WANDI NORTH STRUCTURE PLAN

PROPOSED MAJOR AMENDMENT

OUR REF: 4582B 19/01/2015

ROWEGROUP

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ENDORSEMENT PAGE

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

31 - July - 204 ..... Date

Signed for and on behalf of the Western Australian Planning Commission

.....

an officer of the Commission duly authorised by the Commission pursuant to section 24 of the *Planning and Development Act 2005* for that purpose, in the presence of:

PSchwanke ..... Witness

20 - 1 - 2015 ..... Date

And adopted by:

THE CITY OF KWINANA ON

..... Date

And

PURSUANT TO THE COUNCIL'S ADOPTION HEREUNTO AFFIXED IN THE PRESENCE OF:

C. Allan .....

Mayor,

CITY OF KWINANA

.....

Chief Executive Officer,

CITY OF KWINANA

..... Date

This Structure Plan is prepared under the provisions of the City of Kwinana Town Planning Scheme No. 2

TABLE OF CHANGES OR DEPARTURES FROM THE STRUCTURE PLAN

Change or Departure No.	Description of Change or Departure	Date Adopted by Council	Date Endorsed by WAPC (if required)	Date Structure Plan Commences Operation
1	Minor change – Correction of the boundary between the Wandi North and Wandi South Structure Plan areas.	22 February 2012		22 February 2012
2	Minor Change – Alterations to the road layout (Stage 4) to address Kwinana Freeway noise and removal of road link (Stage 1).	11 July 2012		11 July 2012
3	Minor Change – Alterations to road layout, POS areas and the removal of a small part of the Investigation Area at the Primary School on Lot 677 Lyon Road.	27 February 2013		27 February 2013
4	Minor change – Alterations to the road layout and lot configurations at Lot 683 Lyon Road (Stages 5 and 6).	10 April 2013		10 April 2013
5	Major change – The incorporation of an additional area of land to the north of the Structure Plan within Lot 683 Lyon Road and its integration into the Structure Plan area.	28 May 2014	4 August 2014	

EXECUTIVE SUMMARY

The Structure Plan incorporates major changes to the existing approved Wandi North Structure Plan.

These changes include:

- The extension of the Structure Plan boundary north to Rowley Road, incorporating the full extent of the Urban zone;
- The removal of references to the railway station in light of the Western Australian Planning Commission's resolution of 23 April 2013 that a train station is no longer intended to be developed at Rowley Road;
- The reconfiguration of the road layout, zoning and public open space for standard residential development, reflecting the deletion of the train station and associated transit-oriented development precinct identified on the current approved Wandi North Structure Plan;
- The retention of the Investigation Area at the proposed Primary School and its general locality (Investigation Area 1) and adds Investigation Area 2 as the potential location for a Community Facility site and a Local Centre given their location is no longer a part of an envisioned railway station at Wandi on the current approved structure plan; and
- The consolidation of minor changes made to the current structure plan since its adoption by the City of Kwinana.

Structure Plan Summary Table

Item	Structure Plan	Section number referenced in report
Wandi North Gross Structure Plan Area	97.5 hectares	1.2
Area of each land use proposed: Zones Residential Reserves Parks, Recreation and Drainage Public Purposes – Primary School (Investigation Area 1) Investigation Area 2 (set aside for potential Public Purposes use as a Community Centre and for potential Commercial use as a Local Centre)	 39.7 hectares 31.7 hectares 4.94 hectares 0.3 hectares	3.1
Estimated Lot Yield	1,004 lots	3.3
Estimated Number of Dwellings	1,006 dwellings	3.3
Estimated Residential Density: dwellings per gross urban hectare as per Directions 2031 dwellings per site hectare as per Liveable Neighbourhoods	10 dwellings per gross urban hectare 25 dwellings per site hectare	3.3
Estimated population	2816 people @2.8 people per household	3.3
Number of Secondary Schools	nil	3.7
Number of Primary Schools	1 primary school	3.7
Amount of Unrestricted Public Open Space as per Liveable Neighbourhoods Amount of Restricted Public Open Space as per Liveable Neighbourhoods	6.7 hectares, 9.17% 6.7 hectares, 9.16%	3.2 3.2
Composition of Public Open Space Neighbourhood Parks Local Parks	 29.4 hectares, 93% 2.3 hectares, 7%	3.2

Note: All areas are approximate only and are subject to detailed design and survey

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TECHNICAL APPENDICES

Appendix Number	Document Title	Nature of Document	Referral/Approval Agency	Summary of Document Modifications
1.	Certificate of Title	Supporting document	n/a	No change
2.	Environmental Assessment Report	Supporting document	n/a	Updated to reflect LSP amendment
3.	Summary of Wetland Outcomes and DPAW Correspondence	Supporting document	n/a	n/a
4.	Fire Management Plan, including Fire Hazard Assessment Addendum	Approved	City of Kwinana	Plans updated. Fire Hazard Assessment Addendum added.
5.	Heritage Assessment	Supporting Document	n/a	No change
6.	Landscape Master Plan	Supporting Document	n/a	Updated to reflect LSP amendment
7.	Transport Assessment Report	Supporting Document	n/a	Updated to reflect LSP amendment
8.	Local Water Management Strategy (Addendum)	Requires Approval	Department of Water and City of Kwinana	Updated to reflect LSP amendment
9.	Department of Water Approval – LWMS Addendum	Approval	Department of Water and City of Kwinana	n/a
10.	Local Centre Assessment Report	Supporting Document	n/a	Updated to reflect LSP amendment
11.	Engineering Services Report	Supporting Document	n/a	Updated to reflect LSP amendment
12.	Traffic Noise Impact Assessment	Approval	Main Roads WA	Updated to reflect LSP amendment

Part One
STATUTORY SECTION

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1. Structure Plan Area

This Structure Plan shall apply to the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan Map.

2. Structure Plan Content

This Structure Plan comprises:

2.1 Part One - Statutory section

This section contains the Structure Plan Map and statutory planning provisions and requirements.

2.2 Part Two – Non-statutory (explanatory) section

This section to be used as a reference guide to interpret and justify the implementation of Part One.

2.3 Appendices – Technical reports and supporting plans and maps.

3. Interpretation and Relationship with Town Planning Scheme No. 2

Unless otherwise specified in this part, the words and expressions used in this Structure Plan shall have the respective meanings given to them in the City of Kwinana Town Planning Scheme No. 2 (the Scheme) including any amendments gazetted thereto.

The Structure Plan Map outlines land use, zones and reserves applicable within the Structure Plan area. The zones and reserves designated under the Structure Plan apply to the land within it as if the zones and reserves were incorporated into the Scheme.

Pursuant to clause 6.17.7.6 of the Scheme, if a provision in the Structure Plan is inconsistent with the Scheme, then the provision in the Scheme prevails to the extent of the inconsistency.

4. Operation

This Structure Plan comes into effect on the day it is adopted by the City of Kwinana pursuant to clause 6.17.4.15 of the Scheme.

The manner in which a change or departure from the Structure Plan is determined is outlined in clause 6.17.5 of the Scheme.

5. Land Use

Subdivision and development of the Structure Plan area shall be generally in accordance with the Structure Plan Map.

The residential densities as prescribed on the Structure Plan Map apply to the Structure Plan area.

6. Subdivision and Development

6.1 Notifications on Title

In respect of applications for the subdivision of land the Council 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:

6.1.1 Land or lots deemed to be affected by a Bush Fire Hazard as identified in an approved Fire Management Plan (Fire Management Plan – Wandi North Local Structure Plan, Honeywood Estate prepared by Fireplan WA (as amended)) contained within appendix 4 of the Structure Plan.

6.1.2 Construction standards to achieve quiet house design in accordance with State Planning Policy 5.4 Road and Rail Transportation Noise and Freight Considerations in Land Use Planning (as amended) and as identified spatially in the Traffic Noise Impact Assessment – Honeywood Estate, Wandi – Stages 7, 8 and 9 (as amended) prepared by ATP Consulting dated April 2014 contained within Appendix 12 of the Structure Plan.

6.2 Detailed Area Plans

Detailed Area Plans (DAPs) prepared pursuant to clause 6.17.6 of the Scheme are to inform the subdivision and development for lots with one or more of the following site attributes:

a) Lots with rear-loaded (laneway) vehicular access;

b) Lots with direct boundary frontage to an area of public open space;

c) Lots with an area of 260m2 or less;

d) Lots within 100 metres of vegetation classified as being deemed at risk from bush fire pursuant to the WAPC and DFES's Planning for Bushfire Protection Guidelines (2010) and as identified spatially in the Fire Management Plan – Wandi North Local Structure Plan, Honeywood Estate prepared by Fireplan WA (as amended) contained in Appendix 4 of the Structure Plan; and/ or

e) Lots with outdoor noise levels beyond the target prescribed in State Planning Policy 5.1 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning and as identified spatially in the Traffic Noise Impact Assessment – Honeywood Estate, Wandi – Stages 7, 8 and 9 (as amended) by ATP Consulting dated April 2014 contained in Appendix 12 of the Structure Plan.

6.3 Variations to the Residential Design Codes 2013

This Structure Plan amends the following deemed-to-comply provisions requiring the approval of the Western Australian Planning Commission:

Table 1 - R-Code Variations

Design Element	Current Provision	Amended deemed to–comply-provision
5.1.4 Open space for the R30 density coding	45% minimum	35%
5.1.4 Open space for the R40 density coding	45% minimum	35%
5.1.4 Open space for the R60 density coding	40% minimum	30%

6.4 Other Provisions and Requirements

6.4.1 Fire Management Plan

This Structure Plan is supported by a Bushfire Management Plan (BMP) – *Fire Management Plan – Wandi North Local Structure Plan, Honeywood Estate* prepared by Fireplan WA (as amended) contained within Appendix 4 of the Structure Plan. Any land falling within 100 metres of a bushfire hazard identified in the BMP is designated as a Bushfire Prone Area for the purpose of the Building Code of Australia.

6.4.2 Investigation Areas

a) The classification of land use within Investigation Area 1 has no force or effect until the Western Australian Planning Commission is satisfied on the advice of the City of Kwinana, Department of Parks and Wildlife and the Department of Education that suitable land has been set aside for the purpose of a primary school

b) The classification of land uses within Investigation Area 2 has no force or effect until the land use classification within the investigation area is adopted by the City of Kwinana as a minor change to the Structure Plan.

6.4.3 Conditions of Subdivision Approval

A Mosquito and Midge Management Plan is recommended as a condition of subdivision approval.

Planning Design Delivery

LEGEND

LOCAL SCHEME RESERVES

- Parks, Recreation and Drainage
- PS — Public Purpose
  - PS Primary School

ZONES

- Residential - R10
- Residential - R30
- Residential - R40
- Residential - R60

OTHER

- Neighbourhood Connector
- Future Bus Route
- Structure Plan Boundary
- Wetland Buffer
- Conservation Category Wetland Core
- Peel Main Drain Easement
- 1 — Investigation Area for Proposed Primary School Site.
- 2 — Investigation Area for Potential Community Purpose Site and Potential Commercial (Local Centre) Site.

0 50 100 150 200 250 300 Metres

REVISIONS

Rev	Date	Drawn
E	2014.05.06	M.Sullivan
F	2014.05.21	M. Winfield
G	2014.07.11	M. Sullivan
H	2014.08.18	K. Trenberth

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PLANNING DESIGN DELIVERY

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Job Ref:	4582C
Scale:	1:7500 @ A3
Client:	Satterly
Designer:	R.Cumming
Drawn:	S.Blanchard
Projection:	PCG94
Plan ID:	4582C-STR-01-H

Cadastre supplied by McMullen Nolan Surveyors

Wandi North Structure Plan Map

Plan 1

N:\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582C_STR01H_20140818 HONEYWOOD_STRUCTURE PLAN.DWG
Kim Trenberth 18 August 2014

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Part Two
EXPLANATORY SECTION

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01 Planning Background

1.1 Introduction and Purpose

This Structure Plan comprises a major change to the existing approved Wandi North Structure Plan. For the purposes of the 'Part Two – Explanatory Section' of the Structure Plan, this report will primarily focus on the area pertaining to the major change, providing contextual information in relation to the wider Structure Plan area where required.

These changes include:

- The extension of the Structure Plan boundary north to Rowley Road, incorporating the full extent of the Urban zone;
- The removal of references to the railway station in light of the Western Australian Planning Commission's resolution of 23 April 2013 that a train station is no longer intended to be developed at Rowley Road;
- The reconfiguration of the road layout, zoning and public open space for standard residential development, reflecting the deletion of the train station and associated transit-oriented development precinct identified on the current approved Wandi North Structure Plan;
- The retention of the Investigation Area at the proposed Primary School and its general locality (Investigation Area 1) and adds Investigation Area 2 as the potential location for a Community Facility site and a Local Centre given their location is no longer a part of an envisioned railway station at Wandi on the current approved structure plan; and
- The consolidation of minor changes made to the current structure plan since its adoption by the City of Kwinana.

1.2 Land Description

1.2.1 Location

The Structure Plan is located within the metropolitan south west corridor, within the municipality of the City of Kwinana. The site is situated approximately 24 km south of the Perth Central Area, and is accessible via the Kwinana Freeway. The Kwinana Town Centre is located approximately 8 km south and the Spectacle Regional Reserve approximately 1km from the site.

The area pertaining to the major change comprises the northernmost precinct of the Structure Plan, being Part Lot 683 and the street block south of Morwell Entrance, being Lot 9017 Lyon Road.

The Structure Plan area is generally bound by the Kwinana Freeway to the west, Lyon Road to the east, Rowley Road to the north.

Refer Figure 1 – Regional Location.

Refer Figure 2– Local Location.

1.2.2 Area and Land Use

The areas the subject of the major change to the Structure Plan includes:

- Approximately 11.9 hectares of part Lot 683 Lyon Road, and
- Approximately 0.3ha of Lot 9019 Lyon Road (Investigation Area 2).

The areas the subject of the major change generally comprises the final stages of the Honeywood Estate residential development. The balance of the development received Structure Plan and subdivision approval in December 2009. Construction of the first stages commenced in May 2010, with the most recent development stages (Stages 5 and 6) due to commence construction in the second half of 2013. Stages 5 and 6 represent the last stages to be developed under the existing approved Structure Plan. The remaining development stages, comprising primarily Stages 7 to 9, will be subdivided and constructed in accordance with the proposed major changes to the Wandi North Structure Plan.

The area the subject of the major change has been partly cleared, with some earthworks undertaken under existing approvals for the site. Vegetation remains within the north portion of the Structure Plan area, previously situated outside the Structure Plan boundary. A portion of the amendment area in the vicinity of the Lyon Road/Honeywood Avenue intersection is currently being utilised as the site office for construction. The unconstructed portion of Honeywood Avenue adjacent to the amendment area is currently being used for access for construction vehicles for the estate.

Honeywood Avenue has partly been constructed as part of previous development stages, with the final section, being that portion adjacent to the area pertaining to the major change, intended to be completed as part of Stage 6 construction. There are existing services constructed within the Honeywood Avenue alignment.

There is an existing sewer pressure main traversing the area, which was constructed under the previous Structure Plan layout. This is required to be realigned under the proposed major change to the Structure Plan, and has been included as part of forward planning for the development.

1.2.3 Legal Description and Ownership

The areas the subject of the major change to the Structure Plan include the land parcels, being:

- Part Lot 683 on Plan 202618, Certificate of Title Volume 2103 and Folio 717, and
- Lot 9019 on Plan 400699, Certificate of Title Volume 2838 and Folio 776.

The land is under the ownership of a single entity, being Wandi Anketell Holdings Pty Ltd.

Refer Figure 3 – Site Plan/Aerial and Appendix 1 – Certificate of Title.

1.3 Planning Framework

1.3.1 Land Classification

The areas that are subject of the major change to the Structure Plan are zoned 'Urban' under the Metropolitan Region Scheme, and 'Development' under the City of Kwinana Town Planning Scheme No. 2.

The change to the Structure Plan incorporates an additional area of land (part Lot 683). The zones and reservations in the current Structure Plan, other than in the area to the north of Stages 5 and 6, are to remain as adopted with the designation of an additional Investigation Area 2, any land use classification has no force or effect until its is adopted as a minor change to the Structure Plan.

Refer Figure 4 – Metropolitan Region Scheme Zoning.

Refer Figure 5 – Town Planning Scheme No. 2 Zoning.

1.3.2 Regional and Sub-Regional Structure Plans

1.3.2.1 Jandakot Structure Plan

The existing Wandi North Structure Plan area is situated within the Jandakot Structure Plan (JSP) area, whilst the northern portion of part Lot 683 (the subject of this major change) is excluded.

Further to the review of the Jandakot Underground Water Pollution Control Area (Jandakot UWPCA), the JSP was prepared to provide a planning framework for the balance area previously affected by the underground water pollution control area. As such, the northern portion of part Lot 683, previously forming part of the Jandakot UWPCA was excluded from the JSP.

As detailed in Section 1.3.4.1 of this report, the northern area (the subject of this major change) excluded from the JSP was subsequently rezoned to Urban under the MRS in 2011. Whilst not included within the JSP, the objectives and framework set out have been adhered to in the urbanisation of this area and reflected in the proposed Structure Plan.

The district level requirements of the JSP, such as the identification and preservation of natural areas, the allocation of public open space and public purpose areas, road network and hierarchy, the allocation of school sites and the allocation of commercial activity have therefore been further refined through the preparation of the Structure Plan and subsequent amendments.

Previously, the major constraint to urban development within this corridor was in relation to groundwater and stormwater management. With the preparation of the Jandakot District Water Management Plan however, these issues have now being resolved and have been accommodated in current planning for the Wandi Cell detailed in Section 3.6 of this report.

The proposed major changes to the Structure Plan are therefore considered consistent with the intent and requirements of the JSP.

1.3.2.2 Eastern Residential Intensification Concept (ERIC)

The City of Kwinana's draft District Structure Plan, referred to as the 'Eastern Residential Intensification Concept' (ERIC) was prepared by the City of Kwinana in 2005 to provide strategic direction and refinement of the future urban areas identified under the Jandakot Structure Plan. Whilst ERIC has yet to be finally adopted by Council, it was used as an informal guide in the preparation of the Structure Plan.

Given the northern area (the subject of this major change) was not included within the JSP, ERIC similarly excludes this area. Structure planning outcomes as proposed under this major change however reflect the objectives and district outcomes of ERIC and are therefore considered to be consistent with the general intent and requirements of ERIC.

1.3.3 Policies

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

- Design Guidelines for Medium Density Development;
- Community Facilities Sites;
- Crossovers;
- Design Guidelines for Medium Density Development;
- Footpaths;
- Public Open Space;
- Residential Development;
- Residential Subdivision Development Guidelines;
- Residential Subdivision Road Standards;
- Retaining Walls Levels;
- Street Lighting;
- Street Naming, and
- Street Trees and Verge Treatments.

1.3.4 Other Approvals and Decisions

1.3.4.1 MRS Amendment – 'Rural Water Protection' Zone to 'Urban' Zone

A MRS Amendment was progressed in 2008 for the area adjacent to the then proposed Mandogalup railway station site (approximately 400-600 metres south of Rowley Road), transferring the site from Rural Water Protection (Priority 2 area) to Urban. Whilst urban development is not consistent with the objectives of the Priority 2 area, the WAPC, Department of Water, Water Corporation and Department of Environment and Conservation recognised the 'strategic state importance' of the urban catchment in the context of state infrastructure (Perth to Mandurah rail line) and subsequently resolved to support the rezoning.

The MRS amendment was gazetted in August 2011; however in April 2013 the WAPC resolved to delete the Mandoglaup Station from future planning as discussed below.

1.3.4.2 Mandogalup Train Station

Under the draft JSP, two railway station sites were proposed for the Perth to Mandurah railway line adjacent to the Wandi North Urban Cell, being the Rowley Road (north) and Anketell Road sites. However, in early 2007, under a Ministerial directive, the then Department for Planning and Infrastructure in conjunction with the Public Transport Authority began a review of all proposed railway stations along the Perth to Mandurah railway line, including the Rowley Road (north) and Anketell Road sites.

