scheme amendment  Environmental factors	Department of Environment and Conservation	Telephone and email correspondence	Coterra undertook consultation via telephone and email with David Lodwick regarding the proposed amendment and associated environmental considerations to assist David to provide a response to WAPC. We understand that the response was received by WAPC shortly afterwards.	Resolved
29.11.13	Proposed scheme amendment  Environmental	Swan River Trust	Written correspondence	The Swan River Trust had no objection to the proposed MRS rezoning from 'Rural' to 'Urban', however made the following comments: <ol style="list-style-type: none"> <li>1. The interface with the Helena River foreshore is an important aspect of the development and any boundary fencing, retaining walls, setbacks etc., will need to be considered and addressed in</li> </ol>	Resolved



	factors			<p>accordance with the Trust requirements.</p> <ol style="list-style-type: none"> <li>2. Further liaison with the Department of Aboriginal Affairs is recommended.</li> <li>3. Some detailed comments were provided on the DWMS document.</li> <li>4. Flood risk along the Helena River should be managed.</li> <li>5. It is recommended that the Department of Environmental Regulation's Contaminated Sites Branch be contacted if ASS is found to be an issue.</li> <li>6. Vegetation retention is encouraged as well as an interface (i.e. road) with the Bush Forever Site.</li> </ol>	
March and April 2014	Proposed scheme amendment  Environmental factors	Office of the Environmental Protection Authority	Telephone and email correspondence	Liaison with Liesl Rohl, Gary Williams and Angela Coletti regarding OEPA's formal response to WAPC in relation to the rezoning application for the site. OEPA advertised their decision as 'Scheme Amendment Not Assessed – Advice Given' on 7 April 2014.	Resolved
03.04.14	Drainage strategy	Department of Water	Meeting	<p>The Department of Water had no major concerns over the concept plan presented. However made the following recommendations:</p> <ol style="list-style-type: none"> <li>1. 1 year ARI should be treated prior to discharge to the drains (if they are flowing).</li> <li>2. Maintenance issues should be considered for any proposed culverting of the drains.</li> <li>3. The intentions for the excess water currently licenced to the golf course should be outlined in the LWMS.</li> <li>4. Non-habitable structures (i.e. paths, benches, boardwalks etc.) can be placed within the floodway as long as they do not interfere with flood flows and are water resistant.</li> </ol>	Resolved
05.05.14	Drainage strategy	Main Roads WA	Meeting	Liaison with Laura Alderslade and Guillaume Willemsen regarding the Great Eastern Bypass stormwater drainage pipeline which crosses the site. Main Roads WA would not object to the pipeline being altered as long as it can be demonstrated that there would be no change in its stormwater drainage function.	Resolved
01.07.14	MRS Advertising  Environmental factors	Urbis / City of Swan	Email correspondence	<p>Advice was provided to Urbis for conveyance to the City of Swan (John Elliott – Coordinator Statutory Project Planning) regarding black cockatoo habitat in relation to the project area and the appropriate process through which this matter is likely to be dealt (EPBC referral process). The query from John was prompted by scrutiny from the public regarding the appropriate handling of environmental issues.</p> <p>The advice was reviewed by Lavan Legal for accuracy and compliance with statutory requirements.</p>	Resolved

08.07.14	MRS Advertising  Environmental factors	City of Swan	Memorandum (via email)	Advice was provided to the City of Swan (John Elliott – Coordinator Statutory Project Planning) regarding the National Wildlife Corridors Plan and other ecological linkages due to concern from the public regarding the appropriate handling of environmental issues.	Resolved
23.10.14	Threatened and priority fauna	Department of Parks and Wildlife	Telephone and email correspondence	A discussion was had with Amy Mutton at DPaW regarding the Carter's Freshwater Mussel occurring within the Rosehill site, after a member of the public (Karen Firth) published on the "Save our Golf Courses" Facebook website that it was inhabiting the drainage line within the golf course. She confirmed that there are no formal records of this species occurring in this location and for a record to be kept, evidence would have to be provided to DPaW (which had not occurred at this stage). She confirmed this view in an email.	Resolved
27.10.14	EPA assessment process	Office of the Environmental Protection Authority	Telephone liaison	<p>The OEPA's scheme amendment assessment was informally questioned by a community group (OEPA noting there is no formal appeal process for the setting of EPA level of assessment for scheme amendments) on the basis that the OEPA did not fully consider all of the significant environmental factors that may be impacted by the proposed development. The OEPA (Angela Coletti and Liesl Rohl) responded with the following points:</p> <ul style="list-style-type: none"> <li>Angela and Liesl had no concerns that the assessment did not follow all required processes – pre-referral stage followed by formal referral.</li> <li>A common misconception is that if the EPA deems a project not to warrant formal assessment, that the project has no environmental values, when there are in fact other processes or legislation in place that can adequately capture any environmental design and management requirements to ensure these factors are appropriately addressed at the correct stage of the planning process.</li> </ul>	Resolved
07.11.14	Environmental values of the site – response to community member letter to Ministers	Minister for Environment (WA)  Shadow Minister for Environment (WA)  Minister for Environment (Federal)  Shadow Minister for	Written correspondence	A letter was drafted by Coterra Environment for distribution (by Handle Property Group) to various environmental and planning ministers in response to a submission made to them by Dave Abbott (community member), to clarify the environmental approvals processed previously undertaken for the Rosehill development and provide advice on the points raised in regard to the presence of threatened flora and fauna and the biodiversity values of the site.	Resolved

