STRUCTURE PLAN

LOTS 75 TO 81 PRIZMIC STREET AND LOTS 84 TO 90 WATSON ROAD, BEELIAR

OUR REF: 8350 19/07/2017

ROWEGROUP

RECORD OF ENDORSEMENT

This Structure Plan is prepared under the provisions 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:

28 July 2017

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

28 July 2017 Date

28 July 2037 Date of Expiry

Table of Amendments

Amendment No.	Summary	WAPC Endorsement Date
1	Various amendments made to the map pursuant to Clause 29A(2) of the Deemed Provisions, to coincide with Amendment No. 187 to Town Planning Scheme No. 3 (TPS 3).	TPS 3 Amendment No. 187 gazetted 12 May 2026. Structure Plan amended in accordance with Schedule 2 - Deemed Provisions, Clause 29A on 17 June 2026.

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EXECUTIVE SUMMARY

This Structure Plan addresses the urban zoned land comprising Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar (the 'subject site'). The purpose of this Structure Plan is to facilitate the development of the subject site for residential purposes.

There is currently no existing Structure Plan affecting the subject site.

Structure Plan Summary Table

Item	Data	Structure Plan Ref (section no.)
Total area covered by the Structure Plan	5.7 hectares	1.2.3
Area of each land use proposed: Residential Public Open Space	 3.68 hectares 0.56hectares (10% of GSA)	 3.2
Total estimated lot yield	Minimum 121 lots	3.3
Estimated number of dwellings	Minimum 121 dwellings	3.3
Estimated residential site density	Minimum of 33 dwellings per site hectare in accordance with LN	3.3
Estimated population	339 people (based on 2.8 people per household)	3.3
Estimated area and percentage of public open space given over to: - Regional open space - District open space - Local Parks	 n/a n/a 0.56 hectares 2 parks	3.2

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TECHNICAL APPENDICES

Appendix Number	Document Title	Nature of Document	Referral/Approval Agency	Summary of Document Modifications
1.	Certificates of Title	Supporting		
2.	Engineering Services Report	Supporting	City of Cockburn	
3.	Bushfire Management Plan	Supporting	City of Cockburn	
4.	Acoustic Assessment	Supporting	City of Cockburn	
5.	Landscape Concept Plan	Supporting	City of Cockburn	
6.	Traffic Report	Supporting	City of Cockburn	

Part One
IMPLEMENTATION

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1. Structure Plan Area

This Structure Plan applies to Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar, being the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map (Refer Plan 1 situated at the end of Part 1 of this Structure Plan report).

2. Operation

In accordance with Schedule 2, Part 4 of the *Planning and Development (Local Planning Schemes) Regulations 2015*, this Structure Plan shall come into operation when it is approved by the Western Australian Planning Commission (WAPC) pursuant to Schedule 2, Part 4, Clause 22 of the Regulations.

3. Staging

Development of the site will commence upon issue of subdivision approval. A proposed Plan of Subdivision (Stage 1) was lodged with the West Australian Planning Commission (WAPC Ref: 154138) on the 11 August 2016, for the subdivision of Lot 81 Prizmic Street and Lots 84 to 90 Watson Road, Beelier, only.

Specific staging and timing for the developments lots not included in the proposed Plan of Subdivision (Stage 1) application, being Lots 75 to 80 Prizmic Street, Beelier is still unknown at this stage.

4. Subdivision and Development Requirements

4.1 Land use and zones

The Structure Plan Map (Plan 1) outlines land use, zones and reserves applicable within the Structure Plan area. Land use permissibility within the Structure Plan area shall be in accordance with the corresponding zone or reserve under Town Planning Scheme No. 3.

4.2 Interface with adjoining land

Development of the site will have due regard to existing surrounding development, service infrastructure and road connections.

Prizmic Street is to be constructed by and at the cost of the developer at the time of subdivision of the site.

Construction of the 9m east-west aligned laneway at the north eastern corner of the subject site is to generally be in accordance with the cross section included within Part 2 (Figure 9)

4.3 Noise Attenuation

Subdivision and development of the subject site is to have due regard to the noise attenuation requirements outlined in the Acoustic Assessment Report, provided at Appendix 4 of this Structure Plan.

Whilst the assessment confirms no portion of the site is within an unacceptable acoustic range for residential development, a Noise Management Plan prepared in accordance with the *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning* and *Local Planning Policy 1.12 Noise Attenuation* will be required as a condition of subdivision approval to identify those lots requiring Noise Insulation Packages to be applied, as well as any other noise attenuation requirements for the site.

Notifications on Title will be required for those lots subject to Noise Insulation Package requirements.

4.4 Public Open Space

The Structure Plan is to provide for a minimum of 10 per cent public open space in accordance with the WAPC's Liveable Neighbourhoods. Public open space is to be provided generally in accordance with Plan 1 and the public open space schedule provided in Part 2 (Section 3.2) of this Structure Plan.

4.5 Residential Density Targets

In accordance with Liveable Neighbourhoods and Directions 2031 targets, subdivision of the site is to achieve the following:

a) A minimum average of 22 dwellings per residential site hectare across the Structure Plan area; and

b) A minimum average of 15 dwellings per gross urban hectare across the Structure Plan area.

Plan 1 defines the residential densities that apply to specific areas within the Structure Plan.

4.6 Notifications on Title

In respect of applications for the subdivision of land, the City of Cockburn shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate(s) of Title(s) to advise of the following:

a) Land or lots deemed to be affected by a Bush Fire Hazard as identified within the Bushfire Management Plan contained within Appendix 3 (or as updated);

b) Building setbacks and construction standards required to achieve a Bushfire Attack Level (BAL) of BAL - 19 or lower in accordance with the *Australian Standards (AS3959-2009): Construction of Buildings in Bushfire Prone Areas*; and

c) Land or lots deemed to be affected by midges from nearby lakes and/or wetlands being within 500-800m of the wetland bound by Fawcett Road, Preston Drive and Riverina Parade.

4.7 Urban Water Management Plan

An Urban Water Management Plan (UWMP) to be prepared, approved and implemented at the time of Subdivision.

4.8 Geotechnical Investigation

A Geotechnical Investigation is required as a condition of Subdivision Approval to determine the permeability values of the site.

5. Local Development Plans

Local Development Plans may be prepared in accordance with Town Planning Scheme No. 3 for any lots within a subdivision area, prior to the creation of said lots. A Local Development Plan is required for any lot that:

a) immediately adjoins public open space;

b) abuts a rear laneway;

c) has an area of 260m^2 or less;

d) requires special conditions to be set; or where otherwise deemed appropriate to the satisfaction of the City of Cockburn.

6. Other Requirements

6.1 Infrastructure Provision

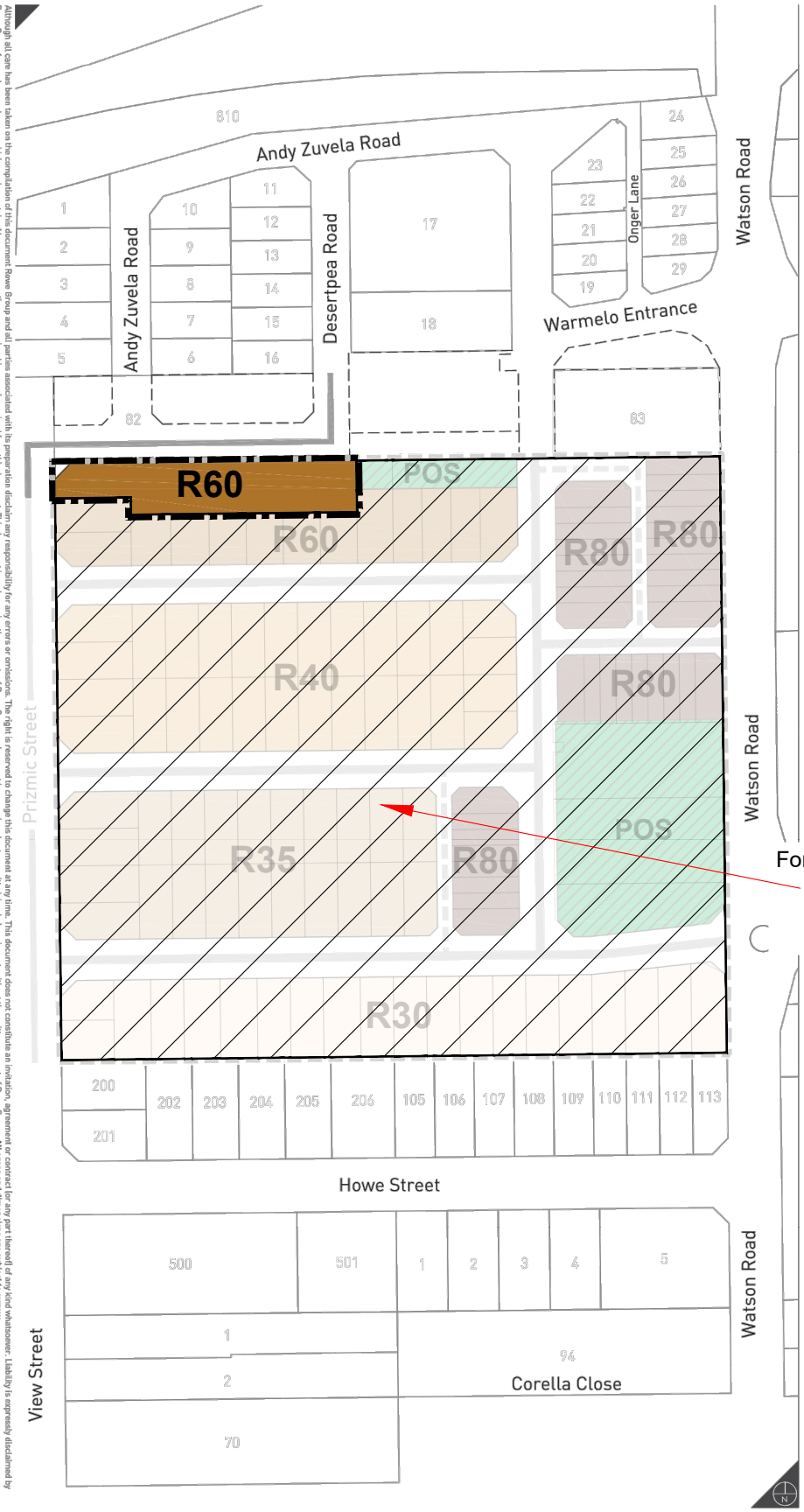
As a condition of subdivision approval, Prizmic Street will be required to be constructed to an urban standard where it abuts the subject site, as part of the development of the subject site.

The design and construction of the Prizmic Street extension will need to have due regard to the existing design, service alignments and connection points to the north and south.

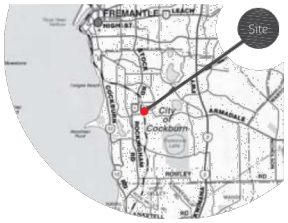
Similarly, the internal road infrastructure will need to have due regard to the existing design, service alignments and connection points to the immediate surrounding development, including connection to the existing roundabout on Watson Road.

6.2 Development Contribution Arrangements

In accordance with the Schedules 11 and 12 of Town Planning Scheme No. 3, the subject site is subject Development Contribution Plans 4 and 13. Contribution costs are to be paid in accordance with the requirements of the Scheme.



Planning Design Delivery



LEGEND

- Local Structure Plan Boundary
- 7 Existing Lot Numbers
- Existing Boundaries

RESIDENTIAL

- Residential - R30
- Residential - R35
- Residential - R40
- Residential - R60
- Residential - R80

PARKS,RECREATION & CONSERVATION

- Public Open Space

TRANSPORT

- Access Street - Local Road
- Access Street - Laneway

OTHER

- Local Structure 4C Plan
- Rationalised area

Former area of Local Structure Plan rationalised into Town Planning Scheme No.3 under Amendment 187

0 50 Metres

REVISIONS

Rev	Date	Drawn
A	2017.02.09	M. Sullivan

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Plan 1

Local Structure Plan

Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar

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Part Two
EXPLANATORY SECTION

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01 Planning Background

1.1 Introduction and Purpose

The purpose of this Structure Plan is to facilitate the development of the subject site for residential purposes. The proposed development is situated within an existing Urban area with existing development to the north and east, and development progressing to the west and south. The proposed Structure Plan is therefore considered to be infill development, and seeks to achieve urban infill targets specified under the current state planning framework.

1.2 Land Description

1.2.1 Location

The Structure Plan area is located within the metropolitan south-west corridor, within the municipality of the City of Cockburn. The site is situated approximately 20 kilometres south-west of the Perth central area, 6 kilometres west of Cockburn Central, 18 kilometres north-east of the Rockingham City Centre, and 8 kilometres south-east of the Fremantle City Centre. The site is accessible by Beeliar Road and Stock Road, via Watson Road.

The site is generally bound by Watson Road to the east, Howe Street to the south, Prizmic Street to the west, and existing residential development to the north.

Refer Figure 1 – Regional Location.

Refer Figure 2 – Local Location.

1.2.2 Area and Land Use

The Structure Plan area comprises approximately 5.7 hectares of land, and is generally cleared with winter grasses and a few scattered trees and shrubs. There are some small existing structures associated with past uses, which are to be removed as part of the development of the site.

The site is currently accessed by Watson Road on its eastern boundary and Prizmic Street terminating at the sites south western boundary. Road connections to the north through existing residential development (via Andy Zuvela Road) are planned as part of this proposal.

Refer Figure 3 – Site Plan.

1.2.3 Legal Description and Ownership

The Structure Plan comprises 14 land parcels in Beeliar, being:

Lot number / address	Proprietor/s	Deposited Plan	Volume / Folio
Lot 75 Prizmic Street	Midterm Nominees Pty Ltd	P3562	2856 / 787
Lot 76 Prizmic Street	Seaforth Nominees Pty Ltd	P3562	1097 / 394
Lot 77 Prizmic Street	Silverday Enterprises Pty Ltd	P3562	2775 / 536
Lot 78 Prizmic Street	Nextlink Holdings Pty Ltd	P3562	2866 / 351
Lot 79 Prizmic Street	Brightvale Pty Ltd	P3562	2866 / 352
Lot 80 Prizmic Street	Midterm Nominees Pty Ltd	P3562	2866 / 353
Lot 81 Prizmic Street	Midterm Nominees Pty Ltd	P3562	2866 / 350
Lot 84 Watson Road	Nextlink holdings Pty Ltd	P3562	1074 / 878
Lot 85 Watson Road	Brightvale Pty Ltd	P3562	2866 / 354
Lot 86 Watson Road	Seaforth Nominees Pty Ltd	P3562	2866 / 355
Lot 87 Watson Road	Nextlink Pty Ltd	P3562	2866 / 356
Lot 88 Watson Road	Brightvale Pty Ltd and Seaforth Pty Ltd	P3562	2855 / 993
Lot 89 Watson Road	Nextlink Holdings Pty Ltd and Silverday Enterprises Pty Ltd	P3562	2855 / 994
Lot 90 Watson Road	Brightvale Pty Ltd and Silverday Enterprises Pty Ltd	P3562	2822 / 764

All of the abovementioned lots are under the management of Aigle Royal Developments.

The Structure Plan area comprises approximately 5.7 hectares of land, with each lot measuring approximately 4047m^2.

Refer Appendix 1 – Certificates of Title.

1.3 Planning Framework

1.3.1 Zoning and Reservations

The subject site is currently zoned 'Urban' under the Metropolitan Region Scheme (MRS) and 'Development' under the City of Cockburn Town Planning Scheme No. 3 (TPS 3).

The site is situated within Development Contribution Areas 4 and 13.

The subdivision, use and development of land within the Development zone is to be generally in accordance with a Structure Plan that has been prepared and approved by the Western Australian Planning Commission. The lodgement of this Structure Plan is therefore considered to satisfy this requirement. The subject site is not situated within a District Structure Plan area.

Refer Figure 4 – Metropolitan Region Scheme Zoning.

Refer Figure 5 – Town Planning Scheme No. 3 Zoning.

1.3.2 Regional and Sub-Regional Structure Plan

1.3.2.1 Directions 2031

Directions 2031 is a long term strategic document for the Perth Metropolitan and Peel Regions that provides a broad framework for urban growth. The document primarily seeks to control urban growth by maximising infill of existing urban zoned land. Directions 2031 sets a density target of 15 dwellings per gross urban zoned hectare and encourages more intensive development closer to Activity Centres.

The subject site is situated within the south-west sub-region, as identified under Directions 2031.

Directions 2031 notes the south-west sub-region will require 41,000 additional dwellings and 41,000 new jobs. Growth will be accommodated by a combination of infill and Greenfields development. The subject site is within the 'Urban' zoned land, and as such the development of the site will contribute to meeting these growth targets for the wider region.

1.3.2.2 Perth and Peel @ 3.5 Million

The Draft Perth and Peel @ 3.5 Million was released for public comment in May 2015, and seeks to provide a framework for the development of the Perth and Peel regions as the population reaches an estimated 3.5 million by 2050. The document seeks to meet the targets identified under Directions 2031 and the State Planning Strategy 2050. The suite of documents also includes four draft sub-regional planning frameworks for the Central, North-West, North-East and South Metropolitan Peel sub-regions.

The subject site is situated within the South Metropolitan Sub-Region, and is identified as 'Urban', consistent with the current MRS zoning.

1.3.2.2.1 South Metropolitan Peel Sub-Regional Planning Framework

As noted above, the subject site is identified for urban expansion under the draft South Metropolitan Sub-Regional Planning Framework (the Framework). The development of the subject site will therefore contribute to reaching the urban infill targets specified under the Framework. Urban infill targets for the City of Cockburn are 14,678 dwellings, with an estimated population of 32,292 people. The Framework requires new urban development meet a residential density target of 15 dwellings per gross hectare. The proposed Structure Plan is capable of achieving this.

1.3.3 Policies

Development within the Structure Plan area shall be in accordance with the following City of Cockburn Local Planning Policies, except where otherwise varied by the Structure Plan, an approved Local Development Plan, or by the City of Cockburn.

- LPP 1.1 – Residential Design Codes Alternative Deemed to Comply Provisions;
- LPP 1.2 – Residential Design Guidelines;
- LPP 1.5 – Single Bedroom Dwellings;
- LPP 5.1 – Public Open Space;
- LPP 5.5 – Detailed Area Plans;
- LPP 5.7 – Uniform Fencing;
- LPP 5.11 – Filling of Land;
- LPP 5.12 – Subdivision Retaining Walls;
- LPP 1.14 – Waste Management in Multiple Unit Developments;
- LPP 5.15 - Access Street – Road Reserve and Pavement Standards.

02 Site Conditions and Constraints

2.1 Biodiversity and Natural Area Assets

The subject site is generally cleared with winter grasses and a few scattered trees and shrubs. These are not considered to be of environmental significance.

On advice of the City of Cockburn, no flora, fauna or vegetation surveys have been undertaken over the subject site for the purposes of this Structure Plan.

There are no Bush Forever sites mapped on or within close proximity to the subject site.

There are no wetlands mapped over the subject site.

2.2 Landform and Soils

The topography of the site ranges from approximately 8 metres AHD on the eastern boundary to approximately 28.5 metres AHD on the western boundary. There is an existing ridgeline comprising limestone outcrop located approximately 70 metres from the western boundary.

Preliminary testing undertaken by Douglas Partners in December 2014 identified the following soil types and ground conditions across the subject site.

- Topsoil – brown, sandy topsoil with some silt and rootlets, from surface up to a depth of between 0.05m and 0.1m. There were some areas of the site where no topsoil exists.
- Fill (sand) – medium dense to dense, brown mottled grey, orange-brown and yellow-brown, fine to medium grained sand filling with some limestone gravel, cobbles and boulders, and demolition rubble and wire, to depths of between 0.6m and 3m. Rubble generally comprises brick pieces.
- Sand – generally dense, brown and orange-brown sand, with some silt underlying the topsoil and fill, to depths of between 1.8m and 3m.
- Limestone – generally medium to high strength, white limestone encountered underlying the sand from depths of 0.6m to 2.3m. Refusal to excavate occurred within this layer when excavated using a 10 tonne excavator with a toothed bucket.

No groundwater was encountered by Douglas Partners during testing on 2 December 2014, with the lowest level excavated at the site being 5.5 metres AHD.

Refer to Appendix 2 – Service Report.

2.2.1 Acid Sulphate Soils

The Department of Environmental Regulation (DER) Acid Sulphate Soil Risk Mapping does not identify the subject site as being at risk acid sulphate soils occurring within three metres of the natural soil surface.

2.2.2 Contamination

The Department of Environmental Regulation Contaminated Sites Database does not list the site as being a contaminated site.

However, we understand the Department of Environment Regulation are currently undertaking a site assessment in regard to potential asbestos within the Structure Plan area. As such, further investigations and remediation works may be required as a condition of Subdivision Approval.

2.3 Groundwater and Surface Water

The Perth Groundwater Atlas (2004) indicates the groundwater level for the subject site was approximately 1 metre AHD during May 2003. However noting groundwater levels are affected by climatic conditions and soil permeability, and will therefore vary over time.

The depth to the water table varies from a minimum of 7 metres to in excess of 27 metres.

2.4 Bushfire Hazard

The subject site is partly contained within the Department of Fire and Emergency Services Bushfire Prone Mapping.

Notwithstanding, there is an area of approximately 0.9 hectares located on the eastern side of Watson Road within Radonich Park containing some trees with limited understorey vegetation, considered a low bushfire risk given the 20 metre Watson Road reserve providing separation to the site, this type of vegetation generally occurs in isolation.

Other existing trees located in Radonich Park are situated within a reticulated grass area, with no existing understorey vegetation and have separated canopies, therefore are not considered a bush fire risk.

In addition to Radonich Park, existing vegetation predominantly comprising grasses and low shrubs, west of the subject site on the opposite side of Prizmic Street to Stock Road. This area comprises approximately 3 hectares. Whilst undeveloped at this stage, this land is appropriately zoned for urban / residential development. Therefore this site is not considered to present a long term bush fire risk, and can be appropriately managed through the use of firebreaks and slashing in the interim.

In light of the above, a Bushfire Management Plan has been prepared in support of the Structure Plan, which highlights those lots on the western border fronting Prizmic Street as having a BAL rating of 12.5. A BAL rating of 19 is shown to affect those lots located on the north western boundary opposite a small area of undeveloped land abutting existing residential development.

All existing vegetation on the subject site will be cleared as part of the development of the site.

Refer Figure 6 – BAL Plan and Appendix 3 - Bushfire Management Plan.

2.5 Acoustic Assessment

The subject site is situated within relatively close proximity to Stock Road and Beeliar Drive, located to the west and north of the site respectively. In this regard, an acoustic assessment of traffic noise impacts was undertaken for the subject site in accordance with *State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP 5.4). A copy of the Acoustic Assessment Report is provided at Appendix 4.

The results of the noise modelling indicate there to be small portions of the Structure Plan affected by the reasonable volumes of road traffic emitted from both Stock Road and Beeliar Drive respectively. Lots located within the north western locality are proposed for R60 development and will predominantly comprise of single residential allotments. Results indicate only Lot 62 within the R60

development is to incorporate a Notification on Title as per the Policy requirements and is also subject to 'Noise Insulation Package A'.

Rear laneway lots located in the north eastern locality of the Structure Plan, are proposed for R80 development. Lot 13 and Lots 62 to 68 within this cell are to incorporate 'Noise Insulation Package A' where upper floors are constructed.

The assessment confirms limited portions of the site to be within unacceptable acoustic ranges for residential development, with those lots slightly affected suitably managed through the above mentioned controls.

03 Land Use and Subdivision Requirements

3.1 Land Use

The Structure Plan sets out land use, residential densities, public open space, vehicle and pedestrian access and servicing requirements.

The Structure Plan is proposed to comprise residential development with densities ranging from R30 to R80. The Structure Plan also comprises two areas of public open space in accordance with Liveable Neighbourhoods requirements.

The following describes the design response proposed under the Structure Plan and addresses the relevant elements of Liveable Neighbourhoods. Please refer to the land use summary table provided within the Executive Summary on Page iii of this report.

Please also refer to Plan 1 – Structure Plan, and Figure 7 - Proposed Zoning Plan.

3.2 Public Open Space

The Structure Plan provides for approximately 5,674m² (4,973m² unrestricted and 701m² restricted) of public open space (POS) within two discrete parcels. The northernmost POS area, referred to as POS 1, is provided as an extension to an existing POS area immediately to the north. POS 2 is to be created as a new site within the Structure Plan area.

Refer Figure 8 - POS Plan.

The below Public Open Space Schedule provides a breakdown of the POS within the Structure Plan area.

Table 1: Public Open Space Schedule		
Site Area (Structure Plan boundary)		56,658 m² (5.7 ha)
Deductions		
1 in 1 year drainage area	700 m²	
Total	700 m²	
Gross Subdivisible Area		**55,958 m² (5.6 ha)**
POS @10%		5,595.8 m²
Public Open Space Contribution		
May comprise: - Min 80% unrestricted POS - Min 20% restricted use POS	 4,476.64 m² 1,119.16 m²	
Total Required POS		**5,595.8 m²**
POS Reference Number	**Unrestricted Urban POS sites (m²)**	**Restricted Urban POS sites (m²)**
1	663 m²	0 m²
2	4310 m²	701 m²

Total	**4973 m²** (8.8%)	**701 m²** (1.2%)
Total POS	**5674m² (0.56ha) (10%))**	

The proposed POS areas are provided to serve a range of functions including active and passive recreation, and drainage. The design and configuration of these areas will be determined under a Landscape Management Plan, to be prepared during the detailed design stage as a condition of subdivision approval.

In accordance with Liveable Neighbourhoods, POS is provided within 200 metres of all lots within the Structure Plan area.

Refer Appendix 5 – Landscape Concept Plan.

3.3 Residential

The Structure Plan proposes a target minimum average residential density of 33 dwellings per residential site hectare and 21 dwellings per gross urban hectare. This is consistent with Liveable Neighbourhoods requirements, which stipulates a minimum average of 22 dwellings per site hectare for green field subdivision areas. This is also consistent with Directions 2031 and the Draft Sub-Regional Planning Framework targets of a minimum 15 dwellings per gross urban hectare.

Based on these target densities, the subject site will need to achieve a minimum yield of 121 dwellings. Preliminary concept planning undertaken for the subject site indicates the proposed Structure Plan layout is capable of achieving this.

Residential density codes have been allocated across the site, ranging from R30 to R80. This density code range will facilitate a diversity of lot product across the site, providing for a range of dwelling types. The proposed densities are also considered appropriate for the location of the site within approximately 400 metres of the local centre situated on Beeliar Drive and Ivankovich Avenue, known as 'Beeliar Village', as well as Radonich Park and the South Coogee Primary School. There are also existing bus services available to the subject site, further supporting the proposed densities.

The preparation of Local Development Plans can also assist in facilitating the delivery of diversity in housing product, as well as seeking to achieve built form outcomes consistent with the development intent of the site.

The street block layout, as identified on the Structure Plan, has been designed with an east-west orientation, seeking to maximise passive solar design opportunities.

3.4 Movement Networks

3.4.1 Existing Road Network

Stock Road

Stock Road is situated approximately 120 metres to the west of the subject site. Stock Road is reserved as a 'Primary Regional Road' under the MRS and connects Fremantle in the north to Rockingham in the south.

Access to Stock Road from the subject site is via Beeliar Drive to the north.

Beeliar Drive

Beeliar Drive is situated approximately 140 metres to the north of the subject site and is accessed via Watson Road. Beeliar Drive provides a connection from the site to the Kwinana Freeway.

Beeliar Drive is reserved as an 'Other Regional Road' under the MRS.

Watson Road

Watson Road runs along the site's eastern boundary, providing a direct link to Beeliar Drive. Watson Road has a 20 metre reserve cross-section, facilitating higher traffic volumes through the area and providing for bus services.

The Structure Plan proposes two road connections to Watson Road, one via an intersection with the existing roundabout at Ivankovich Avenue. The Structure Plan also proposes laneway access from Watson Road.

Access Streets

The subject site is surrounded by an existing access street network, comprising Andy Zuvela Road, Desertpea Road, and Prizmic Street. The portion of Prizmic Street adjoining the site's western boundary is yet to be constructed.

The proposed road network for the Structure Plan has consideration for connections to the existing local road network.

3.4.2 Proposed Road Network

The proposed road network predominantly consists of Liveable Neighbourhoods Access Street C roads, designed to 15.4 and 14.5m metre cross-sections. Road reserves have been reduced to 14.4m where adjoining public open space. The proposed road reserve widths are generally consistent with the existing surrounding road network to the north.

The Structure Plan proposes an east west 10m wide road reserve providing an additional connection through to Watson Road. Whilst not considered the main point of entry for the Structure Plan area and is considered a 'widened laneway', it provides manoeuvrability through this portion of the site particularly for waste vehicle services. Figure 3 of the Traffic Engineering Report (Appendix 6) demonstrates the cross section for the 10m road width as being adequate for waste vehicle manoeuvring and is considered consistent with what has previously been applied elsewhere within the City of Cockburn and other Local Government areas.

The rear laneway running in an east/west direction abutting the Structure Plan boundary to the north seeks to incorporate a 3 metre landscaping and visitor parking strip, and has therefore been allocated a reserve width of 9 metres. (Refer to Figure 9)

Similarly to the proposed 10m road reserve, this 9m laneway provides an additional connection through to Watson Road enabling for easy manoeuvrability of rubbish collection vehicles, and is considered consistent with the waste collection specifications obtained from the City of Cockburn's Waste Services Department. The proposed 9 metre reserve allows for a rubbish truck to manoeuvre and reverse if required out in both directions, as illustrated in Figure 4 to Figure 7 of the Traffic Engineering Report.

The proposed road network has been designed with relatively short street blocks in a grid network, and provides connections to the existing surrounding road network. Traffic modelling has not been undertaken for the subject site, however, traffic volumes are not expected to exceed 1,000 vehicle

movements per day. This is consistent with Liveable Neighbourhoods requirements for Access Street C, which caters for traffic volumes less than 3,000 vehicle movements per day.

Visitor vehicle parking is to be provided as indicated within the traffic engineering report, adjacent to higher residential and along public open space areas.

3.4.3 Public Transport

There are existing bus services along Watson Road (route 531) on the site's eastern boundary. There are also existing services along Beeliar Drive (routes 530, 531 and 532) to the north of the site. These routes provide connections to the Cockburn Central and Fremantle train stations.

3.4.4 Pedestrian and Cycle Network

In accordance with Liveable Neighbourhoods requirements, footpaths will be provided on at least one side of every street.

3.5 Water Management

Water management for the subject site will be undertaken in accordance with the following guidelines and standards:

- Better Urban Water Management (DoW, 2008);
- Planning Bulletin 92 – Urban Water Management (WAPC, 2008); and
- City of Cockburn Engineering Standards.

The developer is committed to a water sensitive urban design approach for stormwater management.

In accordance with City of Cockburn requirements, all stormwater will be contained and disposed of on site, with measures to promote infiltration of stormwater and recharge to groundwater for all events up to the 1 in 100 year ARI.

The proposed surface water management approach for the site includes the following key principles.

- Intercepting the road stormwater gutter flows and underground piping to a detention basin located in the POS.
- The drainage basin will include a landscaped rain garden to treat the 1 in 1 year ARI event.
- 1 in 20 year 5 minute event to be detained within lots via soak wells to be provided by lot purchasers and the builder.
- 1 in 100 year storm water overflow from lots and roadways shall flow overland within the road reserve to the proposed drainage basin.
- A landscape plan will be prepared for the 1 in 1 year detention basin as part of final construction.

In accordance with the processes defined under *Better Urban Water Management*, an Urban Water Management Plan (UWMP) will be required to be prepared and implemented at the time of subdivision. The UWMP will refine and implement the proposed drainage network / system, as outlined above.

Whilst subject to refinement by the UWMP, the following table outlines the drainage calculations for detention area proposed within POS area 2, as identified under the Structure Plan.

ARI	1 Year	5 Year	10 Year	100 Year
Catchment Area (ha)	6.18	6.18	6.18	6.18
Peak Flow at Basin (m^3/sec)	0.196	0.698	1.036	1.83
Modelled Volume (m^3)	110	417	612	1608
Basin Base RL (m)	6.4	6.4	6.4	6.4
Basin Base Area (m^2)	700	700	700	700
Side Slopes	1:0.02	1:0.02	1:0.02 / 1:6	1:0.02 / 1:6
TWL (m)	6.564	6.959	7.271	8.207
TWL Area (m^2)	700	701	747	1607
Depth (m)	0.165	0.5959	0.871	1.807

Given the size of the site and its location within an existing urban area, a formal Local Water Management Strategy has not been prepared as part of this Structure Plan.

3.6 Education Facilities

The Structure Plan does not propose any primary, secondary or tertiary education facilities.

There are existing primary and secondary schools within relatively close proximity to the subject site. These include (but are not limited to):

- South Coogee Primary School (350 metres to the east);
- St Jerome's Primary School (980 metres to the north west);
- Newton Primary School (1.7 kilometres to the north):
- Beeliar Primary School (2.6 kilometres to the east);
- Hamilton Senior High School (6 kilometres to the north);
- Perth Waldorf School (7 kilometres to the north east);
- Lakeland Senior High School (8 kilometres to the east); and
- South Fremantle Senior High School (9 kilometres to the north).

The Challenger Institute of Technology is also situated approximately 1.5 kilometres to the south of the site.

3.7 Activity Centres and Employment

The 'Beeliar Village' local centre is situated approximately 400 metres to the east of the subject site on Beeliar Drive. This centre comprises a Coles, petrol station, pharmacy, liquor store and various take away food outlets, and will provide for the day-to-day needs for future residents within the Structure Plan area. Cockburn Central is situated approximately 6 kilometres to the east of the site on Beeliar Drive, catering for the higher order needs of the site.

The site is also situated with good access to Stock Road and the Kwinana Freeway, providing for access to major employment nodes, including the Perth, Rockingham and Fremantle Central Areas, and the Kwinana, Rockingham and Henderson Industrial Precincts.

3.8 Infrastructure Coordination, Servicing and Staging

The following provides a summary of the infrastructure and servicing proposed for the Structure Plan area, however for further information it is recommended the reader consult the Engineering Services Report provided at Appendix 2.

3.8.1 Water

There is an existing 200mm diameter water main located within Watson Road and Andy Zuvela Road. There is also an existing 150mm diameter main located in Prizmic Street. To connect to the proposed development extensions to the existing network will be required.

3.8.2 Sewer

There are existing sewer reticulation located within Watson Road, Prizmic Street and Firbank Road. The proposed development for the subject site is able to be connected to this existing system.

3.8.3 Power

There are existing overhead and underground electricity services situated within Watson Road, Prizmic Street and Andy Zuvela Road. Connection to the existing power system will be subject to the design and approval of Western Power.

3.8.4 Gas

Gas mains are available from Watson Road, Prizmic Street and Andy Zuvela Road.

Reticulated gas supply will be provided to each lot by ATCO Gas, with trenching provided by the Developer.

3.8.5 Telecommunications

There are existing Telstra networks located within Watson Road, Prizmic Street and Andy Zuvela Road.

The Developer will be required to install NBN standard 'pit and pipe' infrastructure, with NBN providing the fibre optics.

3.8.6 Earthworks and Staging

Prior to development at the subject site, demolition will need to take place to remove existing sheds and other structures. Earthworks will include clearing of vegetation, topsoil stripping and replacement, cut to fill, import of clean sand fill, and retaining wall construction.

Site works will need to ensure levels and road connections seamlessly connect to surrounding development.

Staging for the development of the subject site is unknown at this stage.

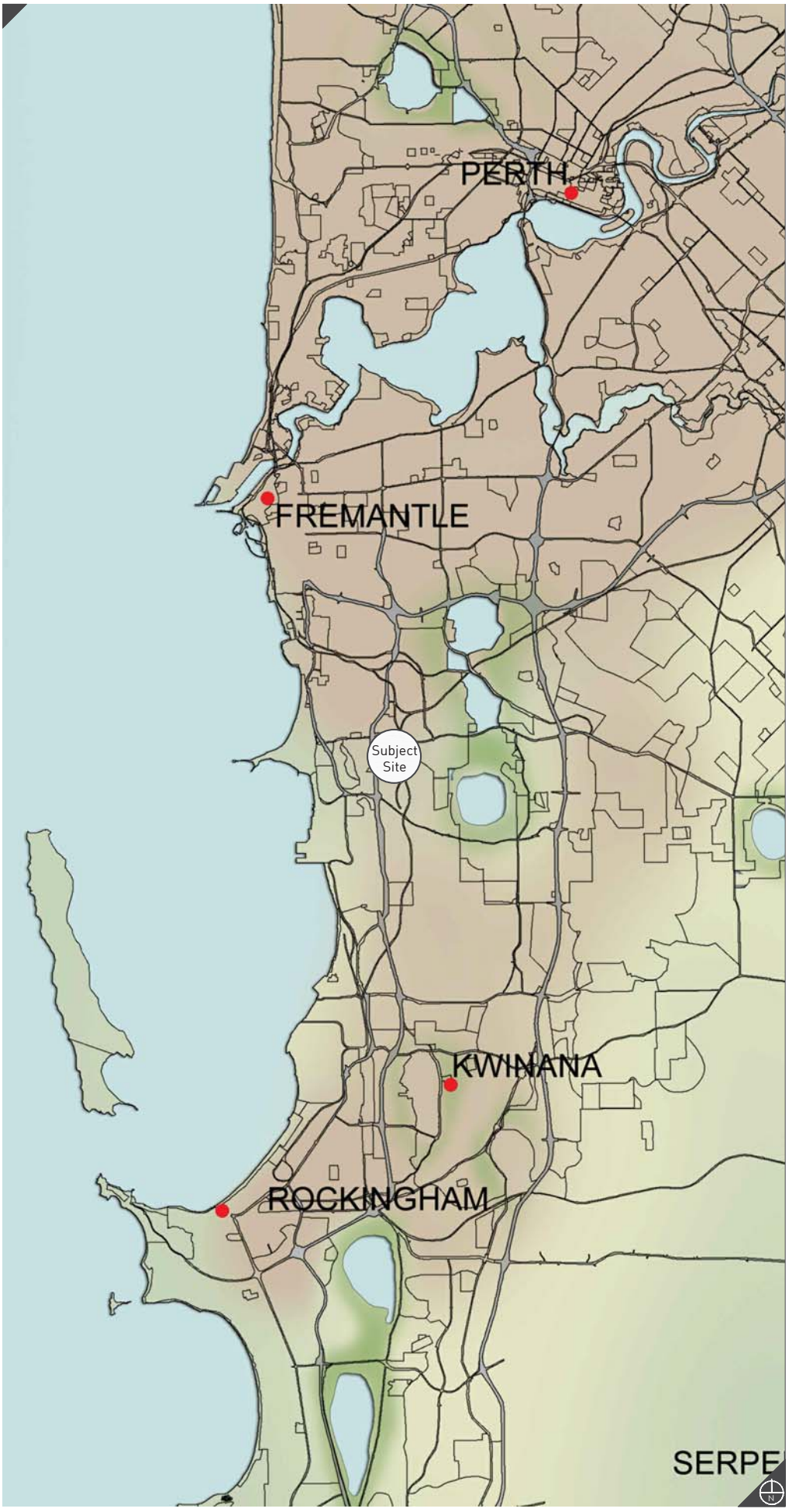
3.9 Developer Contribution Arrangements

The subject site is situated within Development Area 4 (DA 4) and Development Contribution Area 4 (Yangebup West) (DCA 4) and 13 (Community Infrastructure) (DCA 13), as detailed in Schedules 11 and 12 of the City of Cockburn Town Planning Scheme No. 3.