As a result of this review, the WAPC resolved in 2008 to consolidate the two sites and endorse a station 400-600 metres south of Rowley Road (Mandogalup Station Site).

The original Wandi North Structure Plan approved in December 2009 reflected the WAPC resolution for Mandogalup station, identifying a TOD precinct within a 400 metre catchment of the station. The station was also identified in the 2010 draft Outer Metropolitan Perth and Peel Sub-Regional Strategy for the south-west sub region.

The Public Transport Plan for Perth in 2031 was released by the Department of Transport for public comment in 2011, identifying the location of a single station at either Success or Mandogalup before 2031. The Public Transport Plan for Perth in 2031 therefore further consolidates the original stations identified for this corridor to a single station, adding to the ongoing uncertainty for the Mandogalup station site, contrary to the WAPC's resolution of 2008 which sought to remove this uncertainty.

Following further review and consideration, and in order to provide certainty to the future development of the Wandi North Structure Plan, the WAPC resolved on 23 April 2013 to delete the Mandogalup from future planning for the corridor. The proposed major change to the Structure Plan therefore reflects this decision through a standard residential design response rather than the TOD design response previously pursued.

1.3.4.3 Subdivision Approvals

Subsequent to approval of the original Wandi North Structure Plan, subdivision approval was granted for the area between the northern boundary of Lot 677 and Rowley Road. The Plan of Subdivision created the area the subject of this major change as a super lot to enable bulk earthworks and clearing to be undertaken. This approval expired on 21 December 2013. New subdivision approvals will therefore be sought for the northern area in accordance with the major changes proposed under this Structure Plan proposal.

Subsequent subdivision approvals have also been issued for the estate on a stage-by-stage basis, with the subdivision layout being modified to address site conditions, current market expectations for lot product type, and to respond to noise and fire management requirements.

Honeywood Avenue provides access to the area the subject of this major change. Honeywood Avenue will however be constructed under existing previous approvals for the estate.

1.3.4.4 EPBC Act Referral

The northern area the subject of this major change was included as part of the EPBC Act Referral for the existing Wandi North Structure Plan area, which was submitted and approved with conditions. The Structure Plan will be implemented in accordance with conditions of the EPBC 2010/5476 approval.

02 Site Conditions and Constraints

The following provides a summary of the environmental site conditions and constraints; however for further information it is recommended the reader consult the Environmental Assessment Report provided at Appendix 2.

2.1 Biodiversity and Natural Area Assets

The area the subject of the major change to the Structure Plan does not comprise any identified Bush Forever sites, nor does it comprise any other environmental assets of conservation significance.

The northern area comprises a mapped Resource Enhancement and a mapped Multiple Use wetland. These wetlands are not required to be retained under the Structure Plan, as agreed with the Department of Environment and Conservation and the City of Kwinana as part of the wetland package negotiations undertaken under the initial Structure Plan process.

Within the Structure Plan area, three Conservation Category Wetland areas have been retained and reserved, and are subject to specific management controls implemented through an approved Wetland Management Plan.

Please refer to Appendix 3 for history and correspondence on wetland outcomes.

2.2 Landform and Soils

The area the subject of this major change to the Structure Plan is located within the interface of the Bassendean and Spearwood dune systems. The soils consist primarily of deep Bassendean Sands (S8), with pockets of shallow Bassendean Sands over Guildford Formation clays (S10) and Sandy Silt swamp deposits (Msg).

A geotechnical investigation undertaken by Golder Associates for the Structure Plan area recommends a site classification of 'Class A' will be applicable, provided their recommended site preparation procedures are undertaken.

The topography of the site is relatively flat, with elevations being between RL 23.0 metres AHD and RL 25.0 metres AHD. Gradients across the site range from 1 in 200 to 1 in 6, with an average gradient of 1 in 100.

The site requires filling to ensure adequate grades and cover to drainage and sewerage, and to provide acceptable slopes and pads for building in accordance with maximum allowable engineering grades. It is anticipated the majority of the required fill will need to be imported.

2.2.1 Acid Sulphate Soils

The Department of Environment and Conservation (DEC) database identifies the site as having a Moderate to High Acid Sulphate Soils (ASS) risk. The north-western boundary, extending in to the middle of the northern area (the subject of this major change to the Structure Plan) exhibits a high risk of ASS occurring. The balance of the northern area exhibits a moderate risk.

Based on the DEC database, there is likely to be a high risk of disturbing potential or actual ASS during ground intrusive earthworks in low lying areas, given the majority of the area is within approximately 1 metre of the water table.

An ASS Management Plan has been prepared and implemented as part of the Structure Plan to minimise the risk of ASS occurring across the site.

2.3 Groundwater and Surface Water

2.3.1 Groundwater

Groundwater mapping indicates the water table underlying the northern area is approximately RL 21.0 metres AHD. This corresponds with the groundwater level being approximately two metres below the surface in the localised low areas, to more than four metres below ground level elsewhere within the site.

The grade of the water table surface indicates a general east to west groundwater flow direction.

Hydrographs from nearby monitoring bores indicate groundwater levels have declined over the last decade.

2.3.2 Surface Water

The northern area the subject of the major change to the Structure Plan comprises a Multiple Use wetland and a portion of the mapped Resource Enhancement wetland. The Resource Enhancement mapped area is heavily degraded and is not required to be retained as part of development of the site, nor is the Multiple Use wetland.

No other surface water exists within the northern area.

An amendment to the existing approved Local Water Management Strategy has been prepared to support the proposed changes to the Structure Plan and is contained within Appendix 8. An Urban Water Management Plan will also be prepared and implemented at subdivision. These will demonstrate how surface and groundwater will be dealt with across the site to facilitate development for residential purposes.

2.4 Bushfire Hazard

The Fire Management Plan – *Wandi North Local Structure Plan, Honeywood Estate* was approved by the City in June 2013. In response to the incorporation an additional portion of Part Lot 683 Lyon Road as part of the major change to the Structure Plan, the applicant/ owner has updated the Fire Management Plan with the *Addendum to the Wandi North (Honeywood) Fire Management Plan* (December 2013). It rates the bushfire hazard for Lot 51 and Kwinana Freeway where adjoining the northern portion of the Structure Plan area as *Moderate.* Bushfire Attack Levels (BAL) will be determined based on existing vegetation types and fuel loads at the time of development.

The approved Fire Management Plan (and addendum) will be required to be implemented as a condition of subdivision approval.

Refer Appendix 4 – Approved Fire Management Plan, inclusive of the updated Fire Hazard Assessment addendum.

2.5 Heritage

A search of the Department of Indigenous Affairs Aboriginal Heritage Inquiry System identified one site (ID: 3427) of significance within close proximity to the Structure Plan. The site is Mandogalup

Swamp / Spectacles and is classified as a mythological site previously used as a hunting place and water source.

A search of the City of Kwinana Municipal Heritage Inventory identified a site of significance located directly south of the Structure Plan on Lot 674, referred to as 'Leslie Property' in the Wandi South Structure Plan. Heritage requirements relating to this site are required to be satisfied under the Wandi South Structure Plan, and do not impact on the development ability of the Wandi North Structure Plan.

R and E O'Connor Pty Ltd undertook an Aboriginal Heritage Analysis of the Wandi Cell in January 2008. The purpose of the preliminary analysis was to establish whether there were any currently known Aboriginal heritage constraints which needed to be taken into consideration in advance of development in the Wandi Cell.

The report recommended that an application pursuant to Section 18 of the Aboriginal Heritage Act be made in respect to the Wandi Cell prior to any development involving ground disturbance taking place. Given the above recommendation, Quartermaine Consultants were appointed to undertake an archaeological survey of the Wandi Cell and the results were submitted to the ACMC in support of the Section 18 application. We confirm all necessary heritage requirements have previously been satisfied for the Structure Plan area.

A complete copy of the Aboriginal Heritage Analysis is contained within Appendix 5.

2.6 Context and Other Land Use Constraints

2.6.1 Noise Management

The noise associated with the Kwinana Freeway and the Perth to Mandurah railway to the west as well as Rowley Road (a designated freight route) to the north, impacts the northern portion of the site the subject of this Structure Plan change. In accordance with *State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP 5.4), a Traffic Noise Impact Assessment addressing the noise impact on the subject land has been prepared (and approved by Main Roads Western Australia).

An approval to commence development has also been granted by the City to construct an extension of the existing sound attenuating wall along the western boundary of the subject land and along its northern boundary (Rowley Road). As part of the conditions of approval of the development application, the applicant/ owner will be required to update the Noise Impact Assessment. The updating of the noise assessment will also update the identification of the lots that will require a notification on title advising of noise impacts and dwelling insulation measures to address those noise impacts.

2.6.2 Water Corporation Bore

A Water Corporation bore is situated at the north east corner of the Rowley Road and Lyon Road intersection. This bore incurs a 300 metre buffer, in which no additional drainage storage and infiltration is permitted. In this regard, the proposed drainage design ensures no additional drainage is being retained within the buffer area, with proposed drainage basins being situated outside the buffer.

03 Land Use and Subdivision Requirements

3.1 Land Use

The major change to the Structure Plan consists, primarily of additional Residential land use on part Lot 683 at densities of R30, R40 and R60 as well as two additional areas of public open space reserved for Parks, Recreation and Drainage. The Investigation Area sets aside 0.3 hectares of land for potential Public Purpose as a community centre site and for a potential Commercial use as a local centre.

3.2 Public Open Space

The Public Open Space Schedule has been prepared in accordance with Liveable Neighbourhoods requirements.

Please refer to Figure 6 – Public Open Space Schedule, and Figure 7 – Public Open Space Plan.

The Public Open Space Schedule and associated plan provided comprise the entire Structure Plan area. The northern area proposes two additional areas of public open space, being reference numbers 2 and 5 on the public open space schedule and plan.

The public open space calculations have been based on surveyed areas, where available. On this basis, the calculated areas may vary from the original approved public open space schedule, which were based on planned areas only and were therefore more indicative. However, it is noted a number of areas are yet to be constructed, and therefore may still be subject to modification at detailed engineering and survey stage.

The public open space for the balance of the Structure Plan area has been subject to negotiation and approval under the existing Wandi North Structure Plan. The only proposed modifications are to the configuration and size of public open space within the area the subject of the major change, as well as the relocation of the Public Purpose site more centrally within the Wandi catchment.

The public open space provided within the northern area serves drainage and passive and active recreation functions. The open space has been positioned to maximise pedestrian connections through the site to the wider public open space network.

The Landscape Master Plan provided at Appendix 6 depicts the proposed uses and layout for the public open space within the northern area.

3.3 Residential

The area the subject of this major change to the Structure Plan achieves an average residential density of 27 dwellings per site hectare and 17 dwellings per gross urban hectare. This is consistent with Liveable Neighbourhoods requirements, which stipulates a minimum average of 22 dwellings per site hectare for greenfields subdivision areas, and Directions 2031 targets of a minimum 15 dwellings per gross urban hectare.

Density has been calculated based on an indicative subdivision plan prepared for the site, yielding approximately 208 lots. For reference, an indicative Plan of Subdivision is provided at Figure 8. This is provided for explanatory purposes only, and is subject to review and detailed design at subdivision.

As with the balance of the Structure Plan, the developer will deliver lot typologies consistent with current market demand and acceptance by the building industry.

Where the site configuration permits, the northern area is likely to deliver the following standard lot typologies:

- 17 m x 30 m front loaded;
- 15 m x 30 m front loaded;
- 12.5 m x 30 m front loaded;
- 10 m x 30 m front loaded;
- 10 m x 30 m rear loaded;
- 7.5 m x 30 m rear loaded;
- 15 m x 20 m front loaded.

3.3.1 Climate Responsive Design

Under Liveable Neighbourhoods lots should be oriented to facilitate the sitting of dwellings and private open space to optimise solar access. Despite the configuration of the parent lot, the northern area achieves relatively good solar access, with majority of lots having their long axis within the range N10°W to N30°E or E10°N to E30°S. Figure 9 depicts the solar orientation achieved within the northern area.

3.4 Community Purpose

The existing Structure Plan and City of Kwinana Community Infrastructure Plan identifies a Community Facility site of approximately 3000m^2 within the northern area, previously associated with the TOD precinct. Given the deletion of the Mandogalup train station and associated transit TOD precinct from future planning for the corridor, the Community Facility site is no longer considered appropriate at this location.

It has been agreed with the City of Kwinana to relocate the Community Facility site more centrally within the Structure Plan, to maximise the catchment and viability of the facility. Investigations are currently underway to determine the most appropriate location for the site. There are two potential locations – within Stage 5A of the Honeywood estate on Morwell Entrance adjacent to Stage 1 of the development, or co-located with the Primary School site and Local Playing Fields. Ideally, the centre would be co-located with the primary school to create a community hub and centre of activity. However, a number of design constraints exist that may limit the opportunity of this location, primarily being site levels and the limited extent of urban zone.

Given the parameters yet to be investigated to determine the most appropriate location for the Community Facility site, the Structure Plan Map (Plan 1 in Part 1) identifies an 'Investigation Area 2' over the Stage 5A location. Until such time as the ultimate location has been determined, Investigation Area 2 as depicted on the Structure Plan (Plan 1 in Part 1) is considered to be the preferred location for the Community Facility site by the City of Kwinana, and should be treated as the final location until determined otherwise.

The introduction of Investigation Area 2 also formalises the assumptions and agreements made under the existing Structure Plan, whereby it was understood between the City of Kwinana and the Developer

that the community site would be relocated to Stage 5A, should the train station never eventuate. Stage 5A is therefore 'on hold' from residential development whilst the ultimate location of the Community Facility site is being resolved.

3.5 Activity Centres

The following provides a summary of the activity centre demand for the Structure Plan, however for further information it is recommended the reader consult the Local Centre Assessment Report provided at Appendix 10.

The existing Structure Plan identified a local centre within the former TOD precinct, subject to the proposed major changes. Given the deletion of the train station from future planning, a local centre is no longer considered viable at this location.

Investigations and modelling undertaken by Taktics4 suggests the Wandi locality may be capable of supporting a local centre of up to 750 square metres of retail floorspace by 2021, and 1250 square metres by 2031. Taktics 4 recommends this centre would be best located at the Lyon Road/Rowley Road intersection. It is noted however that a local centre is already planned for generally within this location, north of Rowley Road within the City of Cockburn, as identified within the City of Cockburn's Local Commercial and Activity Centres Strategy (LCACS). Therefore, it is recommended that any local centre provided within the Structure Plan area be situated further south so as to not compete with the planned centre north of Rowley Road. Notwithstanding, Taktics4 identifies any centre within the Structure Plan presents a commercial risk given the limited catchment and exposure.

In addition, the City of Kwinana Draft LCACS identifies a centre of up to 1500 square metres of retail floor space by 2021 and up to 3000 square metres of retail floor space by 2031 within the Structure Plan area. However, this centre is noted as being unconfirmed or optional and is subject to further more detailed consideration. The Draft LCACS was advertised in early 2014 and is currently subject to further review.

On this basis, given the planned centre north of Rowley Road and the planned district centre on Anketell Road, it is considered a centre is not necessary or viable within the Structure Plan area.

Notwithstanding, the Structure Plan identifies an Investigation Area (Investigation Area 2 on the Structure Plan Map – Plan 1, Part 1) over the City's preferred location of the local centre, should it be resolved that such a centre is required. Alternate locations are also being explored, with investigations underway for the potential location of the local centre within the primary school precinct to take advantage of the catchment and traffic generated by the school and associated playing fields, as well as the community facilities currently being investigated for this location.

In addition to the local centre identified for within or in close proximity to the Structure Plan area, the site is situated approximately 7 kilometres south of Cockburn Central, and approximately 9 north of the Kwinana Town Centre. There is also a district centre planned south of the Structure Plan at Anketell Road. Honeywood Avenue will provide direct access to the district centre.

3.6 Movement Networks

The following provides a summary of the movement network, however for further information it is recommended the reader consult the Transport Assessment Report provided at Appendix 7.

3.6.1 Existing Road Network

Honeywood Avenue

Honeywood Avenue abuts the northern area, the subject of the major change to the Structure Plan, on its eastern boundary.

Honeywood Avenue is designed as a Neighbourhood Connector, distributing traffic through the Structure Plan from Rowley Road in the north to Anketell Road in the south.

Honeywood Avenue is designed to a 25.2 metre cross-section, with a central vegetated drainage swale. Projected traffic volumes along Honeywood Avenue are estimated at 6000 vehicles per day abutting the northern area.

Lyon Road

Lyon Road is classified as a District Distributor Type B road in the Main Roads WA Functional Road Hierarchy. It is currently constructed to a rural standard with a 7.0 metre wide carriageway. Lyon Road provides a north-south link through the suburbs of Wandi, Aubin Grove and Atwell.

Historical data indicates traffic volumes of less than 1,000 vehicle movements per day on Lyon Road, which is predominantly generated by local residents.

Lyon Road is to be realigned to connect with Honeywood Avenue, adjacent to the northern area. The detailed design of this intersection is currently being undertaken with the City of Kwinana, and will be constructed as part of Stage 6 of the development.

Lyon Road is required to be upgraded as part of the subdivision of the Structure Plan area. These works are to be undertaken by the developer, and reimbursed through the Developer Contributions Scheme.

Rowley Road

Rowley Road is classified as a District Distributor Type A road in the Main Roads WA Functional Road Hierarchy. It provides an east-west connection between the South Western Highway (via Eleventh Road), Tonkin Highway, Kwinana Freeway and Rockingham Road (via Wattleup Road).

Rowley Road is currently constructed to a rural standard single carriageway road, however has been planned as a future designated freight route servicing the Naval Base and Kwinana Beach industrial areas. Land has previously been allocated for the widening and upgrading of Rowley Road where it abuts the amendment area.

Traffic data indicates Rowley Road currently accommodates approximately 6,451 vehicles per day east of the Kwinana Freeway, of which 11.2% are heavy vehicles.

3.6.2 Proposed Road Network

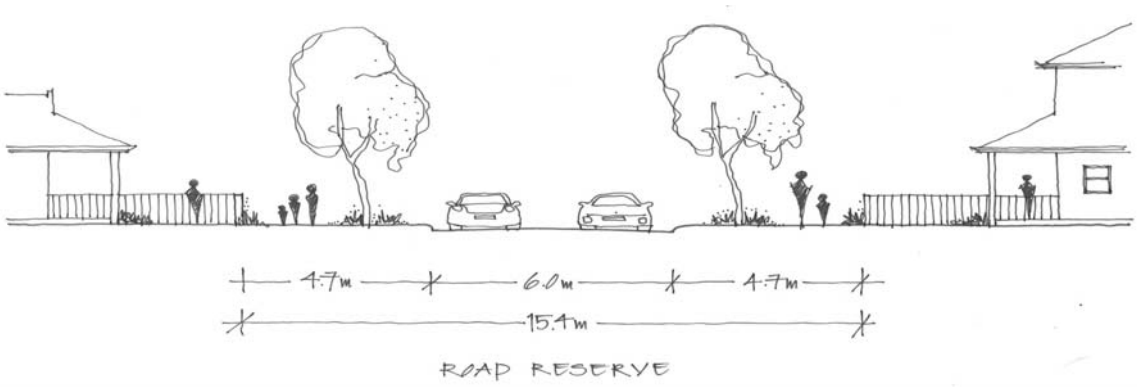
Road classifications for the northern area have been determined on the basis of modelling undertaken by Transcore. Road cross-sections are proposed generally in accordance Liveable Neighbourhoods

for the relevant corresponding road type, and are consistent with the cross-sections provided in the balance of the Structure Plan area.

The northern area primarily consists of Access Street C roads, designed to a 15.4 metre cross-section. An Access Street D road is proposed along a portion of the site adjacent to the Kwinana Freeway, where servicing is only required along one side and therefore a reduced verge width is appropriate. Laneways have been provided where lots directly front public open space, providing for rear vehicle access.

The following image depicts the typical Access Street C road cross-section for the amendment area and wider Structure Plan.