		Environment (Federal)  Minister for Planning (WA)			
13.11.14	Environmental values of the site – response to community member letter to Ministers	Office of the Environmental Protection Authority	Telephone liaison	<p>Coterra Environment was contacted by Anthony Sheehan (OEPA) who advised that the response to the letter (Item 15) that will come from the Minister will reiterate that the EPA considered at the time of their review that the environmental value of the site is relatively low, and that there will be a net environmental benefit with regard to the drainage design and foreshore management.</p> <p>He also advised us that a community member had sent the Minister further correspondence stating that two of the lakes within the site had been drained illegally. Our response was that the lakes are artificial water bodies and that the irrigation lake that was drained was done so by irrigating the land, which is entirely within the owner's right. The City of Swan had provided their consent, despite this not being a requirement.</p>	Resolved
02.01.15	Environmental values of the site – response to community member letter to Ministers	Department of the Environment	Written correspondence (addressed to Sandra Bransby)	The DotE informed that they were confident that we have provided enough information at this time to ensure that our obligations under the EPBC Act are considered, in response to Dave Abbott's letter. A rezoning decision is not considered by the DotE to be an action for the purposes of the EPBC Act.	Resolved
14.01.15	Environmental values of the site – response to community member letter to Ministers	Department of Planning	Email correspondence (addressed to Sandra Bransby)	Anthony Muscara enquired as to whether the proposed development had or would be referred to the DotE under the EPBC Act. In consultation with Coterra, Sandra responded stating that preliminary consultation had been undertaken with the DotE had been undertaken, and that it is the intention to refer the proposal during the structure plan process as this will provide a definite conceptual basis on which any possible environmental impact can be measured.	Resolved
14.05.15	Groundwater licence – prospective licence trading options	Department of Water	Telephone liaison	<p>Further advice requested from Handle of the status of their groundwater allocation post development (i.e. more water than they will need) and what options Handle has for potentially selling the water. Request from JDA to buy some water from Rosehill for another development.</p> <p>Regarding cost of water: DoW (Glenn Simmons) advised that the \$1/KL was more when water trading first started and the demand for water wasn't so great. DoW advised \$6/KL is around the Swan Area. We are in the Shire of Swan South. He also advised \$3-4/KL was fairly common for</p>	Resolved

				<p>more 'in demand' locations. These price indications show that the sale of the volume JDA is requesting could potentially generate a revenue of approximately \$200,000-350,000.</p> <p>Reminded that DoW does reserve the right to reclaim unused allocations of groundwater licence under the Statewide Policy No.11 <i>Management of Unused Licensed Water Entitlements</i> (WRC, 2003).</p>	
29.06.15	Foreshore and interface management	WAPC	Telephone liaison and email	<p>Coterra contacted Tony Pantano to discuss his liaison with Urbis regarding the weed infestation requiring control in the land swap portion of the foreshore reserve (Rosehill land to be transferred to WAPC). Coterra advised that the weed control had been undertaken to minimise seed spread of cottonbush which Tony supported. We discussed the potential for an Interim Weed Management Plan to be prepared given the Foreshore Management Plan (at that time) finalisation and approval was likely to be a while away. It was acknowledged that Tony will be contacted throughout the management plan preparation process to ensure consistency with previous / current works and WAPC expectations.</p>	Resolved
14.10.15	LPS Amendment  EPA assessment process	Office of the Environmental Protection Authority	Telephone liaison	<p>Liaison was undertaken with Angela Coletti regarding OEPA's response to the City of Swan in relation to the Local Planning Scheme rezoning application for the site. The query was raised that if the EPA had previously considered the site for assessment under the MRS amendment, did the LPS amendment provide another opportunity for the OEPA to assess the project? Angela advised that they had received the referral and as it is under a separate scheme amendment they are required to look at it (there is potential for the project plan to have changed). If found to be in line with the MRS amendment, the OEPA are likely to recommend to issue the same or very similar advice as provided at the MRS amendment phase.</p>	Resolved
21.10.15	LPS Amendment  EPA assessment process	Office of the Environmental Protection Authority	Telephone liaison	<p>Angela Coletti was followed up for an update on the previous week's conversation regarding the EPA's decision on the LPS amendment referred to the OEPA. Angela advised that her recommendation has been forwarded to the Chairman, which will then be sent to the Minister. It is due to be published in the Monday advertisements on 2 November 2015. She raised the issue that the Special Use zoning in the north-eastern portion is not consistent with the Rural zoning under the MRS, however advised that this is a planning issue rather than environmental. It was noted that there had been little to no changes with respect to the likely impact of this planning inconsistency to the environment and as such did not have much bearing in the OEPA recommendation process. It will be resolved through the planning system. Whilst not providing any certainty</p>	Resolved



