Taylor Burrell Barnett

Lots 35-36 (No. 590-588) Rockingham Road, Munster

STRUCTURE PLAN

Prepared for **Progress Development**
Prepared by **Taylor Burrell Barnett**

December 2018

DOCUMENT HISTORY AND STATUS

Lots 35-36 (# 590-588) Rockingham Road, Munster
Structure Plan

Revision	Reviewer	Date Issued
17/040-0	ST	22 June 2017
17/040-1	ST	29 June 2017
17/040-2	ST	3 August 2017
17/040-3	ST	13 December 2018

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In association with:
Strategen
KCTT
Herring Storer Acoustics

APPROVAL

This Structure Plan is prepared under the provision of the City of Cockburn Town Planning Scheme No.3.

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

20 December 2018 Date

Signed for and on behalf of the Western Australian Planning Commission

.....

an officer of the Commission duly authorised by the Commission pursuant to section 16 of the *Planning and Development Act 2005* for that purpose, in the presence of:

..... Witness

20 December 2018 Date

20 December 2028 Date of Expiry

TABLE OF AMENDMENTS

Amendment No.	Summary of the Amendment	Amendment Type	Date Approved by WAPC

TABLE OF DENSITY PLANS

Each time a density plan is approved, the plan is to be recorded in the table of density plans at the front of the Structure Plan.

EXECUTIVE SUMMARY

This Structure Plan is prepared to guide the subdivision and development of Lots 35-36 (No. 590-588) Rockingham Road, Munster (hereafter referred to as 'subject land').

The subject land is located:

- Within the municipality of the City of Cockburn;
- Approximately 20 km southwest of the Perth Central Business District (CBD); and
- Approximately 300 metres south of Beeliar Drive.

The Structure Plan proposes development of land for:

- Residential purposes comprising a mix of low to medium residential densities; and
- Access streets.

Item	Data	Structure Plan Ref. (Section No.)
Total area covered by the Structure Plan	8860m²	1.2.3
Area of each land use proposed: • Zones • Residential • Reserves • Road reserve • Public open space & drainage	 0.6128 ha 0.0230 ha 0.2502 ha Cash-in-lieu	3.3
Total estimated lot yield	24 lots	3.3.1
Estimated number of dwellings	24 dwellings	3.3.1
Estimated residential site density	0.37 dwellings per site/ha	3.3.1
Estimated population	Approximately 65 people (based on 2.72 persons / dwelling)	3.3.1

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APPENDICES

PART ONE
IMPLEMENTATION

1 STRUCTURE PLAN AREA

This Structure Plan shall apply to Lots 35-36 Rockingham Road, being the land contained within the inner edge of the line denoting the structure plan boundary on the Structure Plan map (**Plan 1**).

2 OPERATION

This Structure Plan commences operation on the date it is approved by the Western Australian Planning Commission (WAPC).

3 STAGING

Development staging is still to be refined, however, it is likely that the subject land will be developed in 1 stage. The staging and development will be influenced by market forces, connection to infrastructure and changes to the road network.

4 SUBDIVISION AND DEVELOPMENT REQUIREMENTS

4.1 LAND USE

The Structure Plan Map (**Plan 1**) identifies the following zones and reserves:

- Residential (R40); and
- Local Road Reserves.

Land use permissibility within the Structure Plan area shall accord with the land use permissibility of the corresponding zone/reserve in the City of Cockburn (City) Town Planning Scheme No. 3 (TPS 3).

4.1.1 PUBLIC OPEN SPACE

The proposed Structure Plan does not include the provision of public open space, but rather proposes a requirement for a cash-in-lieu contribution.

4.2 DEVELOPMENT

Development of land within the subject land is to be generally in accordance with the standards and requirements of TPS 3.

4.3 NOTIFICATION OF TITLE

In respect of applications for the subdivision of land, the Council shall recommend to the WAPC that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate of Titles to advise the following:

i. Land or lots to be affected by an identified noise impact as outlined within the 'Noise Assessment' contained within **Appendix F.**

ii. Construction standards to achieve quiet house design in accordance with State Planning Policy 5.4 *Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP 5.4); and

iii. Land or lots deemed to be impacted by midge nuisances as identified in Local Planning Policy 1.11 Residential Rezoning and Subdivision Adjoining Midge Infested Lakes and Wetlands.

5 RESIDENTIAL DESIGN CODE VARIATIONS

5.1 LOCAL DEVELOPMENT PLANS

Local Development Plans (LDPs) are required to be prepared and implemented for lots comprising of one or more of the following:

- Lots which are affected by SPP 5.4; and
- Lots with a Bushfire Attack Level (BAL) of BAL-12.5 or greater.

A LDP will be a condition of subdivision approval.

6 THE REQUIREMENTS

6.1 BUSHFIRE MANAGEMENT

This Structure Plan is supported by a bushfire management plan (BMP), prepared by Strategen Environmental and is contained at **Appendix A**.

Development will have regard to the BAL assessment contained in this report and be determined in accordance with Schedule 2, Part 10A of the Planning and Development (Local Planning Schemes) Regulations 2015 and Section 6.3 of *State Planning Policy Planning in Bushfire Prone Areas* (SPP 3.7).

6.2 ROAD WIDENING

The SP (Plan 1) depicts Land reserved for Primary Regional Road along the eastern boundary of the subject land to facilitate widening/upgrading of Stock Road. The widening of Stock Road is in accordance with the reservation under the MRS and has been taken into account in the design process. The land required for road widening shall be set aside at the time of subdivision of adjacent land.

6.3 DEVELOPMENT CONTRIBUTIONS

The developer is to make satisfactory arrangements with the City to provide proportional contributions towards those items of development infrastructure defined by the City TPS 3 for Development Contribution Area No. 6 (DCA 6) and Development Contribution Area No. 13 (DCA 13).

The provision of DCA 6 is a proportional contribution towards widening and upgrading of Beeliar Drive (Mayor Road), between Stock and Cockburn Roads. The provision of DCA 13 requires a per lot/dwelling contribution towards the provision of Community Infrastructure in the Munster catchment.

7 ADDITIONAL INFORMATION

Prior to any subdivision or development of the land being supported, the following management plans, reports and strategies are to be prepared, as applicable, to the satisfaction of the relevant authority and provided at the relevant submission stage nominated in **Table 1**.

TABLE 1: MANAGEMENT PLANS, REPORTS AND STRATEGIES

Additional information	Approval stage	Approving Authority
Water Management		
Urban Water Management Plan (UWMP)	Condition of subdivision	WAPC, City, DoW
Environment		
Bushfire Management Plan	Condition of structure planning stage	WAPC, City
Acoustic Assessment	Condition of structure planning stage	City
Engineering		
Servicing Report	Documented in Structure Plan Condition of Subdivision	City, Water Corp, Western Power, ATCO Gas
Acid Sulphate Soils	Condition of Subdivision	DWER
Geotechnical	Condition of Subdivision	City
Other		
Local Development Plan(s)	Condition of subdivision if deemed necessary by City	City
Midge	Condition of Subdivision - Notification on title	City

City City of Cockburn

WAPC Western Australian Planning Commission

DWER Department of Water and Environmental Regulation

LEGEND

REGION SCHEME RESERVE

Primary Regional Road

LOCAL SCHEME

LOCAL SCHEME ZONE

Residential (R40)

LOCAL SCHEME RESERVE

Local Road

OTHER CATEGORY

Structure Plan Boundary

0m 10 20 30 40 50m

PLAN 1 - Structure Plan Map

PART TWO EXPLANATORY INFORMATION

1 PLANNING BACKGROUND

1.1 INTRODUCTION AND PURPOSE

This documentation has been prepared by Taylor Burrell Barnett and the project team, on behalf of Progress Developments, to facilitate the assessment and approval of a Structure Plan for Lots 35-36 Rockingham Road, Munster (the 'subject land').

The Structure Plan outlines the vision for the ultimate development of the subject land and establishes key requirements. The Structure Plan also includes information assessing the proposed development in context with the surrounding physical and natural environment. The Structure Plan has been prepared to address the requirements of the City of Cockburn (City) Town Planning Scheme No.3 (TPS 3) and the *Planning and Development (Local Planning Schemes) Regulations 2015* (the Regulations).

The project team responsible for preparing the information contained within this report is detailed in **Table 1.**

TABLE 1: PROJECT TEAM AND RESPONSIBILITIES

Project Role	Consultant
Town Planning and Urban Design	Taylor Burrell Barnett
Civil Engineering	KCTT
Traffic and Transport	KCTT
Environmental Assessment	Strategen
Bushfire Management	Strategen
Acoustic Assessment	Herring Storer Acoustics

1.2 LAND DESCRIPTION

1.2.1 LOCATION

The subject land is within the municipal boundaries of the City, approximately 20 km southwest of the Perth CBD.

The subject land is situated within the suburb of Munster and is bounded by Stock Road to the east, Rockingham Road to the west, Lot 586 to the northern boundary and Lot 592 to the southern boundary (refer to **Figure 1**).

The subject land is well connected to the regional movement network, being located on Rockingham Road, approximately 0.45km to Stock Road (Primary Regional Road) and Beeliar Drive (Other Regional Road) intersection and approximately 2.0 km to the Cockburn Road (Primary Regional Road) and Mayor Road (Other Regional Road) intersection.

The subject land benefits from its proximity to two district centres; Phoenix District Centre (approximately 4 km) and Cockburn Central District Centre (approximately 7 km) and is in close proximity Merevale Gardens Neighbourhood Centre (approximately 1.5 km). The subject land is also in close proximity to Churchill Avenue Local Centre (approximately 0.4 km) and Fairbarin Road Deli Local Centre (approximately 2 km).

1.2.2 LAND USE

Both existing lots are primarily cleared of native vegetation and already used for residential purposes with one existing dwelling located in the western portion of each lot.

Surrounding land is largely cleared for residential purposes, with low density residential development to the north of the subject land and predominately established low to medium density residential development to the south and west of the subject land.

FIGURE 1 - Location plan

1.2.3 LEGAL DESCRIPTION AND OWNERSHIP

The subject land is approximately 8860m² in area comprising Lots 35-36 Rockingham Road (refer **Figure 2** and **Table 2**), and may be described as follows:

TABLE 2 - LAND TENURE

Lot	Landowners	Plan Number	Volume/Folio	Area (m²)
35	Papasergio, Shelley Mihaljevich, Frances Bilcich, Josie	P3562	1172/969	4360
36	Bilich, Danica Mihaljevich, Frances Bilcich, Josie Papasergio, Shelley Bilcich, Paul Steven Bilcich, Steven Vincent	P3562	1197/514	4500
Total				**8860m²**

FIGURE 2 - Site Plan

1.3 PLANNING FRAMEWORK

1.3.1 ZONING AND RESERVATIONS

METROPOLITAN REGION SCHEME

The subject land is predominately zoned urban under the Metropolitan Region Scheme (MRS). Land reserved as a Primary Regional Road is located along the eastern boundary of the subject land to facilitate widening/upgrading of Stock Road. The widening of Stock Road is in accordance with the reservation under the MRS and has been considered in the design process.

The majority of the surrounding area is zoned urban.

CITY OF COCKBURN TOWN PLANNING SCHEME NO. 3

The subject land is predominately zoned development under the City TPS 3. Consistent with the reservation under the MRS, the subject land is also affected by the Primary Regional Road reservation under the City's TPS 3.

The subject is within Development Area 5 (DA 5) as prescribed in Table 9 – Development Areas within TPS 3. Table 9 of TPS 3 outlines the provisions applicable to DA 5, outlining that an approved Structure Plan together with all approved amendments shall be given due regard in the assessment of applications for subdivision and development in accordance with clause 27(1) of the deemed provisions within the Regulations.

The references to DCA 6 and DCA 13 within TPS 3 require developer contributions.

DIRECTIONS 2031 AND BEYOND

Directions 2031 and Beyond is Western Australia's high level spatial framework and strategic plan. The document provides a vision for future growth of the metropolitan Perth and Peel region, with the aim of achieving a pattern of growth which promotes a better balance between greenfield and infill development.

The subject land is located within the southwest sub-region as identified by Directions 2031, where it is noted that an additional 208,000 dwellings are required in order to accommodate a projected population of 278,000 in the region by 2031. This growth is to be achieved through a combination of infill and greenfield development and presumes that all urban zoned land within the southwest sub-region is made available to accommodate this objective.

PERTH AND PEEL @ 3.5MILLION AND SUB-REGIONAL PLANNING FRAMEWORK

Perth and Peel@3.5Million is a suite of documents released by the WAPC in 2018 for the Perth and Peel metropolitan regions to identify:

- where future homes and jobs should be located;
- how to protect important environmental assets;
- how to best utilise existing and proposed infrastructure; and
- appropriate areas for greater infill development and residential density.

As part of this documentation, sub-regional planning frameworks have been prepared to guide future development. The subject land is included within the South Metropolitan Pell Sub-regional Planning Framework (Sub-regional Planning Framework). The Sub-regional Planning Framework identifies the subject land within a pocket of urban.

The minimum urban infill dwelling targets identified for the City of Cockburn are 2,794 dwellings in 2016-21 and 1,689 dwellings from 2021-26. This local structure plan will assist in achieving the infill dwelling targets for the City.

1.3.2 PLANNING POLICIES

STATE PLANNING POLICIES (SPP)

PLANNING IN BUSHFIRE PRONE AREAS (SPP 3.7)

SPP 3.7 provides precautionary guidance to reduce the bushfire risk to people, property, and infrastructure by encouraging a conservative approach to strategic planning, subdivision, development, and other planning decisions proposed in bushfire prone areas.

SPP 3.7 applies to all land which has been designated as bushfire prone by the Fire and Emergency Services (FES) Commissioner as identified on the Map of Bush Fire Prone Areas. The subject land is identified as bushfire prone on the Map of Bush Fire Prone Areas.

Accordingly, a Bushfire Management Plan (BMP) has been prepared for the subject land. A copy of the BMP is included at **Appendix A**.

ROAD AND RAIL TRANSPORT NOISE AND FREIGHT CONSIDERATIONS IN LAND USE PLANNING (SPP 5.4)

SPP 5.4 seeks to minimise the adverse impact of transport noise, without placing unreasonable restrictions on noise sensitive residential development.

Due to the nature and volume of traffic along Stock Road, a Noise Assessment has been undertaken in accordance with the requirements of SPP 5.4 and to inform the SP design. A copy of the Noise Assessment is contained in **Appendix F.**

LOCAL PLANNING POLICIES

LOCAL PLANNING POLICY 1.11 RESIDENTIAL REZONING AND SUBDIVISION ADJOINING MIDGE INFESTED LAKES AND WETLANDS

The subject land is within the 500 metre and 800 metre buffers of Market Garden Swamp 2 and 3 and therefore subject to the requirements of the LPP 1.11.

In accordance with this policy, as a condition of subdivision, a notification pursuant to Section 70A of the *Transfer of Land Act 1893* is to be placed on the certificates of title of the proposed lots advising of the existence of a hazard or other factors.

LOCAL PLANNING POLICY 1.16 SINGLE HOUSE STANDARDS FOR MEDIUM DENSITY HOUSING IN THE DEVELOPMENT ZONE

LPP 1.16 outlines the acceptable variations to the deemed-to-comply provisions of the Residential Design Codes (R-Codes) for medium density single dwellings in areas zoned Development under the City TPS 3.

The purpose of LPP 1.16 is to replace the deemed-to-comply requirements of the following clauses of the R-Codes with those set out in the provisions of the policy:

- Building and Garage setbacks – Clauses 5.12, 5.13 and 5.21;

- Open Space – Clause 5.1.4;
- Parking – Clause 5.3.3;
- Visual Privacy – Clause 5.4.1; and
- Solar Access – Clause 5.4.2.

It is intended that medium-density single house development standards apply to all land designated R40 on Plan 1, substituting the deemed-to-comply provisions of the R-Codes. All other R-Codes standards apply.

2 SITE CONDITIONS AND CONSTRAINTS

An environmental assessment report has been prepared by Strategen Environmental to support the Structure Plan. This report is included at **Appendix B**.

2.1 BIODIVERSITY AND NATURAL AREA ASSETS

The subject land currently comprises remnant vegetation, cleared areas and two existing residential buildings, reflecting the subject land's previous rural use.

2.1.1 WETLAND, BUFFERS AND RECLASSIFICATION

The nearest Conservation Category Wetland (CCW) is Lake Coogee (UFI 12394) located approximately 800 m southwest from the subject land.

2.2 LANDFORM AND SOILS

2.2.1 LANDSCAPE AND TOPOGRAPHY

The subject land is located on the swan coastal plain, which is characterised by a low-lying coastal plain, mainly covered with woodlands. The subject land has a slope of approximately 2%, rising from a low point of 10m AHD at Rockingham Road to 19m AHD at Stock Road.

2.2.2 CONTAMINATED SITES

A review of aerial imagery from 1953 to 2017 has identified no potential contaminating activities expected to have impacted the subject land. The subject land has been vacant (with the exception of two residential buildings since 1963-2017, where previously aerial imagery demonstrated potential market gardening activities in the north western portion of the subject land.

Furthermore, based on review of the DWER Contaminated Sites Register, the subject land is not classified as a contaminated site under the *Contaminated Sites Act 2003* (CS Act).

2.3 SURFACE WATER

2.3.1 SURFACE WATER

No surface water expressions are present within the site.

The soils are mapped as sand derived from limestone which generally has a high infiltration rate and consequently runoff from the site in a pre-development state would be limited. The topography indicates any stormwater would drain towards Binjar Lake to the west of the site, identified as UFI 6369 on Figure 4 of the EAR (refer **Appendix B**). The City Intramaps identifies existing drainage in Yindi Way that drains towards Bindjar Lake. Post-development flows are also anticipated to drain towards Bindjar Lake.

The minor events including the 1 in 1 year Average Return Interval event is anticipated to be managed through soakage on site. Larger events will be managed through the local drainage network. The drainage design will be developed at the subdivision stage in consultation with the City.

2.3.2 BUSHFIRE HAZARD

The BMP is a strategic level plan which identifies the bushfire protection measures to be applied to development on the subject land to accommodate compliance with:

- SPP 3.7;
- Guidelines for Planning in Bushfire Prone Areas; and
- Australian Standard 3959 – Construction of buildings in bushfire prone areas (AS 3959).

BUSHFIRE ATTACK LEVEL ASSESSMENT

As part of the BMP, a BAL Contour Map has been prepared which identifies the worst-case BAL in relation to the subject land.

Proposed lots abutting the northern and southern boundaries of the project area are subject to a worst-case BAL of BAL-FZ due to the potential for unmanaged grassland to occur on adjacent lots at these interfaces. The rationale behind this is that the firebreak notice does not require management of grassland for properties larger than 2,023 m². Strategen does not consider that these BAL impacts are prohibitive of development as an internal APZ setback of 5 m could be accommodated within all but three of the proposed lots to ensure that future development on these lots is subject to BAL-29 or lower. The three remaining lots share a side boundary with adjacent grassland, rather than a rear boundary, meaning that the lot orientation will not enable the internal 5 m wide APZ setback to be accommodated. As such, a staged approach to development of the site will need to be taken so that development on the three affected lots is restricted until the adjacent hazards to the north and south have been removed and/or managed. This is considered to be an appropriate strategy to ensure that no future development occurs on land subject to BAL-40/FZ.

Main Roads WA (MRWA) has advised that it conducts regular inspections and maintenance of the road reserve. Weed spraying and grass slashing are carried out as part of their Annual Works Program. Additional vegetation control activities including mowing, pruning and removal of dead branches, shrubs and trees are prioritised across the metropolitan region in accordance with risk assessment of fuels, fire spread paths and adjacent land uses. MRWA has also advised that the proposed 5.7 m vegetation clearing and crushed limestone base (or similar) as indicated in the BMP may be supported on the basis that the vegetation is degraded with limited public amenity, biodiversity and habitat values.

The bushfire construction provisions of the National Construction Code will be applied to proposed buildings in accordance with the assessed BAL under AS 3959, provided the building is a Class 1, 2 or 3 building or a Class 10a structure associated with a Class 1, 2 or 3 building as defined within the Building Code of Australia.

The BAL contour assessment is considered suitable for the purposes of informing future planning/building stages, however, acceptance of the BAL contour map at future planning/building stages is at the discretion of the City and reassessment of the BAL may be required at future planning/building stages.

2.4 EXISTING MOVEMENT NETWORK

A Transport Impact Statement has been prepared by KCTT to support the Structure Plan. This report is included at **Appendix C.**

2.4.1 REGIONAL ROADS

The subject land is connected to the Primary Regional Road network (Stock Road) via Rockingham Road which connects into Mayor Road/ Beeliar Drive.

2.4.2 DISTRICT AND LOCAL ROADS

ROCKINGHAM ROAD

To the west, the subject land fronts Rockingham Road. Rockingham Road is a significant single carriageway local distributor with a road reserve and pavement width of approximately 20 metres and 10 metres respectively.

Based on the traffic count information sourced, Rockingham Road carried the following number of vehicles per day (vpd) in October 2016:

- Rockingham Road (North of Beeliar Drive) with approximately 9 654 vpd including 8.1% for heavy vehicles;
- Rockingham Road (South of Beeliar Drive) with approximately 7 076 vpd including 5.9% for heavy vehicles; and
- Rockingham Road (100m North of Stock Road) with approximately 4 174 vpd including 7.0% for heavy vehicles.

2.4.3 PEDESTRIAN NETWORK AND CYCLING

There are presently no formal pedestrian paths within the subject land which is consistent with the existing land use.

Shared paths within a 400m radius of the subject land are located along Rockingham Road (North of Beeliar Drive), Beeliar Drive (East of Rockingham Road), Mayor Road (West of Rockingham Road) and Riverina Parade. High quality shared paths are located along Beeliar Drive (East of Stock Road) and unclassified paths are located along Bamboore Street, Datatine Way, Pekin Pass and Greenie Chase.

Cyclist's access to the subject land is available via the bicycle lanes/sealed shoulders along Beeliar Drive (East of Stock Road) and Stock Road.

2.4.4 PUBLIC TRANSPORT

The subject land is served by four bus service located within 400 m (are outlined below:

Bus Route	Description	Peak Frequency	Off-Peak Frequency
530	Cockburn Central Station - Fremantle Station via Yangebup Road	10 minutes	60 minutes
531	Cockburn Central Station – Fremantle Station via Marvell Avenue & The Grange	10 minutes	60 minutes
532	Cockburn Central Station – Fremantle Station via Beeliar Drive	10 minutes	60 minutes
549	Fremantle Station – Rockingham Station via Rockingham Road & Kwinana Town Centre	10 minutes	60 minutes

2.4.5 NOISE

A Noise Assessment has been prepared by Herring Storer Acoustics to support the Structure Plan and is contained in **Appendix F**.

The purpose of this assessment is to assess noise received within the development from vehicles travelling along Stock Road. If noise levels exceed determined criteria, required attenuation measures to control noise intrusion to acceptable levels have been identified.

Noise received at the residences in close proximity to Stock Road would, as shown by the noise contour plot (refer Figure 1C in Appendix C of the Noise Assessment), exceeds SPP 5.4 Noise Limits. For these residences to achieve compliance with SPP 5.4 the construction of a 1.8m high solid noise wall along the eastern boundary between the residential development and Stock Road is required. The barrier will have a surface density of 15kg/m^2. In addition to this, Lots 10 to 15 would require architectural treatment packages (Quiet Noise Design) and notifications on certificates of title.

2.5 CONCEPT PLAN

The Structure Plan for Lot 38 Rockingham Road, Munster, is shown in **Figure 3**. This Structure Plan has demonstrated a coordinated approach proposing a comprehensive design consistent with the broader layout. This includes, providing an appropriate interface with adjoining lots and proposed lot depths of 20 metres for lots located adjacent to Stock Road, consistent with the overall Structure Plan proposed for Lot 38 Rockingham Road.

This Structure Plan also proposes a movement network consistent with the broader area, considering integration with the neighbouring areas and allowing for future connections to be provided to the north and south of the subject land.

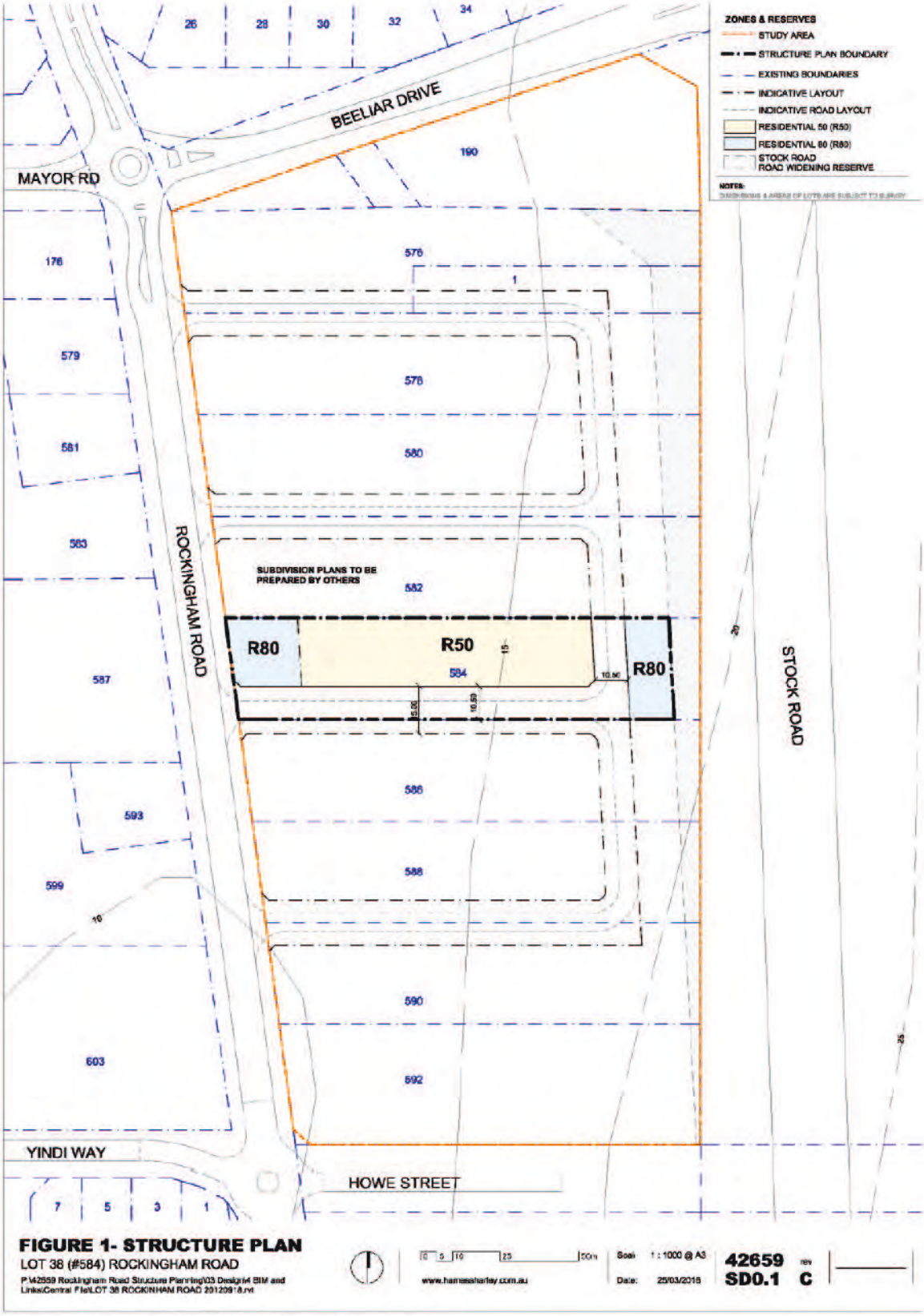

Figure 3 – Indicative Plan (Lot 38 Rockingham Road)

3 STRUCTURE PLAN

3.1 DESIGN PRINCIPLES

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

- Provide for lot diversity that will enable the construction of a diverse range of housing types to accommodate different housing demands;
- Provide for development to extend into adjacent land holdings in the future in the form of future road connectivity;
- Provision of attractive, safe and convenient local roads; and
- Provide for the future widening of Stock Road in accordance with the Region Scheme.

3.2 DEVELOPMENT CONCEPT PLAN

In addition to the Structure Plan Map included within Part 1 – Implementation (**Plan 1**), a Development Concept Plan (**Figure 4**) has been prepared to provide an illustration of the development intent. This graphical representation is indicative only, however, it indicates how the streetscapes and residential development will occur.

The Development Concept Plan has been prepared based on the following key design considerations:

- **Road Structure** – The existing road reserves for Rockingham Road and Stock Road have defined the structure of the Concept Plan. A local access street connection from Rockingham Road is proposed. A temporary turn around will facilitate movement within the Structure Plan area until future connections are established to facilitate development on adjacent properties.
- **Residential Development** – The Structure Plan provides for a variety of housing choices through the designation of R40. A diverse range of lot sizes and housing types is achievable based on the proposed street block structure through the use of different lot depths on street block ends and frontages.
- **Integration** - The Development Concept Plan demonstrates how the development integrates with the adjacent proposed development north and south of the subject land (Lot 34 and 37 Rockingham Road).

FIGURE 4 - Development Concept Plan

3.3 LAND USE

The primary land use within the Structure Plan area is Residential. A summary of the land uses and areas is provided in **Table 3:**

TABLE 3 – LAND USE

Zone / Reserve	Area (m²)
Residential	6,128
Roads	2,502
Primary Regional Road	230
Total	8,860m²

3.3.1 RESIDENTIAL

It is intended that medium density single house development standards apply to all land designated R40 on **Plan 1**.

The density codes and indicative yield are detailed in **Table 4**.

TABLE 4 – ESTIMATED DWELLING YIELD

Density Coding	Yield
R40	24
TOTAL	**24**

POPULATION TARGET

The Development Concept Plan suggests a potential yield of at least 24 lots. This could accommodate a total population of up to 65 people based on 2.72 per household (Id Community 2016).

3.4 OPEN SPACE

3.4.1 PUBLIC OPEN SPACE

In accordance with Draft Liveable Neighbourhoods (2015) the provision of POS is considered impractical in terms of use and management as the subject land is less than 1 hectare. Therefore, given the relatively small size of the subject (0.886 ha), the 10 per cent contribution of POS would be too small to be of practical use, and a cash-in-lieu contribution is a better outcome for the subject land and the surrounding locality. This approach has been discussed and agreed with the City of Cockburn.

A requirement for a cash-in-lieu contribution towards the provision of POS is to be implemented as a condition of future subdivision and will allow for funds to be allocated towards the maintenance of existing or future areas of POS.

A POS calculation has been prepared in accordance with Liveable Neighbourhoods, as detailed in **Table 5**. A total of 863m² of POS is required for the Structure Plan area.

TABLE 5 - PUBLIC OPEN SPACE SCHEDULE

PUBLIC OPEN SPACE	
Gross Site Area	**8860m²**
DEDUCTIONS	
MRS Road Widening	**230m²**
Total Deductions	**230m²**
Gross Subdivisible Area	**8630m²**
Creditable Public Open Space Required @ 10%	**863m²**
PUBLIC OPEN SPACE PROVISION	**0**

3.5 MOVEMENT NETWORK

KCTT has undertaken an analysis of the existing movement networks in the vicinity of the subject land and assessed the impact of the proposed development on these existing networks. The Transport Impact Assessment is included at **Appendix C**.

3.5.1 ROAD NETWORK AND TRAFFIC VOLUMES

LOCAL ACCESS STREETS

Two local access roads Road 01 and Road 02 (extension of Howe Street West) are proposed within the subject land and are classified as local access streets on the basis that they are expected to carry volumes below 1,000 vpd. The typical road reserve for an Access Street D includes a road reserve width ranging from 15 m, with a 3m road pavement width per traffic lane.

Based on the indicative dwelling yield of 24, it is expected that the proposed development will generate up to 216 vpd (198 vpd additional traffic on the surrounding network).

3.5.2 PEDESTRIAN AND CYCLING NETWORK

A path network is proposed, inclusive of a 2.3 metre path on one side of the road. The proposed network will focus on providing linkages to the broader pedestrian network.

The exact location of the provision of footpaths will be determined at the detailed design stage, to the satisfaction of the City.

3.5.3 DELIVERY AND SERVICE VEHICLES

It is expected that delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking spaces given that they can operate safely within the road reserve. All intersections and temporary turnarounds at ends of development stages will be designed in accordance with the turning circle requirements of delivery and service vehicles. Temporary bin pads for Lots 11-16 will be placed at various locations around the proposed temporary turnaround (refer **Figure 4**).

Temporary bin pads and turnaround proposed will be removed as future access connections are constructed on adjacent properties.

3.6 WATER MANAGEMENT

STORMWATER DRAINAGE STRATEGY

The Department of Water and Environmental Regulation have advised that a Local Water Management Strategy (LWMS) is not required to support this Structure Plan (refer to **Appendix G**).

A Stormwater Drainage Strategy (SDS) has been prepared by KCTT in support of the Structure Plan to suit the existing site characteristics to effectively manage the runoff generated in 1, 5, 20 and 100 year ARI events. The SDS has been developed in compliance with the Australian Standards and regulatory requirements inclusive of City stormwater management requirements.