TYPICAL ACCESS STREET C ROAD CROSS-SECTION



The northern area is anticipated to generate approximately 1,664 vehicle trips per day per dwelling, based on 8 vehicle trips per day per dwelling, with projected traffic volumes expected to be less than 1,000 vehicles per day per road. On this basis, the proposed road typologies are considered to be adequate to accommodate the relevant traffic volumes, as well as drainage and parking requirements.

Refer Figure 10 – Proposed Road Network.

3.6.3 Public Transport

The Structure Plan area is not currently directly serviced by public transport. However, Honeywood Avenue has been designed to accommodate a future bus route. Timing for the establishment of a service through the Structure Plan area is yet to be determined by the Public Transport Authority.

Bus Route 527 servicing Aubin Grove is the closest existing bus service, and runs along Lyon Road, north of Rowley Road. Route 527 provides a service through to Cockburn Central.

The Perth to Mandurah railway line runs along the western boundary of the site within the Kwinana Freeway reserve. The closest stations to the amendment area are Cockburn Central, approximately 6 kilometres to the north, and Kwinana, approximately 5.8 kilometres to the south. An additional station is also planned for Russell Road/Success, approximately 2.7 kilometres to the north.

3.6.4 Pedestrian and Cycle Network

Footpaths will be provided on at least one side of every street, with the possible exception of short cul-de-sacs and laneways, in accordance with Liveable Neighbourhoods requirements.

There is a planned dual use path along the extent of Honeywood Avenue, which will connect to the footpath network within the northern area.

The proposed road network provides for relatively short street blocks and regular connections. This provides for a well connected and permeable pedestrian network. Additionally, the positioning of the public open space areas provides for high quality pedestrian links through the northern area and south through the wider Structure Plan area.

3.7 Local Water Management

A Local Water Management Strategy has been approved for the Structure Plan, with Urban Water Management Plans being prepared and implemented for each stage of subdivision. Given the modifications proposed within the northern area, an amendment to the Local Water Management Strategy has been prepared and approved by the Department of Water in November 2013.

A copy of the approved addendum to the Local Water Management Strategy is enclosed within Appendix 8.

The sub-catchments, modelled peak outflows and detention storages have been updated in the addendum to reflect the modified road network and reduction in density and yield from the existing Structure Plan.

The northern area forms part of the 283 hectare district sub-catchment CAT21. Based on a pro-rata approach, the northern area forms approximately 2.2% of CAT21 and the allowed outflow is 0.014m3/s (14 L/s) to the Peel Main Drain. The 100 year ARI peak discharge from this basin into the Peel Main Drain is 0.63 m^3/s.

Drainage within the northern area is proposed to have detention storages within public open space for flood management, with outlets to the Peel Main Drain. Storages have been designed to contain runoff from the 100 year storm event, with discharge for the 100 year ARI event designed not to exceed estimated pre-development flows. Storage locations have been determined based on existing topographic contours, depth to groundwater mapping, and Structure Plan constraints. Storage elevations have been assumed at least 0.3 metres above the design groundwater level for modelling purposes.

3.8 Education Facilities

There is a primary school site identified in the south eastern corner of Structure Plan area (4.39ha), servicing the Wandi locality. The site is currently shown as 'Investigation Area 1' (4.94ha) so as to enable the City of Kwinana, the Department of Education and the Department of Parks and Wildlife to determine that a suitable area of land has been set aside for the purpose of a primary school to the satisfaction of the Western Australian Planning Commission.

Upon determination of the above, the Investigation Area will be deleted from the Structure Plan.

3.9 Infrastructure Coordination, Servicing and Staging

The following provides a summary of the infrastructure and servicing for the northern area, however for further information it is recommended the reader consult the Engineering Services Report provided at Appendix 11.

3.9.1 Water Supply

The Water Corporation has made provision for water supply to the Wandi Cell in its planning for servicing the south-east corridor. The northern area is located within the Water Corporation's Thomsons Lake gravity water supply scheme, fed from existing water storage facilities located on

Henderson Road in Beeliar. The northern area will be serviced by a 100mm to 200mm diameter reticulation, connected to the existing 250mm diameter main in Honeywood Avenue.

Water Corporation planning indicates the need for a future 700mm diameter distribution main along Honeywood Avenue and west through the northern area (Honeywood Stage 7) to Mandogalup. It is anticipated these works will be undertaken by Water Corporation at a later date, and will require excavation along the kerb and pavement of Honeywood Avenue and the east/west road through Stage 7.

3.9.2 Sewer

The Water Corporation has made provision for a reticulated sewerage scheme for the Wandi Cell in its planning for servicing the south-east corridor. The northern area is located within a sub-catchment of the Water Corporation's Thomsons Lake sewerage catchment, which discharges to an existing sewerage pump station located on Lot 666 east of the Kwinana Freeway. Effluent is pumped from this pump station north via a pressure main in to an existing gravity sewer located near Hammond Road and Jackadder Avenue. This system is constructed and operating under the management and maintenance responsibility of the Water Corporation.

The northern area will be serviced by a 150/225 mm diameter gravity system, which is directed south to the system to be constructed as part of the Honeywood Stage 5/6 development.

There is an existing 250mm diameter sewer pressure main traversing the northern area, which is required to be realigned to reflect the proposed road layout. This will occur as part of Stage 7 works.

3.9.3 Gas and Electricity

All lots within the northern area will be serviced with underground power, of which the cost of works will be fully developer funded. Electricity connections will be via an extension of existing services within the Honeywood development.

The provision of a reticulated gas supply will be from existing mains within the Honeywood Avenue reserve, via the system to be provided as part of the Honeywood Stage 5/6 development.

3.9.4 Telecommunications

All lots within the Honeywood estate, including the northern area, are to be serviced by a private telecommunication network – Service Elements Pty Ltd – utilising their own pit and pipe network, installed by the Developer.

Where appropriate, Service Elements will utilise Western Power service trenches in lieu of the Developer providing additional trenching.

Service Elements will "cable" the development once construction of housing has commenced and applications are made by individual owners for communications services to their lots.

Headwork charges for Telecommunication service extensions are anticipated.

3.9.5 Development Staging

The northern area comprises Stages 7 to 9 of the Honeywood estate, and represents the final development stages for the estate.

Stages 5 and 6 of the estate are currently under construction, with construction of Stage 7 to commence as soon as approvals are in place.

Preliminary bulk earthworks will be undertaken for the northern area under existing approvals.

An indicative staging plan for the northern area is provided at Figure 11.

3.10 Developer Contribution Arrangements

The Structure Plan is included within Development Contribution Area Number 9 (DCA 9) for the Wandi Cell community infrastructure items and DCA 5 for the 'hard' infrastructure items.

DCA 9 was introduced to TPS 2 by way of Scheme Amendment 115 (Gazetted on 19 June 2012), and is intended to have an operation period of 20 years (2011 to 2031).

The following items are currently listed under TPS 2 as being subject to funding by DCA 9.

DCA 9	Item
Sub-Regional	Community Knowledge and Resource Centre (excluding leasable office space and cafe component)
	Destination Park (Calista)
	Wells Beach Foreshore Upgrade (Park and Boating facility)
District A	Sporting Pavilion
	Community Centre
	Youth Centre
	Dry Recreation Centre
	Branch Library
Local	Local Community House/Centre
	Local Sports Pavilion
Admin	Administrative Costs

Notwithstanding the above, it is understood the City of Kwinana are currently reviewing the community infrastructure needs for the ERIC corridor on the basis of the reduced urban catchment within Mandoglaup. This is likely to result in a reduced need for facilities to be provided within the ERIC corridor.

Scheme Amendment (Amendment 100A) was initiated by the City of Kwinana at its December, 2014 meeting to introduce 'hard' infrastructure items to the Scheme. Upon gazettal of Amendment 100A, the Wandi Cell will also be subject to Development Contribution Area 5 (DCA 5).

Whilst the items to be included within DCA 5 are yet to be finalised, it is understood the indicative list of items includes the following:

- Anketell Road realignment;
- Lyon Road upgrade;
- Public Open Space; and
- Neighbourhood Connector.

Should the review of DCA 9 and the finalisation of Amendment 100A not be complete prior to subdivision within the LSP area, it is likely a legal agreement will be entered into between the City of

Kwinana and the Developer for the payment of interim costs, to be reconciled upon Gazettal of Amendment 100A and any amendments to the existing DCA 9.

FIGURES

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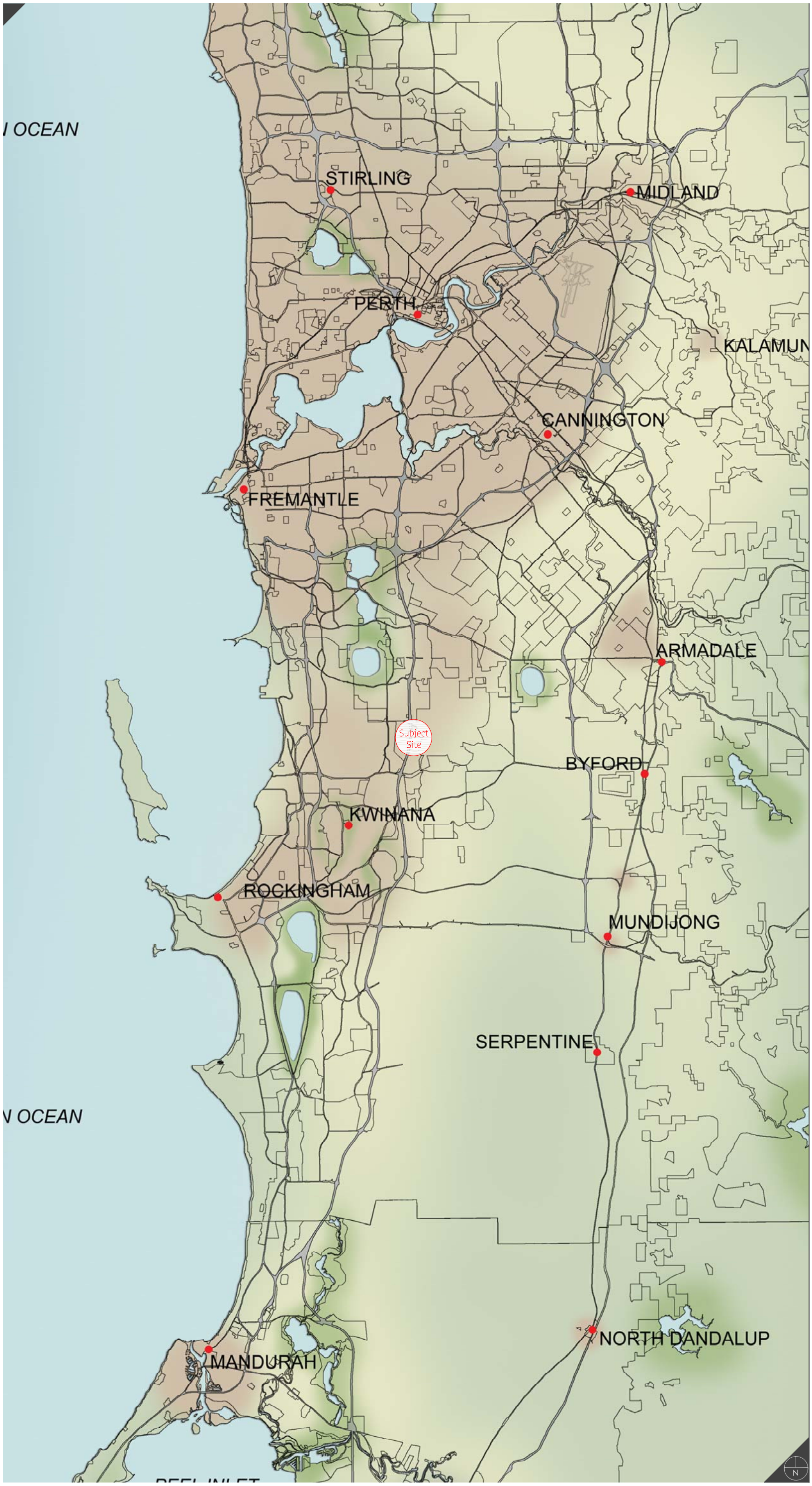

Regional Location

Figure 1

N:\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582A_FIG19A_20140521_HONEYWOOD NORTH (REGIONAL - FIGURE 1).DWG
Kim Trenberth 8 August 2014

REVISIONS

Rev	Date	Drawn
A	2014.05.21	M. Winfield

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Designer:	R. Cumming
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Planning Design Delivery

LEGEND

Wandi North Structure Plan Area

Local Location

Figure 2

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Kim Trenberth 8 August 2014

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B	2014.08.08	K. Trenberth

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Map supplied by Street Smart

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Planning Design Delivery

LEGEND

- Area the subject of the major change (not including Investigation Areas 1 and 2)

0 50 100 Metres

REVISIONS

Rev	Date	Drawn
A	2014.05.21	M. Winfield
B	2014.08.08	K. Trenberth
C	2015.01.16	M. Sullivan

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Projection:	PCG94
Plan ID:	4582A-FIG-21-C

Aerial Photo Captured and Supplied by Nearmap

Aerial/Site Plan

Figure 3

\\GRA-PER-DC1\DATA\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582A_FIG21C_20150116_HONEYWOOD NORTH (SITE AERIAL - FIGURE 3).DWG
Matt Sullivan 16 January 2015

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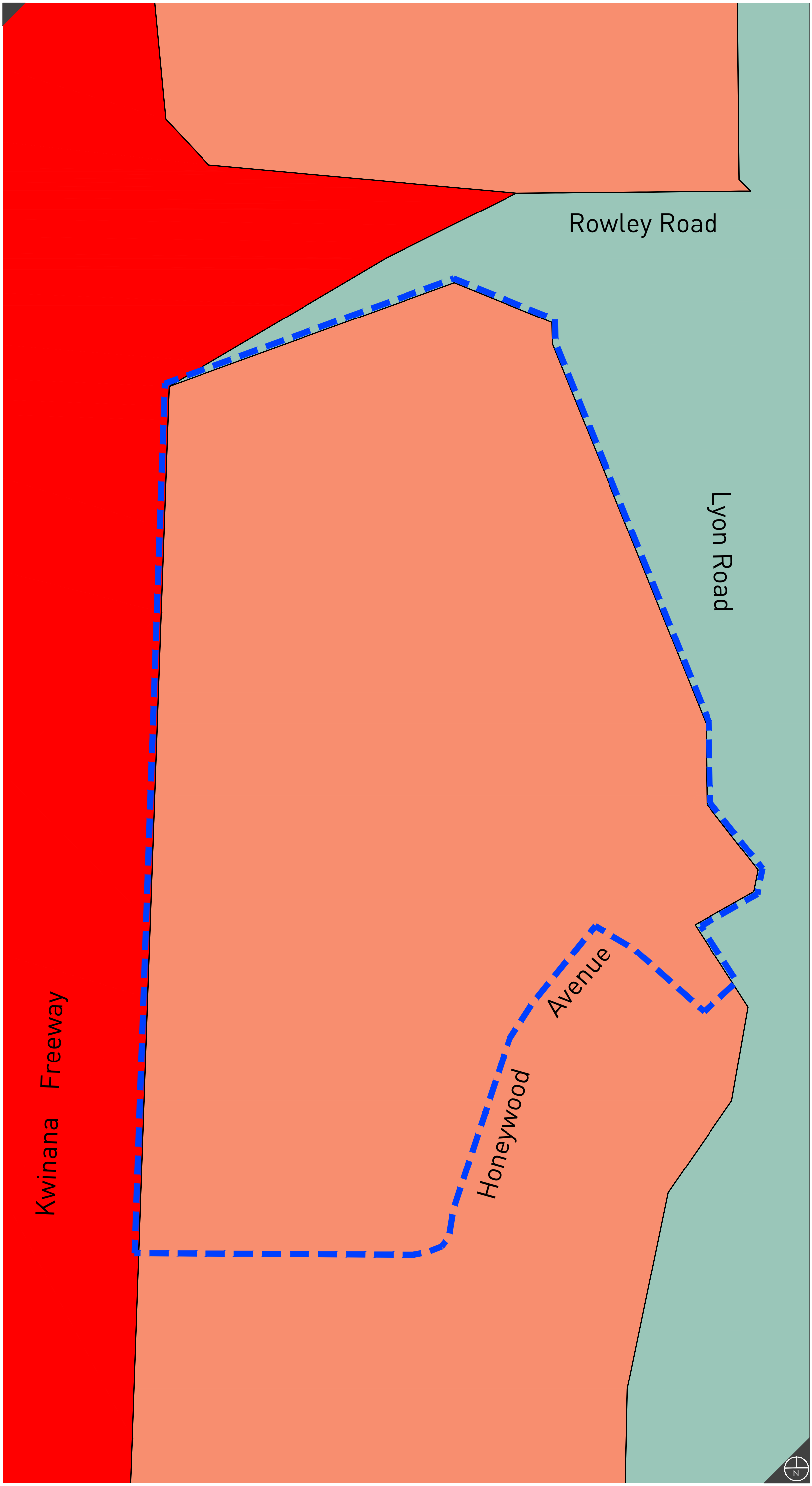

Metropolitan Region Scheme

Figure 4

Planning Design Delivery

LEGEND

- Area the subject of the major change (not including Investigation Area 2)

RESERVED LANDS

- Primary Regional Roads

ZONES

- Urban
- Urban Deferred
- Rural - Water Protection

0 50 100 Metres

REVISIONS

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B	2014.08.08	K. Trenberth
C	2015.01.16	M. Sullivan

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Job Ref:	4582A
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Client:	Satterley
Designer:	R. Cumming
Drawn:	M. Winfield
Projection:	PCG94
Plan ID:	4582A-FIG-22-C

Zoning supplied by WAPC

\\GRA-PER-DC1\DATA\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582A_FIG22C_20150116_HONEYWOOD NORTH (MRS - FIGURE 4).DWG
Matt Sullivan 16 January 2015

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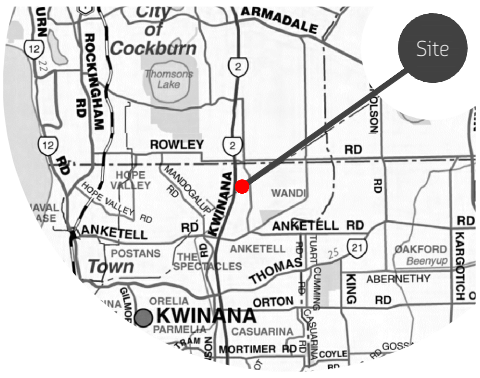

LEGEND

Area the subject of the major change (not including Investigation Areas 1 and 2)

METROPOLITAN REGION SCHEME RESERVES

Primary Regional Roads

ZONES

Rural Water Resource

Special Rural

OTHER

Local Government Boundary

Scheme Boundary

Development Contribution Area

Area of Landscape Protection

SR16 Special Rural Area

DP17 Development Plans

Rowley Road

Lyon Road

Kwinana Freeway

0 50 100 Metres

REVISIONS

Rev	Date	Drawn
A	2014.05.21	M. Winfield
B	2014.08.08	K. Trenberth
C	2015.01.16	M. Sullivan

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Scale:	1:2000 @ A3
Client:	Satterley
Designer:	R. Cumming
Drawn:	M. Winfield
Projection:	PCG94
Plan ID:	4582C-FIG-23-C

Zoning supplied by WAPC

Town Planning Scheme No.2

Figure 5

\\GRA-PER-DC1\DATA\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582A_FIG23C_20150116_HONEYWOOD NORTH (TPS - FIGURE 5).DWG
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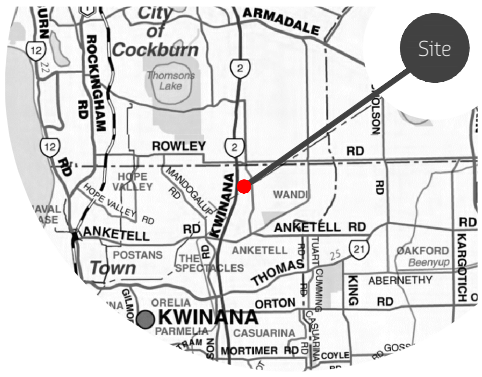