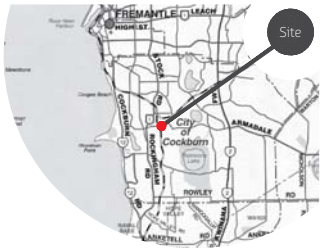
FIGURES

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Planning Design Delivery



REVISIONS

Rev	Date	Drawn
A	2015.06.05	W. Clements
B	2015.08.18	W. Clements
C	2016.08.03	W. Clements
D	2016.08.10	W. Clements

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Projection:	N/A
Plan ID:	8350-FIG-01-D

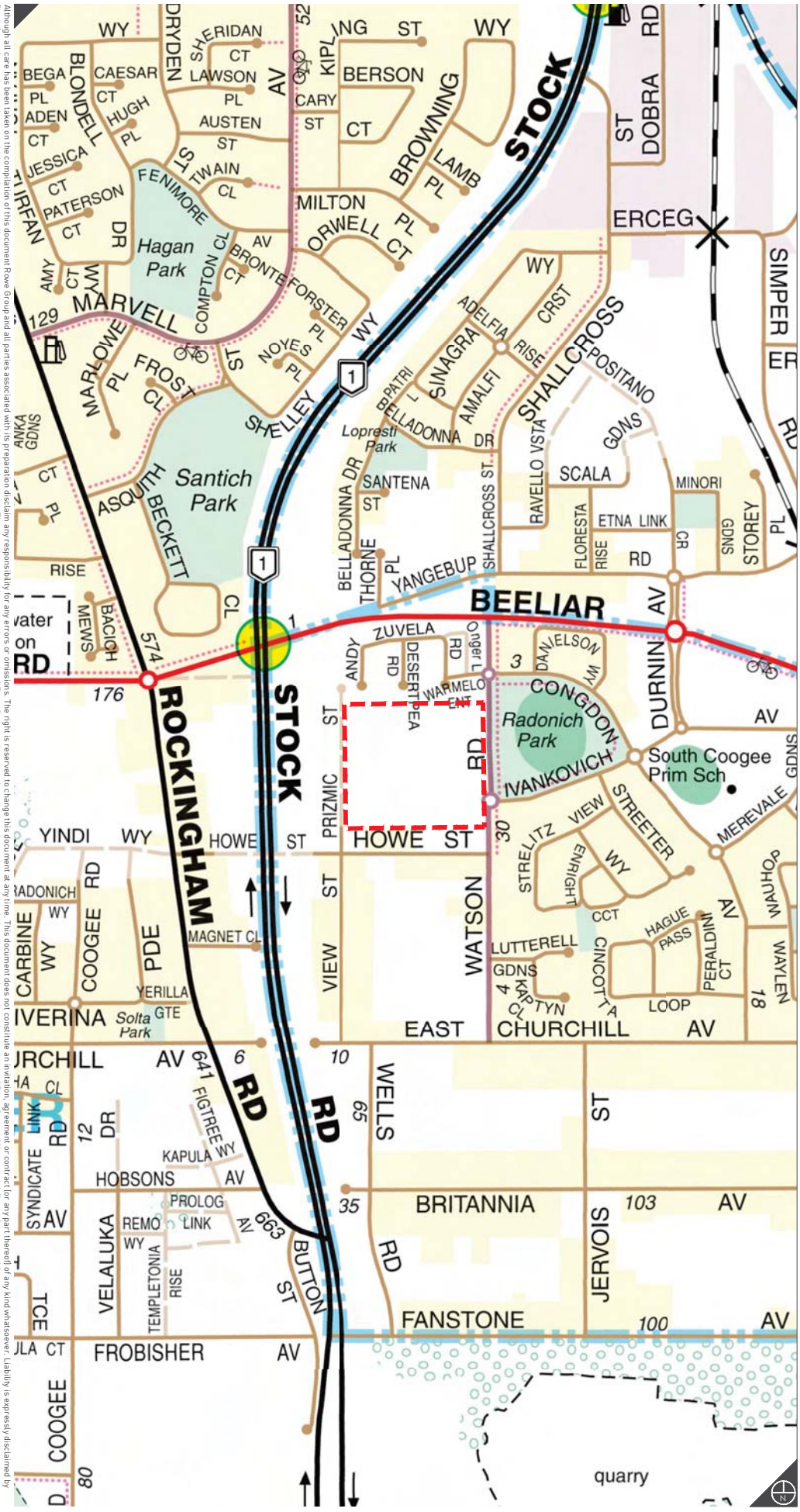
Map Data Supplied By WA Planning Commission

Regional Location

Lot 81 Prizmic Street and Lots 84 to 90 Watson Road
Beeliar

N:\TOWN PLANNING\8000-8999\8350\DRAFTING\A-CAD\8350_FIG01D_20160810 (REGIONAL LOCATION).DWG
William Clements 10 August 2016

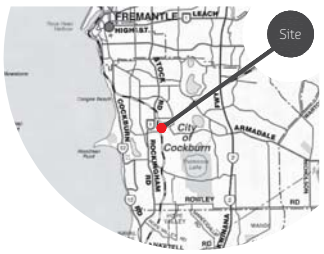
Figure 1



Local Location

Watson Road, Beeliar
Figure 2

Planning Design Delivery



LEGEND

Subject Site

0 250 Metres

REVISIONS

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A	2015.06.05	W. Clements
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Plan ID:	8350-FIG-02-B

Map Data Supplied by Streetsmart

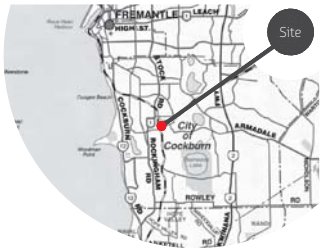
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Planning Design Delivery



LEGEND

- Subject Site
- Contours
- 7 Existing Lot Numbers
- Existing Boundaries
- Water
- Sewer
- Power

0 50 Metres

REVISIONS

Rev	Date	Drawn
A	2015.06.05	W. Clements
B	2015.08.18	W. Clements

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Projection:	MGA50
Plan ID:	8350-FIG-03-B

Aerial Photography capture and supplied by Nearmaps

Site Plan/Aerial

N:\TOWN PLANNING\8000-8999\8350\DRAFTING\A-CAD\8350_FIG03B_20150818 (SITE PLAN).DWG
William Clements 19 August 2015

Watson Road, Beeliar
Figure 3

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Planning Design Delivery



LEGEND

- Subject Site
- 7 Existing Lot Numbers
- Existing Boundaries

RESERVED LANDS

- Primary Regional Roads

ZONES

- Urban

0 50 Metres

REVISIONS

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A	2015.06.05	W. Clements
B	2015.08.18	W. Clements

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Projection:	MGA50
Plan ID:	8350-FIG-04-B

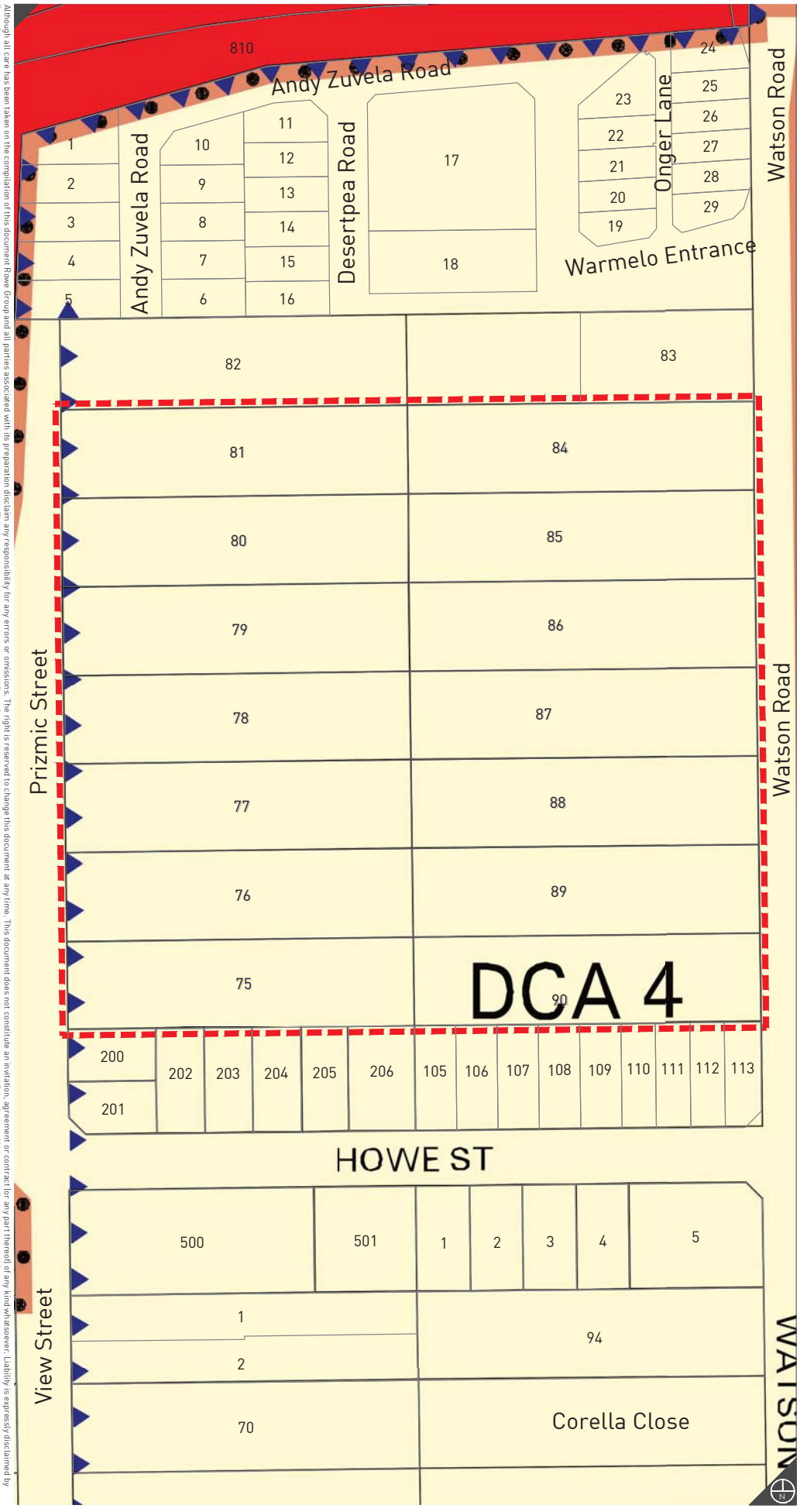
Zoning supplied by WA Planning Commission

Metropolitan Region Scheme Zoning

Watson Road, Beeliar
Figure 4

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Planning Design Delivery



LEGEND

- Subject Site
- 7 Existing Lot Numbers
- Existing Boundaries

RESERVED LANDS

- Primary Regional Roads

ZONES

- Development

OTHER

- DCA4 Development Contribution Area Boundary
- DA4 Development Area Boundary

0 50 Metres

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A	2015.06.05	W. Clements
B	2015.08.18	W. Clements

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Zoning supplied by WA Planning Commission

Town Planning Scheme No. 3 Zoning

Watson Road, Beeliar
Figure 5

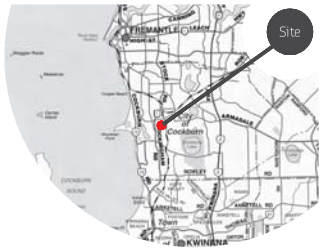
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William Clements 18 August 2015



Bushfire Attack Levels

Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar
Figure 6

Planning Design Delivery



LEGEND

- Subject Site
- 7 Existing Lot Numbers
- Existing Boundaries
- 7 Proposed Lot Numbers
- Proposed Boundaries
- Public Open Space

BUSHFIRE ATTACK LEVELS*

- BAL 19 (Indicative Only)
- BAL 12.5 (Indicative Only)
- BAL LOW (Indicative Only)

*Information retrieved from the BMP Report

0 25 50 Metres

REVISIONS

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A	2016.09.13	M. Sullivan
B	2016.10.10	M. Sullivan
C	2017.03.22	M. Sullivan

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Drawn:	M. Sullivan
Projection:	MGA50 GDA94
Plan ID:	8350-FIG-11-C

Cadastre supplied by Water Corporation

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Matt Sullivan 22 March 2017

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Planning Design Delivery





LEGEND

- Subject Site
- 7 Existing Lot Numbers
- Existing Boundaries

RESIDENTIAL

- Residential - R30
- Residential - R35
- Residential - R40
- Residential - R60
- Residential - R80

PARKS,RECREATION & CONSERVATION

- Public Open Space

OTHER

- Local Structure 4C Plan

0 50 Metres

REVISIONS

Rev	Date	Drawn
C	2015.09.25	W. Clements
D	2016.09.01	M. Sullivan
E	2016.09.02	M. Sullivan
F	2016.10.10	M. Sullivan

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Projection:	MGA50 GDA94
Plan ID:	8350-FIG-07-F

Cadastre supplied by Water Corporation of WA

Proposed Zoning and Density Code Plan

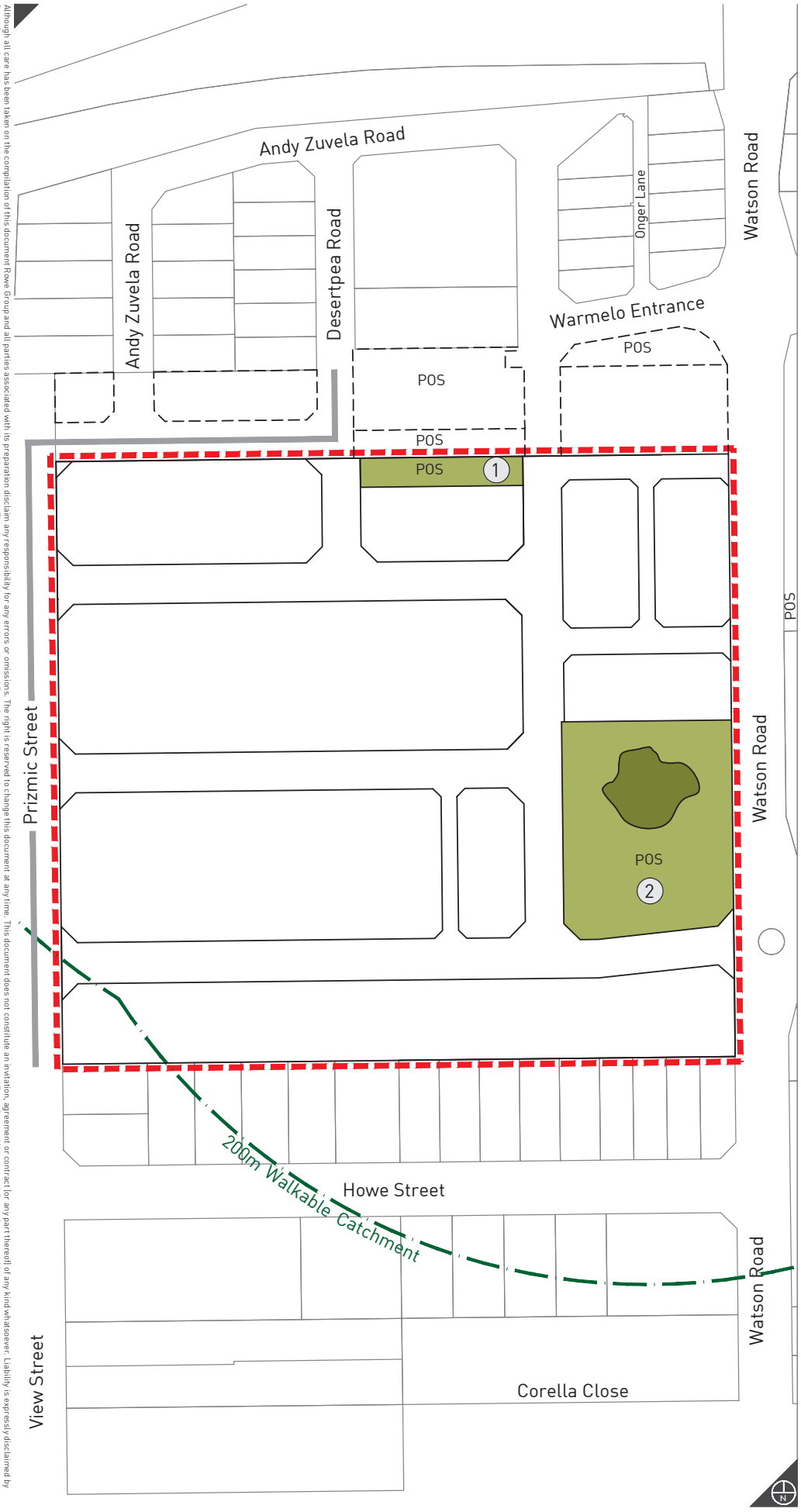
Watson Road, Beeliar
Figure 7

N:\TOWN PLANNING\8000-8999\8350\DRAFTING\A-CAD\8350_FIG07F_20161010 (PROPOSED ZONING AND DENSITY).DWG
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Planning Design Delivery





LEGEND

- Subject Site
- Existing Boundaries
- Unrestricted Public Open Space
- Restricted Public Open Space (Indicative Drainage Basin)
- 200m Walkable Catchment
- (1) Public Open Space Reference
- Local Structure 4C Plan

0 50 Metres

REVISIONS

Rev	Date	Drawn
C	2015.09.25	W. Clements
D	2016.09.01	M. Sullivan
E	2016.09.02	M. Sullivan
F	2016.10.10	M. Sullivan

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Designer:	R. Cumming
Drawn:	W. Clements
Projection:	MGA50 GDA94
Plan ID:	8350-FIG-08-F

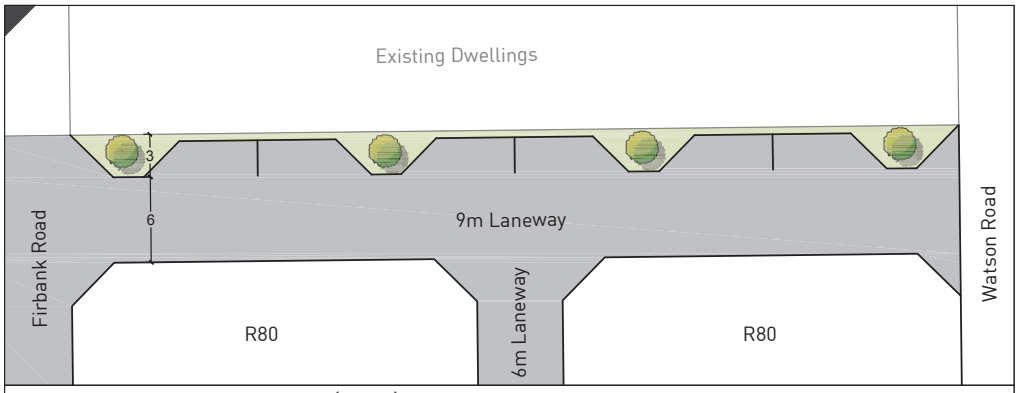
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Public Open Space Distribution

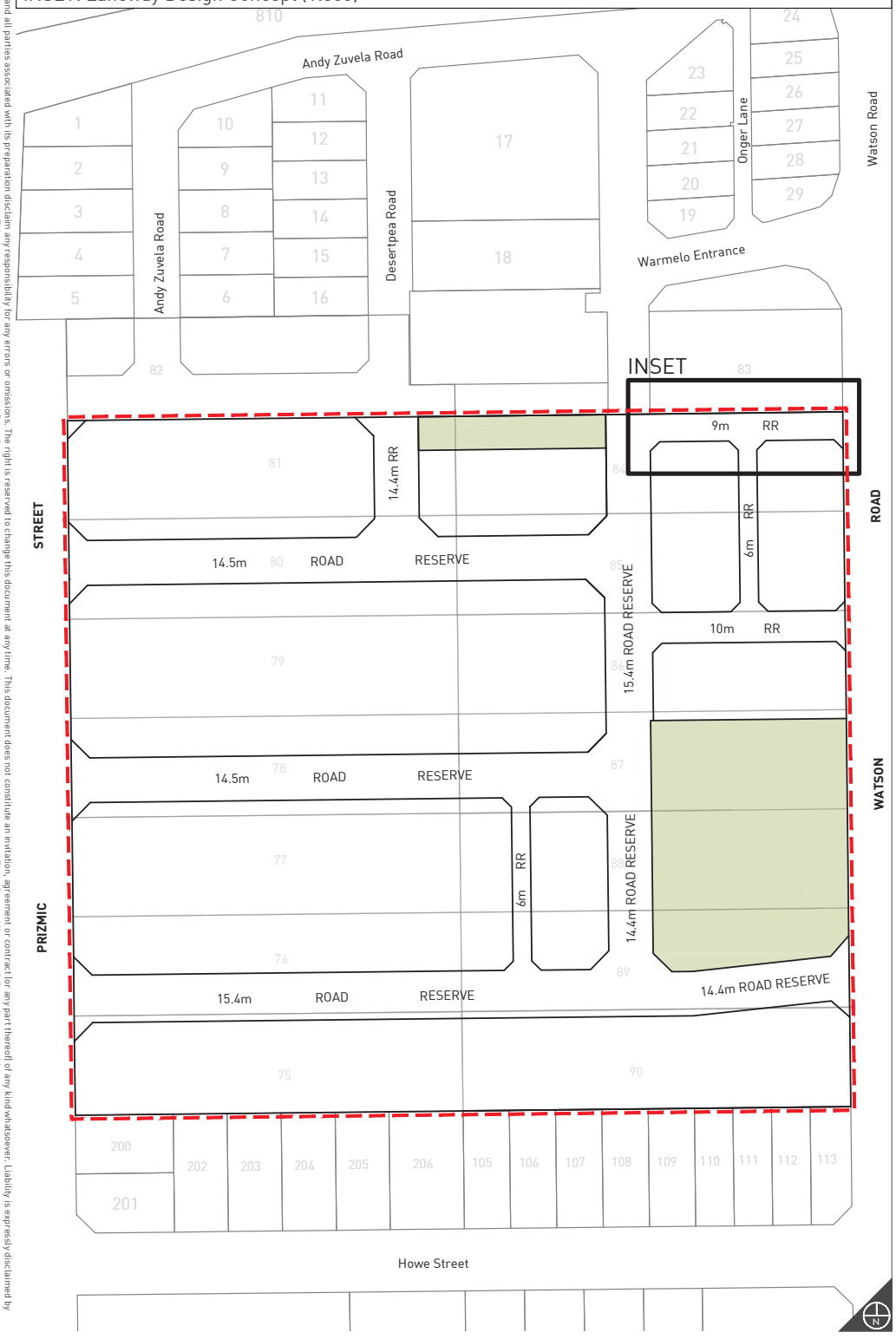
Watson Road, Beeliar
Figure 8

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INSET: Laneway Design Concept (1:500)



Laneway Design Concept

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Matt Sullivan 7 October 2016

Watson Road, Beeliar
Figure 9

Planning Design Delivery



LEGEND

- Subject Site
- 7 Existing Lot Numbers
- Existing Boundaries
- 7 Proposed Lot Numbers
- Proposed Boundaries
- Landscaping
- Road Pavement

0 50 Metres

REVISIONS

Rev	Date	Drawn
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Projection:	MGA50 GDA94
Plan ID:	8350-FIG-12-A

Cadastre supplied by Water Corporation of WA

Part Three
TECHNICAL APPENDICES

ROWEGROUP

APPENDIX 1

CERTIFICATES OF TITLE

ROWEGROUP

WESTERN AUSTRALIA

REGISTER NUMBER	
84/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1074 FOLIO 878

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 84 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MIDTERM NOMINEES PTY LTD
NEXTLINK HOLDINGS PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893883) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	1074-878 (84/P3562).
PREVIOUS TITLE:	1060-436.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
76/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
3	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1097 FOLIO 394

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 76 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SEAFORTH NOMINEES PTY LTD OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
(T M893873) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	1097-394 (76/P3562).
PREVIOUS TITLE:	1060-436.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
77/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2775 FOLIO 536

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 77 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SILVERDAY ENTERPRISES PTY LTD OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
(T M893874) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	1190-795.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
90/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2822 FOLIO 764

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 90 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SILVERDAY ENTERPRISES PTY LTD
BRIGHTVALE PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893884) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	702-181.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
88/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2855 FOLIO 993

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 88 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SEAFORTH NOMINEES PTY LTD
BRIGHTVALE PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893881) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	1005-217.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
89/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2855 FOLIO 994

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 89 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SILVERDAY ENTERPRISES PTY LTD
NEXTLINK HOLDINGS PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893882) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	1005-217.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
75/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2856 FOLIO 787

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 75 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MIDTERM NOMINEES PTY LTD OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
(T M893872) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
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Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	1190-793.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
81/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2866 FOLIO 350

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 81 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MIDTERM NOMINEES PTY LTD
SILVERDAY ENTERPRISES PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893885) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	1074-506.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
78/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2866 FOLIO 351

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 78 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

NEXTLINK HOLDINGS PTY LTD OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
(T M893875) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	652-90.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
79/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2866 FOLIO 352

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 79 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

BRIGHTVALE PTY LTD OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
(T M893876) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
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Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	652-90.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
80/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2866 FOLIO 353

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 80 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MIDTERM NOMINEES PTY LTD
SEAFORTH NOMINEES PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893877) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

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SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	652-90.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
85/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2866 FOLIO 354

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 85 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MIDTERM NOMINEES PTY LTD
BRIGHTVALE PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893878) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	652-90.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
86/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2866 FOLIO 355

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 86 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SEAFORTH NOMINEES PTY LTD
SILVERDAY ENTERPRISES PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893879) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	652-90.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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WESTERN AUSTRALIA

REGISTER NUMBER	
87/P3562	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	4/3/2015

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2866 FOLIO 356

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 87 ON PLAN 3562

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SEAFORTH NOMINEES PTY LTD
NEXTLINK HOLDINGS PTY LTD
BOTH OF LEVEL 14, 197 ST GEORGES TERRACE, PERTH
AS TENANTS IN COMMON IN EQUAL SHARES

(T M893880) REGISTERED 23 JANUARY 2015

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	P3562.
PREVIOUS TITLE:	652-90.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF COCKBURN.

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APPENDIX 2

ENGINEERING SERVICES REPORT

ROWEGROUP

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LOTS 75 – 81 VIEW STREET & LOTS 84 – 90 WATSON ROAD BEELIAR

SERVICE REPORT

Document No : 14023/01

Project : Lots 75 – 81 View Street & Lots 84 – 90 Watson Rd Beeliar

OCHREWEST
CONSULTING ENGINEERS

DOCUMENT HISTORY AND STATUS

Revision	Date Issued	Reviewed By	Approved By	Date Approved	Revision Type
1	5/09/2016	C. Fingher	C. Fingher	5/9/2016	Approval
2	5/09/2016	C. Fingher	C. Fingher	10/10/2016	Approval
3	16/12/2016	C. Fingher	C. Fingher	16/12/2016	Approval

DISTRIBUTION OF COPIES

AUTHOR: COLIN FINGHER
PROJECT MANAGER: COLIN FINGHER
NAME OF ORGANISATION: OCHRE WEST PTY LTD
NAME OF PROJECT: LOT 75-81 VIEW STREET & 84-90 WATSON ROAD BEELIAR
NAME OF DOCUMENT: SERVICE REPORT
DOCUMENT VERSION: 3
PROJECT NUMBER: 14023

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1	1	1	Kris Kennedy Aigle Royal Developments Pty Ltd
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1 INTRODUCTION

This report has been prepared to support an application for structure planning of Lots 75 – 81 Prizmic Street & Lots 84 – 90 Watson Road, and further referenced in this report as Lots 75 – 81 Prizmic Street & Lots 84 – 90 Watson Road. The report provides information on existing and proposed services plus preliminary details for earthworks, retaining walls, roads, stormwater, groundwater, sewerage reticulation, water supply, power supply, gas, telecommunication required for current urban development standards

2 SITE CHARACTERISTICS

2.1 EXISTING SITE DESCRIPTION

Lots 75 – 81 Prizmic Street & Lots 84 – 90 Watson Road, Beeliar is approximately 5.66 hectares in area and located west of Radonich Park, east of Stock Road and south of Beeliar Road. The development site fronts Watson Road to the east with existing road connection from the north Firbank and Desert Pea Roads and Prizmic Street from the south west.

Existing lots have been created along the south boundary of Lot 75 and 90 with lots fronting Howe Street and along the north boundary fronting Andy Zuvela, Desert Pea and Watson Road. There is also a POS abutting the north boundary.

The majority of the site has been utilised for market gardening and associated activity. Little or no remnant vegetation remains onsite.

The existing site levels vary from RL 28.5m midway on the west boundary to a minimum RL 8.0m to the east at Watson Road as shown in figure 1.

The cleared areas along the east boundary grade gently to the east. The cleared area to the south west is evenly graded at approximately 10% fall.

A ridge line including limestone outcrop exists approximately 70 metres from the west boundary separating a high platform level of RL27.0m and lower platform at RL 18.0m.

Farm buildings have previously been constructed and now demolished at several locations on the site. Some shed structures remain of poor quality together with remnant machinery, building materials and rubbish scattered around the site.

2.2 GROUND CONDITIONS

Preliminary site test pits were excavated and logged by Douglas Partners in December 2014. The location of test pits and results are attached as Appendix A. The preliminary investigation included eleven test pits across the site.
The ground conditions encountered at the test locations generally comprise:

- Topsoil – brown, sandy topsoil with some silt and rootlets, from surface up to a depth of between 0.05 m and 0.1 m at all test pits, with the exception of TP6 and TP8 where no topsoil was encountered;
- Filling (Sand) – medium dense to dense, brown mottled grey, orange-brown and yellow-brown, fine to medium grained sand filling with some limestone gravel, cobbles and boulders, and demolition rubble and wire, underlying the topsoil at TP3 and TP7 and from surface at TP6 and TP8, to depths of between 0.6 m and test pit termination depths of 3.0m. Rubble generally comprises brick pieces.
- Sand – generally dense, brown and orange-brown sand, with some silt, underlying the topsoil and filling at all test pits to depths of between 1.8 m and test pit termination depths of 3.0 m. Limestone cobbles and boulders were encountered within some of the test pits at depth.
- Limestone – generally medium to high strength, white limestone encountered in test pits underlying the sand at TP1, TP2, and TP6 to TP9 from depths of 0.6 m to 2.3 m. Refusal was experienced within this layer when excavated using a 10 tonne excavator with toothed bucket.

No groundwater was encountered in any of the test pits on 2 December 2014, with the lowest excavated level at the site of RL 5.5 m AHD at TP10.

2.3 GROUNDWATER

The Perth Groundwater Atlas (2004) indicates that in May 2003 the groundwater level was around RL 1 m AHD. It should be noted that groundwater levels are affected by climatic conditions and soil permeability, and will therefore vary with time.

The depth to the water table varies from a minimum of 7.0 metres to in excess of 27 metres.



Figure 1 Lots 75 – 81 Prizmic Street& Lots 84 – 90 Watson Road, Existing Contours

3 PROPOSED DEVELOPMENT

It is proposed to develop the land as residential subdivision with new road access from the intersection of Watson Road and Ivankovich Avenue and extension of existing roads Prizmic Street and Firbank Road.

A proposed concept layout has been assumed creating 123 residential lots and Public Open Space as detailed in figure 2.

Proposed lots will be provided with all services for sewer, water, power, gas, telecommunications, roads, footpaths and ancillary works. Stormwater drainage will be retained and disposed on site using best management practices.

Water Corporation sewer and water services will be extended from Watson Road, Prizmic Street and Firbank Road.

Siteworks will entail cut to fill over the whole development lot with extensive retaining walls to provide free draining flat building blocks. Some imported fill will be required.

Stormwater drainage will be managed by an on site drainage basin located within the POS near Watson Road. All individual lots created will have site soakage.

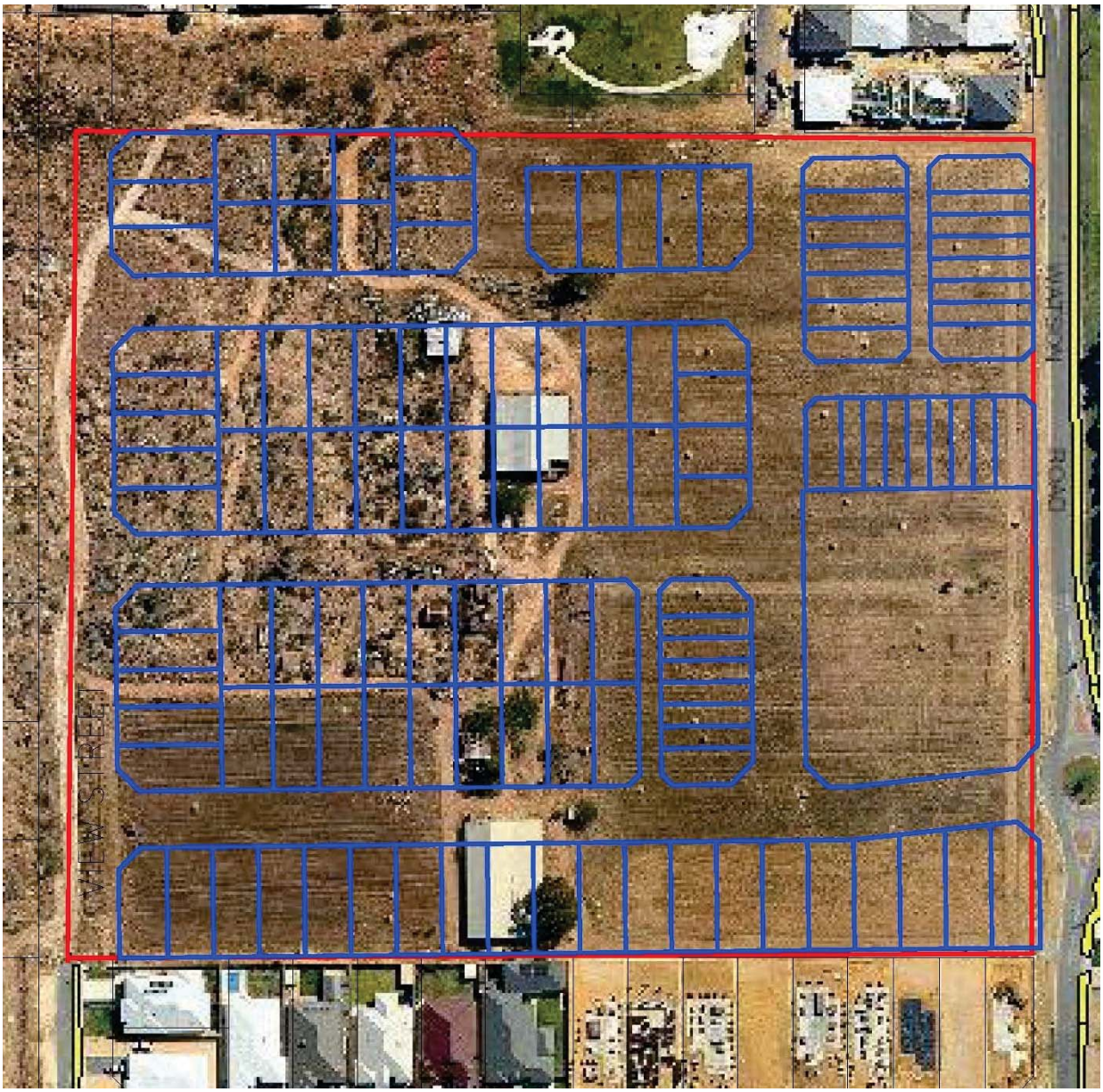


Figure 2 Concept Development Layout

4 SITE CHARACTERISTICS

4.1 EARTHWORKS AND DEMOLITION

Demolition of existing sheds will be required prior to commencing earthworks.

Siteworks will need to be undertaken to match proposed earthwork levels to existing road interfaces east of the site, existing lots north and south of the site.

The site works shall comply with the City of Cockburn requirements and other statutory requirements.

Earthwork operations will include clearing of vegetation, topsoil stripping and replacement, cut to fill, import of clean sand fill and retaining wall construction.

Due to the excessive fall on the development site extensive cut to fill earthworks will be required over the whole site. Concept earthworks levels are shown on plan 16004-C-sk1 is attached as Appendix B and show indicative finished lot levels together with preliminary road levels.

Development levels within the site are constrained by existing parameters on the four title boundaries;

- The existing Andy Zuvela and Desert Pea Road levels to the north;
- Existing Watson Road to the East;
- Established lots with rear retaining to the south; and
- Existing landholding to the west of the proposed View road extension- development levels will need to match the natural surface.

To facilitate the lot layout prepared in discussion with the City of Cockburn will necessitate road gradients up to and possibly exceeding 10 % however, any gradient exceeding this mark is expected to be minimal and for short lengths.

A maximum road profile grading of 10% has been adopted where possible, and extensive retaining walls generally low to medium height will be required to create flat building pads.

A dust management plan for the site will be prepared and submitted to the City of Cockburn for approval prior to commencing work on site.

Earthworks and finished lots will be stabilised appropriately to prevent wind borne dust nuisance.

4.2 RETAINING WALLS

Retaining walls have been included to retain lots from surrounding land and create flat building pads within the subdivision layout.

Retaining walls will be mass limestone walls subject to council building approval.

Generally retaining walls will be less than 1.48 metres in height with isolated walls up to 3.33 metres in height where necessary.

4.3 ROADS

All internal roads will be kerbed and drained and constructed to the City of Cockburn standards and approvals.

Existing road extensions from Prizmic Street and Firbank Road will be required as well as a new road connection to the existing roundabout at Watson Road and Ivankovich Avenue.

Internal roads will be 6.0 metres in width with asphalt seal with concrete kerbs including footpaths. Laneways are proposed between to the rear of Lot 94 to 101, 18 to 32 and 62 to 70. The laneways to the rear of Lots 94 to 101 and 18 to 33 will be 6.0 metres in width with asphalt seal and flush kerbs.

The laneway to the north of lot 18 and 25 will connect to Watson Road and will be 9.0 metres in width.

The laneway to the rear of lots 64 to 72 will be 10.0 metres in width to facilitate access for waste collection.

Maximum road profile grading of 10% and minimum road grading of 0.6% will be maintained where possible, in accordance with the City of Cockburn and IPWEA Subdivision Guidelines.

All new and internal road extensions will be funded by the developer and once constructed and taken over by the City will be maintained and operated by the City of Cockburn.

4.4 SEWER RETICULATION

All new lots will be required to be serviced with sewer reticulation, existing Water Corporation sewer reticulation is located in Watson Road, Prizmic Street and Firbank Road proposed sewer system.
A 150mm dia gravity sewer connection for all new lots is available from the existing sewer connection points.

All sewer reticulation work is at the developer's expense and when completed and taken over by the Water Corporation will be maintained and operated by the corporation.

4.5 WATER RETICLUATION

All new lots will be required to be serviced with water reticulation, an existing 200mm dia Water Corporation water main is located in the east verge of Watson Road as well as Andy Zuvela Road. An existing 150mm dia main is located in View Street.

Water supply extensions and new works will be required as follows:

- Extend the 200mm water main along the northern side of the proposed 13.5m wide road reserve from the Kirk Close intersection to the south eastern side of the lot (north of POS subdivision no. 29);
- 200mm dia main extension along Andy Zuvela Road extension to Road 1;
- 200mm dia main in Road 1 from Andy Zuvela Road to east verge of Watson Road including underroad bore on Watson Road;
- 150mm dia main extension along Prizmic Street and road 3; and
- 100mm dia main along Road 2.

All water reticulation work is at the developer's expense and when completed and taken over by the Water Corporation will be maintained and operated by the corporation.

4.6 POWER

Specific details have not been provided by Western Power but overhead and underground power reticulation exists on Watson Road, Prizmic Street and Andy Zuvela Road.

Lots 75 – 81 Prizmic Street & Lots 84 – 90 Watson Road are surrounded by development and connection to the existing power system will be made subject to the design approval of Western Power.

Power reticulation will be installed underground with ground mounted transformer/switchgear required to service the development in accordance with Western Power requirements.

Standard street lighting will be provided to all roads in accordance with City of Cockburn and Western Power requirements.

All power reticulation work is at the developer's expense and when completed and taken over by the Western Power will be maintained and operated by Western Power.

4.7 TELECOMMUNICATION

Telstra network is located in Watson Road, Prizmic Street and Andy Zuvela Road.

Specific details have not been provided by NBN/Telstra on available capacity but it is expected that extensions from the existing abutting services will be available.

The developer will be required to install NBN “pipe and pit” to allow for future installation of cables for the NBN.

The developer is responsible for the design and providing a “fibre ready” pit and pipe system to NBN standards.

4.8 GAS

Gas mains are available from Watson Road, Prizmic Street and Andy Zuvela Road.

Gas supply to each lot will provided by ATCO with trenching provided by the developer.

5 STORMWATER DRAINAGE

5.1 GENERAL

Water Management for the development will be provided in accordance with the following guidelines and standards:

- *Better Urban Water Management (DoW 2008)*
- *Planning Bulletin 92 – Urban Water Management (WAPC, 2008)*
- *City of Cockburn Engineering Standards*

According to the Better Urban Water Management Manual (2008) the proposal is classified as "infill development". On this basis there is no requirement for a local water management strategy to accompany the Structure Plan. Instead an urban water management plan will be completed prior to subdivision. This approach has been confirmed as suitable by the Department of Water and the City of Cockburn.

The developer is committed to Water Sensitive Design approach for stormwater management.

The requirement of the City of Cockburn regarding stormwater drainage is that all rainfall must be contained and disposed of on site to promote the infiltration of stormwater and recharge to the groundwater for all events up to the 1 in 100 year ARI event.

The surface water management proposed for the site includes intercepting the road stormwater gutter flows and piping the stormwater to a retention basin in the POS. The retention basin will include a landscaped Rain Garden to treat the 1 in 1 year event and store the critical 1 in 5 year event. Rainfall events in excess of the 1 in 5 year event will temporarily flood within the POS before infiltrating.

Road surface drainage will be collected in Side Entry Pits built within the kerbs of the road and piped to the drainage retention basin within the POS. The pit and pipe will be designed to transport rainfall up to the 1 in 5 year rainfall event in accordance with the City of Cockburn standards. All rainfall events in excess of the 1 in 5 year and up to the 1 in 100 year event will be routed by overland flow within the road reserve to the POS retention basin for storage and disposal. An XPSWMM analysis has been undertaken to determine flood depth for rainfall events and further modelling shall be undertaken as part of the subdivision stage to confirm the pipe sizes, the flows to the side entry pits and to confirm the inlet pit capacities.

The POS will be contoured to store the 1in 100 year event.

The preliminary sizing of the retention basin will be based on the discharge volumes calculated from the drainage modelling in XPSWMM software. Further details of the design parameters and results are provided. Discharge volumes and peak flow rates have been calculated for the 1, 5, 10 and 100 year events.

The City requires the 20 year 5 minute event to be contained and disposed on each lot via soakwell storage as per the City of Cockburn standards. This is to be provided by the builders/lot purchasers.

The drainage modelling has allowed for the overflow from the lots for larger events to be included into the design pipe flows and the POS retention basin storage.

It is proposed water surface management will include:

- intercepting the road stormwater gutter flows and underground piping to a detention basin located in the POS;
- the drainage basin will include a landscaped Rain Garden to treat the 1 in 1 year ARI event;
- 1 in 20 year 5 min event to be detained within lots;
- 1 in 100 year storm overflow from lots and roadways shall flow overland within road reserve to the proposed drainage basin; and
- A landscape plan will be prepared for the 1 in 1 year detention basin as part of final construction.

The 1 in 20 year 5 minute rainfall event for each lot will be detained within soakwells on each lot provided by lot purchasers and their builder.

5.2 PRELIMINARY DETENTION BASIN SIZING

The preliminary sizing of the retention basin has been determined using XP-SWWM software. The detention volume for the basin has been calculated for the 1,5,10 and 100 year events.

Modelling as allowed for the 1 in 20 year 5 minute lot detention and overflow into the road reserve for larger events.

A preliminary field permeability test was undertaken at test pit 11 during the Douglas Partners December 2014 investigation, indicates a field value of approximately 2 m/day, this value is considered conservative and while adopted for the purposes of this report has been based on a small test sample and will be verified during subdivision development, it is anticipated a permeability rate closer to 8m/day should be applicable for a sand site.

The catchment area has been modelled utilising XPSWWM software for multiple storm events and various Annual Rainfall Intensities.

Modelling scenarios were the 10 min, 30 min, 1 hour, 2 hour, 6 hour and 12 hour events for 1 in 1, 1 in 5, 1 in 10 and 1in 100 ARI events.