Storm events up to a 20% AEP, 5-minute event will be managed by soakage pits, with run off exceeding this directed to the Rockingham Road reservation where it will be managed as per the city's stormwater management system, as approved by the City. Runoff generated from road reserve areas in the 20% (1:4.48 ARI) event is to be captured and infiltrated in soakage pits with combined side entry pit lids.

As the existing drainage system in Rockingham Road does not have sufficient capacity, the lots will be required to store and infiltrate runoff for events up to and including the 5% AEP (1:20 ARI) onsite.

The SDS is included at **Appendix D**.

3.7 EDUCATION FACILITIES

South Coogee Primary School is the closest primary school, just outside 800 metres of the subject land will serve the subject land in the short term. However, Lots 35 and 36 Rockingham Road form part of the City TPS 3 DA 5, for which a Structure Plan has not been prepared.

Additional existing education facilities located within close proximity to the subject land include the following:

- St Jerome's Primary School (1km);
- Coogee Primary School (1.5km); and
- South Metropolitan TAFE-ACEPT Campus (1.5km).

3.8 INFRASTRUCTURE COORDINATION, SERVICING AND STAGING

The project's civil engineering consultant, KCTT, has prepared an Infrastructure Servicing Report. This report is included as **Appendix E**, and a summary of the utility infrastructure advice is outlined as follows:

3.8.1 WATER SUPPLY

Water main infrastructure will be provided adjacent to the subject land on the opposite side of Rockingham Road. Existing water reticulation services are available for connection, sourced from Dial Before You Dig (DBYD) and the Water Corporation Electronic Submissions Interface (ESInet) and TPS 3.

Water Corporation infrastructure has sufficient capacity to service the development.

3.8.2 WASTEWATER

Water Corporation planning shows the subject within a wastewater catchment that is to connect to a proposed 450mm diameter gravity sewer main along Forrest Road in Hamilton Hill. Through the review of Water Corporation sewer planning, the sewer reticulation has sufficient capacity for the proposed development.

3.8.3 POWER SUPPLY

The information gathered from Western Power shows sufficient power supply for the development. This is illustrated via high voltage (HV) and low voltage (LV) overhead power lines directly adjacent to the landholding on the western side of the subject land. Additionally, low voltage (LV) underground power is aligned adjacent to the western boundary of the development.

3.8.4 TELECOMMUNICATIONS

Existing underground telecommunication services are available and suitable for connection immediately adjacent to the subject land, located on both sides of the road reserve and are considered suitable for the proposed development.

3.8.5 GAS SUPPLY

A gas service exists adjacent to the subject land on the opposite side of Rockingham Road. Gas services are to be designed in conjunction with ATCO Gas with sufficient capacity for the Structure Plan.

3.8.6 RETAINING WALLS

The topography of the subject land has an average 7% grade from west to east, requiring an increase in the general retaining requirements. The required retaining is expected to be 2-3 course exposed limestone retaining between lots for side boundaries and 1-2 course exposed limestone for rear boundaries.

3.9 TECHNICAL STUDIES APPENDICES INDEX

Appendix	Document Title	Assessment Agency	Approval Status
A	Bushfire Management Plan	Strategen	
B	Environmental Assessment Report	Strategen	
C	Transport Impact Statement	KCTT	
D	Stormwater Drainage Strategy	KCTT	
E	Infrastructure Servicing Report	KCTT	
F	Noise Assessment	Herring Storer Acoustic	

APPENDIX A
BUSHFIRE MANAGEMENT PLAN

intelligent outcomes | respected experience

Bushfire Management Plan

Lots 35 and 36 Rockingham Road, Munster

Prepared for
Progress Developments
by Strategen

September 2018

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

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Bushfire Management Plan

Lots 35 and 36 Rockingham Road, Munster

Strategen is a trading name of
Strategen Environmental Consultants Pty Ltd
Level 1, 50 Subiaco Square Road Subiaco WA 6008
ACN: 056 190 419

September 2018

Limitations

Scope of services

This report ("the report") has been prepared by Strategen Environmental Consultants Pty Ltd (Strategen) in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, Strategen has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen has also not attempted to determine whether any material matter has been omitted from the data. Strategen will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen. The making of any assumption does not imply that Strategen has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

Client: Progress Developments

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Draft Report	Rev A	For review by client	L Wears / Z Cockerill (BPAD37803)	Electronic (email)	13/06/2017
Final Report	Rev 0	Issued for approval	L Wears / Z Cockerill (BPAD37803)	Electronic (email)	26/06/2017
Final Report	Rev 1	Issued for approval	L Wears / Z Cockerill (BPAD37803)	Electronic (email)	28/07/2017
Final Report	**Rev 2**	**Issued for approval**	**L Robertson, Z Cockerill (BPAD37803) / L Wears (BPAD11809)**	**Electronic (email)**	**17/09/2018**

Filename: PDE17243_01 R001 Rev 2 - 17 September 2018

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1. Introduction

1.1 Background

Progress Developments (the developer) intends to lodge a Structure Plan to facilitate development of Lots 35 and 36 Rockingham Road, Munster in the City of Cockburn (hereon referred to as the project area). The proposed Structure Plan seeks to create approximately 24 residential lots, as depicted in Figure 1.

A proportion of the project area is designated as bushfire prone on the WA *Map of Bush Fire Prone Areas* (DFES 2018). As a result, Strategen has prepared this Bushfire Management Plan (BMP) to address the following information requirements triggered by strategic planning proposal (Structure Plan) under *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7; WAPC 2015), namely Policy Measure 6.3:

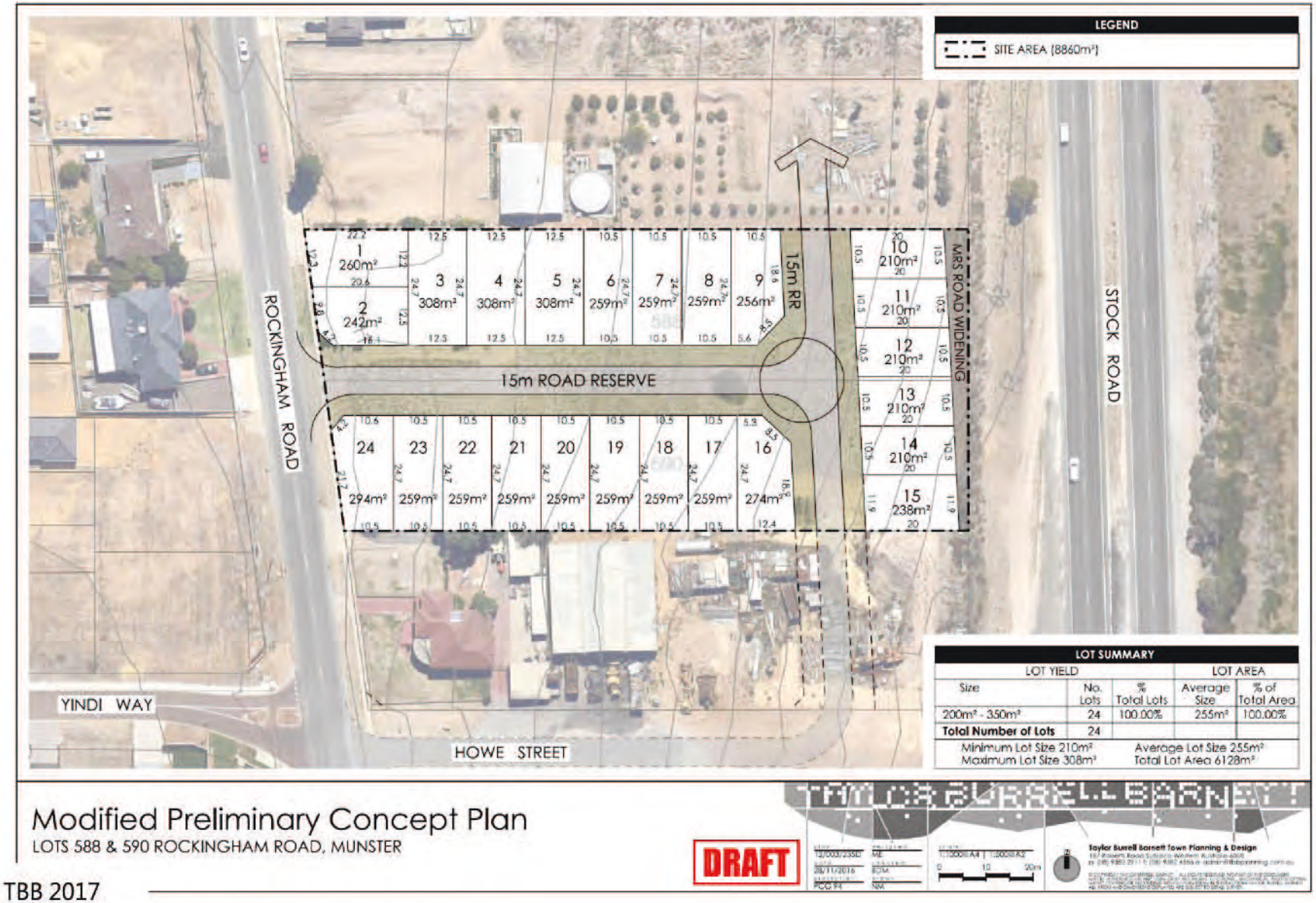
- a Bushfire Attack Level (BAL) contour map, given the indicative lot layout is known, to determine the indicative acceptable BAL ratings across the subject site in accordance with *Guidelines for Planning in Bushfire Prone Areas* (the Guidelines; WAPC 2017) – refer to Section 2.2 and Figure 4
- identification of any bushfire hazard issues arising from the BAL contour map – refer to Section 2.4
- clear demonstration that compliance with the bushfire protection criteria in the Guidelines can be achieved in subsequent planning stages – refer to Section 4 and Table 4.

This BMP has been prepared in accordance with the Guidelines and addresses all the above information requirements to satisfy SPP 3.7.

Lot 38 Rockingham Road, to the north of the project area, is currently subject to Structure Plan assessment by WAPC for proposed residential development. Strategen understands that WAPC has been reviewing the proposed Structure Plan for Lot 38 and that the indicative road network for the local area shown on that Structure Plan forms the basis for this Structure Plan.

1.2 Purpose of the BMP

The purpose of this BMP is to provide guidance on how to plan for and manage the bushfire risk to future life and property assets of the project area through incorporation of a range of bushfire management measures into future planning, development design and construction. The BMP outlines how future on-site assets can be protected during the summer months when the threat from bushfire is at its peak. This is particularly relevant when existing fire appliances in the area may be unable to offer an immediate emergency suppression response; therefore, development planning and design should aim to provide mitigation strategies that protect future life and property from bushfire as a priority.



Modified Preliminary Concept Plan

LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

Source: TBB 2017

Figure 1: Proposed Structure Plan

2. Spatial consideration of bushfire threat

2.1 Existing site characteristics

2.1.1 Location

The project area comprises Lots 35 and 36 Rockingham Road, Munster in the City of Cockburn. The project area occupies approximately 0.886 ha and is bound by the following, as depicted in Figure 2:

- Rockingham Road, residential dwellings and cleared lots to the west
- Stock Road to the east
- Lot 37 Rockingham Road to the north
- Lot 34 Rockingham Road to the south.

2.1.2 Assets

Both existing lots within the project area have an existing residential dwelling located at the entrance to the lots, which represent the only existing life or property assets on the lots. Other than the dwellings, the remainder of the lots consist of undeveloped, vacant land. The surrounding land consists of urban residential dwellings or cleared land proposed for urban residential development, especially to the west of Rockingham Road. Lots 37 and 34 (directly adjacent to the north and south of the project area respectively) are currently rural residential lots with an existing single dwelling and are predominantly cleared.

Most of the land within 100 m of the project area has been cleared of native vegetation, with the only remnant vegetation occurring on the eastern side of Stock Road. Vegetation in the nearby rural residential lots is generally grassland with some plots of regrowth vegetation and an orchard within Lot 38 to the north. The project area contains some unmanaged grassland, and as such, lacks any significant environmental values.

2.1.3 Access

The project area is currently accessed via Rockingham Road to the west, with future connections to be available once adjacent subdivisions are developed to the north and south.

2.1.4 Water and power supply

Reticulated mains water and underground power supplies are available to the project area through extension of existing services from adjacent land.

Figure 2: Site Plan

Scale 1:5,000 at A4

Meters
0 15 30 45 60 75

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 13/06/2017
Author: DWhite
Source: Aerial: Nearmaps 04/2017; Site boundary: Client 05/2017 12_003_235D_SUBC_MUNSTER_(161128)_Default; ASS DER 2017.
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Legend

- Project area
- 100m assessment area
- Existing cadastre

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2.2 BAL contour assessment

2.2.1 Assessment inputs

Vegetation classification

Post-development vegetation class has been assessed in accordance with *AS 3959–2009 Construction of Buildings in Bushfire-Prone Areas* (AS 3959; SA 2009). This involved on-ground verification of vegetation class within the adjacent 100 m assessment area as per conditions at time of assessment on 31 May 2017. The post-development vegetation class extent is depicted in Figure 3 along with the location and direction of site photographs to provide validation of the various vegetation classes and exclusions identified. Site photographs are contained in Appendix 1.

Existing vegetation within the project area currently consists of Class G grassland primarily located outside the existing dwellings on Lots 35 and 36 and within the perimeter firebreak. This vegetation will be cleared and earthworked as part of subdivisional staging works to enable proposed residential development to progress throughout the site. The project area will therefore meet the exclusion criteria of AS 3959 Clauses 2.2.3.2 (e) and (f) post-development.

Post-development vegetation extents within the adjacent 100 m surrounding the project area are expected to comprise:

- Class B woodland within a small plot east of Stock Road (northeast of the project area)
- Class D scrub within several plots north and south of the project area, in addition to the large plot directly east of Stock Road (note the plot to the north within Lot 38 will be cleared in the near future to accommodate proposed development on this lot)
- Class G grassland within:
    - rural residential lots directly north and south of the project area (it should be noted that grassland within these lots was observed to be predominantly managed at the time of inspection and they have been classified as Glass G grassland as a precautionary measure)
    - grassland portions of other rural residential lots greater than 2,023 m^2 in area to the north and south of the project area
    - the Stock Road reserve, which, although managed at the time of inspection has been classified as Class G grassland as a precautionary measure, based on potential for grassland to grow to a height of >100 mm in the absence of active management (it should be noted however, that Main Roads WA [MRWA] has provided advice that they will conduct annual maintenance of vegetation within the road reserve (refer to Appendix 2), so it is unlikely that this vegetation will present a bushfire risk to the project area).

Non-vegetated areas excluded from classification under Clause 2.2.3.2 (e) of AS 3959, include:

- land where vegetation has been cleared to enable construction of roads, buildings and sealed areas.
- three metre wide firebreaks constructed around the internal perimeter of rural residential lots greater than 2,023 m^2 in area in accordance with the City of Cockburn Firebreak Notice (refer to Appendix 3). This includes 3 metre wide firebreaks that are being maintained around the internal perimeters of Lot 37 (directly north of the project area) and Lot 34 (directly south of the project area).
- a 5.7 m wide non-vegetated buffer (constructed of limestone base or similar) which will be installed directly adjacent to the eastern boundary of the project area and the proposed 2.8 m high noise attenuation wall. The buffer will be located partially on MRWA land and partially within land to be ceded to MRWA for widening of Stock Road. MRWA has provided written advice that they agree to maintenance of the buffer once established by the developers (refer to Appendix 2).

Areas where the land is managed in a low threat, minimal fuel condition excluded from classification under Clause 2.2.3.2 (f) of AS 3959, include:

- managed portions of Lots 37 and 34, directly north and south of the project area, including areas of managed gardens and lawns.
- managed portions of other rural residential lots greater than 2,023 m^2 in area
- developed residential lots west of Rockingham Road, based on the presence of cultivated gardens and reticulated lawns.
- vacant residential lots west of Rockingham Road, based on regular slashing of grass/weed regrowth observed at time of inspection (management of grassland is enforceable under the City of Cockburn Firebreak Notice [refer to Appendix 3] which requires vacant land <2,023 m^2 in area to be maintained at <50 mm height).
- Rockingham Road reserve, on the basis of regular slashing of grass/weed regrowth observed at time of inspection.

Effective slope

Effective slope under classified vegetation has been assessed in accordance with methodology contained within AS 3959, which involved on-ground verification as per conditions at time of assessment on 31 May 2017.

The project area is predominately sloping from approximately 19 m–21 m AHD in the east to 10 m AHD in the west. The effective slope beneath the vegetation varies between flat land (0°) and down-slope (>0–5°). Effective slope under classified vegetation is depicted in Figure 3.

Summary of inputs

Figure 3 illustrates the anticipated post-development vegetation classifications following implementation of the 2.8 m noise attenuation wall and 5.7 m wide non-vegetated buffer. The post-development vegetation classifications/exclusions and effective slope are summarised in Table 1.

Table 1: Summary of classified vegetation and exclusions

Plot	Vegetation classification/exclusion	Effective slope
1	Class G grassland	Flat/Upslope
2	Class D scrub	Downslope >0-5°
3	Class G grassland	Downslope >0-5°
4	Class G grassland	Flat/Upslope
5	Exclusion 2.2.3.2 (e)	N/A
6	Class B woodland	Flat/Upslope
7	Class D scrub	Flat/Upslope
8	Class G grassland	Flat/Upslope
9	Exclusion 2.2.3.2 (e) & (f)	N/A

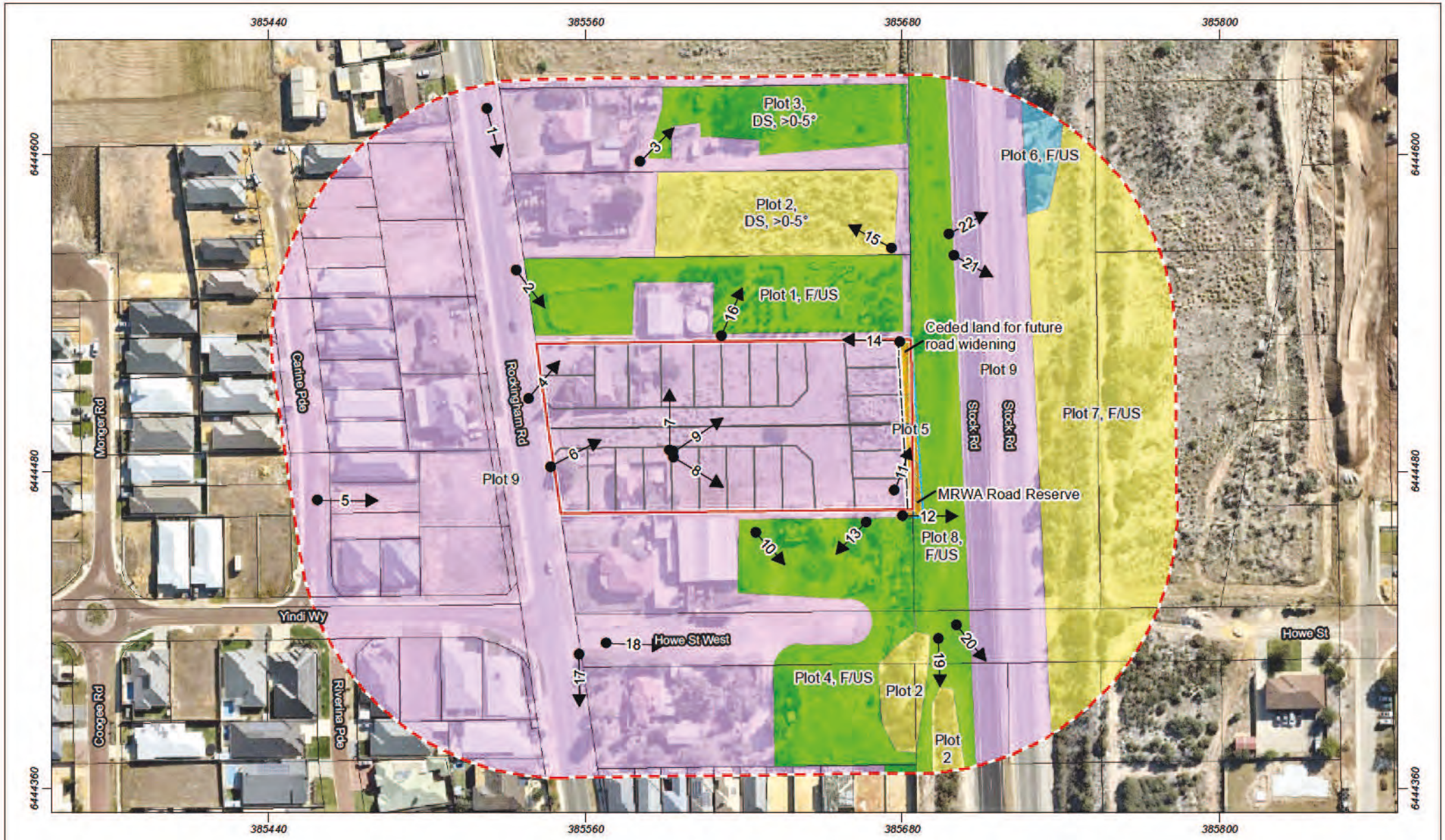

Figure 3: Vegetation classification and effective slope

Scale 1:1,963 at A4

Meters 0 12 24 36

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 14/09/2018
Author: jorute
Source: Aerial: Nearmaps 04/2017.

Legend

- Photo point and direction
- 2.8m highwall
- Project area
- 100m assessment area
- Subdivision layout
- Cadastre
- Management agreement to be maintained as low threat (private land owner)
- Management agreement to be low threat (MRWA)

Vegetation class

- Class B Woodland
- Class D Scrub
- Class G Grassland
- Excluded Clause 2.2.3.2 (e) and (f)
- Managed area and wall

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2.3 Assessment outputs

2.3.1 Bushfire Attack Level (BAL) assessment

Strategen has undertaken a BAL contour assessment in accordance with Method 1 and Method 2 of AS 3959 for the project area (refer to Figure 4 and Figure 5).

Method 1 analysis

The Method 1 procedure (as outlined in AS 3959) was used to calculate the BALs for all plots except for Plot 8 (i.e. Class G grassland within Stock Road reserve at eastern site interface). The Method 1 modelling incorporates the following factors:

- state-adopted FDI 80 rating
- vegetation class as assigned in Table 1
- effective slope as assigned in Table 1
- distance maintained between proposed development areas and the classified vegetation.

Method 2 analysis

The Method 2 procedure was used to model Plot 8 (Stock Road reserve Class G grassland). The Method 2 procedure incorporates the following:

- vegetation classification of Class G grassland with default surface fuel load of 4.5 t/ha and overall fuel load 4.5 t/ha.
- effective slope of flat/upslope
- a worst-case flame width of 65 m for the entire eastern elevation of the proposed subdivision
    - given the actual fire run approaching the eastern elevation is only 17–18 m long, this is considered extremely conservative and could be reduced using a short fire run calculation
- flame temperature of 1200 K for the noise attenuation wall
    - although it is understood this is currently DFES requirement for modelling shielding walls, given the short fire run it is highly unlikely that the flame temperature would reach these temperatures, and as such, this is considered a very conservative assumption
- a 2.8 m high noise attenuation wall (shielding wall)
    - the wall has been modelled as being adjacent to the grassland when it will in fact be further from the edge of the unmanaged grassland. This is conservative as the wall will in reality be 'more shielding' because of the increased effective height with respect to the resultant flame front
- an additional 5.7 m separation provided by the establishment and maintenance of a crushed limestone non-vegetated buffer adjacent to the eastern side of the noise attenuation wall.

The Methodology 2 radiant heat barrier analysis inputs and outputs using FLAMESOL are provided in Appendix 4.

BAL assessment results

The BAL rating gives an indication of the level of bushfire attack (i.e. the radiant heat flux) that may be received by proposed future development and subsequently informs the standard of building construction (if applicable) and/or setbacks required for proposed habitable development to potentially withstand such impacts.

Results of the BAL assessment are listed in Table 2 and illustrated in Figure 4 and Figure 5.

The highest BAL applicable to the proposed future lots is BAL-FZ which is from the Class G grassland abutting the site to the north and south. However, through the provision of the existing 3 m wide firebreaks within the adjacent lots to the north and south, plus a 5 m wide internal Asset Protection Zone (APZ) setback (as shown on Figure 5), the revised achievable BAL for all but three of the proposed lots is BAL-29. The three remaining lots share a side boundary with adjacent grassland, rather than a rear boundary, meaning that the lot orientation will not enable the internal 5 m wide APZ setback to be accommodated. As such, a staged approach to development of the site will need to be taken so that development on the three affected lots is restricted until the adjacent hazards to the north and south have been removed and/or managed. This is considered to be an appropriate strategy to ensure that no future development occurs on land subject to BAL-40/FZ.

Table 2: BAL assessment results

Plot	Vegetation classification/ exclusion	Effective slope	AS 3959 Method	Relevant BAL contour width	Highest BAL	Lower achievable BAL
1	Class G grassland	Flat/Upslope	Method 1	<6 m	BAL-FZ*	BAL-29
2	Class D scrub	Downslope <0-5°	Method 1	31 m - <100 m	BAL-12.5	N/A
3	Class G grassland	Downslope <0-5°	Method 1	>50 m	BAL-LOW	N/A
4	Class G grassland	Flat/Upslope	Method 1	<6 m	BAL-FZ*	BAL-29
5	Exclusion 2.2.3.2 (e)	N/A	N/A	N/A	N/A	N/A
6	Class B Woodland	Flat/Upslope	Method 1	29 m - <100 m	BAL-12.5	N/A
7	Class D Scrub	Flat/Upslope	Method 1	27 m - <100 m	BAL-12.5	N/A
8	Class G grassland	Flat/Upslope	Method 2	5.7 m - <8.3 m	BAL-29	BAL-12.5
9	Exclusion 2.2.3.2 (e) & (f)	N/A	N/A	N/A	N/A	N/A

* Development will not occur in BAL-40 or BAL-FZ through provision of a 5 m wide internal APZ setback from the northern and southern boundaries to enable all future habitable buildings to achieve BAL-29 or lower

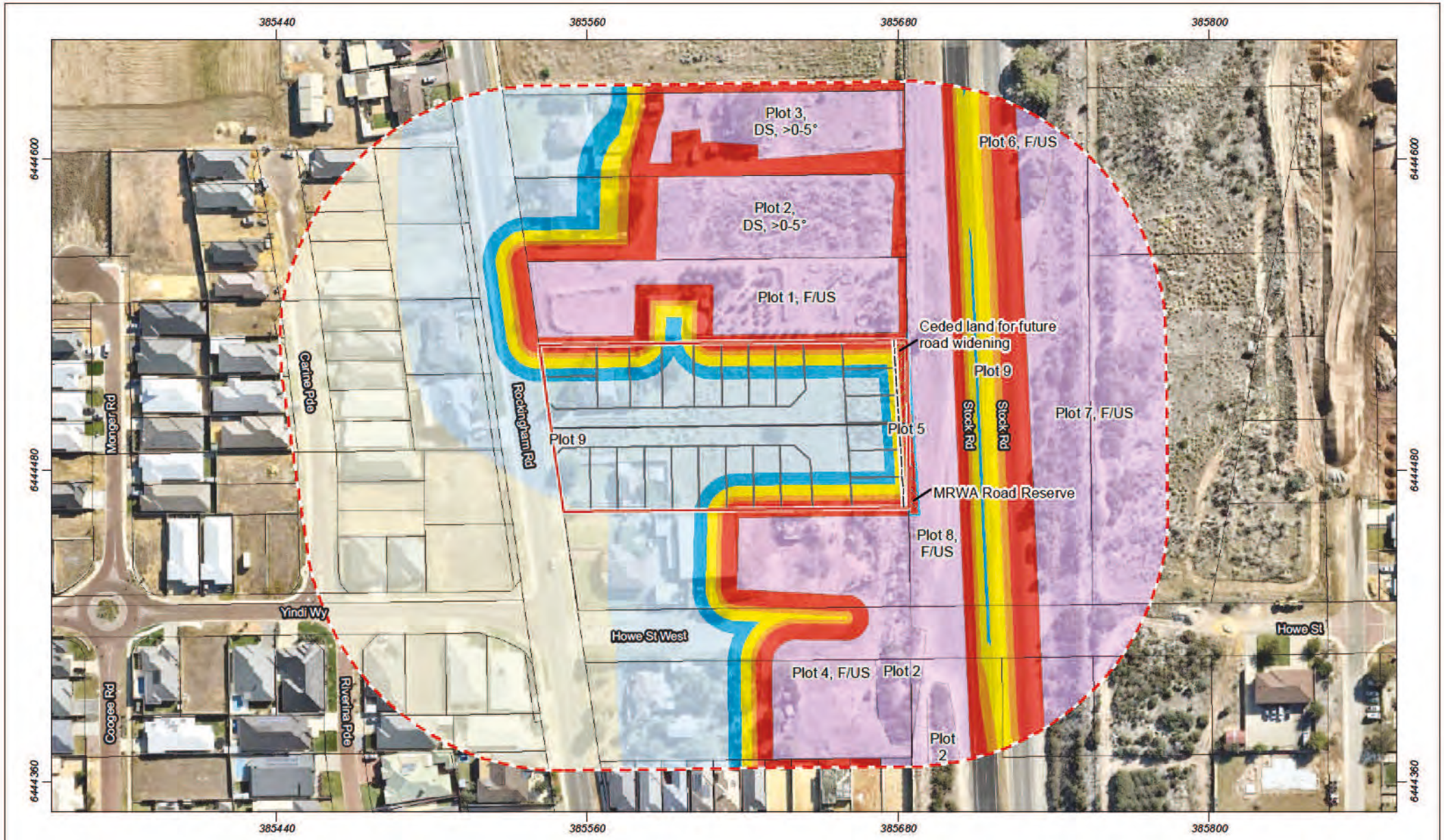

Figure 4: BAL Contour map

Scale 1:2,000 at A4

Meters 0 12 24 36

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 14/09/2018
Author: jorute
Source: Aerial: Nearmaps 04/2017.

Legend

- 2.8m highwall
- Project area
- 100m assessment area
- Subdivision layout
- Cadastre
- Management agreement to be maintained as low threat (private land owner)
- Management agreement to be low threat (MRWA)

BAL contours

- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- BAL Low

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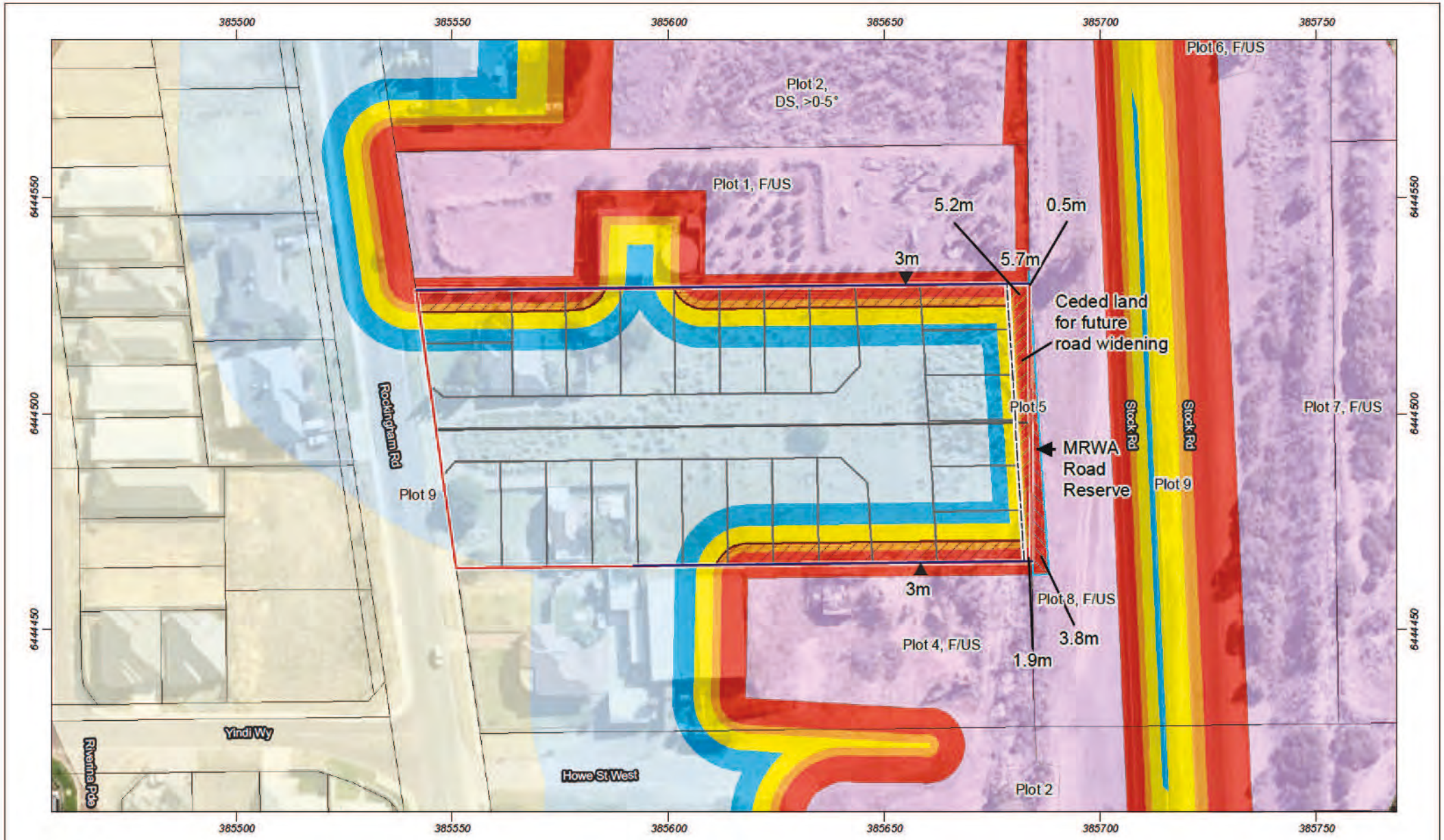

Figure 5: BAL Contour map (detailed view)

Scale 1:1,200 at A4

0 12 24 36 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 14/09/2018
Author: jorute
Source: Aerial: Nearmaps 04/2017.