Wandi North Local Structure Plan – Public Open Space Schedule			
Site Area (Local Structure Plan boundary)			97.5 ha
Less			
CCW 16	4.7 ha		
CCW 20	11.7 ha		
Total		**16.4 ha**	
Net Site Area			81.2 ha
Deductions			
Primary School (Investigation Area – may be subject to change)	4.2 ha		
Peel Main Drain (within LSP boundary)	0.7 ha		
Gas Pipeline (easement within LSP boundary)	1.8 ha		
Total		6.8 ha	
Gross Subdivisible Area			**74.4 ha**
POS @10%			7.4 ha
Public Open Space Contribution			
May comprise: - Min 80% unrestricted POS - Min 20% restricted use POS		 6.0 ha 1.5 ha	
Total Required POS			**7.4 ha**

POS Reference Number	**Unrestricted Urban POS sites (m^2)**	**Restricted Urban POS sites (m^2)**
2	2,054	0
4	1,386.6	0
5	1,973.0	2,065.0
6A	641.9	0
6C	1,329.6	2,248.1
7	2,392.1	5,184.1
8	4,913.3	2,902.6
9	6,591.3	10,681.9
10	2,463.3	164.9
11 (adjacent to easement)	2,429.7	0
12A (adjacent to easement)	1,935.3	0
12B (adjacent to easement)	2,436.7	0
13	1,212.4	997.2
14	4,716.6	2,955.8
15	11,213.9	0
16	1,312.3	18,707.7
20	2,379.3	20,786.2
21 (by others)	13,027	742.9
Community Centre	3,064.7	0
Total	**67,472.8 m^2** **(6.7 ha)**	**67,436.3 m^2** **(6.7 ha)**

Additional Public Open Space (for noting – Rural Water Protection Zone)	**Unrestricted POS sites (m^2)**	**Restricted POS sites (m^2)**
Local Playing Fields (POS 22) – final size and configuration subject to investigation:		
- 22A	2,132.6	0
- 22B	40,886.3	0
- 22C	20,968.5	0
CCW 6 (minus Peel Main Drain)	0	72,259.9
6A	6,196.8	16,915
6B	354.4	15,653.8
10	3,547.6	0
4	1,389.9	0
Total for noting	75,476.0 m^2 (7.5 ha)	104,828.7 m^2 (10.5 ha)
Total Combined POS Provision	**142,948.8m^2** **(14.3 ha)**	**172,265.0 m^2** **(17.2 ha)**

REVISIONS

Rev	Date	Drawn
A	2013.07.15	K. Trenberth
B	2013.12.03	K. Trenberth
C	2014.07.17	K. Trenberth
D	2014.08.08	K. Trenberth

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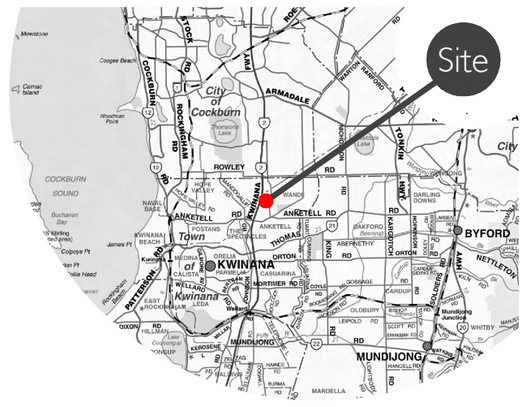
Client:	Satterley
Designer:	R. Cumming
Drawn:	K. Trenberth
Projection:	N.A.
Plan ID:	4582C-FIG-16-D

Table: 4582B_14July01_POS Schedule.docx

Public Open Space Schedule

Figure 6

Planning Design Delivery



LEGEND

- Local Structure Plan Boundary
- Community Facility
- Restricted POS
- Restricted POS (RWP zone)
- Unrestricted POS
- Unrestricted POS (RWP zone)
- Restricted POS (Gas Pipeline Easement)
- CCW
- CCW Buffer
- CCW (RWP Zone)
- CCW Outline
- POS Boundary
- (8) POS Reference Numbers
- Peel Main Drain

ROWLEY ROAD
LYON ROAD
KWINANA FREEWAY
HONEYWOOD AVENUE
PEEL MAIN DRAIN
WANDI DRIVE
BODEMAN ROAD
MAGENUP DRIVE
DARLING CHASE
PUBLIC OPEN SPACE
CCW 6
CCW 16
CCW 20
PRIMARY SCHOOL
LOCAL PLAYING FIELDS
DISTRICT OPEN SPACE
CP
2
4
5
6A
6B
6C
7
8
9
10
11
12A
12B
13
14
15
16
20
21
22A
22B
22C

0 125 250 Metres

Public Open Space

\\GRA-PER-DC1\DATA\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582C_FIG08F_20140808_HONEYWOOD NORTH (POS - FIGURE 8).DWG
Matt Sullivan 16 January 2015

Figure 7

REVISIONS

Rev	Date	Drawn
C	2013.11.11	S. Blanchard
D	2014.03.10	M. Sullivan
E	2014.07.17	K. Trenberth
F	2014.08.08	K. Trenberth

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Scale:	1:5000 @ A2
Client:	Satterley
Designer:	R. Cumming
Drawn:	K. Trenberth
Projection:	PCG 94
Plan ID:	4582C-FIG-08-F

Cadastre supplied by McMullen Nolan Surveyors

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Planning Design Delivery

LEGEND

Area the subject of the major change (not including Investigation Areas 1 and 2)

ROWLEY ROAD

LYON ROAD

KWINANA FREEWAY

AVENUE

HONEYWOOD

POS 8004 2036m²

POS 8003 4013m²

0 50 100 Metres

REVISIONS

Rev	Date	Drawn
F	2013.11.11	S.Blanchard
G	2014.03.10	M.Sullivan
H	2014.08.08	K. Trenberth
I	2014.11.12	M. Sullivan

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Drawn:	S.Blanchard
Projection:	PCG94
Plan ID:	4582A-SUB-22-I

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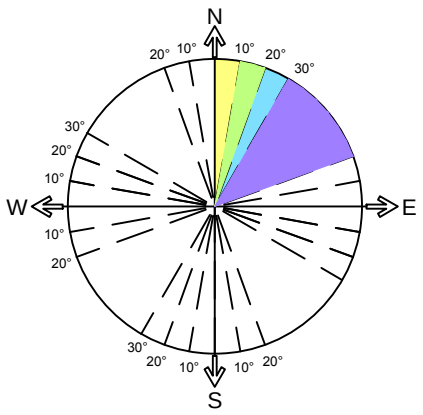
Indicative Plan of Subdivision

Figure 8

Planning Design Delivery

LEGEND

Area the subject of the major change (not including Investigation Areas 1 and 2)



0 125 Metres

REVISIONS

Rev	Date	Drawn
A	2013.07.01	S.Blanchard
B	2013.11.11	S.Blanchard
C	2014.03.10	M.Sullivan
D	2014.08.08	K. Trenberth

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Designer:	R. Cumming
Drawn:	S.Blanchard
Projection:	PCG94
Plan ID:	4582C-FIG-13-D

Cadastre supplied by WaterCorp

Solar Orientation

Figure 9

\\GRA-PER-DC1\DATA\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582C_FIG13D_20140808_HONEYWOOD NORTH (SOLAR ACCESS - FIGURE 10).DWG
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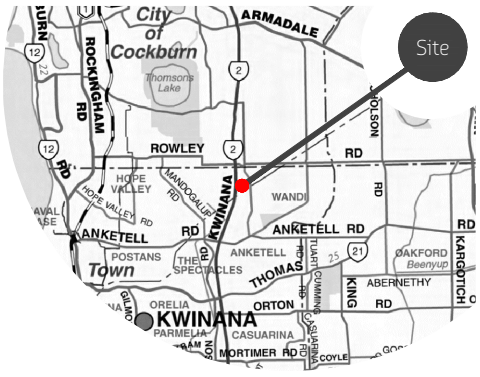

ROWLEY ROAD

LYON ROAD

KWINANA FREEWAY

HONEYWOOD AVENUE

POS

POS

POS

LEGEND

- Area the subject of the major change (not including Investigation Areas 1 and 2)
- Neighbourhood Connector
- Access Street C
- Access Street D
- Laneway

0 125 Metres

Movement Network

Figure 10

REVISIONS

Rev	Date	Drawn
A	2013.06.27	S.Blanchard
B	2013.11.11	S.Blanchard
C	2013.03.10	M.Sullivan
D	2014.08.08	K. Trenberth

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Designer:	R. Cumming
Drawn:	S. Blanchard
Projection:	PCG94
Plan ID:	4582C-FIG-12-D

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\\GRA-PER-DC1\DATA\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582C_FIG12D_20140808_HONEYWOOD NORTH (MOVEMENT NETWORK - FIGURE 11).DWG
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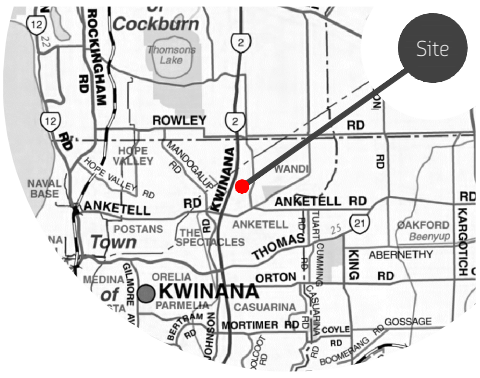
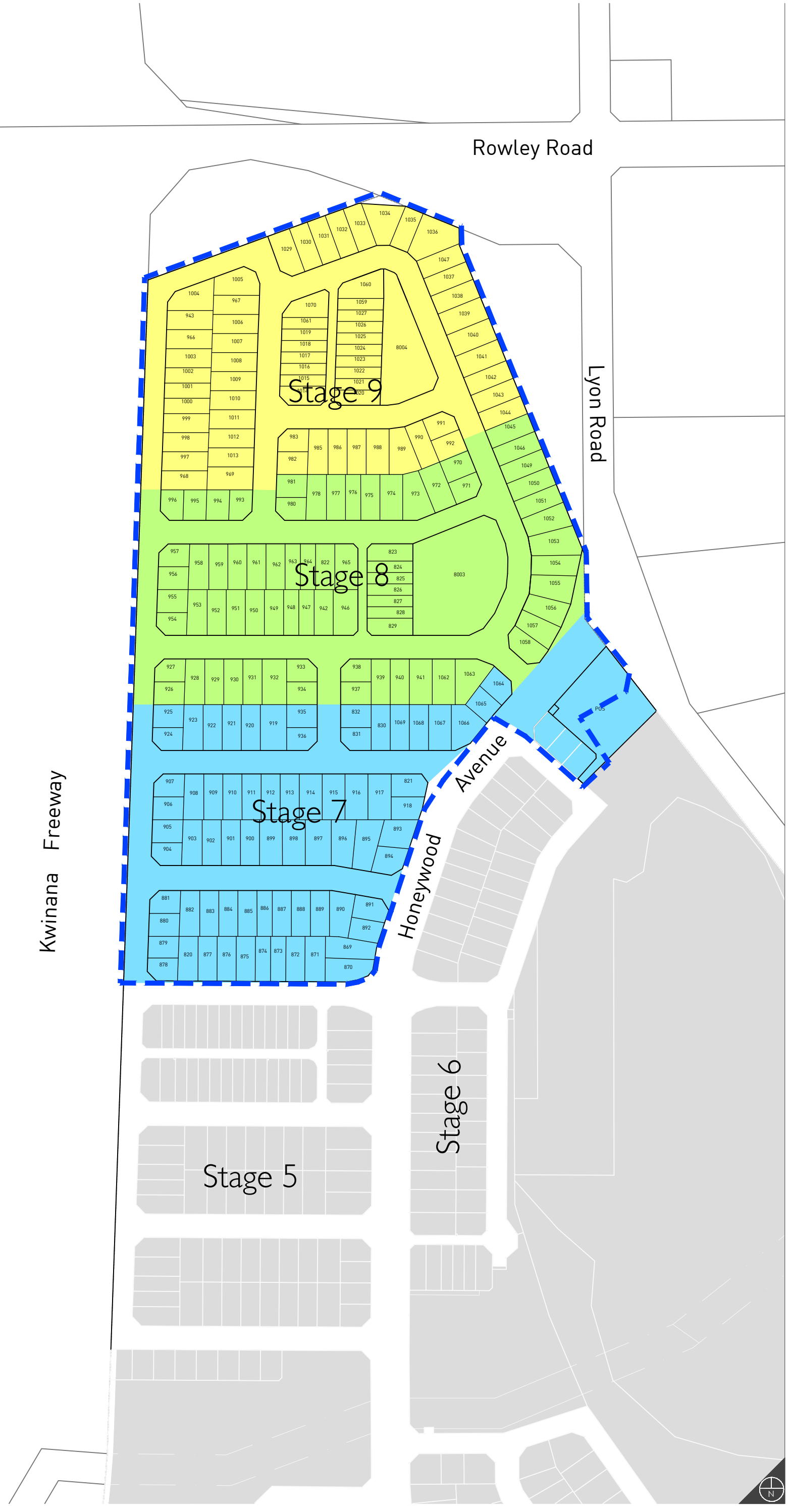


LEGEND

- Area the subject of the major change (not including Investigation Areas 1 and 2)
- Stage 9
- Stage 8
- Stage 7



0 125 Metres

REVISIONS

Rev	Date	Drawn
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D	2014.08.08	K. Trenberth
E	2015.01.16	M. Sullivan

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Scale:	1:2500 @ A3
Client:	Satterley
Designer:	R. Cumming
Drawn:	M. Winfield
Projection:	PCG94
Plan ID:	4582A-FIG-25-E

Cadaste Supplied by The Water Corporation of WA

Indicative Staging

Figure 11

\\GRA-PER-DC1\DATA\TOWN PLANNING\4000-4999\4582A\DRAFTING\A-CAD\4582A_FIG25E_20150116_HONEYWOOD NORTH (STAGING PLAN - FIGURE 12).DWG
Matt Sullivan 16 January 2015

Part Three
TECHNICAL APPENDICES

ROWEGROUP

Appendix 1

CERTIFICATE OF TITLE

ROWEGROUP

REGISTER NUMBER	
683/DP202618	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
5	**12/7/2011**

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

VOLUME **2103** FOLIO **717**

UNDER THE TRANSFER OF LAND ACT 1893

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 683 ON DEPOSITED PLAN 202618

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

WANDI ANKETELL HOLDINGS PTY LTD OF LEVEL 2, 18 BOWMAN STREET, SOUTH PERTH
(T J271364) REGISTERED 3 MAY 2005

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

1. THE LAND THE SUBJECT OF THIS CERTIFICATE OF TITLE EXCLUDES ALL PORTIONS OF THE LOT DESCRIBED ABOVE EXCEPT THAT PORTION SHOWN IN THE SKETCH OF THE SUPERSEDED PAPER VERSION OF THIS TITLE.
2. L537548 MORTGAGE TO AUSTRALIA & NEW ZEALAND BANKING GROUP LTD REGISTERED 24.1.2011.
3. L537549 MORTGAGE TO WANDI ANKETELL LAND FINANCE COMPANY PTY LTD REGISTERED 24.1.2011.
   L537550 TRANSFER OF MORTGAGE L537549 , MORTGAGEE NOW AUSTRALIA AND NEW ZEALAND BANKING GROUP LTD REGISTERED 24.1.2011.
4. L629136 EASEMENT TO WATER CORPORATION FOR ACCESSWAY PURPOSES - SEE SKETCH ON DEPOSITED PLAN 69832 REGISTERED 17.5.2011.

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: 2103-717 (683/DP202618).
PREVIOUS TITLE: 2059-311.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: CITY OF KWINANA.

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF PEEL ESTATE LOT 683 (OR THE PART THEREOF) ON

END OF PAGE 1 - CONTINUED OVER

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		SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 683 ON DEPOSITED PLAN 202618 ON 22-APR-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 2:		THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.
NOTE 3:	M098733	DEPOSITED PLAN 74075 LODGED (INTEREST ONLY)
NOTE 4:	M098736	DEPOSITED PLAN 74032 LODGED (INTEREST ONLY)

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Appendix 2

ENVIRONMENTAL ASSESSMENT REPORT

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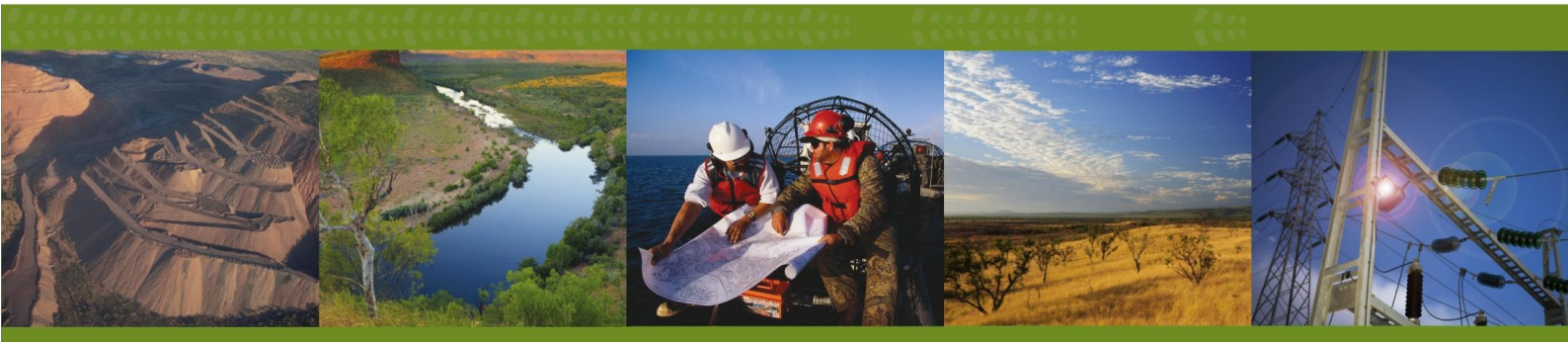

Environmental Assessment Report - Wandi North

Supporting document to the Wandi North Local Structure Plan Amendment

Prepared for
Satterley Property Group
by Strategen

July 2013

STRATEGEN
environmental consultants

Environmental Assessment Report - Wandi North

Supporting document to the Wandi North Local Structure Plan Amendment

Strategen is a trading name of
Strategen Environmental Consultants Pty Ltd
Level 2, 322 Hay Street Subiaco WA
ACN: 056 190 419

July 2013

Disclaimer and Limitation

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In particular, it should be noted that this report is a qualitative assessment only, based on the scope of services defined by the Client, budgetary and time constraints imposed by the Client, the information supplied by the Client (and its agents), and the method consistent with the preceding.

Strategen has not attempted to verify the accuracy or completeness of the information supplied by the Client.

Client: Satterley Property Group

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Draft Report	A	Client review	J Morgan / D Walsh	Electronic	10 June 2013
Final Report	B	For lodgement	J Morgan	Electronic	11 July 2013

Filename: SPG13054_01 R001 RevB - 11 July 2013

Executive summary

This environmental assessment report has been prepared in support of the proposed amendment to the existing Wandi North Local Structure Plan (LSP) (Honeywood). The site comprises a total area of approximately 11.36 ha adjacent to the northern boundary of the existing Honeywood Estate, Wandi.

The purpose of the assessment is to address environmental considerations for the LSP amendment based on all investigations undertaken and technical reports prepared to support the existing LSP (Honeywood) approval. This EAR discusses the following key environmental factors:

- climate
- geology, soils, topography
- hydrology
- acid sulphate soils
- conservation areas
- Aboriginal and European heritage
- contaminated sites
- flora and vegetation
- fauna

The amendment will result in the clearance of 6.07 ha of vegetation, comprising degraded to Very Good condition vegetation. No threatened or priority flora species or vegetation of conservation significance occur within the Amendment area. Vegetation comprises Black cockatoo foraging and other fauna habitat, however it is unlikely that removal of these areas will result in a significant impact to Black cockatoo species or impacts to species that may use the area. An EPBC Act referral has been previously submitted and approved by DSEWPaC and managed accordingly.