Stage storage depths from the base of the basin of the critical storm for each rainfall event is shown in Figure 5.1, 5.2, 5.3 and 5.4

XPSWWM results are shown in Table 5.1

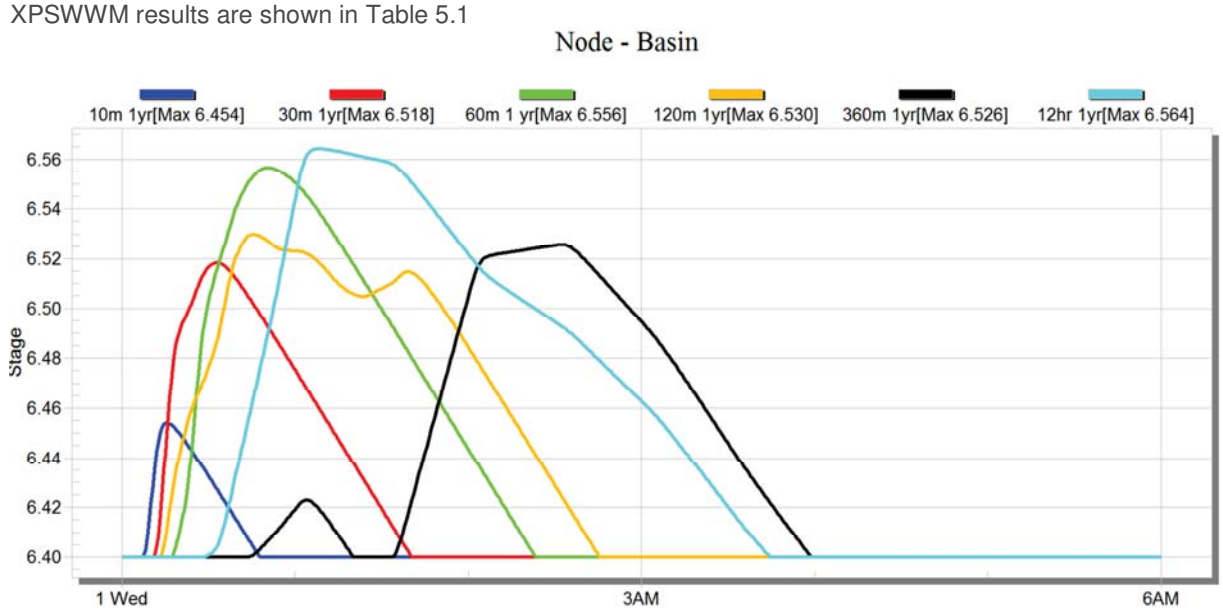


Figure 5.1 1 in1 year Critical Storage Depth 12hr event

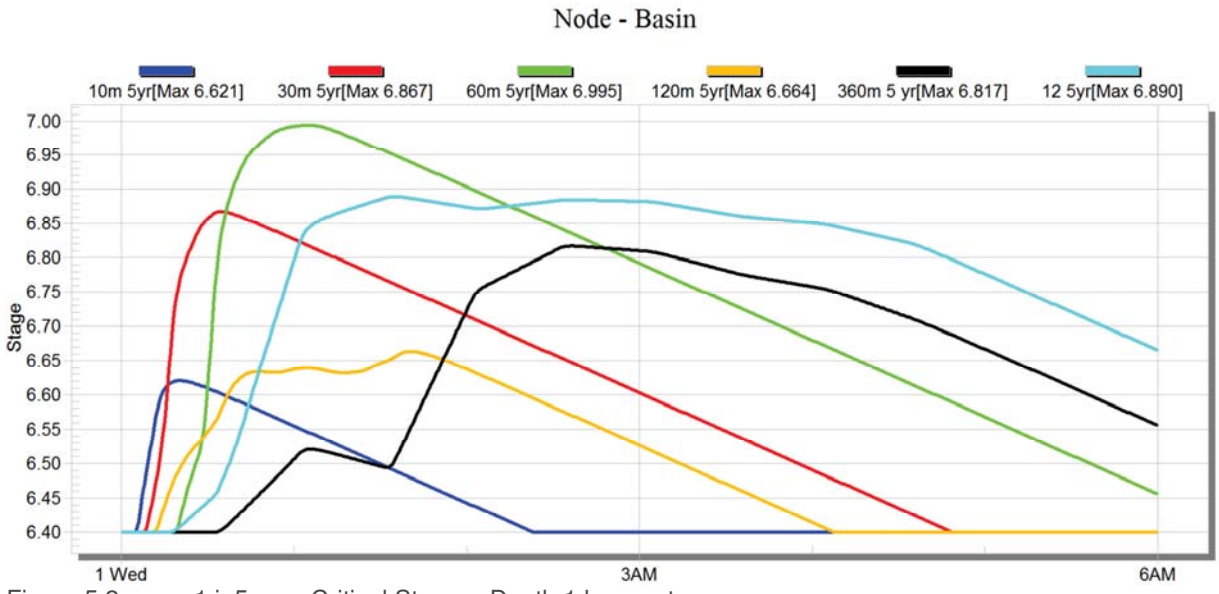


Figure 5.2 1 in5 year Critical Storage Depth 1 hr event

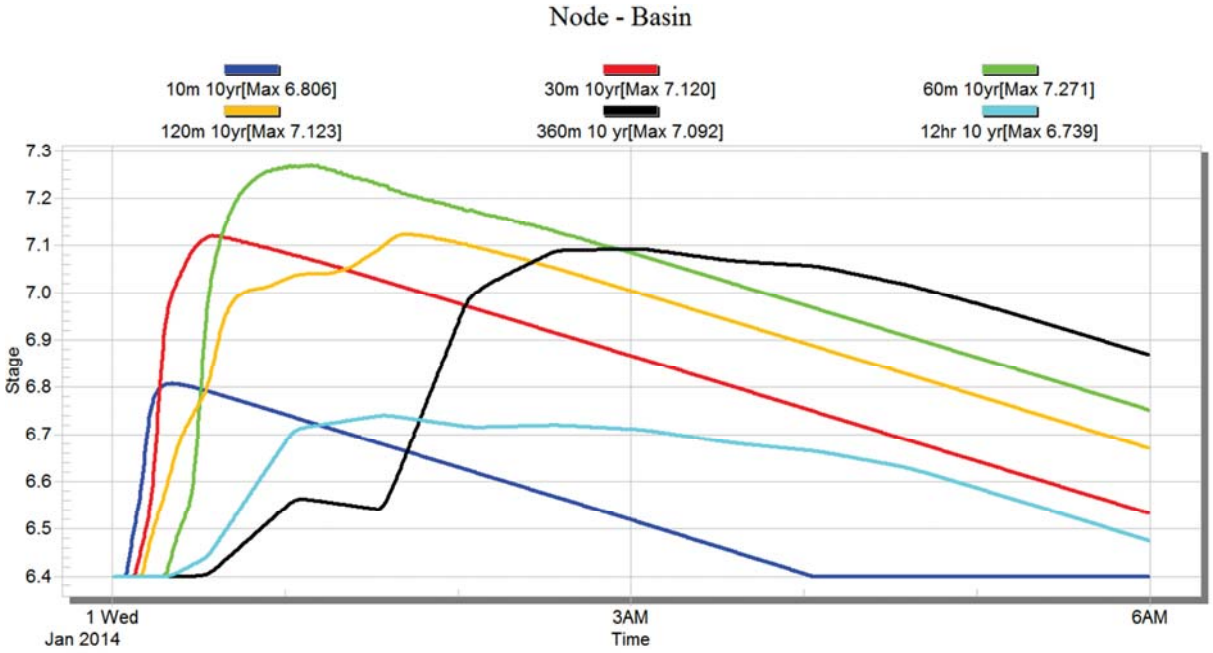


Figure 5.3 1 in10 year Critical Storage Depth 1 hr event

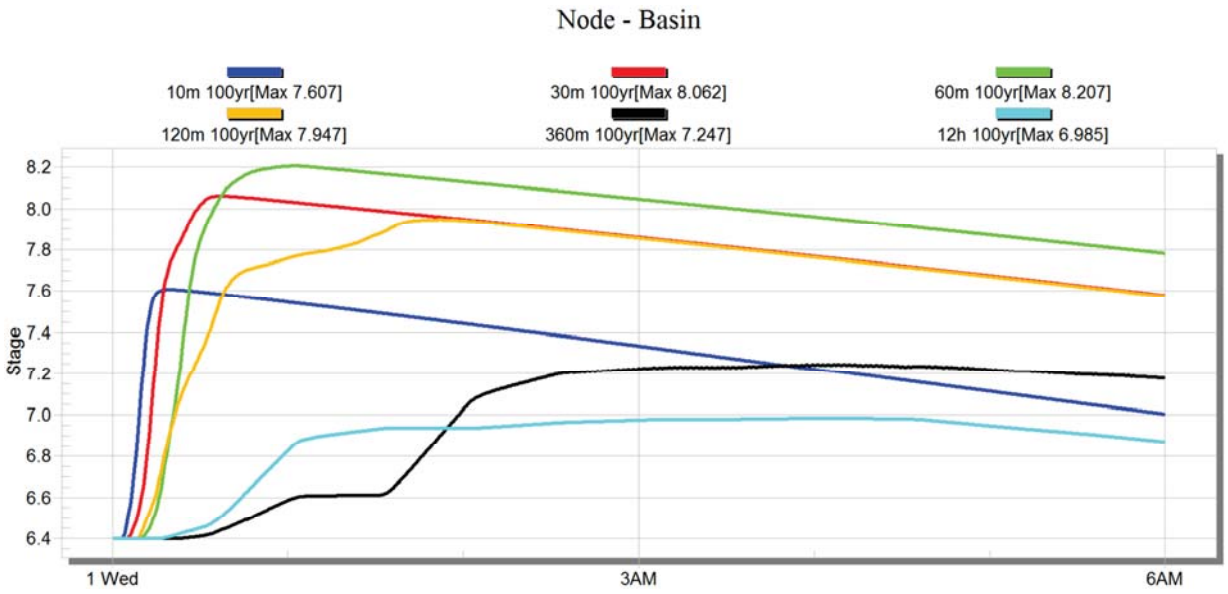


Figure 5.4 1 in100 year Critical Storage Depth 1 hr event

Table 5.1 XPSWWM analysis

ARI	1 YEAR	5 YEAR	10YEAR	100 YEAR
Catchment Area ha	6.18	6.18	6.18	6.18
Peak Flow at Basin Cum/s	0.196	0.698	1.036	1.83
Modelled Volume cum	110	417	612	1608
Basin Base RL m	6.4	6.4	6.4	6.4
Basin Base Area sqm	700	700	700	700
Side Slopes	1:0.02	1:0.02	1:0.02/ 1:6	1:0.02/ 1:6
TWL m	6.564	6.959	7.271	8.207
TWL Area sqm	700.	701.	747.	1607
Depth m	0.165	0.595	0.871	1.807

5.2.1 XPSWWM PARAMETERS

Laurenson Routing Model

Rainfall intensities from Bureau of Metereology for Beeliar

Manning's n values

- Roads 0.025
- Concrete pipes 0.014
- Landscape POS/Lots 0.03

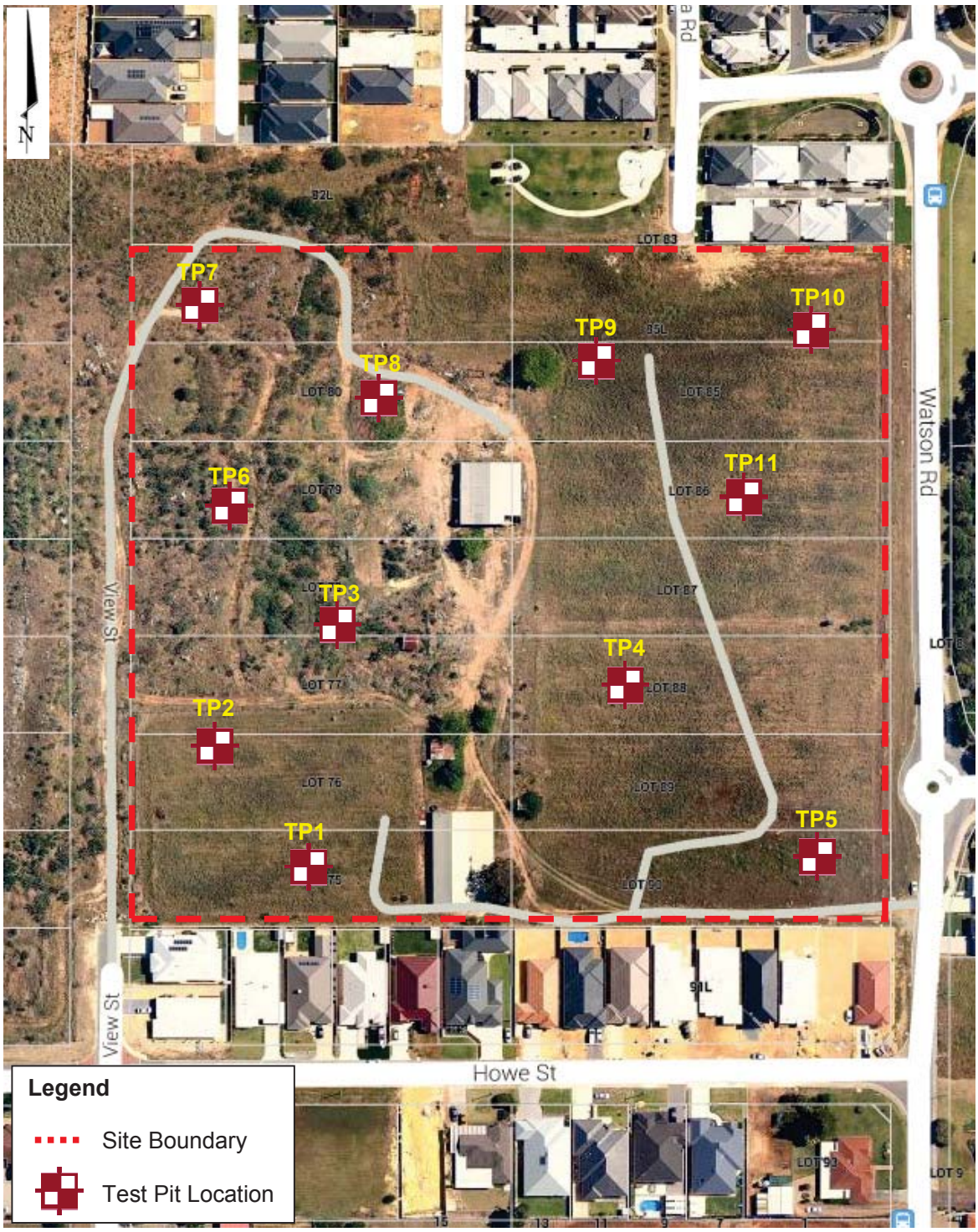
Roads - Allowed for 100% area of the road reserve as impervious runoff

- nil initial loss

Lots
- 70% area of lot area impervious runoff
- 12 mm initial loss (allowance for 1 in 20 year 5 min soakwell storage)

APPENDIX A

TEST PIT LOCATIONS AND LOGS



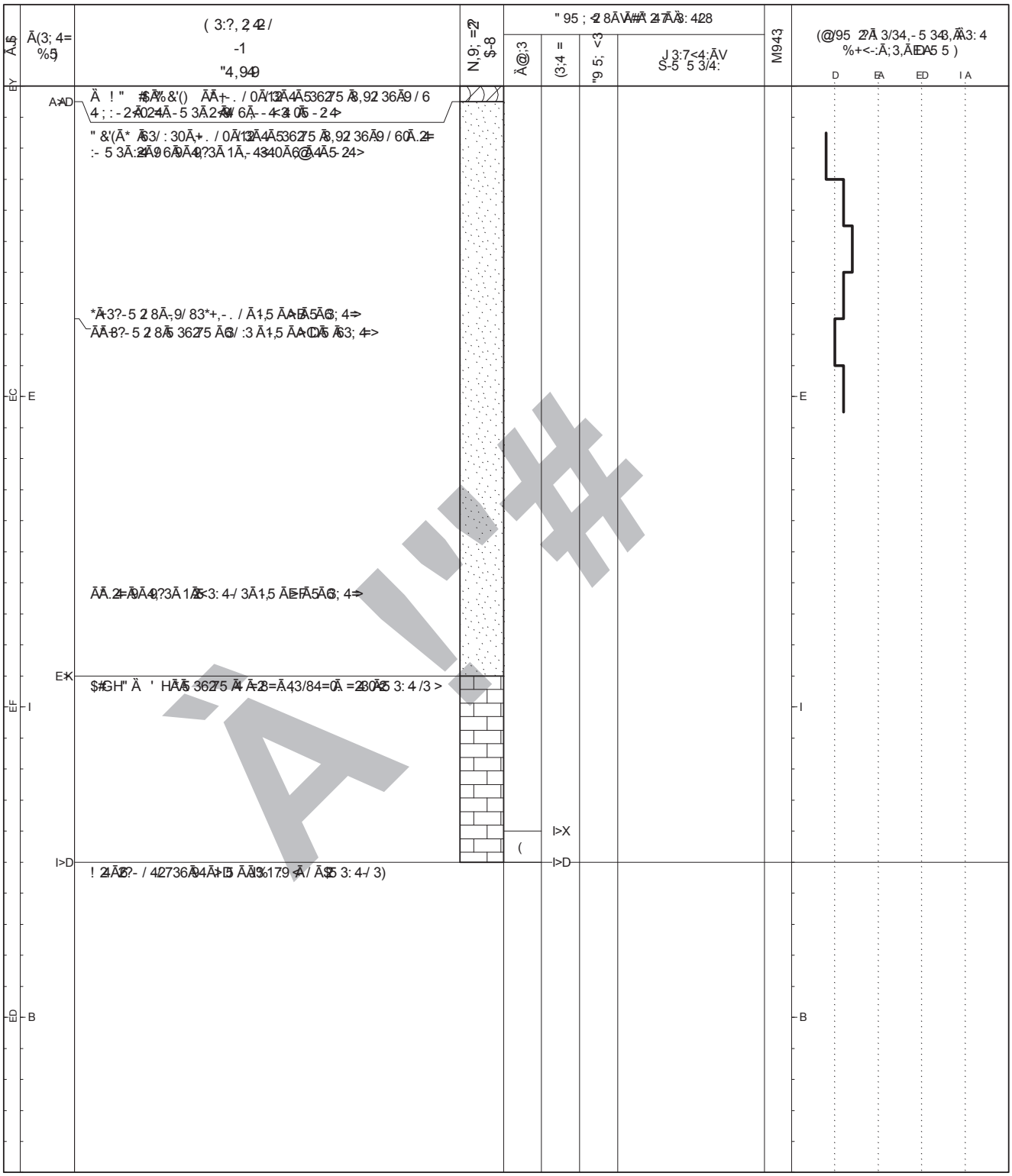
Douglas Partners Geotechnics / Environment / Groundwater	**Location of Tests** **Watson Road** **Beeliar, WA**	PROJECT:	82393
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		REV:	A
	CLIENT: Aigle Royal Developments Pty Ltd	DATE:	3-Dec-14

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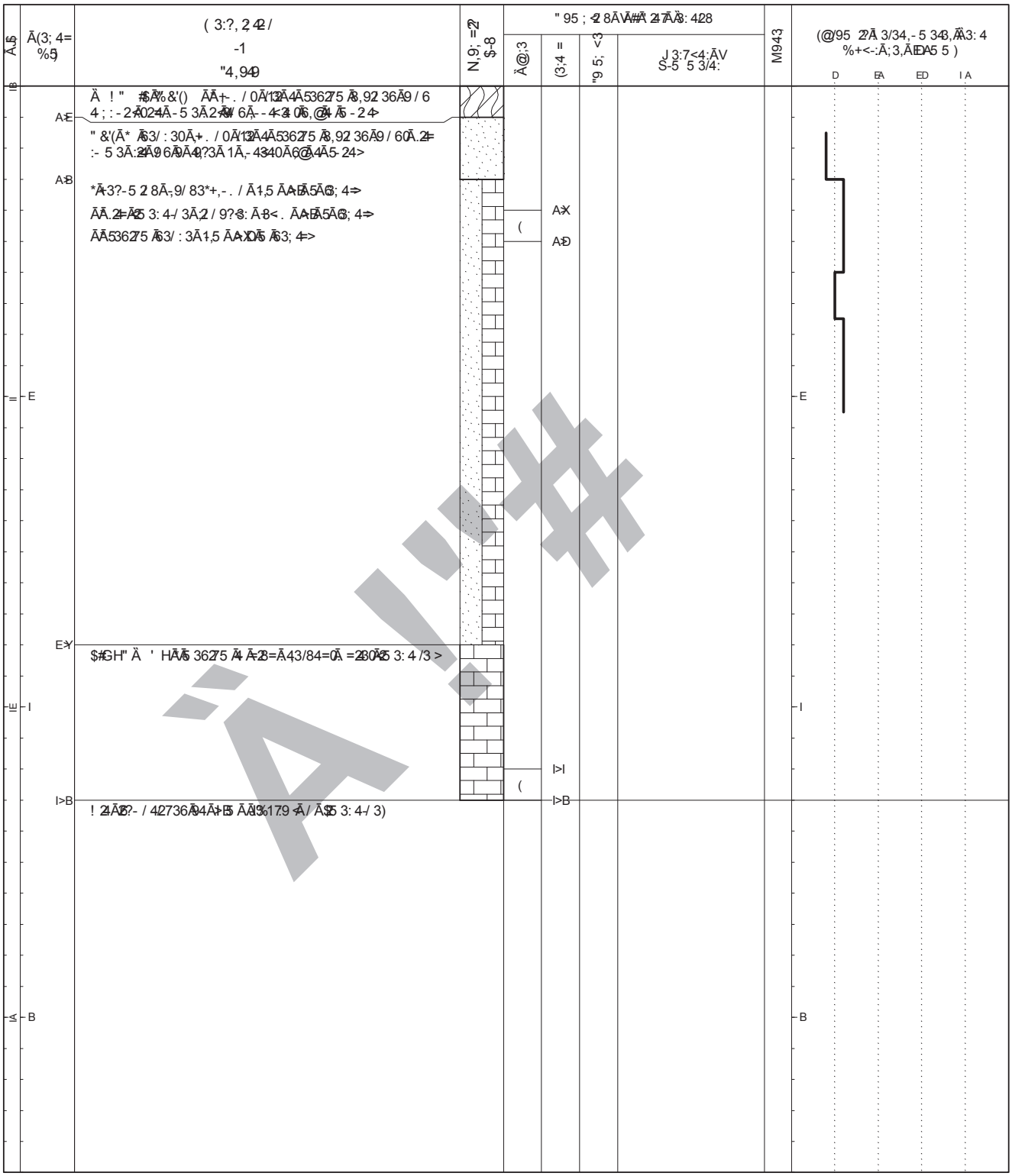
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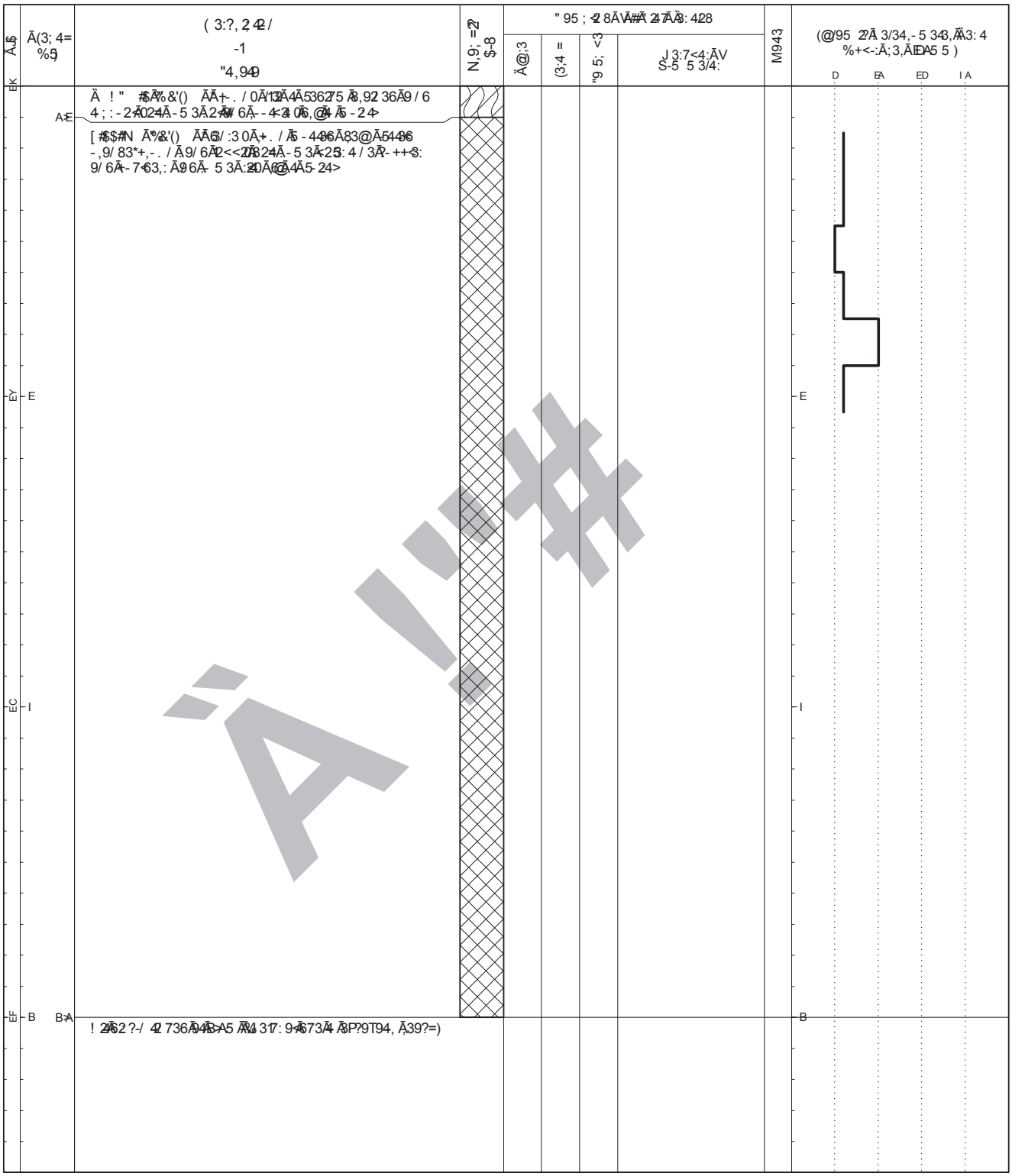
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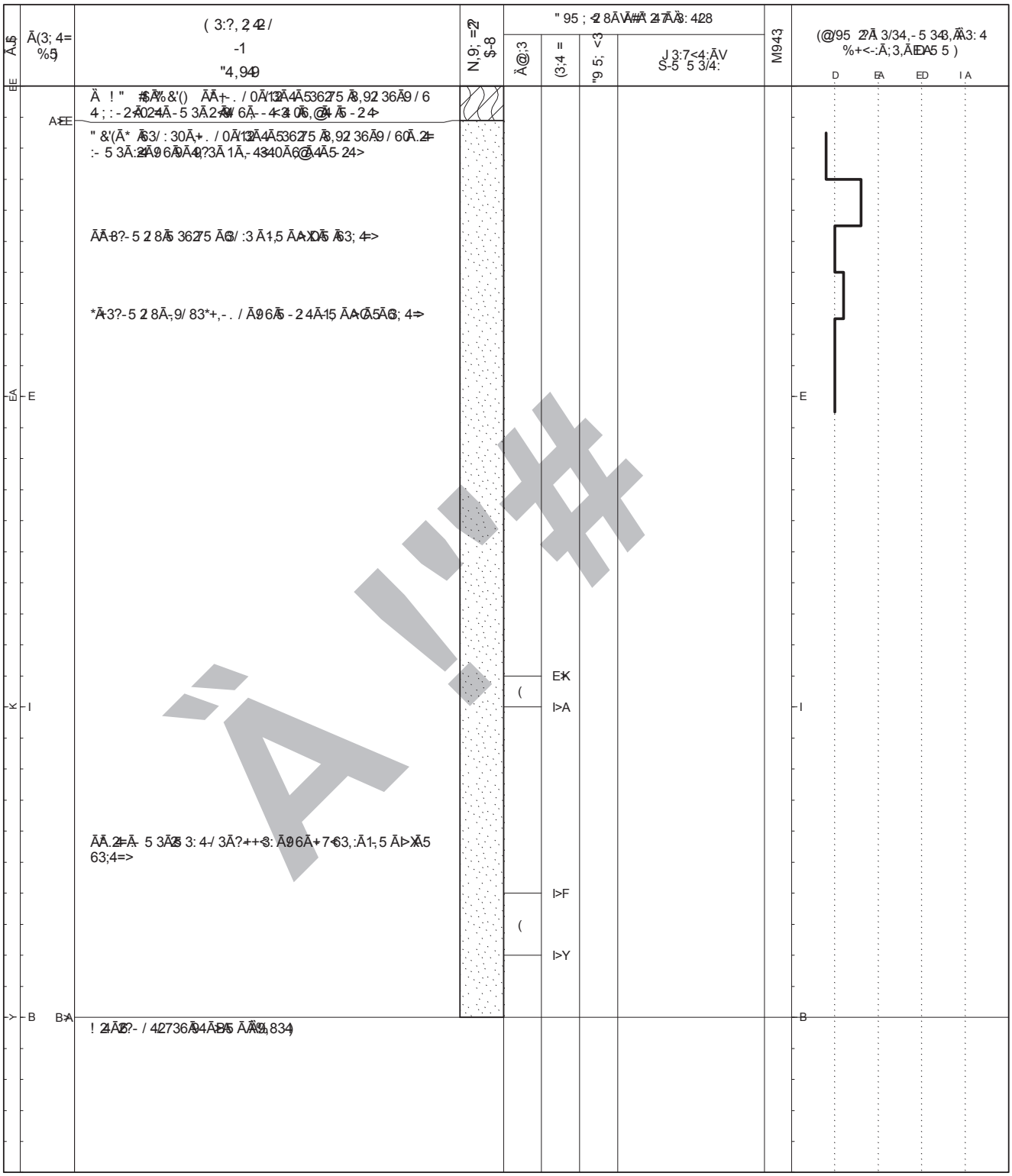
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S	S-, 3Ā, 2-4 8	M	M 94-3,Ā95 ; <3	; ;	! -? C34Ā 3/ 34-5 34-3,ĀG 9)
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H	H/ T2,-/ 5 3/ 4-9-Ā95 ; <3	▼	M 94-3,ĀT3<	U	" =39,Ā9/ 3ĀG 9)

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#- $#Ā&#Ā'. *

2' (-)# / &28<ĀJ-@9<Ā(3T<-; 53/4 : Ā4@Ā546
& . 3-2 #/ M94:-/ĀJ-96
' . 2!# (.)/ L33<2,0ĀM&

$, " ! 2 -Ā' -0-'/ ĀĀEĒĀ5Ā^ (\ **&#Ā, 4/ĀĀÀX**
-! $#() * /ĀĀĒĀĀAĒB **& . 3-2 #Ā, 4/ĀĀYĒB**
). # 5()*/ ĀĀĀKXDXF **À!# -/** ĀĀIZĒIAEX
$5 --# ĀĀEĀĒĀĀE



(* /ĀĒĀĀĀ- / / 3Ā, 9/ 5 9, ĀH-?9T94 -,Ā.2=-ĀAĀĀ5 5 Ā4- 4-36Ā+7?C84

' . **- À/ĀĀQ

$, 0-1 ĀĀ! #, %/ĀĒN&KX

7 ! #- Ā 8 $- 0!# (.) $/ **' -Ā,13Ā8,- 7/ 6. 943,Ā-+: 3,T36**

- %! 6 $/ **\" 7, 19?3Ā8T3-Ā2 43,;-<-9436Ā,-5 Ā 7,T3@-Ā9/ Ā,- T2236Ā+@Ā23/ 4**

☒ " 9/6Ā! 3/3 4- 5 34-8,Ā&" EIYK-F-B-B
☐ S-/3 Ā 3/ 34- 5 34-8,Ā&" EIYK-F-B-

$! %&' () * Ā+ĀĀ(#, Ā#-$#() * Ā- * -) Ā

&	&783,Ā95 ; -8	N	N9: Ā95 ; -8	! #	! =-4-Ā2-/ 2:94-/ Ā3-8?4 ,Ā‰; 5)
L	L7<ĀA95 ; -8	!	! 2:4 / Ā95 ; -8	! $%&)	! -2/ 4-96 ĀP294Ā3: 4-# %ĒA)Ā‰G9)
L$Q	L < ?ĀA95 ; -8	R_p	Ā7+3Ā95 ; -8Ā‰Ā5 Ā629>	! $%)	! - 2/4-96 Ā5295349-4Ā3: 4-# %ĒA)ĀG!9)
S	S-, 3Ā, 2-8	M	M94-8,Ā95 ; -8	; ;	! -? C84Ā 3/ 34-5 34-8,ĀG 9)
(	(2: 4-7, +36Ā95 ; -8	▷	M94-8,Ā33;	"	" 4-9/ 69,6Ā 3/ 34-94-2-/ Ā6: 4
H	H/ T2,-/ 5 3/ 4-9-Ā95 ; -8	▼	M94-8,Ā8T3<	U	" =39,Ā9/ 3ĀG 9)

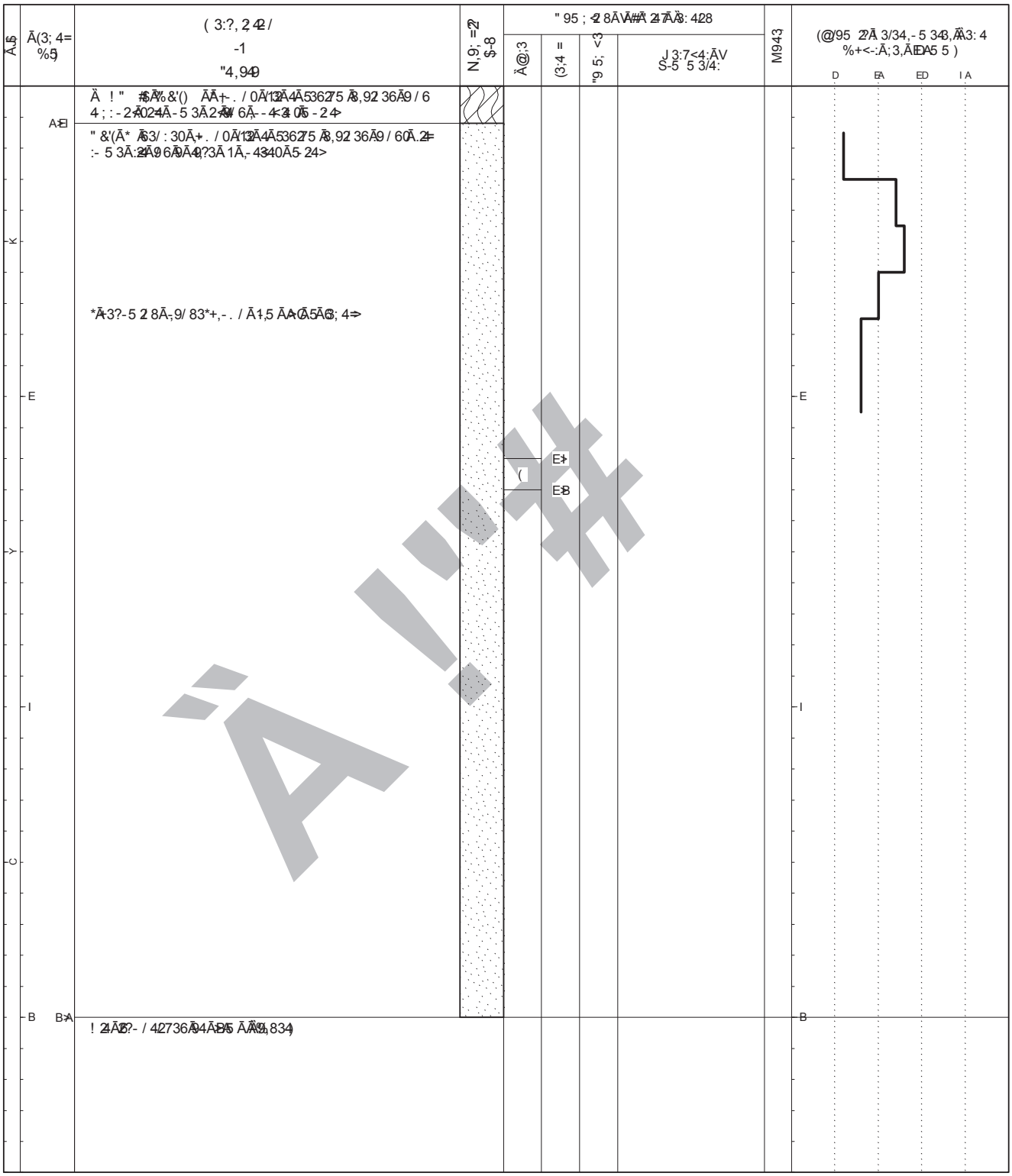
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#- $#Ā&#Ā'. *

2' (-)# / &28<ĀJ-@9<Ā(3T<-; 53/4 : Ā4@Ā546
& . 3-2 #/ M94:-/ĀJ-96
' . 2!# (.)/ L33<2,0ĀM&

$, " ! 2 -Ā' -0-'/ ĀĀKĀĀĀ&'(\
-! $#() * /ĀĀĀĀĀĀK
). # 5()*/ ĀĀĀKXDAI

&#Ā, 4/ĀĀĀD
& . 3-2 #Ā, 4/ĀĀYIĀB
À!# -/ ĀĀIZIEIAEX
$5 --# ĀĀEĀĀĀE



Ä !#

(* /ĀĀĀĀ- / / 3Ā, 9/ 5 9,ĀH?9T94 ,Ā.2=ĀĀAĀ5 5 Ā4- 4=36Ā+7?O84

' . **- À/ĀĀQ

$, 0-1 ĀĀ! #, %/ĀĀN&KX

7 ! #- Ā 8 $- 0!# (.) $/ ' - Ā,13Ā8,- 7/ 6. 943Ā+: 3,T36

- %! 6 $/ \" 7, 19?3Ā8T3Ā2 43,;-<9436Ā,-5 Ā 7,T3@Ā9/ Ā,- T2236Ā+@Ā23/ 4

☒ " 9/6Ā! 3/3 4- 5 34,Ā&" EIYK>F>B>B
☐ S-/3 Ā 3/ 34- 5 34,Ā&" EIYK>F>B>

$! %&' () * Ā+ĀĀ(#, Ā#-$#() * Ā- * -) Ā

&	&783,Ā95 ; <8	N	N9: Ā95 ; <8	! #	! =-4-Ā2-/ 2:94-/Ā34-8?4 ,Ā‰; 5)
L	L7<ĀĀ95 ; <8	!	! 2:4 / Ā95 ; <8	! $%&)	! -2/ 4Ā96 ĀP294Ā: 4# %DA)Ā‰G9)
L$Q	L < ?ĀĀ95 ; <8	R_p	Ā7+3Ā95 ; <8Ā‰Ā5 Ā629>	! $%()	! - 2/4Ā96 Ā5295349 4Ā: 4# %DA)Ā‰G!9)
S	S-, 3Ā, 2 42 8	M	M94,Ā95 ; <8	; ;	! -? O34Ā 3/ 34-5 34,Ā‰G 9)
(	(2: 47, +36Ā95 ; <8	▷	M94,Ā33;	"	" 49/ 69,6Ā 3/ 3494 2-/Ā‰: 4
H	H/ T2,-/ 5 3/ 49+Ā95 ; <8	▼	M94,Ā‰T3<	U	" =39,Ā9/ 3Ā‰G 9)

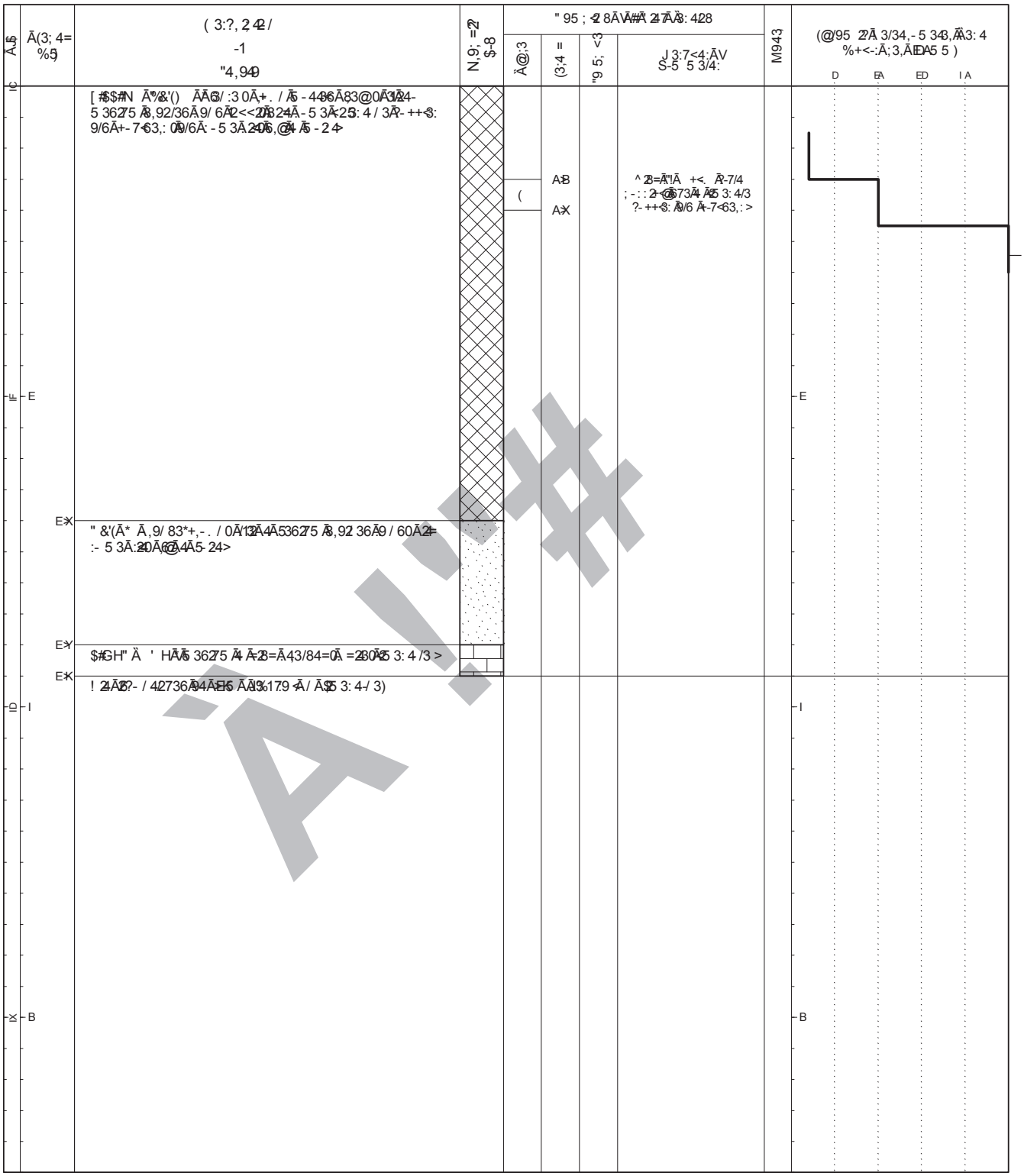
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#- $#Ā&#Ā'. *

2' (-)# / &28<ĀJ-@9<Ā(3T<-; 53/4 : Ā4@Ā546
& . 3-2 #/ M94:-/ĀJ-96
' . 2!# (.)/ L33<2,0ĀM&

$, " ! 2 -Ā' -0-'/ ĀĀIQ>Ā5Ā^ (\
-! $#() * /ĀĀĀĀĀDY K
). # 5()*/ ĀĀĀKXDKF

&#Ā, 4/ĀĀĀÀF
& . 3-2 #Ā, 4/ĀĀYIKB
À!# -/ ĀĀIZIEIAEX
$5 --# ĀĀEĀĀĀE



(* /ĀĀĀĀ- / / 3Ā, 9/ 5 9, ĀH#?9T94 , Ā. 2=-ĀAĀ5 5 Ā4- 4=36Ā+7?O84

' . **- À/ĀĀQ

$, 0-1 ĀĀ! #, %/ĀĀN&KX

7 ! #- Ā 8 $- 0!# (.) $/ ' - Ā,83Ā8,- 7/ 6. 943Ā-+: 3,T36

- %! 6 $/ \" 7, 19?3Ā8T3Ā2 43,;-<9436Ā,-5 Ā 7,T3@Ā9/ Ā, - T2236Ā+@Ā2/ 4

☒ " 9/6Ā! 3/3 4- 5 34-8,Ā&" EIYK>F>B>B
☐ S-/3 Ā 3/ 34- 5 34-8,Ā&" EIYK>F>B>

$! %&' () * Ā+Ā(Ā(#, Ā#-$#() * Ā - * -) Ā

&	&783,Ā95 ; <8	N	N9: Ā95 ; <8	! #	! =-4-Ā2-/ 2:94-/ Ā34-8?4 ,Ā%; 5)
L	L7<ÔĀ95 ; <8	!	! 2:4 / Ā95 ; <8	! $%&)	! -2/ Ā+96 ĀP294-8: -# %DA)Ā%G!9)
L$Q	L < ?ÔĀ95 ; <8	R_P	Ā7+3Ā95 ; <8Ā%Ā5 Ā29>	! $%9)	! - 2/Ā+96 Ā29534 9+Ā8: -# %DA)Ā%G!9)
S	S-, 3Ā, 2+8	M	M 94-8,Ā95 ; <8	; ;	! -? O34Ā 3/ 34-5 34-8,ĀG 9)
(	(2: 4-7, +36Ā95 ; <8	▷	M 94-8,Ā33;	"	" 4-9/ 69,6Ā 3/ 34-94-2-/ Ā6: 4
H	H/ T2,-/ 5 3/ 4-9+Ā95 ; <8	▼	M 94-8,Ā8T3<	U	" =39,Ā9/ 3Ā6 9)

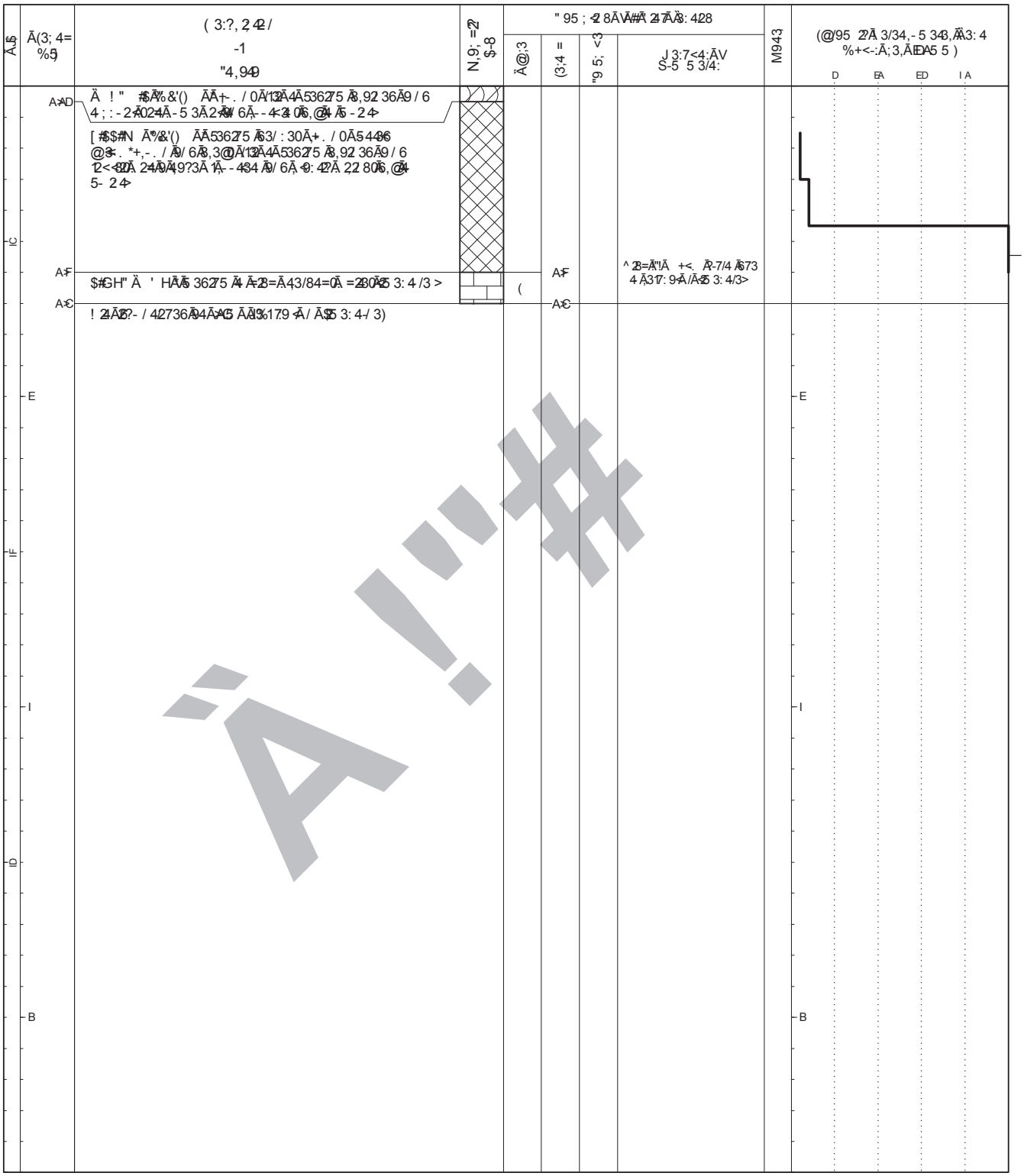
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#- $#Ā&#Ā'. *

2' (-)# / &28<ĀJ-@9<Ā(3T<-; 53/4 : Ā4@Ā546
& . 3-2 #/ M94:-/ĀJ-96
' . 2!# (.)/ L33<2,0ĀM&

$, " ! 2 -Ā' -0-'/ ĀĀIC>Ā5Ā^ (\
-! $#() * /ĀĀĀĀĀY1
). # 5()*/ ĀĀĀKXFCC

&#Ā, 4/ĀĀĀC
& . 3-2 #Ā, 4/ĀĀYIB
À!# -/ ĀĀIZIAEX
$5 --# ĀĀEĀĀĀE



(* /ĀĒĀĀ- / / 3Ā, 9/ 5 9, ĀH#?9T94 , Ā. 2#=ĀFAAĀ5 5 Ā4- 4=36Ā+7?C84

' . **- À/ĀĀQ

$, 0-1 ĀĀ! #, %/ĀĒN&KX

7 ! #- Ā 8 $- 0!# (.) $/ ' - Ā,13Ā8, - 7/ 6. 943Ā+: 3, T36

- %! 6 $/ \" 7, 19?3Ā8T3Ā2 43, ;-< 9436Ā, -5 Ā 7, T3@Ā9/ Ā, - T2236Ā+@Ā2/ 4>Ā7, 12?29<Ā5 3: 4 / 3Ā +: 3, T36Ā 39, Ā3: 4 ;24>