N

Legend

- 2.8m high wall
- Project area
- Subdivision layout
- Cadastre
- Lot to be restricted from development until adjacent hazard removed and/or managed
- Management agreement to be maintained as low threat (private land owner)
- Management agreement to be low threat (MRWA)
- 5m wide APZ setback

BAL contours

- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- BAL Low

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2.4 Identification of bushfire hazard issues

There is no landscape scale bushfire risk to the project area due to the significant amount of clearing and fragmentation of vegetation created by ongoing urban development in the locality, including Rockingham and Stock Roads to the west and east respectively and progressive dwelling construction either side of these key distributor roads.

The classified scrub and grassland vegetation north and south of the project area is bound by firebreaks and managed vegetation; thereby resulting in discrete vegetation plots with very small fire runs. On this basis, it is unlikely a bushfire will be able to escalate and significantly impact future life and property assets.

The most significant bushfire risk in the area is posed by vegetation east of Stock Road, where potential fire runs of about 200 m are possible through the patchy scrub and woodland vegetation. Ember attack could potentially impact the project area under this scenario, particularly during easterly winds, typical of morning summertime conditions; however, no radiant heat impact is expected due to the significant separation provided by Stock Road. Stock Road also provides access for emergency services and fire suppression if required.

MRWA has confirmed that the Stock Road reserve will be managed on a regular basis (refer to Appendix 2), therefore, grassland vegetation with the reserve is unlikely to present a significant risk to proposed development. Nevertheless, a precautionary approach has been adopted to classify the road reserve vegetation as Class G Grassland. In order to mitigate potential impacts of unmanaged grassland within the road reserve, Strategen has demonstrated that the combination of a 5.7 m wide non-vegetated buffer and a 2.8 m high noise attenuation wall adjacent to the eastern boundary of the project area will mitigate any adverse BAL impacts (i.e. BAL-40 or BAL-FZ).

Proposed lots abutting the northern and southern boundaries of the project area are subject to a worst case BAL of BAL-FZ due to the potential for unmanaged grassland to occur on adjacent lots at these interfaces. The rationale behind this is that the firebreak notice does not require management of grassland for properties larger than 2,023 m^2. Strategen does not consider that these BAL impacts are prohibitive of development as an internal APZ setback of 5 m could be accommodated within all but three of the proposed lots to ensure that future development on these lots is subject to BAL-29 or lower. The three remaining lots share a side boundary with adjacent grassland, rather than a rear boundary, meaning that the lot orientation will not enable the internal 5 m wide APZ setback to be accommodated. As such, a staged approach to development of the site will need to be taken so that development on the three affected lots is restricted until the adjacent hazards to the north and south have been removed and/or managed. This is considered to be an appropriate strategy to ensure that no future development occurs on land subject to BAL-40/FZ.

Further to this, Strategen understands that the lots directly north and south of the project area are likely to be subdivided in the future, which would remove the grassland impacts on the project area entirely. Should development of the adjacent lots occur prior to or concurrently with development of the project area, then the subsequent reduction in BAL would need to be reassessed, which would likely result in a reduced impact of BAL-12.5 or BAL-LOW.

Bushfire management for the project area should focus on providing increased building construction standards for individual lots where required in accordance with AS 3959. Access and egress to the proposed residential development will largely be to the west towards cleared areas in order to direct residents and the public away from the direction of predominant bushfire risk. Fire brigades will have sufficient access to the development via Rockingham Road and firefighting water supplies will be from street hydrants on the town main water supply.

On the basis of the above information, Strategen considers the bushfire hazards and associated bushfire risks are readily manageable through standard acceptable solution responses outlined in the Guidelines and AS 3959. These responses will need to be factored in to proposed development as early as possible to ensure a suitable, compliant and effective bushfire management outcome is achieved to ensure protection of future life and property assets.

3. Bushfire management measures

This section outlines the bushfire management measures that will be adopted to ensure Guideline compliance and a manageable level of bushfire risk is achieved for proposed development within the project area. The management actions recommended are directly referred to in the bushfire compliance table outlined in Table 5 to assist with implementation, enforcement and auditing of all works.

3.1 Asset Protection Zones (APZs)

Proposed lot and building locations will be finalised at subdivision and building permit application stages respectively. Therefore, for the purposes of informing a compliant outcome for this Structure Plan application, sufficient separation distances between classified vegetation and proposed development can be achieved for all but three of the proposed lots in the form of an internal 5 m wide APZ setback to ensure future habitable development within these lots can achieve a rating of BAL–29 or lower. Three lots demarcated on Figure 5 as requiring temporary building restrictions until the adjacent hazards to the north and south are removed and/or managed will ensure that development on these lots is not subject to BAL-40/FZ. These strategies will ensure all parts of the project area comply with Guidelines Acceptable Solution A1.1 and A2.1. All APZs are to be maintained in accordance with Schedule 1 of the Guidelines (see Appendix 5).

3.2 Building construction standards and BAL compliance

The BAL contour assessment over the project area (as outlined in Section 2.2 and Figure 4) indicates that all proposed lots will ultimately be able to achieve a BAL rating of between a BAL–12.5 and BAL–29, including the use of staged development to address the adjacent temporary hazards to the north and south. BAL ratings for individual lots can be revalidated at subdivision application if any design changes have occurred. BAL ratings for individual buildings can be confirmed post-completion of subdivision works prior to lot title/sale, or at the building permit application stage.

The bushfire constructions provisions of the National Construction Code will be applied to proposed buildings in accordance with the assessed BAL under AS 3959, provided the building is a Class 1, 2 or 3 building or a Class 10a building associated with a Class 1, 2 or 3 building.

3.3 Vehicular access

The proposed vehicular access network will provide access to the surrounding public road network in Rockingham Road to the west, whereby travel will be permitted either a northerly or southerly direction through predominately urban residential development away from the predominant bushfire risk, which is situated opposite Stock Road to the east. The connection of the proposed road network with Rockingham Road ensures a minimum of two access routes are provided at all times; thereby meeting compliance with Acceptable Solution A3.1. In addition, all proposed public roads will meet the technical requirements of the Guidelines in accordance with Acceptable Solution A3.2, as outlined in Table 3.

Strategen acknowledges that the proposed internal road network will eventually interlink with future roads on adjacent lots to the north and south. This proposed road layout is currently being finalised with WAPC as part of the Structure Plan for Lot 38. Until these connections are made, there will be two temporary dead ends created on the north-south oriented road and a temporary cul-de-sac/turnaround at their centre. This is not considered to affect development compliance since this temporary cul-de-sac will be approximately 100 m long and the turnaround head will have a diameter of 17.5 m (at the centre of the two dead-ends) to ensure members of the public and emergency services are not subject to any additional bushfire risk throughout the duration of these temporary access arrangements. The temporary cul-de-sac will meet all other technical requirements of the Guidelines, as outlined in Table 3; thereby meeting compliance with Acceptable Solution A3.3.

No battle axes, private driveways longer than 50 m, emergency access ways, fire service access routes or firebreaks are proposed or required as part of this development, and on this basis, Acceptable Solutions A3.4 through to A3.8 are not applicable in this instance.

Table 3: Vehicular access technical requirements

Technical requirement	Public road	Cul-de-sac
Minimum trafficable surface (m)	6*	6
Horizontal distance (m)	6	6
Vertical clearance (m)	4.5	N/A
Maximum grade <50 m	1 in 10	1 in 10
Minimum weight capacity (t)	15	15
Maximum crossfall	1 in 33	1 in 33
Curves minimum inner radius	8.5	8.5
*Refer to E3.2 Public roads: Trafficable surface		

Source: WAPC 2017

3.4 Reticulated water supply

All proposed lots will be provided a reticulated water supply through extension of existing services from adjacent urban development. The reticulated system will ensure an all year-round supply of water is provided for each lot to meet minimum domestic and emergency water supply requirements to comply with Guideline acceptable solution A4.1.

A network of hydrants will also be provided along the internal road network at locations which meet relevant water supply authority and DFES requirements, in particular the Water Corporation Design Standard DS 63 'Water Reticulation Standard Design and Construction Requirements for Water Reticulation Systems up to DN250'. This standard will guide construction of the internal reticulated water supply system and fire hydrant network, including spacing and positioning of fire hydrants so that the maximum distance between a hydrant and the rear of a building envelope (or in the absence of a building envelope, the rear of the lot) shall be 120 m and the hydrants shall be no more than 200 m apart.

3.5 Additional measures

Strategen makes the following additional recommendations to inform ongoing stages of development:

1. Notification on Title: where relevant, a notification pursuant to Section 165 of the *Planning and Development Act 2005* is to be placed on the certificates of title of proposed lots with a BAL rating of 12.5 or above, advising of the existence of a hazard or other factor (relevant authority). The notification is to state as follows:

   This land is subject to a Bushfire Management Plan. Additional planning and building requirements may apply to development on this land.
2. BMP addendum and future BAL compliance assessment: a BMP addendum may be prepared to accompany subdivision application to revalidate BAL ratings and management measures for the site consistent with lot layout once confirmed. BAL compliance assessment may be undertaken post-completion of subdivisional works (prior to lot title/sale) or at the building permit application stage to confirm final BAL ratings for individual lots/dwellings.
3. Compliance with current City of Cockburn annual firebreak notice: all parties are to comply with the current City of Cockburn annual firebreak notice (Appendix 3), which specifies the following for all property (vacant or developed) less than 2,032 m^2:
   1.1 Have all flammable materials such as long dry grass and weeds slashed, mown or trimmed down by other means to a maximum height of 50 mm across the entire property for the duration of this Firebreak Time; and
   1.2 Remove all dead vegetation.
4. Construction of 2.8 m high noise wall and maintenance of 5.7 m wide non-vegetated buffer: the developer will construct the noise wall and the adjacent 5.7 m wide buffer. MRWA has agreed to maintain the buffer in a non-vegetated stated on a regular and ongoing basis (refer to Appendix 2).

5. Management of vegetation within Stock Road reserve: MRWA has confirmed that regular maintenance will be carried out in relation to grassland vegetation within the Stock Road reserve (refer to Appendix 2).

4. Proposal compliance and justification

Proposed development within the project area is required to comply with SPP 3.7 under the following policy measures:

6.2 Strategic planning proposals, subdivision and development applications

a) Strategic planning proposals, subdivision and development applications within designated bushfire prone areas relating to land that has or will have a Bushfire Hazard Level (BHL) above low and/or where a Bushfire Attack Level (BAL) rating above BAL-LOW apply, are to comply with these policy measures.

b) Any strategic planning proposal, subdivision or development application in an area to which policy measure 6.2 a) applies, that has or will, on completion, have a moderate BHL and/or where BAL-12.5 to BAL-29 applies, may be considered for approval where it can be undertaken in accordance with policy measures 6.3, 6.4 or 6.5.

c) This policy also applies where an area is not yet designated as a bushfire prone area but is proposed to be developed in a way that introduces a bushfire hazard, as outlined in the Guidelines.

6.3 Information to accompany strategic planning proposals

Any strategic planning proposal to which policy measure 6.2 applies is to be accompanied by the following information in accordance with the Guidelines:

a) (i) the results of a BHL assessment determining the applicable hazard level(s) across the subject land, in accordance with the methodology set out in the Guidelines. BHL assessments should be prepared by an accredited Bushfire Planning Practitioner, or;

(ii) where the lot layout of the proposal is known, a BAL Contour Map to determine the indicative acceptable BAL ratings across the subject site, in accordance with the Guidelines. BAL Contour Maps should be prepared by an accredited Bushfire Planning Practitioner

b) the identification of any bushfire hazard issues arising from the relevant assessment

c) clear demonstration that compliance with the bushfire protection criteria in the Guidelines can be achieved in subsequent planning stages.

Implementation of this BMP is expected to meet the following objectives of SPP 3.7:

5.1 Avoid any increase in the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact are paramount.

5.2 Reduce vulnerability to bushfire through the identification and consideration of bushfire risks in decision-making at all stages of the planning and development process.

5.3 Ensure that higher order strategic planning documents, strategic planning proposals, subdivision and development applications take into account bushfire protection requirements and include specified bushfire protection measures.

5.4 Achieve an appropriate balance between bushfire risk management measures and, biodiversity conservation values, environmental protection and biodiversity management and landscape amenity, with consideration of the potential impacts of climate change.

In response to the above requirements of SPP 3.7, the bushfire management measures, as outlined in Section 3, have been devised for the proposed development in accordance with acceptable solutions of the Guidelines to meet compliance with bushfire protection criteria. An 'acceptable solutions' assessment is provided in Table 4 to assess the proposed bushfire management measures against each bushfire protection criteria in accordance with the Guidelines and demonstrate that the measures proposed meet the intent of each element of the bushfire protection criteria.

Table 4: Acceptable solutions assessment against bushfire protection criteria

Bushfire protection criteria	Intent	Acceptable solutions	Proposed bushfire management measures	Compliance statement
Element 1: Location	To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.	A1.1 Development location The strategic planning proposal, subdivision and development application is located in an area that is or will, on completion, be subject to either a moderate or low bushfire hazard level, or BAL–29 or below.	Refer to Section 3.1, which demonstrates that all future development will avoid areas of BAL–FZ and BAL–40 and a rating of BAL–29 or lower can be achieved. An internal APZ setback of 5 m is required for all but three of the lots to avoid BAL40/FZ. The remaining three lots require temporary building restrictions until vegetation on adjacent land is permanently removed and/or managed.	The measures proposed are considered to comply and meet the intent of Element 1 Location.
Element 2: Siting and design of development	To ensure that the siting and design of development minimises the level of bushfire impact.	A2.1 Asset Protection Zone (APZ) Every habitable building is surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the following requirements: • Width: Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL–29) in all circumstances • Location: the APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity (see explanatory notes) • Management: the APZ is managed in accordance with the requirements of 'Standards for Asset Protection Zones' (see Guidelines Schedule 1).	Refer to Section 3.1, which demonstrates that all but three of the proposed lots will be provided with a suitably sized APZ to ensure a rating of BAL–29 or lower can be achieved. An APZ sufficient to achieve BAL-29 is unable to be achieved for the three remaining lots at this time, therefore, these lots are to have temporary building restrictions applied until vegetation on adjacent land is permanently removed and/or managed.	The measures proposed are considered to comply and meet the intent of Element 2 Siting and design of development.
Element 3: Vehicular access	To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.	A3.1 Two access routes Two different vehicular access routes are provided, both of which connect to the public road network, provide safe access and egress to two different destinations and are available to all residents/the public at all times and under all weather conditions.	Refer to Section 3.3, which demonstrates that the proposed public access network will provide at least two different vehicular access routes for the proposed development at all times.	The measures proposed are considered to comply and meet the intent of Element 3 Vehicular access.
		A3.2 Public road A public road is to meet the requirements in Table 4 Column 1 of the Guidelines.	Refer to Section 3.3, which demonstrates that the proposed public access network will meet technical requirements of the Guidelines.	

		A3.3 Cul-de-sac (including a dead-end-road) A cul-de-sac and/or a dead-end road should be avoided in bushfire prone areas. Where no alternative exists (i.e. the lot layout already exists and/or will need to be demonstrated by the proponent), detailed requirements will need to be achieved as per Table 4 Column 2 of the Guidelines.	Refer to Section 3.3, which demonstrates the temporary cul-de-sac will meet technical requirements of the Guidelines.	
		A3.4 Battle-axe Battle-axe access legs should be avoided in bushfire prone areas. Where no alternative exists, (this will need to be demonstrated by the proponent) detailed requirements will need to be achieved as per Table 4 Column 3 of the Guidelines.	N/A No battle-axes are proposed as part of the development.	
		A3.5 Private driveway longer than 50 m A private driveway is to meet detailed requirements as per Table 4 Column 3 of the Guidelines.	N/A No private driveways longer than 50 m are proposed as part of the development.	
		A3.6 Emergency access way An access way that does not provide through access to a public road is to be avoided in bushfire prone areas. Where no alternative exists (this will need to be demonstrated by the proponent), an emergency access way is to be provided as an alternative link to a public road during emergencies. An emergency access way is to meet detailed requirements as per Table 4 Column 4 of the Guidelines.	N/A No emergency access ways are required as part of the development.	
		A3.7 Fire service access routes (perimeter roads) Fire service access routes are to be established to provide access within and around the edge of the subdivision and related development to provide direct access to bushfire prone areas for fire fighters and link between public road networks for fire fighting purposes. Fire service access routes are to meet detailed requirements as per Table 4 Column 5 of the Guidelines.	N/A No fire service access routes are required as part of the development.	
		A3.8 Firebreak width Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three metres or to the level as prescribed in the local firebreak notice issued by the local government.	N/A No firebreaks are required as part of the development.	
Element 4: Water	To ensure that water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.	A4.1 Reticulated areas The subdivision, development or land use is provided with a reticulated water supply in accordance with the specifications of the relevant water supply authority and Department of Fire and Emergency Services.	Refer to Section 3.4, which demonstrates that all proposed lots will be provided a reticulated water supply and network of hydrants in accordance with local water authority, City and DFES requirements.	The measures proposed are considered to comply and meet the intent of Element 4 Water.
		A4.2 Non-reticulated areas Water tanks for fire fighting purposes with a hydrant or standpipe are provided and meet detailed requirements (refer to the Guidelines for detailed requirements for non-reticulated areas).	N/A The proposed development will not occur within a non-reticulated area.	

		A4.3 Individual lots within non-reticulated areas (only for use if creating 1 additional lot and cannot be applied cumulatively) Single lots above 500 square metres need a dedicated static water supply on the lot that has the effective capacity of 10 000 litres.	N/A The proposed development will not occur within a non-reticulated area.	

5. Implementation and enforcement

Implementation of the BMP applies to the developer, prospective landowners and the City to ensure bushfire management measures are adopted and implemented on an ongoing basis. An indicative bushfire compliance table is provided in Table 5 to drive implementation of all bushfire management works associated with this BMP at future planning stages.

Table 5: Indicative bushfire compliance table

Action	Timing	Responsibility
Establishment of project area as low threat vegetation in accordance with AS 3959 Clauses 2.2.3.2 (e) & (f)	Following subdivision approval and prior to construction of buildings	Developer
Establishment of 5.7 m non-vegetated buffer and 2.8m high noise attenuation wall	Following subdivision approval and prior to construction of buildings	Developer
Maintenance of 5.7 m non-vegetated buffer in a non-vegetated state	Ongoing	MRWA
Maintenance of vegetation with Stock Road reserve as part of annual works programme	Ongoing	MRWA
Ongoing maintenance of internal 5 m wide APZ setback for the majority of lots affected by BAL-FZ	Ongoing	Future landowners
Temporary quarantining of three lots as depicted on Figure 5	Until adjacent hazards to the north and south are removed	Developer
Construct buildings in accordance with AS 3959 and the assessed BAL	At building construction	Future landowners
Construct public roads and temporary cul-de-sac in accordance with Guideline technical requirements	Following subdivision approval and prior to construction of buildings	Developer
Provide a reticulated water supply and network of hydrants in accordance with subdivision approval and water authority, DFES and City technical requirements	Following subdivision approval and prior to construction of buildings	Developer
Where relevant, place notification on the certificates of title for proposed lots with a BAL rating of 12.5 or above	At creation of title	Relevant authority
BMP addendum and BAL compliance assessment	At future planning stages/post subdivisional works as required	Developer and/or prospective landowners
Comply with the City of Cockburn annual firebreak notice (refer to Appendix 3)	Ongoing all year round	All parties

6. References

Department of Fire and Emergency Services (DFES) 2017, *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from: *http://www.dfes.wa.gov.au/regulationandcompliance/bushfireproneareas/Pages/default.aspx*.

Standards Australia (SA) 2009, *Australian Standard AS 3959–2009 Construction of Buildings in Bushfire-prone Areas*, Standards Australia, Sydney.

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire-Prone Areas*, Western Australian Planning Commission, Perth.

Western Australian Planning Commission (WAPC) 2017, *Guidelines for Planning in Bushfire-Prone Areas*, Western Australian Planning Commission, Perth.

Appendix 1
Site photographs

Photo Point 1: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (road, buildings, managed gardens and managed grassland; Plot 9)

Photo Point 2: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (firebreak, buildings and managed gardens; Plot 9)

Photo Point 3: Class G grassland in centre and on left (Plot 3)

Photo Point 4: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (buildings and managed gardens/lawn; Plot 9)

Photo Point 5: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (buildings, managed gardens and managed grassland; Plot 9)

Photo Point 6: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (buildings and firebreak) on right; Class G grassland within project area to be removed as part of the development in foreground.

Photo Point 7: Class G grassland directly north of project area (Plot 1)

Photo Point 8: Class G grassland within project area to be removed as part of the development.

Photo Point 9: Class G grassland directly north of project area (Plot 1)

Photo Point 8: Vegetation within lot directly south of project area classified precautionarily as Class G grassland (Plot 4)

Photo Point 9: Class G grassland in left (Plot 1), Class G grassland within Stock Road reserve in centre (Plot 8); Class B woodland in left background (Plot 6); Class D scrub in right background (Plot 7).

Photo Point 10: Class G grassland within Stock Road reserve in foreground (Plot 8); Class D scrub in background (Plot 7).

Photo Point 11: Class G grassland within project area to be removed as part of the development

Photo Point 12: Class G grassland within project area to be removed as part of the development

Photo Point 13: Class D scrub in mid-ground (Plot 2); Class G grassland in background (predominately hidden by Class D scrub; Plot 3)

Photo Point 14: Orchards directly north of project area classified as Class G grassland as a precautionary measure (Plot 1).

Photo Point 15: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (buildings, roads and managed gardens/lawn; Plot 9)

Photo Point 16: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (buildings, roads and managed gardens/lawn; Plot 9)

Photo Point 17: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (road reserve, track; Plot 9); Class D scrub in centre and far right (Plot 7).

Photo Point 18: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (road reserve; Plot 8); Class D scrub in background (Plot 7).

Photo Point 19: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (road reserve; Plot 9); Class D scrub in background (Plot 7).

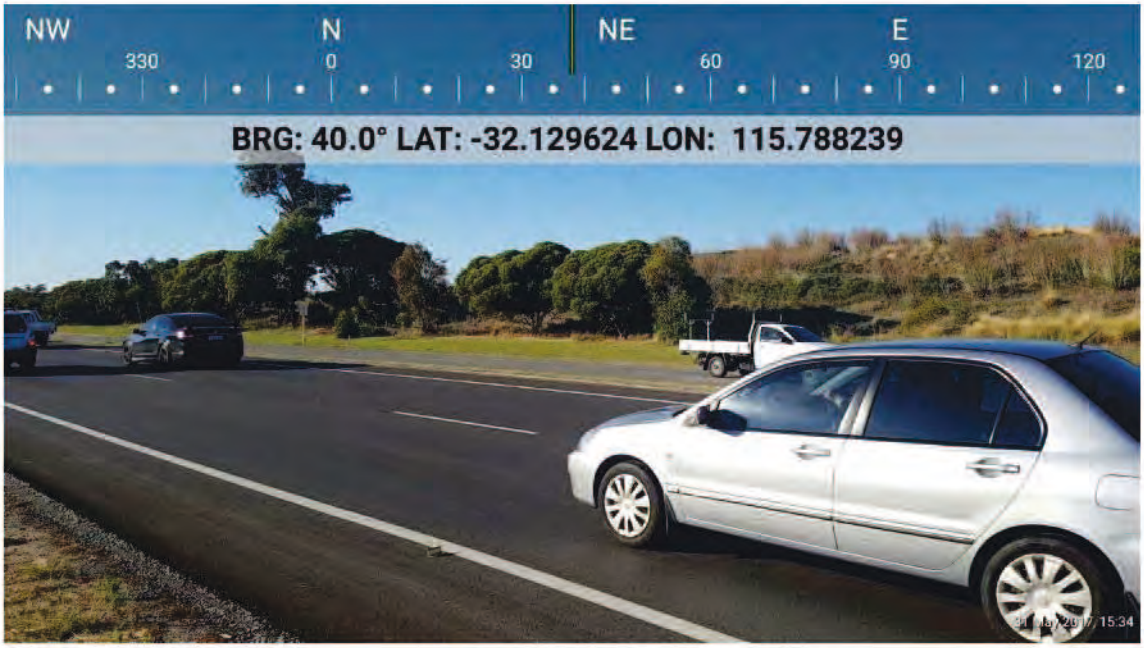

Photo Point 20: Low threat and non-vegetated areas excluded from classification under Clauses 2.2.3.2 (e) and (f) of AS 3959 (road reserve; Plot 9); Class B woodland in left background (Plot 6); Class D scrub in right background (Plot 7).

Appendix 2
Agency correspondence

From: Chris Lewis [mailto:clewis@progressdevelopments.com.au]
Sent: Wednesday, 29 August 2018 1:51 PM
To: Bouwhuis, Jason
Subject: FW: Proposed Structure Plan Lots 35 and 36 Rockingham Rd Munster - Main Roads

Dear Jason

We have received a positive response from Mr Shane Collins- Environmental Officer MRWA.

The email confirms and supports the following.

MRWA conducts regular maintenance of the Stock Rd reserve;
The vegetation is degraded; and
The proposed method of reducing the fire load with weed removal and crushed limestone for both the land owned by MRWA and future ceded land likely supported.

In a direct conversation, Mr Collins confirmed if this work was carried out, MRWA would then maintain the reserve in that state.

It is proposed we update the BMP acknowledging MRWA undertake annual maintenance of the road reserve, the reduction method above be undertaken as part of the subdivision works and the resultant BAL is assessed at BAL- 29.

We have sent you the original correspondence to MRWA for the context of the response.

We would also like to discuss our proposed amended of BMP to ensure this satisfies all requirements you have to enable the LSP to be supported by DoP.

Regards
CHRIS LEWIS
MANAGING DIRECTOR

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P.O. Box 204 Hillarys 6923
progressdevelopments.com.au

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DEVELOPMENTS

From: COLLINS Shane (EO) <shane.collins@mainroads.wa.gov.au>
Sent: Wednesday, 29 August 2018 11:45 AM
To: Chris Lewis <clewis@progressdevelopments.com.au>
Cc: ALDERSLADE Laura (MAMRP/A) <laura.alderslade@mainroads.wa.gov.au>; LA SPADA Anthony (AM/A) <anthony.laspada@mainroads.wa.gov.au>; MATHEWS Annamarie (CSM) <annamarie.mathews@mainroads.wa.gov.au>
Subject: Proposed Structure Plan Lots 35 and 36 Rockingham Rd Munster - Main Roads

Hi Chris. Thank you for sending through the information regarding a Local Structure Plan over Lots 35 and 36 (588 & 590) Rockingham Road, Munster.

We concur with the statement by the Department of Fire and Emergency Services (DFES) in its letter to the City of Cockburn dated 9th October 2017 that in relation to "vegetation within the Stock Road reserve... there is no enforcement mechanism to ensure that the area in question is going to be maintained to low threat as per AS3959 in perpetuity". This is a response that has been provided in the past by the DFES in relation to other areas of road reserve. Related to this is the situation that Main Roads' maintenance works can vary from year-to-year depending on other maintenance imperatives that may arise such as sightline clearing, rubbish removal, drainage works, storm damage, controlling declared noxious weed outbreaks and emergency repairs.

Main Roads conducts regular inspections and maintenance of the road reserve as noted by Strategen in its Bushfire Management Plan report (PDE17243_01 R001 Rev 1). Weed spraying and grass slashing are carried out as part of our Annual Works Program. Additional vegetation control activities including mowing, pruning and removal of dead branches, shrubs and trees are prioritised across Metropolitan Region in accordance with risk assessment of fuels, fire spread paths and adjacent land uses. The attached Operational Guideline 94 excerpts describe this maintenance in more detail. This Guideline is being revised and included as part of a new Vegetation Maintenance Plan currently under development.

Regarding the proposed 5.7 m of vegetation clearing as indicated in the attached Strategen drawing, we may support this on the basis that the vegetation is degraded with limited public amenity, biodiversity and habitat values. For formal consideration and approval, please refer to https://www.mainroads.wa.gov.au/OurRoads/Pages/WorksOnMainRoads.aspx for application information and forms required for Low Complexity Works on Main Roads road reserves.

Kind regards,
Shane.

Shane Collins
ENVIRONMENTAL OFFICER
Main Roads Western Australia
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p: +61 08 9323 4424 | **m:** 0419 047 724
w: www.mainroads.wa.gov.au

From: ALDERSLADE Laura (MAMRP/A)
Sent: Monday, 20 August 2018 9:37 AM
To: Chris Lewis <clewis@progressdevelopments.com.au>
Subject: RE: Proposed Structure Plan Lots 35 and 36 Rockingham Rd Munster

Hi Chris

Thanks for your email. As discussed in our phone conversation I have passed your request for information onto our Environment Officer to respond to you. Please allow up to 10 days for the reply.

Regards,
Laura

Laura Alderslade
A/ MANAGER ASSET MANAGEMENT & ROAD PROGRAMS
Metropolitan and Southern Regions Directorate / Metropolitan Region
p: +61 9323 4985
w: www.mainroads.wa.gov.au

From: Chris Lewis <clewis@progressdevelopments.com.au>
Sent: Thursday, 16 August 2018 6:30 PM
To: ALDERSLADE Laura (MAMRP/A) <laura.alderslade@mainroads.wa.gov.au>
Subject: Re: Proposed Structure Plan Lots 35 and 36 Rockingham Rd Munster

Dear Laura

Thank you for your call yesterday. As discussed we have applied for a Local Structure Plan (LSP) over Lots 35 and 36 (588 & 590) Rockingham Road, Munster. The properties are directly adjoining Stock Rd on the eastern boundary. A copy of the proposed LSP (Layout plan) is attached.

The LSP Report included a Bushfire Management Plan (BMP) prepared by Strategen as a proportion of the project area is designated as Bushfire prone on the WA Map of Bush Fire Prone Areas (DFES 2017). The area identified was primarily impacted by the Stock Rd reserve with the most significant bushfire risk being posed by vegetation east of Stock Rd. The road reserve was not deemed as an issue by Strategen and there was evidence regular slashing at the time of inspection. Therefore the BAL rating applied to the site was BAL 12.5. A copy of the BMP (PDE17243_01 R001 Rev 1) is attached.

During the advertising period the City of Cockburn (Council) received a response from Department of Fire and Emergency Services (DFES) requesting the Stock Rd reserve be amended as unmanaged grassland (weed) and the BMP be updated accordingly. On 12 October 2017 the Council resolved to approve the LSP subject to modifications including updating the BMP to the satisfaction of the

Commission, the Council and DFES. The LSP was referred to the Department of Planning, Land and Heritage (DPLH) on 25 October 2017. See DFES response attached.

If the BMP and resultant BAL plan are updated to include the Stock Rd reserve as 'unmanaged grassland' this has a major impact on the ability for the LSP over the project area being approved, as the BAL classification over a portion of the site increases to BAL-40 and BAL-FZ. In addition DPLH have also stated the area of land we are required to cede to MRWA for future Stock Rd widening be classified as 'unmanaged grassland' (weed) despite it currently being maintained in a low threat state. The DPLH reasoning is MRWA do not manage the road reserve and therefore when MRWA take tenure over this land it will also become unmanaged. We would object to the land being unmanaged to our determent. A copy of the BAL plan (PD 17243_01_R001_Reva_FB) is attached.

There has been ongoing dialogue with DPLH since October 2017 in an effort to convince the DPLH the bushfire risk is low and satisfy the required modifications. The DPLH has itself recognised the land would be sterilised from urban development This sterilisation would place pressure on green fields development and is not consistent with the State Government land use planning and infrastructure framework - Perth and Peel 3.5million.

Strategen have put forward a managed and practical solution to DPLH that consists of us constructing a 2.8m noise wall (Shielding Wall) and a 5.7m strip of land within the Stock Rd reserve is managed. This includes the area we are required to cede and approximately 125 sqm of existing road reserve. See BAL Managed Noise Wall attached.

We understand a pragmatic approach has been taken with respect to management of MRWA and Department of Transport land in Bennett Springs and along the Freeway were similar instances have occurred.

We would like to understand what maintenance plan is currently in place for Stock Rd, and if there is no formal maintenance plan can this be implemented or are we able construct a limestone base (or similar) within the 5.7m strip to reduce the maintenance thus reduce the BAL classification.