To address impacts associated with vegetation removal and associated habitat disturbance, the following key factors require management:

- vegetation
- fauna and habitat
- weed and dieback control
- construction.

Management of key aspects of the amendment will be undertaken in accordance with management plans and measures implemented as part of the amendment, as detailed in Section 4 of this EAR.

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1. Introduction

1.1 Background

Strategen was commissioned by Satterley Property Group (Satterley) to undertake an environmental assessment of the northern portion of the existing Wandi North Local Structure Plan (LSP) (Honeywood), which partially comprises the LSP Amendment area (Amendment area). The Amendment area was not previously included as part of the Honeywood development, therefore an amendment is now required to the existing Wandi North LSP (Honeywood). This environmental assessment report (EAR) supports the proposed amendment to the LSP for submission to the City of Kwinana.

The Amendment area comprises a total area of approximately 11.36 ha adjacent to the Kwinana Freeway in the suburb of Wandi, approximately 25 km south of Perth (Figure 1 and Figure 2). Of this area, 4.16 ha has been previously cleared and 1.13 ha is considered to be completely degraded and dominated by weeds. The proposed development will result in the clearing of the remaining 6.07 ha of vegetation in varying condition.

The (EAR) is prepared to support the Wandi North LSP amendment, investigating the existing environment, the environmental opportunities and constraints associated with the development of the site in accordance with the proposed LSP, including recommended management measures to mitigate impacts.

1.2 Surrounding land use

1.2.1 Existing land use

Prior to development of Honeywood, the area was predominantly vegetated. Land immediately to the east is zoned Special Rural, comprising of privately owned rural residential lots as the primary land use (RPS 2008). To the east of the site the Priority 2 Jandakot Underground Water Pollution Control Area occurs within the Special Rural land. The Priority 2 designation seeks to prevent incompatible land uses, while allowing land uses considered low risk of impacting on groundwater (RPS 2008). The Kwinana Freeway occurs to the west of the site.

The existing LSP (Honeywood) area is subject to the City of Kwinana Town Planning Scheme No. 2 which was adopted by the Western Australian Planning Commission in 1992 and 1998 respectively. The Amendment was previously part of a transit orientated development due to its location in proximity to the then proposed Wandi railway station. Following a decision not to locate the railway station in the area, an amendment has now been sought to facilitate subdivision of the Amendment area.

The Amendment area comprises vacant land zoned as ‘Urban’ and ‘Development’.

1.2.2 Future land use

Development of the Honeywood project is currently underway, with construction activities currently taking place.

Satterley are proposing to develop the site as the northern extension of the existing LSP (Honeywood) area. The Amendment area comprises 11.36 ha of housing and public open space (Figure 2). The amendment will represent an extension of the LSP, with the aim of creating an attractive, affordable and self-sustaining community.

Figure 1 Regional location

Scale 1:150,000 at A4

0 1 2 3 4 5 km

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 11/07/2013
Author: JCrute
Source: Topography: Geoscience Australia 2011.

Legend

- Town
- Locations
- Major road
- Minor road
- Major river
- Amendment area boundary

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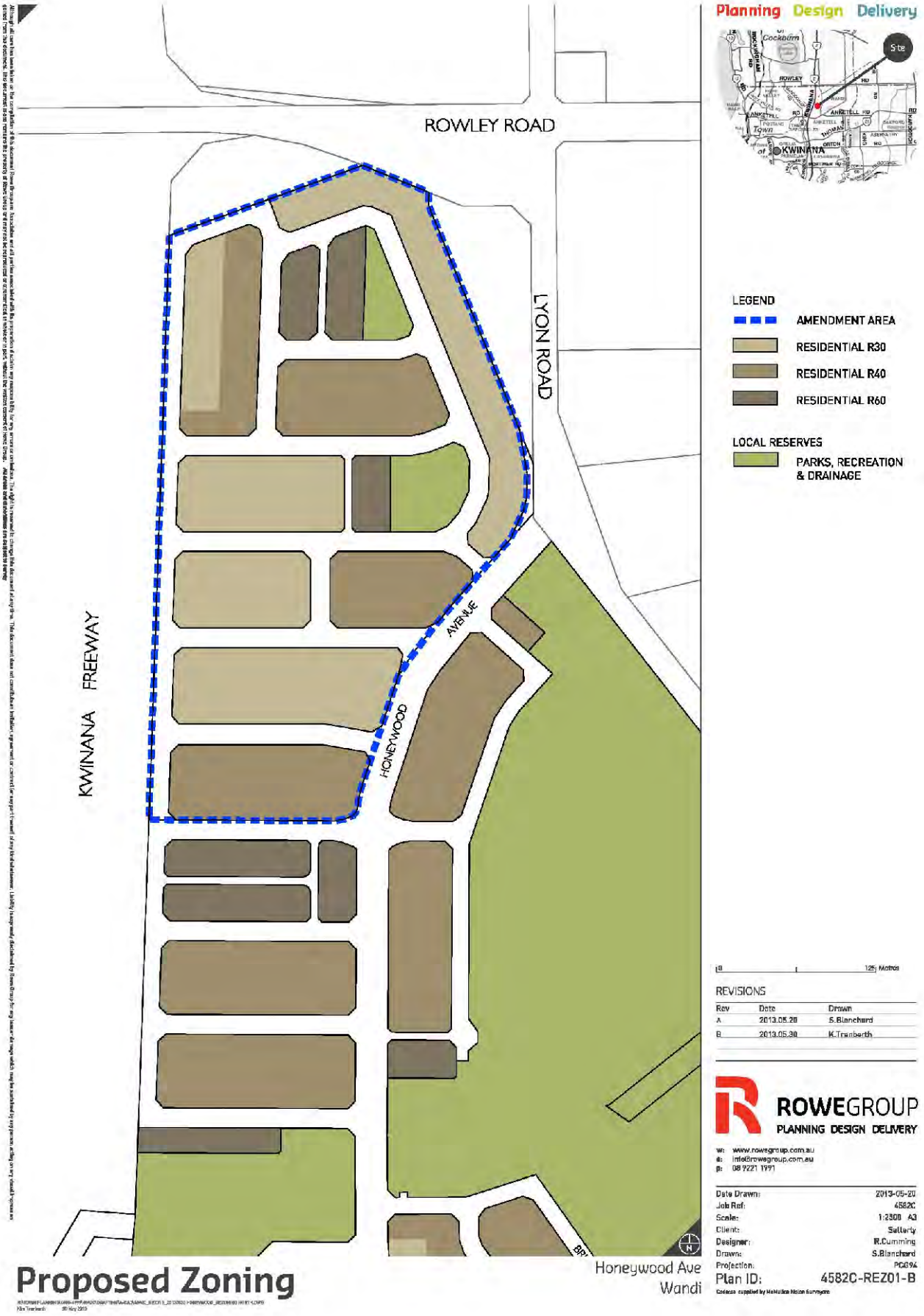

Figure 2 Local Structure Plan area

Date: 11/07/2013
Author: JCrute
Source:

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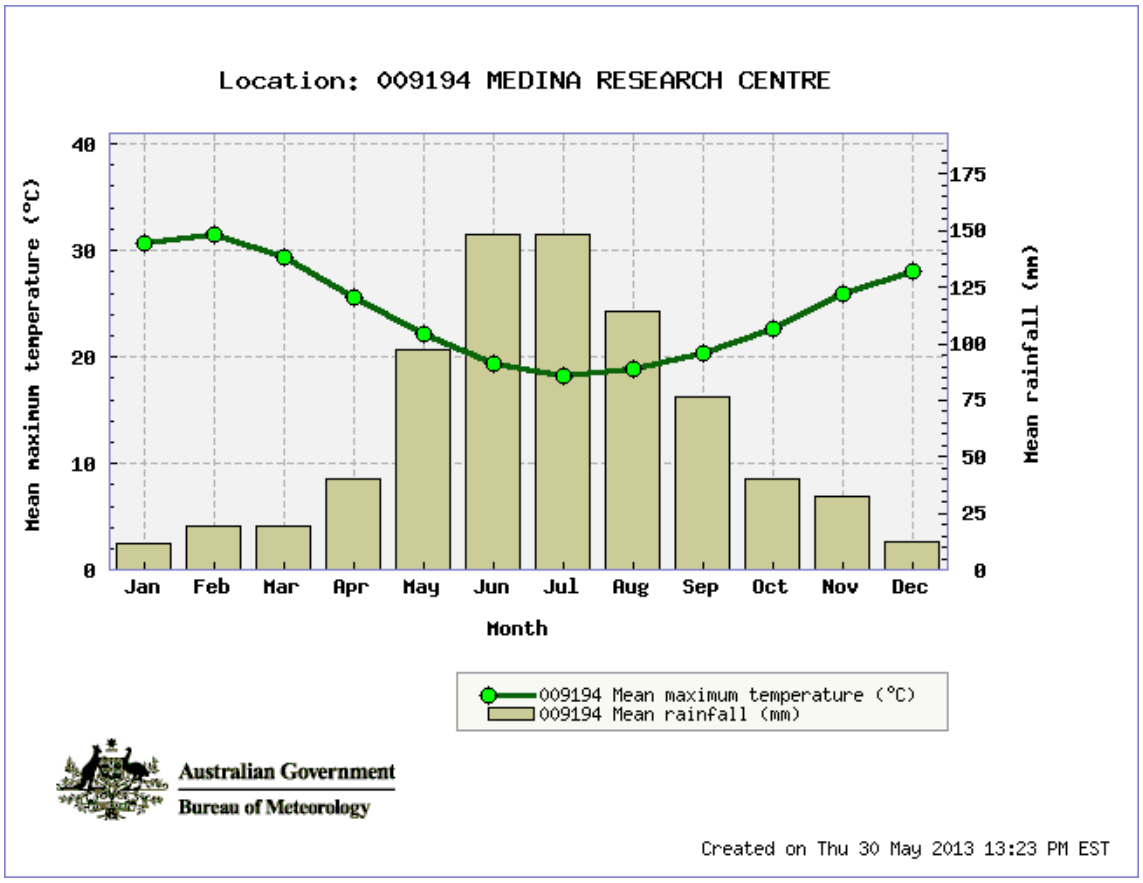
2. Existing environment

2.1 Climate

The Amendment area exhibits a Mediterranean climate, characterised by hot dry summers and mild wet winters. The closest meteorological weather station to the site is the Medina Research Centre located approximately 8.1 km away (BoM 2013). Mean maximum temperature ranges from 18.3ºC in July and 31.5ºC in February (BoM 2013).

Annual rainfall of the site accounting records from 1983 to 2012, totalled 759.7 mm, with a mean maximum rainfall of 148.3 mm occurring in June and a mean minimum rainfall of 12.1 mm occurring in January (BoM 2013). Highest rainfall is received over June to August, with the lowest rainfall received from December through to March (BoM 2013). Figure 3 identifies mean monthly maximum temperatures and rainfall from the site.



Source: BoM 2013

Figure 3 Mean monthly maximum temperatures and mean rainfall for Wandi

2.2 Geology, soils and topography

The Amendment area is located within the interface between the Bassendean and Spearwood dune systems (RPS 2008). The geological units found at the project area are therefore associated with two dune systems: older Spearwood dunes and newer sandy Bassendean dunes.

The Amendment area is characterised by Bassendean sands described as very light at the surface, yellow at depth, fine to medium grained, sub-rounded quarts moderately well sorted of aeolin origin (RPS 2008).

The topography of the site is mostly low and gently undulating, with local relief from 14 mAHD up to 38 m AHD on the eastern border along Lyon Road (RPS 2008).

2.3 Hydrology

2.3.1 Groundwater

Interrogation of the Perth Groundwater Atlas undertaken by RPS (2008) indicates that the groundwater table lies between 21 mAHD in the eastern and 13 mAHD in the western part of the study area, which corresponds with groundwater levels monitored at 15 metres below ground level (mbgl) in the east and as little as 0.3 mbgl in the west (RPS 2008). Groundwater levels are anticipated to be consistent with those identified to support the original LPS documentation.

Hydrographs from nearby monitoring bores indicate that groundwater levels have declined over the last decade (RPS 2008).

2.3.2 Surface water

The Amendment area incorporates areas classified by the DEC as Multiple Use (MU) management category wetland and a portion of area mapped as Resource Enhancement (RE) category. There are no RAMSAR or Conservation Category Wetlands located within the LSP area, this area mapped as RE is however heavily degraded and predominately cleared. DEC wetland mapping across the site is shown in Figure 4. Wetlands mapped in the amendment area are not required to be retained following outcomes of earlier agreements with DEC that relate to the initial LSP development.

An Urban Water Management Plan (UWMP) and associated monitoring is currently being prepared and undertaken for the whole development and will be subject to review separately to the LSP process.

2.4 Acid sulphate soils

Acid sulphate soils (ASS) are naturally occurring soils and sediments that contain sulphide minerals (predominately pyrite) (RPS 2008). If these soils are drained, excavated or exposed by lowering of the watertable, the sulphides may react with oxygen to form sulphuric acid, which may result in contamination of the receiving environment (RPS 2008).

The DEC database identifies the site as having a Moderate and High ASS risk. The north-western boundary, extending into the middle of the proposed amendment exhibits a high risk of acid sulphate soils occurring. The balance of the area exhibits a moderate risk, as presented in Figure 5.

Based on the DEC database, there is likely to be a high risk of disturbing potential or actual ASS during ground intrusive earthworks in low lying areas, as the majority of this area is 1 m below the watertable (RPS 2008).

2.5 Conservation areas

Approximately 1,500 ha of regionally significant vegetation was identified in Bush Forever within 5 km of the project area, however no bushland within the LSP was identified as part of the Bush Forever conservation process.

The Mandogalup Road Bushland Bush Forever site (Bush Forever Site 268) is located approximately 1200 m to the west of the site. Bush Forever sites 269, 270, 347, 391 and 392 occur within 1800 m of the site, comprising 1698 ha of protected bushland habitat, including both wetland and upland habitat (RPS 2008).

Within the existing LSP (Honeywood) area, three wetland areas have been reserved and are subject to additional management controls including use of development buffers to ensure consistency with DEC and Environmental Protection Authority (EPA) guidance for the protection, management and enhancement (where possible) of wetlands. Wetlands mapped in the amendment area are not required to be retained following outcomes of earlier agreements with DEC that relate to the initial LSP (Honeywood) area.

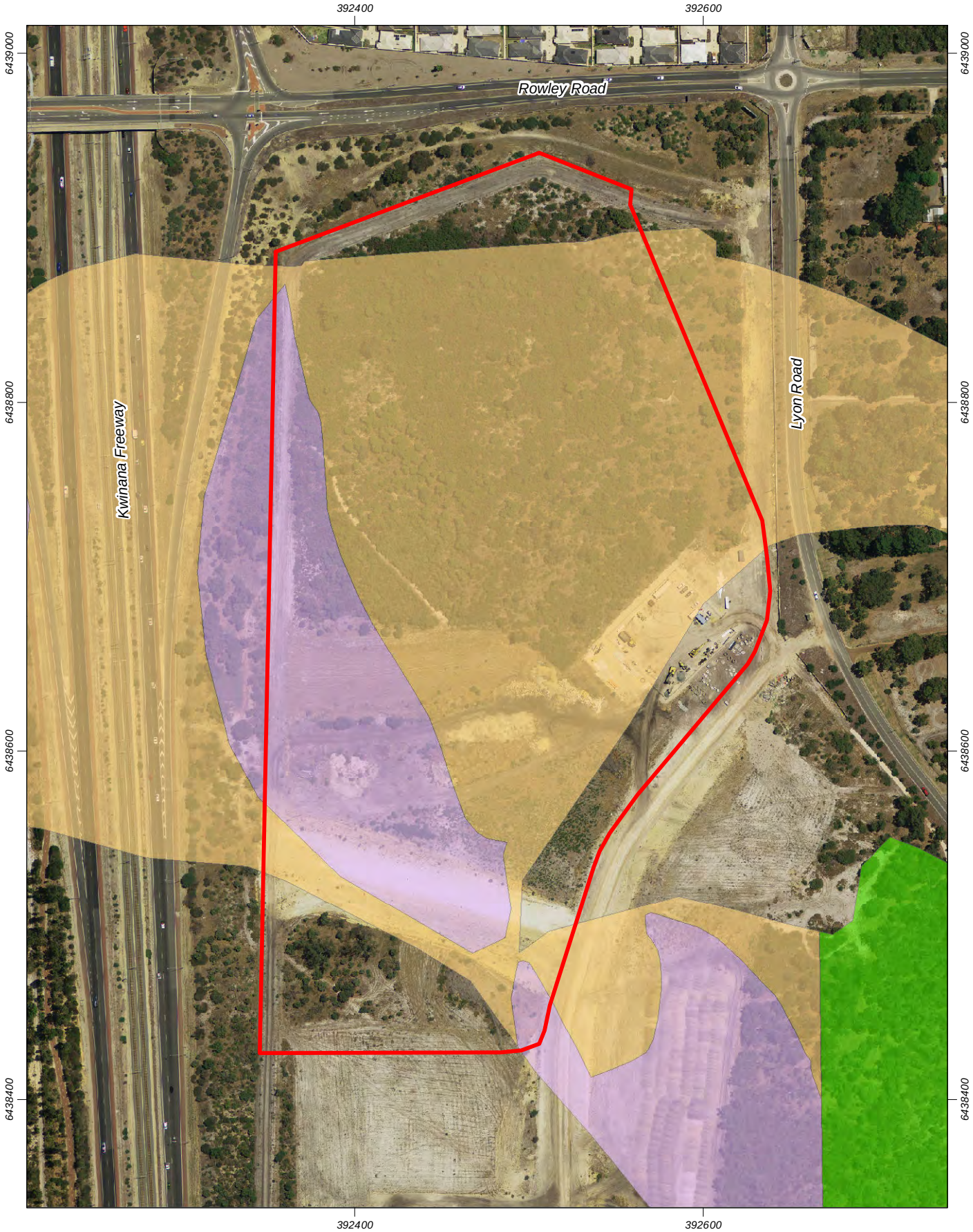


Figure 4 Proximity of geomorphic wetlands to the Local Structure Plan area

Scale 1:3,000 at A4

0 20 40 60 80 100 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 11/07/2013
Author: JCrute
Source: Aerial image: Landgate, flown 29/01/2013, downloaded 30/05/2013. Wetlands: DEC 2012.