☒ " 9/6Ā! 3/3 4 - 5 34Ā, ĀĀ" EIYK>F>B>B
☐ S- /3 Ā 3/ 34 - 5 34Ā, ĀĀ" EIYK>F>B>

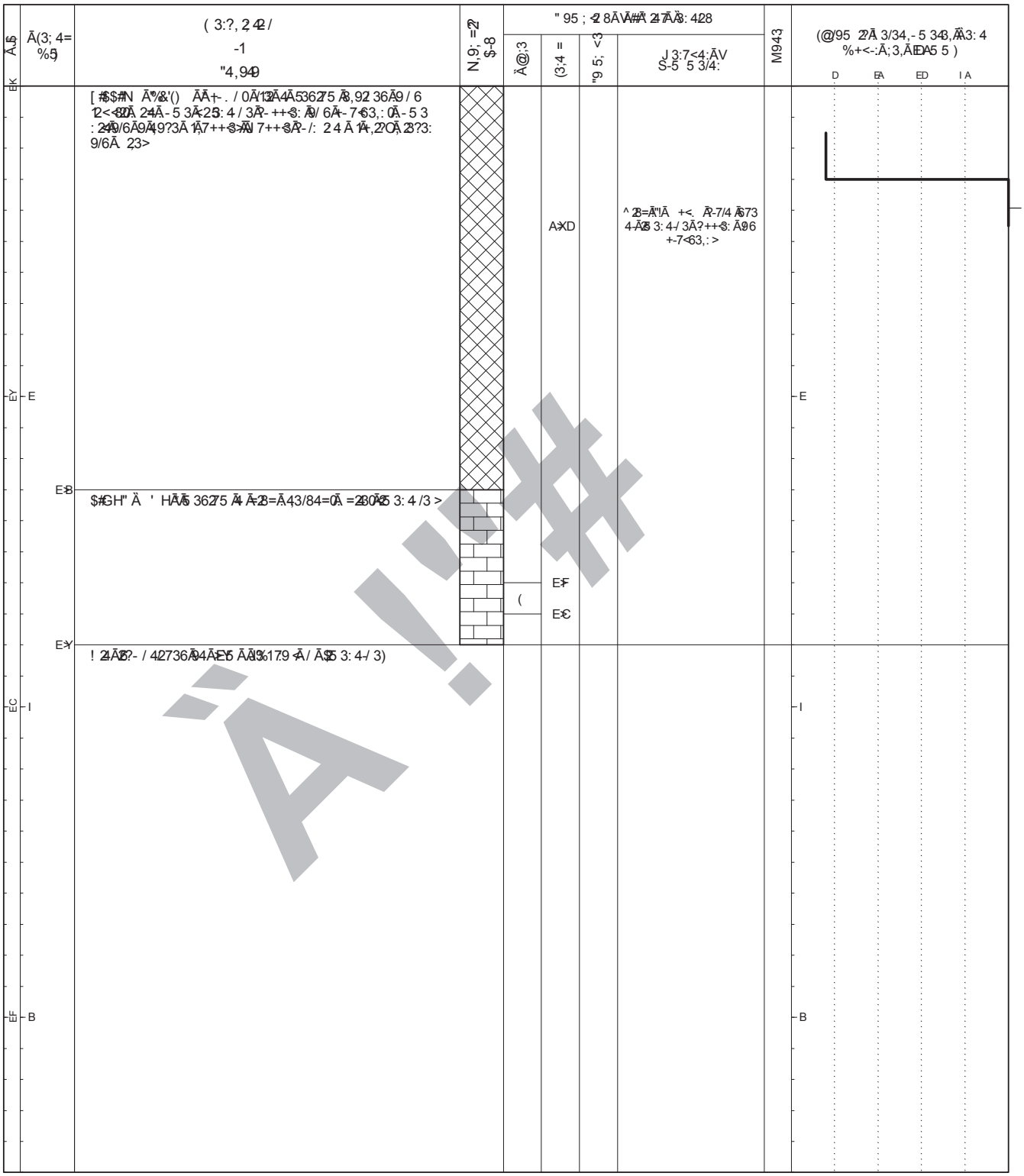
$! %&' () * Ā+ĀĀ(#, Ā#-$#() * Ā - * -) Ā					
&	&783, Ā95 ; <$	N	N9: Ā95 ; <$	! #	! =-4-Ā2-/ 2:94-/ Ā3-4?4 , Ā‰; 5)
L	L7<ĀĀ95 ; <$	!	! 2:4 / Ā95 ; <$	! $%&)	! -2/ 4Ā96 ĀP294Ā3: 4# %ĒA)Ā%G9)
L$Q	L < ?ĀĀ95 ; <$	R_p	Ā7+3Ā95 ; <$Ā‰Ā5 Ā629>	! $%()	! - 2/ 4Ā96 Ā29534 94Ā3: 4# %ĒA)ĀG!9)
S	S-, 3Ā, 2428	M	M 94Ā, Ā95 ; <$	; ;	! -? ĀĀ4Ā 3/ 34 -5 34Ā, ĀĀG 9)
(	(2: 47, +36Ā95 ; <$	▷	M 94Ā, Ā33;	"	" 49/ 69, 6Ā 3/ 34 94 2 -/ Ā6: 4
H	H/ T2, -/ 5 3/ 49>Ā95 ; <$	▼	M 94Ā, ĀT3<	U	" =39, Ā9/ 3ĀG 9)

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#- $#Ā&#Ā'. *

2' (-)# /
& . 3-2 #/
' . 2!# (.)/

$, " ! 2 -Ā' -0-'/
-! $#() * /
). # 5()*/



Ā!#

(* /ĀĀAĀ- / / 3Ā 9/ 5 9,ĀH?9T94 ,Ā.2=ĀAĀ5 5 Ā4- 4=36Ā+7?C84

' . **- À/ĀĀQ

$, 0-1 ĀÀ! #, %/ĀĀN&KX

7 ! #- Ā 8 $- 0!# (.) $/ ' -Ā,83Ā8,-7/ 6. 943Ā-+: 3,T36

- %! 6 $/ \" 7, 19?3Ā8T3Ā2 43,;-<9436Ā,-5 Ā 7,T3@Ā9/ Ā,-T2236Ā+@Ā23/ 4

☒ " 9/6Ā! 3/3 4,- 5 34-8,Ā&" EIYK>F>B>B
☐ S-/3 Ā 3/ 34,- 5 34-8,Ā&" EIYK>F>B>+

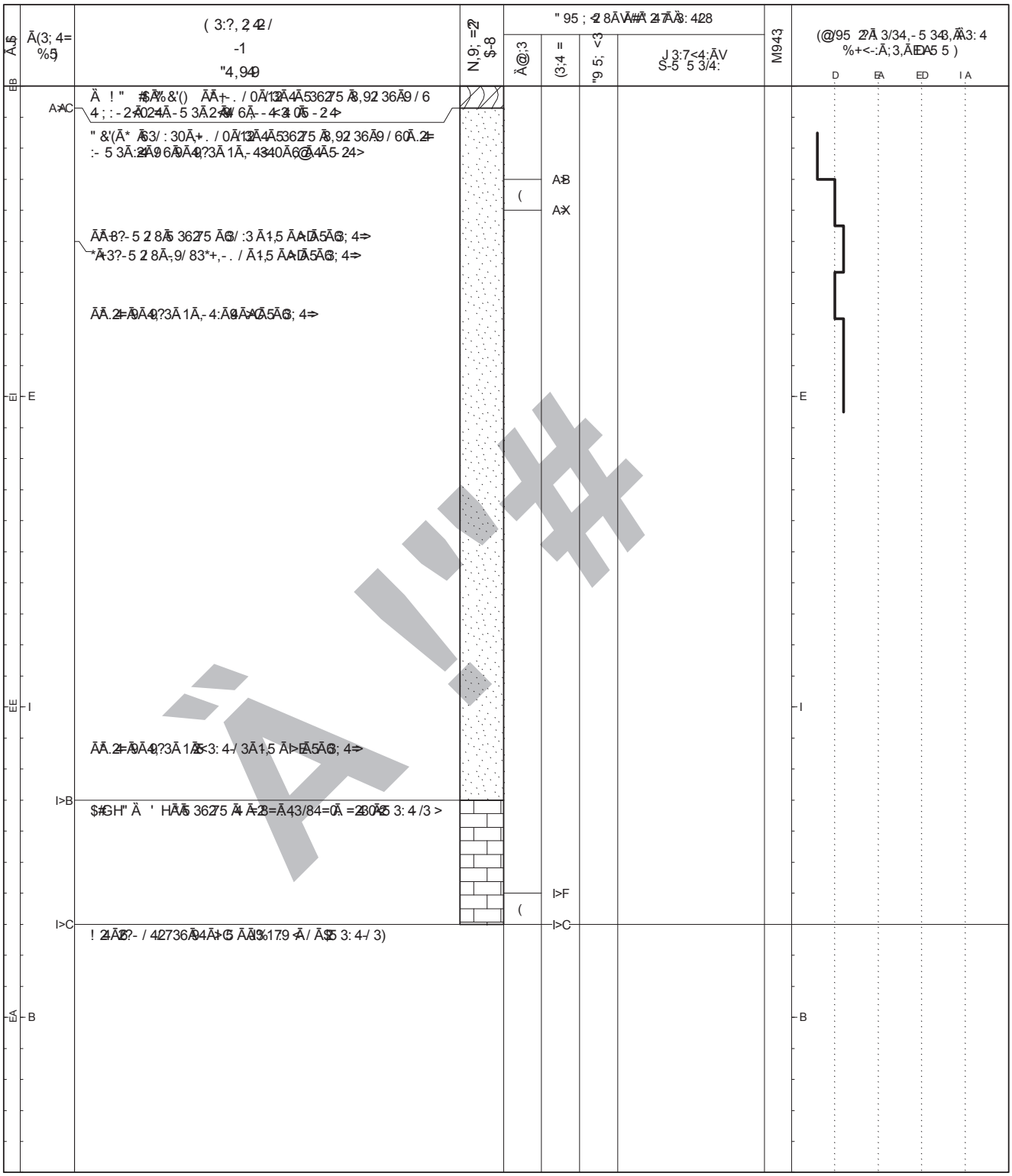
$! %&' () * Ā+ĀÝ,Ā(#, Ā#-$#() * Ā- * -) Ā					
&	&783,Ā95 ; <8	N	N9: Ā95 ; <8	! #	! =-4-Ā2-/2:94-/Ā34-8?4 ,Ā%; 5)
L	L7<ÔĀ95 ; <8	!	! 2:4 / Ā95 ; <8	! $%&)	! -2/Ā496 ĀP294-8: -Ā# %DA)Ā%G!9)
L$Q	L< ?ÔĀ95 ; <8	R_P	Ā7+3Ā95 ; <8Ā%Ā5 Ā629>	! $%()	! - 2/Ā496 Ā29534949-8: -Ā# %DA)Ā%G!9)
S	S-, 3Ā, 2Ā8	M	M94-8,Ā95 ; <8	; ;	! -? ÔĀ3/ 34-5 34-8,ĀG 9)
(	(2: 4Ā, +36Ā95 ; <8	▷	M94-8,Ā33;	"	" 4-9/ 69,6Ā3/ 3494-2-/Ā6: 4
H	H/ T2,-/ 5 3/ 4-9+Ā95 ; <8	▼	M94-8,ĀT3<	U	" =39,Ā9/ 3ĀG 9)

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#- $#Ā&#Ā'. *

2' (-)# / &28<ĀJ-@9<Ā(3T<-; 53/4 : Ā4@Ā546
& . 3-2 #/ M94:-/ĀJ-96
' . 2!# (.)/ L33<2,0ĀM&

$, " ! 2 -Ā' -0-'/ ĀĀEBĀ5Ā^ (\ **&#Ā, 4/ĀĀÀK**
-! $#() * /ĀĀBĀKĀAE
). # 5()*/ ĀĀĀKXFFE **& . 3-2 #Ā, 4/ĀĀYIB**
À!# -/ ĀĀIZIAEX
$5 --# ĀĀEĀĀĀE



(* /ĀĒĀVĀ- / / 3Ā 9/ 5 9,ĀH?9T94 ,Ā.2=ĀFAAĀ5 5 Ā4- 4=36Ā+7?C84 **' . **- ÀĀVĀQ $, 0-1 ĀÀ! #, %ĀĒN&KX**

7 ! #- Ā 8 $- 0!# (.) $/ ' -Ā,13Ā8,- 7/ 6. 943Ā-+: 3,T36

- %! 6 $/ \" 7, 19?3Ā8T3Ā2 43,;-<9436Ā,-5 Ā 7,T3@Ā9/ Ā,- T2236Ā+@Ā23/ 4

☒ " 9/6Ā! 3/3 4,- 5 34 8,Ā&" EIYK>F>B>B
☐ S-/3 Ā 3/ 34,- 5 34 8,Ā&" EIYK>F>B>

$! %&' () * Ā+ĀV,Ā(#, Ā#-$#() * Ā - * -) Ā					
&	&783,Ā95 ; <8	N	N9: Ā95 ; <8	! #	! =-4-Ā2-/ 2:94 2-/Ā34 8?4 ,Ā%; 5)
L	L7<ĀĀ95 ; <8	!	! 2:4 / Ā95 ; <8	! $%&)	! -2/ 4Ā96 ĀP29Ā6: 4Ā# %ĒA)Ā%G!9)
L$Q	L < ?ĀĀ95 ; <8	R_p	Ā7+3Ā95 ; <8Ā%Ā5 5 Ā629>	! $%9)	! - 2/ 4Ā96 Ā29534 9Ā6: 4Ā# %ĒA)ĀG!9)
S	S-, 3Ā, 2Ā8	M	M94 8,Ā95 ; <8	; ;	! -? ĀĀ3/ 34-5 34 8,ĀG 9)
(	(2: 4Ā7, +36Ā95 ; <8	▷	M94 8,Ā33;	"	" 4 9/ 69,6Ā 3/ 34 9 4 2-/ Ā6: 4
H	H/ T2,-/ 5 3/ 4 9+Ā95 ; <8	▼	M94 8,ĀĀT3<	U	" =39,Ā9/ 3ĀG 9)

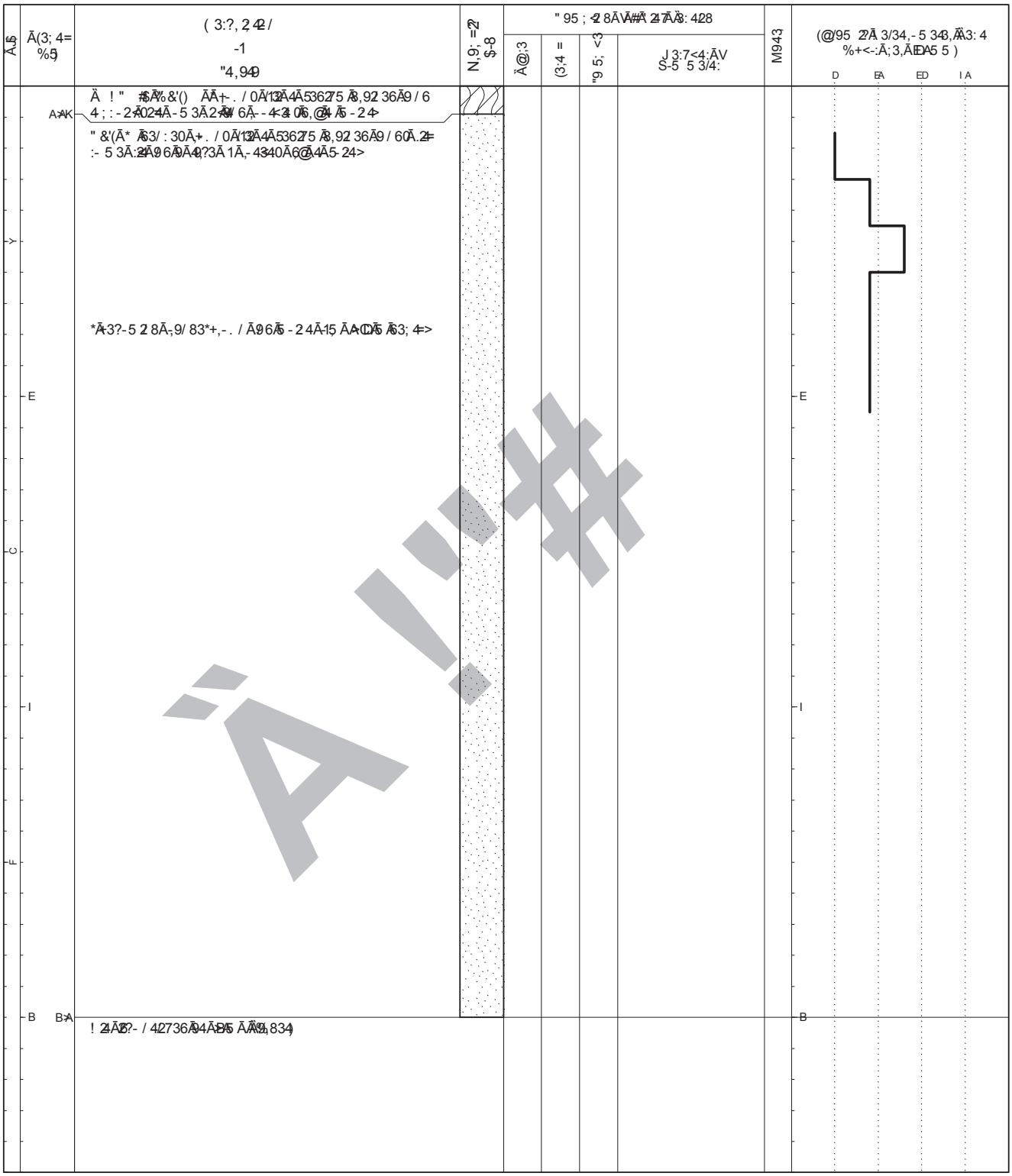
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#- $#Ā&#Ā'. *

2' (-)# / &28<ĀJ-@9<Ā(3T<-; 53/4 : Ā4@Ā546
& . 3-2 #/ M94:-/ĀJ-96
' . 2!# (.)/ L33<2,0ĀM&

$, " ! 2 -Ā' -0-'/ ĀĀYĀĀĀ&'(\
-! $#() * /ĀĀĀĀĀĀK
). # 5()*/ ĀĀĀKXFCE

&#Ā, 4/ĀĀĀA
& . 3-2 #Ā, 4/ĀĀYIĀB
À!# -/ ĀĀIZIAEX
$5 --# ĀĀEĀĀĀE



(* /ĀĀĀĀ- / / 3Ā, 9/ 5 9,ĀH#?9T94 ,Ā.2#-ĀAĀ5 5 Ā4- 4=36Ā+7?C84

' . **- ÀĀĀQ

$, 0-1 ĀÀ! #, %ĀĀN&KX

7 ! #- Ā 8 $- 0!# (.) $/ ' - Ā,13Ā8,- 7/ 6. 943,Ā-+: 3,T36

- %! 6 $/ \" 7, 19?3Ā8T3+2 4 8,;-<9436Ā,-5 Ā 7,T3@Ā9/ Ā,- T2236Ā+@Ā2/ 4

☒ " 9/6Ā! 3/3 4- 5 34 8,Ā&" EIYK>F>B>B
☐ S-/3 Ā 3/ 34- 5 34 8,Ā&" EIYK>F>B>+

$! %&' () * Ā+ĀĀ(#, Ā#-$#() * Ā- * -) Ā

&	&783,Ā95 ; <8	N	N9: Ā95 ; <8	! #	! =-4-Ā2-/ 2:94-/Ā34 8?4 ,Ā%; 5)
L	L7<ĀĀ95 ; <8	!	! 2:4 / Ā95 ; <8	! $%&)	! -2/ 4Ā96 ĀP294 8: 4# %ĀA)Ā%G9)
L$Q	L < ?ĀĀ95 ; <8	R_p	Ā7+3Ā95 ; <8Ā%Ā 5 Ā29>	! $%9)	! - 2/4Ā96 Ā5295349 4 8: 4# %ĀA)ĀG!9)
S	S-, 3Ā, 2 8	M	M94 8,Ā95 ; <8	; ;	! -? C84Ā 3/ 34-5 34 8,ĀG 9)
(	(2: 4', +36Ā95 ; <8	▷	M94 8,Ā33;	"	" 4 9/ 69,6Ā 3/ 3494 2-/Ā6: 4
H	H/ T2,-/ 5 3/ 4 9+Ā95 ; <8	▼	M94 8,ĀT3<	U	" =39,Ā9/ 3ĀG 9)

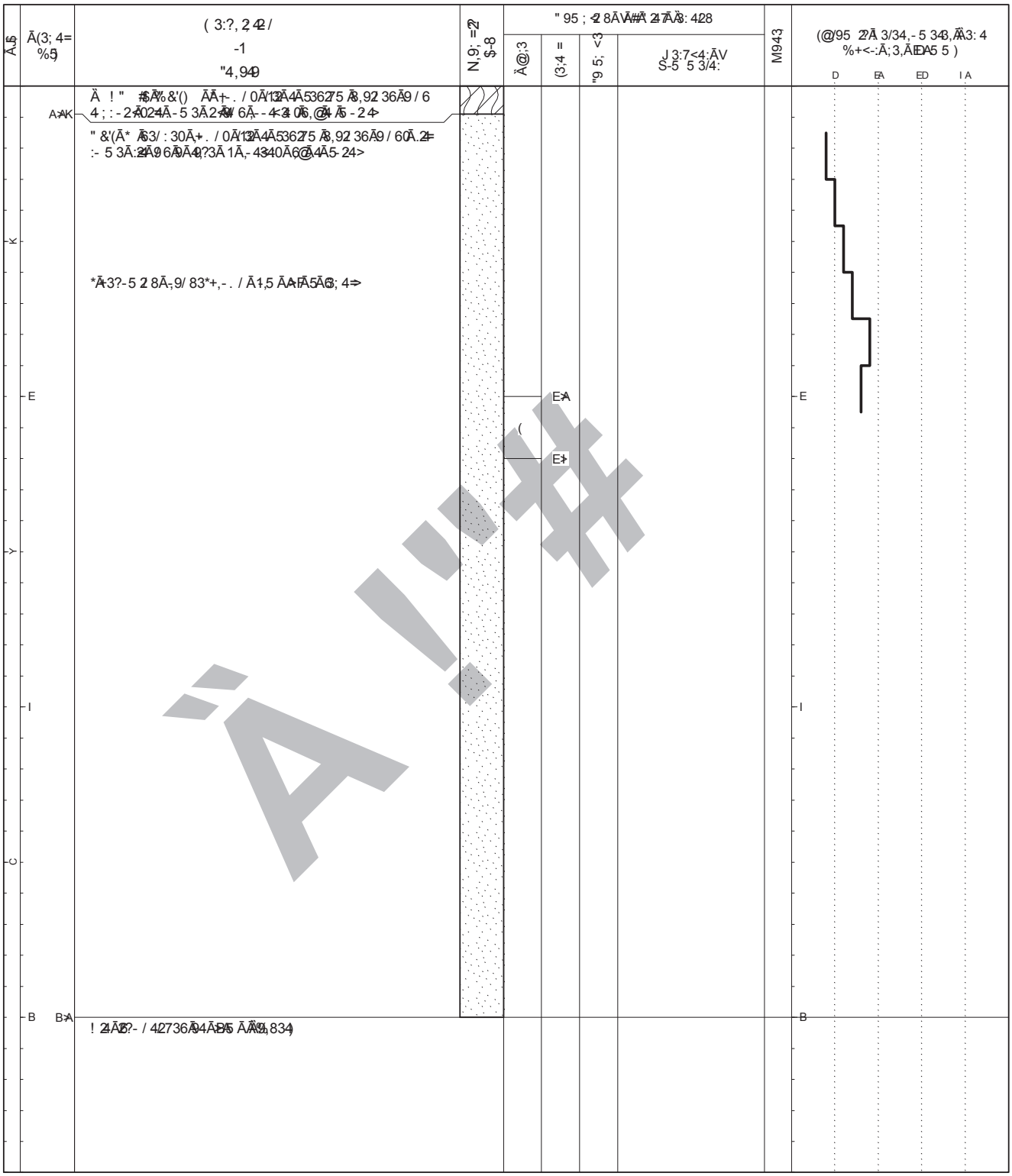
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#- $#Ā&#Ā'. *

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& . 3-2 #/ M94:-/ĀJ-96
' . 2!# (.)/ L33<2,0ĀM&

$, " ! 2 -Ā' -0-'/ ĀĀKĀĐĀ&'(\
-! $#() * /ĀĀĐĀKĀAĐ
). # 5()*/ ĀĀĀKXFAY

&(#Ā, 4/ĀĀĐE
& . 3-2 #Ā, 4/ĀĀYIKB
À!# -/ ĀĀIZIAEX
$5 --# ĀĀEĀĮĀĀE



(* /ĀĐAĀ- / / 3Ā, 9/ 5 9, ĀH?9T94 , Ā. 2=-ĀAA5 5 Ā4- 4=36Ā+7?C84

' . **- À/ĀĀ2,

$, 0-1 Ā&! #, %/ĀĐN&KX

7 ! #- Ā 8 $- 0!# (.) $/ ' - Ā,13Ā8,- 7/ 6. 943,Ā-+: 3,T36

- %! 6 $/ \" 7, 19?3Ā3T3-Ā2 43,;-<9436Ā,-5 Ā 7, T3@-Ā9/ Ā, - T2236Ā+@Ā2/ 4

☒ " 9/6Ā! 3/3 4,- 5 34 8,Ā&" EIYK>F>B>B
☐ S-/3 Ā 3/ 34,- 5 34 8,Ā&" EIYK>F>B>

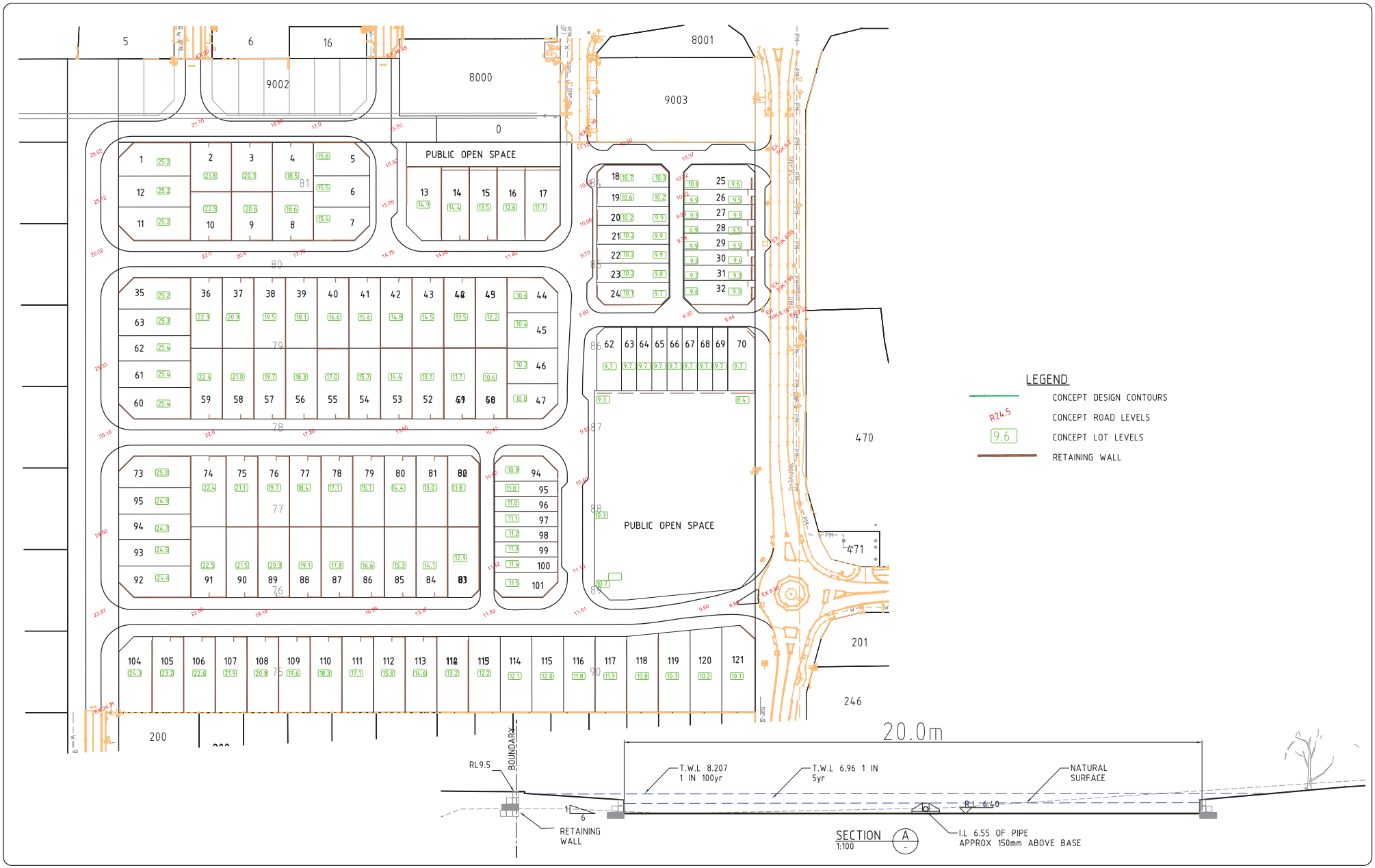
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&	&783, Ā95 ; <8	N	N9: Ā95 ; <8	! #	! =-4-Ā2-/ 2:94-/ Ā34 8?4 , Ā%; 5)
L	L7<ĀĀ95 ; <8	!	! 2:4 / Ā95 ; <8	! $'&)	! -2/ 4Ā96 ĀP294Ā8: 4# %ĐA)Ā%G9)
L$Q	L < ?ĀĀ95 ; <8	R_p	Ā7+3Ā95 ; <Ā%Ā5 Ā629>	! $'%)	! - 2/ 4Ā96 Ā5295349 4Ā8: 4# %ĐA)Ā%G!9)
S	S-, 3Ā, 2 4 8	M	M94 8, Ā95 ; <8	; ;	! -? C84Ā 3/ 34-5 34 8, ĀG 9)
(	(2: 47, +36Ā95 ; <8	▷	M94 8, Ā33;	"	" 4 9/ 69, 6Ā 3/ 3494 2-/ Ā6: 4
H	H/ T2,-/ 5 3/ 4 9+Ā95 ; <8	▼	M94 8, ĀT3<	U	" =39, Ā9/ 3ĀG 9)

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APPENDIX B

CONCEPT LOT AND RETAINING WALL PLAN



Rev.	Date	Drn.	Des.	Issue Description
C	10.10.2016	NMcD	CF	ISSUED FOR REPORT

CLIENT

AIGLE ROYAL
PTY LTD

OCHREWEST
CONSULTING ENGINEERS

PROJECT

LOTS 892 WATSON ROAD
BEELIAR

© 2012

DRN	N.McDONALD	REVIEWED	DATE
DESIGN	C.FINGHER	APPROVED FOR ISSUE	DATE
DIRECTOR	C.FINGHER		

TITLE

CONCEPT EARTHWORK AND
RETAINING WALL PLAN

SCALE	SIZE	DRAWING No	REV.
N.T.S	A1	14023-C-SK1	C

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WWW.OCHREWEST.COM.AU (08)9266 9094 P.O BOX 735 BALCATTA 6914

APPENDIX 3

BUSHFIRE MANAGEMENT PLAN

ROWEGROUP

BPP Group Pty Ltd | ABN: 39 166 551 784
1/42 Victoria Street Midland WA 6056
PO Box 3489 Midland WA 6936
08 6477 1144 | admin@bushfireprone.com.au

Bushfire Management Plan (Strategic Planning Proposal)

Lots 75-81 Prizmic Street & Lots 84-90 Watson Street, Beeliar

City of Cockburn

Project Number:	168384-1
Assessment Date:	16 May 2016
Report Date:	8 September 2016

Plan Details

BMP Template v4.5 ©2016 BPP Group Pty Ltd

Plan Version	Submitted to	Submitted Date
v1.0	Proponent	9-Sep-16

Plan Version	Amendment Record	Submitted Date
v1.1	New structure plan for figure 3.2	12-Sep-16
V1.2	Updated plans and tables for areas and BALs	21-Sep-16
V1.3	Updated BAL contour map and Section 7.3	13-Oct-16
V1.4	Updated lot layout	8-Mar-17

Compliance Statement

This Bushfire Management Plan (the Plan) meets the requirements of both the *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) and the supporting *Guidelines for Planning in Bushfire Prone Areas* (WAPC 2015; the 'Guidelines').

Author	Bushfire Planning and Design (BPAD) Accreditation		Signature
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Disclaimer

The measures contained in this Bushfire Management Plan are considered to be minimum standards and they do not guarantee that a building will not be damaged in a bushfire. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions. Additionally, the achievement of and level of implementation of bushfire management measures will depend, among other things, on the actions of the landowners or occupiers over which Bushfire Prone Planning has no control.

All surveys, forecasts, projections and recommendations made in this report associated with the project are made in good faith on the basis of information available to Bushfire Prone Planning at the time.

All maps included herein are indicative in nature and are not to be used for accurate calculations.

Notwithstanding anything contained therein, Bushfire Prone Planning will not, except as the law may require, be liable for any loss or other consequences (whether or not due to the negligence of their consultants, their servants or agents) arising out of the services provided by their consultants.

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1 Executive Summary

This Bushfire Management Plan (the Plan) has been prepared to accompany the Local Structure Plan application for Lots 75-81 Prizmic Street and Lot 84-90 Watson Road, Beeliar within the City of Cockburn.

The subdivision site of approximately 4.1 ha (127 proposed lots) is within a designated bushfire prone area and the Proposal requires the application of *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas* (SPP 3.7). The assessed bushfire risk is considered to be manageable and will be achieved by the identified stakeholders implementing and maintaining the bushfire risk management measures that are presented in this Plan.

The Proposal, as set out in this Plan, has addressed all applicable legislation, policy, standards and guidelines including the four elements of the Bushfire Protection Criteria of location, siting and design, vehicular access and firefighting water supply.

Against the Bushfire Protection Criteria, the decision maker's assessment of this Proposal is to be on the basis of it being able to meet the acceptable solutions for all four elements once construction and landscaping is complete.

Indicative BAL ratings of BAL-29 or less are able to be achieved on all lots but will require the modification or removal of some classified vegetation to achieve the minimum separation distances from future buildings.

Future buildings within 100 metres of classified vegetation will be constructed to standards which correspond to the determined BALs, as required by *AS 3959-2009 Construction of buildings in bushfire prone areas*. As this proposal does not identify the actual location of building works within each lot, there may be a requirement to determine the BAL for individual building works once the actual building site has been identified.

With respect to this Proposal, the relevant decision maker (WAPC or local government), may condition any application approval with a requirement for the landowner/proponent to place a notification onto the certificate(s) of title and a notice of the notification onto the diagram or plan of survey (deposited plan). This will be done pursuant to Section 165 of the Planning and Development Act 2005 and applies to lots with a determined BAL rating of BAL-12.5 or above.

The notification will be required to state as follows:

'This land is within a bushfire prone area as designated by an Order made by the Fire and Emergency Services Commissioner and may be subject to a Bushfire Management Plan. Additional planning and building requirements may apply to development on this land'.

This condition ensures that:

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1. Landowners/proponents are aware their lot is in a designated bushfire prone area and of their obligations to implement the stated bushfire risk management measures; and
2. Ensures that potential purchasers are alerted to the Bushfire Management Plan so that future landowners/proponents can continue to apply the bushfire risk management measures that have been set out in the Plan.

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2 Application of SPP 3.7

The *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) provides the foundation for land use planning to address bushfire risk in Western Australia.

This Proposal must apply SPP 3.7 and comply with its policy measures for the reasons stated below.

Application of SPP 3.7 – Primary Triggers	
The subject Proposal is a higher order strategic planning document, a strategic planning proposal or a subdivision or development application:	✓
The project site is located in a designated bushfire prone area on the WA Map of Bushfire Prone Areas:	✓
The project site is not located in a designated bushfire prone area on the WA Map of Bushfire Prone Areas but the existing vegetation type and condition dictate that it should be:	
The project site is located in an area not yet designated as bushfire prone but is proposed to be developed in a way that introduces a bushfire hazard (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015 s3.2.2*):	
Application of SPP 3.7 – Secondary Trigger/s	
The Proposal is a strategic planning proposal, subdivision or development application relating to land that has or will have a Bushfire Hazard Level above low and/or where a Bushfire Attack Level rating above BAL-LOW applies (SPP 3.7 s6.2):	✓
The subject Proposal is a development application for the construction or/and use of a single house or ancillary dwelling on a lot or lots greater than 1100m^2 and subject to BAL-40 or BAL-FZ (LPS Amendment Regulations 2015):	
The subject Proposal is a development application for the construction or/and use of a habitable building (other than a single house or ancillary dwelling), or a specified building on any lot size and subject to a BAL rating above BAL-LOW (LPS Amendment Regulations 2015):	

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3 Commissioning and the Land Use Proposal

Bushfire Prone Planning (BPP Group Pty Ltd) has been commissioned to carry out the assessments and prepare the required bushfire planning documentation to accompany the proponent's planning submission associated with their proposed land use project.

Commissioning Record	
Landowner / Proponent:	Aigle Royal Developments
BPP Commissioned by:	Kris Kennedy, Aigle Royal Developments
Purpose:	To accompany a subdivision application
Project Location	
Subject Site and Address:	Lot No. 75-81 Prizmic St & Lots 84-90 Watson St, Beeliar
Local Government:	City of Cockburn
Zoning and R-Code:	Urban Development
Project Description	
Description:	Subdivision of residential areas including public open space with 127 lots
Building Class:	N/A
Lot Areas:	Refer to Table 3.1

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Table 3.1: Current lot sizes of Proposed Structure Plan

Current Lots			
Watson Street		**Prizmic Street**	
Lot Nos	**Area (ha)**	**Lot Nos**	**Area (ha)**
84	0.4047	75	0.4047
85	0.4047	76	0.4047
86	0.4047	77	0.4047
87	0.4047	78	0.4047
88	0.4047	79	0.4047
89	0.4047	80	0.4047
90	0.4047	81	0.4047

Proposed Lots					
Lot Nos	**Area (m^2)**	**Lot Nos**	**Area (m^2)**	**Lot Nos**	**Area (m^2)**
32-38, 43-48	150	26-27	280	60, 62	349
14-21	168	74	281	23-24, 29-30, 76-83, 89-117	350
6-11	171	64	283	61	364
13	188	86, 107	285	4	371
49	228	42	288	50-55, 119-127	375
31, 39	252	75	291	118	379
25, 28	262	63	292	56	383
22	263	85, 87, 106, 108	300	69	389
5, 12	268	1-3	308	104, 110	392
70-73	272	84, 88, 105, 109	339	57	398
65-68	273	40-41	346	58	413
				59	436

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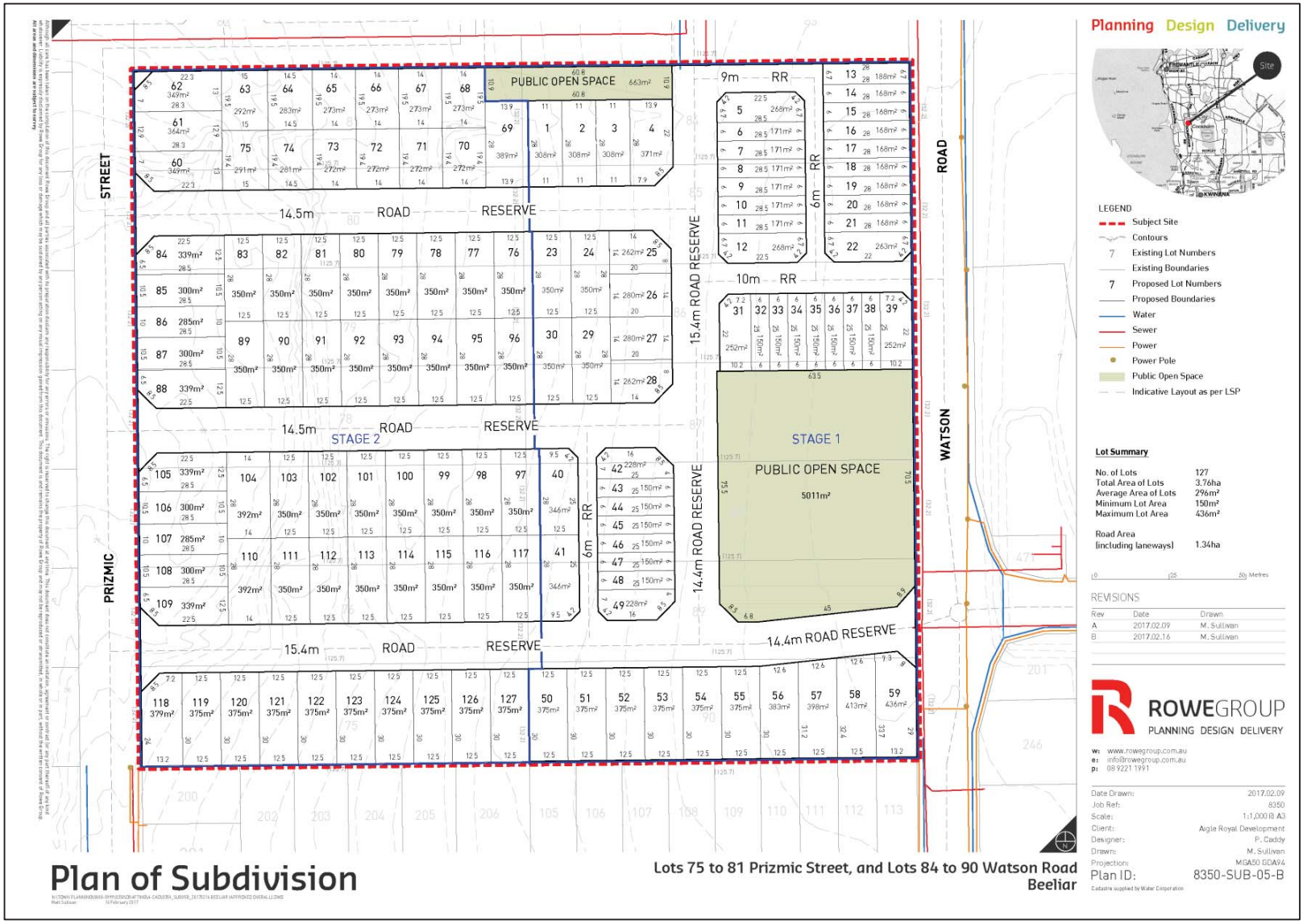


Figure 3.1: Proposed subdivision site plan (Source: Rowe Group)

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Figure 3.2

Proposed Development

Lots 75-81 Prizmic Street &
Lots 84-90 Watson Road
Beeliar



LEGEND

- Proposed Developement
- Lots 75-81 & 84-90
- Other Lots

Parks & Reserves

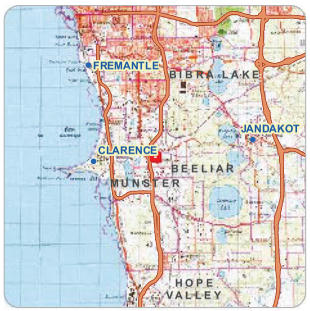
- Public Open Space
- Road Reserve

SCALE (A3)

0 25 50 75

Metres

LOCALITY



N

Assessment Date: 16-05-16
Assessor: Alex Aitken
Accreditation No: BPAD 37739
Accreditation Level: 2
Aerial Image: Landgate Feb 2016
AS 3959 – 2009 Amendment 3

BUSHFIRE PRONE PLANNING

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Projection: Universal Transverse Mercator
Map created on: 7/03/2017
Map compiled by: Bruce Greentree

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4 Planning Submission Details and Required Bushfire Risk Assessments

Policy measures in *SPP 3.7* (and further instruction in the associated document *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*) set out the bushfire planning information and assessments that are to accompany a planning submission. It is dependent on the type of proposal and stage of the development process. In most circumstances this information is to be presented in the form of a Bushfire Management Plan (BMP).

Planning Submission Detail	
Planning Stage:	Development application - a condition of approval
For Submission to:	WA Planning Commission (WAPC)
Project Type:	Subdivision - one lot into a large number of lots
'Vulnerable' Land Use:	N/A
'High Risk' Land Use:	N/A
'Minor' Development:	No
'Unavoidable' Development:	No

This Bushfire Management Plan will include the information indicated by the check mark. If an item is checked it is required by either: SPP 3.7 or by a local government variation. It may also have been prepared at an earlier planning stage and therefore re-included or included by the assessor as it improves the information presented in this Bushfire Management Plan.

Bushfire Hazard Level Assessment	Bushfire Attack Level Contour Map	Bushfire Attack Level Assessment	Identify any issues arising from the BAL contour map or BAL assessment	Identify and specifically address the list of issues related to strategic level planning and defined in the *Guidelines s5.2*	Demonstrate compliance with the Bushfire Protection Criteria can be achieved in subsequent planning stages	Demonstrate compliance with the Bushfire Protection Criteria
	✓		✓			✓

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5 Assessment of Bushfire Risk

5.1 Vegetation Identification and Classification

5.1.1 Existing Vegetation

All vegetation within 100 metres of the subject site has been identified and classified or excluded and presented in Table 5.1.1. This has been done with accordance with *AS 3959-2009* and reference to the *Visual Guide for Bushfire Risk Assessment in WA* (WAPC February 2016).

The vegetation has been assessed as it will be in its mature state and where deemed appropriate, in its unmanaged state. The areas of classified vegetation that will determine bushfire risk are defined on the topography and vegetation map Figure 5.1. Representative photos of each vegetation area is presented after the table.