Once again I thank you for your assistance in this matter.

Regards
CHRIS LEWIS
MANAGING DIRECTOR

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PROGRESS

Appendix 3
City of Cockburn annual firebreak notice

City of Cockburn Fire Control Order
Effective from 9 July 2015
First and Final Notice

Pursuant to *Section 33* of the *Bush Fires Act 1954* owners or occupiers of land situated within the City of Cockburn are required by law to comply with the prescribed Fire Control Order here within.

Definitions:

Authorised Officer	An officer appointed as a City of Cockburn Fire Control Officer.
Flammable Material	Any dead or dry grass, vegetable, substance, object, thing or material (except living flora including live and/ or habitat standing trees) that may or is likely to catch fire and burn or any other thing deemed by an Authorised Officer to be capable of combustion.
Prohibited Burning Time	The time period of each year where it is unlawful to set fire to the bush at any time. This time is normally from 1 December of each year until and including 31 March of the following year. This time may be amended, subject to prevailing seasonal conditions.
Restricted Burning Time	The time period of each year where it is unlawful to set fire to the bush without a valid Permit to Set Fire To The Bush issued by an Authorised Officer. This period normally is from 1 April until and including 31 May and from 1 October until and including 30 November of any year. This time may be amended, subject to the prevailing seasonal conditions.
Unrestricted Burning Time	The time period of each year where it is lawful to set fire to the bush at any time, in areas zoned rural under the City of Cockburn Town Planning Scheme. This time normally is from 1 June until and including 30 September. This time may be amended, subject to the prevailing seasonal conditions.
Firebreak Time	The time of each year where fire hazard reduction works must be maintained as specified in this Fire Control Order. This time is 1 November of each year until and including 15 April of the following year.

1 All property (vacant or developed) –less than 2032m2

To reduce the fire hazard on your land and to comply with the requirements of this Fire Control Order you are required to;

1.1 Have all flammable materials such as long dry grass and weeds slashed, mown or trimmed down by other means to a maximum height of 50mm across the entire property for the duration of this Firebreak Time; and

1.2 Remove all dead vegetation.

2 All property (vacant or developed) – 2032m2 or greater

To reduce the fire hazard on your land and to comply with the requirements of this Fire Control Order you are required to;

2.1 Construct a Firebreak (as defined within section 3 of this order) immediately inside all external property boundaries, including those adjacent to roads, drains, rail reserves and any public open space reserves; and

2.2 Remove all dead vegetation surrounding and over all habitable buildings to a radius of 3 metres except living trees, shrubs, maintained green lawns and gardens under cultivation.

3 Firebreak Specifications

A Firebreak is an area of land cleared of flammable material, installed to minimise the spread or extension of a bush fire and to provide suitable access for fire fighting vehicles. The standards of a compliant Firebreak are as follows;

3.1 A Firebreak must be constructed of bare earth, stone, or sealed surfaces and be clear of all flammable materials to create a 3 metre wide trafficable surface;

3.2 Maintained lawn may occupy a Firebreak, providing it does not exceed 50mm in height during the Firebreak Time;

3.3 Overhanging branches must be pruned to provide a 4 metre vertical clearance above the full width of the Firebreak surface; and

3.4 A Firebreak must be a continuous trafficable path for a fire fighting vehicle, clear of any obstructions and must not terminate in a cul-de-sac (dead end).

4 Additional Works

Regardless of land size and location, the City of Cockburn or its Authorised Officer may require you to undertake additional works on your property to improve access and/or undertake further works where in the opinion of that Authorised Officer, these works would be conducive to preventing the outbreak and/or the spread or extension of a bush fire.

5 Fire Control Order Variations

A variation will be considered where the owner and/or occupiers believe it is impractical to meet the compliance requirements of this Fire Control Order. A firebreak variation application must be submitted in writing to the City of Cockburn for consideration before 1 October of each year. If approved, variations will be valid for three (3) years, unless a new variation has been approved or the property changes ownership during this time.

The City of Cockburn reserves the right to review, amend or revoke an existing variation in writing at any time. Should a request to vary the Fire Control Order requirements on your property not be approved in writing, this Fire Control Order must be complied with as applicable in its entirety.

6 Hazard Reduction Burning

During the declared Prohibited Burning Time owners and/or occupiers cannot undertake any bush or garden refuse burning activities.

During the declared Restricted Burning Time only, owners and/or occupiers may:

6.1 Apply for a permit to burn the bush for bush fire risk mitigation purposes, by following the conditions imposed on a permit to burn as issued by an Authorised Officer.

6.2 In areas zoned rural by the City's Town Planning Scheme, you may undertake burning of leaves, tree branches, and other dry vegetation in piles no larger than 1.0m³ in size, without a permit to burn, subject to the following conditions:

6.2.1 No Flammable Material (other than that being burned) is to be within 5 m of the fire at any time while the fire is burning;
6.2.2 the fire is lit between 6 p.m. and 11pm and is completely extinguished before midnight on the same day;
6.2.3 at least one person is present at the site of the fire at all times until it is completely extinguished; and
6.2.4 When the fire is no longer required, the person ensures that the fire is completely extinguished by the application of water or earth.

During the Unrestricted Burning Time, owners and/or occupiers in areas zoned rural under the City's Town Scheme may burn garden refuse and set fire to bush on their land without a permit 'To Set Fire To The Bush'. Burning of the bush must be in accordance with all relevant State legislative requirements.

Burning of garden refuse in areas not zoned rural shall not be undertaken within the City of Cockburn.

Burning of household waste is prohibited in all areas of the City of Cockburn.

7 Penalties

Failing to comply with this Fire Control Order will result in a penalty of up to $5,000. A person in default is also liable whether prosecuted or not to pay the costs of performing the work directed by a City's Authorised Officer.

Any owner and/or occupier who engages a contractor to undertake works on their behalf is responsible to ensure that the works completed meet the requirements of this Fire Control Order.

Any Fire Control Order previously published by the City of Cockburn in the Government Gazette or in any Western Australian newsprint is hereby revoked.

By Order of Council

Appendix 4
Method 2 analysis

Calculated July 6, 2018, 6:08 pm (RHBc v.1.3)

Radiant Heat Barrier calculator - AS3959-2009

Inputs		Outputs	
Grassland Fire Danger Index	80	Rate of spread	10.4 km/h
Vegetation classification	Grassland	Flame length	5.86 m
Surface fuel load	4.5 t/ha	Flame angle	59 °
Overall fuel load	4.5 t/ha	Panel height	5.02 m
Vegetation height	n/a	Elevation of receiver	2.51 m
Effective slope	0 °	Effective barrier height	2.8 m
Site slope	0 °	Fire intensity	24,180 kW/m
Distance to vegetation	5.7 m	Transmissivity	0.892
Flame width	65 m	Viewfactor	0.5136
Windspeed	n/a	Radiant heat flux	51.2 kW/m²
Heat of combustion	18,600 kJ/kg	Viewfactor of barrier	0.2263
Flame temperature	1,200 K	Adjusted viewfactor	0.2873
Actual barrier height	2.8 m	Adjusted radiant heat flux	28.64 kW/m²
		Bushfire Attack Level	BAL-29

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

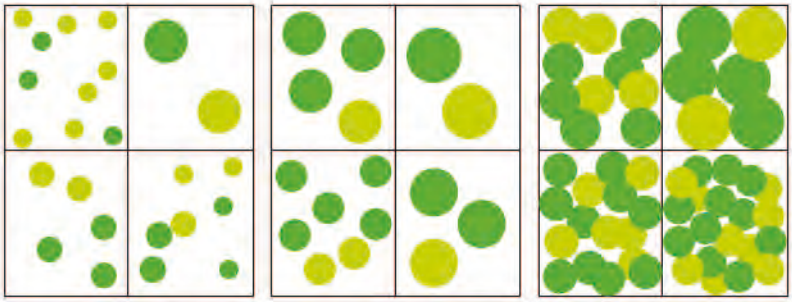
Appendix 5
APZ standards (Schedule 1, the Guidelines)

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^2 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 B
ENVIRONMENTAL ASSESSMENT REPORT

intelligent outcomes | respected experience

Lots 588-590 Rockingham Road, Munster

Environmental Assessment Report

DRAFT

Prepared for
Progress Developments
by Strategen

October 2018

strategen
ENVIRONMENTAL

Lots 588-590 Rockingham Road, Munster

Environmental Assessment Report

DRAFT

Strategen is a trading name of
Strategen Environmental Consultants Pty Ltd
Level 1, 50 Subiaco Square Road Subiaco WA 6008
ACN: 056 190 419

October 2018

Limitations

Scope of services

This report ("the report") has been prepared by Strategen Environmental Consultants Pty Ltd (Strategen) in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, Strategen has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen has also not attempted to determine whether any material matter has been omitted from the data. Strategen will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen. The making of any assumption does not imply that Strategen has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

Client: Progress Developments

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Preliminary Draft Report	A	For client review	D White / D Newsome	Electronic	8 June 2017
Draft Report	B	For client review	M Dunlop / D Newsome	Electronic	30 October 2018
Final Draft Report					
Final Report					

Filename: PDE17243_01 R002 Rev B - 30 October 2018

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1. Introduction

This Environmental Assessment Report has been developed to support a Local Structure Plan (LSP) for 588 and 590 Rockingham Road, Munster.

1.1 Background

Progress Developments proposes to subdivide 588 and 590 (Lots 36 and 35) Rockingham Road in Munster, Western Australia (the site) within the City of Cockburn (Figure 1). The proposed Local Structure Plan (LSP) seeks to create approximately 24 residential lots within the site.

The site is currently zoned as Urban and Primary Regional Roads under the Metropolitan Region Scheme (MRS) and the following zonings under Town Planning Scheme No. 3 (TPS 3):

- Development Area 5
- Development Contribution Area 13
- Development Contribution Area 6
- Development Zone
- RR-Primary Regional Roads.

1.2 Objectives

The objective of the Environmental Assessment Report is to:

- describe the environmental values within the site and surroundings based on a desktop assessment of land information
- identify any potential opportunities, constraints to the proposed urban development of the site as presented by the environmental values and any management required to enable development.

This EAR will support the LSP for the development of the site.

1.3 Scope of work

The following scope of works was undertaken for the EAR:

1. Desktop review, interrogation and/or assessment of land information at the site and surrounds including:
   (a) site historical aerial photography
   (b) Department of Water (DoW) Water Information Reporting database
   (c) Department of Aboriginal Affairs (DAA) aboriginal heritage publicly available database
   (d) Heritage Council of WA (HCWA) European heritage database
   (e) COW Council Records Freedom of Information (FOI) Search
   (f) Department of Environment Regulation (DER) Contaminated Sites Database
   (g) West Australian Land Information Platform (Landgate) for environmental values.
2. A site inspection to confirm the findings of the desktop investigation and identify any other evidence of other potentially contaminating land uses that may not have been apparent through review of historical information.

2. Site identification

The site comprises of 588 and 590 (Lots 36 and 35) Rockingham Road in Munster and is located approximately 20 km southwest of the Perth CBD within the City of Cockburn (Figure 2). The site is 0.89 ha and is bound by Rockingham Road to the west, Stock Road to the east, Howe Street to the south and rural properties to the north.

Table 1 and Table 2 present site identification details for the site.

Table 1: Site identification details for 588 Rockingham Road, Munster

Subject	Detail
Lot address (street number)	Lot 36 on Plan 3562
Common name of site	588 Rockingham Road, Munster
Area	0.45 ha
Current certificate of title	Volume:1197 Folio: 514
Current site owners	Danica Bilcich Shelley Papasergio Frances Mihaljevich Josie Bilchich
Local Government Authority	City of Cockburn
Current MRS zoning	Urban, Primary regional roads
Current TPS 3 Zoning	Development Area 5 Development Contribution Area 13 Development Contribution Area 6 Development Zone RR-Primary Regional Roads
Current land use and status	Vacant land with one existing residential building located in the western portion of the site
Proposed future use	Residential development

Table 2: Site identification details for 590 Rockingham Road, Munster

Subject	Detail
Lot address (street number)	Lot 35 on Plan 3562
Common name of site	590 Rockingham Road, Munster
Area	0.44 ha
Current certificate of title	Volume:1172 Folio: 969
Current site owners	Shelley Papasergio Frances Mihaljevich Josie Bilchich
Local Government Authority	City of Cockburn
Current MRS zoning	Urban, Primary regional roads
Current TPS 3 Zoning	Development Area 5 Development Contribution Area 13 Development Contribution Area 6 Development Zone RR-Primary Regional Roads
Current land use and status	Vacant land with one existing residential building located in the western portion of the site
Proposed future use	Residential development

2.1 Current and proposed use

2.1.1 Current land use

The site comprises vacant land, primarily cleared of native vegetation, with two existing residential buildings.

2.1.2 Current zoning

The site is currently zoned as the following under the City of Cockburn Town Planning Scheme No. 3 (TPS 3):

- Development Area 5
- Development Contribution Area 13
- Development Contribution Area 6
- Development Zone
- RR-Primary Regional Roads.

The site is zoned as 'Urban' and 'Primary regional roads' under the Metropolitan Region Scheme (MRS).

2.1.3 Proposed land use

The proposed use for the site is for a residential development comprising 24 allotments, and a 15 m wide road reserve. The proposed development layout is presented in Figure 2.

Figure 1: Regional and local site location

Scale 1:2,000 at A4

0 10 20 30 40 50 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 31/05/2017
Author: DWhite
Source: Aerial: Nearmaps 04/2017; Site boundary: Client 05/2017 12_003_235D_SUBC_MUNSTER_(161128)_Default

N

Legend

- Site boundary
- Existing cadastre

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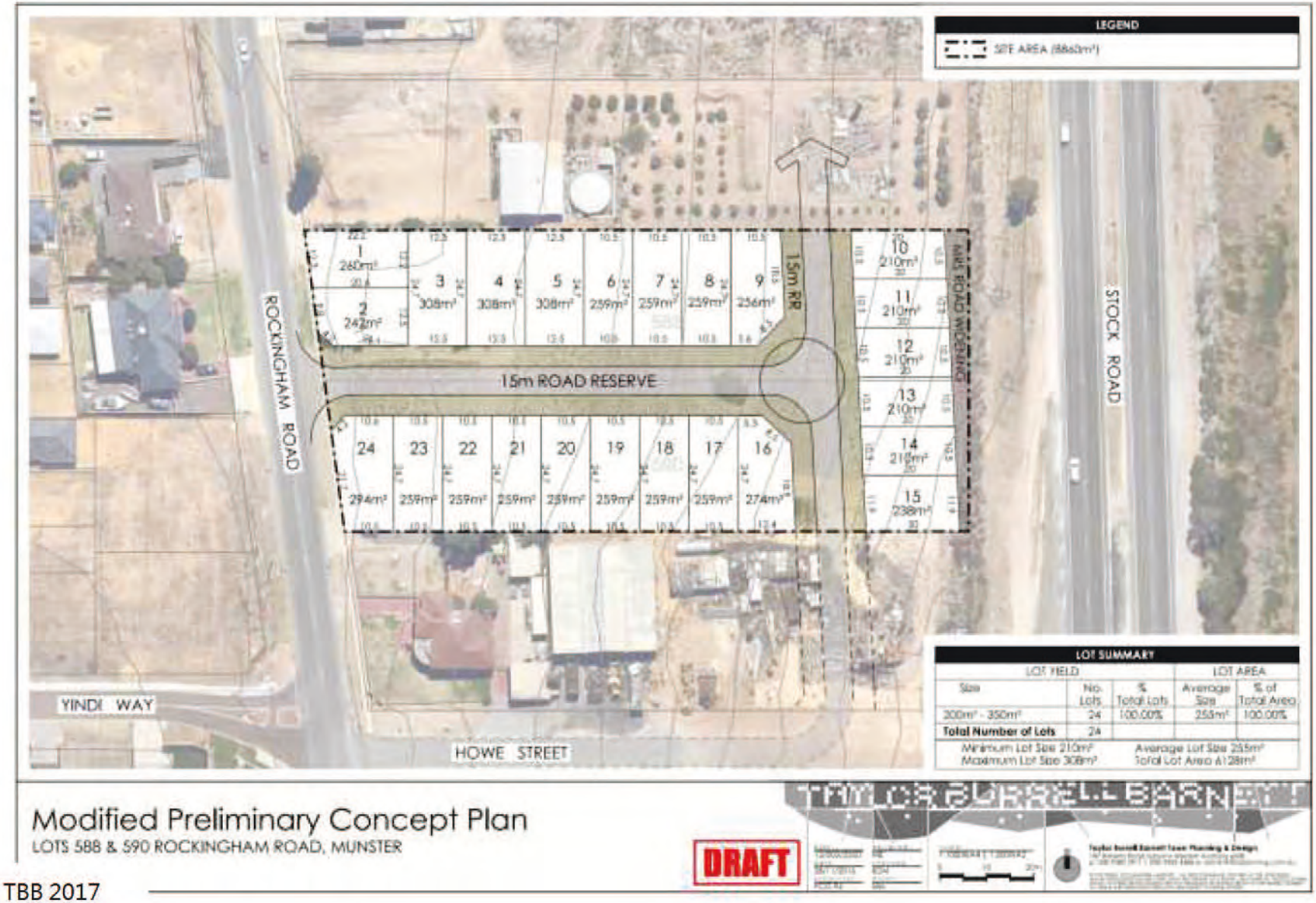

Modified Preliminary Concept Plan

LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

Source: TBB 2017

Figure 2: Modified Preliminary Concept Plan

3. Environmental context

3.1 Topography

The site is located on the Swan Coastal Plain, which is characterised by a low-lying coastal plain, mainly covered with woodlands.

The site has an approximate 2% slope west from Stock Road to Rockingham Road with a high point of 19 metres Australian Height Datum (mAHD) in the east of the site to a low point of 10 mAHD in the west of the site (Figure 2).

3.2 Geology and soils

The geology, topography and soils of the site do not represent a constraint to development.

3.2.1 Regional

The Swan Coastal Plain Bioregion comprises the Dandaragan Plateau and Perth Coastal Plain.

The geology of the site is mapped as predominantly calcarenite derived from Tamala Limestone (Qpck) (Gozzard 1986).

3.2.2 Local

A review of the Landgate database (Landgate 2017) was undertaken to determine the surface geology of the site. The desktop research found that the site comprises of one type of soil:

- LS1: LIMESTONE pale yellow-brown fine-grained angular and medium-grained rounded quartz and calcite cross-bedding minor heavy minerals.

Surface geology is presented in Figure 3.

3.2.3 Acid Sulfate Soils

ASS are naturally occurring, iron-sulphide rich soils, sediments or organic substrates, formed under waterlogged conditions. If exposed to air, these sulphides can oxidise and release sulphuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

A search of the Swan Coastal Plain ASS risk map (Landgate 2017) (search conducted 29 May 2017) indicates that the site has not been mapped as having a risk of ASS to occur within 3 m of natural soil surface.

The nearest high to moderate risk of ASS occurring within 3 m of natural soil surface (Class 1) occurs approximately 293 m west of the site (Figure 3).

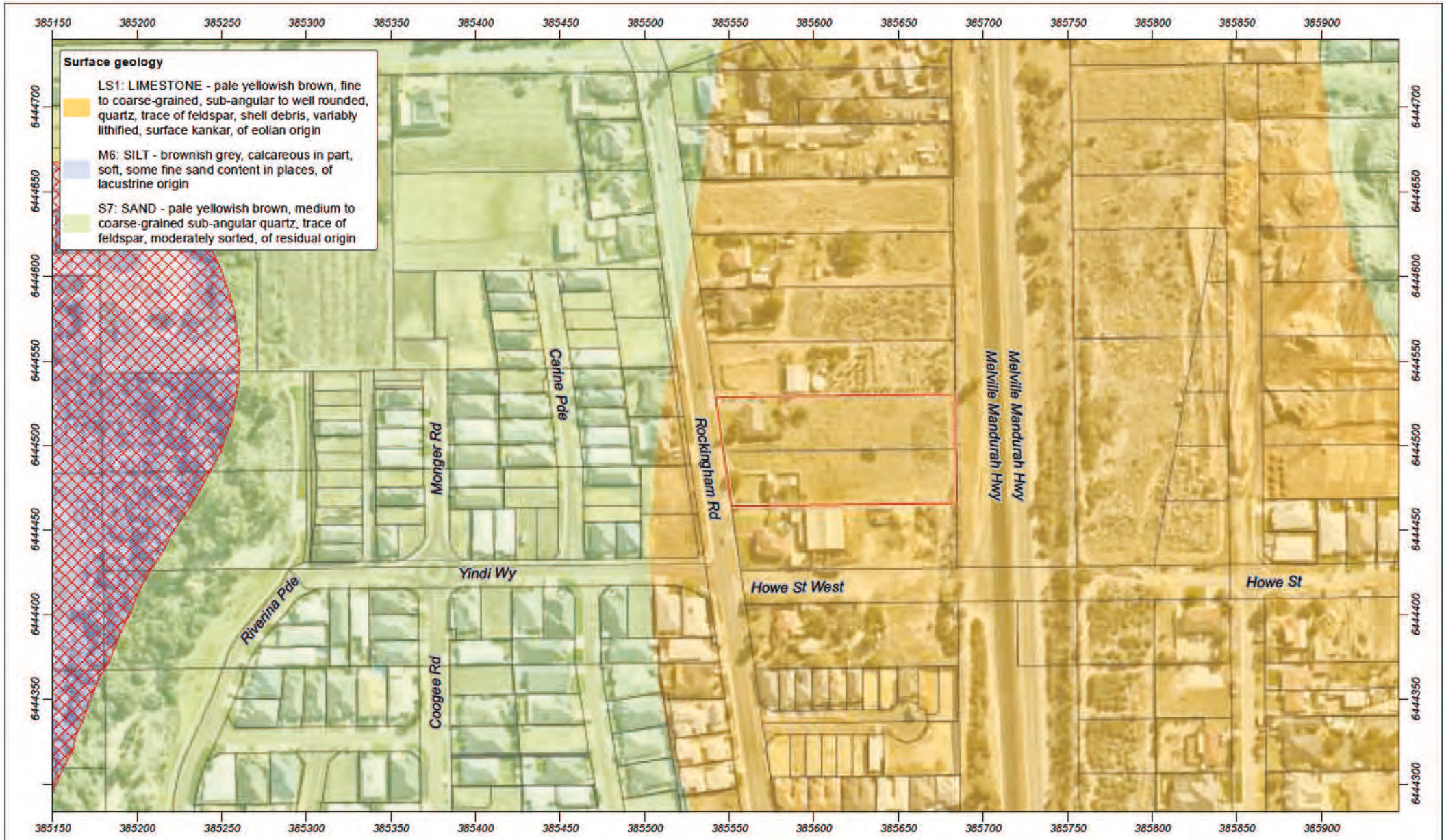

Figure 3: Surface geology and Acid Sulfate Soil risk

Scale 1:3,065 at A4

0 15 30 45 60 75 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 31/05/2017
Author: DWhite

Legend

Site boundary

Existing cadastre

ASS risk category

High to moderate risk

Source: Aerial: Nearmaps 04/2017; Site boundary: Client 05/2017 12_003_235D_SUBC_MUNSTER_(161128)_Default; ASS DER 2017; Geology: Fremantle 50K DMP 2017.

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3.3 Hydrology

The site's hydrological values do not represent a constraint to development.

3.3.1 Surface water

No surface water expressions are present within the site.

The soils are mapped as sand derived from limestone which generally has a high infiltration rate and consequently runoff from the site in a pre-development state would be limited. The topography indicates any stormwater would drain towards Bindjar Lake to the West of the site, identified as UFI 6369 on Figure 4. The City of Cockburn Intramaps identifies existing drainage in Yindi Way that drains towards Bindjar Lake. Post-development flows are also anticipated to drain towards Bindjar Lake.

The 1 in 1 year Average Return Interval event is anticipated to be managed through soakage on site. Larger events will be managed through the local drainage network. The drainage design will be developed at the subdivision stage in consultation with the City.

3.3.2 Flood potential

Based on the DoW Geographic Data Atlas mapping, the site is not located within the 100 year ARI floodplain mapping of rivers and major watercourses (DoW 2017). No risk of major flooding occurring within the site is expected and; therefore, the proposed residential development is not expected to be a constraint to development.

3.3.3 Wetlands

Geomorphic category wetlands

The Geomorphic Wetlands Swan Coastal Plain dataset (Landgate 2017) classifies wetlands in the Swan Coastal Plain by type, based on the characteristics of landform and water permanence. The Swan Coastal Plain wetlands have also been evaluated and assigned a management category that is used by the Environmental Protection Authority and Department of Planning and Infrastructure as a basis to guide planning and decision making.

No geomorphic wetlands have been identified within the site (Landgate 2017).

The nearest Conservation Category Wetland (CCW) is Lake Coogee (UFI 12394) located approximately 800 m southwest from the site (Figure 4).

Ramsar wetlands

The EPBC Protected Matters desktop review (search conducted 29 May 2017) indicates there is one declared Ramsar wetland (Wetlands of International Importance) present within 3 km of the site (DEE 2017a). The Ramsar wetland has been identified as the Forrestdale and Thomsons lakes located approximately 3 km southeast of the site (Figure 4).

The Forrestdale and Thomsons lakes are located hydraulically up-gradient from the site and; therefore, is not expected to pose a constraint to the proposed residential development.

3.3.4 Groundwater

The Perth Groundwater atlas indicates that the groundwater level at the site is approximately 10 to 18 m below ground level (mbgl) and flows in a westerly direction before discharging into Cockburn Sound.

The site is not located in the Perth Coastal and Gwelup Underground Water Pollution Control Area (UWPCA), proclaimed in 1973 under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*.

The proposed residential developments are considered compatible with the groundwater information available for the site.

3.4 Potentially contaminating activities

3.4.1 Previous land use

A desktop review was undertaken by Strategen from a selection of aerial imagery from 1953 to 2017 (Landgate 2017). Observations made from review of historical aerial photography of the site are outlined in Table 3.

Table 3: Historical land use interpreted from aerial photography of the site

Year	Detail
2017	Two residential buildings located in the western portion of the site. Vacant land for the balance of the site.
2015	Two residential buildings located in the western portion of the site. Vacant land for the balance of the site. Immediately south, evidence of caryard storage.
2010	Two residential buildings located in the western portion of the site. Vacant land for the balance of the site. Immediately south, evidence of caryard storage.
2000	Two residential buildings located in the western portion of the site. Vacant land for the balance of the site. Immediately south, evidence of caryard storage. West of the site there is evidence of market garden activities.
1995	Two residential buildings located in the western portion of the site. Vacant land for the balance of the site. Immediately south, evidence of caryard storage. West of the site there is evidence of market garden activities.
1985	Two residential buildings located in the western portion of the site. Vacant land for the balance of the site. Immediately south, evidence of caryard storage. West of the site there is evidence of market garden activities. Market garden activities present west of the site. Scattered areas of rubbish and/or vehicles immediately south of the site (aerial unclear).
1974	Two residential buildings located in the western portion of the site. Vacant land for the balance of the site. West of the site there is evidence of market garden activities.
1965	One residential building located in the western portion of the site. Vacant land for the balance of the site. Potentially some market garden activities in the northern portion of the site. West of the site there is evidence of market garden activities.
1953	Vacant cleared land. No buildings or infrastructure on the site.

Aerial photographs between 1953 and 1965 demonstrate potential market gardening activities in the north western portion of the site. However, the site has been vacant (with the exception of two residential buildings) since 1963–2017. As a result, no potential contaminating activities are expected to have impacted the site.

3.4.2 Surrounding land use and zoning

A summary of past and present surrounding land uses (within 500 m of the site) and present zonings are provided below in Table 4.

Table 4: Current and past surrounding land uses and current zoning of surrounding land

Use category	Surrounding location	Land use/zoning description
Current use	North of the site	Primarily vacant land, with trees and an established building
	East of the site	Stock Road, and vacant land
	South of the site	Residential building/storage yard
	West of the site	Rockingham Road and residential development
Current zoning under MRS	North of the site	Urban
	East of the site	Primary regional roads
	South of the site	Urban
	West of the site	Urban
Historical land use	North of the site	Market gardens (approximately 1953–1974)
	East of the site	Vacant land
	South of the site	Storage car yard/rural property
	West of the site	Market gardens (approximately 1953–1995)

There is no potential risk to development posed by historic and adjacent land uses.

3.4.3 DER Contaminated Sites Register database

The site is not classified as a confirmed contaminated site under the *Contaminated Sites Act 2003* (CS Act) based on review of the DER Contaminated Sites Register (Landgate 2017). The nearest confirmed contaminated site is located approximately 368 m west of the site (Lot 303 on Plan 36917) and is classified as 'Remediated for restricted use' under the CS Act. The Basic Summary of Records Search Response for this property demonstrated that Lot 303 on Plan 36917 (also known as 303 L Preston Drive, Munster) was historically a landfill from 1969 to the mid 1970s and was then used for horticulture. There is a potential for small volumes of asbestos to be present beneath a geotextile fabric warning barrier beyond a depth of 2 mbgl beneath the western half of this site. Chlorine and arsenic were also present in groundwater beneath the eastern boundary of the site during previous soil and groundwater investigations.

Another confirmed contaminated site (comprising approximately 148 parcels of land a portion of Lot 9003 on Plan 66326, a portion of Albion Avenue Road reserve and a portion of Hobsons Avenue Road reserve) is defined as Stage 2 of the Lake Coogee Estate Development. This confirmed contaminated site and is located approximately 513 m south of the site and was historically used historically been used for intensive agricultural purposes, including market gardens, for approximately 45 years, from the early 1950s to the mid 1990s. Previous investigations have identified heavy metals arsenic and zinc that are present in surface soils and low levels of the organochlorine pesticide DDE may be present in some surface soils. Groundwater also contains heavy metals and nutrients.

Both confirmed contamination sites are located hydraulically down-gradient of the site and; therefore, will not pose a constraint to the proposed residential development.

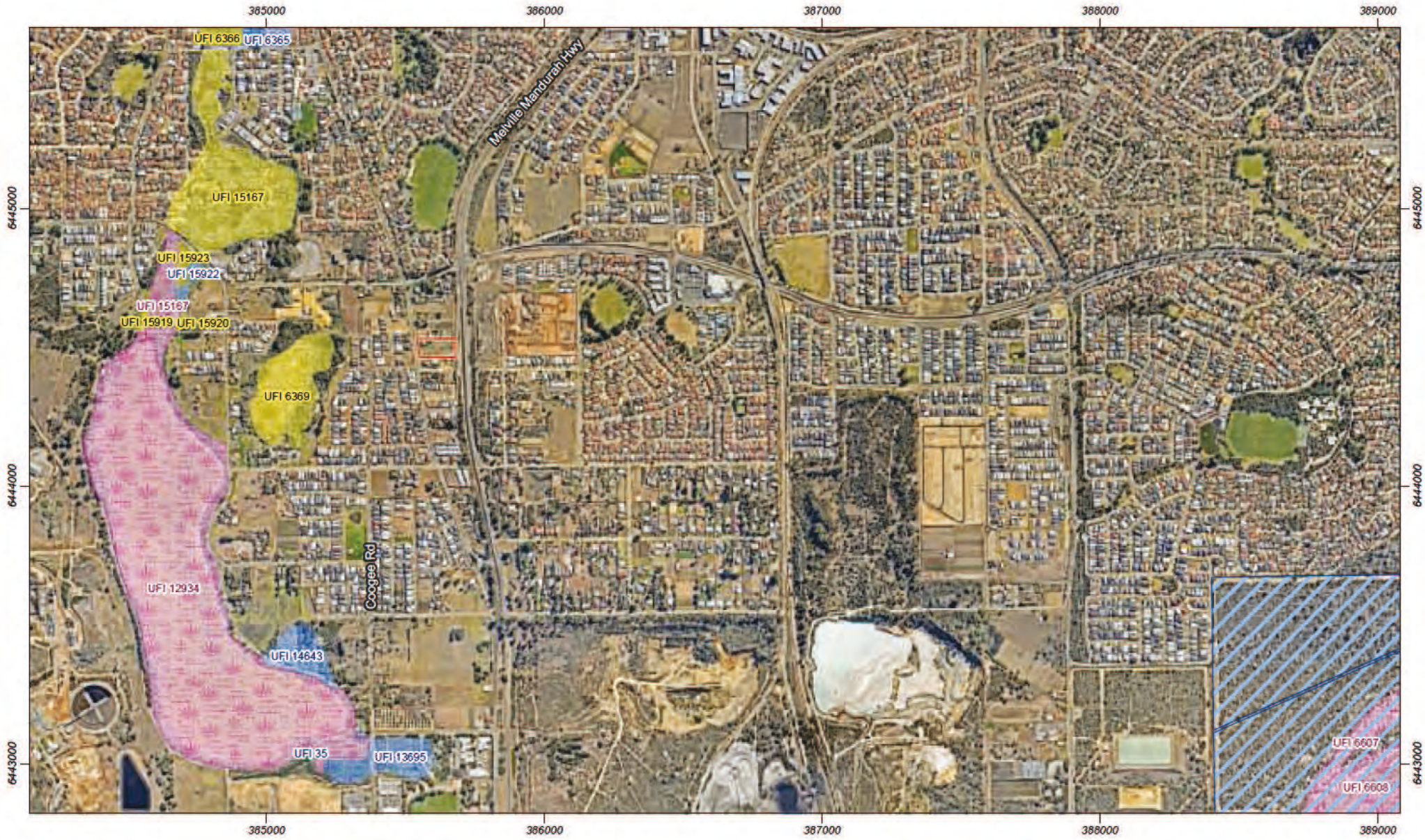

Figure 4: Geomorphic wetlands

Scale 1:19,000 at A4

0 100 200 300 400 500 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 2/06/2017
Author: DWhite
Source: Aerial: Nearmaps 04/2017: Site boundary: Client 05/2017 12_003_235D_SUBC_MUNSTER_(161128)_Default
Path: Q:\Consult\2017\PDE\PDE17243\ArcMap_documents\R002\Rev A\PDE17243_01_R002_RevA_F004.mxd

Legend

- Site boundary
- Ramsar wetland
- **Geomorphic wetland**
- Conservation
- Multiple Use
- Resource Enhancement

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3.5 Biodiversity and natural assets

The site currently comprises remnant vegetation, cleared areas and two existing residential buildings, reflecting the site's previous rural use.