				as to the likely outcome of the EPA decision making process, Angela indicated that the process would be progressed quickly, due to the fact that it has previously been assessed under the MRS amendment.	
20.11.15	Foreshore and interface management	WAPC	Telephone liaison	<p>An attempt to contact Tony was made approximately a month previous. He returned the call to discuss the Foreshore Management Strategy and the WAPC's input to this document and the future Foreshore Management Plan. Key points of the conversation were:</p> <ul style="list-style-type: none"> <li>▪ Works proposed for the near future (to be undertaken by WAPC / Lower Helena Association) includes the control of weedy growth (watercress) within the drainage line, planting of sedges along the banks of the Helena River and drainage line and the spreading of mulch within the most recent revegetation area (adjacent to the drainage line).</li> <li>▪ Tony would like to see the final Foreshore Management Strategy and Baseline Weed Survey Report.</li> <li>▪ He would also appreciate advice regarding the development timeframes.</li> </ul> <p>Once finalised, Coterra will send through the FMS and additional information (with Handle's approval).</p>	Resolved
23.10.2015	Local Structure Plan	City of Swan	Meeting	<p>Urbis and Handle Property met with Phil Russell at the City of Swan to discuss timing, processing and technical requirements for Rosehill Structure Plan. Key take outs from the meeting were as follows:</p> <ul style="list-style-type: none"> <li>- The City would not act on the Structure Plan until the WAPC had made a determination on the ability to progress the structure plan regardless of underlying zoning.</li> <li>- The City confirmed their acceptance of the inclusion of the land zoned 'Rural' under the MRS.</li> <li>- City had a preference for the structure plan map to include local access streets.</li> <li>- City identified potential issue with advertising the structure plan over the Xmas/January period. Suggested Handle would want to avoid this and that they would look to seek an extension of time if necessary.</li> <li>- Suggested a road or POS interface with immediately abutting residential was not appropriate and deep/large lots with some internal buffer treatments was appropriate.</li> <li>- 15m and 20m road reserves adequate but subject detailed design</li> </ul>	Most issues generally resolved.

				<p>and assessment.</p> <ul style="list-style-type: none"> <li>- Handle confirmed lodgement of the structure plan would be late November.</li> </ul>	
16.11.2015	Local Structure Plan and Amendment 113.	Department of Planning and City of Swan	Meeting	<p>Handle Property and Urbis met with Robert Hodges (DoP), Mario Carbone (DoP) and Phil Russell (Swan) to discuss Amendment 113 and expectations for the Local Structure Plan. Key take outs from the meeting were as follows:</p> <ul style="list-style-type: none"> <li>- No determination had been made yet on Amendment 113 in terms of "complex" vs "standard."</li> <li>- Handle advised DoP that the Chairman of the WAPC had advised that Amendment 113 should be determined as a "standard amendment."</li> <li>- No determination had been made on the ability to progress the structure plan but it was likely that Amendment 113 and this item would be considered by the Chairman together.</li> <li>- DoP preference for internal roads to be depicted on Structure Plan map given infill nature but acknowledged that there would be flexibility to vary from these.</li> <li>- Agreed that current version of Liveable Neighbourhoods should/could be utilised for design purposes and not the current draft version.</li> <li>- DoP made clear that WAPC/Minister conditions on MRS Amendment 1266/57 needed to be responded to clearly. In responding to the "appropriate separation from abutting residential" DoP suggested options for how this could be addressed should be covered in the structure plan.</li> </ul>	Most queries responded to.
18.11.2015	Future bus route	Department of Transport	Email correspondence	<ul style="list-style-type: none"> <li>- Sought confirmation from the PTA that bus route No.304 could deviate through the Structure Plan area.</li> <li>- Advice received from Simon Cox at the PTA that this route is a workable route which can be considered at the detailed planning stage. The timing and delivery of this new route would be dependent on resources and will require liaison at detailed planning stages.</li> </ul>	Timing and delivery to be determined at detailed planning stages.

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This report is dated June 2022 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 (**Urbis**) opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of a (**Instructing Party**) for the purpose of Structure Plan (**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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