Legend

- Amendment area boundary

Wetland evaluation

- Conservation
- Resource Enhancement
- Multiple Use

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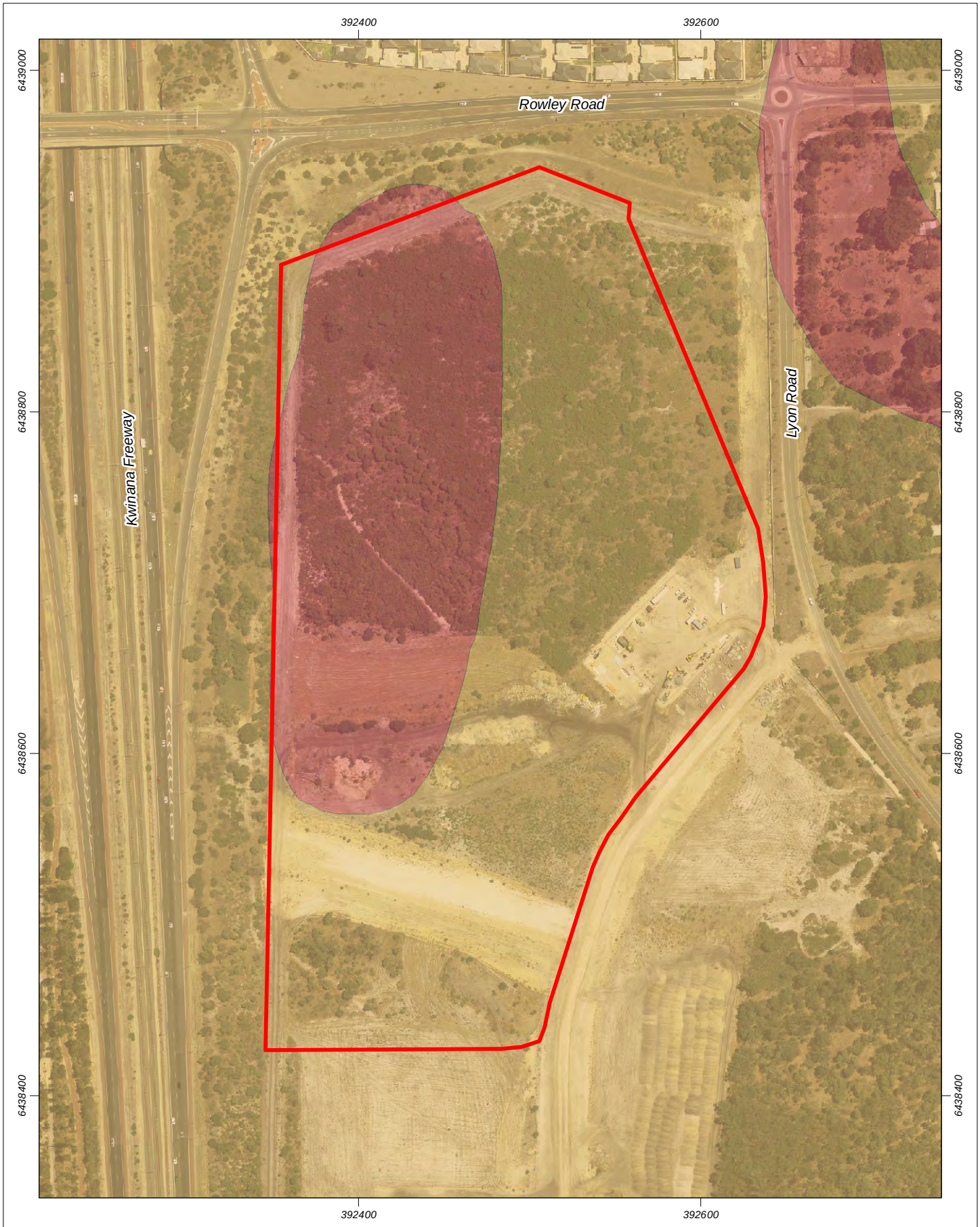

Figure 5 Acid sulphate soil risk mapping

Scale 1:3,000 at A4

0 20 40 60 80 100 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 11/07/2013
Author: JCrute
Source: Aerial image: Landgate, flown 29/01/2013, downloaded 30/05/2013. Soils: SLIP database 2012.

Legend

Amendment area boundary

Acid Sulfate Soil Risk

High to moderate

Moderate to low

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2.6 Aboriginal heritage

The Department of Indigenous affairs (DIA) database indicates no listed Aboriginal heritage sites occur within in the development area (DIA 2013). The closest listed site of interest is Mandogalup Swamp/Spectacles site, identified as mythological site and also a hunting place and water source (RPS 2008). The heritage site occurs within the existing LSP (Honeywood) area.

2.7 European history

A number of heritage places occur within the vicinity of the Amendment area, however the Heritage Council of Western Australia database indicates no registered heritage sites occur within the LSP area (Heritage Council of WA 2013).

2.8 Contaminated sites database search

A preliminary site investigation (PSI) was undertaken across the stage 1 area (RPS 2008). The investigation identified previous land use and potential areas of contamination across the site. Results of the PSI indicate that the Stage 1 area was highly unlikely to be contaminated as a result of previous activities (RPS 2008).

2.9 Flora and vegetation

An assessment of flora and vegetation was undertaken across the Amendment area by RPS Bowman Bishaw Gorham (2007). Unless stated otherwise, this environmental assessment report relates specifically to the northern portion comprising the Amendment area, as detailed in Figure 2.

2.9.1 Vegetation complexes

Mapping undertaken by Heddle (1980) indicates vegetation within the existing LSP (Honeywood) area is considered to be representative of the Bassendean Vegetation Complex – Central and South and the Herdsman Vegetation Complex. Vegetation complexes can be broadly defined as

1. Bassendean Vegetation Complex – Central and South: woodland of jarrah-sheoak-banksia to a low woodland of *Melaleuca* species, to sedgelands in low-lying depressions and swamps.
2. Herdsman Vegetation Complex: sedgelands and fringing woodland of *Eucalyptus rudis* – *Melaleuca* spp.

2.9.2 Vegetation units

Vegetation units across the Amendment area can be broadly categorised into five groups:

1. *Eucalyptus rudis* and/or paperbark woodlands and forests
2. *Banksia* low open woodlands, woodlands open forest
3. *Kunzea glabrescens* scrubs and heaths
4. Weeds with few native species
5. Cleared land

Vegetation units of the Amendment area, their condition rating and position in the landscape are presented in Table 1 and Figure 6.

Table 1 Vegetation units, condition and position of the Amendment area

Reference	Vegetation type/description	Position in the landscape	Condition rating
BLOW	*Banksia attenuata – B. Menziesii* low open woodland, with few *Eucalyptus marginata* trees, understories mainly dominated by aliens (introduced species) but with *Xanthorrhoea preissii*, *Jacksonia furcellata* and *Stirlingia latifolia* shrubs; burnt ca. 2004.	Upland	Completely degraded to good
ErOF-W/MrpLC-OF	*Eucalyptus rudis* Open Forest to Woodland and *Melaleuca rhaphiophylla – M. Preissiana* Low closed forest to low open forest, with *Melaleuca teretifolia*, over understories varying from largely native to largely weedy, regenerating after fire, ca. 2004	Wetland	Very good to degraded
KgTO(Mp)	*Kunzea glabrescens* regenerating to tall open scrub after fire ca. 2004; over *Lepidosperma longitudinal* and *Dielsia stenostachya* sedgelands with enclaves of *Melaleuca preissiana* low open forest; also *Pultenaea reticulate*, *Astartea? Scoparia*, *Dasypogon bromeliifolius*, *Phlebocarya ciliate*, *Eucilopsis linearis*, some other native, including a few *Eucalyptus rudis* trees, and weeds	Dampland	Completely degraded to good
Weeds & cleared areas			Completely degraded

2.9.3 Vegetation condition

The vegetation condition of the Amendment area is predominately completely degraded to good, according to the Bush Forever Scale (Government of Western Australia 2000). Vegetation condition across the Amendment area is presented in Figure 6. Approximately 1,500 ha of regionally significant vegetation was identified in Bush Forever within a 5 km of the project area, however the current site was not nominated as containing regionally significant vegetation worthy of protection as a Bush Forever reserve (RPS 2008).

Glevan Consulting was commissioned by Strategen to conduct an assessment of remnant vegetation within the existing LSP (Honeywood) area for the presence of *Phytophthora cinnamomi* (Glevan 2010). The Amendment area was identified as being 'Uninterpretable' defined as 'areas where indicator plant species are absent or too few to determine the presence of absence of disease caused by *P. Cinnamomi,* no samples were taken in these areas (Glevan 2010).

2.9.4 Vegetation significance

No TECs or PECs were recorded in the Amendment area (RPS 2008). No part of the Amendment area is included within any Bush Forever reserves.

2.9.5 Conservation significant flora species

No Declared Rare Flora (DRF) species or Priority species were recorded in the Amendment area.

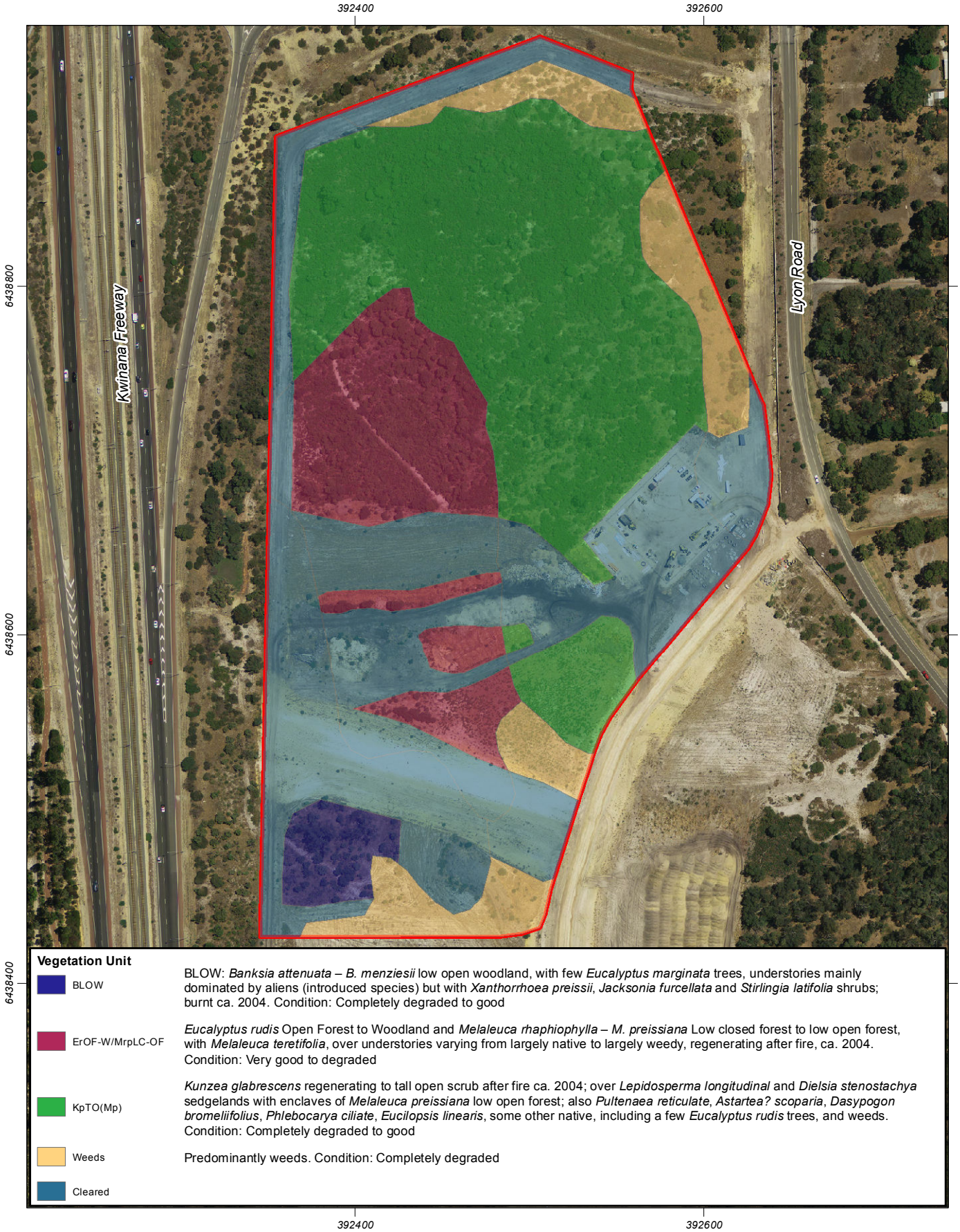

Figure 6 Vegetation units and condition

Scale 1:3,000 at A4

0 20 40 60 80 100 m

N

Legend

Amendment area boundary

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 11/07/2013

Author: JCrute

Source: Aerial image: Landgate, flown 29/01/2013, downloaded 30/05/2013. Vegetation: RPS 2007, modified.

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2.10 Fauna

A Level 1 fauna survey was undertaken in 2007 by Western Wildlife across the existing LSP (Honeywood) area (Western Wildlife 2007). The existing LSP (Honeywood) area was assessed as likely to support a range of fauna species typical of Banksia/Eucalypt woodland on the Swan Coastal Plain (RPS 2008).

Species occurring and with the potential to occur in the existing LSP (Honeywood) area were assessed based on results of the Department of Sustainability Environment Water Population and Communities (DSEWPaC) and DEC database searches and ranked in accordance with the following levels of significance:

1. Conservation significance 1: species listed under State or Commonwealth Acts.
2. Conservation significance 2: species not listed under State or Commonwealth Acts, but listed in publications on threatened fauna or as Priority species by DEC.
3. Conservation significance 3: Species not listed under State or Commonwealth Acts or in publications on threatened fauna or as Priority species by DEC, but considered of local significance because of their pattern of distribution.

Based on habitat type, the site may support one reptile and six birds of Conservation Significance 1, three reptiles, one bird and four mammals of Conservation Significance 2 and twenty birds and one mammal of Conservation Significance 3 (RPS 2008). A summary of Conservation Significance 1 species likely to occur and Migratory species listed under the EPBC Act and their likelihood of occurrence in the existing LSP (Honeywood) area is summarised in the following sections.

2.10.1 Black Cockatoos

Black cockatoos, including Carnaby's Black-Cockatoo (*Calyptorhyncus latirostris;* EPBC Act: Endangered) and the Forest Red-Tailed Black-Cockatoo (*Calyptorhynchus banksii naso*; EPBC Act: Vulnerable) are considered likely to forage on species of *Eucalyptus* and *Banksia* in the existing LSP (Honeywood) area. They may also potentially utilise some of the larger *Eucalyptus* trees within the site for roosting; however, the site is not considered to have significant breeding potential due to the degraded condition of much of the vegetation within the project area (RPS 2008).

The area of potential black cockatoo habitat within the Amendment area was determined based on:

- vegetation type as determined by vegetation mapping conducted by RPS BBG (2007)
- vegetation condition as mapped initially by RPS BBG (2007) and then re-evaluated by Strategen in March 2010
- the presence or absence of potential feeding and roosting trees as determined by a targeted site inspection undertaken by Strategen.

An EPBC Act referral was submitted and approval granted subject to conditions in 2010. The EPBC Act Referral and associated approval incorporate the whole LSP site, including the Amendment area. Additional information relevant to the management of the site is presented in Section 4.

Presence of and likely impact on EPBC Act listed species is discussed further in the EPBC Act Referral and associated approval.

2.10.2 Carpet Python

The Carpet Python could potentially occur in the area; however the species may be locally extinct. The existing LSP (Honeywood) area is not considered optimal Carpet Python habitat and no evidence has been found that a python population exists (RPS 2008).

2.10.3 Peregrine Falcon

The Peregrine Falcon is listed as 'other specially protected fauna' under Schedule 4 of the *Wildlife Conservation Act 1954* (WC Act). The Peregrine Falcon may utilise the site however if present it is likely that the site would form part of a much larger home range for a pair of birds (RPS 2008). No nesting birds were recorded on site (RPS 2008).

2.10.4 Migratory species

A search of the EPBC Act Protected Matters Database identified five EPBC Act listed migratory species that could potentially occur in the existing LSP (Honeywood) area (Strategen 2010); including:

- *Haliaeetus leucogaster* (White-bellied Sea-Eagle)
- *Merops ornatus* (Rainbow bee-eater)
- *Ardea alba* (Great Egret)
- *Ardea ibis* (Cattle Egret)
- *Apus pacificus* (Fork-Tailed Swift).

Based on the habitat present, the White-bellied Sea-Eagle is likely to be an infrequent visitor to the local area for foraging but unlikely to utilise the wetlands within the project area for breeding (Western Wildlife 2007).

The Cattle Egret and Great Egret have not been recorded on site but may potentially frequent the site in association with the seasonally inundated wetlands. As these wetland areas and surrounding fringing vegetation will be retained for conservation on site and given their extensive distribution across Australia and other continents, these species are not specifically considered further here. General descriptions of management of wetland areas for the purpose of migratory bird protection are however described.

The Fork-Tailed Swift is a largely aerial species and the development is unlikely to have any significance to this species.

The Rainbow Bee-eater was recorded on site and occurs across much of mainland Australia and several near-shore islands, as well as several other areas of the world, including eastern Indonesia, Papua New Guinea, the Bismarck Archipelago south-western Micronesia, Saipan, and the Northern Mariana Islands (Strategen 2010).

The Rainbow Bee-eater could potentially construct nests on the ground in the project area. Thus, the proposed action could be considered to reduce the amount of potential breeding habitat for this species; however the extent of this impact is negligible given the widespread distribution of the species. In addition, no wetland areas are present within the Amendment area and sufficient wetland areas will be maintained as part of the existing LSP (Honeywood) area.

The presence of and likely impact on EPBC Act listed species is discussed further in the EPBC Act Referral and associated approval.

3. Key environmental approvals and policies

3.1 Environment Protection and Biodiversity Conservation Act 1999

DSEWPaC recommends that proposed urban developments in areas which contain nationally listed threatened species or ecological communities (matters of national environmental significance [MNES]) are likely to be significant under the EPBC Act and should be referred to the Minister.

The Amendment area was included as part of the EPBC Act Referral which was submitted and approved with conditions. The proposed amendment to the existing LSP (Honeywood) area will be implemented in accordance with conditions of the EPBC 2010/5476.

3.2 Planning context

The Amendment area was not included in the initial LSP (Honeywood) area pending a decision on the transit orientated development (TOD) classification associated with the location of the proposed Wandi railway station.

The Approval of the existing LSP (Honeywood) area for Wandi North was granted by the WAPC in December 2009.

Following this approval a decision was made to locate the railway station at an alternatively location. An amendment to the existing LSP (Honeywood) area has therefore been sought to facilitate a standard subdivision within this area rather than a TOD, as well as including additional land to the north as part of the Amendment area.

4. Environmental impacts and management

4.1 Introduction

The major impacts associated with the amendment include vegetation clearing and associated habitat disturbance. No significant vegetation communities or threatened or priority flora species occur within the Amendment area, it is therefore considered that no significant impacts to vegetation will occur as a result of clearing. Vegetation of the Amendment area may provide some foraging habitat for EPBC Act protected Black cockatoo species, however due to the presence of extensive reserved habitat within the Wandi area, the removal of 11.36 ha is unlikely to significantly reduce foraging habitat for Black cockatoo species. The Amendment area is subject to conditions of EPBC Act approval (EPBC 2010/5476) and will be managed accordingly. In addition, significant fauna including the Peregrine Falcon and Carpet Python are unlikely to rely on the Amendment area.

Environmental impacts associated with clearing of the Amendment area can be readily managed at the subdivision level, through the implementation of a range of measures consistent with those implemented for the existing LSP (Honeywood) area.

Based on management measures implemented for the existing LSP (Honeywood) area, it is recommended that the Satterley implements the following plans, consistent with the existing LSP (Honeywood) area are implemented:

- Vegetation Management Plan
- Fauna Management Plan
- Weed and Dieback Management Plan

In addition, it is recommended that construction management measures consistent with those undertaken in the existing LSP (Honeywood) area are implemented, as detailed in Section 4.1.4.

4.1.1 Fauna and habitat protection

Satterley has committed to on-site retention of fauna habitat within POS and associated wetland areas in the balance of the existing LSP (Honeywood). In addition, Satterley has contributed funds to the DEC for the offset of Black Cockatoo habitat lost as a result of vegetation clearance associated with the existing LSP (Honeywood) as part of EPBC Act approval (EPBC 2010/5476). Satterley has therefore fulfilled their offset and associated management conditions for the Amendment area and no additional requirements under the EPBC Act are necessary.

4.1.2 Vegetation Management Plan

A Vegetation Management Plan (VMP) was developed for the existing LSP (Honeywood) area as part of the original subdivision approval. The aim of the VMP was to identify areas of POS and road reserves within the development area; identifying areas to be treated, how they will be treated and how they will be managed during and post construction with an aim to enhance potential Carnaby's Black Cockatoo habitat.

The VMP was prepared to support the EPBC Act referral for the existing LSP (Honeywood) area (including the Amendment area) that gained subsequent approval under the Act (EPBC 2010/5476). Areas within the Amendment area, including POS and streetscaping will therefore be subject to management measures of the VMP.

Management actions to be applied in the Amendment area include:

- on-site landscaping with Black Cockatoo foraging and nesting species (POS and streetscapes)
- implementation of weed and dieback management measures before and during construction
- implementation of an environmental induction program to raise staff awareness and education regarding Carnaby's Black Cockatoo

- implementation of construction management measures, including:
  - installation of fencing to protect remnant vegetation
  - impose vehicle speed limits to reduce impacts of dust and reduce impacts on flora and vegetation and fauna
  - install appropriate waste disposal infrastructure.