3.5.1 Flora and vegetation

Regional vegetation

Vegetation occurring within the region was initially mapped at a broad scale (1:1 000 000) by Beard during the 1970s. This dataset has formed the basis of several regional mapping systems, including physiographic regions defined by Beard (1981); System 6 Vegetation Complex mapping undertaken by Heddle et al. (1980); the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia) for Western Australia (DEE 2017b).

Beard (1990) Botanical Subdistrict

The site occurs within the Drummond Botanical Subdistrict which is characterised by low *Banksia* woodlands on leached sands; Melaleuca swamps on poorly-drained depressions; and *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) woodlands on less leached soils (Beard 1990).

IBRA subregion

Interim Biogeographic Regionalisation for Australia (IBRA) divides Western Australia into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation (McKenzie *et al.* 2003). The site is located within the Swan Coastal Plain bioregion, which is dominated by woodlands of Banksia and Tuart on sandy soils, Sheoaks on outwash plains and Paperbarks in swampy areas (McKenzie *et al.* 2003).

System 6 mapping

System 6 mapping refers to vegetation mapping undertaken at a Vegetation Complex scale by Heddle *et al.* (1980). This is the primary source of information used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The site occurs within the Cottesloe complex–central and south which is described as:

- mosaic of woodland of *E. gomphocephala* and open forest *E. gomphocephala–E. marginate–E. calophylla;* closed heath on the limestone outcrops.

At a finer scale, the survey area falls within the Spearwood_998 vegetation system association (i.e. Medium woodland, tuart) as defined in Government of Western Australia (2016) (Figure 5).

The City of Cockburn has 19.15% of the Pre-European vegetation remaining, comprising approximately 4 464.34 ha (Table 5).

Table 5: Broad scale vegetation mapping

Broad scale mapping	Association	Pre-European (ha)	Current extent	% remaining	% remaining in Parks and Wildlife reserves
IBRA region	Swan Coastal Plain	1 501 221.93	578 432.17	38.53	10.20
Local government authority	City of Cockburn (Spearwood_998)	4 464.34	854.81	19.15	33.91
Beard vegetation mapping (1981)	Medium woodland; tuart (998)	50 867.50	18 523.20	36.41	12.01

Source: Government of Western Australia (2016)

Flora and vegetation values within the site

A desktop survey for Threatened and Priority flora that may potentially occur within 3 km of the site was undertaken using the DEE Protected Matters Search Tool (DEE 2017a). This search is presented in Appendix 1.

Conservation significant flora

A total of five conservation flora species were identified to potentially occur within 3 km of the site (Appendix 1). These species include:

- *Caladenia huegelii* (King Spider-orchid)
- *Diuris micrantha* (Dwarf Bee-orchid)
- *Diuris purdiei* (Purdie's Donkey-orchid)
- *Drakaea elastica* (Glossy-leafed Hammer Orchid)
- *Drakaea micrantha* (Dwarf Hammer-orchid).

The site has been predominately cleared, and the entire area is covered in exotic weeds and grasses (Plate 1 and Plate 2). No conservation significant flora is expected to occur within the site.

Threatened Ecological Communities

One threatened ecological community (TEC) was identified to potentially occur within 3 km of the site:

- Banksia Woodlands of the Swan Coastal Plain ecological community.

The site has been historically cleared, and comprises of exotic grasses (Plate 1 and Plate 2). No TEC exists within the site and; therefore, will not constrain the proposed subdivision of the site.

3.5.2 Fauna

Conservation significant fauna

A total of 45 threatened and 50 migratory fauna species were identified to occur within 3 km of the site (Appendix 1). Terrestrial conservation significant fauna identified to potentially occur within 3 km of the site comprise of:

- 27 bird species
- 2 mammals.

The site is located within known modelled distribution range for Carnaby's black cockatoo and Forest red-tailed black cockatoo, listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). However, the site has been historically cleared of native vegetation, and is currently comprised of exotic grasses (Plate 1 and Plate 2). No black cockatoo habitat values (i.e. foraging, roosting/breeding habitat) are expected to exist on the site.

Figure 5: Broad scale vegetation mapping

Plate 1: Exotic grasses covering the entire site (photo location: taken at the western boundary of the site facing northeast)

Plate 2: Exotic grasses covering the entire site (photo location: taken at the northeast corner boundary of the site facing southwest)

3.6 Bush Forever

Bush Forever Sites are considered regionally significant urban bushland areas and appropriate management of them is outlined in the draft Bushland Policy for the Perth Metropolitan Region Statement of Planning Policy No 2.8 (WAPC 2010).

There are no Bush Forever Sites within the site.

3.7 Heritage matters

3.7.1 Aboriginal heritage

A search of the DAA Aboriginal Heritage Inquiry System (DAA 2017) (search conducted 29 May 2017) identified no Registered Sites within the site. Nearest registered site is Lake Coogee (ID 20866) located approximately 252 m west of the site.

No other Heritage Places were identified the site.

3.7.2 European heritage

A search of the HCWA website identified seven state registered European heritage sites within Munster (HCWA & SHO 2016). The nearest Heritage Place from the site is 'Channel Marker & Trigonometric Beacon, Munster' (#10163) located approximately 2 km southwest of the site.

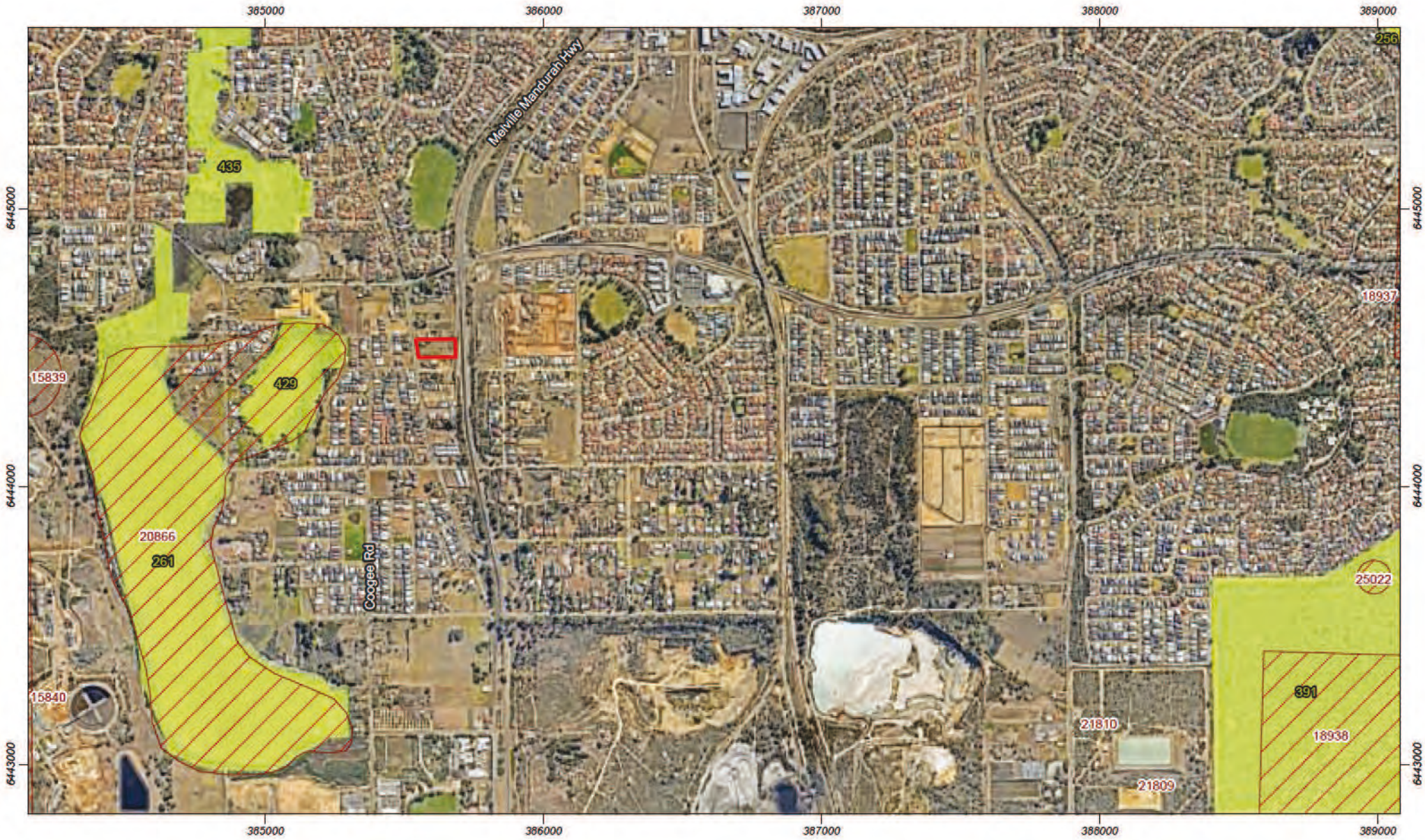

Figure 6: Bush Forever Sites and Heritage

Scale 1:19,000 at A4

0 100 200 300 400 500 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 2/06/2017
Author: DWhite
Source: Aerial: Nearmaps 04/2017: Site boundary: Client 05/2017 12_003_235D_SUBC_MUNSTER_(161128)_Default
Path: Q:\Consult\2017\PDE\PDE17243\ArcMap_documents\R002\Rev A\PDE17243_01_R002_RevA_F006.mxd

Legend

- Site boundary
- Aboriginal heritage - registered site
- Bush forever site

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4. Conclusions

The environmental values and attributes the site have been investigated as part of a desktop investigation to support the preparation of an LSP for the proposed subdivision.

The key findings and conclusions of the environmental assessment are as follows:

- no risk of ASS occurring within 3 m of the natural soil surface of the site and; therefore, no further investigations are required
- no conservation flora, fauna or black cockatoo habitat values present within the site
- historical land use (e.g. agricultural use and other human disturbance) has impacted the vegetation condition via the introduction and spread of weeds
- no Bush Forever sites occurring within the site
- no conservation significant wetlands occur within the site
- no registered Aboriginal sites or European heritage sites occur within the site.

Strategen considers environmental values identified in this desktop investigation do not pose a risk to the proposed subdivision.

5. References

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McKenzie NL, May JE and McKenna S 2003, *Bioregional Summary of the 2002 Biodiversity Audit of Western Australia*, Department of Conservation and Land Management, Perth.

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Appendix 1
EPBC Protected Matters Search
(DEE 2017a)

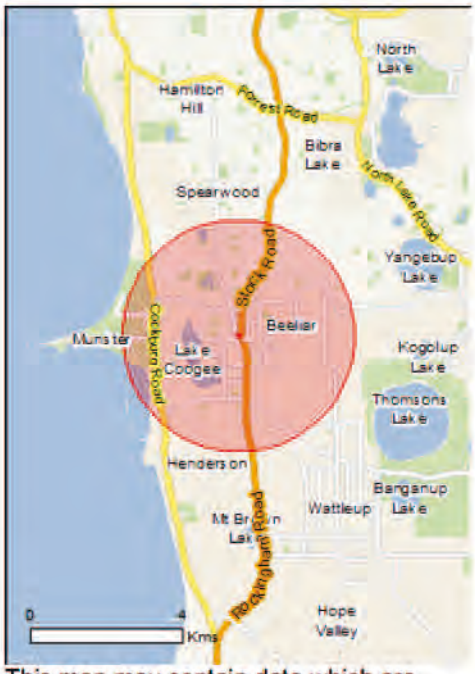
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

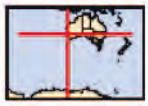
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 29/05/17 14:24:46



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 3.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	45
Listed Migratory Species:	50

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	81
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	42
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Forrestdale and thomsons lakes	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name

Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		

Name	Threatened	Type of Presence
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Unnamed WA42469	WA
Unnamed WA49220	WA

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern,		Species or species

Name	Status	Type of Presence
Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus asparagoides		habitat likely to occur within area
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] Asparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern [48993] Brachiaria mutica		Species or species habitat likely to occur within area
Para Grass [5879] Cenchrus ciliaris		Species or species habitat may occur within area
Buffel-grass, Black Buffel-grass [20213] Chrysanthemoides monilifera		Species or species habitat may occur within area
Bitou Bush, Boneseed [18983] Chrysanthemoides monilifera subsp. monilifera		Species or species habitat may occur within area
Boneseed [16905] Genista linifolia		Species or species habitat likely to occur within area
Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800] Genista sp. X Genista monspessulana		Species or species habitat likely to occur within area
Broom [67538] Lantana camara		Species or species habitat may occur within area
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Lycium ferocissimum		Species or species habitat likely to occur within area
African Boxthorn, Boxthorn [19235] Olea europaea		Species or species habitat likely to occur within area
Olive, Common Olive [9160] Opuntia spp.		Species or species habitat may occur within area
Prickly Pears [82753] Pinus radiata		Species or species habitat likely to occur within area
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] Protasparagus densiflorus		Species or species habitat may occur within area
Asparagus Fern, Plume Asparagus [5015] Protasparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern, Ferny Asparagus [11747] Rubus fruticosus aggregate		Species or species habitat likely to occur within area
Blackberry, European Blackberry [68406] Sagittaria platyphylla		Species or species habitat likely to occur within area
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483] Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		Species or species habitat likely to occur within area
Willows except Weeping Willow, Pussy Willow and		Species or species

Name	Status	Type of Presence
Sterile Pussy Willow [68497]		habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.13274 115.787018,-32.132742 115.788059,-32.133031 115.788061,-32.133318 115.788115,-32.133318 115.787152,-32.133153 115.787074,-32.13274 115.787015,-32.13274 115.787015,-32.13274 115.787018

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX C
TRANSPORT IMPACT STATEMENT

TRANSPORT IMPACT STATEMENT

No 588 & 590 Rockingham Road

Munster

October 2018

Rev B

kctt

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Rev A	25.05.2017	M Kleyweg	M Kleyweg	26.05.2017	Issued for review
Rev B	11.10.2018.	M Kleyweg	M Kleyweg	11.10.2018.	Amended as per comments

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Revision	Date of issue	Quantity	Issued to
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Author	Ana Nikolic / Nemanja Marijanovic
Project Director **Project Manager**	Marina Kleyweg
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Appendices

1. Executive Summary

- The proposed subdivision plan area is located on lots 36 and 35 (No. 588 & 590) Rockingham Road, Munster. It is fronting Rockingham Road to the west, Stock Road to the east, lot 37 to the north and lot 34 to the south. These lots are currently occupied by two single residential units. The proposed development consists of 24 residential lots ranging from 210-308m².
- The total traffic generated by the subdivision plan area is estimated to be 218 vehicular movements per day, 19 vehicular movements in both peak hours. Traffic generated by the two existing residential units is already included in existing traffic counts, therefore, total impact of the proposed development on the surrounding network is 198 vehicular movements per day.
- The main desire lines between structure plan land uses and external attractors / generators are:
    - To / from the north via Rockingham Road; and
    - To / from the south via Rockingham Road.
- There will be 2 roads within the subdivision plan area. Both roads are proposed – Road 1 and Road 2 (extension of existing Howe Street West).
- Crash statistics have shown that number of crashes per million vehicle kilometres travelled is higher than the network average on Rockingham Road in the vicinity of the proposed development. Only property damage crashes were recorded in last 5 years. As this area becomes more urbanised, operating speeds are expected to lower which is likely to reduce crash density on this stretch of the road.
- South Coogee Primary School is located about 750 metres from the subject land. The subject land is within Development Area 5 (DA 5).
- The existing road network has sufficient capacity to cater for the proposed development.

2. Transport Impact Statement

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2.1. Location

Street Number / Lot Number	No 588 & 590 (Lots 36 and 35 respectively)
Road Name/s	Rockingham Road
Suburb	Munster
Description of Site	The site is currently occupied by two single residential units. The proposed development fronts lots 37 and 34 (to the north and to the south respectively), Rockingham Road to the west and Stock Road to the east. The subdivision plan shows 24 residential lots ranging in size from 210m² – 308m².

2.2. Technical Literature Used

Local Government Authority	City of Cockburn
Type of Development	Residential
Are the R-Codes referenced?	YES
If YES, nominate which:	State Planning Policy 3.1 Residential Design Codes 2015 R-Codes (incorporating amendments gazetted on 23/10/15)
Is the NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses) referenced?	YES
Which WAPC Transport Impact Assessment Guideline should be referenced?	Volume 3 – Subdivision Volume 5 – Technical Guidance
Are there applicable LGA schemes for this type of development?	YES
Number of Scheme	No. 3
Name of Scheme	City of Cockburn – Local Planning Scheme (Updated to include AMD 121 GG 09/05/17)

2.3. Land Uses

Are there any existing Land Uses within the Subdivision Plan Area?	YES
If YES, nominate:	Two single residential units
Existing land uses surrounding the subdivision	Residential

Proposed Land Uses

How many types of land uses are proposed?	One
Nominate land use type and yield	Residential – 24 lots ranging from 210-308m²
Is there any proposed staging of the Subdivision Plan Area?	NO
If YES, nominate:	
Are the proposed land uses complimentary with the surrounding land-uses?	YES

2.4. Local Road Network Information

How many existing roads are there within the Subdivision Plan Area?	No existing roads.

Name of Other Roads within 800km radius of site, or roads likely to take increased traffic due to the development:

Road 1

Road Name	**Rockingham Road**
Number of Lanes	One lane each direction
Road Reservation Width	Approximately 10m
Road Pavement Width	Approximately 20m
Classification	Significant Urban Local Road / Distributor B
Speed Limit	60kph
Bus Route	YES – Route 549
On-street parking	NO

Road 2

Road Name	**Stock Road** (listed as Melville Mandurah Highway on MRWA)
Number of Lanes	Two lanes each direction, separated by median
Road Reservation Width	Approximately 70m
Road Pavement Width	Approximately 20m (10m each direction)
Classification	Urban Highway / Primary Distributor
Speed Limit	80kph
Bus Route	YES – Route 549
On-street parking	NO

Road 3

Road Name	**Mayor Road**
Number of Lanes	One lane each direction
Road Reservation Width	Approximately 20m
Road Pavement Width	Approximately 7.5m
Classification	Significant Urban Local Road / Distributor B
Speed Limit	60kph
Bus Route	YES – Route 532
On-street parking	532

Road 4

Road Name	**Beeliar Drive**
Number of Lanes	One lane each direction
Road Reservation Width	Approximately 20m
Road Pavement Width	Approximately 8m
Classification	Significant Urban Local Road / Distributor B
Speed Limit	60kph
Bus Route	YES – Routes 530, 531, 532
On-street parking	NO

2.6. Traffic Volumes

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)				Heavy Vehicle %	Year	
			AM Peak Time	AM Peak VPH	PM Peak Time	PM Peak VPH	*If HV count is Not Available, are HV likely to be in higher volumes than generally expected?*	Date of Traffic Count	*If older than 3 years multiply with a growth rate*
Rockingham Road	North of Beeliar Drive	9,654	08:00	774	15:00	773	8.1%	Oct 2016	N/A
	South of Beeliar Drive	7,076	07:45	571	16:30	589	5.9%		
	100m North of Stock Road*	4,174	N/A	N/A	N/A	N/A	7.0%	May 2015	N/A
Stock Road (Melville Mandurah Highway)	South of Beeliar Drive	25,518	07:15	2,428	15:45	2,582	13.3%	Oct 2016	N/A
Mayor Road	East of Fawcett Road	6,902	08:00	502	16:30	525	5.9%	Oct 2016	N/A
Beeliar Drive	East of Stock Road	13,921	07:30	1,038	16:15	1,150	8.6%	May 2014	N/A
	120m West of Stock Road*	11,004	N/A	N/A	N/A	N/A	7.0%	Mar 2016	N/A
West Churchill Avenue	240m West of Coogee Road*	896	N/A	N/A	N/A	N/A	5.8%	Mar 2017	N/A
East Churchill Avenue	150m West of Watson Road*	705	N/A	N/A	N/A	N/A	4.0%	Apr 2015	N/A
Watson Road	210m North of East Churchill Road*	1,484	N/A	N/A	N/A	N/A	6.4%	May 2016	N/A
	60m South of Beeliar Drive*	2,346	N/A	N/A	N/A	N/A	7.4%	May 2016	N/A

Note Traffic Data obtained from City of Cockburn Intramaps*

2.7. Vehicular Crash Information

Is Crash Data Available on Main Roads WA website? YES

If YES, nominate important survey locations:

Location 1 Intersection of Rockingham Road – Yindi Way & Howe Street West

Location 2 Rockingham Road [SLK 6.73 – 7.05]

Road Name	SLK	Functional Classification	Road Hierarchy	Speed Limit	Crash Statistics			
					No of KSI Crashes (Fatal + Hospital)	No of Medical Attention Crashes	No of PDO Major Crashes	No of PDO Minor Crashes
Intersection of Rockingham Road / Yindi Way / Howe Street West	N/A	Significant Urban Local Road / Urban Local Road /	Distributor B / Access Road / Access Road	60kph / 50kph / 50kph	0	0	1	0

		Urban Local Road						
Rockingham Road	6.73 -7.05	Significant Urban Local Road	Distributor B	60kph	0	0	3	3
No of MVKT Travelled at Location					7,200*365*5yrs*0.32 = 4.2 MVKT			
KSI Crash Rate					0 KSI crashes per 4.2 MVKT = 0 KSI crashes / MVKT.			
Other Crash Rate					6 crashes per 4.2 MVKT = 1.43 crashes / MVKT			
Comparison with Crash Density and Crash Rate Statistics					1.43 crashes / MVKT is higher than network average of 0.91 crashes / MVKT.			
Justification					Although the analysed average is higher than the network average, KCTT believes that there are no major safety risks in this area. In 5-year period there were 6 Property Damage Only crashes. Having this in mind this was mostly unbuilt area enabling drivers to drive at higher speeds than the speed limit, we believe the urbanisation of the area will in fact reduce risks.			

The following table shows the Crash Density and Crash Rates on Metropolitan Local Roads as obtained from Main Roads WA on the 21th October 2016 by email request: -

CRASH DENSITY AND CRASH RATE ON METROPOLITAN LOCAL ROADS NETWORK ONLY

	ALL CRASHES		KSI CRASHES (FAT+HOS)	
	DENSITY ALL CRASHES/KM over 5 years	CRASH RATE/MVKT	DENSITY KSI CRASHES/KM over 5 years	CRASH RATE/MVKT
LOCAL - MIDBLOCK	3.29	0.91	0.15	0.04
LOCAL - ALL	7.16	1.99	0.31	0.09

NOTE: BASED ON 5-YEARS DATA FOR THE PERIOD 2011 TO 2015.

2.8. Public Transport Accessibility

How many bus routes are within 400 metres of the subject site?	Four
How many rail routes are within 800 metres of the subject site?	None

Bus Route	Description	Peak Frequency	Off-Peak Frequency
530	Cockburn Central Station – Fremantle Station via Yangebup Road	10 minutes	60 minutes
531	Cockburn Central Station – Fremantle Station via Marvell Avenue & The Grange	10 minutes	60 minutes
532	Cockburn Central Station – Fremantle Station via Beeliar Drive	10 minutes	60 minutes
549	Fremantle Station – Rockingham Station via	10 minutes	60 minutes

Rockingham Road &
Kwinana Town Centre

Walk Score Rating for Accessibility to Public Transport.

Transit Score – 44. Some Transit. A few nearby public transportation options.

Is the development in a Greenfields area? NO

2.9. Pedestrian Infrastructure

Describe existing local pedestrian infrastructure within a 400m radius of the site:

Classification	Road Name
'Other Shared Path'	Rockingham Road (North of Beeliar Drive); Beeliar Drive (East of Rockingham Road); Mayor Road (West of Rockingham Road); Riverina Parade
'High Quality Shared Path'	Beeliar Drive (East of Stock Road)
Unclassified Pedestrian Paths	Rockingham Road (South of Beeliar Drive); West Churchill Road
Does the site have existing pedestrian facilities	NO
Does the site propose to improve pedestrian facilities?	YES

If YES, describe the measures proposed.

Please refer to Section 2.21. for Road Cross-Sections.

What is the Walk Score Rating?

Walk Score – 26. Car-dependent. Most errands require a car.

2.10. Cyclist Infrastructure

Are there any Cycling Routes within an 800m radius of the subject site?	YES
Classification	**Road Name**
'Other Shared Path'	Rockingham Road (North of Beeliar Drive); Beeliar Drive (East of Rockingham Road); Mayor Road (West of Rockingham Road); Riverina Parade; Fawcett Road (South of Mayor Road); Coogee Road
'High Quality Shared Path'	Beeliar Drive (East of Stock Road)
'Bicycle Lanes or Sealed Shoulder Either Side'	Beeliar Drive (East of Stock Road); Stock Road
'Good Road Riding Environment'	West Churchill Road; East Churchill Road; Mayor Road; Watson Road; Coogee Road; Condgon Avenue

Are there any Cycling Routes within a 400m radius of the subject site?	YES
Classification	**Road Name**
'Other Shared Path'	Rockingham Road (North of Beeliar Drive); Beeliar Drive (East of Rockingham Road); Mayor Road (West of Rockingham Road); Riverina Parade
'High Quality Shared Path'	Beeliar Drive (East of Stock Road)
'Bicycle Lanes or Sealed Shoulder Either Side'	Beeliar Drive (East of Stock Road); Stock Road
'Good Road Riding Environment'	West Churchill Road; East Churchill Road; Mayor Road;
Does the site have existing cyclist facilities?	NO
Does the site propose to improve cyclist facilities?	NO

2.11. Vehicular Parking

Local Government	City of Cockburn
Reference Document Utilised	R-Codes

Description of Parking Requirements:

Residential: *" The following minimum number of on-site car parking spaces is to be provided for each single house, grouped dwelling and special purpose dwelling comprising the following number of bedrooms: Location B: 1 bedroom dwelling = 1 car parking space 2 + bedroom dwelling = 2 car parking spaces On-site visitor's car parking spaces for grouped and multiple dwelling developments provided at a rate of one space for each four dwellings, or part thereof in excess of four dwellings, served by a common access."*

Justification

The only use within the development is residential therefore it is expected that most residences will provide parking on the premises in accordance with R Codes.

Have Vehicle Swept Paths been checked for Parking?	N/A

2.12. Parking Surveys

Was a parking survey required?	NO

2.13. Bicycle Parking

Local Government	City of Cockburn
Reference Document Utilised	City of Cockburn Local Planning Scheme No. 3

Description of Parking Requirements:

City of Cockburn does not stipulate requirements for the provision of bicycle parking for single dwellings.

Justification

It is assumed that residents in the area will store their bicycles and equipment within their respective dwellings.

2.14. ACROD Parking

Class of Building	Class 1a - a detached house or one of a group of two or more dwellings separated by a fire resisting wall, including a row house, terrace house, town house or villa unit.
Does this building class require specific provision of ACROD Parking?	NO

2.15. Delivery and Service Vehicles

Justification

It is expected that delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking spaces given that they can operate safely within the road reserve. All intersections and temporary turnarounds at ends of development stages will be designed to suit the turning circle requirements of delivery and service vehicles.

2.16. Calculation of Development Generated / Attracted Trips

What are the likely hours of operation?	For residential land uses, the hours of operation are not applicable.
What are the likely peak hours of operation?	AM 08:00 to 09:00 PM 17:00 to 18:00
Do the development generated peaks coincide with existing road network peaks?	YES
If YES, Which:	Both AM (entirely) and PM (partially)
Guideline Document Used	WAPC Transport Assessment Guidelines for Developments - Volume 5
Rates from above document:	**Residential** - 0.8 vehicle trips per dwelling for the AM and PM peak hours. A 25% IN / 75% OUT split has been adopted for the AM peak and a 67% IN / 33% OUT split for the PM peak hour.
Guideline Document Used	NSW RTA Guide to Traffic Generating Developments
Rates from above document:	**Residential** - The NSW RTA Guide to Traffic Generating Developments suggests developments of this type in Sydney tend to generate between 4 and 5 vehicular trips per dwelling for medium to high density developments. In Perth, the Department of Planning and Infrastructure conducted a series of studies in the late 1990's / early 2000's which showed that higher density dwellings tended to average closer to 5.5 vehicle

trips per day. These studies assumed that anywhere between 50% and 70% of commuters were travelling to the work by car as a driver. KCTT propose to use a more conservative average of 9 vehicular trips per day per residence, given that within 800m of the proposed development there are not many job, education and shopping opportunities.

Base data for trip calculation (daily trips)	9 vehicular trips per dwelling
Base data for trip calculation (AM peak trips)	0.8 vehicular trips per dwelling (25% IN / 75% OUT)
Base data for trip calculation (PM peak trips)	0.8 vehicular trips per dwelling (67% IN / 33% OUT)

Land Use Type	Rate above	Yield	Daily Traffic Generation	Peak Hour Traffic Generation
Residential	9 vehicular trips per dwelling	24 lots	216 VPD	19 VPH
Total - The Proposed Development			**216 VPD**	**19 VPH**

Does the site have existing trip generation / attraction?	YES
No of Daily Trips	2 residential units * 9 VPD = 18 VPD
No of AM Peak Hour Trips	2 residential units * 0.8 VPD = 2 VPD
No of PM Peak Hour Trips	2 residential units * 0.8 VPD = 2 VPD
What is the total additional traffic on the surrounding road network?	**198** vehicular trips per day. **17** vehicular trips per peak hour.
What is the total impact of the new proposed development?	Moderate impact.

2.17. Trip Purposes

Determine the likely percentage share for different trip purposes based on the land usage.

Land Use	Employment	Shopping	Education	Social / Recreational
Residential	40%	25%	17.5%	17.5%

2.18. Expected Origin / Destination

Name the closest existing major residential generators and non-residential attractors of traffic and the distance from the boundaries of the Subdivision Plan Area.

Residential	Employment 40%	The economic profile in the City of Cockburn shows that according to the latest census that 64.1% of the city's resident's travel outside the area for work while the remaining 24.3% both live and work within the area (Work location unknown for 11.6%) • Cockburn (C) – 24.3% • Melville (C) – 9.5% • Fremantle (C) - Remainder – 7.7% • Canning – 6.4% • Perth (C) – Inner – 6.1%

	• POW State/Territory Undefined – 4.3% • Perth (C) – Remainder – 4.1% • POW No Fixed Address – 4.0% • Fremantle (C) - Inner – 3.0% • Other – 30.6% Excluding work from home, there are not many other job opportunities within 800m of the proposed development.
Shopping 25%	• Beeliar Village is located approximately 1km to the east from the proposed development
Education 17.5%	• South Coogee Primary School (750m to the east of the proposed development) • St Jerome's Primary School (1km to the north of the proposed development) • Coogee Primary School (1.5km to the west of the proposed development • South Metropolitan TAFE-ACEPT Campus (1.5km to the south of the proposed development)
Social / Recreational 17.5%	• There are several parks within 800m of the development (Santich Park, Radonich Park); Coogee Lake is approximately 1km to the west from the development; Indian Ocean is only 2.5km to the west from the development; Thompsons Lake Nature Reserve is approximately 3km to the east.

2.19. Traffic Flow Distribution onto External Road Networks

How many **routes/ movements** are available for access / egress to the site?	2
Route 1	
Provide details for Route No 1 / Road No 1	To the North via Rockingham Road
Percentage of Vehicular Movements via Route No 1 / Road 1	80% (173 VPD)
Route 2	
Provide details for Route No 1 / Road No 1	To the South via Rockingham Road
Percentage of Vehicular Movements via Route No 1 / Road 1	20 % (43 VPD)

2.20. Road Safety

Are sight distances adequate at proposed intersections? YES

Justification

In order to navigate intersections in the vicinity of the subject site, vehicles must reduce operating speed to a maximum of 20km/h (if not stop fully), therefore the requirements for ASD and SISD are not applicable. A review of the plan for the proposed development indicates there are sufficient sight distances for safe traffic movements.