Table 5.1.1: Vegetation types identified, the applied classification and effective slope

All Vegetation Within 100 metres of Subject Site			
Vegetation Area	**Identified Types (AS3959) or Description if 'Excluded'**	**Applied Classification**	**Effective Slope Under Classified Vegetation (degrees)**
1	Open Tussock Grass	Class G Grassland	0
2	Open Shrubland B-09	Class C Shrubland	0
3	Open Tussock Grass	Class G Grassland	9
4	Open Tussock Grass	Class G Grassland	2.2
5	Open Tussock Grass	Class G Grassland	1.2
6	Open Tussock Grass	Class G Grassland	0
Note: When more than one vegetation type is present each type is classified separately with the worst case scenario being applied. The predominant vegetation is not necessarily the worst case scenario.			

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Vegetation Area 1 **Classification Applied: Class G Grassland**

Assessment Comment: offsite tussock grassland with minor shrubs, historically cleared, unmanaged



Photo 1



Photo 2

Vegetation Area 2 **Classification Applied: Class C Shrubland**

Assessment Comment: offsite acacia shrubs associated with road verge vegetation, up to 2.5m height



Photo 3

Vegetation Area 3 **Classification Applied: Class G Grassland**

Assessment Comment: onsite tussock grassland, steep slope



Photo 4

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Vegetation Area 5 **Classification Applied: Class G Grassland**

Assessment Comment: offsite undeveloped residential block with grass



Photo 5

Vegetation Area 6 **Classification Applied: Class G Grassland**

Assessment Comment: offsite undeveloped residential block with grass



Photo 6

Vegetation Area **Classification Applied: Exclusion AS3959-2009 2.2.3.2 (f)**

Assessment Comment: Managed parklands



Photo 7

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5.1.2 Vegetation Excluded from Classification

Certain areas and vegetation may be assessed as 'low threat or non-vegetated'. These are to be excluded from classification and are therefore rated BAL-LOW. They must be managed to maintain the specifications set out in AS3959-2009 s2.2.3.2 in perpetuity (refer to Appendix 3 'Vegetation Classification Exclusions').

For this proposal the area of managed parklands on Watson Street have been excluded as per AS39592009 s2.2.3.2(f).

5.1.3 Expected On-site Vegetation Changes Due to Proposed Subdivision or Development

In assessing vegetation for bushfire threat, consideration must be given to possible future vegetation changes likely on the site that is being assessed and in particular those that would have the potential to increase the bushfire risk.

This may be due to growth of existing vegetation or growth of planned landscape plantings, including future roadside re-vegetation. In particular, there must be careful consideration of the creation of vegetation corridors where they join offsite vegetation and may provide a route for fire to enter an area of future development.

For this Proposal the future onsite vegetation has been considered and is expected to be maintained as "low threat" with a BAL rating of BAL-LOW. It will meet *AS 3959-2009 s2.2.3.2* requirements (refer Appendix 3 'Vegetation Classification Exclusions').

The proposed Public Open Space (POS) is required to be managed in a low threat condition as per the requirements of the exclusions detailed in *AS 3959-2009 s2.2.3.2.*

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Figure 5.1

Topography & Classified Vegetation

Lots 75-81 Prizmic Street &
Lots 84-90 Watson Road
Beeliar



Assessment Date: 16-05-16
Assessor: Alex Aitken
Accreditation No: BPAD 37739
Accreditation Level: 2
Aerial Image: Landgate Feb 2016
AS 3959 – 2009 Amendment 3

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Map created on: 7/03/2017
Map compiled by: Bruce Greentree

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5.2 Bushfire Attack Level (BAL) Contour Map

A BAL CONTOUR MAP A Bushfire Attack Level (BAL) Contour Map is a scale map of a development site including the proposed lot layout, which identifies indicative BAL ratings across the development site and within the immediate surrounding area. A BAL Contour Map illustrates potential bushfire attack levels and radiant heat impacts in relation to any classified vegetation that will remain within 100 metres of the assessment area once development is completed. A BAL Contour Map identifies land suitable and unsuitable for development and guides the location of building envelopes within a development site (*WAPC Factsheet "BAL Contour Maps" Version 2 January 2016*)

THE ASSESSMENT A BAL Contour Map is based on an assessment of the development site and surrounding area as they will be when the proposed development is constructed i.e. when the land has been cleared and all the subdivision works have been undertaken. It needs to take into account any vegetation that will remain or will be introduced when the works are complete (*WAPC Factsheet "BAL Contour Maps" Version 2 January 2016*). Refer to Appendix 2 'Bushfire Risk Management – Understanding the Methodology', for a summary of the BAL assessment procedures.

INTERPRETATION The contour map will present different coloured contours constructed around the classified bushfire prone vegetation. These represent the different Bushfire Attack Levels that exist as the distance increases away from the classified vegetation. If any part of a subject area or building is or will be within a particular contour, it will be subject to that BAL rating (the highest BAL rating will apply to the area or building being assessed).

The width of each shaded contour is a result of calculations involving vegetation type, fuel structure, ground slope, and climatic conditions. These calculations generate the expectations of fire behaviour for the given situation.

INDICATIVE BAL's If the assessed BAL for a lot is stated as being 'indicative', then it is only an indication (usually given as a range) of what BAL's are achievable. Determining the actual BAL of any existing, proposed or future Lot or building will be dependent on the extent of any classified vegetation modification or removal and/or the location of the building on the Lot.

As a result, a BAL Certificate cannot be produced for buildings on such Lots until the location of any future building has been identified and an onsite BAL assessment conducted. A BAL Compliance Report and Certificate for the proposed building can then be issued to accompany a building permit application.

DETERMINED BAL's If the assessed BAL for a Lot or building is stated as being 'determined' then no additional assessment is required. It implies that classified vegetation is not required to be modified or removed to achieve the stated BAL – either for an existing Lot, an existing building or for a future building located anywhere on an existing Lot. The degree of certainty is more than sufficient to allow for any small discrepancy that might occur in the mapping of the contours.

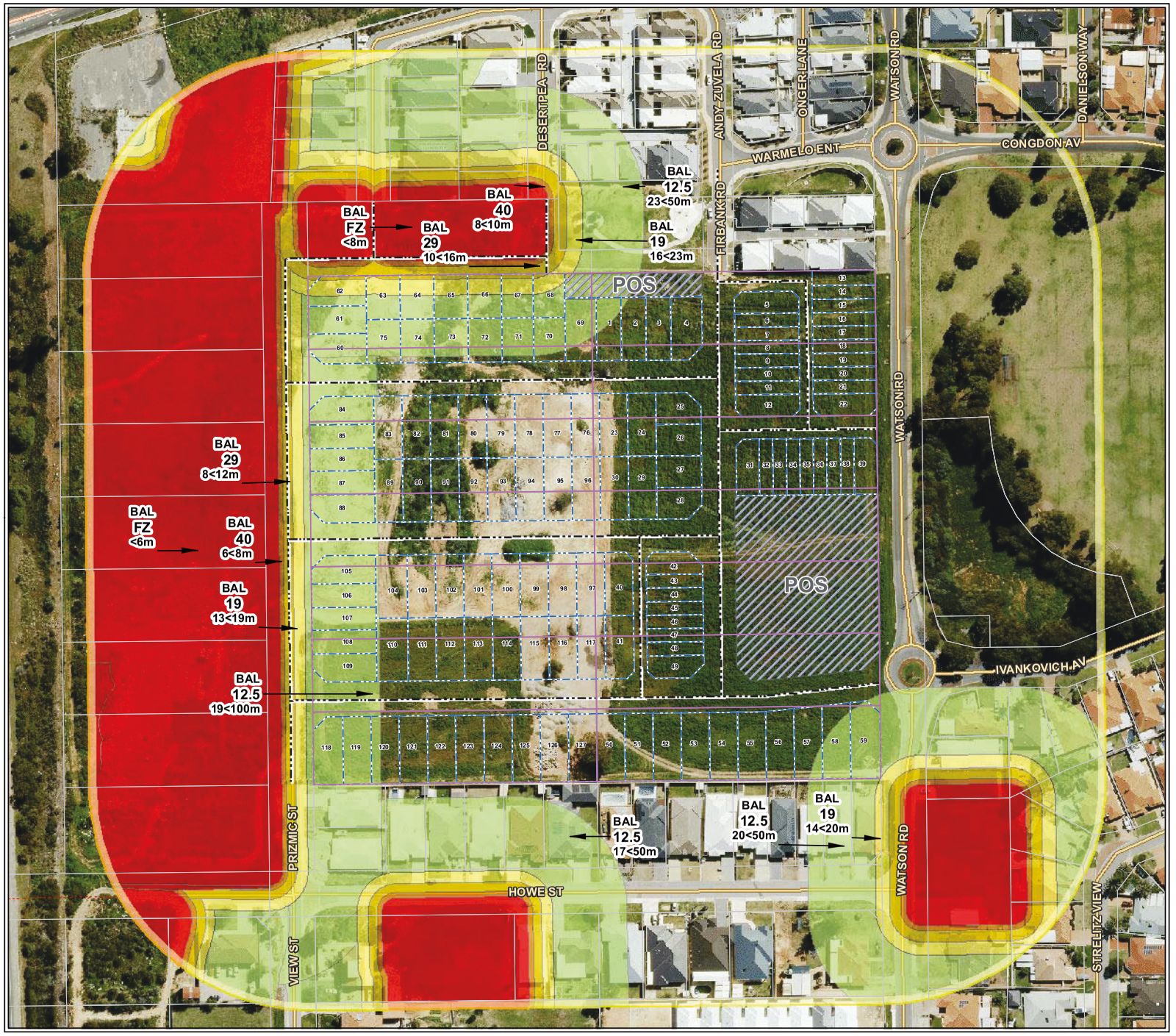
However, the issuing of a BAL Certificate (based on the BAL Contour Map assessment) confirming the BAL, may still be required in applying for a building permit. If significant time has passed since the assessment and the requirement for a BAL certificate a new BAL assessment may be required for any particular Lot or building.

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Figure 5.2

BAL Contour Map

Lots 75-81 Prizmic Street &
Lots 84-90 Watson Road
Beeliar



Assessment Date: 16-05-16
Assessor: Alex Aitken
Accreditation No: BPAD 37739
Accreditation Level: 2
Aerial Image: Landgate Feb 2016
AS 3959 – 2009 Amendment 3

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5.2.1 BAL's as Indicated / Determined by the Contour Map

Vegetation on the Subject Site Classified as 'Class G Grassland'

Grassland vegetation types may have been identified and classified on the subject site (refer to the Vegetation and Topography map in Section 5.1). Where this is the situation for the subject Proposal, and it is considered appropriate by the assessor, the BAL contour map produced for this Plan will exclude the area of Class G Grassland. Therefore, the displayed BAL contours will exist for all classified vegetation types except Grassland.

The rationale for this approach is to be able to derive meaningful information from the contour map. If Grassland was to be contoured the entire mapped area could potentially be BAL-FZ and therefore be presented as a sole colour – providing no useful information.

Grassland is commonly not native vegetation, can be easily managed to a low bushfire threat state and generally will not require approval for its removal. Section 7.3 of this Plan details the management measure required to reduce any classified Grassland to a BAL rating of BAL-Low.

As there no identified building envelopes or actual building locations being presented as part of this proposal, the Bushfire Attack Levels (BAL's) presented in Table 5.2.1 can only be indicative. They are derived from the contour map by estimating where a typical sized building could be located and stating the BAL it would be exposed to.

Once actual building locations are determined at a later planning stage, the BAL ratings for specific buildings or building envelopes may need to be determined by an onsite visit with the actual vegetation separation distances being measured.

Table 5.2.1: Future Buildings on Proposed Lots – Indicative BAL

Indicative Bushfire Attack Level for Future Building on the Proposed Lots	
Relevant Fire Danger Index (AS3959-2009 Table 2.1)	80
BAL Determination Method	Method 1 as per AS 3959-2009 s2.2.6 and Table 2.4.3. Refer to Appendix 2 this Plan
Proposed Lots	**Indicative BAL**
1-56, 76-82, 90-103, 111-117, 121-127	BAL-LOW
57-61, 69-75, 83-89, 104-110, 118-120	BAL-12.5
62-68	BAL-19

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5.2.2 Identification of Specific Issues Arising from BAL Contour Map

Onsite Vegetation

Vegetation onsite is within the control of the subject site's landowner and therefore can potentially be removed or modified to lower the bushfire risk, subject to any approval being required by a local government.

Offsite Vegetation

Vegetation offsite is not within the control of the subject site's landowner and therefore the vegetation cannot be removed or modified by the landowner and as a result the assessed BAL's determined by this vegetation are unable to be reduced.

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6 Environmental Considerations

"Many bushfire prone areas also have high biodiversity values. SPP 3.7 Policy objective 5.4 recognises the need to consider bushfire risk management measures alongside environmental, biodiversity and conservation values" ('Guidelines' s2.3).

"Clearing of native vegetation in Western Australia requires a clearing permit under Part V, Division 2 of the Environmental Protection Act 1986 unless clearing is for an exempt purpose. Exemptions from requiring a clearing permit are contained in Schedule 6 of the Act or are prescribed in the Environmental Protection Regulations" ('Guidelines' s2.3).

6.1 Native Vegetation and Re-vegetation

Establishing development in bushfire prone areas can adversely affect the retention of native vegetation through clearing associated with the creation of Asset Protection and Hazard Separation Zones. Where loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, it will be necessary to consider available options to minimise the removal of native vegetation.

Options to Minimise Removal of Native Vegetation	Considered and Implemented in this Proposal
Reduce lot yield	Yes
Cluster development	No
Construct building to a higher standard as per BCA and AS 3959-2009	Yes
Modify the development location	No
Comments:	

Does this planning proposal satisfy bushfire protection requirements within the boundaries of the land being developed so as not to impact on the bushfire and environmental management of neighbouring reserves, properties or conservation covenants?	Yes

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7 Bushfire Risk Management Measures

7.1 The Bushfire Protection Criteria – Assess and Demonstrate Compliance

State Planning Policy 3.7 Planning in Bushfire Prone Areas (Dept. of Planning and WAPC 2015) requires an assessment against the bushfire protection criteria requirements (contained in the 'Guidelines') to accompany any strategic planning proposal, subdivision application or development application.

Strategic planning proposals need to demonstrate that compliance can be achieved in subsequent planning stages. Subdivision and development applications must demonstrate compliance within the boundary of the subject site or provide justification for those criteria that are not able to be fully met.

The criteria are divided into four elements location, siting and design, vehicular access and water. Each element has an intent outlining the overall aim. The acceptable solutions provide examples of how that intent might be met. The performance principle allows for 'alternative solutions' to be developed where the acceptable solutions cannot be achieved". Source: *Guidelines for Planning in Bushfire Prone Areas WAPC 2015 (s4.5 and Appendix 4).*

Bushfire Prone Planning presents all components of the Bushfire Protection Criteria assessment as a separate table for each element. This includes the intent, the performance principle, a stated level of compliance with the acceptable solutions for each of the criteria and statements that demonstrate the compliance and provide justification for those that have not been fully met.

Summarised Outcome of the Assessment Against the Bushfire Protection Criteria

The Bushfire Protection Criteria Elements	The Planning Assessment – Proposed Basis of Assessment				The Proposal Will in the Future Be Able to Satisfy All the Criteria and/or the Intent of the Element
	Acceptable Solutions	Performance Principle		Minor or Unavoidable Development	
		Variation on Acceptable Solution	Alternative Solution		
	Able to demonstrate compliance currently or in future planning stages	Presented and justified in the following tables. Includes advice from the relevant referral authorities if applicable.		If required supporting statements are presented in this Plan	
Location	✓			-	Yes
Siting and Design of Development	✓				Yes
Vehicular Access	✓				Yes
Water	✓				Yes

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Bushfire Protection Criteria - Element 1- Location			
Intent: 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.			
Performance Principle P1 (used to develop alternative solutions): The intent may be achieved where the strategic planning proposal, subdivision or development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low **OR** a BAL-29 or below applies **AND** the risk can be managed. For minor or unavoidable development in areas where BAL-40 or BAL-FZ applies, demonstrating that the risk can be managed to the satisfaction of DFES and the decision maker.			
Acceptable Solution	**Further Explanation**	**Compliance**	**Demonstration of Compliance and/or Statements of Justification**
A1.1 Development Location The strategic planning proposal, subdivision and development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low **OR** The development is subject to BAL-29 or below.	Land is most suitable for land use intensification where hazard levels are low. Where there is an extreme bushfire hazard level or requirements for use of BAL-40 or BAL-FZ construction standards, the land is not considered suitable for development unless it meets the definition of minor or unavoidable development (which requires WAPC, DFES and local planning approval).	**Will Fully Comply**	The proposed subdivision is located within a designated bushfire prone area. The proposed lots are compliant as they are located in an area where the bushfire hazard level assessment within 100m of the external boundary of the subject site will on completion be moderate or low. By implementing the positioning and vegetation management measures identified in this Plan the proposed subdivision can meet the acceptable solution of being subject to BAL-29 or below.

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Bushfire Protection Criteria - Element 2 - Siting and Design of Development

Intent: To ensure that the siting and design of development minimises the level of bushfire impact.

Performance Principle P2 (used to develop alternative solutions): The intent may be achieved where the siting and design of the strategic planning proposal, subdivision or development application, including roads, paths and landscaping, is appropriate to the level of bushfire risk that applies to the site. That it minimises the bushfire risk to people, property and infrastructure, including compliance with AS3959 if appropriate.

Acceptable Solution Either or both solutions to be met to the extent that it satisfies Element 1.	**Further Explanation**	**Compliance**	**Demonstration of Compliance and/or Statements of Justification**
A2.1 Asset Protection Zone (APZ) Every building is surrounded by an Asset Protection Zone (minimum of twenty metres wide), depicted on submitted plans, which meets the defined requirements. **OR** Where a full 20 metre APZ is not possible the APZ should be sufficient enough to ensure the potential radiant heat impact of a fire does not exceed 29 kW/m^2. The specifications for the establishment and maintenance of the APZ are stated in Appendix 4 and Appendix 3.	The APZ is a low fuel area immediately surrounding a habitable or specified building. All requirements in A2.1 are essential and must be achieved to ensure compliance. If the implementation of protection zones was to result in the loss of vegetation that is not acceptable or causes conflict with landscape and environmental objectives, then the development may need to be modified.	**Will Fully Comply**	The proposed subdivision can achieve the intent of the element by meeting the acceptable solution. This is achieved by: • Incorporating an APZ into the landscaping surrounding the any future building work and maintaining it to comply with specified requirements into the future; and • The extent of the APZ being established within the boundary of the lot results in the potential radiant heat impact of a fire on the proposed building work not exceeding 29kW/m^2

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Bushfire Protection Criteria - Element 2 - Siting and Design of Development (continued)			
Acceptable Solution Either or both solutions to be met to the extent that it satisfies Element 1.	**Further Explanation**	**Compliance**	**Demonstration of Compliance and/or Statements of Justification**
A2.2 Hazard Separation Zone (HSZ) Every building and its contiguous APZ is surrounded by a Hazard Separation Zone (minimum of 80 metres wide), depicted on submitted plans, that meets the defined requirements. **OR** A HSZ may not be required if the proposed construction meets the standard appropriate to the BAL for that location and the determined BAL does not exceed BAL-29. The specifications for the establishment and maintenance of the HSZ are stated in Appendix 4.	Hazard separation should be provided between extreme bushfire hazards and buildings to create a combined separation distance of 100m (50m for unmanaged grassland) in order to protect them from burning embers, radiant heat and direct flame contact. The minimum hazard separation distance may be reduced by compliance with AS 3959 which requires that as the distance from the vegetation is reduced, the construction standard must be increased.	**Will Fully Comply**	The proposed subdivision meets the acceptable solution by: • The indicative BALs not exceeding BAL-29; and • Applying the construction standard corresponding to the indicative BAL rating as per AS 3959-2009.

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Bushfire Protection Criteria - Element 3 - Vehicular Access			
Intent: To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.			
Performance Principle P3 (used to develop alternative solutions): The intent may be achieved where the internal layout, design and construction of public and private vehicular access and egress in the subdivision /development allow emergency and other vehicles to move through it easily and safely at all times.			
Acceptable Solution	**Further Explanation**	**Compliance**	**Demonstration of Compliance and/or Statements of Justification**
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 and the public at all times and under all weather conditions.	This is to apply to access routes leading into a subdivision as well as those within a subdivision. All access should accommodate type 3.4 fire appliances (4WD 7t chassis). Two-way access should be provided as a public road, however, where a public road cannot be provided (and this will need to be demonstrated by the proponent providing justification), an emergency access way may be considered.	**Will Fully Comply**	The proposed subdivision with the proposed road network will allow residents to have two access routes. Currently Watson Road and Prizmic Street provide access to two different locations. The existing and proposed road network provides safe access and egress to two different destinations. As a sealed public road it is available to all residents and the public at all times and under all weather conditions.

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Bushfire Protection Criteria - Element 3 - Vehicular Access (continued)

Intent: To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.

Performance Principle P3 (used to develop alternative solutions): The intent may be achieved where the internal layout, design and construction of public and private vehicular access and egress in the subdivision /development allow emergency and other vehicles to move through it easily and safely at all times.

Acceptable Solution	Further Explanation	Compliance	Demonstration of Compliance and/or Statements of Justification
A3.2 Public Road Minimum trafficable surface of 6m. Constructed to meet the technical requirements stated in Appendix 5.	In special circumstances, where ≤8 lots serviced, a minimum 4m trafficable surface for a maximum of 90 might be approved.	**Will Fully Comply**	All proposed public roads will be designed and constructed to comply with the technical requirements of the Guidelines.
A3.3 Cul-de-sacs - (includes dead-end roads). A maximum length of 200m with a 17.5m turnaround. 600m length if cul-de-sacs services ≤8 lots and is joined to another cul-de-sac by an emergency access way of <600m). Constructed to meet the technical requirements stated in Appendix 5.	Should be avoided in bushfire prone areas as they do not provide access/egress in different directions. Where no alternative exists this will need to be demonstrated by the proponent including if the lot layout already exists. Cul-de-sac is to connect to a public road.	**N/A**	
A3.4 Battle-axe Maximum length 600m, minimum width 6m, passing bays @ 200m, turnaround area @ 500m and at house site. Constructed to a minimum of private driveway standards. Constructed to meet the technical requirements stated in Appendix 5.	Should be avoided in bushfire prone areas If no alternative exists this will need to be demonstrated by the proponent.	**N/A**	

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Bushfire Protection Criteria - Element 3 - Vehicular Access (continued)			
Acceptable Solutions	**Further Explanation**	**Compliance**	**Demonstration of Compliance and/or Statements of Justification**
A3.5 Private Driveways Are required where a house is >50m from a public road. Passing bays @ 200m, turnaround area @ 500m and within 50m of house. Bridges/culverts to support 15t. All weather surface. Constructed to meet the technical requirements stated in Appendix 5.		**Will Fully Comply**	The private driveways will be <50m in length.
A3.6 Emergency Access Way Provided as a right of way or public access easement in gross (maximum length of 600m) to ensure accessibility to the public and fire services in emergencies. It should comply with minimum standards for a public road and be signposted. Constructed to meet the technical requirements stated in Appendix 5.	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. It is to be provided as an alternative link to a public road during emergencies.	**N/A**	
A3.7 Fire Service Access Routes - (perimeter roads) Provided as rights of way or public access easements in gross; all weather surface and allow for two-way traffic; dead-end roads not permitted; turnarounds every 500m; less than 600m to a public road and be signposted. Constructed to meet the technical requirements stated in Appendix 5.	Fire service access routes should be established to separate bushfire prone areas from developed areas and to provide access within and around the edge of the subdivisions and related development. To be used during bushfire suppression operations and prevention work.	**N/A**	
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 prescribed in the local firebreak notice issued by the local government.		**Will Fully Comply**	The proposed lots will comply with the requirements of the local government annual firebreak notice issued under s33 of the Bush Fires Act 1954.

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Bushfire Protection Criteria - Element 4 – Water

Intent: To ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.

Performance Principal P4 (used to develop alternative solutions): The intent may be achieved where the subdivision, development or land use is provided with a permanent and secure supply that is sufficient for firefighting purposes.

Acceptable Solution	Further Explanation	Compliance	Demonstration of Compliance and/or Statements of Justification
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 DFES. Constructed to meet the technical requirements stated in Appendix 6.	The Water Corporations 'No 63 Water Reticulation Standard' is deemed to be the baseline criterion for developments and should be applied unless local water supply authorities' conditions apply. Additionally, any local government variation must be met (s8.4).	**Will Fully Comply**	A reticulated water supply is available in the area of the subject site. Installation of several hydrants will be required within the proposed subdivision as per DFES and Water Corp standards (further detailed in Appendix 6).
A4.2 Non-Reticulated Areas Water tanks for firefighting purposes with a hydrant or standpipe are provided. Minimum of 50,000l/tank; minimum 1 tank/25 lots (or part thereof); house ≤2km from a tank; 20min turnaround time for 2.4 appliance; hardstand area suitable for 3.4 appliance within 3m of tank Must meet the technical requirements stated in Appendix 6. Any local government variation must also be met (s8.4).	The specification of the requirements for the proposal being assessed will be set by the water supply authority and DFES. A procedure must be in place to ensure that water tanks are maintained at or above the designated capacity at all times, including home tanks on single lots. This could be in the form of an agreement with the local government and the fire service. Water tanks and associated facilities are vested in the relevant local government	**N/A**	
A4.3 Non-reticulated Areas (Individual Lots) Single lots above 500 m^2 need a dedicated static water supply on the lot that has the effective capacity of 10,000 litres. Must meet the technical requirements stated in Appendix 6.	A4.3 is only for use if creating one additional lot and cannot be applied cumulatively.	**N/A**	

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7.2 Location and Siting of Buildings and Allowable BAL's

Future buildings on the proposed lots are to be located in areas where an appropriate Bushfire Attack Level rating can be achieved and where minimal removal of valuable existing native vegetation is required to achieve this rating. The intent is to have the subject land of this Proposal located in an area where the bushfire hazard level is, or will on completion, be moderate or low or be subject to a maximum Bushfire Attack Level of BAL-29.

The proposed subdivision is unlikely to be approved if the indicative BAL rating for future buildings on any proposed lots is either BAL-40 or BAL-FZ as it is unacceptable on planning grounds. The exception will be if it meets the definition of unavoidable development ('Guidelines' s5.4 and s5.7). If this applies the appropriate additional assessment and input from the relevant authorities, if required, is included in this Plan.

The proposed subdivision currently has a moderate bushfire risk due to the existing classified vegetation. Once the subdivision has been completed the bushfire fire hazard will be reduced due to the removal of vegetation. The location of the proposed lots will be subject to a BAL of BAL-29 or less depending on their specific location within the subdivision and the separation distance to the classified vegetation.

The required separation distances from the classified vegetation will need to be maintained. These distances are stated in the next section of this Plan, Section 7.3 'Vegetation Management'.

The development of the road network surrounding the proposed subdivision with the extension of Prizmic Street will be required to be constructed for the western and northern boundary lots to achieve a BAL-29 or less.

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7.3 Vegetation Management

Ongoing Maintenance of Assessed Vegetation

1. Where any existing or planned re-vegetation has been assessed as "low threat" (meeting AS 3959-2009 Section 2.2.3.2 requirements) and excluded from classification then this area will be managed to continue to meet those requirements (refer to Appendix 3) and enable the buildings to retain their determined BAL ratings;

2. Any classified vegetation that has directly contributed to the determined BAL rating for a given building, will be managed such as to not change that vegetation to a higher risk classification; and

3. Where a local government issues an annual firebreak notice under s33 of the Bush Fires Act 1954, this will be complied with.

Asset Protection Zone

Implementing an Asset Protection Zone (APZ) creates a low fuel area surrounding any current or future buildings. This will decrease the potential bushfire's intensity, minimise the likelihood of direct flame contact and reduce the exposure of the buildings to radiant heat. It will also be important for firefighter and occupant's safety during fire suppression activities.

The APZ must be maintained as either a non-vegetated area or as low threat vegetation managed in a minimal fuel condition as per AS 3959-2009 s2.2.3.2 (e) and (f). A minimal fuel condition is stated in the standard as meaning "there is insufficient fuel available to significantly increase the severity of the bushfire attack" and being "recognisable as short cropped grass for example to a nominal height of 100mm." Refer to Appendix 3 of this Plan for further detail with other technical requirements for an APZ set out in Appendix 4.

Establishing the APZ

An Asset Protection Zone (APZ) creating a low fuel area will be required to be incorporated into the landscaping surrounding any future buildings on the proposed lots. To the extent possible within the subject lot's boundary, the APZ minimum width is required to be 20m and increased where required such that the proposed building will not be subject to a BAL rating greater than BAL-29.

Minimum Vegetation Separation Distances

To retain the stated BAL ratings of BAL-12.5 the separation distances from the classified vegetation to the proposed lots will need to be maintained to at least the minimum distances shown in Table 7.3.1.

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This minimum separation distance from any classified vegetation, that corresponds to the proposed building's assessed BAL will be maintained as either a non-vegetated area or as low threat vegetation managed in a minimal fuel condition as per AS 3959-2009 s2.2.3.2 (e) and (f). A minimal fuel condition is stated in the standard as meaning "there is insufficient fuel available to significantly increase the severity of the bushfire attack" and being "recognisable as short cropped grass for example to a nominal height of 100mm." Refer to Appendix 3 of this Plan for further detail.

It is also recognised that the local government issues an annual firebreak notice under s33 of the Bush Fires Act 1954 and this will be complied with.

Ongoing Maintenance of Classified and Excluded Vegetation

Any classified vegetation that has directly contributed to the determined BAL rating for a given building, will be managed such as to not change that vegetation to a higher risk classification.

Where any existing or planned re-vegetation has been assessed as "low threat" (meeting AS 3959-2009 Section 2.2.3.2 requirements) and excluded from classification then this area is required to be managed to continue to meet those requirements and enable the buildings to retain their determined BAL ratings

Table 7.3.1: Ongoing maintenance of the separation area from any future building works to the classified vegetation (refer to Figure 5.1 for vegetation area details)

The Minimum Separation Distance Required to Retain the Lowest Achievable BAL Rating						
Vegetation Area	**1**	**2**	**3**	**4**	**5**	**6**
Proposed Lots with Lowest Achievable BAL of BAL-29						
Minimum Separation Distance	17	19	23	20	20	17

Note that the classified vegetation associated with the BAL ratings indicated in Table 7.3.1, is primarily vegetation that is offsite (i.e. outside a subject lot (Areas 1, 2, 5 & 6)). This offsite vegetation has been assessed as it would exist in its mature and unmanaged state. It is a bushfire threat that the owner of the subject land (of this Proposal) has no control over but the level of bushfire threat will not increase above that assessed in this Plan. Areas 3 & 4 will be cleared as part of this subdivision.

The POS is to be managed in accordance with the vegetation exclusions detailed in *AS 3959-2009 s2.2.3.2* so as to not increase the bushfire threat to the area.

7.4 Vehicular Access

The internal layout, design and construction of public and private vehicular access and egress in the subdivision/development must allow emergency and other vehicles to move through it safely at all times and specifically during a bushfire event.

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It is the developer's responsibility to ensure that subdivision and development design allow for the bushfire protection criteria for vehicular access be met as per the 'Guidelines'.

Vehicle access to the proposed subdivision is currently provided by an existing public road network that complies with the technical requirements of the Guidelines. The internal road network for the proposed subdivision will be designed and constructed to comply with the Guidelines including two way access, width, and turn around areas.

As part of this proposed subdivision the construction of Prizmic Street will be required to be implemented to maintain two way access to two different locations for all lots.

7.5 Firefighting Water Supply

The intent is to ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire. This intent may be achieved where the subdivision, development or land use is provided with a permanent and secure supply that is sufficient for firefighting purposes.

A reticulated water supply exists for the proposed subdivision with existing hydrants located on Watson Road, Howe Street and Prizmic Street.

The required hydrants, and access will be installed as per the technical requirements detailed in Appendix 6 to DFES standards as per Water Corp standard DS63.

7.6 Building Construction Standards

7.6.1 Future Buildings

Any proposed residential building work (Class 1, 2, 3 and associated Class 10a buildings and decks) subject to a BAL rating above BAL-Low will be required to be constructed to the requirements corresponding to their determined BAL as set out in *AS 3959-2009 Construction of buildings in bushfire prone areas* or the *(NASH) Standard – Steel Framed Construction in Bushfire Prone* Areas (for Class 1a and 1b buildings only).

The exception will be if higher construction standards are to apply due to a local government requirement or as a part of an alternative solution that might be presented in this Plan to enable compliance with the Bushfire Protection Criteria.

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Only residential buildings Class 1, 2 or 3 and associated Class 10a buildings and decks are required by the BCA to be constructed to the bushfire standards set out in *AS3959-2009* and as determined by their BAL rating. This standard is not applicable to Class 4 – Class 9 buildings unless imposed by the relevant local government (or voluntarily adopted).

However, determining the BAL ratings of proposed Class 4-9 buildings allows for them to be:

- Sited appropriately and have classified vegetation removed and /or managed such that their exposure to flames, radiant heat and embers is as low as is practically possible.
- Constructed to the standard corresponding to the BAL rating if the developer, owner or local government deem it is prudent and necessary.

Bushfire Prone Planning Recommendation: *When the subject site is in a designated bushfire prone area and the determined BAL is BAL-LOW, Bushfire Prone Planning considers a building in this situation to still be at some risk of an ember attack. Therefore, to improve the protection for occupants as well as the building itself, we recommend that consideration be given to constructing the proposed building works to the standard corresponding to a BAL of BAL-12.5.*

This Plan has provided achievable (or indicative) BAL's rather than determined BAL's because any future building works actual location is unknown. Once actual building locations have been determined confirmation or reassessment of the BAL may be required prior to the construction of any buildings.

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8 Compliance Statements - of the Proposal and this Plan

This section of the Plan makes statements with respect to the Proposal's compliance against the components of the WA framework for bushfire risk management. It also states how the content of this BMP satisfies the requirements of SPP 3.7.

The key components of the WA framework for bushfire risk management are summarised in Appendix 1.

8.1 State Planning Policy No. 3.7: Planning in Bushfire Prone Areas

SPP 3.7 Policy Objectives - Proposal Compliance Statement		The Proposal Meets Objectives
s5.1	Avoid any increase in the threat of bushfire to people property and infrastructure	**Yes**
Implementation of the bushfire risk management measures as set out in this Plan, including meeting the requirements of the bushfire protection criteria; will avoid any increase in the threat of bushfire.		
s5.2	Identify and consider bushfire risks in decision-making at all stages of the planning and development process (to reduce vulnerability to bushfire).	**Yes**
The bushfire risks have been identified and assessed, as relevant for the stage of this planning submission, using the tools prescribed in *SPP 3.7* (and the associated document *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*). Refer to Section 5 'Assessment of Bushfire Risk'.		
s5.3	Ensure that all stages of planning submissions take into account bushfire protection requirements and include specified bushfire protection methods.	**Yes**
The bushfire protection requirements and any specified protection methods, relevant for the stage of this planning submission, have been taken into account and presented in Section 7 'Bushfire Risk Management Measures'.		
s5.4	Achieve an appropriate balance between bushfire risk management measures; biodiversity conservation values; environmental protection and biodiversity management; and landscape amenity, with consideration of climate change.	**Yes**
The components of this objective have been considered along with the requirements set out in the 'Guidelines' s2.3. Identifying and addressing issues relevant for the stage of this planning submission is presented in this Plan in Section 6 'Environmental Considerations'.		

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SPP 3.7 Policy Measures – BMP Compliance Statement		This BMP is Compliant
s6.1	Higher order strategic planning documents in bushfire prone areas	**Yes**
The requirements stated in SPP 3.7 s6.3 include provision of high level consideration of relevant bushfire hazards when identifying or investigating land for future development.		
s6.2	Strategic planning proposals, subdivision and development applications	**Yes**
Plans relating to land that has or will have a BHL above low and/or where a BAL rating above BAL-Low apply, are to comply with these policy measures. If the proposal has or will on completion have a moderate BHL and/or where BAL-12.5 to BAL-29 applies, it may be considered for approval when the required information is provided and it can be undertaken in accordance with policy measures 6.3, 6.4 or 6.5.		
s6.3	Information to accompany strategic planning proposals	**Yes**
The requirements stated in SPP 3.7 s6.3 include provision of a Bushfire Hazard Level assessment (or a BAL contour map if lots are known), identify issues arising from the relevant assessment and demonstrate that compliance with the Bushfire Protection Criteria can be achieved in subsequent planning stages. Refer to Section 5 of this Plan.		
s6.4	Information to accompany subdivision applications	**Yes**
The requirements stated in SPP 3.7 s6.4 include provision of a BAL contour map; (or a BAL assessment if appropriate); identify issues arising from the contour map (or BAL assessment) and an assessment against the bushfire protection criteria. Refer to Section 5 of this Plan.		
s6.5	Information to accompany development applications	**N/A**
s6.6	Vulnerable or high risk land uses (subdivision and development applications).	**N/A**

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SPP 3.7 Policy Measures – BMP Compliance Statement		This BMP is Compliant
s6.7	Strategic planning proposals, subdivision or development applications in areas where an extreme BHL and/or BAL-40 or BAL-FZ applies	**N/A**
s6.8	Advice of State/relevant authority/s for emergency services to be sought	**N/A**
s6.9	Advice of State/relevant agencies/authorities for environmental protection to be sought	**N/A**
For all stages of planning proposals, advice from relevant authorities has been sought, considered and is referenced in Section 6 of this Plan where: • The clearing of vegetation within protected environmentally sensitive areas is proposed • Substantial clearing of native vegetation is proposed • Development abuts land managed by a State or Federal authority		
s6.10	Bushfire conditions may be imposed by the decision maker (detailed requirements including modifications and/or conditions)	**Yes**
WAPC and/or the local government may, as a condition of approval, require that a notification be placed on certificates of title and notice of the notification on the deposited plan advising that the lots are in a designated bushfire prone area and subject to a Bushfire Management Plan. This is noted in Section 9 'Responsibilities for Implementation and Maintenance'.		

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8.2 Guidelines for Planning in Bushfire Prone Areas (WAPC 2015 as amended)

The 'Guidelines' are designed to assist in the interpretation of SPP3.7's objectives and policy measures. As such they have been referenced and complied with in compiling this Bushfire Management Plan which is to accompany the planning submission. This Plan contains, as a minimum, the information required as per the 'Guidelines' checklist.

8.3 Bushfire Protection Criteria (WAPC 2015 'Guidelines')

The proposed land use has been assessed against the bushfire protection criteria. The assessment of the bushfire risk management measures (i.e. those relevant to each element) and the demonstration of how the proposal meets the criteria are presented in Section 7.1 of this Plan - 'Bushfire Protection Criteria - Assess and Demonstrate Compliance'.

Where the proposal has not been able to fully meet an acceptable solution for a given element or an alternative solution is proposed, then the appropriate sub section of Section 7 'Risk Management Measures', demonstrates how the Proposal will comply with the performance principle and the intent of that element. Any required advice and recommendations from DFES and other referral authorities will be included.

8.4 Local Variations to Bushfire Protection Criteria

Are there any endorsed local variations to the bushfire protection criteria (e.g. through a local planning policy) that are to apply to the proposed land use and therefore addressed in Section 7 'Bushfire Risk Management Measures' of this Plan?	No
Does the proposal satisfy the local variations to the bushfire protection criteria?	N/A

8.5 WA Building Act 2011

Relevant regulations associated with the Act are the *Building Regulations 2012* and the Building *Amendment Regulations (No 3)* 2015. The legislation adopts the Building Code of Australia as the minimum technical requirement for the design and construction of buildings and certain other structures in WA and prescribes applicable building standards for certain classes of buildings located in areas designated by the Fire and Emergency Services Commissioner as bushfire prone areas (identified on the Map of Bushfire Prone Areas).

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Is this land use proposal at a planning stage at which lot layout is known and construction of buildings (any class) is being proposed?	Yes

If the response is 'No', then this Proposal is at a planning stage where specific compliance with the Building Act 2011 is not required – rather it will apply at future planning stages. However, if a BAL Contour Map and/or BAL assessment has been provided as part of this Plan, they can apply and may be able to be used for any future planning application (at the applicable planning stage involving construction of buildings).

If the response is 'Yes', then one of the situations below will apply to this proposal.

The Nature of this Land Use Proposal	Applicable
A proposal for a single house or ancillary dwelling (Class 1); or a specified building located in a bushfire prone area on a lot less than 1100m2 or on a lot equal to or greater than 1100m2 but subject to a BAL of BAL-29 or less, does not need to lodge a development application (but will require a building permit application). However, the relevant local government can additionally require that a development application is submitted for planning approval. Bushfire construction requirements will apply in both cases.	Yes
A proposal for a single house or ancillary dwelling (i.e. Class 1); or a specified building located in a bushfire prone area on a lot equal to or greater than 1100m2 but subject to BAL-40 or BAL-FZ must lodge a development application and bushfire construction requirements will apply.	N/A
A proposal, regardless of lot size, for a habitable building other than a single house or ancillary dwelling (i.e. Class 2 or 3 residential or accommodation buildings); or a specified building, located in a bushfire prone area, must lodge a development application and bushfire construction requirements will apply.	N/A
A proposal, regardless of lot size, for mixed use, commercial, industrial buildings or public facilities (i.e. Class 4-9 buildings), located in a bushfire prone area, and must lodge a development application. Bushfire construction requirements will not apply (unless the local government additionally requires them to apply).	N/A

This Proposal complies with the *WA Building Act 2011* and associated regulations by referring to a BAL Contour Map (refer Section 5 of this Plan 'Assessment of Bushfire Risk') and noting any obligation for future buildings to be constructed to the standard corresponding to the determined bushfire attack levels in Section 9 of this Plan 'Responsibilities for Implementation and Maintenance'.

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8.6 AS 3959 Construction of Buildings in Bushfire Prone Areas (2009 as amended)

This Proposal complies with the methodology set out in *AS 3959* to classify vegetation that is a bushfire threat and to calculate the bushfire attack levels presented as a BAL Contour Map and/or a BAL assessment in Section 5 of this Plan 'Assessment of Bushfire Risk'.

For the construction of any Class 1, 2, 3 buildings and associated Class 10a buildings and decks, this land use proposal will comply with the construction requirements, set out in *AS 3959,* that correspond to the determined bushfire attack level/s for the subject site. This obligation is stated in Section 9 of this Plan 'Responsibilities for Implementation and Maintenance'.

8.7 Local Government Firebreak Notice

This Proposal complies with the requirements of the relevant local government notice by stating the landowner's obligations in Section 8 of this Plan 'Responsibilities for Implementation and Maintenance.' Additionally, the obligation is noted in Section 7.3 'Vegetation Management' and as part of meeting the requirements of the bushfire protection criteria Section 7.4 'Element 3 – Access'.

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9 Responsibilities for Implementation & Maintenance

This section sets out the responsibilities of landowners/proponents (including future landowners), builders and local government in relation to the implementation and maintenance of the requirements of SPP 3.7 and the 'Guidelines'.

9.1 Landowner / Proponent Responsibilities (and those acting on their behalf)

Implementation

- WAPC requires that an approved detailed plan demonstrating the location and capacity of fire emergency infrastructure be prepared and implemented. This is noted in Section 9 'Responsibilities for Implementation and Maintenance'.
- Ensure anyone listed as having responsibility under the Plan has endorsed it and is provided with a copy for their information. This includes the landowners/proponents, local government and any other authorities or referral agencies ('Guidelines' s4.6.3).
- To confirm the indicative BAL ratings identified on the BAL Contour Map are still accurate after subdivision works have been completed, a compliance certificate or report will be required to be submitted before titles can be issued (WAPC Factsheet 'BAL Contour Maps').
- Construction of public roads must comply with the standards (Appendix 5 'Vehicular Access').
- Construction of private driveways must comply with the standards (Appendix 5 'Vehicular Access').
- Installation of a reticulated water supply must comply with the standards (Appendix 6 'Water') or the requirements set out by the relevant local government.
- Implement the low fuel Asset Protection Zone (APZ) as per s7.3 'Vegetation Management' and Appendix 4 'APZ and HSZ'.
- Before any of the subject lots are sold, each individual lot is to be compliant with the local government's annual firebreak notice before it is sold ('Guidelines' s6.1 and referenced in this Plan s8.7 'Local Government Firebreak Notice' and Appendix 4 'APZ and HSZ').
- Implement the relevant minimum separation distances from classified vegetation and ensuring adequate access is provided prior to the clearance of subdivision conditions ('Guidelines' s4.6.4).

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- Ensure all future buildings the landowner/proponent has responsibility for, are designed and constructed in full compliance with the requirements of the WA Building Act 2011 and the referenced Building Code of Australia (BCA), and with any identified additional requirements of the relevant local government. This should include due consideration of constructing any Class 4-9 buildings to the standard corresponding to their determined BAL even though not required by the BCA.

  For any Class 1, 2, or 3 buildings and associated Class 10a buildings or decks this will include compliance with AS 3959-2009 *Construction of Buildings in Bushfire Prone Areas* (2009 as amended) and/or the National Association of Steel Housing – *(NASH) Standard – Steel Framed Construction in Bushfire Prone Areas,* whereby construction standards corresponding to the assessed BAL will be applied (Appendix 2 'Bushfire Risk Assessment – Methodology Explained').