4.1.3 Weed and dieback management plan

Weed and dieback management will be implemented in accordance with measures implemented as part of the existing LSP (Honeywood) area. Specifically management measures will include the following:

- ensure gravel, soil and sand brought on site is free of *Phytophthora cinnamomi* and weeds
- use of topsoil from site rather than importing of fill
- ensure vehicles, machinery and equipment are free from mud and soil when arriving at the site and when transporting gravel and other construction materials
- conduct inductions and awareness training incorporating weed and dieback risks, potential impacts and management.

4.1.4 Construction

Overall environmental impacts during construction will be managed through the implementation of a range of management measures. Prior to construction activities, any areas of vegetation to be retained within POS will be fenced to ensure the areas are not disturbed during clearing or earthworks. Appropriate speed limits for construction equipment and light vehicles will be implemented, sign-posted and enforced throughout construction activities.

5. Summary and recommendations

This report has been developed as a supporting document for the proposed amendment of the existing LSP (Honeywood) area, being submitted for the proposed Wandi North development, as part of the Honeywood Estate. The report provides a summary of the environmental characteristics, potential environmental constraints and policy requirements applicable to the management of environmental factors associated with the development.

The Amendment will result in a number of minor impacts to the environment that can be readily managed through implementation of management measures currently implemented for the existing LSP (Honeywood) area. Impacts associated with construction, including vehicle movement and associated dust and potential noise impacts will result from subdivision activities, however these will also be managed in accordance with measures implemented for the existing LSP (Honeywood) area. There is not anticipated to be any major constraints to development as all relevant environmental issues have been assessed and approved as part of previous approvals for the existing LSP (Honeywood) area.

The Amendment area has been subject to detailed investigations and assessment by the WAPC and DSEWPaC. It has been designed to incorporate measures undertaken for the existing LSP (Honeywood) area, including retention of POS areas and associated fauna habitat. Management measures undertaken to date for the existing LSP (Honeywood) area will also be extended across the Amendment area.

6. References

Bureau of Meteorology (BoM) 2013 *Climate Data Online,* [online], Commonwealth of Australia, available from *http://www.bom.gov.au/climate/data/index.shtml?bookmark=200* [30 May 2013].

Department of Indigenous Affairs 2013 Aboriginal heritage Inquiry System [online] Government of Western Australia, available from: *http://www.dia.wa.gov.au/AHIS/default.aspx [30* May 2013].

Glevan Consulting 2010, *Wandi Phytophthora cinnamomi occurrence assessment,* report prepared for Strategen Environmental Consulting, February 2010.

Heritage Council of WA 2013 Quick Search–Places database, [online] Government of Western Australia, available from: *http://register.heritage.wa.gov.au/index.html [30* May 2013].

RPS 2008 *Environmental Assessment Report: Residential Rezoning – Satterley Lanholdings, Wandi/Mandogalup,* report prepared for Satterley Landholdings, January 2008.

RPS 2007 *Vegetation and Flora: Wandi/Mandogalup Proposed Urban Development Area,* report prepared for Satterley Property Group, March 2007.

Strategen 2010, *EPBC Act Referral: Honeywood Estate Development: Lots 4-7, 678-680 and 683 Lyon Road,* report prepared for Satterley Property Group, April 2010.

Western Wildlife 2007, *Mandogalup proposed Urban Development: Threatened Fauna Assessment,* report prepared for RPS Bowman Bishaw Gorham, February 2007.

Appendix 3

SUMMARY OF WETLAND OUTCOMES AND DPAW CORRESPONDENCE

ROWEGROUP

From: Darren Walsh
To: paul.neilson@kwinana.wa.gov.au
Cc: John Hirdman; Julia Morgan; Kim Kyle; Rebecca Cumming
Subject: FW: Honeywood north
Date: Monday, 25 November 2013 4:58:10 PM
Attachments: image002.png

Hi Paul – further to our recent meeting, I have followed up with Jacqui Clinton (nee MacGuire) from the DPaW in relation to the agreed outcome with the former DEC in relation to wetland and bushland conservation outcomes for the Satterley Honeywood development, including the northern section the subject of the current LSP. Please find Jacqui's advice below which clearly confirms that this area was considered in terms of the DEC's agreed position on the matter. I trust that this is sufficient for you to close out the issue internally. Please let me know if this is not the case.

Regards

Darren

Darren Walsh
Chief Executive Officer & Senior Principal

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From: Clinton, Jacqui [mailto:Jacqui.Clinton@dpaw.wa.gov.au]
Sent: Friday, 22 November 2013 2:11 PM
To: Darren Walsh
Cc: John Hirdman; Julia Morgan
Subject: RE: Honeywood north

HI Darren,

I recall the extensive background related to this proposal particularly in relation to wetlands, which were a significant environmental consideration in the planning for the site and DEC's assessment of the development. As part of the assessment of the Local Structure Plan (LSP) DEC (now Department of Parks and Wildlife) did consider the whole of the development area including the north western area that at the time was zoned as Rural Groundwater Protection. Both the LSP and subsequent Wetland Management Plan did include this area even though it was recognised it was unable to be developed until it was rezoned.

While DEC supported the retention of all wetlands onsite, including those classified Resource Enhancement, it was recognised that due to the highly constrained nature of the site, focus would have to be placed on the retention and protection of larger Conservation Category wetlands within the development. Sometime early in the planning for the site (around 2008) I understand that high level discussions with DEC had resolved that some RE wetlands on site would be impacted by the development and the standard buffers and EPA guidelines on wetland protection may need to be slightly compromised. Although this is not DPaW's standard position on wetland protection it was recognised that consideration of the proportion area of the development already set aside for conservation had to be factored into the environmental assessment process.

So in answer to your query below I can confirm that DEC did consider the whole of the Honeywood site(including the northern portion) in its assessment of wetlands onsite. The configuration of the POS conservation reserves as shown in the Approved LSP was a result of a long period of negotiation between the developer, the Shire, Dept of Water and DEC and although it was noted there would be wetland impacts, the commitment to manage and enhance the retained wetlands on site was supported by DEC as a reasonable conservation outcome.

Please contact me if you have any queries regarding the above information.

Regards

Jacqui

Jacqui Clinton

Department of Parks and Wildlife
Swan Region
Phone: (08) 9422 0356 Fax (08) 9386 6399
Mobile:0439 977 455
Email: jacqui.clinton@dpaw.wa.gov.au

** I currently work part-time on Tuesdays and Fridays*

From: Darren Walsh [mailto:d.walsh@strategen.com.au]
Sent: Friday, November 22, 2013 12:34 PM
To: Clinton, Jacqui
Cc: John Hirdman; Julia Morgan
Subject: Honeywood north

Hi Jacqui – good to catch up with you again. As discussed on the phone – I have put the attached letter together which documents the history of the wetland outcomes for the Honeywood project. Satterley are currently going through an additional LSP process for the area right at the northern end of the site. As you can see from the attached, this area was considered as part of the original structure plan area in terms of wetland and conservation outcomes, however was subject to a subsequent MRS Amendment process due to it originally

being zoned Rural Groundwater Protection. It would be appreciated if you could confirm that your recollection of the history is in line with that documented in the attached letter and in particular, confirm that the then DEC was satisfied that the wetland conservation outcomes were relevant for the whole of the Honeywood site (including the northern portion) in its comments on the Structure Plan in 2009 (Attachment 4 to letter).

Many thanks

Darren

Darren Walsh
Chief Executive Officer & Senior Principal

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STRATEGEN
environmental consultants

John Hirdman
Senior Development Manager
Satterley Property Group
18 Bowman Street
SOUTH PERTH WA 6951

Reference: SPG13054.01

Dear John

HISTORY OF KEY ENVIRONMENTAL AND WETLAND CONSERVATION OUTCOMES AND APPROVALS – WANDI LOCAL STRUCTURE PLAN AREA

As requested, please find detailed below a history of the interactions between Satterley Property Group, the Department of Environment and Conservation (DEC) and City of Kwinana which led to the wetland conservation outcomes for the Wandi Local Structure Plan (LSP) area.

A summary of other key environmental approvals relating to clearing and development on the site is also provided.

The process of approval of the key environmental outcomes for the LSP area were the subject of detailed discussions and negotiations, involving various officers at the DEC, City of Kwinana and Satterley through 2008 to 2009. Given the passage of time it is useful to provide historical context to ensure that the wetland conservation outcomes which were agreed are understood in the current approvals context.

Structure planning for Satterley's Wandi's land holdings was undertaken by Greg Rowe and Associates (GRA) through 2007 to 2009, and documented in the LSP Part A – LSP Report (June 2009). It is important to note that the LSP which is the subject of the GRA report covered all of the Satterley land holdings Lots 677, 678, 679, 680 and 683 Lyon Road and Lots 1, 2, 3, 4, 5 ,6 and 7 Darling Chase, Wandi (Attachment 1).

This LSP process followed the rezoning of the land to urban under the Metropolitan Region Scheme (MRS). The MRS Amendment was referred to the Environmental Protection Authority (EPA) pursuant to Section 48A of the *Environmental Protection Act* and deemed not to require formal environmental assessment.

At the time of the preparation of the Wandi LSP, the northern most portion of the land holdings within Lot 683 had not been rezoned under the MRS as a result of its location within the Jandakot Groundwater Protection Area. This area was subject to a subsequent MRS Amendment (1186/41) in 2010. However, it is important to note that the Wandi LSP work considered the future development of all of Lot 683, particularly in the context of the wetland conservation outcomes for the whole of the Satterley land holdings.

The Satterley land holdings within Wandi originally contained a number of wetlands mapped by the DEC in its Geomorphic Wetlands Database. These included Conservation category wetlands on Lots 2, 3, 4, 5, 6, and 7; a Conservation category wetland on Lot 678; a Resource Enhancement wetland on Lot 680 and Conservation and Resource Enhancement wetlands on Lot 683 (Attachment 2). It is important to note that at the time of commencement of structure planning, the southern most Conservation category wetland located on lots 2 - 7 Darling Chase was located on land that had already been subjected to subdivision approval and was developed for special rural purposes.

Through detailed discussions with the DEC as part of the development and approval of the LSP for the Wandi land holdings the following wetland conservation outcomes were agreed:

1. The Conservation category wetland (UFI6752) on Lots 680 and 683 in the north-eastern corner of the site was protected in its entirety.
2. The Conservation category wetland (UFI6671) located on the western part of Lot 678 and associated buffer was protected. An additional buffer of upland vegetation on the eastern side of the wetland was also added to provide a larger overall conservation reserve in this area.
3. The southern Conservation category wetland (UFI12980 and 12981) east of the existing Fig Rise was to be protected as a conservation area rather than developed for special rural uses.
4. The Resource Enhancement wetland located on Lot 680 (UFI6664) would be retained within a conservation reserve with some modification of the edges of the wetland to allow for integration of drainage functions.

Other areas of wetland located on the site which were mapped in the wetland database, including Resource Enhancement wetland on Multiple Use wetlands on Lot 683, were not required to be retained as part of the overall structure plan for site on the basis that an appropriate balance had been provided for the protection of wetlands and bushland across the site. The final approved LSP clearly showed these outcomes (Attachment 3).

The detail associated with the conservation protection of these wetlands and associated buffers was incorporated into the Wandi LSP and referred to the DEC for comment and endorsement. This endorsement was provided in correspondence dated 21 April 2009 (Attachment 4).

Subsequent to the approval of the LSP, an application for subdivision was submitted to the WAPC on 30 June 2009 for Lots 680, 683, 678 and 679 of the Satterley land holdings. This subdivision application was in accordance with the approved LSP and while not including detailed subdivision design for the northern part of Lot 683 (which was yet to be re-zoned under the MRS scheme), it showed an indicative future lot layout and provided for the creation of a balance super lot on the northern part of Lot 683. This application was also forwarded to the DEC for comment. The DEC provided its advice on the application on 6 August 2009 and indicated no changes for requirements for conservation areas to be set aside and merely requested that wetland and bushland Management Plans be prepared and implemented for all areas of public open space containing Conservation category wetlands within the subdivision (Attachment 5).

This subdivision application was subsequently approved by the WAPC 21 December 2009. Subdivision and development works have consequently proceeded in line with subdivision approval and the LSP.

Condition 13 of WAPC approval 140239 required that “prior to commencement of subdivision works, measures being taken to the satisfaction of the WAPC to ensure the identification and protection of any vegetation on the site, worthy of retention, not affected by necessary subdivision works”.

This condition was fulfilled through the setting aside of substantial areas of wetland vegetation, plus additional upland vegetation, most notably the upland Conservation Park located adjacent to the Conservation category wetland on Lot 678 (which was requested by the City of Kwinana in line with its Local Biodiversity Strategy), as detailed in the LSP, Landscape Master Plan and wetland management plans for the LSP area. Given the characteristics of the site, bulk earthworks have been required in the areas for development outside of the conservation and open space areas, including filling of the northern portion of Lot 683 with 1.5-2m of fill. This has meant that additional retention of vegetation has not been possible as areas outside of the already substantial conservation areas have been affected by necessary subdivision works.

In addition to MRS, LSP and subdivision approvals which set aside key wetland and other conservation areas within Satterley’s Wandi land holdings, the project was also the subject of a referral and approval under the *Environmental Protection Biodiversity and Conservation (EPBC) Act*. This was as a result of the existence of habitat for Carnaby’s Black Cockatoo on the site. The project was issued with approval under the EPBC Act on 28 June 2010. It is important to note the EPBC approval covered all of the land holdings including the northern portion of Lot 683 which had yet to be rezoned under the MRS. The form of the residential development approved through the EPBC Act processes was the same as that in

the LSP, with identical conservation areas required to be protected as under the LSP. Conditions applied to the EPBC approval relating to the retention of Black Cockatoo habitat within the existing conservation areas along with rehabilitation and provision of funding for offsite offsets and top soil transfer.

In 2010 the northern part of Lot 683 was the subject of MRS Amendment 1186/41. The amendment was referred to the Environmental Protection Authority (EPA) under Section 48A of the *Environmental Protection Act*. In March 2010, the EPA advised the WAPC that the amendment did not require formal environmental assessment and made no comment with respect to any requirements for additional wetland conservation on the site (Attachment 6).

Clearing of vegetation within the Satterley land holdings has subsequently been undertaken in line with subdivision approval 140239 and EPBC approval 2010/5476. This includes the northern portion of Lot 683 which is covered by both the above subdivision and EPBC approvals. Separate clearing permit approvals are not required as a result of the exemption provided pursuant to item 9 of Schedule 6 of the *Environmental Protection Act*. Furthermore, it is understood that earthworks approval for this area has been provided by the City of Kwinana.

The recent clearing within the northern portion of Lot 683 was undertaken in line with the Fauna Management Plan for the LSP area. A pre-clearing habitat assessment was undertaken, which included assessment for evidence of Black Cockatoo nesting or roosting. None was found, nor were any large logs or hollows which could be salvaged as potential fauna habitat.

Quenda trapping was undertaken prior to clearing and the results of this work are currently being documented.

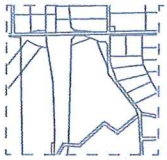
I trust that the above information provides clarity with respect to history and agreement of the wetland conservation outcomes for the Satterley Wandi land holdings. Please do not hesitate to contact me should you require any additional information.