2.21. Proposed Internal Road Network

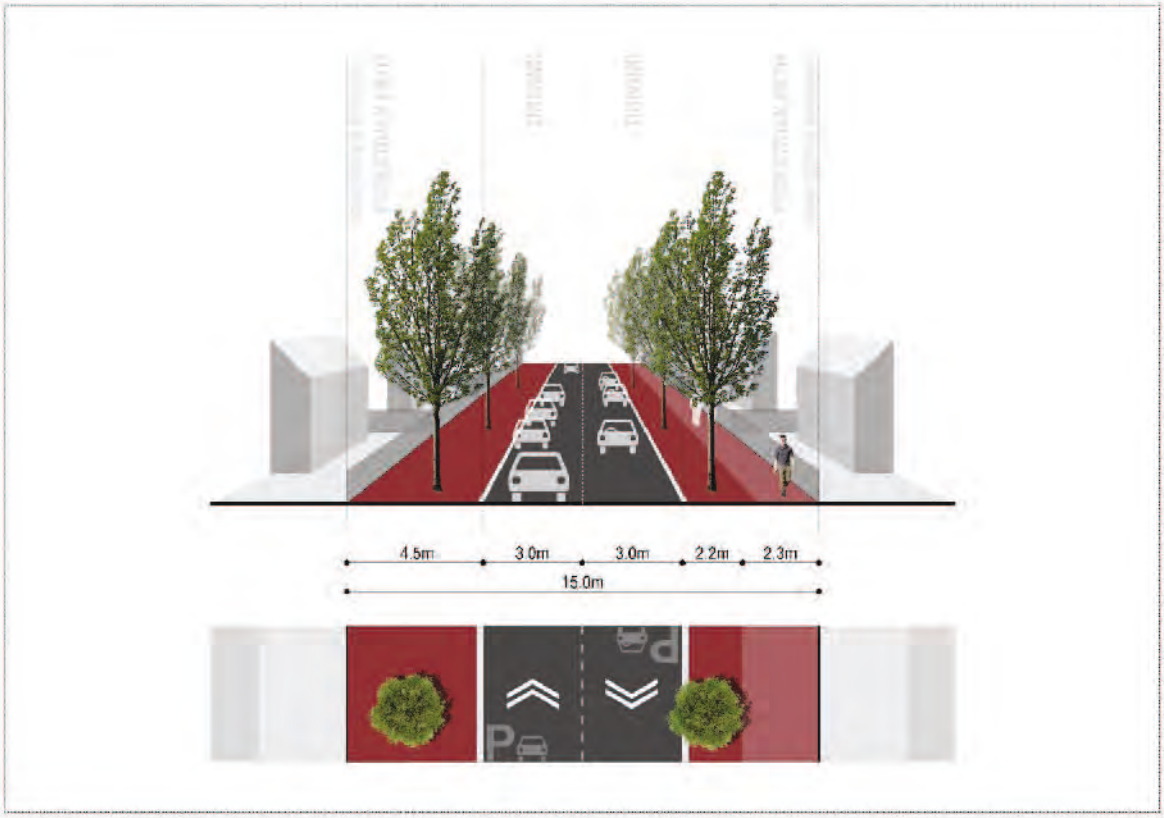
Guideline Document used as reference: Liveable neighbourhoods

How many proposed roads are there within the Subdivision Plan Area?	2

Name of Roads within the Subdivision Plan Area / Road Classification and Description:

Type 1	**"Access Street D"**
Name of Roads	Road 01, Road 02 (Extension of Howe Street West)
Projected Traffic Volumes	<1,000
Proposed Number of Lanes	1 per direction
Proposed Road Reservation Width	15m
Proposed Road Pavement Width	3m per traffic lane
Proposed Median Width	no median
Proposed Pedestrian / Cyclist / Shared Path Width	2.3m Pedestrian Path (on one side only)
Proposed Speed Limit	50km/h (30km/h-target speed)
Proposed Bus Route Extension / Introduction	NO
If YES Nominate Bus Routes	n/a
Proposed On-street parking	NO

Provide graphics of the proposed internal road cross section within the Subdivision Plan Area



2.22. Proposed Intersection Controls

Intersection 1

Name	Road 01 – Rockingham Road

Proposed Intersection Control	Sign Controlled (Give-way)
Intersection 2	
Name	Howe Street – Rockingham Road
Proposed Intersection Control	Sign Controlled (Give-way)

2.23. Proposed Internal Transport Networks

Are there any changes / additions to the existing road network?	YES
If YES, nominate:	One new road (Road 1) and extension of Howe Street West (Road 2).
Were there any discussions / agreements with MRWA regarding intersections with, or direct access onto roads under their jurisdiction?	NO
If YES, nominate:	N/A
Are there any pedestrian / cycle networks and crossing facilities proposed for the roads within the Subdivision Plan Area?	YES. Please refer to Section 2.21 for Road Cross-sections.
Were there any discussions / agreements with the local authority over local road networks and pedestrian and cycle facilities?	NO
If YES, nominate:	
Were there any discussions / agreements with PTA / Transperth on new bus services or extensions / alterations to existing bus services to serve the Subdivision Plan Area?	Not at the time of writing the Rev A report.
If YES, nominate:	N/A

2.24. Changes to External Transport Networks

Are there any proposed changes of the road network?	YES
If YES, nominate:	MRS stipulates road reservation widening of Stock Road, which impacts the proposed development's lots. As it can be seen in Appendix 1 – the layout of the proposed development, this change has been considered.
Are there any proposed changes of the intersection controls?	NO
If YES, nominate:	N/A
Are there any proposed changes of the pedestrian / cycle networks and crossing facilities?	NO
Are there any proposed changes of the public transport services?	N/A

2.25. Integration with Surrounding Area

Are there any existing major residential generators of traffic within a minimum of 800 metres from the boundaries of the Subdivision Plan Area?	NO. All major residential generators of traffic are outside the 800 metres from the boundaries of the Subdivision Plan area.
If YES, nominate:	N/A
Are there any existing major non-residential attractors of traffic within a minimum of 800 metres from the boundaries of the Subdivision Plan Area?	YES
If YES, nominate:	Beeliar Village is just outside the 800m radius from the Subdivision Plan area.
Identify any proposals for major changes to the land uses within 800 metres of the boundaries of the Subdivision Plan Area.	N/A
What are the main desire lines between the Subdivision plan land uses and these external attractors / generators?	Via Rockingham Road and Beeliar Drive from the proposed development to Beeliar Village.
Will the existing transport networks, plus any proposed changes, adequately match these desire lines, particularly for pedestrians, cyclist and public transport users?	YES
Identify any deficiencies or areas for improvement in the surrounding transport networks and/or areas where improvements could be made.	N/A
Propose remedial measures to address these deficiencies.	N/A

2.26. Analysis of Transport Networks

Determine the year(s) for assessment and the time period(s) for the traffic flow analysis.	2018 (expected time of completion) 2028 (10 years after completion)
Determine Subdivision plan generated traffic.	216 VPD (198 VPD of additional traffic on the surrounding network). Refer to Section 2.16.
Determine annual growth rate for the base traffic	This is mostly an undeveloped area. Therefore, KCTT propose using 4% as annual growth rate.
Determine the base, i.e. without Subdivision plan, flows on the surrounding road network. These are to be factored up to the Subdivision plan assessment year(s).	Rockingham Road – 7,076 VPD – 2016 7,653 VPD – 2018 11,329 VPD – 2028
Assess extraneous (through) traffic i.e. existing traffic passing through the site on existing roads and/or the proposed road network attracting traffic from surrounding roads for the Subdivision plan assessment year(s).	N/A

Determine the design traffic flows (i.e. total traffic) by adding the extraneous traffic to the Subdivision plan generated traffic.	N/A
Determine the total traffic flows on the external road network by adding the Subdivision plan generated traffic to the above base flows.	Rockingham Road – 7,274 VPD – 2016 7,851 VPD – 2018 11,527 VPD – 2028
Identify all schools within the Subdivision plan area and those within 800 metres of the Subdivision plan area.	The only primary school, 750 metres from the Subdivision plan area is South Coogee Primary School.
Identify the most likely walk and cycle routes to each school from the catchment areas.	Current path to primary school: - Rockingham Road; - Beeliar Drive; - Watson Road; - Congdon Avenue. Since walkable distance to the school is more than 10-minute walking distance from the proposed development from the proposed development, it is likely that the residents will use only passenger vehicles and buses to go the school.

2.27. Site Specific Issues and Proposed Remedial Measures

How many site specific issues need to be discussed?	1
Site Specific Issue	Proximity to schools
Remedial Measure / Response	Currently, the walkable distance to all schools is more than 10-minute walking distance from the proposed development. However, lots 35 and 36 are part of Development Area 5 of the City of Cockburn Local Planning Scheme No 3, for which a Structure Plan has not been prepared yet. It can be expected that there will be at least one primary school as this area grows.

APPENDIX D
STORMWATER DRAINAGE STRATEGY

STORMWATER DRAINAGE STRATEGY

588 & 590 Rockingham Road,

Munster

July 2017

Revision B

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CONTENTS

Appendices

HISTORY AND STATUS OF THE DOCUMENT AND DISTRIBUTION

Revision	Date issued	Reviewed by	Approved by	Revision Type	Issued To
Rev A	09/06/2017	L. Harris	C Kleyweg	Issued for Information	Chris Lewis- Progress Developments
Rev B	25/07/2017	L. Harris	C Kleyweg	Issued for Information	Lia Roberts - TBB Planning

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Author	Lachlan Harris
Project Manager	Lachlan Harris
Name of the Project	588 & 590 Rockingham Road, Munster
Name of the Document	588 & 590 Rockingham Road, Munster SDS
Document Version	Rev B

1. INTRODUCTION

KCTT have been requested to provide a Stormwater Drainage Strategy (SDS) for the potential development of 588 & 590 Rockingham Road, Munster. The subject site comes under the jurisdiction of the City of Cockburn. The drainage strategy proposed herein is structured around the City of Cockburn's Stormwater Management requirements.

The SDS has been broken down into the following sections:

- Section 1 Introduction (including the report layout, the relevant design standards and objectives for this project, and information for the proposed development);
- Section 2 Relevant standards and strategy objectives;
- Section 3 Existing site characteristics;
- Section 4 Catchment areas for drainage calculations;
- Section 5 Stormwater drainage calculations; and
- Section 6 Stormwater management strategy.

1.1 Scope of Works

The drainage strategy for the management of stormwater runoff for the proposed development is based on the basic hydrologic processes occurring over the subject landholding. This SDS assesses the design storm recommended by the City of Cockburn that will guide more detailed design processes at later stages (20% AEP). The SDS places focus on connectivity into the City of Cockburn's current drainage infrastructure.

The suitability and design of the stormwater drainage system is dependent on the existing characteristics for the subject site. Part of developing this strategy includes the assessment of the following:

- Groundwater Levels;
- Topography;
- Soil Conditions; and
- Existing Stormwater Drainage Infrastructure and Overland Flow Areas.

To access this information, KCTT have performed a desktop analysis, utilising the following information:

- Dial Before You Dig (DBYD);
- Aerial Imagery (Nearmap);
- City of Cockburn Intramaps;
- Water Corporation ESInet Platform;
- Perth Groundwater Atlas;
- Landgate mapping; and
- Department of Water Hydrogeological and Geographic Data Atlas.

2. RELEVANT STANDARDS AND STRATEGY OBJECTIVES

KCTT have developed the SDS to be in compliance with the requirements of the City of Cockburn's Stormwater Management requirements.

This strategy has been completed based on the Modified Preliminary Concept Plan completed by Taylor Burrell Barnett Planning and Design on the 20th of May 2017. Please note that the information provided herein is a concept plan for stormwater management of the proposed development and not a detailed design. A detailed design is to be undertaken on acceptance of the concept put forth and is to be certified by a practicing Hydraulic Engineer. KCTT advises that further investigation into the site conditions including but not limited to; a geotechnical soil investigation and feature survey shall be conducted prior to commencing a detailed design or commencing construction. The detailed design phase will also include consideration for the integration of the system with building components, inclusive of designing guttering, downpipes and capturing all roof flows as well as impervious flows on the site.

2.1 City of Cockburn Requirements

As per the requirements provided by the City of Cockburn, soakage pits for the disposal of stormwater runoff (roof water or surface water) need to be constructed such that the distance from all buildings and boundaries must be not less than the depth of the soakwell (measured from ground level). This has been considered generally in the Stormwater Drainage Strategy however will assume greater importance in the detailed design phase.

All stormwater runoff up to and including a 20% AEP (1 in 4.48 year ARI) event is required to be drained/disposed of within an underground pit system as close to the source as possible ensuring that roads and parking areas remain trafficable. Stormwater runoff volumes occurring between a 20% AEP (1 in 4.48 year ARI) and 1% AEP (1 in 100 year ARI) events must be contained within the road however are allowed to be retained and conveyed above ground. With runoff generated in the 1:1 ARI (1 EY) required to be treated prior to entering any conveyance system.

2.2 Assumptions

- Rainfall data has been sourced from the Bureau of Meteorology website for the coordinates of the subject site obtained from Nearmaps, latitude = -32.130124, and longitude of 115.787158.
- The functionality of the proposed system is dependent on the drainage system being free from blockage and that the subsequent design of the system components is compliant with the relevant Australian Standards, and the Building Code of Australia.

3. EXISTING SITE CHARACTERISTICS

KCTT have undertaken desktop investigations to aid in the assessment of the sites' ability to manage stormwater. The general topographic features of the study area as well as local gradients within the study area have been assessed to determine the overland flow paths for runoff generated in events greater than the 1 in 100 year ARI event (1% AEP).

3.1 Topography and Proposed Levels

The existing topography of the subject site grades down from east to west as demonstrated in Figure 1 below. As a feature survey was not available at the time of writing this report, online mapping tools (Perth Groundwater Atlas and Landgate Mapping) were utilised to determine the general topography of the site. The site slopes at a grade of approximately 6.7% from the eastern boundary at approximately 19m AHD to approximately 10m AHD at the western boundary. KCTT advise that a feature survey should be carried out prior to conducting detailed design due to the grades across the site.

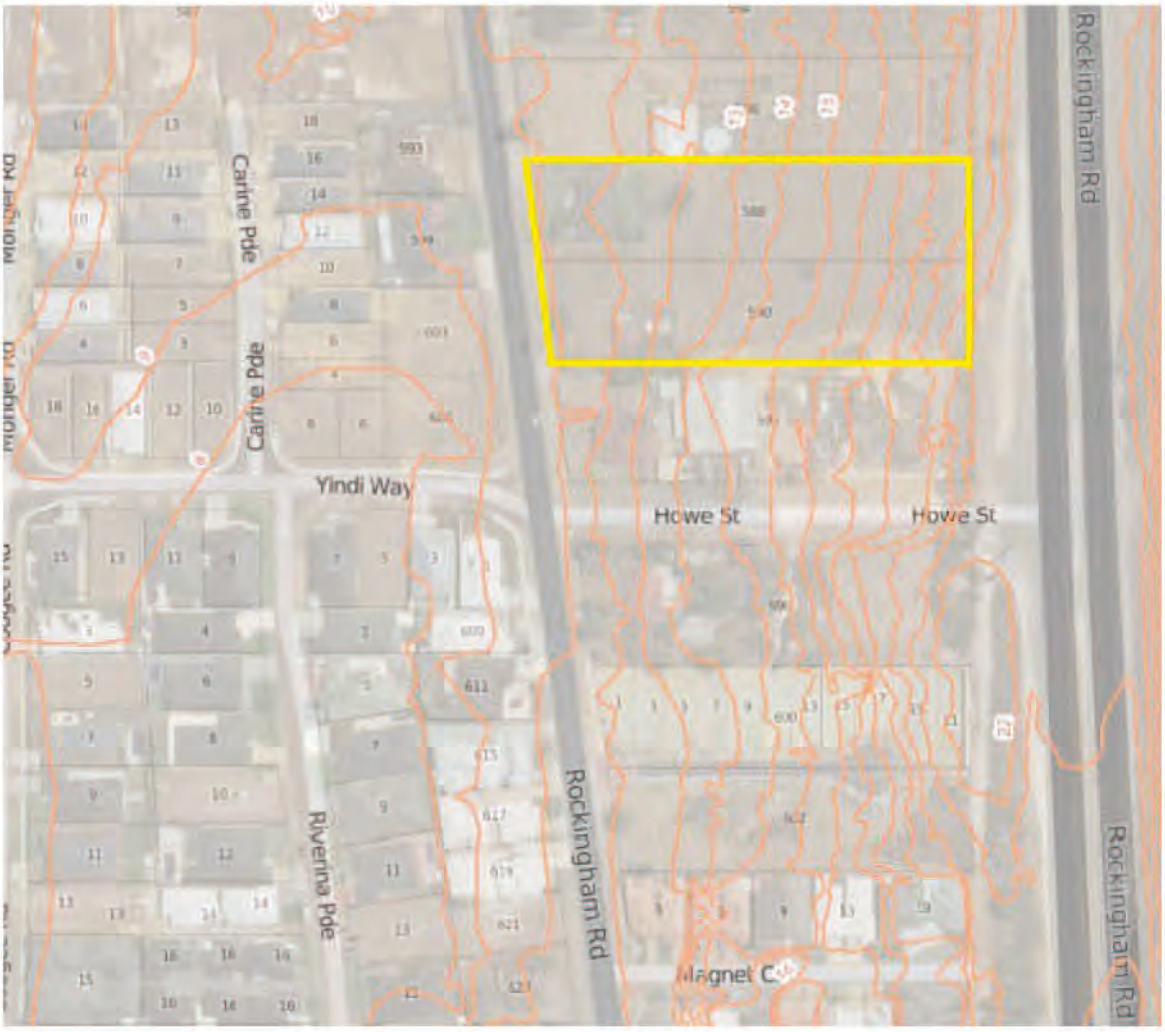


Figure 1: Existing Contours and Site Locality Plan

3.2 Groundwater Levels

Preliminary desktop investigations utilising the Perth Groundwater Atlas (demonstrated in Figure 2a and 2b) suggest that across the site the minimum separation between average annual mean groundwater levels (AAMGL) and the surface level is 8.8m and the maximums is 17.7m. During winter months, the groundwater level marginally rises, however, KCTT do not view this as an issue given the excavation requirements do not result in a significant reduction in the ground surface height. A minimum distance of 500mm is required between the bottom of a soak well and groundwater to allow adequate infiltration. This will be achieved in this development.

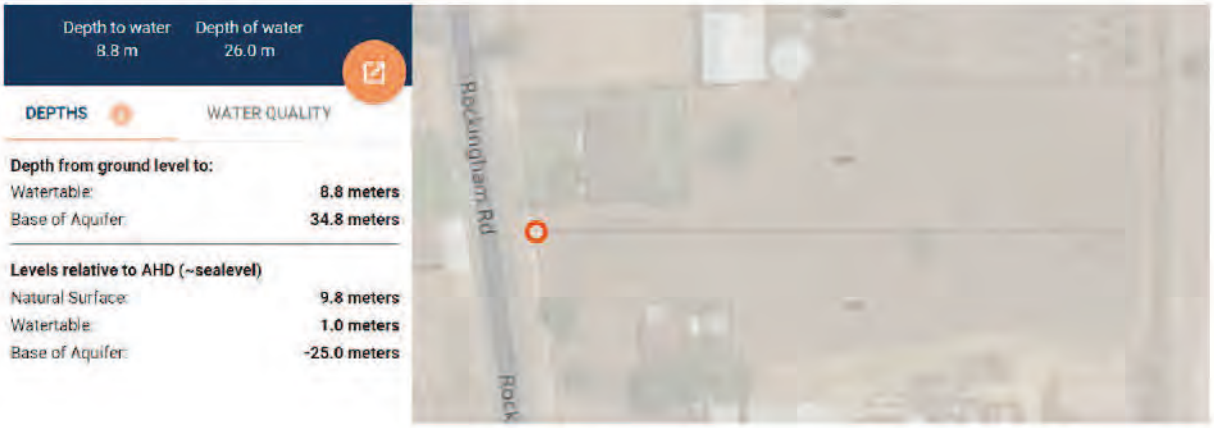


Figure 2(a): Depth to Groundwater

Figure 2(b): Depth to Groundwater

3.3 Soil Conditions

A geotechnical report was not available at the time of writing this report and KCTT have thus utilised online mapping tools (Perth Groundwater Atlas and Landgate Mapping) for conducting desktop research on the likely soil conditions of the site. Figure 3 and 4 below demonstrate that the soil type present is expected to be Tamala Limestone which

is predominantly calcarenite with a low risk of acid sulphate soils being present. Generally, in our experience these types of soils are free-draining and are suitable for infiltration of surface waters and for drainage systems that use soak wells or other forms of underground storage. KCTT believe that a geotechnical report should be conducted prior to commencing detailed design to confirm the likely rates of infiltration in the soil sub-strata.

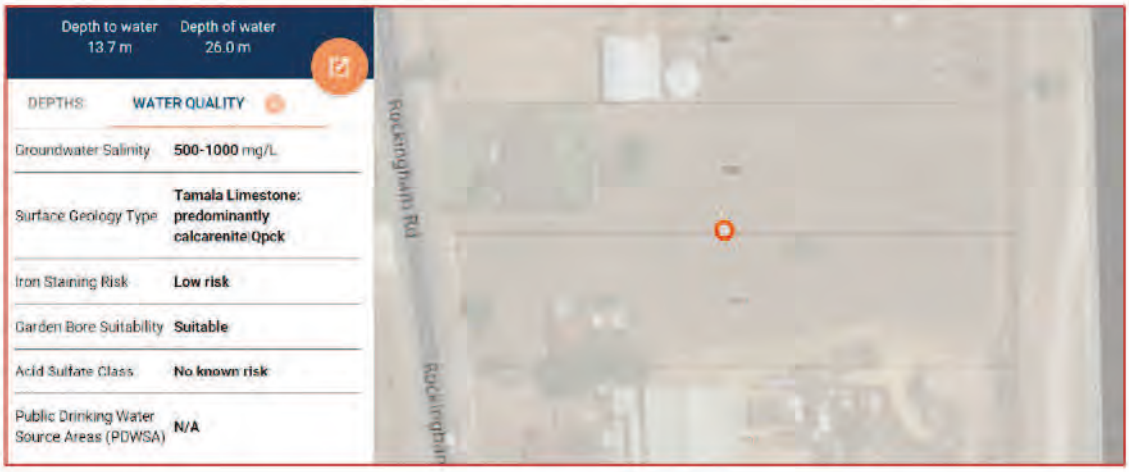


Figure 3: Expected Soil Conditions

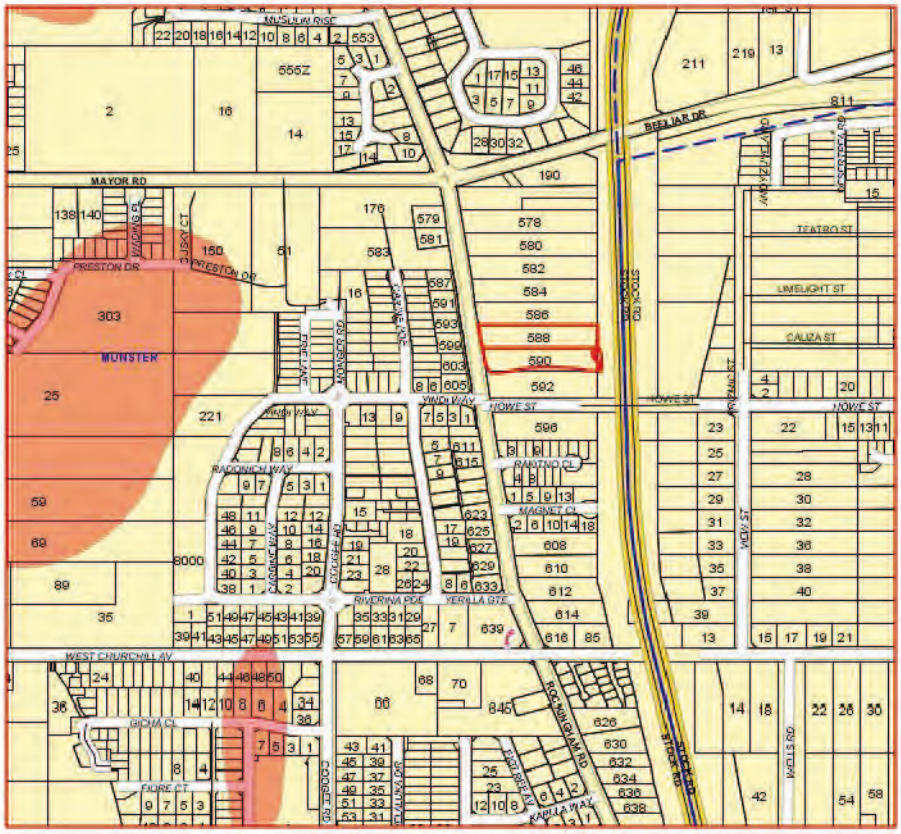


Figure 4: Expected Acid Sulphate Risk

4. CATCHMENT AREAS

The catchment areas for the calculation of drainage requirements for the proposed development have been illustrated in the sketch shown in Appendix B.

For the purpose of this strategy and in the absence of detailed information about roof grades, KCTT have assumed that the cross fall of the roads to be 3%, with the longitudinal grade of Road 1 = 6% and Road 2 = 2%. The total catchment area has been determined by considering the development's road reserve areas for calculating the total volume of stormwater runoff. When undertaking concept and detailed design, the catchment area may be adjusted where necessary.

Lot runoff will be disposed of onsite via soak wells and the MRS road widening runoff will be captured by the Stock Road drainage system

Table 1 - Catchment Details (588 & 590 Rockingham Road, Munster)

Catchment	Area (m^2)	Coefficient of Runoff (1 year)	Coefficient of Runoff (5 years)	Coefficient of Runoff (100 years)
Road 1 - A	375	0.9	0.9	1.00
Road 1 - B	375	0.9	0.9	1.00
Road 1 - C	475.5	0.9	0.9	1.00
Road 1 - D	475.5	0.9	0.9	1.00
Road 2 - E	388.5	0.9	0.9	1.00
Road 2 - F	388.5	0.9	0.9	1.00
Lots	6128	N/A	N/A	1.00
MRS Road Widening	164	N/A	N/A	N/A
Total Catchment Area	**8860**			

5. STORMWATER DRAINAGE CALCULATIONS

This Stormwater Drainage Strategy provides the stormwater drainage calculations for the purpose of understanding the likely volume and direction of stormwater flows. One of the first steps in hydrologic design is the determination of the rainfall events to be used. KCTT have determined that the critical storm duration for the 20% AEP is the 6-hour (360min) event.

The IFD curves and tables have been sourced from the Bureau of Meteorology and provide the time rate of precipitation for a given duration of rainfall event, for a particular frequency of occurrence. The rainfall calculations and subsequent flow rates for the subject site have been provided in Appendix D, which both serve to support the rational judgment used for the values used in the design.

KCTT have utilised the following storm data for the calculations involved in developing the stormwater drainage strategy:

Table 2 – Storm Data (Retrieved from Bureau of Meteorology IFD Charts)

ARI Event	Duration (hr)	Intensity (mm/hr)
63.2% (1:1)	6	5.6
20% (1:4.48)	6	7.94
5% (1:20)	6	10.9
1% (1:100)	6	15.1

Due to the absence of a geotechnical investigation and report of the subject site assumptions made include:

- Infiltration occurs in events up to and including the 1:20 ARI.
- For 1:100 ARI events, the ground is saturated and therefore no infiltration will occur.

6. CONCLUSIONS

KCTT have developed a Stormwater Drainage Strategy that complies with the relevant Australian Standards and regulatory requirements inclusive of the City of Cockburn's drainage requirements, and suits the existing site characteristics to effectively manage the runoff generated in 1, 5, 20 and 100-year ARI events. Storm events up to a 20% AEP, 1-hour event will be managed by soakage pits, with run off exceeding this directed to the Rockingham Road reservation where it will be managed as per the city's stormwater management system, as approved by the City of Cockburn.

Runoff generated from road reserve areas in the 20% (1:4.48 ARI) event is to be captured and infiltrated in soakage pits with Combined Side Entry Pit lids.

As the existing drainage system in Rockingham Road does not have sufficient capacity to allow for lot connection pits, the lots will be required to store and infiltrate runoff for events up to and including the 5% AEP (1:20 ARI), 5 min duration onsite.

Table 3 – Minimum Soakage Pit Requirements

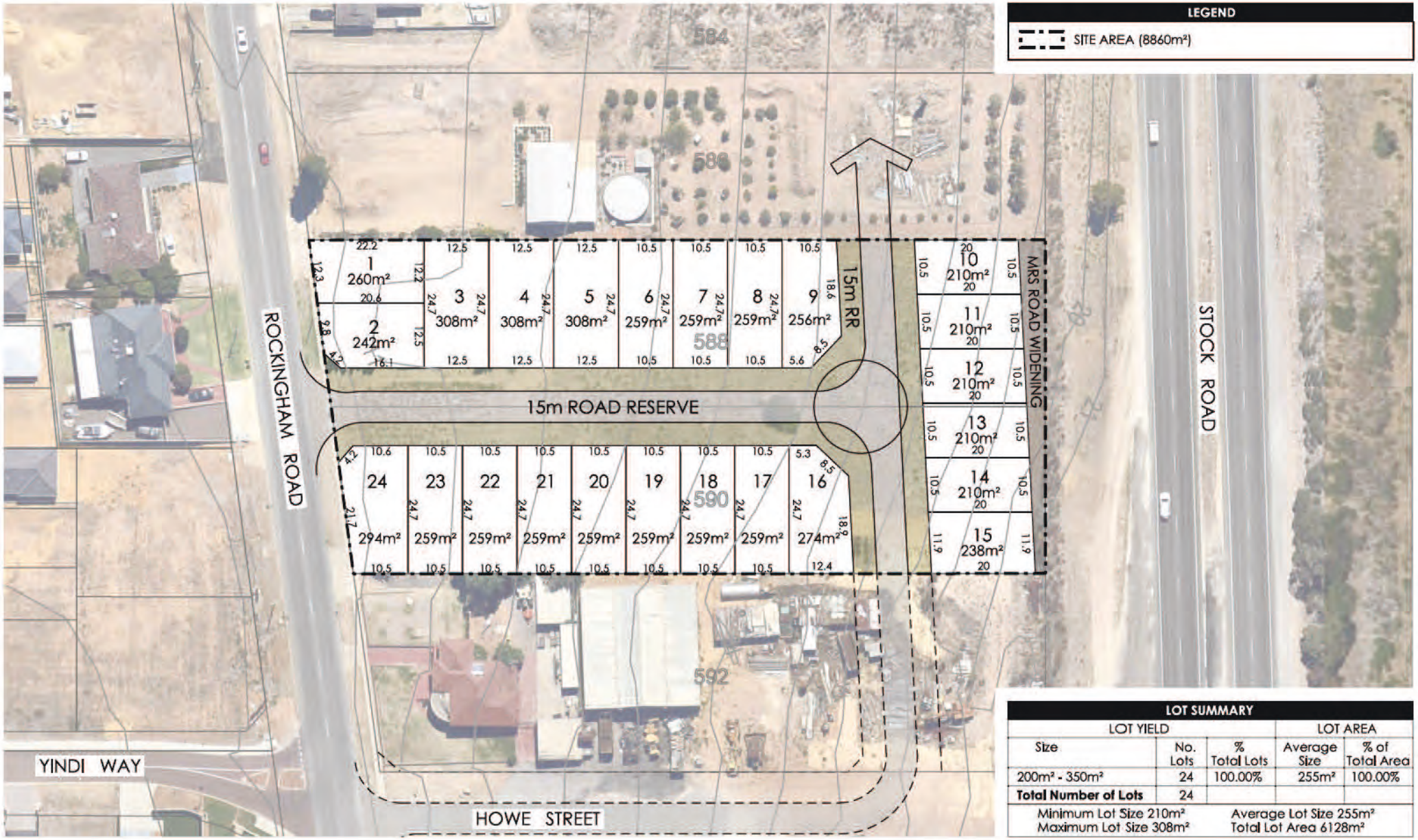
Catchment	Catchment Area (m^2)	Runoff Generated (m^3)	Storage Provided (m^3)
A	375	2.02	2.12
B	375	2.02	2.12
C	475.5	2.56	2.65
D	475.5	2.56	2.65
E	388.5	2.10	2.12
F	388.5	2.10	2.12
Total	**2,478**	**13.37**	**13.78**

The stormwater drainage strategy plan may be observed in Appendix C. Further detail will be provided at detailed design stage of development.

Given the existing topography and insitu soil, the Post Development runoff for the 1% AEP (1:100-year event) is expected to be equivalent to the Pre-Development runoff and so runoff would be expected to follow existing overland flow paths to nearby wetlands to the west adjacent to Riverina Parade. On this basis and review the existing road network surrounding the subject site, the overland flow path has been determined and can be seen in appendix E.