Deposited Plan and Certificate of Title – Potential Obligation

The WAPC may condition a subdivision application approval with a requirement for the landowner / proponent to place a notification onto the certificate(s) of title and a notice of the notification onto the diagram or plan of survey (deposited plan). This will be done pursuant to Section 165 of the Planning and Development Act 2005 ('Hazard etc. affecting land, notating titles as to:') and applies to lots with a determined BAL rating of BAL-12.5 or above.

The notification will be required to state: 'This land is within a bushfire prone area as designated by an Order made by the Fire and Emergency Services Commissioner and may be subject to a Bushfire Management Plan. Additional planning and building requirements may apply to development on this land'.

The local government may condition a development application approval with a requirement for the landowner/proponent to register a notification onto the certificate of title (and may need to be included on the deposited plan). This will be done pursuant to Section 70A Transfer of Land Act 1893 as amended ('Factors affecting use and enjoyment of land, notification on title:'). This is to give notice of the bushfire hazard and any restrictions and/or protective measures required to be maintained at the owner's cost.

This condition ensures that:

1. Landowners/proponents are aware their lot is in a designated bushfire prone area and of their obligations to apply the stated bushfire risk management measures; and
2. Ensures that potential purchasers are alerted to the Bushfire Management Plan so that future landowners/proponents can continue to apply the bushfire risk management measures that have been established in the Plan.

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Maintaining Compliance

- Current and future landowners/proponents must continue to apply the bushfire management measures set out in this Plan. They must inform any builders (of future structures on a Lot) of the existence of the Plan and the responsibilities it contains.

- The landowner/proponent is responsible for the ongoing review and implementation of the Bushfire Management Plan to ensure that the bushfire risk management measures remain effective. Bushfire plans do not expire and should be seen as a 'living document'. They may require updating in certain circumstances, including (but not limited to) if site conditions change, if further details are required at subsequent stages of the planning process or to reflect new technologies or methodologies in best practice bushfire risk management ('Guidelines' s4.6.4 and s4.6.5).

- Respond to and comply with fire protection or hazard management notices issued by the local government. This includes compliance with the City of Cockburn Fire Control Order (the current requirements can be found on the City of Cockburn website), issued under s33 of the Bush Fires Act 1954 as directed by the 'Guidelines' s6.1 and referenced in this Plan s7.1 'Bushfire Protection Criteria', s8.7 'Local Government Firebreak Notice' and Appendix 4 'APZ and HSZ'.

- Maintain the low fuel Asset Protection Zone (APZ) within the Lot boundary as per s7.3 'Vegetation Management' and Appendix 4 'APZ and HSZ'.

- The stated minimum separation distance (refer to s7.3 Table 7.3.1) from any classified vegetation, that corresponds to a particular lot's assessed BAL, must be maintained as either a non-vegetated area or as low threat vegetation managed in a minimal fuel condition as per AS 3959-2009 s2.2.3.2 (e) and (f). A minimal fuel condition is stated in the standard as meaning "there is insufficient fuel available to significantly increase the severity of the bushfire attack" and being "recognisable as short cropped grass for example to a nominal height of 100mm." Refer to Appendix 3 of this Plan for further detail.

- Where any existing or planned re-vegetation has been assessed as "low threat" (meeting AS 3959-2009 Section 2.2.3.2 requirements) and excluded from classification then this area will be managed to continue to meet those requirements and enable the buildings to retain their determined BAL ratings.

- Any classified vegetation that has directly contributed to the determined BAL rating for a given Lot or building, must be managed such as to not change that vegetation to a higher risk classification.

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9.2 Builder Responsibilities

The builder (generally named on the building permit) is responsible for ensuring that the building or incidental structure to which a building permit applies is, on completion, compliant with the Building Code of Australia (BCA).

For Classes 1a, 1b, 2, 3 and associated 10a buildings or decks located in a designated bushfire prone area, compliance with the BCA requires that these buildings are constructed to the requirements corresponding to their bushfire attack level rating.

The construction standards for Class 1a and 1b buildings are contained in:

- *AS 3959 - 2009 Construction of buildings in bushfire prone areas; or*
- National Association of Steel Housing – *(NASH) Standard – Steel Framed Construction in Bushfire Prone Areas*.

The construction standards for Classes 2, 3 and associated 10a buildings or decks are contained in:

- *AS 3959 - 2009 Construction of buildings in bushfire prone areas.*

The building/s must also comply with any additional local government requirements.

For any Class 4-9 buildings the builder must comply with any construction requirements that are additional to those contained in the BCA. Of particular issue is any requirement, made by the relevant local government or the owner, to construct to the standard corresponding to the determined BAL for proposed buildings.

9.3 Local Government Responsibilities

Implementation

- Provide advice where the clearing of locally significant vegetation is proposed.

- Register this Bushfire Management Plan and keep a record of the sites referred to for the purpose of identify servicing and infrastructure gaps. ('Guidelines' s4.6.4).

Maintaining Compliance

- Develop and maintain district bushfire fighting services and facilities.

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- Monitor landowner compliance with the annual firebreak notice issued under s33 of the Bush Fires Act 1954.

On land vested in their control, the local government must give due consideration to future actions that have the potential of changing the BAL ratings that an existing habitable building (or existing assessed development site) is subject to. Broadly these actions include:

1. Any planned revegetation of an area; and/or
2. The reduction of any vegetation management over an area that has in the past been actively managed to a minimal fuel condition and would most reasonably be expected to continue to be managed this way.

Specifically, the local government should:

1. Not revegetate an area/s to the extent that it would increase the BAL rating an existing neighbouring habitable building (or assessed development site) is subject to. The area (ha) and location (relative to any classified vegetation) of any revegetation with respect to how it would be assessed from a bushfire perspective (as per AS 3959-2009), must be considered.

2. Continue to manage vegetation to a minimum fuel condition on areas that have been assessed as low threat vegetation in a Bushfire Attack Level assessment if:
    a. The area has been correctly excluded from classification as per AS 3959-2009 s2.2.3.2 (f); and
    b. The exclusion of this area from classification has directly resulted in a neighbouring existing habitable building (or assessed development site), being subject to a BAL-Low rating.

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10 Appendices – Advisory Information Only

Appendix 1
The WA Framework for Bushfire Risk Management

This section of the Bushfire Management Plan sets out the applicable legislation, regulations, policies, guidelines, documents, and associated bushfire risk assessments that a Bushfire Management Plan will need to reference and where applicable, comply with. Statements of compliance against these requirements, as required by the 'Guidelines', are presented in Section 8 of this Plan.

The state government of WA has committed to addressing bushfire through the implementation of a risk-based system of land-use planning and development that aims to reduce the risk of bushfire.
The legislative means of facilitating this is through the ***Planning and Development Act 2005*** and its interaction with the ***Fire and Emergency Services Act 1998*** and the ***Building Act 2011***.

Planning and Development (Local Planning Schemes) Amendment Regulations 2015

These regulations are given effect under the ***Planning and Development Act 2005***. The *Planning and Development (Local Planning Schemes) Regulations 2015* are amended to introduce 'Schedule 2 Part 10A 'Bushfire Risk Management' which establishes the *deemed provisions relating to bushfire risk management.*

"The deemed provisions relating to bushfire risk management work with the State Planning Policy 3.7: Planning in Bushfire Prone Areas (SPP 3.7) and Guidelines for Planning in Bushfire Prone Areas (Guidelines); Map of Bushfire Prone Areas; Building Regulations 2012 and Building Code of Australia to guide planning and development proposals in bushfire prone areas to ensure bushfire risk is properly managed.

The deemed provisions provide a mechanism to require a development approval, and through this the application of SPP 3.7 and the Guidelines, to development on sites where BAL-40 or BAL-Flame Zone (FZ) applies. SPP 3.7 sets out the planning hierarchy and the information required at each stage of the planning process whilst the Guidelines provide information on how SPP 3.7 should be implemented" (source: WAPC Planning Bulletin 111/2015 Planning in Bushfire Prone Areas).

The ***deemed bushfire provisions***:

- Only apply to development that is proposed on a site in a designated bushfire prone area.

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- Override any existing local planning scheme provisions relating to bushfire, including any inconsistent provisions, apart from special control areas.
- Are in addition to any provisions relating to development in a bushfire prone area that apply to a special control area.
- Can be supplemented by a local planning scheme (by implementing a special control area) but not varied or exempted.
- Are applied and work through the following legislation, regulations, policies, guidelines, and documents – each of which this Bushfire Management Plan will address.

Map of Bushfire Prone Areas

The Map of Bushfire Prone Areas identifies land that has been designated as being bushfire prone by the Fire and Emergency Services Commissioner under the *Fire and Emergency Services (Bushfire Prone Areas) Order 2015* as part of the ***Fire and Emergency Services Act 1998***.

Designation as a bushfire prone area (highlighted as pink on the map) reflects the potential of bushfire to affect that site. It acts as a mechanism for initiating further assessment in the planning and building process. This can involve bushfire risk assessment and management measures being required in planning submissions and activation of the bushfire construction requirements of the Building Code of Australia.

State Planning Policy No. 3.7: Planning in Bushfire Prone Areas (SPP 3.7)

This policy is made under the ***Planning and Development Act 2005*** and provides the foundation for land use planning to address bushfire risk management in Western Australia.

SPP 3.7 applies to every stage of the planning process (i.e. all higher order strategic planning documents; strategic planning proposals; subdivision and development applications) in designated bushfire prone areas. It also applies to an area not yet designated as bushfire prone but is proposed to be developed in a way that introduces a bushfire hazard (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015 s3.2.2*).

The objectives of this policy are to:

- Ensure that all stages of land use planning (higher order strategic planning documents; strategic planning proposals; subdivision and development applications) identify and consider bushfire risk and apply specified bushfire protection measures; and
- To have an outcome that will avoid any increase in the threat of bushfire to people, property and infrastructure, preserve life and achieve an appropriate balance between bushfire risk management measures and all environmental conservation aspects.

Policy measures to achieve the objectives are defined and:

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- They vary according to the type and scale of the planning proposal and stage of the development process;
- They set out the information to be prepared for each type of proposal; and
- They refer to the Guidelines *for Planning in Bushfire Prone Areas (WAPC 2015)* as supporting this policy and providing the procedural detail for assessment and presentation of the required information.

Guidelines for Planning in Bushfire Prone Areas (WAPC 2015 as amended)

These Guidelines are designed to supplement and assist in the interpretation of SPP3.7's objectives and policy measures. They provide advice on how bushfire risk is to be addressed when planning, designing or assessing a planning proposal.

As an endorsed standard (by the Office of Bushfire Risk Management), these Guidelines, in conjunction with SPP 3.7, are the predominant documents in the State for use by decision making authorities and referral agencies, during the consideration of strategic planning proposals, subdivisions and development applications.

The Guidelines set out the interrelationships between, and requirements for, various assessment tools used to assess risk in the planning context, as prescribed by SPP 3.7. These include:

- A Bushfire Hazard Level assessment;
- A Bushfire Attack Level (BAL) Contour Map;
- A Bushfire Attack Level (BAL) assessment;
- The Bushfire Protection Criteria; and
- A Bushfire Management Plan

The 'Guidelines' reference the Bushfire Attack Level descriptions and assessment methodologies that are defined in AS 3959.

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Bushfire Protection Criteria

The bushfire protection criteria (set out in the 'Guidelines Appendix 4) are a performance based system of assessing bushfire risk management measures. An assessment against the criteria is to be undertaken for any strategic planning proposal, subdivision and development application for a site that has or will on completion, have a bushfire hazard level above 'Low or a BAL rating above BAL-LOW.

The protection criteria consist of four elements: Location; Siting and Design of Development; Vehicular Access; and Water.

Each element has three components: Intent; Acceptable Solutions; and a Performance Principle. How to apply the Criteria is set out in the 'Guidelines' s4.5.2.

Local Variations to Bushfire Protection Criteria

Local governments may seek to add or to modify the acceptable solutions to recognise special local or regional circumstances (e.g. topography / vegetation / climate which reinforce the intent of a particular bushfire protection element and apply across a defined locality.

These endorsed (by WAPC and DFES) variations will be in the form of a local planning scheme amendment /provision or special control area. Currently they may be in the form of a local planning policy.

WA Building Regulations 2012

- These regulations exist under the **WA Building Act 2011** and adopt the **Building Code of Australia** as the minimum technical requirements for the design and construction of buildings and certain other structures in WA.
- The majority of development in WA requires a building permit before construction can commence. This process typically occurs after the planning process.
- The Regulations include the **Building Amendment Regulations (No.3) 2015** that prescribe applicable building standards for buildings located in areas designated by the Fire and Emergency Services Commissioner as bushfire prone areas (identified on the Map of Bushfire Prone Areas).

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Building Code of Australia (BCA)

- The BCA provides minimum technical requirements for the construction of buildings. These are presented as Volumes One and Two of the National Construction Code series.
- The BCA requires an assessment of the potential intensity of bushfire attack for specific classes of residential buildings located in designated bushfire prone areas (Classes 1a, 1b, 2, 3 and associated 10a buildings or decks).
- The BCA requires that these buildings are constructed to the requirements corresponding to their bushfire attack level rating.
- Compliance with BCA bushfire requirements for Class 1a and 1b buildings in designated bushfire prone areas can be demonstrated by compliance with:
    a. Australian Standard *AS 3959 Construction of buildings in bushfire prone areas; or*
    b. National Association of Steel Housing – *(NASH) Standard – Steel Framed Construction in Bushfire Prone Areas.*
- Compliance with BCA bushfire requirements for Classes 2, 3 and associated 10a buildings or decks in designated bushfire prone areas can be demonstrated by compliance with:
    a. Australian Standard *AS 3959 Construction of buildings in bushfire prone areas.*

AS 3959 Construction of Buildings in Bushfire Prone Areas (2009 as amended)

The objective of this Standard is to prescribe particular construction details for buildings to reduce the risk of ignition from a bushfire, appropriate to the:

a) Potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire; and
b) Intensity of the bushfire attack on the building

To achieve this, the Standard defines six categories of Bushfire Attack Level (BAL), details their assessment methodology and specifies constructions standards corresponding to each.

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Western Australia Bush Fires Act 1954 (as amended)

'An Act to make better provision for diminishing the dangers resulting from bush fires, for the prevention, control and extinguishment of bush fires'. Matters addressed in the Act include prohibited burning times, total fire bans, bushfire control and extinguishment

The Act sets out the authority given to local government which enables them to:

- Control and extinguish bushfires
- Establish and maintain Bushfire Brigades
- Require landowners and/or occupiers to install and maintain firebreaks to their required specifications
- Require landowners and/or occupiers manage bushfire fuel loads upon the land to their required specifications

The applicable document is the annually issued ***Firebreak Notice*** published by the relevant local government that sets out the obligations for landowners and/or occupiers.

Other Applicable Local Government Documents

These may include:

- Local planning scheme provisions.
- Local planning strategy references to bushfire risk management.
- Local planning strategy references to environment.
- Applicable structure plans
- Special control area provisions
- Previous planning approvals

Other Documents

These may include:

- Any existing Bushfire Management Plan, Bushfire Hazard Level assessment or BAL assessment prepared over the site.
- Relevant landscaping plans applicable to the subject site.

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Appendix 2
Bushfire Risk Assessment – Understanding the Methodology

In SPP 3.7 'bushfire risk' is defined as "the chance of a bushfire igniting, spreading and causing damage to people, property and infrastructure."

"Before a strategic planning proposal, subdivision or development application can be considered, it is necessary to understand the extent of the bushfire hazard and its potential to affect people, property and infrastructure. An assessment of bushfire risk is a key component of deciding whether a strategic planning proposal, subdivision or development application should be approved in an area with a potential bushfire threat (from the 'Guidelines')."

Policy measures in *SPP 3.7* (and the associated document *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*) prescribe the various assessment tools to be used to assess bushfire risk in the planning context. These are:

- Bushfire Hazard Level assessment;
- Bushfire Attack Level (BAL) Contour Map;
- Bushfire Attack Level (BAL) assessment;
- Bushfire protection criteria; and
- Bushfire Management Plan

The intent of this Appendix 'Bushfire Risk Assessment – Understanding the Methodology' is to provide an overview of the methodology used in assessing the Bushfire Hazard Level and the Bushfire Attack Level.

Bushfire Hazard Level Assessment Methodology

Used at a strategic planning level, this methodology rates bushfire hazards into three potential categories of low, moderate and extreme by considering the following characteristics:

- Vegetation types and areas
- Effective ground slope under the vegetation threat
- Existing land use on and around the area being assessed
- Prevailing climatic conditions when appropriate

These results are then presented as a Bushfire Hazard Level Map.

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Bushfire Attack Level Assessment Methodology

The Australian Standard *AS 3959-2009 Construction of Buildings in Bushfire Prone Areas* defines a Bushfire Attack Level (BAL) as:

"A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and is the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire."

AS 3959-2009 defines six categories of Bushfire Attack Level (BAL) (*AS 3959 Appendix G*); provides the assessment methodology (*AS 3959 s2 and Appendix B);* and specifies constructions standards corresponding to each BAL (*AS 3959 s3 Table 3.1*). The BAL's and corresponding descriptions of the predicted levels of exposure and heat flux exposure thresholds are contained in the table on the following page.

AS 3959-2009 provides two methods to calculate Bushfire Attack Levels:

1. **Method 1 -** a simplified procedure that involves five procedural steps to determine the BAL. It is subject to some limitations of the circumstances in which it can be used.
2. **Method 2 -** a detailed procedure using calculations to determine BALs where a more specific result is sought or site conditions are outside the scope of Method 1. In particular, the use of Method 2 is to apply if the effective slope under the classified vegetation is greater than 20^0 down slope (and no more than 30^0 down slope) and the slope of the land between the site and the classified vegetation is no more than 20^0 regardless of slope type.

Method 1 – Summarised Procedure

- Determination of the area to be assessed
- Determine predominant vegetation type(s) within 100 metres of the site and classify
- Determination of distance of the site, building or building envelop from the classified vegetation type(s)
- Determination of the effective slope under the classified vegetation type(s)
- Determination of BAL's - Forest Fire Danger Index (FFDI) of 80 is used for WA

Separation Distance: *The distance from a subject site (or building) to a specific area of classified vegetation (i.e. the bushfire threat) is labelled in the tables of this Plan as a separation distance. This distance is measured to a point in the vegetation area represented by the "edge of the vegetation" as per AS 3959 -2009 s2.2.4 and the "base of the bushfire prone vegetation (not the canopy)" as per the BAL Assessment [Basic] Factsheet Version 1 December 2015 WAPC. The exact point of measurement is then decided by the assessor on the basis of the fuel structure and expected fire behaviour. If a precautionary approach is considered appropriate to a given situation the measurement will be taken at the canopy line.*

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Bushfire Attack Level Definitions and Corresponding Sections Specifying Construction Requirements (Source: *AS 3959-2009, Appendix G and Table 3.1*)		
Bushfire Attack Level (BAL)	**Description of Predicted Bushfire Attack and Levels of Heat Flux Exposure**	**Construction Section of AS 3959**
BAL - LOW	There is insufficient risk to warrant specific construction requirements but there is still some risk.	4
BAL - 12.5	There is risk of ember attack. The construction elements are expected to be exposed to a heat flux not greater than 12.5 kW/m^2	3 and 5
BAL - 19	There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m^2	3 and 6
BAL - 29	There is an increased risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to an increased level of radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m^2	3 and 7
BAL - 40	There is a much increased risk of ember attack and burning debris ignited by wind borne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux not greater than 40 kW/m^2	3 and 8
BAL - FZ	There is an extremely high risk of ember attack and burning debris ignited by wind borne embers, a likelihood of exposure to an extreme level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux greater than 40 kW/m^2	3 and 9



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Appendix 3
Vegetation Classification Exclusions (AS 3959-2009 s2.2.3.2)

Certain vegetation can be excluded from being classified in which case the Bushfire Attack Level shall be rated as BAL-LOW and no bushfire specific construction requirements apply. Such vegetation is one or a combination of the following:

a) Vegetation of any type that is more than 100m from the site.
b) Single areas of vegetation less than 1ha in area and not within 100m of other areas of vegetation being classified.
c) Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site or each other.
d) Strips of vegetation less than 20m in width regardless of length and not within 20m of the site or each other, or other areas of vegetation being classified.
e) Non-vegetated areas, including waterways, roads, footpaths, buildings, and rocky outcrops.
f) Low threat vegetation, including grassland managed in a **minimal fuel condition** (i.e. insufficient fuel available to significantly increase the severity of a bushfire attack – recognisable as short cropped grass to a nominal height of 100mm for example), maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks.

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Appendix 4
Technical Requirements – Bushfire Protection Criteria (APZ & HSZ)

A vital and effective component of managing the potential bushfire risk to people, property and infrastructure is creating bushfire protection zones in which fire fuel loads are reduced and maintained. They are an integral part of subdivision and development design and appropriately designed will greatly assist with bushfire prevention and suppression operations.

The *Guidelines for Planning in Bushfire Prone Areas (WAPC 2015, Appendix 4)* set out the requirements to create an Asset Protection Zone (APZ) and a Hazard Separation Zone (HSZ). The aim of these bushfire protection zones is to have a fire of diminishing intensity and flame length as it approaches development. These reduced fuel loads will reduce the intensity of radiant heat onto the buildings, thereby increasing their survivability.

The APZ is a low fuel area immediately surrounding a habitable or specified building and is designed to prevent direct flame contact with buildings and it improves safety for firefighters and occupants during fire suppression activities. Maintaining this zone in a minimal fuel condition is essential and firefighters are not obliged to protect an asset if they think the separation distance between the dwelling and vegetation is unsafe.

Note that individual local governments may vary their specifications of the APZ from those indicated below. These specifications will be contained in their Firebreak and Fuel load notices and are to be complied with.

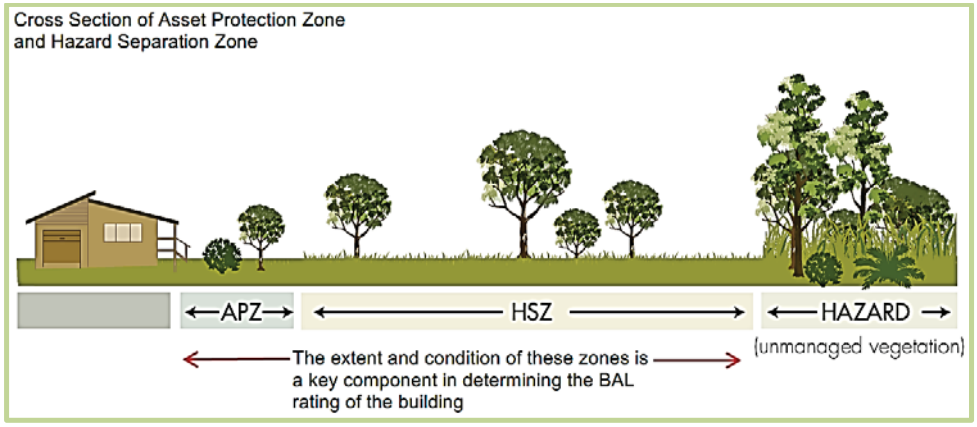
Asset Protection Zone (APZ) Requirements (source: 'WAPC Guidelines')

- **Width:** 20 metres measured from any external wall of the building or building envelope. Where the slope increases above 10^0, the APZ should be increased to ensure the potential radiant heat impact of a fire does not exceed 29 kW/m^2 (i.e. a BAL-29 rating on the building).
- **Location:** the APZ should be accommodated within the boundaries of the lot on which the building is situated. Where a full 20 metre APZ is not possible the APZ should be sufficient enough to ensure the potential radiant heat impact of a fire does not exceed 29 kW/m^2 (i.e. a BAL-29 rating on the building).
- **Fine Fuel Load:** reduced to and maintained at 2 t/ha. (DFES guidance-keep grasses short, remove leaves, twigs, dead material within shrubs and trailing bark, and prune branches to 2 metres above the ground).
- **Trees:** crowns are a minimum distance of 10 metres apart (a small group of trees within close proximity to one another may be treated as one crown provided the combined crowns do not exceed the area of a large or mature crown size for that species) and no crowns overhang the building.
- **Shrubs/Trees:** no tall shrubs or tree foliage within two metres of a building
- **Sheds and Fences:** within the APZ are constructed using non-combustible materials (e.g. iron, brick, limestone, metal post and wire) and sheds do not contain flammable materials.

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Additional DFES Guidance

a) Do not clump shrubs close to a building. Ensure there is a gap between shrubs and buildings of three times their mature height.
b) Store firewood at least 20 metres away from the building.
c) Keep gutters free of leaves and other combustible material.
d) Roof mounted evaporative coolers to be fitted with ember screens.
e) Gas cylinders to vent away from a building and be tethered to prevent falling over.
f) Driveways and access ways must allow for safe passage of a fire appliance to all buildings on the land.
g) Land owners/occupiers must maintain compliance with the local government's annual firebreak notice issued under s33 of the Bush Fires Act 1954.
h) Barriers such as driveways, lawns, ovals, orchards and pathways surrounding dwellings can form part of a APZ. Locate them to maximise building protection.



Hazard Separation Zone (HSZ) Requirements (source: 'WAPC Guidelines')

The 'Guidelines' set out the requirement for a physical separation between extreme bushfire hazard areas and development in low and moderate hazard areas both around and within subdivisions.

- **Width:** a minimum of 80 metres measured from the outer edge of the APZ for any vegetation classified in AS3959 as forest, woodland, closed shrub, open shrub, mallee/mulga and rainforest OR 30 metres, measured from the outer edge of the APZ, for unmanaged grassland.
- **Location:** within the boundaries of the lot on which the building is situated or, where this is not possible or desirable, within the boundaries of the development precinct in which the building is proposed to be located.
- **Fine Fuel Load:** dead material <6mm diameter and live material <3mm is to be reduced to and maintained at 5 - 8 t/ha for jarrah/marri dominated forest and woodlands, below 12 -15 t/ha in mallee heath and below 15 t/ha in karri forest.
- **Exception -** a HSZ may not be required if the proposed construction meets the standard appropriate to the assessed BAL for that location/building and that BAL does not exceed BAL-29.

The intent is to create a combined minimum separation distance of 100 metres between the buildings and the hazard (50 metres if unmanaged grassland). This separation distance may be reduced if the development is compliant with AS 3959 (i.e. as the distance from classified vegetation is reduced, the construction standard must be increased) or by using a performance principle assessment.

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Appendix 5
Technical Requirements - Bushfire Protection Criteria (Vehicular Access)

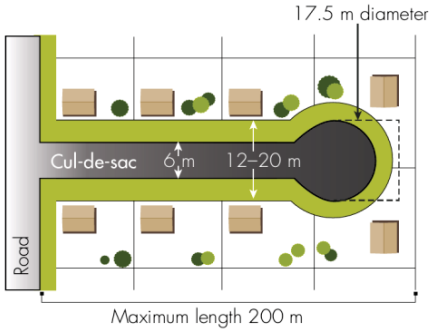
Vehicular Access – Technical Requirements of Acceptable Solutions - Part 1

Source: *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*

Acceptable Solution 3.3 Cul-de-sacs (including a dead-end road)

Their use in bushfire prone areas should be avoided. Where no alternative exists then the following requirements are to be achieved:

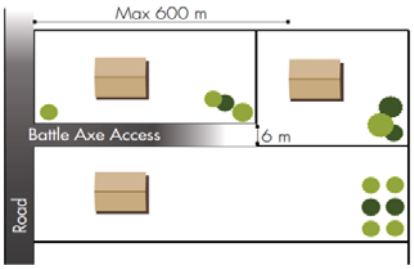
- Maximum length is 200m. If public emergency access is provided between cul-de-sac heads (as a right of way or public access easement in gross), the maximum length can be increased to 600m provided no more than 8 lots are serviced and the emergency access way is less than 600m in length;
- Turnaround area requirements, including a minimum 17.5m diameter head to allow type 3.4 fire appliances to turn around safely;
- The cul-de-sac connects to a public road that allows for travel in two directions; and
- Meet the additional design requirements set out in Part 2 of this appendix.



Acceptable Solution 3.4 Battle-axe

Their use in bushfire prone areas should be avoided. Where no alternative exists then the following requirements are to be achieved:

- Maximum length 600m and minimum width 6m; and
- Comply with minimum standards for private driveways.



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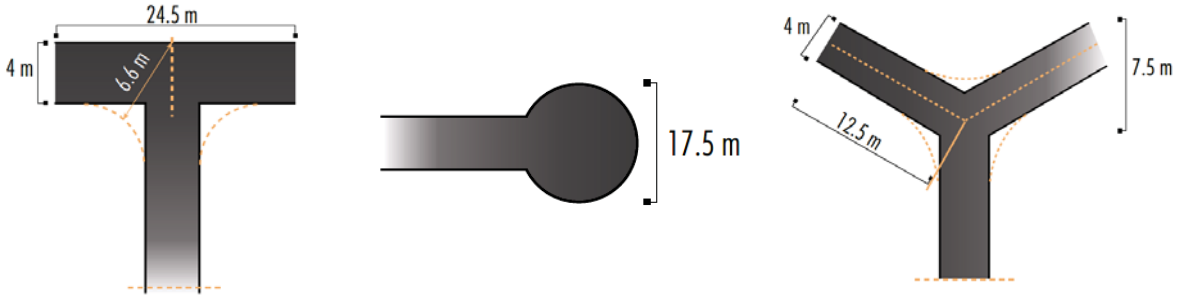
Acceptable Solution 3.5 Private Driveways

The following requirements are to be achieved:

- The design requirements set out in Part 2 of this appendix; and

Where the house site is more than 50 metres from a public road:

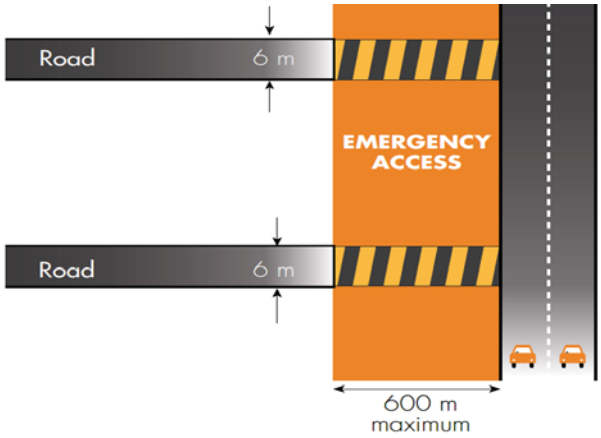
- Passing bays every 200 metres with a minimum length of 20 metres and a minimum width of two metres (ie combined width of the passing bay and constructed private driveway to be a minimum six metres);
- Turn-around areas every 500 metres and within 50 metres of a house, designed to accommodate type 3.4 fire appliances to turn around safely (ie kerb to kerb 17.5 metres);
- Any bridges or culverts are able to support a minimum weight capacity of 15 tonnes; and
- All weather surface (i.e. compacted gravel, limestone or sealed).



Acceptable Solution 3.6 Emergency Access Way

An access way that does not provide through access to a public road is to be avoided bushfire prone areas. Where no alternative exists, an emergency access way is to be provided as an alternative link to a public road during emergencies. The following requirements are to be achieved:

- No further than 600 metres from a public road;
- Must be signposted including where they ajoin public roads;
- Provided as a right of way or public access easement in gross;
- Where gates are used they must not be locked and they must be a minimum width of 3.6 metres with design and construction approved by local government (refer to the example in this appendix); and
- Meet the additional design requirements set out in Part 2 of this appendix.



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Acceptable Solution 3.7 Fire Service Access Routes (Perimeter Roads)

Are to be established to provide access within and around the edge of subdivision and related development and to provide direct access to bushfire prone areas for firefighters and link between public road networks for firefighting purposes. Fire service access is used during bushfire suppression activities but can also be used for fire prevention work. The following requirements are to be achieved:

- No further than 600 metres from a public road (driveways may be used as part of the designated fire service access;
- Dead end roads not permitted;
- Allow for two-way traffic (i.e. two 3.4 fire appliances);
- Provide turn-around areas designed to accommodate 3.4 fire appliances and to enable them to turn around safely every 500m (i.e. kerb to kerb 17.5 metres);
- All weather surface (i.e. compacted gravel, limestone or sealed) and have erosion control measures in place;
- Must be adequately sign posted;
- Where gates are used they must be a minimum width of 3.6 metres with design and construction approved by local government (refer to the example in this appendix) and may be locked (use a common key system);
- Meet the additional design requirements set out in Part 2 of this appendix;
- Provided as right of ways or public access easements in gross; and
- Management and access arrangements to be documented and in place.

A3.8 Firebreak Width

Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three meters or to the level as prescribed in the local firebreak notice issued by the local government.

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Vehicular Access - Technical Requirements of Acceptable Solutions - Part 2 Source: *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*					
Technical Component	Vehicular Access Types				
	Public Roads	Cul-de-sacs	Private Driveways	Emergency Access Ways	Fire Service Access Routes
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	4.5	4.5	4.5	4.5
Maximum grade <50 metres	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum cross-fall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5

* A six metre trafficable surface does not necessarily mean paving width. It could, for example, include four metres of paving and one metre of constructed road shoulders. In special circumstances, where 8 lots or less are being serviced, a public road with a minimum trafficable surface of four metres for a maximum distance of ninety metres may be provided subject to the approval of both the local government and DFES.

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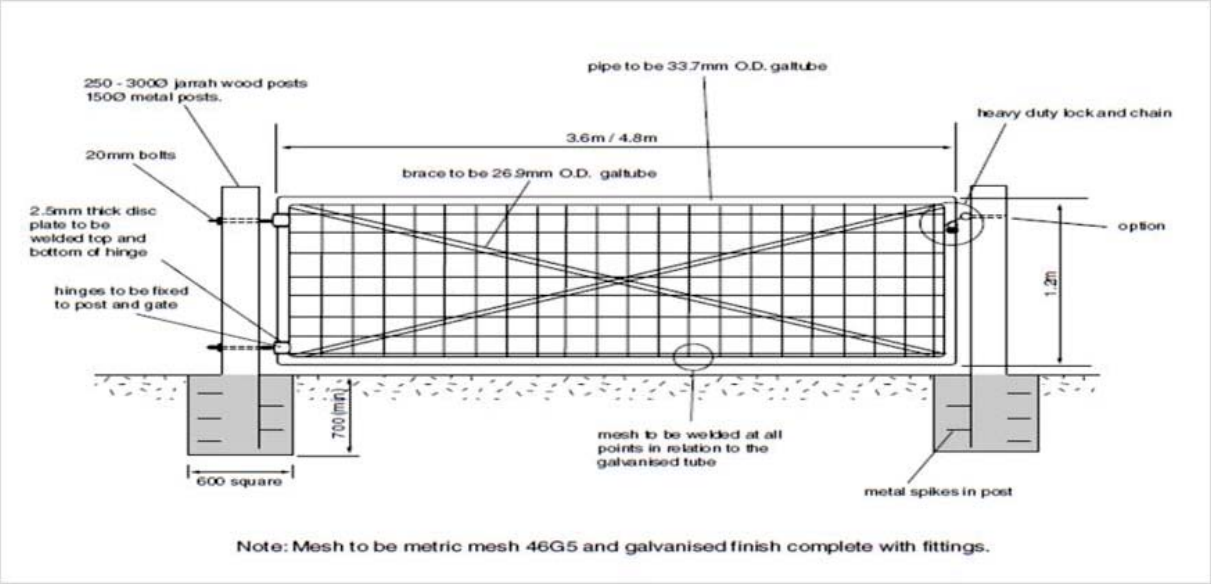
Vehicular Access - Technical Requirements of Acceptable Solutions

Gates and Signs

(example requirements – check with local government)

Gates (Bollards)

- Minimum width 3.6m
- Design and construction to be approved by relevant local government.
- Emergency access way gates must not be locked.
- Fire service access route gates may be locked but only with a common key that is available to local fire service personnel.
- Bollards will be to the relevant local government specifications



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Signs

- Minimum height above ground of 0.9m.
- Lettering height to be 100mm.
- To display the words (as appropriate) “Emergency Access Only” or “Fire Service Access – No Public Access”.
- Design and construction to be approved by the relevant local government.
- Size 600mm x 400mm.
- Sign colour red, base (white) area is reflective background.
- Rounded corners, radius 20mm.
- White key-line 3mm wide, 3mm from outside edge.
- Suggested mounting hole six 6mm diameter.



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Appendix 6
Technical Requirements - Bushfire Protection Criteria (Water)

Source: *Guidelines for Planning in Bushfire Prone Areas WAPC 2015* and DFES website

Acceptable Solution 4.1 Reticulated Areas

The requirement is to supply a reticulated water supply, together with fire hydrants, in accordance with the specifications set by DFES and the relevant water supply authority (WA Water Corporation or Aqwest - Bunbury or Busselton Water). The Water Corporation's 'No 63 Water Reticulation Standard' is deemed to be the baseline criteria for developments and should be applied unless local water supply authority's conditions apply. Key specifications in the most recent version/revision of the design standard include:

- ***Residential Standard*** – hydrants are to be located so that the maximum distance between the hydrants shall be no more than 200 metres.

- ***Commercial Standard*** – hydrants are to be located with a maximum of 100 metre spacing in Industrial and Commercial areas.

- ***Rural Residential Standard*** – where minimum site areas per dwelling is 10,000 m^2 (1ha), hydrants are to be located with a maximum 400m spacing. If the area is further subdivided to land parcels less than 1ha, then the residential standard (200m) is to be applied.

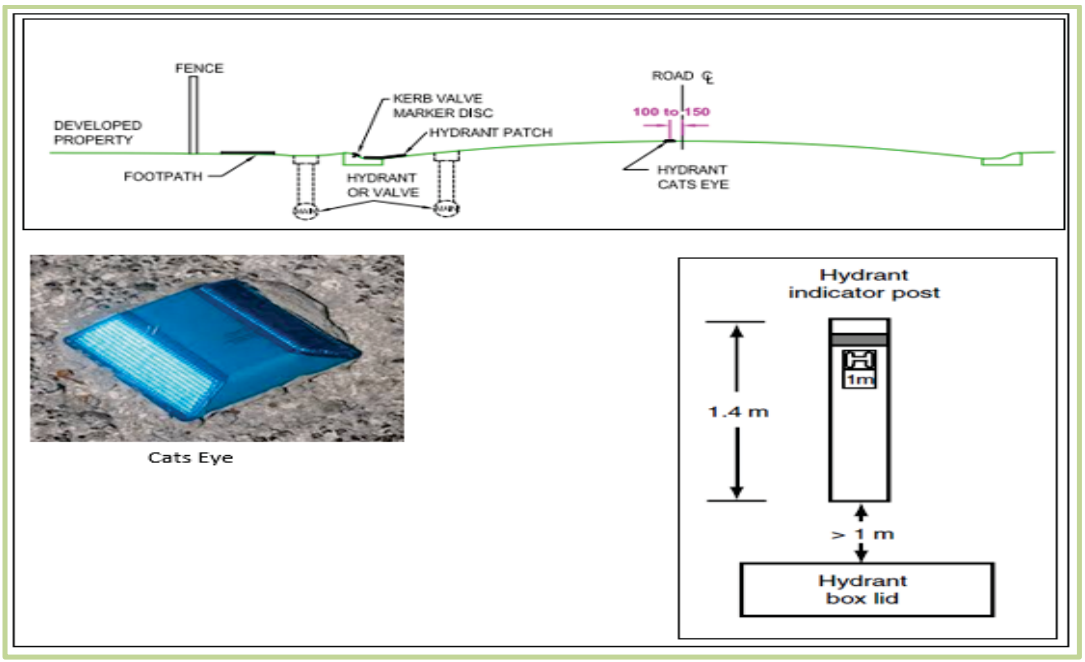


Figure A4.1: Hydrant Location and Identification Specifications

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Acceptable Solution 4.2 Non-Reticulated Areas

Static water supplies are used by firefighters in areas where there is no reticulated water supply. Water tanks are the only acceptable static water source acceptable to meet Element 4 (Water) of the Bushfire Protection Criteria as per the *Guidelines for Planning in Bushfire Prone Areas (WAPC 2015) Appendix 4*.

The requirements for the development being assessed can be increased by the relevant local government. If a variation applies it will be noted in s7.1 and s7.4.

Volume:	50,000 litres per tank
Ratio of tanks to lots:	1 tank per 25 lots (or part thereof)
Location:	No more than two kilometres to the furthermost house site within the residential development to allow a 2.4 fire appliance to achieve a 20-minute turnaround time at legal road speeds.
Tank Construction:	Above ground tanks constructed using concrete or metal. Stands of raised tanks are constructed using non-combustible materials and heat shielding where applicable (required for metal stands).
Pipe Construction:	Galvanised or copper (PVC if buried 300mm below ground).
Access:	Hardstand and turnaround areas suitable for a 3.4 appliance (i.e. kerb to kerb 17.5metres) are provided within three metres of each tank.
Couplings:	Tanks are to be fitted with a full flow gate (not ball) valve and a 100mm cam-lock coupling of metal/alloy construction (source: DFES). Examples below:  
Ownership and Responsibility:	Water tanks and associated facilities are vested in the relevant local government. A procedure must be in place to ensure that water tanks are maintained at or above designated capacity at all times. This could be in the form of an agreement with the local government and the fire service.

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Acceptable Solution 4.3 Non-Reticulated Areas - Individual Lots

This solution is only for use if creating one additional lot and cannot be applied cumulatively (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015 Appendix 4)*.

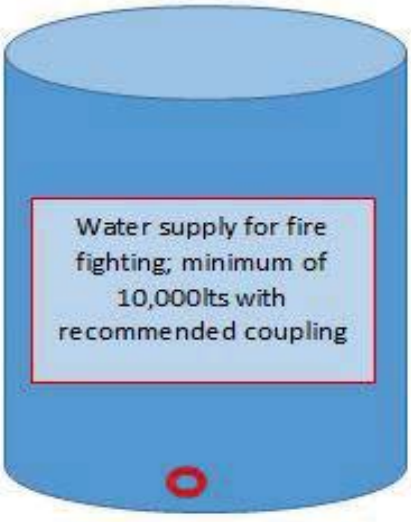
Single lots above 500 m^2 need a dedicated static water supply on the lot that has an effective capacity of 10,000 litres (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015)*.

An Example Local Government Requirement:

Volume:	Minimum 10,000 litres (effective) per tank dedicated to firefighting purposes. The storage tank must not facilitate sharing the water for domestic use (danger of contamination).
Tank Construction:	Above ground tanks constructed using concrete or metal.
Pipe Construction:	Galvanised or copper (PVC if buried 300mm below ground).
Access:	Hardstand and turnaround area suitable for a 3.4 appliance (i.e. kerb to kerb 17.5metres) is provided at the tank.
Couplings:	Tanks are to be fitted with a full flow gate (not ball) valve and a 50mm or 100mm cam-lock coupling of metal/alloy construction. Examples below:
Responsibility:	A procedure must be in place to ensure that water tanks are maintained at or above designated capacity at all times. This could be in the form of an agreement with the local government and the fire service.



Recommended coupling 50mm



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APPENDIX 4

ACOUSTIC ASSESSMENT REPORT

ROWEGROUP

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Transportation Noise Assessment

Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar

Reference: 15063230-01e.docx

Prepared for:
Aigle Royal Developments

Report: 15063230-01e.docx

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Prepared By:	Terry George 
Position:	Project Director
Date:	12 July 2017

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A Acceptable Treatment Packages

B Terminology

1 INTRODUCTION

Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road (refer *Figure 1-1*) are to be redeveloped for residential purposes as per the Local Structure Plan of *Figure 1-2* and subdivision concept of *Figure 1-3*. To the north and west of the site are Beeliar Drive and Stock Road respectively, both of which carry reasonable volumes of road traffic. This report considers the potential noise impacts from road traffic to the proposed subdivision, including the future grade separated interchange of Stock Road and Beeliar Drive.

Appendix B contains a description of some of the terminology used throughout this report.