Appendix A

Preliminary Concept Plan



LOT SUMMARY

LOT YIELD			LOT AREA	
Size	No. Lots	% Total Lots	Average Size	% of Total Area
200m² - 350m²	24	100.00%	255m²	100.00%
Total Number of Lots	24			

Minimum Lot Size 210m² | Average Lot Size 255m²
Maximum Lot Size 308m² | Total Lot Area 6128m²

Modified Preliminary Concept Plan

LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

DRAFT

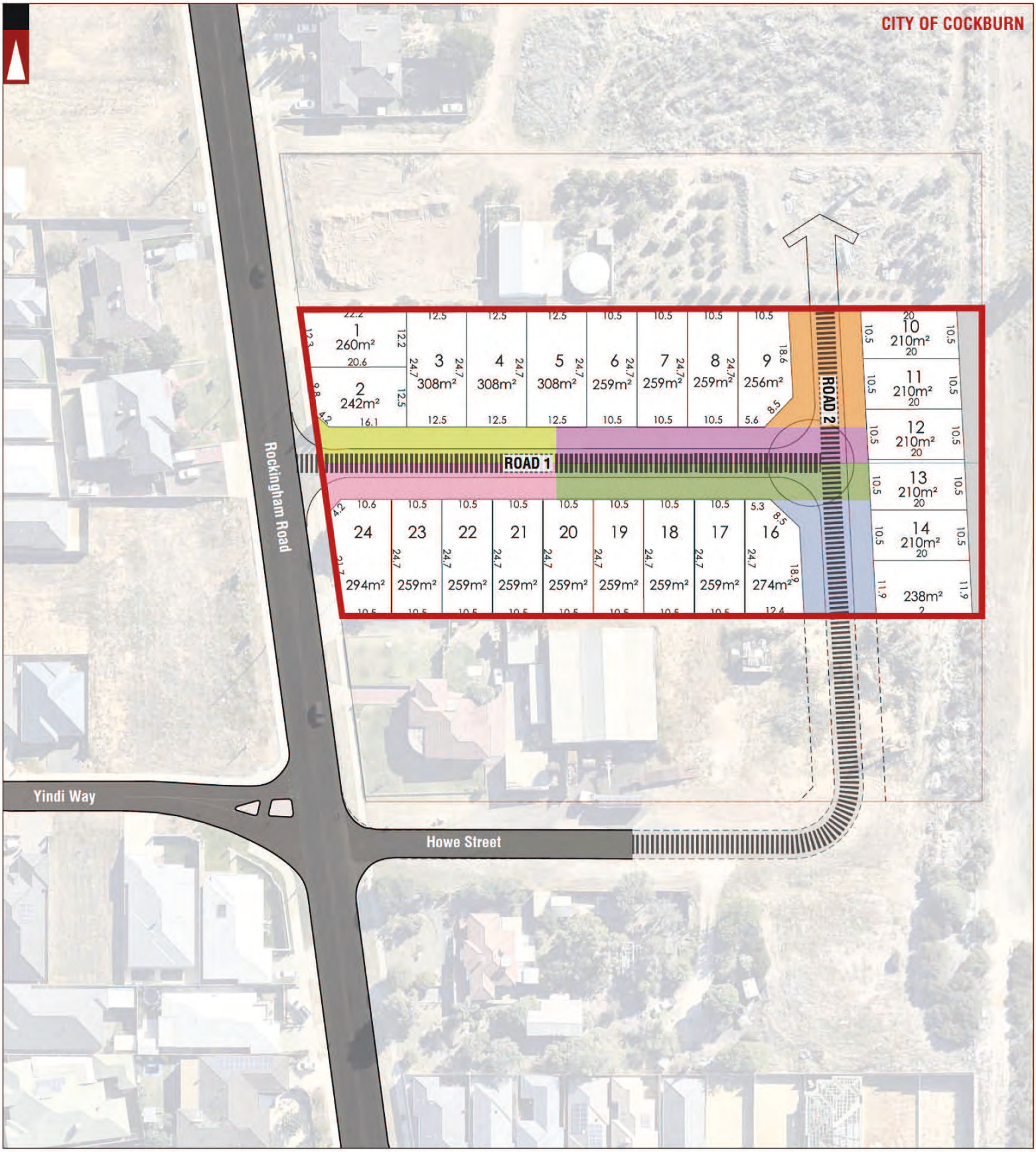
plan: 12/003/235D | designed: ME | scale: 1:1000@A4 | 1:500@A2
date: 28/11/2016 | checked: BDM
projection: PCG 94 | drawn: NM

Taylor Burrell Barnett Town Planning & Design
187 Roberts Road Subiaco Western Australia 6008
p: (08) 9382 2911 f: (08) 9382 4586 e: admin@tbbplanning.com.au

Appendix B

Concept Stormwater Drainage Catchment Plan

CITY OF COCKBURN



LOCATION BOUNDARY
ROAD (VARIED WITH ROAD WIDTH)
PROPOSED ROAD
Yindi Way ROAD NAME
ROAD 1 PROPOSED ROAD NAME

CATCHMENT AREA A
CATCHMENT AREA B
CATCHMENT AREA C
CATCHMENT AREA D
CATCHMENT AREA E
CATCHMENT AREA F

NOTE: THE PLAN IS COURTEOUSY OF TAYLOR BURRELL BARNETT TOWN PLANNING & DESIGN

LEGEND

Certified System
Quality ISO 9001
SAI GLOBAL

No	DATE	AMENDMENT
A	08-06-2017	ISSUED FOR REVIEW

PROJECT: LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

TITLE: CATCHMENT AREA PLAN

DRAWING NUMBER: KC00652.000_ S001

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
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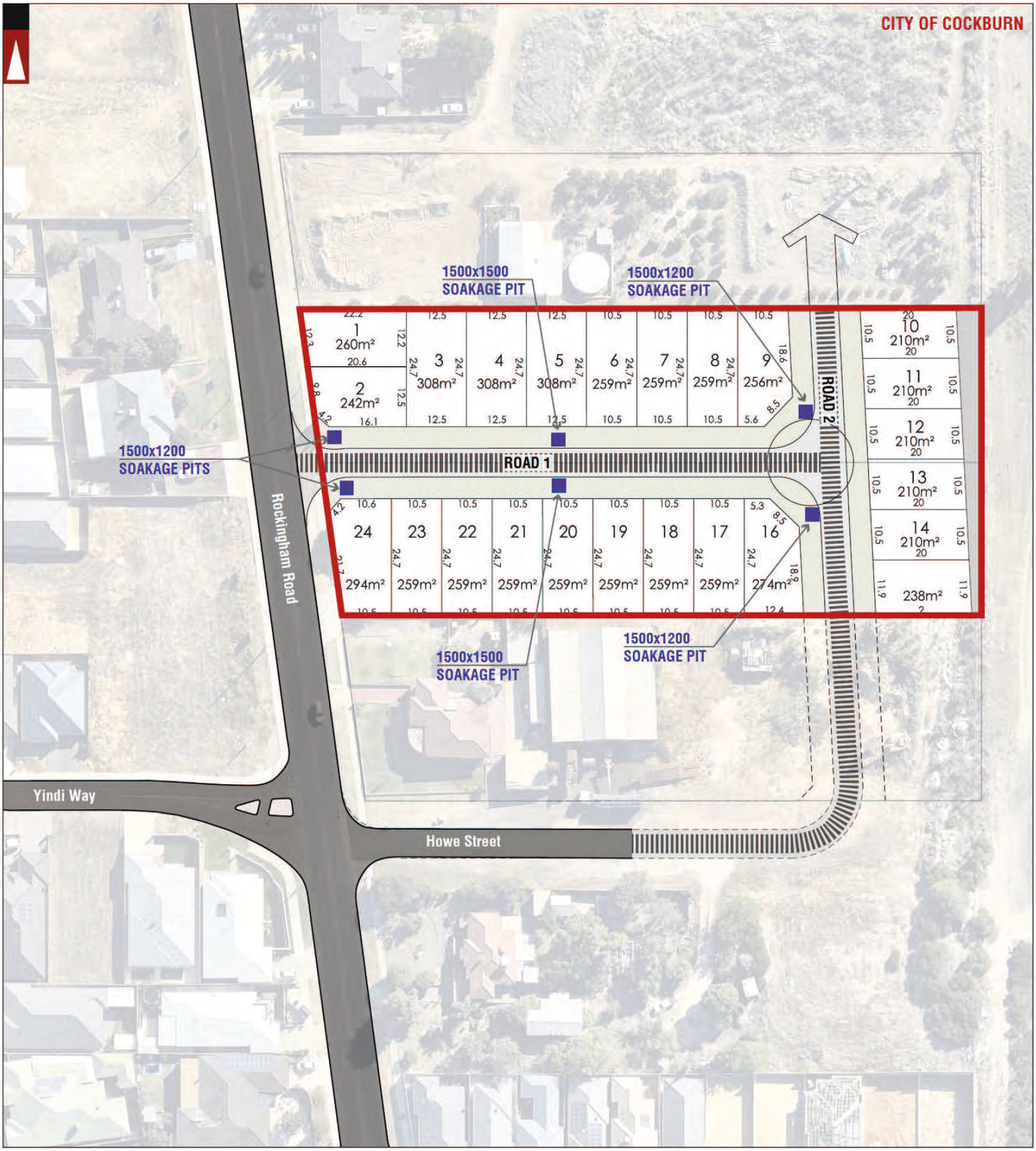
Appendix C

Concept Stormwater Drainage Catchment Plan



LOCATION BOUNDARY

ROAD (VARIED WITH ROAD WIDTH)

PROPOSED ROAD

Yindi Way ROAD NAME

ROAD 1 PROPOSED ROAD NAME

SOAKAGE PITS

NOTE: THE PLAN IS COURTEOUSY OF TAYLOR BURRELL BARNETT TOWN PLANNING & DESIGN

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
B	27-07-2017	DESIGN AMMENDED
A	08-06-2017	ISSUED FOR REVIEW

PROJECT: LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

TITLE: STORMWATER DRAINAGE PLAN

DRAWING NUMBER: KC00652.000_ S002

DRAWN BY: J.S.

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Appendix D

Design Calculations

Hydrograph Calculations

DATE: 24/07/2017

PROJECT: Lot 588 & 590 Rockingham Road, Munster SDS

OUR REF: KC00652.000

TYPE OF WORK INTENDED: Stormwater Drainage Strategy

Rev: A

CRITICAL STORM

6 hours 7.94 mm/hr

Period	Hyetograph		Depth (mm)		Time (hrs)	IL = 15mm	CL = 5mm/30min	Runoff (mm)
1	3.6	3.6%	47.64	1.71504	0.5	-13.285	0	0
2	7.8	7.8%	47.64	3.71592	1	-9.56904	0	0
3	11.4	11.4%	47.64	5.43096	1.5	-4.13808	0	0
4	25	25.0%	47.64	11.91	2	7.77192	2.77192	2.77192
5	16	16.0%	47.64	7.6224	2.5	7.6224	2.6224	2.6224
6	8.2	8.2%	47.64	3.90648	3	3.90648	-1.09352	0
7	6.7	6.7%	47.64	3.19188	3.5	3.19188	-1.80812	0
8	6.7	6.7%	47.64	3.19188	4	3.19188	-1.80812	0
9	4.7	4.7%	47.64	2.23908	4.5	2.23908	-2.76092	0
10	5.7	5.7%	47.64	2.71548	5	2.71548	-2.28452	0
11	2.7	2.7%	47.64	1.28628	5.5	1.28628	-3.71372	0
12	1.5	1.5%	47.64	0.7146	6	0.7146	-4.2854	0

	Catchment						
Time (hrs)	A	B	C	D	E	F	
0.5	0	0	0	0	0	0	
1	0	0	0	0	0	0	
1.5	0	0	0	0	0	0	
2	1.04	1.04	1.32	1.32	1.08	1.08	
2.5	0.98	0.98	1.25	1.25	1.02	1.02	
3	0	0	0	0	0	0	
3.5	0	0	0	0	0	0	
4	0	0	0	0	0	0	
4.5	0	0	0	0	0	0	
5	0	0	0	0	0	0	
5.5	0	0	0	0	0	0	
6	0	0	0	0	0	0	Total
Total	2.02	2.02	2.56	2.56	2.10	2.10	13.37

BoM IFD Table

DATE OBTAINED:
22/07/2017

PROJECT:
Lot 588 & 590 Rockingham Road, Munster SDS

OUR REF:
KC00652.000

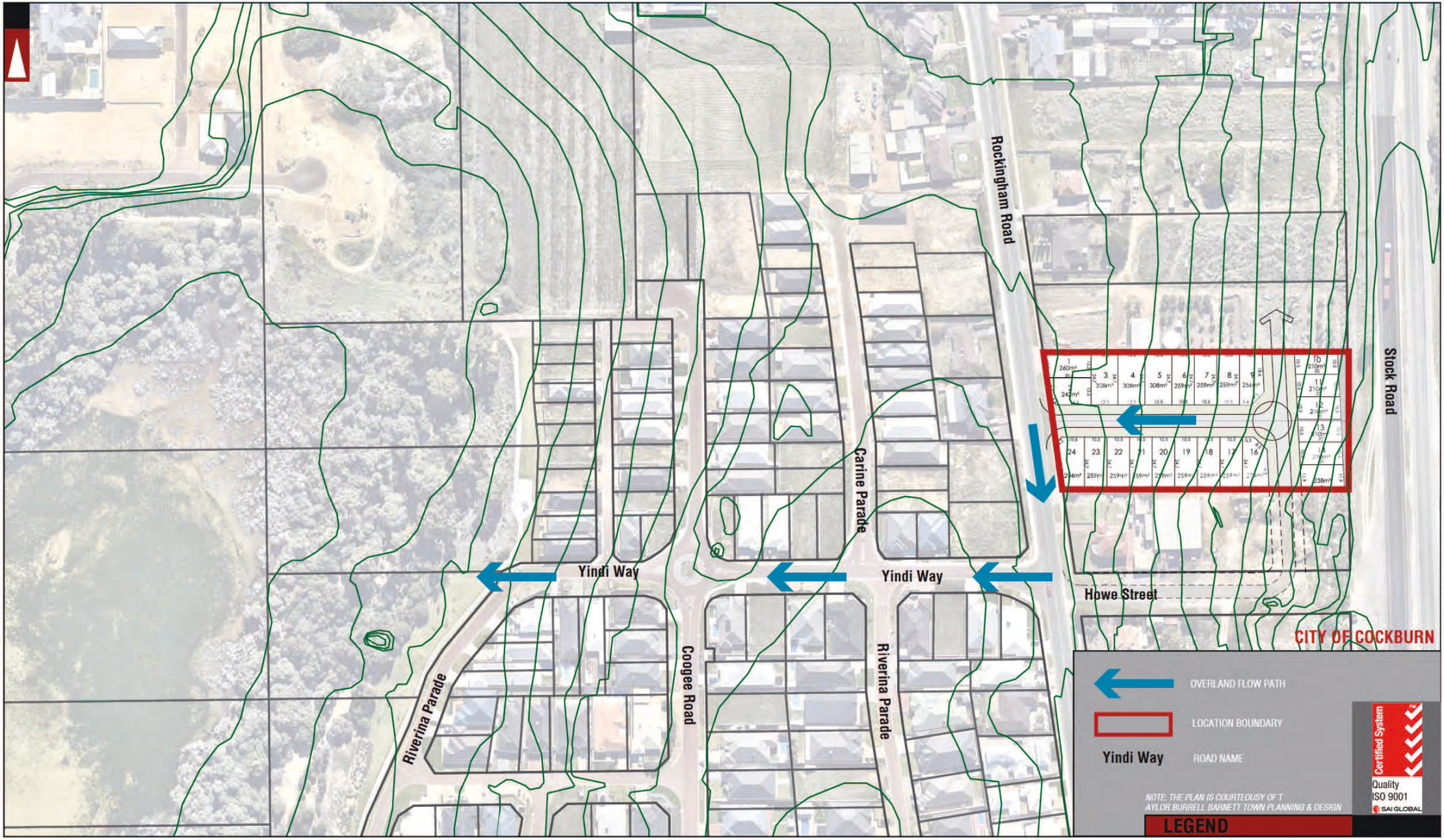
TYPE OF WORK INTENDED:
Stormwater Drainage Strategy

Rev: B

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	109	120	156	182	207	243	271
2 min	96.0	105	133	153	174	203	227
3 min	85.6	93.5	120	138	157	184	205
4 min	77.5	84.9	109	127	144	169	189
5 min	71.0	78.0	101	117	134	156	175
10 min	51.6	56.9	74.1	86.2	98.6	115	129
15 min	41.5	45.8	59.6	69.4	79.3	92.7	103
30 min	27.7	30.5	39.4	45.8	52.2	61.0	68.0
1 hour	18.0	19.7	25.3	29.4	33.5	39.4	44.1
2 hour	11.5	12.6	16.1	18.8	21.6	25.6	28.9
3 hour	8.85	9.65	12.4	14.5	16.7	20.0	22.8
6 hour	5.60	6.12	7.94	9.35	10.9	13.2	15.1
12 hour	3.50	3.83	5.02	5.94	6.94	8.43	9.71
24 hour	2.15	2.36	3.10	3.65	4.24	5.10	5.82
48 hour	1.31	1.44	1.86	2.16	2.47	2.90	3.24
72 hour	0.984	1.08	1.38	1.58	1.78	2.06	2.27
96 hour	0.812	0.890	1.13	1.28	1.43	1.64	1.79
120 hour	0.707	0.772	0.971	1.10	1.22	1.39	1.52
144 hour	0.636	0.694	0.870	0.984	1.09	1.24	1.35
168 hour	0.587	0.640	0.800	0.906	1.01	1.15	1.25

Appendix E

Overland Flow Path



A	27-07-2017	ISSUED FOR REVIEW
No	DATE	AMENDMENT

PROJECT:
LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

TITLE:
OVERLAND FLOW PATH PLAN

DRAWING NUMBER:
KC00652.000_ S003

DRAWN BY:
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APPENDIX E
INFRASTRUCTURE SERVICING REPORT

INFRASTRUCTURE SERVICING REPORT

588 & 590 Rockingham Road,

Munster

June 2017

Rev C

kctt

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Issued To	Revision type
Rev A	17/02/2017	L Harris	C Kleyweg	Chris Lewis (Progress Developments)	Issued for Review
Rev B	26/05/2017	C Kleyweg	C Kleyweg	Chris Lewis (Progress Developments)	Issued for LSP Submission
RevC	15/06/2017	L Harris	C Kleyweg	Lia Roberts (TBB Planning)	Issued for LSP Submission

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Author	Lachlan Harris
Project Director / Project Manager	Colin Kleyweg / Lachlan Harris
Name of Project	588 & 590 Rockingham Road, Munster
Name of the Document	KC00652.000 588 & 590 Rockingham Road, Munster - ISR
Document Version	Revision C

Table of Contents

1. KCTT Infrastructure Servicing Report

1.1 Location

Lot Number	House Number	Road Name	Suburb	Locality (Shire, City etc.)
35 & 36	588 & 590	Rockingham Road	Munster	City of Cockburn

Brief Description of Investigation Area:

The investigation Area currently contains 2 buildings used as residential dwellings with small garden sheds. There are also 2-3 notable mature trees present, but mostly the site is sparsely populated with seasonal grasses growing in the topsoil.

The investigation area is currently zoned urban, under the City of Cockburn and falls within Contribution Areas 13 and 6.

The general lot size proposed in the Preliminary Concept Plan is generally R30 to R40 which generally consist of frontages of approximately 10m and an average lot size of 250m². There are no existing easements within the landholding, thus the location of subdivision is not restricted.

The current soil conditions are consistent across the investigation area. The Perth Groundwater Atlas confirms the investigation area is likely to consist of Tamala Limestones and sands descendant of limestones, and has significant depth to groundwater from existing surface levels with depth to AAMGL being a minimum of 9 metres. A geotechnical report will assist in further investigating the in-situ soil.

1.2 Proposed Development Type

Development Type: Urban Residential R30 to R40

1.3 Proposed Yield

TYPE: (Residential, Commercial, Industrial and Other)	Residential, with Urban.
Residential	Approx. Area = 8,860 m² The LSP plan proposes 24 lots
Public Open Space	The preliminary concept plan does not propose any POS within the landholding

Other Land Uses	Not Applicable

1.4 Remediation

Does the landholding feature existing buildings?	YES, there are 2 residential dwellings located at the front of each lot. The remaining site area is also sparsely populated with vegetation (topsoil and grasses throughout). Likely to require some clearing.
Is asbestos likely to be an issue? YES / NO	NO, not likely. However, if a concern regarding asbestos were to arise it would be due to demolition of existing dwelling.
Are septic tanks present? YES / NO	YES, it is likely the existing dwelling is serviced by a septic tank due to the absence of a connection to sewer.
Did the site store, or have a history of storage of chemicals?	Not likely, as the site appears to have been used as a residential dwelling thus is not expected to store chemicals.

1.5 Earthworks

The groundwater and topography data has been sourced from The Department of Water - Perth Ground Water Atlas, the soil and geotechnical information has been gathered from the Landgate SLIP Portal and LSP provided by RPS.

Describe the general levels across the site	Relatively steep, grading from 10m AHD at the interface of the development to Rockingham Road up to 20m AHD at the rear of the site. Giving an average grade of 7% from west to east.
Describe AAMGL levels across the site	Groundwater contours rise from west to east, are well below the existing surface level. AAMGL = 1.0m AHD across the site, giving minimum 9m separation to groundwater.
Describe MGL levels across the site	Approximately 1.5m AHD across the site. MGL will have no impact on this development.
Is Groundwater an issue on this site?	NO Groundwater is approximately a minimum of 9m depth from the existing surface levels.
Can cut to fill techniques be utilised? If YES, provide quantity m^3	YES, Cut to fill techniques are expected possible due to groundwater being at great depth however this will be subject to further geotechnical investigation and quality of the in-situ material.
What is the likely depth of topsoil (mm)?	Expected to be approximately 150mm, geotechnical investigation will confirm exact depth.
Is the topsoil suitable for re-use? If YES, is there a suitable location to bury?	Potential to blend with cut/fill material and spread in verges.
Describe the natural vegetation on the site? Dense / Moderate / Sparse / Cleared	Sparse vegetation.
Are there significant trees that need to be kept?	No, only trees are located in proposed lots.
What is the likely soil profile?	From Land Gate and Perth Groundwater Atlas investigation indicates site area consists of Tamala

	Limestone: predominantly calcarenite. Geotechnical to confirm.
Risk of acid sulphate soils? High / Moderate / Low	The Land Gate and Perth Groundwater Atlas investigation indicates a No Known Risk of acid sulphate soils for the landholding and surrounding lots. It is expected with the significant depth to groundwater that ASS will not be present.
Is there peat or other unsuitable materials?	UNLIKELY However, to be confirmed by Geotechnical report.

Figure 1: Existing Site Conditions

1.6 Roadworks

Do existing roads require upgrade?	No, based on current condition of Rockingham Road, not expected to require upgrade works.

Existing road (Rockingham Road) is in good condition as can be seen in the below images. Due to the current condition of the road it is not expected to require upgrading as part of development works.

Figure 2: Existing Road Condition

Road Name	Length	Width	Road Reserve
Rockingham Road	64.8m	10m	20m

Proposed Road Network: Details on all new roads below

Road Name	Length	Width	Road Reserve
Road 1	100m	6m	15m
Road 2	65m	6m	15m

The above proposed road network is based on the details provided in the LSP Plan.

1.7 Stormwater Drainage

Does the location have suitable flow-paths for existing overland flow?	Yes, overland flow is towards Rockingham Road, east to west across the site.
Can infiltration drainage techniques be used?	Likely, due to good separation to groundwater. However, further geotechnical investigation required to confirm. In our experience we believe soak wells will be suitable on this site.
Does existing stormwater drainage systems exist in site vicinity?	Yes. Existing drainage located in Rockingham Road.

1.8 Water

Are suitable water services located adjacent to the site?		YES
Road Name	**Pipe Diameter**	**Location (distance from site if no)**
Rockingham Road	100CI	Located adjacent to the site, opposite side of Rockingham Road to the landholding for full frontage of site.

The above is an indication of existing water reticulation services available for connection, which is sourced from DBYD and the Water Corporation ESINet and planning scheme. It is understood through Water Corporation planning that this infrastructure will have sufficient capacity to service the development.

1.9 Wastewater

Water Corporation Planning shows the site falls within a wastewater catchment that is to connect to a proposed 450mm diameter gravity sewer main grading west along Forrest Road. Through the review of Water Corporation sewer planning, the sewer reticulation discussed above to has sufficient capacity for the development.

Is the development BROWNFIELD / GREENFIELD?		GREENFIELD		
Road Name	**Pipe Diameter**	**Location**	**Depth**	**Distance from Site (If NO)**
Rockingham Road	150PVC	Opposite side of Rockingham Road	7.01m AHD	N/A

Can the development be serviced adequately without the need for import fill? If NO, describe the fill requirements;	Yes, due to the grade of the natural ground surface and location of connection to existing.
Is groundwater likely to be an issue?	NO. Groundwater is approx. 9m below the existing surface level on the western boundary of the site.

Figure 3: Location of Connection to Existing – Sewer

1.10 Gas

Gas services are to be designed in conjunction with ATCO Gas. It is believed that there will be sufficient capacity for the development to be serviced with gas reticulation.

Are suitable gas services located adjacent to the site?		YES
Road Name	**Pipe Diameter**	**Location (distance from site if no)**
Rockingham Road	155 PVC (Medium Pressure)	Located adjacent to the site, opposite side of Rockingham Road to the landholding for full frontage of site.

1.11 Power

Electrical consultant to be used for all liaison with Western Power, the information gathered from Western Power shows high voltage (HV) and low voltage (LV) overhead power lines directly adjacent to landholding on the western side of the site. Additionally, low voltage (LV) underground power lies adjacent to the western boundary of the development.

Existing Services Location	Underground/Overhead	Location	Type
Rockingham Road	Overhead	Located adjacent to the site, opposite side of Rockingham Road to the landholding for full frontage of site.	HV, LV
Rockingham Road	Underground	Located adjacent to the site, opposite side of Rockingham Road to the landholding for full frontage of site.	LV

1.12 Telecommunications

	YES/NO	If YES/NO nominate type (NBN /Velocity Fibre Optic/Standard Telstra Copper/Other) and location?	If NO, distance from site (m)?
Are existing underground services available and suitable for connection immediately adjacent to the site?	YES	Telstra Located in both side of road reserve.	N/A

1.13 Retaining Walls

Does the site have topography requirements that increase the general retaining requirements?	Yes, Average 7% grade from west to east over the site, retaining expected to be 2-3 exposed course limestone retaining walls.
What is the average lot size (m^2)?	170-270m^2
How many lots are less than 300m^2?	22

Required retaining is expected to be similar to that shown in the below images. 2-3 course exposed limestone retaining between lots for side boundaries and 1-2 course exposed limestone for rear boundaries.

Figure 4: Expected Required Retaining

APPENDIX F
NOISE ASSESSMENT

HERRING STORER ACOUSTICS

PROPOSED RESIDENTIAL DEVELOPMENT

LOTS 35 & 36 ROCKINGHAM ROAD MUNSTER

NOISE ASSESSMENT

NOVEMBER 2018

OUR REFERENCE: 23747-1-17121

Rochdale Holdings Pty Ltd A.B.N. 85 089 049 867 trading as
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P.O. Box 219, Como, W.A. 6952
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DOCUMENT CONTROL PAGE

NOISE ASSESSMENT
MUNSTER

Job No: 17121

Document Reference: 23747-1-17121

FOR

PROGRESS DEVELOPMENTS

DOCUMENT INFORMATION			
Author:	Geoffrey Harris	**Checked By:**	Paul Daly
Date of Issue :	13 November 2018		

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Revision	**Description**	**Date**	**Author**	**Checked**

DOCUMENT DISTRIBUTION				
Copy No.	**Version No.**	**Destination**	**Hard Copy**	**Electronic Copy**
1	1	Progress Developments Attn: Chris Lewis Email: clewis@progressdevelopments.com.au		✓

CONTENTS

APPENDICES

1. INTRODUCTION

Herring Storer Acoustics was commissioned by Progress Developments to undertake a road traffic noise assessment for the proposed development located at Lot 35 & 36 Rockingham Road, Munster.

The purpose of this assessment was to assess noise received within the development from vehicles travelling along Stock Road and if exceedance with the stated criteria were determined, establish the required attenuation measures to control noise intrusion to acceptable levels. The traffic noise assessment has been carried out in accordance with the WAPC State Planning Policy 5.4 *"Road and Rail Transportation Noise and Freight Consideration in Land Use Planning"*.

As part of the study, the following was carried out:

- Monitor existing noise received from vehicles travelling along Stock Road.
- For future traffic flows, determine noise that would be received at residences within the development from vehicles travelling on Stock Road.
- Assess the predicted noise levels for compliance with the appropriate criteria.
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

For information, the development plan is attached in Appendix A.

2. SUMMARY

Under the Western Australian Planning Commission (WAPC) Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations in Land Use Planning"* (SPP5.4), we believe that the appropriate criteria for assessment for this development are as listed below for "Noise Limits".

EXTERNAL

$L_{Aeq(Day)}$ of 60 dB(A); and
$L_{Aeq(Night)}$ of 55 dB(A).

INTERNAL

$L_{Aeq(Day)}$ of 40 dB(A) in living and work areas; and
$L_{Aeq(Night)}$ of 35 dB(A) in bedrooms.

Noise received at an outdoor area should also be reduced as far as practicable, with an aim of achieving an L_{Aeq} (night) of 50 dB(A).

Noise received at the residences in close proximity Stock Road would, as shown by the noise contour plot attached as Figure C1 in Appendix C exceed the Policies "Noise Limits". For the residences in close proximity to Stock Road, highlighted in Appendix D, to achieve compliance with SPP 5.4, the following option is stated:

- Construct a barrier at least 1.8m high between the residence and Stock Road, at the edge of the development. This barrier must meet the required surface density of 15 kg/m^2 and have an anti-graffiti coating applied to the Eastern façade adjoining the Stock Road Primary Regional Road Reservation.

- Lots 10 through to 15 would require "Quiet House Design" Package A

- Lots 10 through to 15 would also require notifications on titles.

If there is a requirement for multiple storey houses to be constructed, specialist acoustic advice is to be sought for the upper floors.

For information, "Quiet House" requirements are attached in Appendix D.

3. ACOUSTIC CRITERIA

3.1 WAPC PLANNING POLICY

The Western Australian Planning Commission (WAPC) released on 22 September 2009 State Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations In Land Use Planning"*. Section 5.3 – Noise Criteria, which outlines the acoustic criteria, states:

"5.3 - NOISE CRITERIA

Table 1 sets out the outdoor noise criteria that apply to proposals for new noise-sensitive development or new major roads and railways assessed under this policy.

These criteria do not apply to –

- *proposals for redevelopment of existing major roads or railways, which are dealt with by a separate approach as described in section 5.4.1; and*
- *proposals for new freight handling facilities, for which a separate approach is described in section 5.4.2.*

The outdoor noise criteria set out in Table 1 apply to the emission of road and rail transport noise as received at a noise-sensitive land use. These noise levels apply at the following locations—

- *for new road or rail infrastructure proposals, at 1 m from the most exposed, habitable façade of the building receiving the noise, at ground floor level only; and*
- *for new noise-sensitive development proposals, at 1 m from the most exposed, habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.*

Further information is provided in the guidelines.

Table 1 - Outdoor Noise Criteria

Time of day	*Noise Target*	*Noise Limit*
Day (6 am–10 pm)	$L_{Aeq(Day)}$ = 55 dB(A)	$L_{Aeq(Day)}$ = 60 dB(A)
Night (10 pm–6 am)	$L_{Aeq(Night)}$ = 50 dB(A)	$L_{Aeq(Night)}$ = 55 dB(A)

The 5 dB difference between the outdoor noise target and the outdoor noise limit, as prescribed in Table 1, represents an acceptable margin for compliance. In most situations in which either the noise-sensitive land use or the major road or railway already exists, it should be practicable to achieve outdoor noise levels within this acceptable margin. In relation to greenfield sites, however, there is an expectation that the design of the proposal will be consistent with the target ultimately being achieved.

Because the range of noise amelioration measures available for implementation is dependent upon the type of proposal being considered, the application of the noise criteria will vary slightly for each different type. Policy interpretation of the criteria for each type of proposal is outlined in sections 5.3.1 and 5.3.2.

The noise criteria were developed after consideration of road and rail transport noise criteria in Australia and overseas, and after a series of case studies to assess whether the levels were practicable. The noise criteria take into account the considerable body of research into the effects of noise on humans, particularly community annoyance, sleep disturbance, long-term effects on cardiovascular health, effects on children's learning performance, and impacts on vulnerable groups such as children and the elderly. Reference is made to the World Health Organization (WHO) recommendations for noise policies in their publications on community noise and the Night Noise Guidelines for Europe. See the policy guidelines for suggested further reading.

5.3.1 Interpretation and application for noise-sensitive development proposals

In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –

- *acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot[1].*

If a noise-sensitive development takes place in an area where outdoor noise levels will meet the noise target, no further measures are required under this policy.

In areas where the noise target is likely to be exceeded, but noise levels are likely to be within the 5dB margin, mitigation measures should be implemented by the developer with a view to achieving the target levels in a least one outdoor living area on each residential lot[1]. Where indoor spaces are planned to be facing any outdoor area in the margin, noise mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces. In this case, compliance with this policy can be achieved for residential buildings through implementation of the deemed-to-comply measures detailed in the guidelines.

1 For non residential noise-sensitive developments, (e.g. schools and child care centres) consideration should be given to providing a suitable outdoor area that achieves the noise target, where this is appropriate to the type of use.

In areas where the outdoor noise limit is likely to be exceeded (i.e. above $L_{Aeq(Day)}$ of 60 dB(A) or $L_{Aeq(Night)}$ of 55 dB(A)), a detailed noise assessment in accordance with the guidelines should be undertaken by the developer. Customised noise mitigation measures should be implemented with a view to achieving the noise target in at least one outdoor living or recreation area on each noise-sensitive lot or, if this is not practicable, within the margin. Where indoor spaces will face outdoor areas that are above the noise limit, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces, as specified in the following paragraphs.

For residential buildings, acceptable indoor noise levels are $L_{Aeq(Day)}$ of 40 dB(A) in living and work areas and $L_{Aeq(Night)}$ of 35 dB(A) in bedrooms[2]. For all other noise-sensitive buildings, acceptable indoor noise levels under this policy comprise noise levels that meet the recommended design sound levels in Table 1 of Australian Standard AS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors.

These requirements also apply in the case of new noise-sensitive developments in the vicinity of a major transport corridor where there is no existing railway or major road (bearing in mind the policy's 15-20 year planning horizon). In these instances, the developer should engage in dialogue with the relevant infrastructure provider to develop a noise management plan to ascertain individual responsibilities, cost sharing arrangements and construction time frame.

If the policy objectives for noise-sensitive developments are not achievable, best practicable measures should be implemented, having regard to section 5.8 and the guidelines."

The Policy, under Section 5.7, also provides information regarding "Notifications on Titles".

3.2 APPROPRIATE CRITERIA

Based on the above, the following criteria are proposed for this development:

External	
Day	Maximum of 60 dB(A) L_{Aeq}
Night	Maximum of 55 dB(A) L_{Aeq}
Outdoor Living Areas*	Maximum of 50 dB(A) $L_{Aeq\ (night\ period)}$
Internal	
Sleeping Areas	35 dB(A) $L_{Aeq(night)}$
Living Areas	40 dB(A) $L_{Aeq(day)}$

*This is a suggested noise level; noise is to be reduced as far as practicably possible.

2 For residential buildings, indoor noise levels are not set for utility spaces such as bathrooms. This policy encourages effective "quiet house" design, which positions these non-sensitive spaces to shield the more sensitive spaces from transport noise (see guidelines for further information).

4. MEASUREMENTS AND OBSERVATIONS

To determine the existing acoustic environment at the proposed development, a noise data logger was located adjacent to Stock Road, with data collected from Monday 29 October to Friday 2 November 2018.

The automatic noise data logger records sound pressure levels in accordance with Australian Standard 2702-1984: *Acoustics - Method For Measurement of Road Traffic Noise*. The logger used records statistical noise level data, of which the L_{A1}, L_{A10}, L_{Aeq} and L_{A90} levels are reported. These are defined below:

L_{A1} The noise level exceeded for 1% of the time (in this instance, the noise level exceeded for 36 seconds in each 1-hour period).

L_{A10} The noise level exceeded for 10% of the time (in this instance, the noise level exceeded for 6 minutes in each 1-hour period).

L_{Aeq} The energy equivalent noise level for the 1-hour period. A single number value that expresses the time-varying sound level for the 1-hour period as though it were a constant sound level with the same total sound energy as the time-varying level.

L_{A90} The noise level exceeded for 90% of the time (in this instance, the noise level exceeded for 54 minutes in each 1-hour period).

The loggers were calibrated before and after the measurement period and have been subject to a laboratory calibration within the last 24 months.

The results of the noise logging are summarised in Table 4.1. The results are also shown graphically on Figure B1, attached in Appendix B.

TABLE 4.1 - SUMMARY OF MEASURED NOISE LEVELS (STOCK ROAD)

Parameter	Measured Level dB(A)*	Difference between $L_{10(18hour)}$ and $L_{Aeq(parameter)}$ dB(A)
$L_{A10\ (18\ hour)}$	62.5	N/A
$L_{Aeq,\ day\ (6am\ to\ 10pm)}$	61.0	$= L_{A10\ (18\ hour)} - 1.5$
$L_{Aeq,\ night\ (10pm\ to\ 6am)}$	53.6	$= L_{A10(18\ hour)} - 8.9$

* It is normal practice to quote decibels to the nearest whole number. Fractions are retained here to minimise any cumulative rounding error.

5. MODELLING

Modelling of noise received within the subdivision from Stock Road was carried out using SoundPlan, using the Calculation of Road Traffic Noise (CoRTN) algorithms. The input data for the model included:

- Increased traffic volume, assuming 2% growth over 20 years.
- Other traffic data as listed in Table 4.1.
- A +2.5 dB adjustment to allow for façade reflection.
- A -2.5 dB adjustment for the change in road surface from chip seal to dense graded asphalt

The traffic data currently available on the Main Roads web site are as listed in Table 5.1. Table 5.1 also lists the percentage heavy vehicles and the calculated future traffic flows.

TABLE 5.1 - SUMMARY OF TRAFFIC DATA

Parameter	Stock Road
Current Traffic Flow (vpd)	24955 (2016/17 MR Traffic Digest)
Future Traffic Flow (vpd)	33000
Percentage Heavy Vehicles (%)	13.3
Speed (km/hr)	80

For the noise modeling for future traffic it has been assumed that the percentage of future heavy vehicles remains the same as for the current traffic flows. In this case, we believe that this is a conservative approach, as we believe that the percentage of heavy vehicles would fall over time.

We note that with the difference between the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ being greater than 5 dB(A), achieving compliance with the day period criteria will also result in achieving compliance with the night period criteria.

Noise modelling was undertaken for the following scenarios:

A 2031 traffic flows, without any noise amelioration.

B 2031 traffic flows, with a 1.8m high barrier constructed adjacent to Stock Road

The noise contour plots for the night period is attached in Appendix C.

6. ASSESSMENT

In accordance with the WAPC Planning Policy 5.4, an assessment of the noise that would be received within the development located at Lots 35 & 36 Rockingham Road, Munster, from vehicles travelling on Stock Road has been undertaken.

In accordance with the Policy, the following would be the acoustic criteria applicable to this project:

External

Day	Maximum of 60 dB(A) L_{Aeq}
Night	Maximum of 55 dB(A) L_{Aeq}
Outdoor Living Areas (Night)	Maximum of 50 dB(A) L_{Aeq}

Internal

Sleeping Areas	35 dB(A) $L_{Aeq(night)}$
Living Areas	40 dB(A) $L_{Aeq(day)}$

Noise received at an outdoor area should also be reduced as far as practicable with an aim of achieving an L_{Aeq} (night) of 50 dB(A).

Noise received at the residences in close proximity to Stock Road would, as shown by the noise contour plot attached as Figure C1 in Appendix C exceed the Policies "Noise Limits". For the residences in close proximity to Stock Road, highlighted in Appendix D, to achieve compliance with SPP 5.4, the following option is stated:

- Construct a barrier at least 1.8m high between the residence and Stock Road, at the edge of the development. This barrier must meet the required surface density of 15 kg/m^2 and have an anti-graffiti coating applied to the Eastern façade adjoining the Stock Road Primary Regional Road Reservation.

- Lots 10 through to 15 would require “Quiet House Design” Package A

- Lots 10 through to 15 would also require notifications on titles.

An example of a suitable notice, as provided within the Guidelines is:

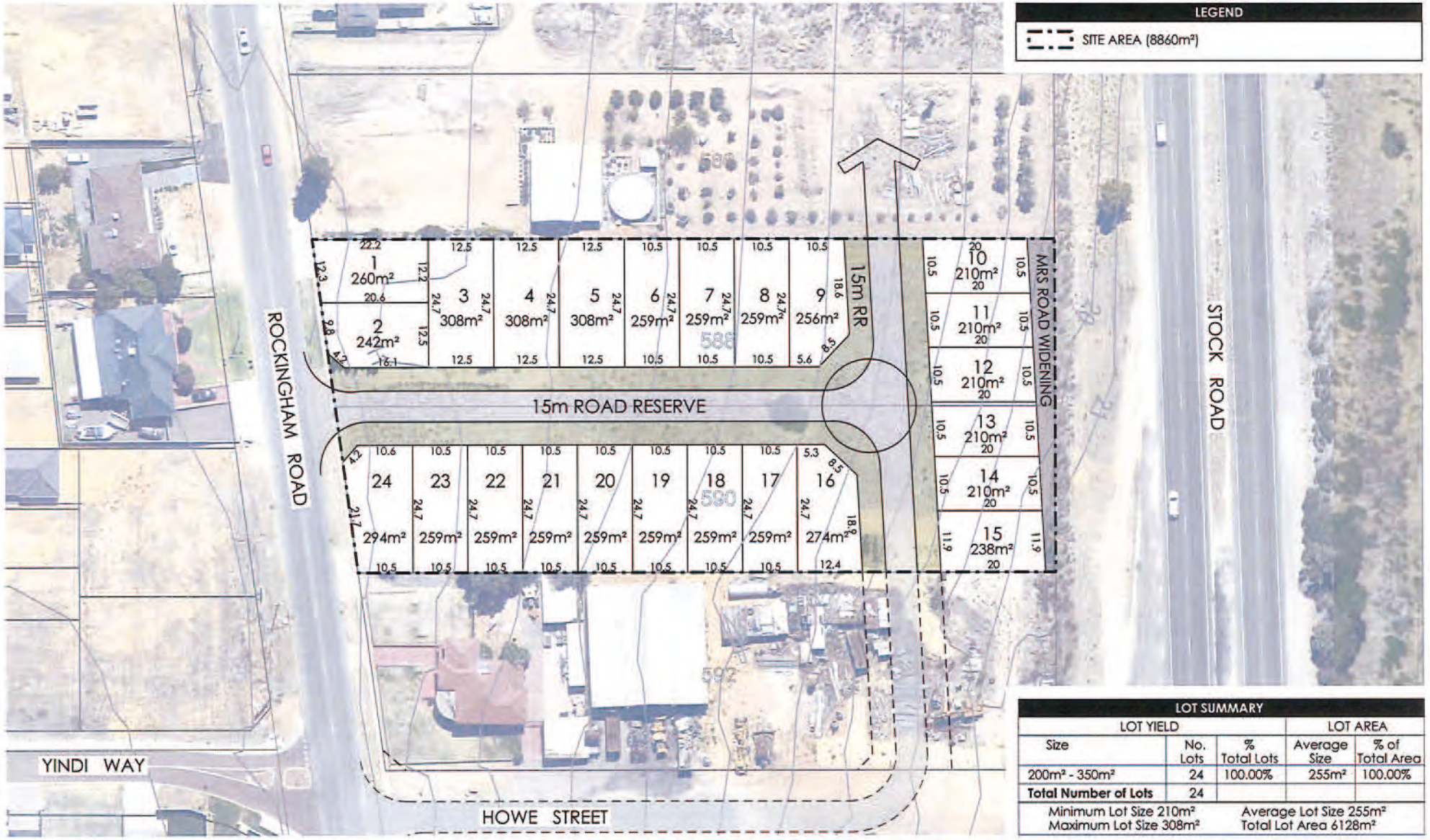
> *This lot is situated in the vicinity of Stock Road and is currently affected, and / or may in the future be affected by transport noise.*

If there is a requirement for multiple storey houses to be constructed, specialist acoustic advice is to be sought for the upper floors.

For information, “Quiet House” requirements are attached in Appendix D.

APPENDIX A

DEVELOPMENT PLAN



LOT SUMMARY

LOT YIELD			LOT AREA	
Size	No. Lots	% Total Lots	Average Size	% of Total Area
200m² - 350m²	24	100.00%	255m²	100.00%
Total Number of Lots	24			
Minimum Lot Size 210m² Maximum Lot Size 308m²			Average Lot Size 255m² Total Lot Area 6128m²	

Modified Preliminary Concept Plan

LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

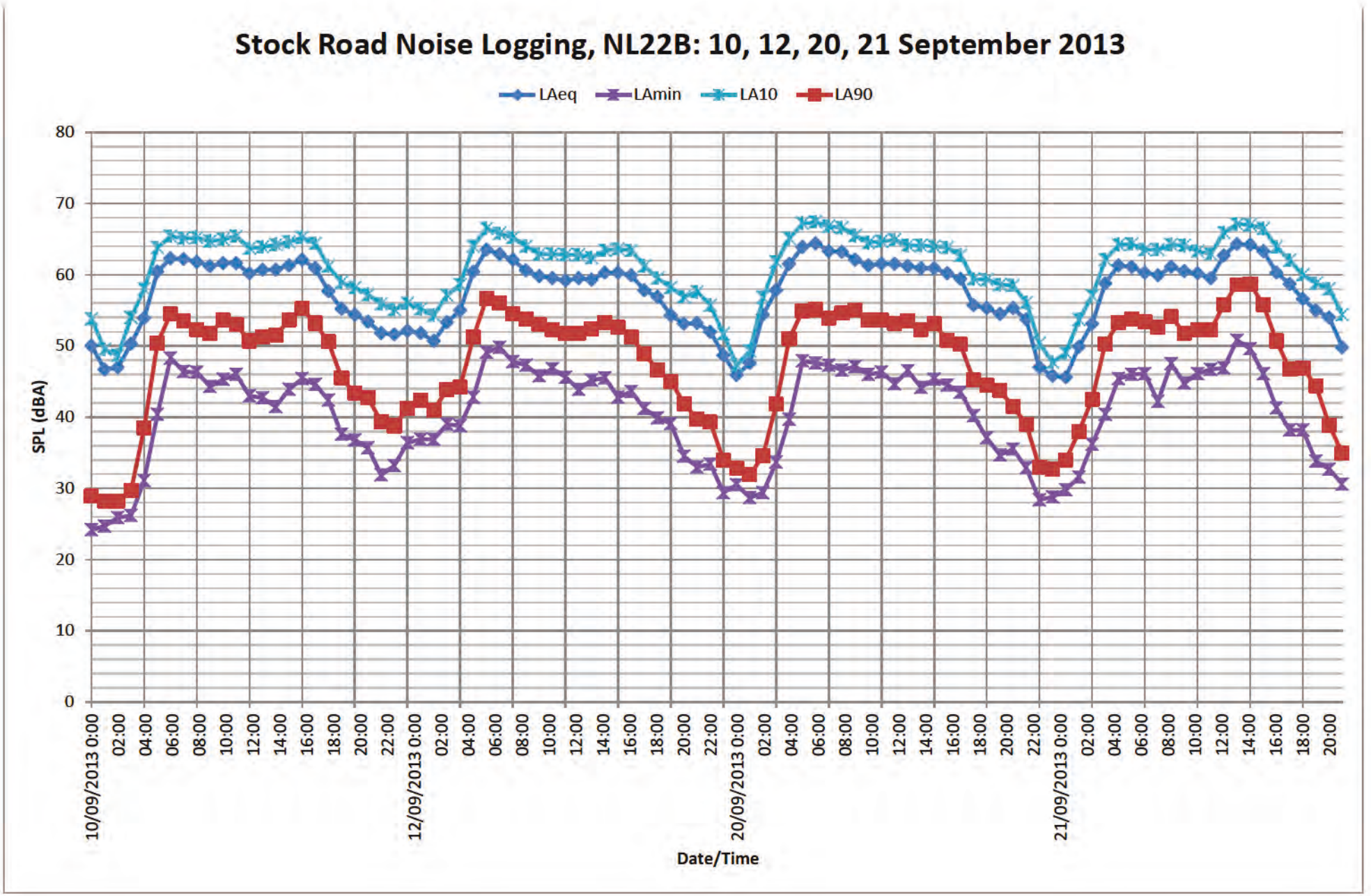
DRAFT

plan: 12/003/235D
date: 28/11/2016
projection: PCG 94
designed: ME
checked: BDM
drawn: NM
scale: 1:1000@A4 | 1:500@A2
0 10 20m

Taylor Burrell Barnett Town Planning & Design
187 Roberts Road Subiaco Western Australia 6008
p: (08) 9382 2911 f: (08) 9382 4586 e: admin@tbbplanning.com.au

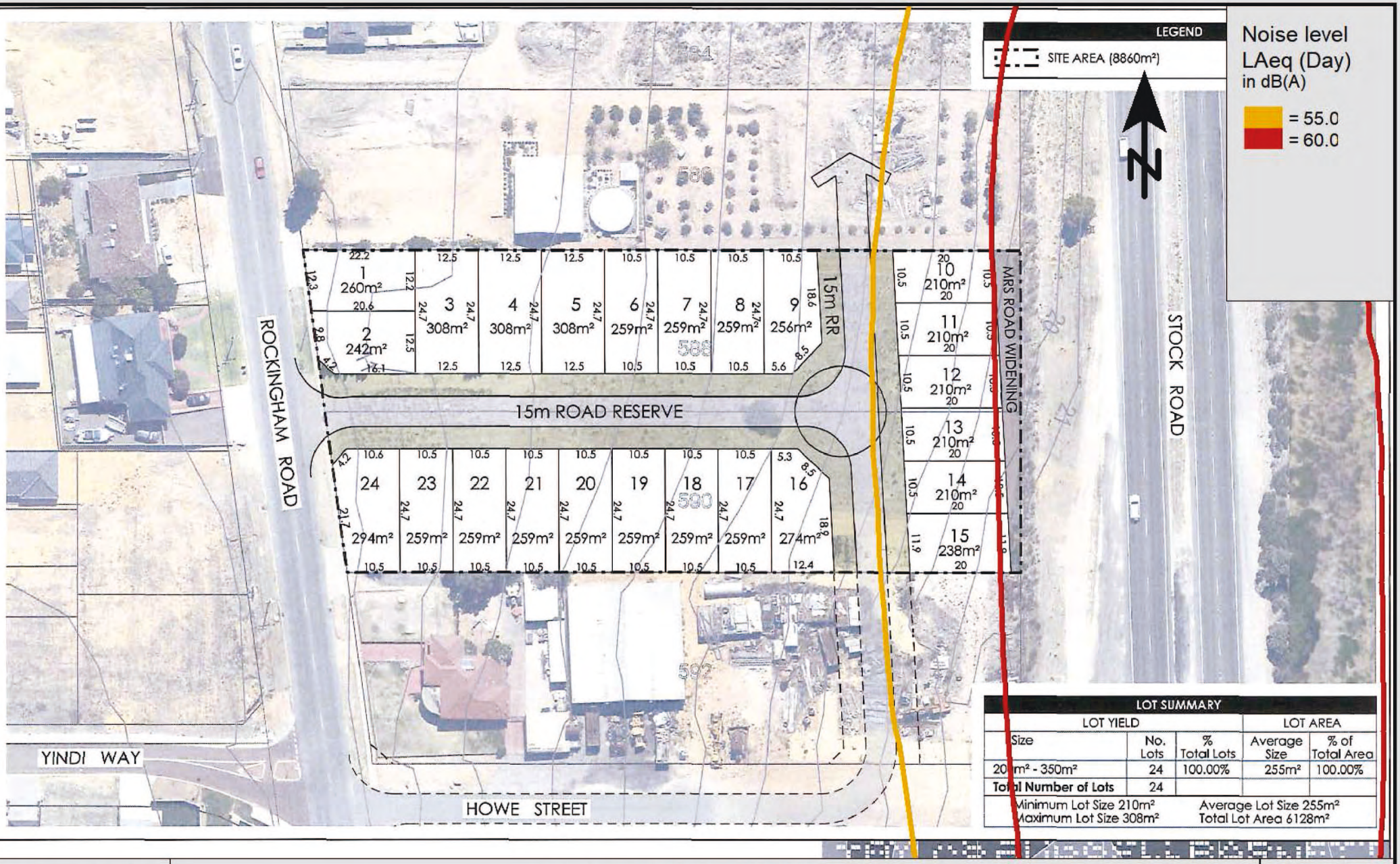
APPENDIX B

NOISE MONITORING


Stock Road Noise Logging, NL22B: 10, 12, 20, 21 September 2013
LAeq
LAmin
LA10
LA90
SPL (dBA)
80
70
60
50
40
30
20
10
0
10/09/2013 0:00
12/09/2013 0:00
20/09/2013 0:00
21/09/2013 0:00
Date/Time

APPENDIX C

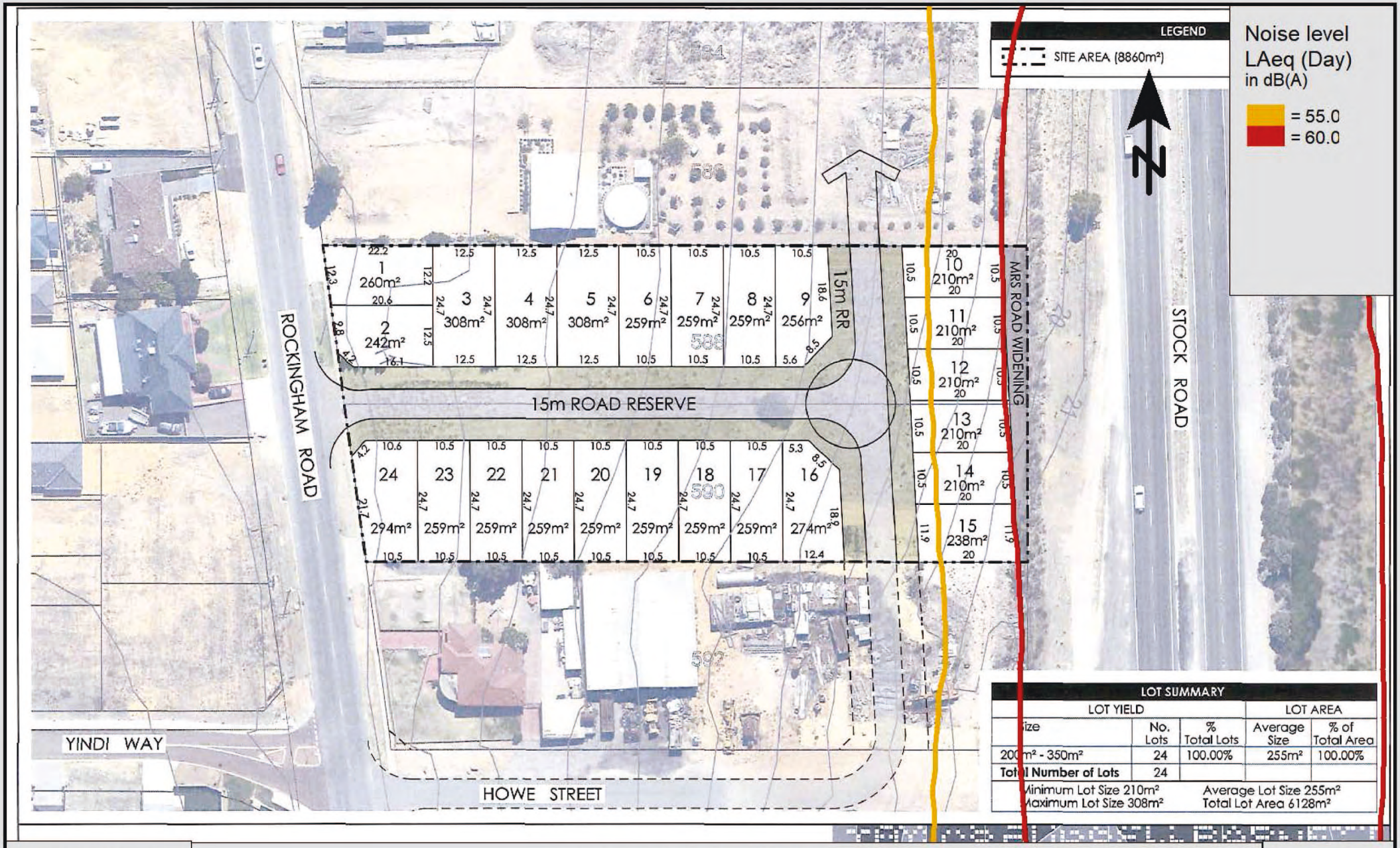
NOISE CONTOUR PLOTS



Herring Storer Acoustics
Job No :17121
Date : 13 November 2018

LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER
DAY PERIOD NOISE CONTOURS
NO AMELIORATION

Figure C1
Appendix C



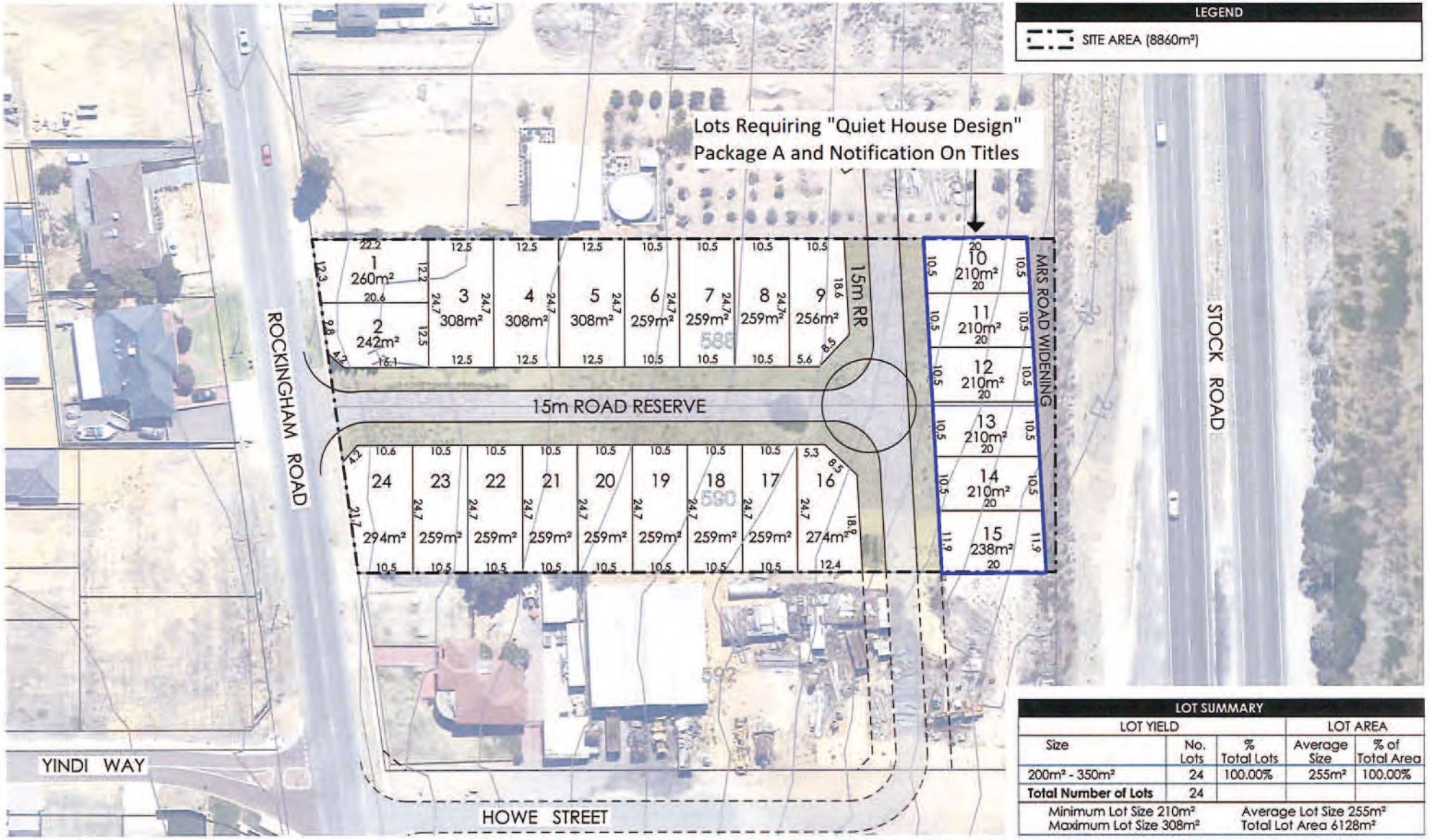
Herring Storer Acoustics
Job No :17121
Date : 13 November 2018

LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER
DAY PERIOD NOISE CONTOURS
1.8m NOISE WALL

Figure C2
Appendix C

APPENDIX D

NOISE AMELIORATION &
"QUIET HOUSE" DESIGN REQUIREMENTS



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LOTS 588 & 590 ROCKINGHAM ROAD, MUNSTER

DRAFT

plan: 12/003/235D
date: 28/11/2016
projection: PCG 94
designed: ME
checked: BDM
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scale: 1:1000@A4 | 1:500@A2
0 10 20m

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QUIET HOUSE DESIGN PACKAGES FOR RESIDENCE

Area	Orientation to road or rail corridor	Package A L_{Aeq},Day up to 60dB L_{Aeq},Night up to 55dB	Package B L_{Aeq},Day up to 63dB L_{Aeq},Night up to 58dB	Package C L_{Aeq},Day up to 65dB L_{Aeq},Night up to 60dB
Bedrooms	Facing	• Walls to R_w+C_{tr} 45dB • Windows and external door systems: Minimum R_w+C_{tr} 28dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 31dB: 60%] [if R_w+C_{tr} 34dB: 80%] • Roof and ceiling to R_w+C_{tr} 35dB (1 layer 10mm plasterboard) • Mechanical ventilation as per Section 6.3.1	• Walls to R_w+C_{tr} 50dB • Windows and external door systems: Minimum R_w+C_{tr} 31dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 34dB: 60%] • Roof and ceiling to R_w+C_{tr} 35dB (1 layer 10mm plasterboard) • Mechanical ventilation as per Section 6.3.1	• Walls to R_w+C_{tr} 50dB • Windows and external door systems: Minimum R_w+C_{tr} 34dB (Table 6.4), total glazing area limited to 40% of room floor area [if 20% of floor area or less, R_w+C_{tr} 31dB] • Roof and ceiling to R_w+C_{tr} 40dB (2 layers 10mm plasterboard) • Mechanical ventilation as per Section 6.3.1
	Side-on	•As above, except glazing Rw+Ctr values for each package may be 3dB less, or max % area increased by 20%		
	Opposite	• No requirements	• As per Package A 'Side On'	• As per Package A 'Facing'
Indoor living and work Areas	Facing	• Walls to Rw+Ctr 45dB • Windows and external door systems: Minimum Rw+Ctr 25dB (Table 6.4), total glazing area limited to 40% of room floor area. [if Rw+Ctr 28dB: 60%] [if Rw+Ctr 31dB: 80%] • External doors other than glass doors to Rw+Ctr 26dB (Table 6.4) • Mechanical ventilation as per Section 6.3.1	• Walls to Rw+Ctr 50dB • Windows and external door systems: Minimum Rw+Ctr 28dB (Table 6.4), total glazing area up to 40% of room floor area. [if Rw+Ctr 31dB: 60%] [if Rw+Ctr 34dB: 80%] • External doors other than glass doors to Rw+Ctr 26dB (Table 6.4) • Mechanical ventilation as per Section 6.3.1	• Walls to R_w+C_{tr} 50dB • Windows and external door systems: Minimum R_w+C_{tr} 31dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 34dB: 60%] • External doors other than glass doors to R_w+C_{tr} 30dB (Table 6.4) • Mechanical ventilation as per Section 6.3.1
	Side-on	• As above, except the glazing R_w+C_{tr} values for each package may be 3dB less, or max % area increased by 20%		
	Opposite	• No requirements	• As per Package A 'Side On'	• As per Package A 'Facing'
Other indoor areas	Any	• No requirements	• No requirements	• No requirements
Outdoor living areas	Any (Section 6.2.3)	• As per Package C, and/or • At least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2 metres height above ground level	• As per Package C, and/or • At least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2.4 metres height above ground level	• At least one outdoor living area located on the opposite side of the building from the transport corridor

APPENDIX G
DEPARTMENT OF WATER ADVICE – LOCAL WATER MANAGEMENT STRATEGY

From: DUNN Brett [mailto:Brett.Dunn@water.wa.gov.au]
Sent: Tuesday, 26 April 2016 1:03 PM
To: Simon Blackwell
Subject: RE: Lots 588, 590 Rockingham Rd - LWMS required at LSP stage?

Hi Simon,

Thank you for your e-mail.

Given the small size of the site, its infill nature, depth to groundwater and lack of sensitive receptors, a Local Water management Strategy, or subsequent monitoring program, is not considered necessary to inform a Local Structure Plan for this site.

Kind Regards,

Brett Dunn
Program Manager – Urban Water Management
Department of Water
Peel Region
Ph: (08) 9550 4202
Email: brett.dunn@water.wa.gov.au

From: Simon Blackwell [mailto:simon@tbbplanning.com.au]
Sent: Wednesday, 20 April 2016 2:29 PM
To: DUNN Brett
Subject: Lots 588, 590 Rockingham Rd - LWMS required at LSP stage?

Hi Brett,

Good speaking to you on the phone just now.

We are looking for preliminary advice on whether an LWMS or groundwater monitoring would be required at LSP stage for Lots 588 and 590 Rockingham Road (see attached plan). As mentioned, it is understood that no LWMS was required for the LSP prepared over Lot 584, approximately 50m north of the subject site.

Many thanks

Simon Blackwell
Planner - Urban Design

Taylor Burrell Barnett Town Planning & Design
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www.taylorburrellbarnett.com.au