Figure 1-1 Site Locality



Figure 1-2 Local Structure Plan

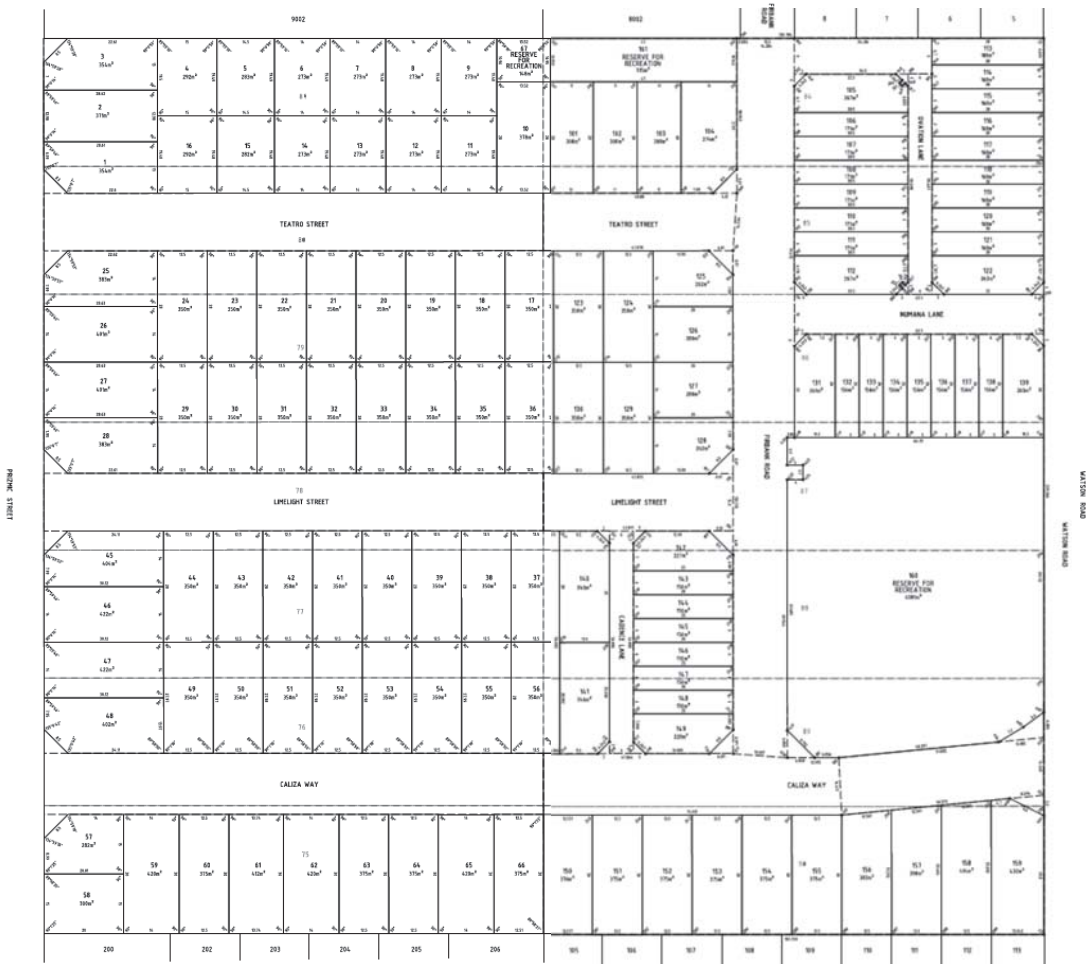


Figure 1-3 Subdivision Concept Plan

Appendix B contains a description of some of the terminology used throughout this report.

2 CRITERIA

The criteria relevant to this assessment is the *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (hereafter referred to as the Policy) produced by the Western Australian Planning Commission (WAPC). The objectives in the Policy are to:

- Protect people from unreasonable levels of transport noise by establishing a standardised set of criteria to be used in the assessment of proposals;
- Protect major transport corridors and freight operations from incompatible urban encroachment;
- Encourage best practice design and construction standards for new development proposals and new or redevelopment transport infrastructure proposals;
- Facilitate the development and operation of an efficient freight network; and
- Facilitate the strategic co-location of freight handling facilities.

The Policy's outdoor noise criteria are shown below in *Table 2-1*. These criteria applying at any point 1-metre from a habitable façade of a noise sensitive premises and in one outdoor living area.

Table 2-1 Outdoor Noise Criteria

Period	Target	Limit
Day (6am to 10pm)	55 dB $L_{Aeq(Day)}$	60 dB $L_{Aeq(Day)}$
Night (10pm to 6am)	50 dB $L_{Aeq(Night)}$	55 dB $L_{Aeq(Night)}$

Note: The 5 dB difference between the target and limit is referred to as the margin.

In the application of these outdoor noise criteria to new noise sensitive developments, the objectives of this Policy is to achieve -

- acceptable indoor noise levels in noise-sensitive areas (e.g. bedrooms and living rooms of houses); and
- a 'reasonable' degree of acoustic amenity in at least one outdoor living area on each residential lot.

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

In areas where the *target* is exceeded, but noise levels are likely to be within the 5 dB margin (i.e. less than the *limit*), customised noise mitigation measures should be implemented with a view to achieving the *target* in at least one outdoor living area on each residential lot, or if this is not practicable, within the *margin*. Where indoor spaces are planned to be facing outdoor areas that are above the *target*, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces.

3 METHODOLOGY

Noise measurements and modelling have been undertaken in accordance with the requirements of the Policy as described below in *Sections 3.1 and 3.2*.

3.1 Site Measurements

Noise monitoring was undertaken for previous projects at two (2) locations in order to:

- Quantify the existing noise levels;
- Determine the differences between different acoustic parameters ($L_{A10,18hour}$, $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$); and
- Calibrate the noise model for existing conditions.

The instruments used were ARL Type 316 noise data loggers. One logger was located at an existing residence along Beeliar Drive (9 Danielson Way, Beeliar) and the other (pictured below) approximately 21 metres from the edge of Stock Road. The loggers were programmed to record hourly L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels. These instruments comply with the requirements of *Australian Standard 2702-1984 Acoustics – Methods for the Measurement of Road Traffic Noise*. The logger was field calibrated before and after the measurement session and found to be accurate to within +/- 1 dB. Lloyd George Acoustics also holds current laboratory calibration certificate for the loggers.



Figure 3-1 Noise Logger Alongside Stock Road

3.2 Noise Modelling

The computer programme *SoundPLAN 7.3* was utilised incorporating the *Calculation of Road Traffic Noise* (CoRTN) algorithms, modified to reflect Australian conditions. The modifications included the following:

- Vehicles were separated into heavy (Austroads Class 3 upwards) and non-heavy (Austroads Classes 1 & 2) with non-heavy vehicles having a source height of 0.5 metres above road level and heavy vehicles having two sources, at heights of 1.5 metres and 3.6 metres above road level, to represent the engine and exhaust respectively. By splitting the noise source into three, allows for less barrier attenuation for high level sources where barriers are to be considered. Note that corrections are applied to the exhaust of –8.0 dB (based on Transportation Noise Reference Book, Paul Nelson, 1987) and to the engine source of –0.8 dB, so as to provide consistent results with the CoRTN algorithms for the no barrier scenario;
- An adjustment of –1.7 dB has been applied to the predicted levels based on the findings of An Evaluation of the U.K. DoE Traffic Noise Prediction; Australian Road Research Board, Report 122 ARRB – NAASRA Planning Group 1982.

Predictions are made at heights of 1.4 metres and 4.4 metres above ground floor level and at 1.0 metre from an assumed building façade (resulting in a + 2.5 dB correction due to reflected noise).

Various input data are included in the modelling such as ground topography, road design, traffic volumes etc. These model inputs are discussed below.

3.2.1 Ground Topography

Topographical data of the general area was on file from previous projects, originating from Landgate.

Finished lot levels for the site were provided by Ochre West and incorporated into the noise model.

Buildings have been included as these can provide barrier attenuation when located between a source and receiver, in much the same way as a hill or wall provides noise shielding. All single storey buildings are assumed to have a height of 3.5 metres with all double storey building assumed to be 7.0 metres high.

The design of the grade separated interchange was not available digitally and therefore the details provided in *Figures 3-2 & 3-3* were manually incorporated into the noise model as best possible. This involved the centreline being incorporated as per the horizontal and vertical alignment information shown. This is then assumed to be applicable to the edge of the north and southbound carriageways, noting that Stock Road flies over Beeliar Drive and becomes 3 lanes in each direction. This is a significant realignment and widening, particularly to the east of the existing alignment.

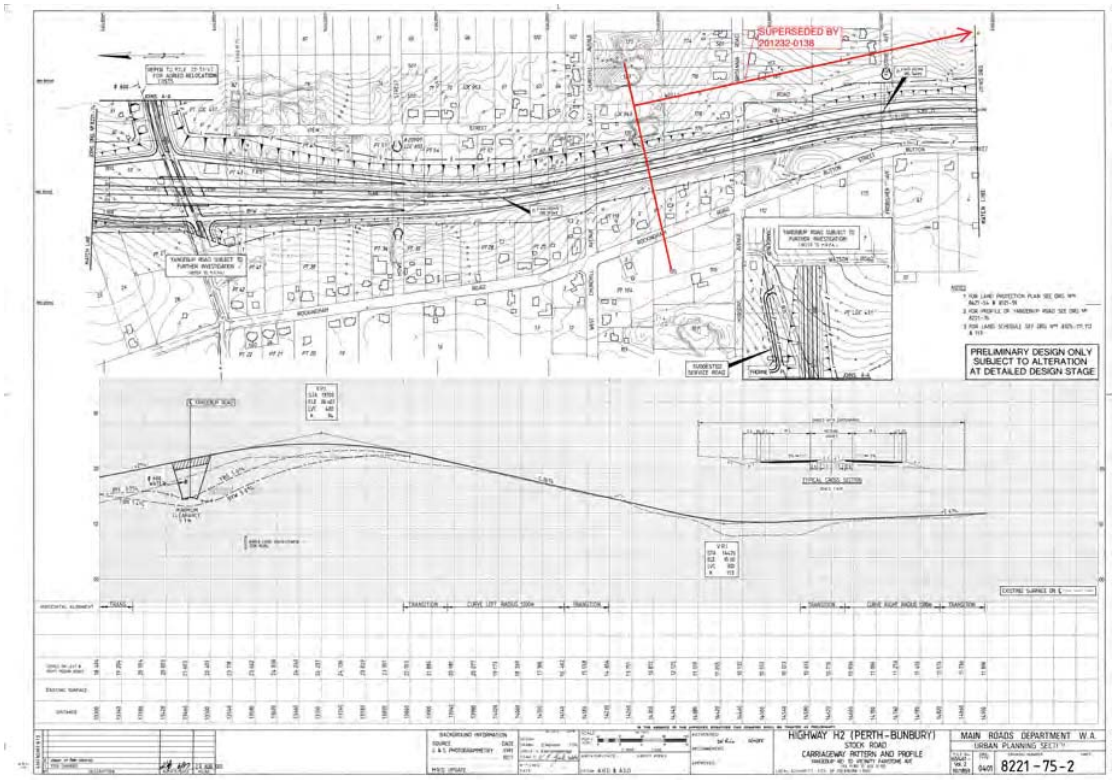


Figure 3-2 Stock Road Design South Section

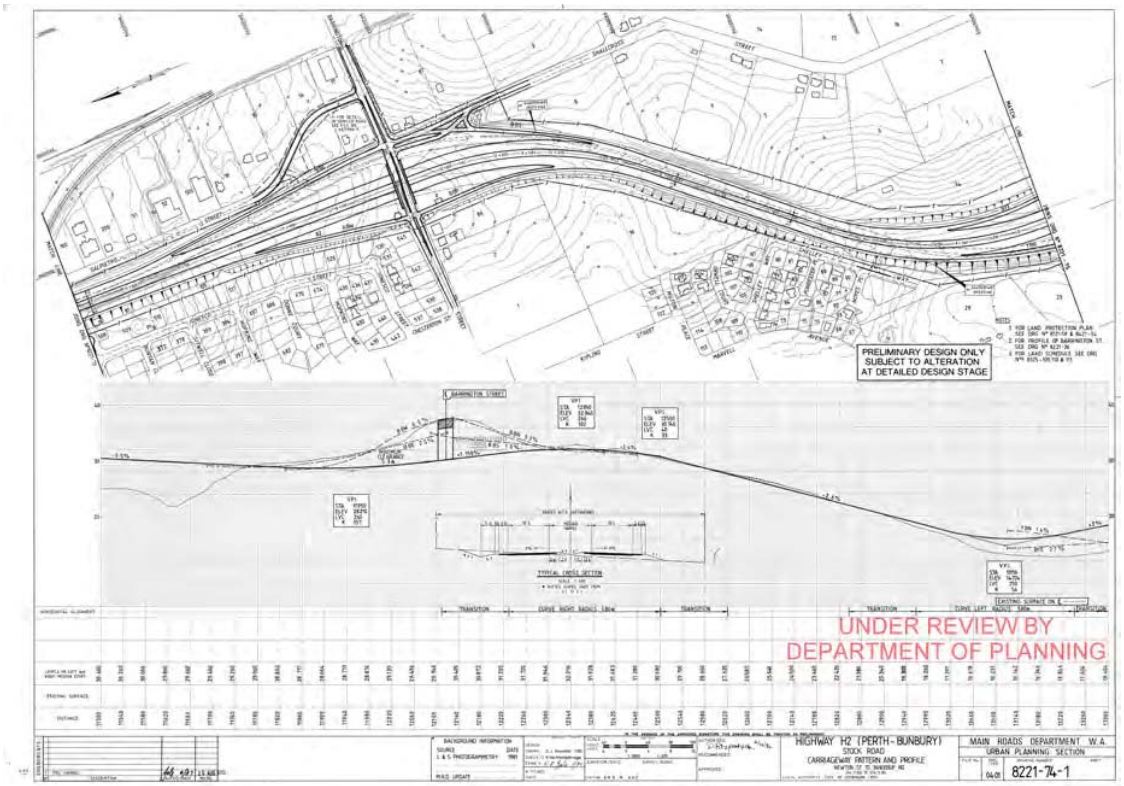


Figure 3-3 Stock Road Design North Section

3.2.2 Traffic Data

Traffic data includes:

- Road Surface – The noise relationship between different road surface types is shown below in *Table 3-1*.

Table 3-1 Noise Relationship Between Different Road Surfaces

Chip Seal			Asphalt			
14mm	10mm	5mm	Dense Graded	Novachip	Stone Mastic	Open Graded
+3.5 dB	+2.5 dB	+1.5 dB	0.0 dB	-0.2 dB	-1.0 dB	-2.5 dB

The existing and future road surfaces for both Beeliar Drive and Stock Road are dense graded asphalt.

- Vehicle Speed – The posted speed along Beeliar Drive is 70km/hr, reducing to 60km/hr at the crest of the hill, approaching Stock Road. Stock Road has a posted speed of 80km/hr.

- Traffic Volumes – Information used in the modelling was based on data provided by MRWA (Clare Yu, Traffic Modelling Analyst, Email dated 20 December 2016, Job No. 40449). The information provided was a 2011 calibration plot (comparing the MRWA model to observed counts) and a 2016 & 2031 link volume plot.

  In 2011, this section of Beeliar Drive did not exist. As such, a May 2014 (most recent) traffic count was obtained from the MRWA reporting centre showing 6,980 vehicles per day (vpd) eastbound (10% heavy) and 6,942 vpd westbound (7% heavy). The MRWA calibration plot shows these as 6,800 vpd eastbound and 7,300 vpd westbound so that eastbound volumes are under-predicted by 2% and westbound volumes over-predicted by 5%. The differential in the vehicle volumes has been applied to the MRWA modelled 2031 volumes. The 2016 percentage heavy vehicles were modelled as approximately 2% higher than that observed. As such, the 2031 percentage heavies were also reduced by 2%.

  For Stock Road, the 2011 calibration plot showed that northbound volumes were under-predicted by 700 vpd northbound and over-predicted by 1900 vpd southbound. These adjustments were then applied to the 2031 volumes. No modifications were made to the 2031 percentage heavy vehicles or to the traffic on the on/off ramps.

  Table 3-2 provides the volumes and percentage heavy vehicles used in the noise modelling for the 2031 design year, taking into account the above discussion.

Table 3-2 Forecast (2031) Traffic Volumes Used in the Modelling

Road	Section	Direction	Volumes	% Heavy
Beeliar Drive	East of Stock Road	Eastbound	8,680	8.1
		Westbound	8,842	9.7
Stock Road	South of Beeliar Drive	Northbound	28,700	21.9
		Southbound	28,000	19.3
	Through Traffic	Northbound	22,400	22.0
		Southbound	22,000	21.0
		Northbound	27,300	20.0
		Southbound	26,700	17.5
Interchange	On Ramp	Northbound	4,900	8.0
		Southbound	6,000	19.0
	Off Ramp	Northbound	6,300	19.0
		Southbound	4,700	8.0

3.2.3 Ground Attenuation

The ground attenuation has been assumed to be 0.20 (20%) for the road reserve, 0.6 (60%) throughout the subdivision and 0.65 (65%) elsewhere. Note 0.0 represents hard reflective surfaces such as water and 1.00 represents absorptive surfaces such as grass.

4 RESULTS

4.1 Noise Monitoring

The results of the noise monitoring are summarised in *Tables 4-1 & 4-2* and graphically in *Figures 4-1 & 4-2*.

Table 4-1 Measured Average Noise Levels – Beeliar Drive

Date	Average Weekday Noise Level, dB			
	$L_{A10,18hour}$	$L_{Aeq,24hour}$	$L_{Aeq\ (Day)}$	$L_{Aeq\ (Night)}$
Friday, 21 May 2010	59.9	56.4	57.6	52.5
Monday, 24 May 2010	58.4	55.7	57.2	48.6
Tuesday, 25 May 2010	59.2	56.7	58.2	48.6
Wednesday, 26 May 2010	59.4	57.1	58.7	48.5
Average	**59.2**	**56.5**	**57.9**	**49.6**

Table 4-2 Measured Average Noise Levels – Stock Road

Date	Average Weekday Noise Level, dB			
	$L_{A10,18hour}$	$L_{Aeq,24hour}$	$L_{Aeq\ (Day)}$	$L_{Aeq\ (Night)}$
Thursday, 14 August 2014	61.0	58.3	59.7	51.9
Friday, 15 August 2014	60.4	57.6	58.9	52.1
Monday, 18 August 2014	60.0	57.6	58.9	52.4
Tuesday, 19 August 2014	60.8	58.5	59.9	52.6
Wednesday, 20 August 2014	61.8	59.0	60.4	52.2
Thursday, 21 August 2014	60.4	57.9	59.1	53.2
Average	**60.7**	**58.1**	**59.5**	**52.4**

The average differences between the weekday $L_{A10,18hour}$ and $L_{Aeq(Day)}$ is 1.2-1.3 dB and this conversion has been used in the modelling. The average differences between the weekday $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ is more than 5 dB. This same difference has been assumed to exist in future years. As such, it is the daytime noise levels that will dictate compliance, since these are at least 5 dB more than night-time levels.

4.2 Noise Modelling

The future $L_{Aeq(Day)}$ noise levels are provided as noise contour plots in *Figures 4-3 & 4-4* being for the ground and upper floors respectively.

Figure 4-1 - Noise Monitoring Alongside Beeliar Drive
9 Danielson Way, Beeliar

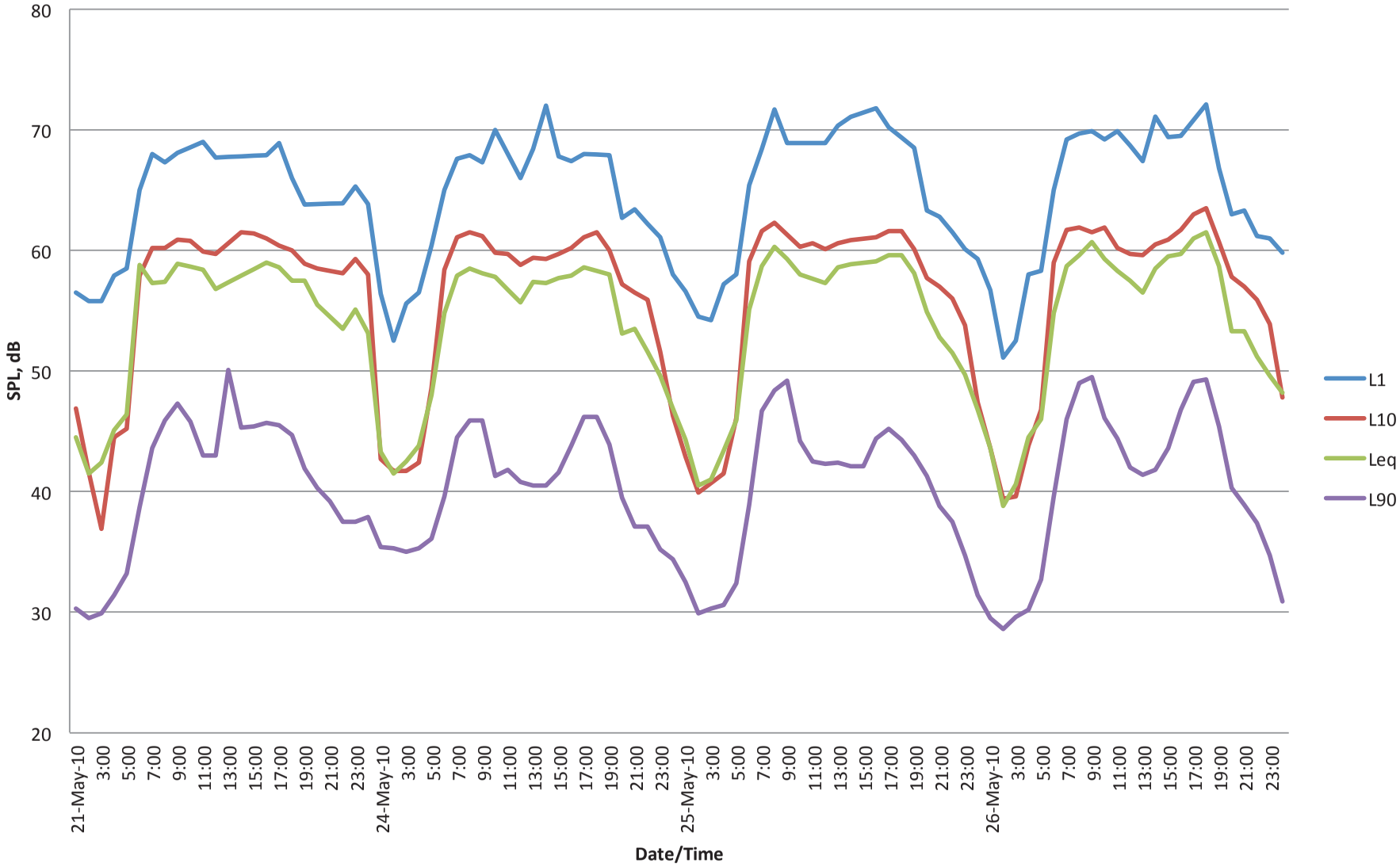


Figure 4-2: Noise Monitoring Alongside Stock Road

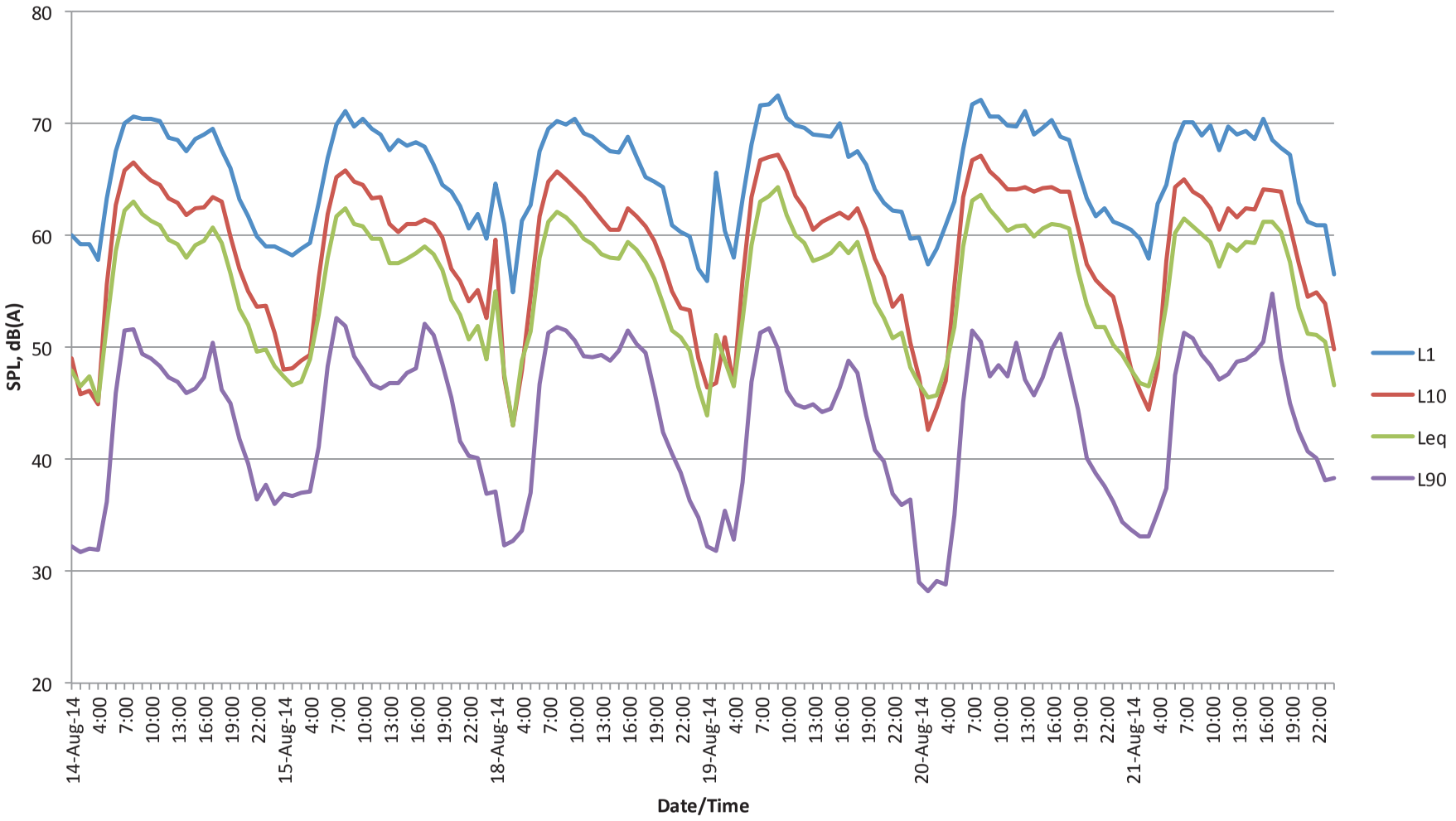
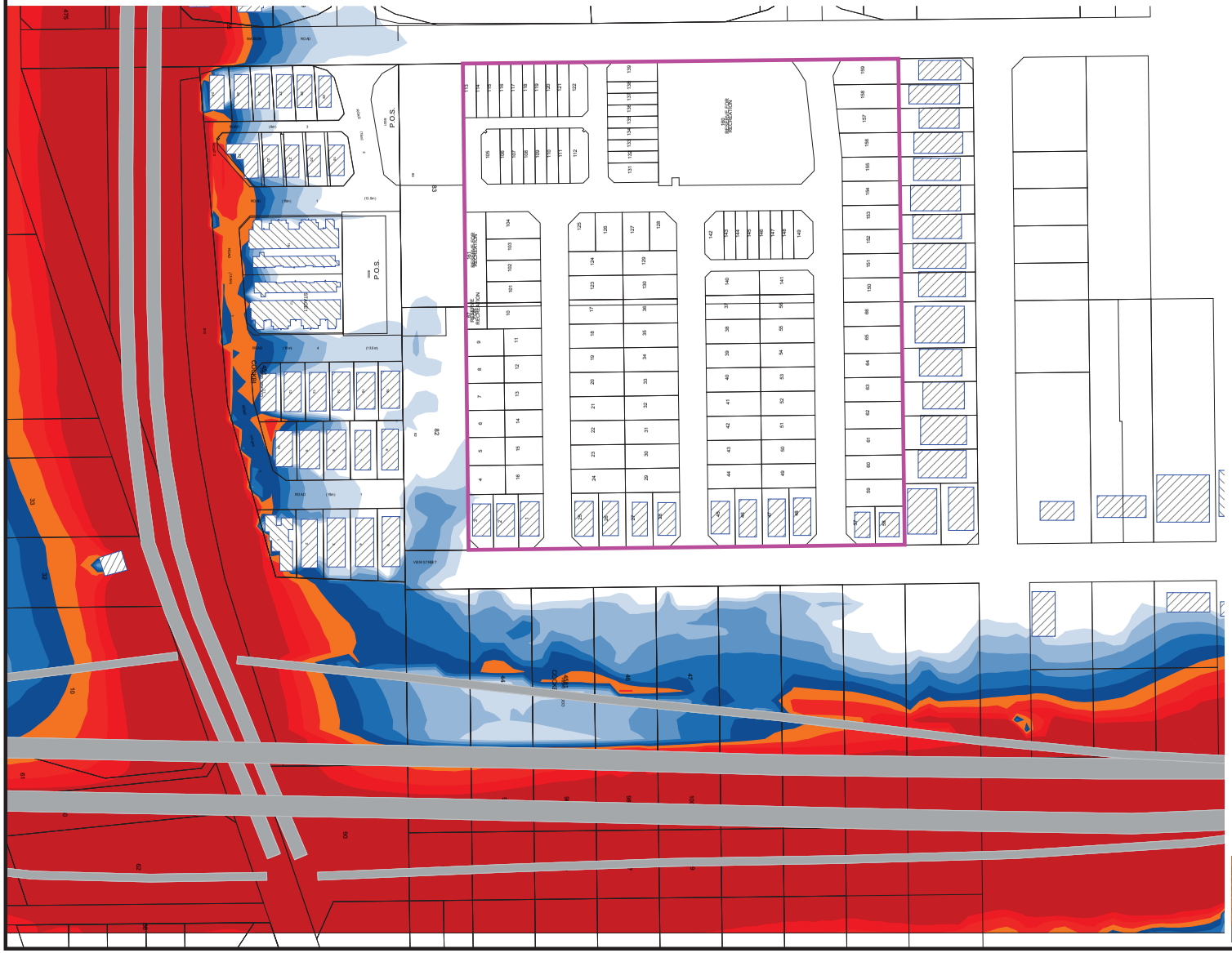


Figure 4-3

Watson Road Beeliar - Residential Subdivision

LAeq(Day) Noise Level Contours - Future 2031



Noise levels
LAeq,Day dB

	<= 55
55 <	<= 56
56 <	<= 57
57 <	<= 58
58 <	<= 59
59 <	<= 60
60 <	<= 61
61 <	<= 62
62 <	<= 63
63 <	

N

Signs and symbols

- Building
- Subject Site
- Road

12 July 2017

Length Scale 1:3000

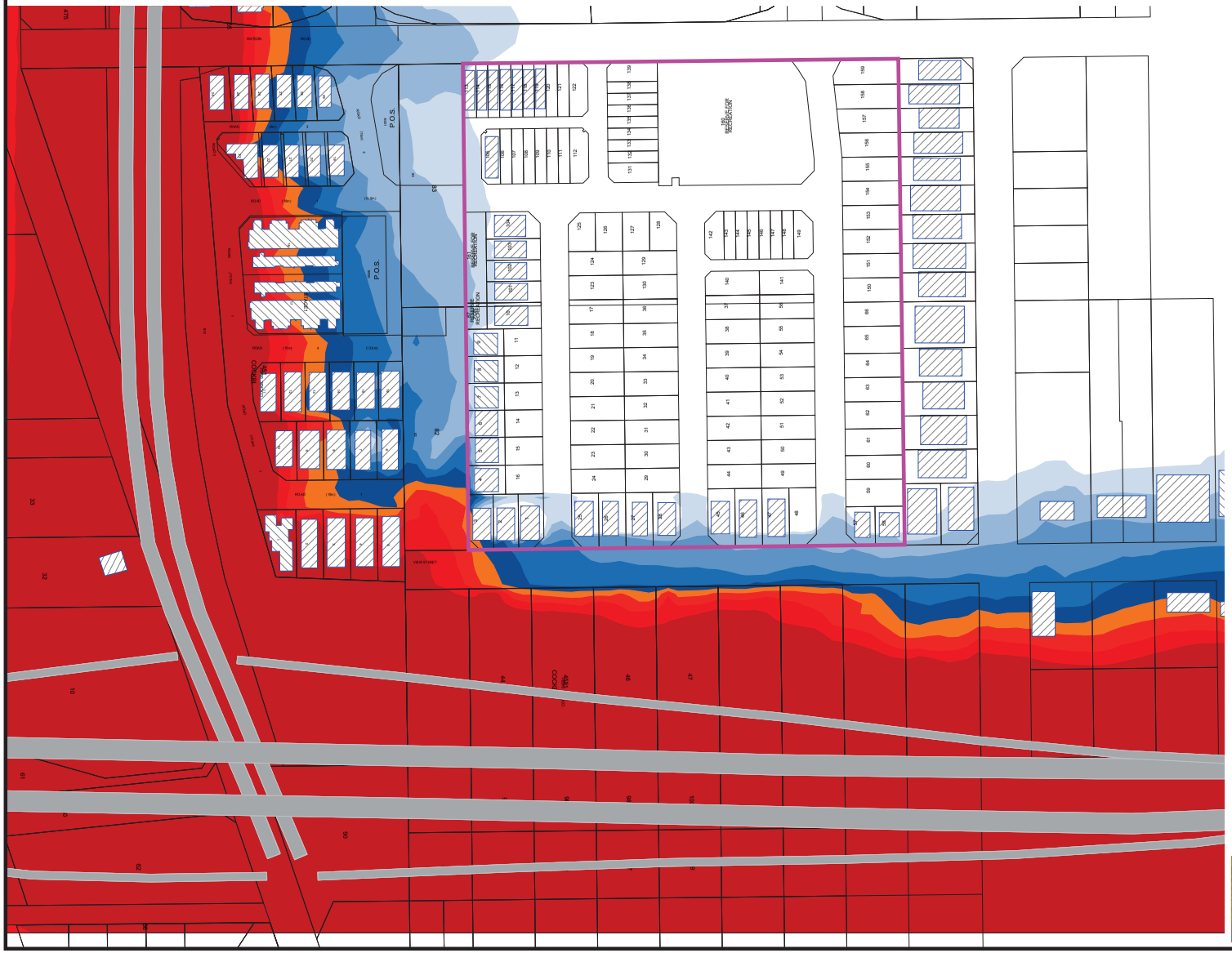
0 15 30 60 90 120 m

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by Terry George
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Figure 4-4

Watson Road Beeliar - Residential Subdivision

LAeq(Day) Noise Level Contours - Future 2031: Upper Floor



Noise levels
LAeq,Day dB

	<= 55
55 <	<= 56
56 <	<= 57
57 <	<= 58
58 <	<= 59
59 <	<= 60
60 <	<= 61
61 <	<= 62
62 <	<= 63
63 <	

N

Signs and symbols

- Building
- Subject Site
- Road

12 July 2017

Length Scale 1:3000

0 15 30 60 90 120 m

Lloyd George Acoustics
by Terry George
terry@lgacoustics.com.au
(08) 9401 7770

5 ASSESSMENT & RECOMMENDATIONS

The objectives of the criteria are for noise at all houses to be no more than the *limit* and preferably no more than the *target*. Where the *target* is achieved, no further controls are required. Where the *limit* is achieved or noise levels are within the *margin* (between the *limit* and *target*), further controls are necessary.

The results of the noise modelling (*Figures 4-3 & 4-4*) indicate that for single storey development, Lot 3 (north-west corner) may be noise affected. Should lots be developed as two storey, the upper floor of Lots 13, 60-68, 84-88, 105-109 and 118 are noise affected. As such, the following is recommended:

- Lot 3 to incorporate notification on title as per the Policy requirements (refer *Appendix A*).
- Dwelling on Lot 3 to incorporate Package A deemed to satisfy construction (refer *Appendix A*). Alternatives to Package A can be implemented if supported by a report undertaken by a suitably qualified acoustical consultant (member firm of the Association of Australian Acoustical Consultants).
- Where Lots 1-9, 25-28, 45-48, 57-58 and 113 are two storey, the upper floor is to incorporate Package A deemed to satisfy construction. Again, alternatives to Package A can be implemented if supported by a report undertaken by a suitably qualified acoustical consultant (member firm of the Association of Australian Acoustical Consultants).

Appendix A

ACCEPTABLE TREATMENT PACKAGES

The packages and information provided on the following pages are taken from *Implementation Guidelines for State Planning Policy 5.4 Road and Rail Transport Noise and freight Considerations in Land Use Planning*; December 2014.

Where outdoor noise levels are above the *target* level, excluding the effect of any boundary fences, the Guidelines propose acceptable treatment packages that may be implemented without requiring detailed review. The packages are also intended for residential development only. At higher noise levels or for other building usages, specialist acoustic advice will be needed.

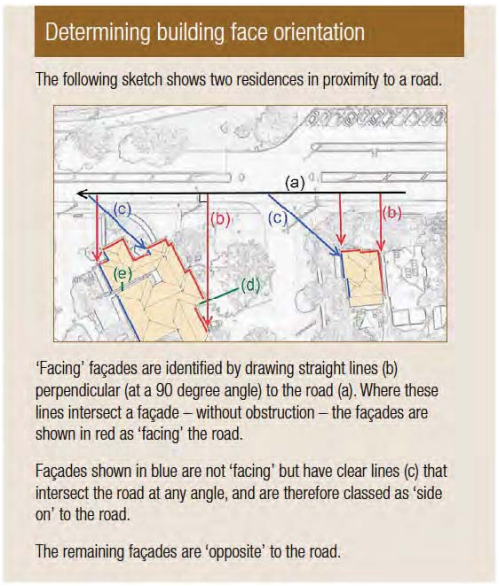
The acceptable treatment packages are intended to simplify compliance with the noise criteria, and the relevant package should be required as a condition of development in lieu of a detailed assessment.

Transition between each package should be made on the basis of the highest incident $L_{Aeq(Day)}$ or $L_{Aeq(Night)}$ value to the nearest whole number determined for the building development under assessment.

Any departures from the acceptable treatment specifications need to be supported by professional advice from a competent person that the proposal will achieve the requirements of the Policy.

With regards to the packages, the following definitions are provided:

- **Facing** the transport corridor: Any part of a building façade is 'facing' the transport corridor if any straight line drawn perpendicular to its nearest road lane or railway line intersects that part of the façade without obstruction (ignoring any fence).
- **Side-on** to transport corridor: Any part of a building façade that is not 'facing' is 'side-on' to the transport corridor if any straight line can be drawn from it to intersect the nearest road lane or railway line without obstruction (ignoring any fence).
- **Opposite** to transport corridor: Neither 'side on' nor 'facing', as defined above.



Package A

Area	Orientation to Road or Rail Corridor	Package A (up to 60 dB $L_{Aeq(Day)}$ and 55 dB $L_{Aeq(Night)}$)
Bedrooms	Facing	• Windows systems: Glazing up to 40% of floor area (minimum $R_w + C_{tr}$ 28) – 6mm thick glass (monolithic, toughened or laminated) in fixed sash, awning or casement opening with seals to openings.
	Side	• Windows systems: As above.
	Opposite	No requirements
Other Habitable Rooms Including Kitchens	Facing	• Windows and external door systems: Glazing up to 60% of floor area (minimum $R_w + C_{tr}$ 28) – 6mm thick glass (monolithic, toughened or laminated) in fixed sash, awning or casement opening with seals to openings. Doors to be either 35mm thick solid timber core door with full perimeter acoustic seals. Glazed inserts to match the above. Sliding glass doors to be same performance including brush seals.
	Side	• Windows and external door systems: As above.
	Opposite	No requirements
General	Any	• Walls (minimum $R_w + C_{tr}$ 45) – Two leaves of 90mm thick brick with minimum 50mm cavity • Roof and ceiling (minimum $R_w + C_{tr}$ 35) – Standard roof construction with 10mm plasterboard ceiling and minimum R2.5 insulation between ceiling joists. • Eaves to be closed using 4mm compressed fibre cement sheet. • Mechanical ventilation – Refer following pages.
Outdoor Living Area		• Locate on the side of the building that is opposite to the corridor if practicable; or • Locate within alcove area so that the house shields it from corridor if practicable.

Note: Any penetrations in a part of the building envelope must be acoustically treated so as to not downgrade the performance of the building elements affected. Most penetrations in external walls such as pipes, cables or ducts can be sealed through caulking gaps with non-hardening mastic or suitable mortar.

Mechanical Ventilation requirements

It is noted that natural ventilation must be provided in accordance with F4.6 and F4.7 of Volume One and 3.8.5.2 of Volume Two of the National Construction Code. Where the noise *limit* is likely to be exceeded, a mechanical ventilation system is usually required. Mechanical ventilation systems will need to comply with AS 1668.2 – *The use of mechanical ventilation and air-conditioning in buildings*.

In implementing the acceptable treatment packages, the following must be observed:

- Evaporative air conditioning systems will meet the requirements for Packages A and B provided attenuated air vents are provided in the ceiling space and designed so that windows do not need to be opened.
- Refrigerant based air conditioning systems need to be designed to achieve fresh air ventilation requirements.
- External openings (e.g. air inlets, vents) need to be positioned facing away from the transport corridor where practicable.
- Ductwork needs to be provided with adequate silencing to prevent noise intrusion.

Notification

Notifications on certificates of title and advice to prospective purchasers warning of the potential for noise impacts from major transport corridors help with managing expectations.

The area of land for which notification is required should be identified in the noise management plan and contain a description of major noise sources nearby (e.g. 24-hour freight rail).

Notification should be provided to prospective purchasers, and required as a condition of subdivision (including strata subdivision) for the purposes of noise sensitive development or planning approval involving noise sensitive development, where external noise levels are forecast or estimated to exceed the 'target' criteria as defined by the Policy.

In the case of subdivision and development, conditions of approval should include a requirement for registration of a notice on title, which is provided for under Section 165 of the Planning and Development Act 2005 and Section 70A of the Transfer of Land Act 1893. An example of a suitable notice is:

Notice: This lot is situated in the vicinity of a transport corridor and is currently affected, or may in the future be affected, by transport noise. Transportation noise controls and Quiet House design strategies at potential cost to the owner may be required to achieve an acceptable level of noise reduction. Further information is available on request from the relevant local government offices.

Appendix B

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)
The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting
An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

L_1
An L_1 level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{10}
An L_{10} level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{90}
An L_{90} level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the "*background*" noise level.

L_{eq}
The L_{eq} level represents the average noise energy during a measurement period.

$L_{A10,18hour}$
The $L_{A10,18\ hour}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00 am and midnight. The *CoRTN* algorithms were developed to calculate this parameter.

$L_{Aeq,24hour}$
The $L_{Aeq,24\ hour}$ level is the logarithmic average of the hourly L_{Aeq} levels for a full day (from midnight to midnight).

$L_{Aeq,8hour}$ / $L_{Aeq\ (Night)}$
The $L_{Aeq\ (Night)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 10.00 pm to 6.00 am on the same day.

$L_{Aeq,16hour}$ / $L_{Aeq\ (Day)}$
The $L_{Aeq\ (Day)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the $L_{A10,18hour}$.

R_w

This is the weighted sound reduction index and is similar to the previously used STC (Sound Transmission Class) value. It is a single number rating determined by moving a grading curve in integral steps against the laboratory measured transmission loss until the sum of the deficiencies at each one-third-octave band, between 100 Hz and 3.15 kHz, does not exceed 32 dB. The higher the R_w value, the better the acoustic performance.

C_{tr}

This is a spectrum adaptation term for airborne noise and provides a correction to the R_w value to suit source sounds with significant low frequency content such as road traffic or home theatre systems. A wall that provides a relatively high level of low frequency attenuation (i.e. masonry) may have a value in the order of –4 dB, whilst a wall with relatively poor attenuation at low frequencies (i.e. stud wall) may have a value in the order of -14 dB.

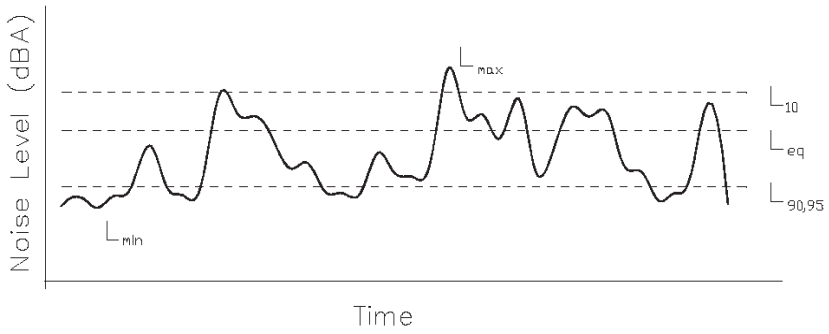
Satisfactory Design Sound Level

The level of noise that has been found to be acceptable by most people for the environment in question and also to be not intrusive.

Maximum Design Sound Level

The level of noise above which most people occupying the space start to become dissatisfied with the level of noise.

Chart of Noise Level Descriptors



Austroads Vehicle Class

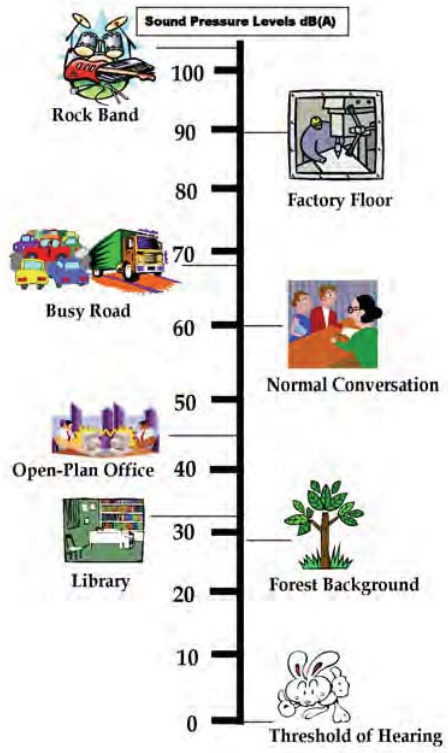
AUSTROADS Vehicle Classification System

Level 1 Length (Indicative) Type	Level 2 Axles and Axle Groups Axles	Groups	Level 3 Vehicle Type Typical Description	AUSTROADS Classification Class	Parameters	Typical Configuration
			LIGHT VEHICLES			
Short up to 5.5m		1 or 2	**Short** Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc	1	d(1) ≤ 3.2m and axles = 2	
	3, 4 or 5	3	**Short - Towing** Trailer, Caravan, Boat, etc	2	groups = 3 d(1) ≥ 2.1m, d(1) ≤ 3.2m, d(2) ≥ 2.1m and axles = 3, 4 or 5	
			HEAVY VEHICLES			
Medium 5.5m to 14.5m	2	2	**Two Axle Truck or Bus**	3	d(1) > 3.2m and axles = 2	
	3	2	**Three Axle Truck or Bus**	4	axles = 3 and groups = 2	
	> 3	2	**Four Axle Truck**	5	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	**Three Axle Articulated** Three axle articulated vehicle, or Rigid vehicle and trailer	6	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	**Four Axle Articulated** Four axle articulated vehicle, or Rigid vehicle and trailer	7	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	**Five Axle Articulated** Five axle articulated vehicle, or Rigid vehicle and trailer	8	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	≥ 6	> 2	**Six Axle Articulated** Six axle articulated vehicle, or Rigid vehicle and trailer	9	axles = 6 and groups > 2 or axles > 6 and groups > 3	
Medium Combination 17.5m to 36.5m	> 6	4	**B Double** B Double, or Heavy truck and trailer	10	groups = 4 and axles > 6	
	> 6	5 or 6	**Double Road Train** Double road train, or Medium articulated vehicle and one dog trailer (M.A.D.)	11	groups = 5 or 6 and axles > 6	
Large Combination Over 33.0m	> 6	> 6	**Triple Road Train** Triple road train, or Heavy truck and three trailers.	12	groups = 6 and axles > 6	

Definitions: Group: Axle group, where adjacent axles are less than 2.1m apart; Groups: Number of axle groups; Axles: Number of axles (maximum axle spacing of 10.0m)

d(1): Distance between first and second axle
d(2): Distance between second and third axle

Typical Noise Levels



APPENDIX 5

LANDSCAPE CONCEPT PLAN

ROWEGROUP



POS CONCEPT

POS TYPOLOGY

- Neighbourhood, Passive POS

SIZE (excluding verges)

- 5,674 square metres

CONCEPT

- Provide the residents with an open space which caters for the neighbourhood predominantly focused on those within the 400m walking catchment
- The space is intended to be planted with shade trees and providing low key recreational facilities
- Provide water catchment areas for rain fall events up to 100yr ARI
- Terraced walls will create a large turf space to allow space for organised / informal activity
- Proposed POS to complement existing open spaces (Radonich Park and Firbank Playground) to further enhance the local area

ENVIRONMENTAL CONSIDERATIONS

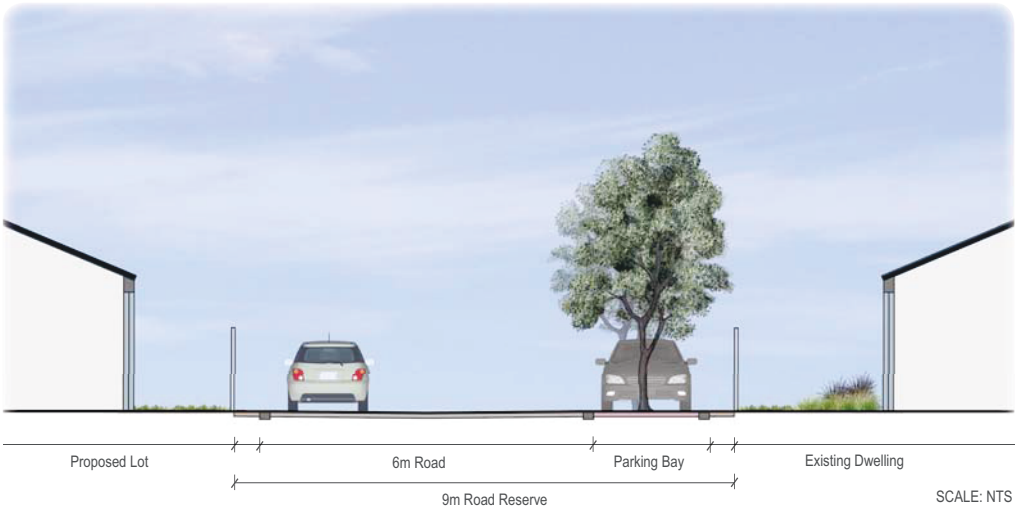
- Predominantly water wise native planting
- Source local materials where possible to minimise transport requirements and provide local employment
- Consider long term maintenance requirements
- Low planting <600mm along rear boundary POS interface

FUNCTIONS

- Provide local amenity (selected shelter, furniture and BBQ)
- Junior play space (0-6 years)
- Connected internal path network and connections to broader path network
- Bio-swales
- Gated access and connecting paths for lots fronting onto POS
- Passive surveillance from adjacent lots to encourage interaction and use of open space

LEGEND

FITNESS AREA
PICNIC FACILITIES
SHELTER
BIORETENTION AREAS
+10.20 INDICATIVE LEVELS ONLY



Section Aa - North / South section through laneway

REV C
DATE 11-10-16
SCALE 1 : 1000 @ A3
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APPENDIX 6

TRAFFIC REPORT

ROWEGROUP

TECHNICAL NOTE

Subject:	Stage 1 – Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar Traffic Engineering Review (1608020)
Date:	17/10/16
Author:	Paul Nguyen (Reviewed: Ed Wilks)
Client:	Aigle Royal Developments
Version:	4

Introduction and Background

The purpose of this technical note is to assess the road layout for Stage 1 of the proposed subdivision of Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar, in the City of Cockburn. The following issues have been addressed as part of the assessment:

- Vehicle manoeuvring, including rubbish truck disposal, for laneways in the north-east corner of the subdivision.
- The minimum required width and recommended road cross section for the proposed east-west minor road. It is understood that this road needs to allow for a rubbish trucks to reverse from the laneway if there are obstructions.
- Street parking requirements for the proposed subdivision and recommendations for the appropriate location of street parking.

The site location is shown in **Figure 1**. The laneway and minor road being assessed is indicated in **Figure 2**. The proposed subdivision layout is attached as **Appendix A**. The subdivision forms part of the Local Structure Plan for Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar which has been attached as **Appendix B**.

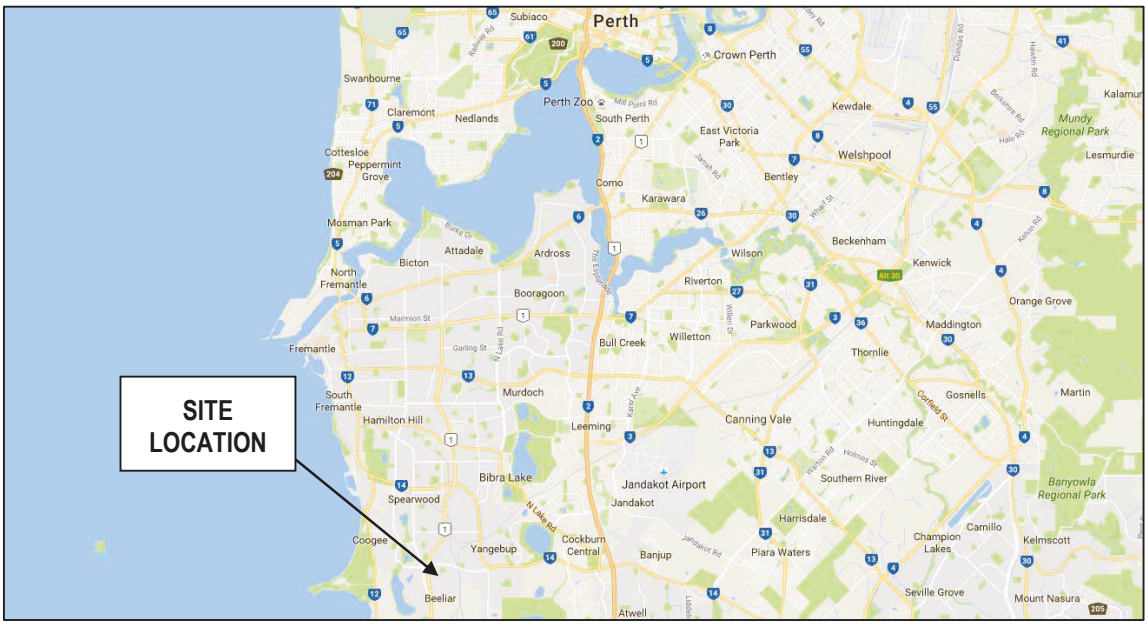


Figure 1: Site Location

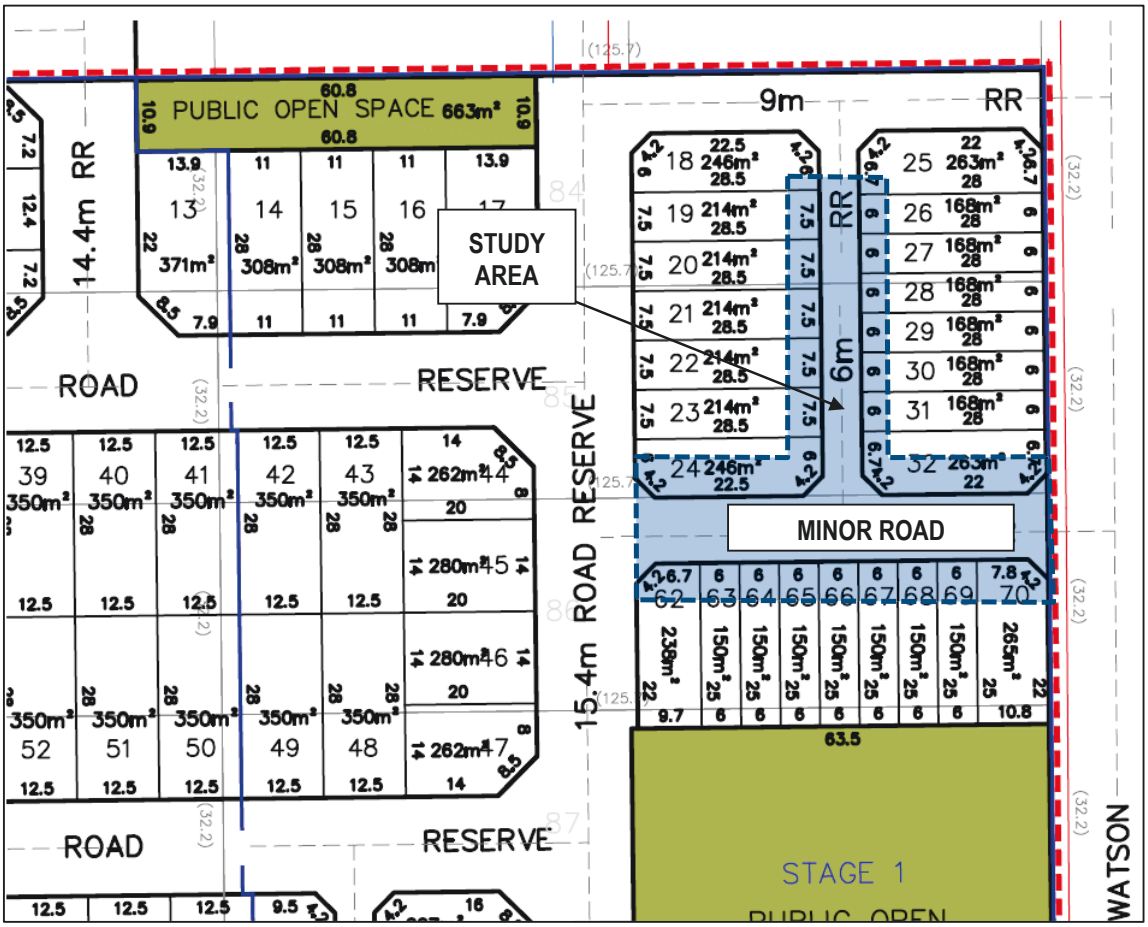


Figure 2: Proposed Subdivision Layout and Study Area

East-West Minor Road Cross Section, Intersection Kerb Radius and Lot Truncations

Based on discussions between the developer and the City, the proposed east-west minor road should incorporate a 10.0-10.5 metre wide road reserve consisting of a 3.0-3.5 metre wide verge to the north, a 6.0 metre wide carriageway and a 1.0-1.5 metre wide verge to the south. The minimum road cross section has been recommended including a 6.0 metre wide carriageway, a 3.0 metre wide verge to the north and a 1.0 metre wide verge to the south within a 10.0 metre wide road reserve as illustrated in **Figure 3**. This cross section has been demonstrated to be adequate for waste vehicle manoeuvring in the next section of this report.

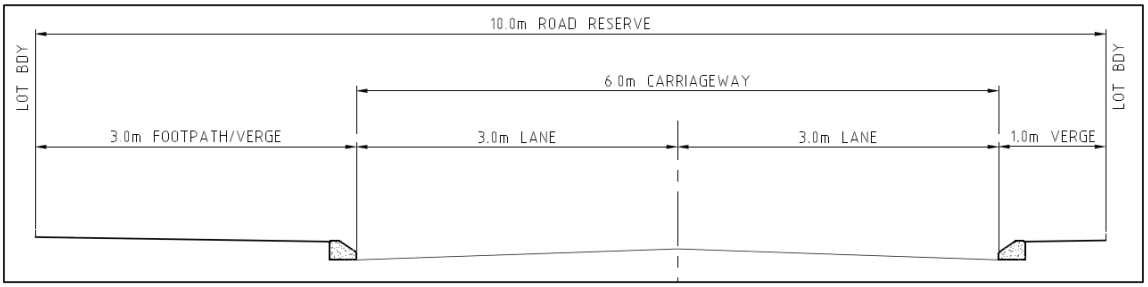


Figure 3: Proposed East-West Minor Road Cross Section

The City of Cockburn *Subdivision Guidelines* (November 2013) notes that the IPWEA *Local Government Guidelines for Subdivisional Development* are to be considered as the minimum standard for subdivision development. The IPWEA guidelines states that "the minimum kerb radius at intersections shall be nine metres in residential areas". The IPWEA guidelines and the City of Cockburn guidelines do not specify whether a smaller radius can be used for intersections with laneways. It is recommended that a 5.0 metre kerb radius is applied for the intersection of the proposed east-west minor road with the laneway as this is consistent with what has been applied elsewhere in the City of Cockburn and other Local Government Areas and a 5.0 metre kerb radius has been shown to accommodate the manoeuvring of waste collection vehicles. Further, the application of a 9.0 metre radius will require truncation of the lots adjacent to the intersection which would compromise access to these lots via the laneway.

Waste Collection Vehicle Manoeuvring

Waste collection vehicle specifications were obtained from the City of Cockburn Waste Services Department. The typical waste collection vehicle servicing residential areas are a maximum 9.7 metres long with a turning radius of 10.28 metres. An AutoTrack assessment for these vehicles has been undertaken to determine the suitability of the proposed road reserve, cross section, kerb radius and whether waste vehicles can reverse from the laneway. The results of the assessment are shown in **Figure 4** to **Figure 7**.

The results demonstrate that the waste vehicle is able to manoeuver through the proposed laneways and reversing out from the laneway is possible in both directions. The proposed 10.0m wide road reserve and recommended cross section is therefore adequate. The kerb radius of 5.0 metres is also demonstrated to be adequate for the intersection between the laneway and the minor road.

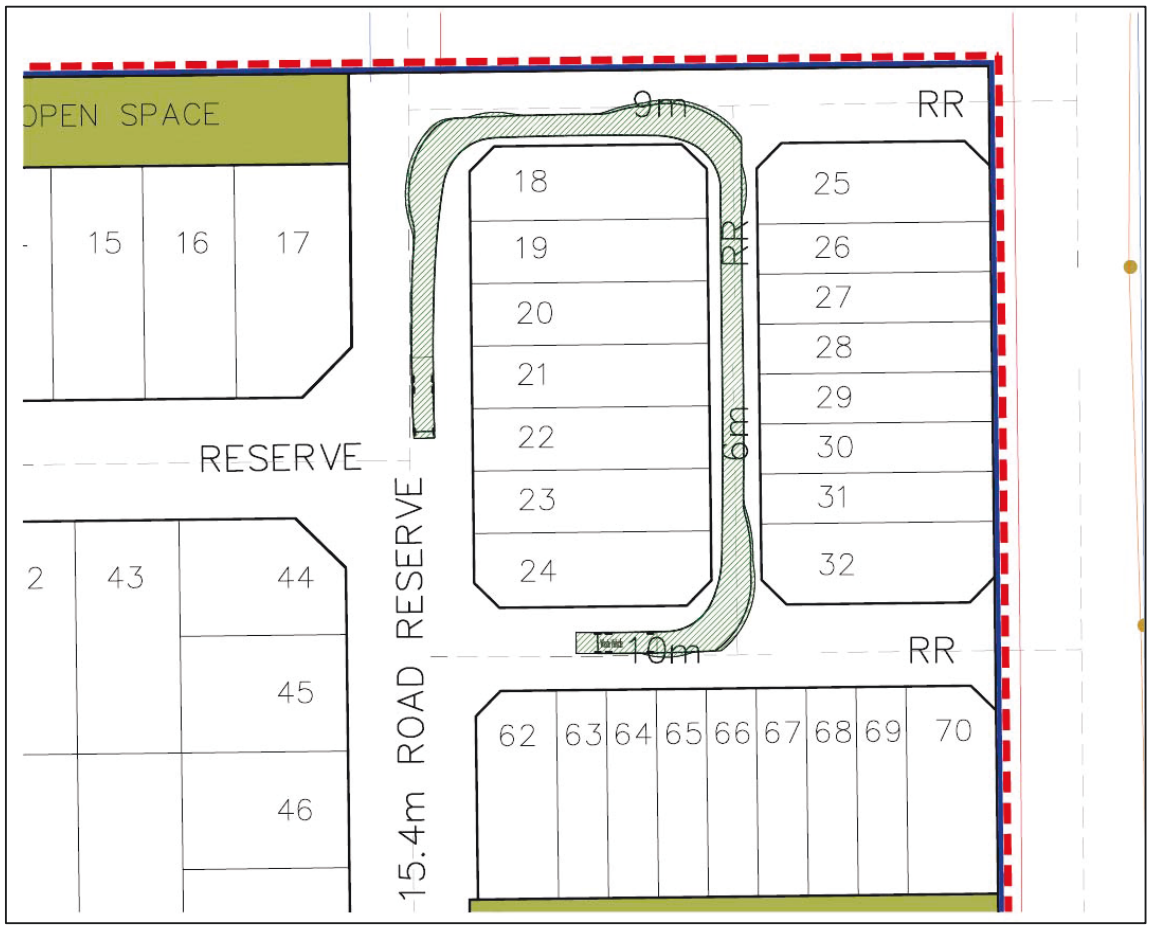


Figure 4: AutoTrack Assessment - 9.7m Waste Vehicle - Through Laneway from Access Road

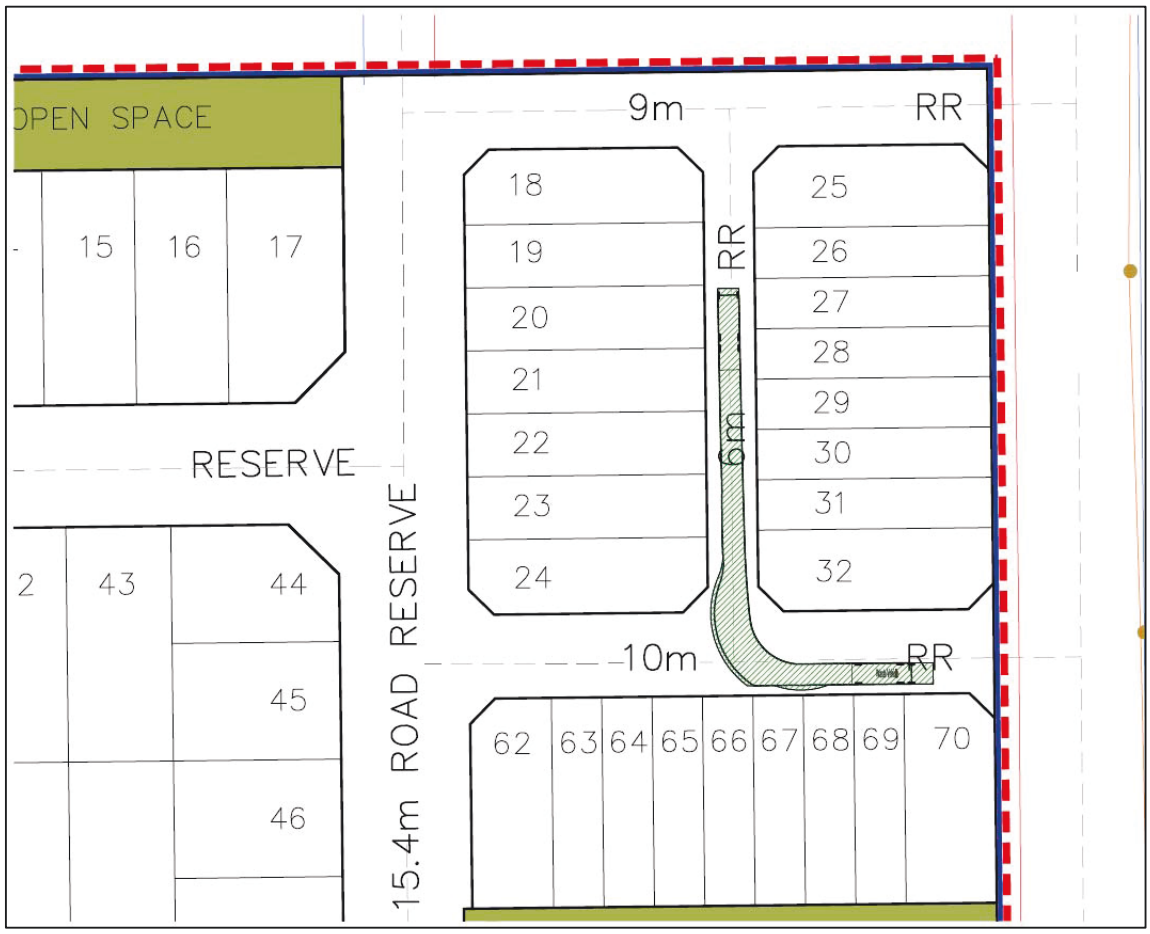


Figure 5: AutoTrack Assessment - 9.7m Waste Vehicle - Through Laneway from Watson Road

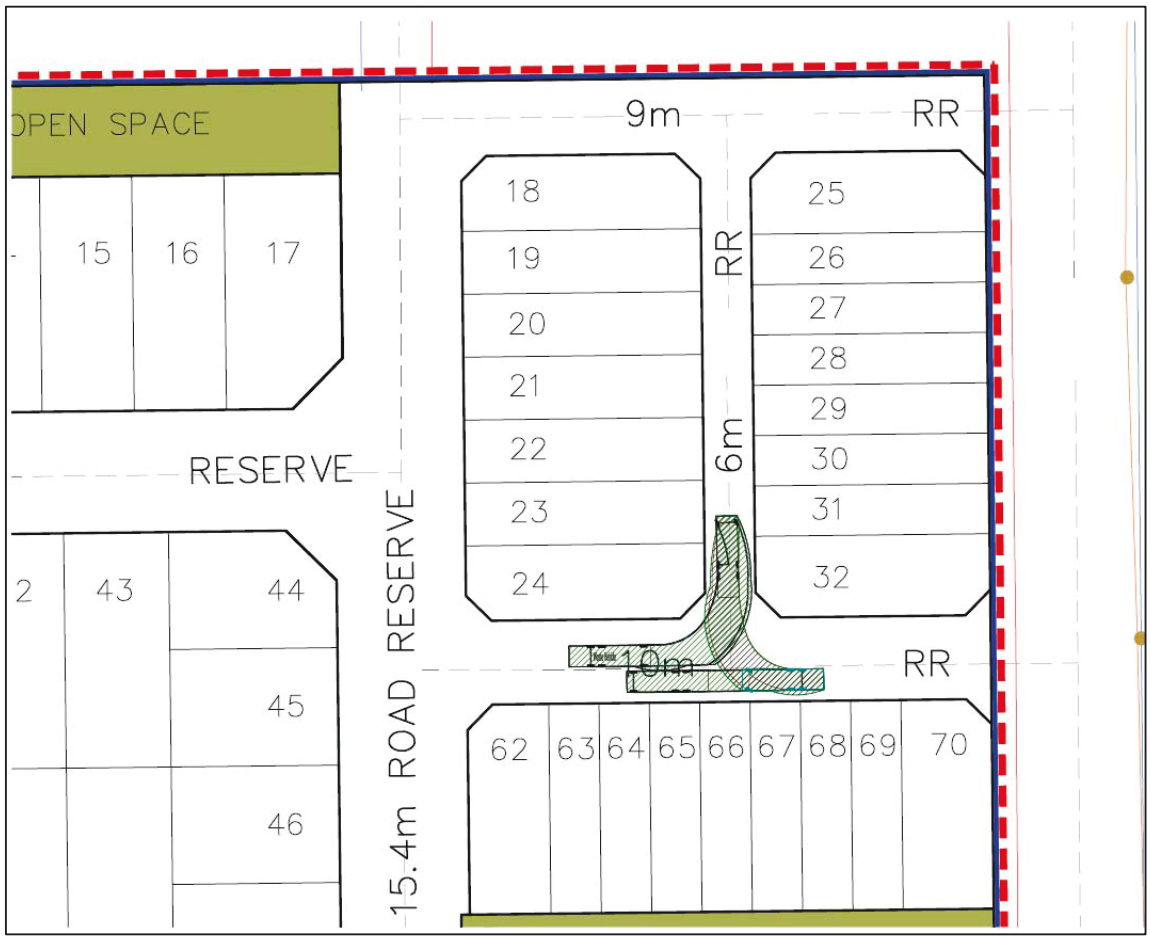


Figure 6: AutoTrack Assessment - 9.7m Waste Vehicle - Reversing from Laneway Towards Access Road

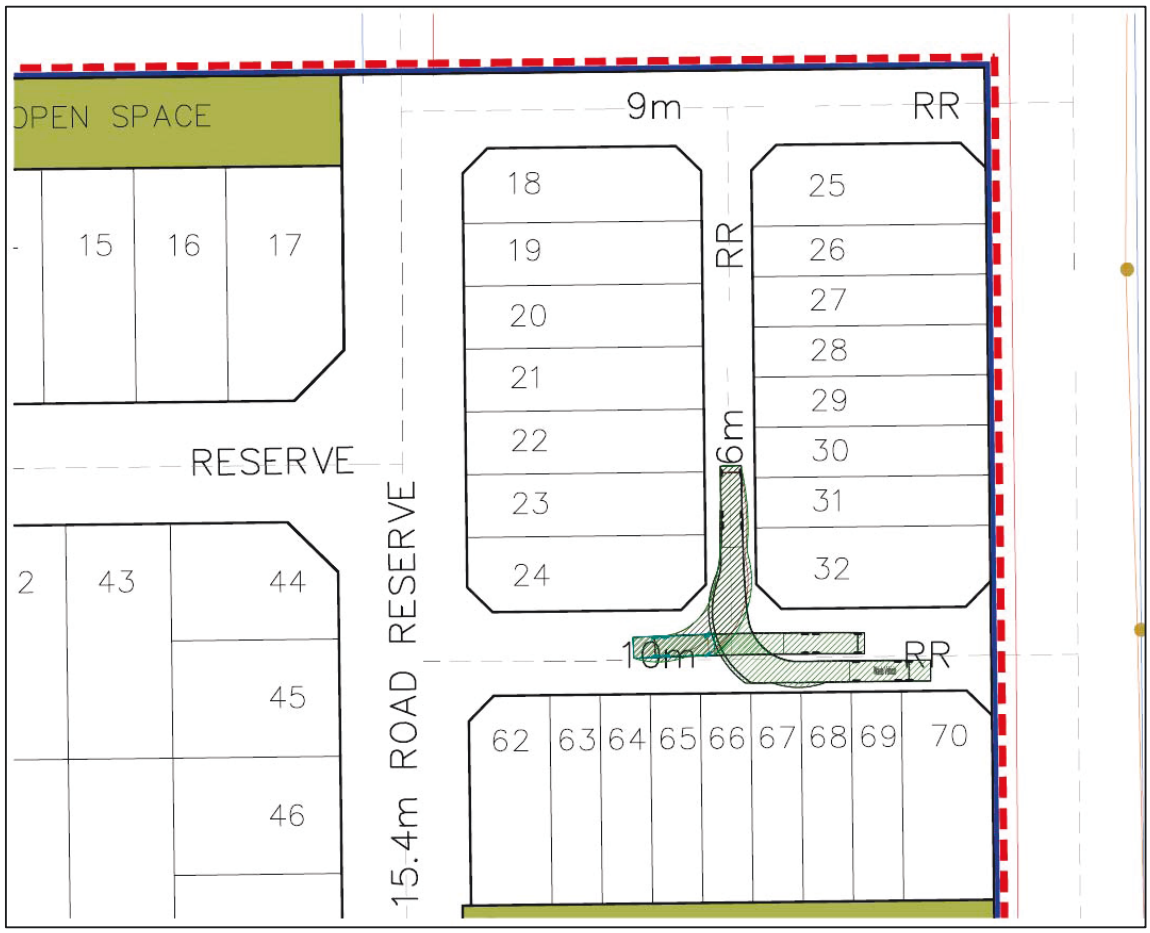


Figure 7: AutoTrack Assessment - 9.7m Waste Vehicle - Reversing from Laneway Towards Watson Road

Street Parking Requirements

The requirements for on-street parking have been reviewed in accordance with WAPC *Liveable Neighbourhoods*. On-street parking should typically be provided adjacent to higher density residential, where the road layout allows for garages to be facing rear laneways and adjacent to or opposite public open space. Indicative locations where on-street parking could be provided is shown in **Figure 8**. The laneway design concept for the east-west laneway in the north-east corner of the site is attached as **Appendix C**.

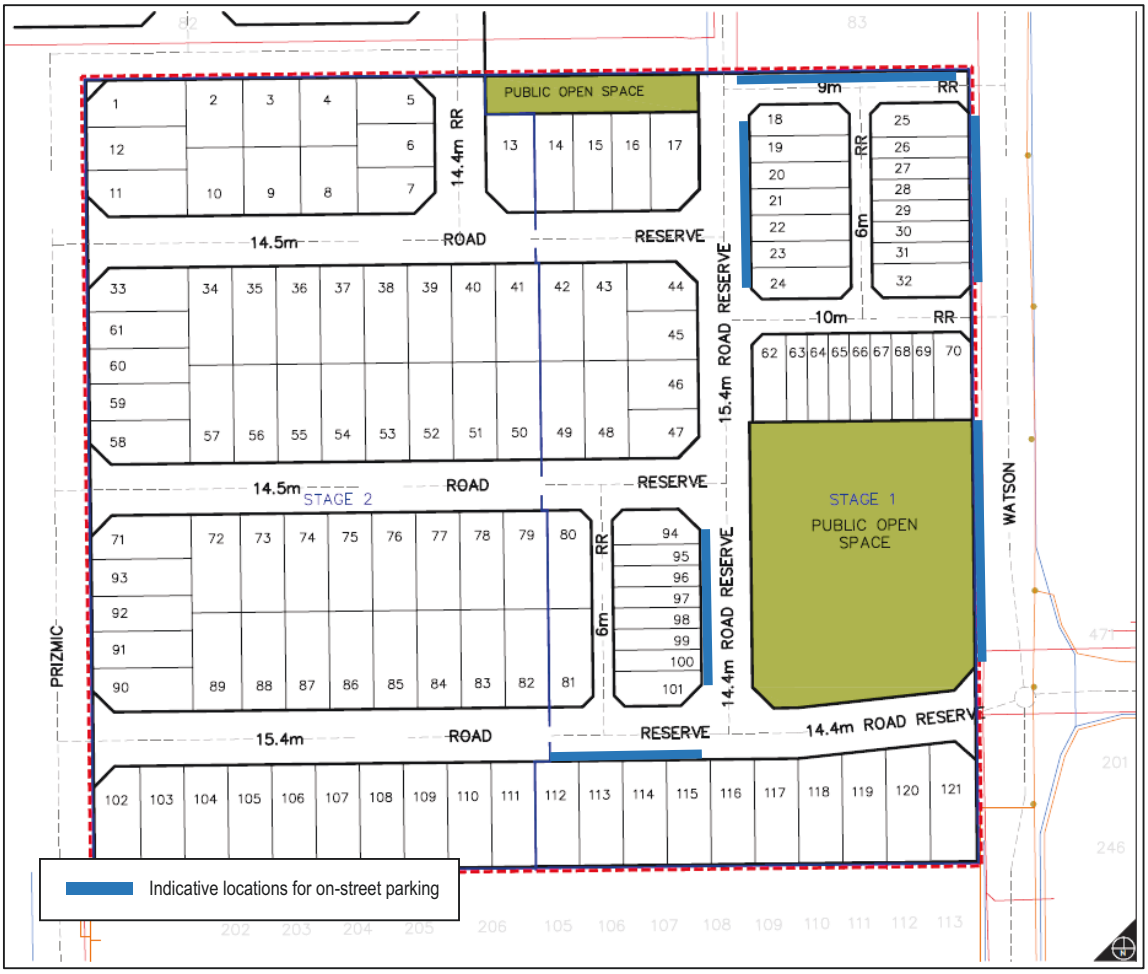
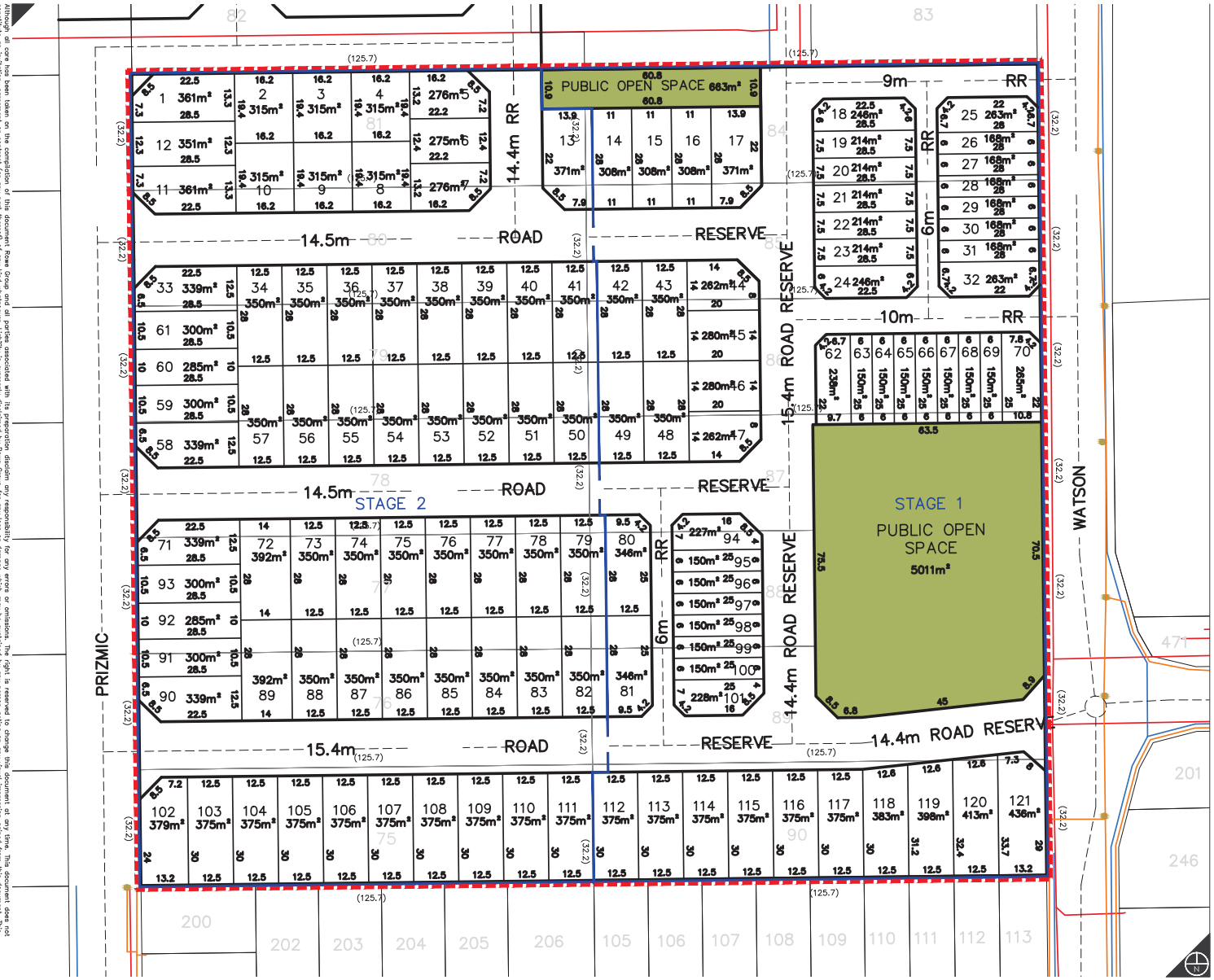
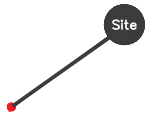


Figure 8: Indicative On-street Parking Locations

Appendix A - Subdivision Layout



Planning Design Delivery



LEGEND

- Subject Site
- Contours
- 7 Existing Lot Numbers
- Existing Boundaries
- 7 Proposed Lot Numbers
- Proposed Boundaries
- Water
- Sewer
- Power
- Power Pole
- Public Open Space

Lot Summary

No. of Lots	121
Total Area of Lots	3.6674ha
Average Area of Lots	304m²
Minimum Lot Area	150m²
Maximum Lot Area	438m²
Road Area (including laneways)	1.4287ha

0 25 50 Metres

REVISIONS

Rev	Date	Drawn
D	2016.09.01	M. Sullivan
E	2016.09.02	M. Sullivan
F	2016.09.08	M. Sullivan
G	2016.10.07	M. Sullivan

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Date Drawn:	2016.07.29
Job Ref:	8350
Scale:	1:1000@A3
Client:	Aigle Royal Developments
Designer:	F. Chesterman
Drawn:	W. Clements
Projection:	MGA50 GDA94
Plan ID:	8350-SUB-02-G

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Subdivision Concept

Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road
Beeliar

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Shawmac CAD3 17 October 2016

Appendix B - Local Structure Plan

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Planning Design Delivery



LEGEND

- Local Structure Plan Boundary
- 7 Existing Lot Numbers
- Existing Boundaries

RESIDENTIAL

- Residential - R30
- Residential - R35
- Residential - R40
- Residential - R60
- Residential - R80

PARKS,RECREATION & CONSERVATION

- Public Open Space

TRANSPORT

- Access Street - Local Road
- Access Street - Laneway

OTHER

- Local Structure 4C Plan

0 50 Metres

REVISIONS

Rev	Date	Drawn
G	2016.08.10	W. Clements
H	2016.09.01	M. Sullivan
I	2016.09.02	M. Sullivan
J	2016.10.07	M. Sullivan

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Date Drawn:	2015.08.06
Job Ref:	8350
Scale:	1:2,000 @ A4
Client:	Aigle Royal Developments
Designer:	R. Cumming
Drawn:	M. Sullivan
Projection:	MGA50 GDA94
Plan ID:	8350-LSP-02-J

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Local Structure Plan

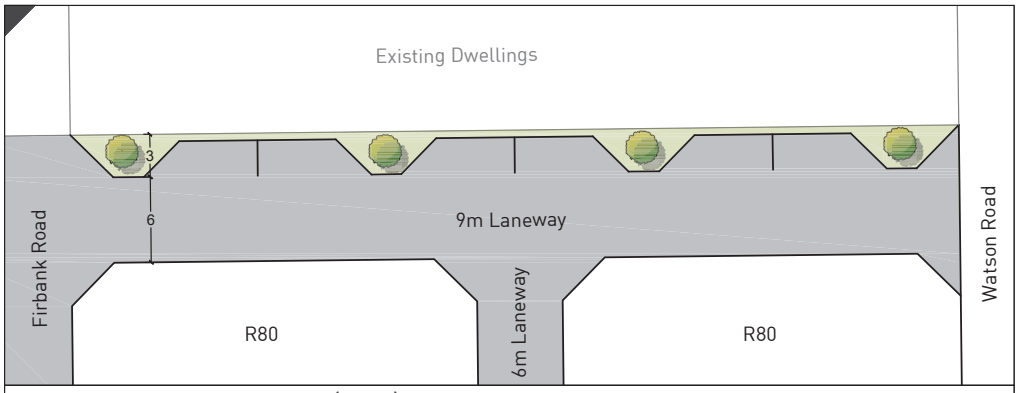
Lots 75 to 81 Prizmic Street and Lots 84 to 90 Watson Road, Beeliar

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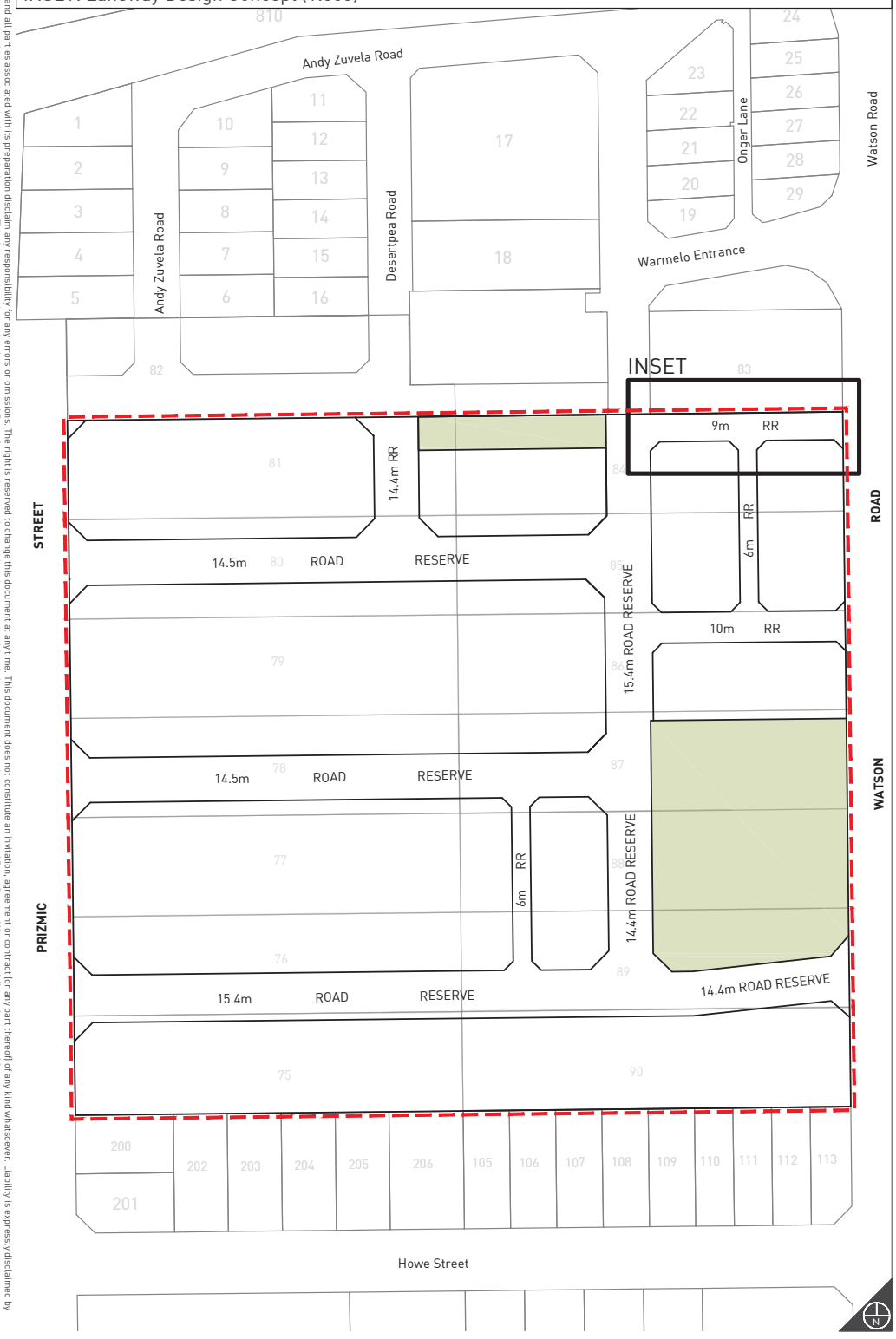
Plan 1

Appendix C - 9m Laneway Design Concept

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INSET: Laneway Design Concept (1:500)



Laneway Design Concept

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Watson Road, Beeliar
Figure 9

Planning Design Delivery



LEGEND

- Subject Site
- 7 Existing Lot Numbers
- Existing Boundaries
- 7 Proposed Lot Numbers
- Proposed Boundaries
- Landscaping
- Road Pavement

0 50 Metres

REVISIONS

Rev	Date	Drawn
A	2016.10.07	M. Sullivan

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PLANNING DESIGN DELIVERY

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Date Drawn:	2016.10.07
Job Ref:	8350
Scale:	1:2,000 @ A4
Client:	Aigle Royal Developments
Designer:	P. Caddy
Drawn:	M. Sullivan
Projection:	MGA50 GDA94
Plan ID:	8350-FIG-12-A

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