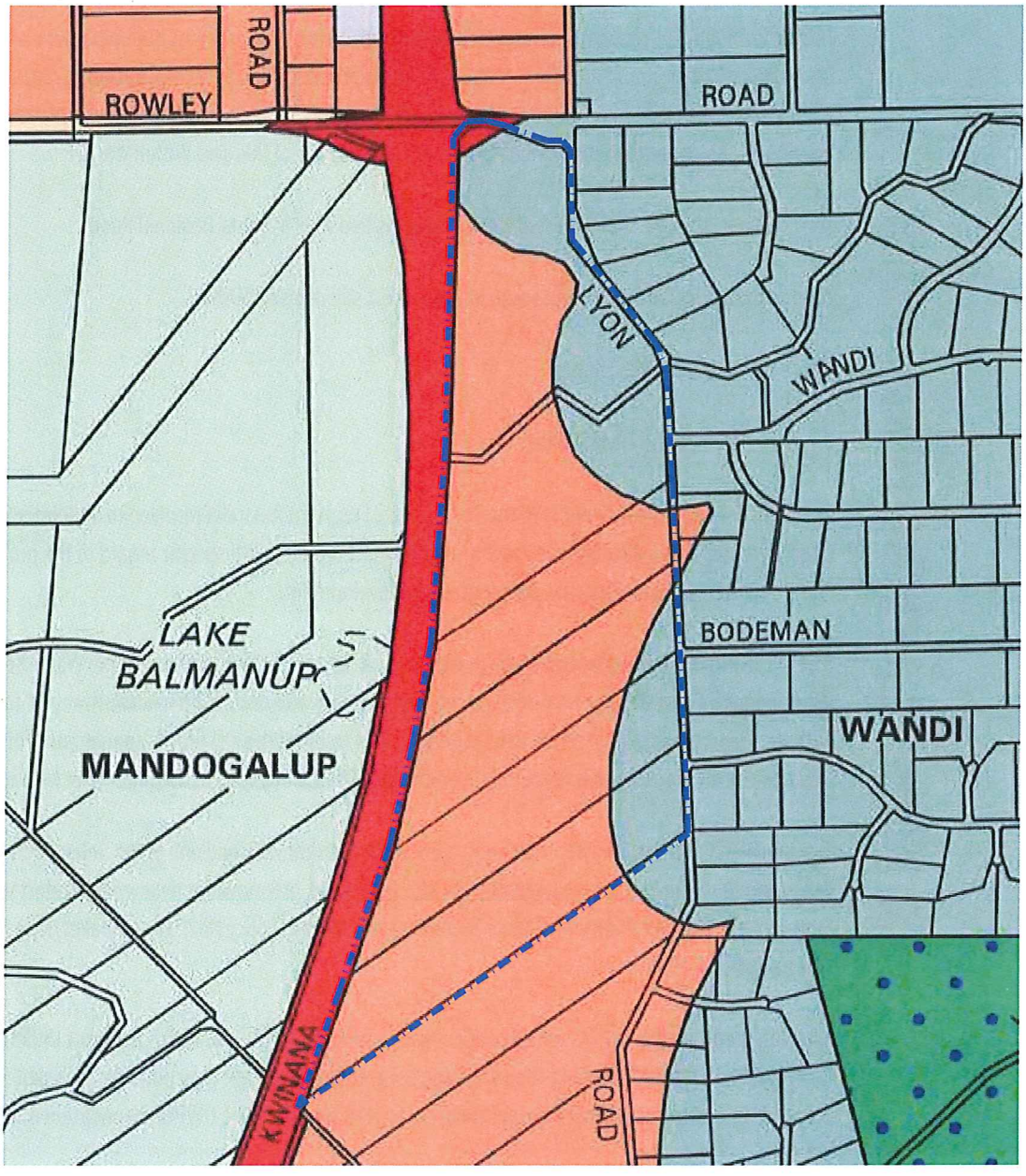
Yours sincerely

Darren Walsh
CEO AND SENIOR PRINCIPAL

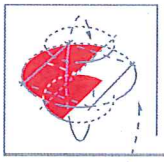
2 October 2013

Attachment 1

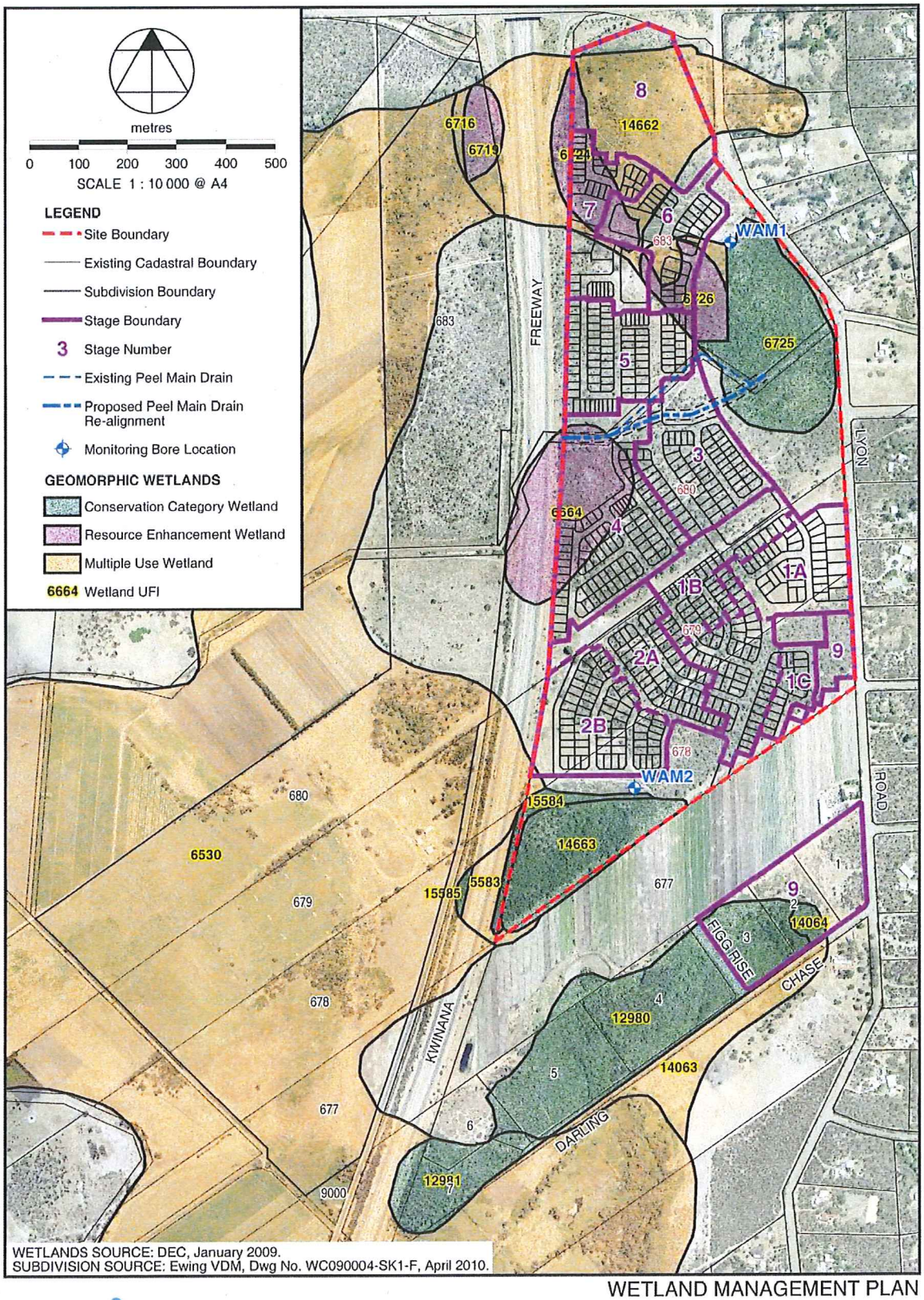




| FIGURE 5: MRS ZONING |



Attachment 2



PRINTED: Wed 20 Jul 11 CHECKED: BvdW 20-07-11 DRAWN: CR 20-07-11 DATUM: MGA zn50 ENV/PERT/01185AA/Wetland Management Plan/EP2009-177F04.dgn

WETLANDS SOURCE: DEC, January 2009.
SUBDIVISION SOURCE: Ewing VDM, Dwg No. WC090004-SK1-F, April 2010.

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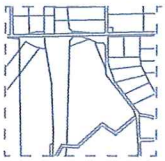
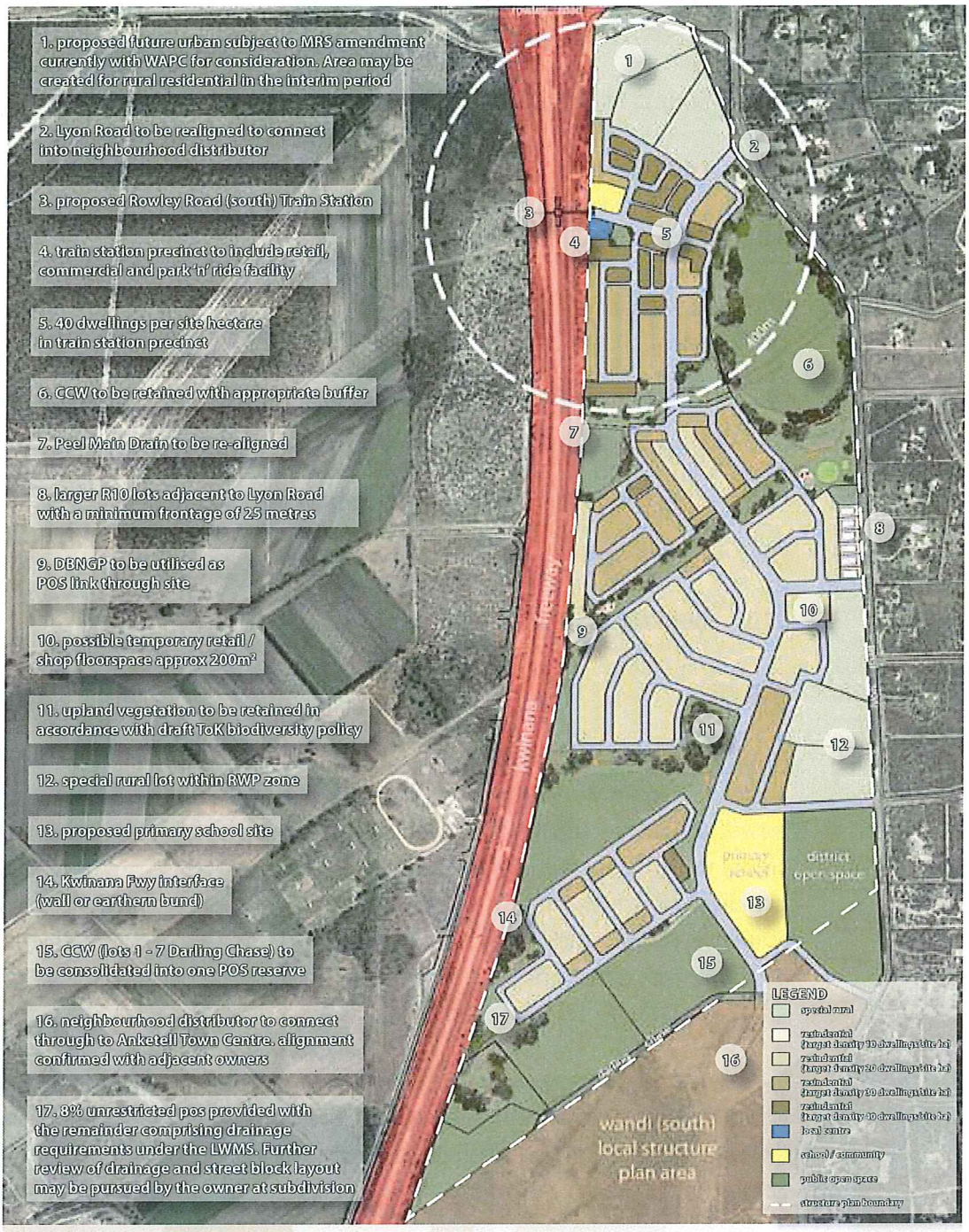
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

WETLAND MANAGEMENT PLAN
HONEYWOOD SUBDIVISION ROWLEY ROAD, WANDI
GEOMORPHIC WETLANDS

Attachment 3



4.0 LOCAL STRUCTURE PLAN

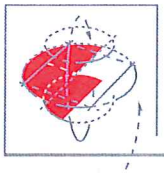


Satterley

GREG ROWE & associates

Wandi Local Structure Plan

FIGURE 9: LOCAL STRUCTURE PLAN



Attachment 4

Government of **Western Australia**
Department of **Environment and Conservation**

Your ref:E01540
Our ref: SRS25414
Enquiries: Jacqui Maguire
Phone: (08) 9405 0743
Fax: (08) 9405 0777
Email: jacqui.maguire@dec.wa.gov.au

Chief Executive Officer
Town of Kwinana
PO Box 21
KWINANA WA 6966

Att: Christopher Lynch

Proposed Structure Plan – Lot 677,678,679,680,683 Lyon Road & Lots 1,2,3,4,5,6,7 Darling Chase, Wandi

I refer to your recent correspondence requesting comments on the above Wandi Local Structure Plan (LSP). The Department of Environment and Conservation (DEC) has reviewed the plan and associated information and provides the following comments.

Flora and Vegetation

As stated in the plan, the subject area is predominantly cleared however does contain areas of remnant vegetation including a number of Conservation category (CCW's) and Resource enhancement wetlands (REW's). The Department supports the retention of areas of environmental significance in reserves set aside for the protection and enhancement of conservation values. DEC recognises that the LSP proposed to set aside up to 49 hectares of conservation and public open space reserves and recommends that relevant management plans be prepared in liaison with DEC at further stages in the planning process to ensure these reserves are appropriately managed and protected.

Wetlands

DEC recognises that the structure plan area contains over 37 hectares of Conservation and Resource Enhancement category wetlands. DEC's Wetlands Section provides the following comments on the structure plan in relation to wetland impacts including recommendations for their protection:

Buffer distances to Conservation category wetlands

It is acknowledged that the buffer distances proposed in the structure plan are not consistent with the minimum 50m buffer distances required in DEC and the Environmental Protection Authority (EPA) positions and guidance statements. The buffer distances applied to the Conservation category wetlands in the structure plan is however consistent with the distances negotiated and agreed between the developer and DEC in 2008. A reduced buffer distance in this situation is not justification or setting a precedent that other developments will be approved with a buffer that is not in accordance with a minimum 50m.

Land uses within buffers

The structure plan (Figure 17) outlines that the areas designated as buffer to the three Conservation category wetlands will contain land uses such as pedestrian sealed paths, boardwalks, viewing platforms and shelters. These land uses and infrastructure are not compatible with the purposes of a wetland buffer and will limit the potential for the buffer to protect, maintain and enhance the important attributes, functions and values of the wetland. The proposed infrastructure is required to be restricted to the outside edge of the wetland's buffer where a hard

XDECL090

edge or physical barrier can be employed to control the spread of weeds and prevent access and activities. The surrounding area of unrestricted public open space (Figure 16) is an additional area where the necessary passive recreational activities and their associated infrastructure should be constructed.

Conservation category wetland UFI 12980 and 14064
Recent email correspondence from Satterley Property Group dated 8 April 2008 outlines that it is now proposed that the school buildings will be located outside of the Conservation category wetland and in its associated buffer. This information should be updated in the structure plan.

Resource Enhancement Wetlands
According to the structure plan the central western Resource Enhancement category wetland (UFI 6664) will contain stormwater treatment/ nutrient stripping basins. It is recommended that all stormwater and drainage and its associated infrastructure is in accordance with the *Stormwater Manual for Western Australia* (DoW 2004). In addition, native species currently within the wetland should be retained and native species of local provenance should be used for rehabilitation.

Wetland Management Plan
The structure plan outlines that a wetland management plan will be prepared for the Conservation category wetlands. It is recommended that the contents and format of the wetland management plan/s be prepared in accordance with *Guidelines checklist for preparing a wetland management plan* (DEC 2008) available on DEC's website.

Omissions
It is noted that a description of the land uses proposed to occur in the 'unrestricted POS' of area 10, outlined Figure 17 of the structure plan, is absent

Acid Sulphate Soils
A portion of the study area, particularly on the western side, has been identified as having a high risk of disturbing potential or actual acid sulphate soils (ASS). The investigations to date have been very limited and therefore the presence and extent of potential acid sulfate soils can not be confidently determined. DEC strongly recommends that further investigations to adequately delineate the occurrence and extent of ASS across the LSP be conducted. In addition a condition related to an investigation and management of ASS should be placed on any subdivision approval for any of the Lots where more than 100m^3 of soil is to be disturbed and/or dewatering activities are proposed.

Contaminated Sites
Investigations have identified four sites with previous land uses which are potentially contaminating. DEC supports further investigations of the area, to determine the extent of contamination and any remedial measures required, prior to the commencement of any site works.

Thank you for the opportunity to comment on this structure plan and please contact Jacqui Maguire at the DEC's Swan Coastal District on 9405 0743 if you have any queries regarding this advice.

Yours sincerely

David Lodwick
Regional Leader – Land Use Planning
SWAN REGION

21 April 2009

Attachment 5

Department of
Environment and Conservation

Your ref: 140239
Our ref: SRS26179
Enquiries: Jacqui Maguire
Phone: (08) 9405 0743
Fax: (08) 9405 0777
Email: jacqui.maguire@dec.wa.gov.au

DEPARTMENT OF PLANNING
11 AUG 2009
FILE 140239

The Secretary
Western Australian Planning Commission
Albert Facey House
469 Wellington Street
PERTH WA 6000

Att: Frank Ness

APPLICATION NO: 140239 – Lot 678 Wandi

I refer to your correspondence of 3 July 2009 requesting comments on the subdivision of Lot 678 and 679, Wandi. The Department of Environment and Conservation (DEC) has reviewed the referral and provides the following comments.

Conservation Areas

DEC requests that wetland and bushland management plans be prepared and implemented for all areas of public open space containing Conservation category wetlands within the subdivision. It is recommended that the contents and format of the wetland management plan/s be prepared in accordance with *Guidelines checklist for preparing a wetland management plan* (DEC 2008) available on DEC's website. DEC is happy to provide advice during the preparation and implementation of this plan to ensure appropriate protection and management of conservation values.

Contamination

DEC is aware that the location of this subdivision is within a site identified by the DEC as having currently or historically supported activities that have the potential to contaminate soil and/or groundwater. DEC understands Preliminary and Detailed Site Investigation Plans have been prepared for the site and recommends the following condition be placed on the subdivision approval.

"Prior to any ground-disturbing activities, investigation for soil and groundwater contamination and completion of any remediation, including validation of remediation, shall be carried out to the satisfaction of the Western Australian Planning Commission to ensure that the lots created can accommodate the proposed development .

Advice: The investigation, remediation and validation of remediation, shall be carried out in accordance with the guidelines adopted by the Department of Environment and Conservation, as detailed in the Department's Contaminated Sites Management Series"

Carnaby's Cockatoo

The vegetation complex the subdivision application area is recognised as a foraging habitat for *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo).

Carnaby's Black Cockatoo is classified as Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*). Clearing the vegetation will result in a loss of some foraging habitat for this species. It is suggested that the proponent confirm the exact area of the vegetation to be cleared then discuss the matter with the Commonwealth Department of Environment Heritage, Water and the Arts to confirm whether an EPBC Act referral is necessary.

Thank you for the opportunity to comment on this subdivision application and please contact Jacqui Maguire at the Swan Coastal District of DEC (Ph: 9405 0743) if you have any queries regarding this advice.

Yours sincerely,

Mike Meinema
DISTRICT MANAGER
Swan Coastal District

6 August 2009

LEGEND

- SUBJECT SITE
- PUBLIC OPEN SPACE
- EXISTING PEEL MAIN DRAIN
- PROPOSED PEEL MAIN DRAIN
- GAS PIPELINE
- WETLAND
- 50M INDICATIVE WETLAND BUFFER
- EXISTING LOT BOUNDARY
- FUTURE DEVELOPMENT NOT THE SUBJECT OF THIS APPLICATION

NORTH

title: wandi (north) proposed subdivision

address: wandi

date	23 June 09	job no.	4582e
scale	1:2000@A0	e ref	060903
designer	K Kyle	drawn	O Lekoko
client			

GREG ROWE & associates
Level 3, 369 Newcastle Street Northbridge Western Australia

TOWN PLANNING PROJECT MANAGEMENT

Attachment 6

Environmental Protection Authority

The Atrium,
Level 8, 168 St Georges Terrace,
Perth, Western Australia 6000.
Telephone: (08) 6364 6500.
Facsimile: (08) 6467 5557.

Postal Address: Locked Bag 33,
Cloisters Square, Perth, Western Australia 6850.
Website: www.epa.wa.gov.au

DEPARTMENT OF PLANNING
04 MAR 2010
FILE RLS/0059

Secretary
Western Australian Planning Commission
469 Wellington Street
PERTH WA 6000

Your Ref 809-2-26-13 Pt 1
Our Ref CRN222494
Enquiries Angela Coletti 6467 5490

Attn: Mr Anthony Muscara

Dear Sir/Madam

DECISION UNDER SECTION 48A(1)(a)
Environmental Protection Act 1986

SCHEME AMENDMENT TITLE:	**Metropolitan Regional Scheme Amendment 1186/41 Wandi Transit Oriented Development Precinct - rezoning from rural-water protection zone to urban zone**
SCHEME AMENDMENT LOCATION:	**Pt Lot 683 Lyon Road**
LOCALITY:	**Wandi, Town of Kwinana**
RESPONSIBLE AUTHORITY:	**Western Australian Planning Commission**
DECISION:	**Scheme Amendment Not Assessed - Advice Given (no appeals)**

Thank you for your letter of 6 January 2010 referring the above proposed scheme amendment.

After consideration of the information provided by you, the Environmental Protection Authority (EPA) considers that the proposed scheme amendment should not be assessed under Part IV Division 3 of the *Environmental Protection Act 1986* (EP Act) but nevertheless provides the following advice and recommendations.

ADVICE AND RECOMMENDATIONS

1. Environmental Issues

- Management of water quality and quantity
- Noise

2. Advice and recommendations regarding Environmental Issues

Management of water quality and quantity
The Office of the EPA acknowledges that the Department of Water (DoW) has been consulted and has no objection to this amendment to be zoned urban although it is contrary to the water resource protection objectives of the DoW and State Planning Policy 2.3 – Jandakot Groundwater Protection Policy.

Noise
As the Kwinana Freeway and Rowley Road abut the western and northern boundaries of the subject land respectively and in close proximity to the proposed Rowley Road (south) train station then the road and rail transport may create the potential for noise, dust, vibration and light spill to impact upon future residential development. It is recommended that noise and site-specific studies, or at least predictions, be carried out prior to subdivision to determine the noise levels on the

subject site, the extent of the noise affected area and management measures which can be implemented through development of the site. Notification in the form of a memorial to be placed on the Certificate of Title of all proposed residential lots within the area advising the existence of a hazard or other factor, in accordance with Section 165 of the *Planning and Development Act 2005* to the satisfaction of the Western Australian Planning Commission at the applicants cost. The Notification should read as follows:

> "The subdivider making arrangements satisfactory to the Western Australian Planning Commission to ensure that prospective purchasers of the proposed lots will be advised of the potential for amenity from the Railway, Kwinana Freeway and Rowley Road and that a memorial is placed on title advising of the impacts and measures that should be taken to mitigate the impacts".

In addition to this the EPA provides the following guidance which should also be considered at the detailed planning stages. Sometimes a combination of measures is required to effectively treat noise exposure and meet the accepted guidelines. These may include:

- providing barriers or adjusting the site layout to create separation distances between sources and receivers;
- noise mitigation measures incorporated during the construction of residential Dwellings; and
- provision of suitably detailed information to prospective purchasers to allow them to make informed decisions on noise issues.

3. General Advice

- For the purposes of Part IV of the EP Act, the scheme amendment is defined as an assessed scheme amendment. In relation to the implementation of the scheme amendment, please note the requirements of Part IV Division 4 of the EP Act.
- There is no appeal right in respect of the EPA's decision on the level of assessment of scheme amendments.
- A copy of this advice will be sent to relevant authorities and made available to the public on request.

Yours faithfully

Colin Murray
Director
Assessment and Compliance Services

2 March 2010

Appendix 4

FIRE MANAGEMENT PLAN

ROWEGROUP

FIRE MANAGEMENT PLAN

Wandi North Local Structure Plan

Honeywood Estate

Wandi

City of Kwinana

FirePlan WA

Original FMP May 2009

Updated December 2013

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Fire Management Plan Wandi North LSP - Honeywood Estate

Prepared For

Satterley Property Group

Prepared By
FirePlan WA
10 Bracken Road
Thornlie WA 6108

T: 94931692 F: 94930330 E: firepla@bigpond.net.au

Document Status

Version	Comment	Reviewer	Review Date
Version 1	Original FMP	BWH	05.09
Version 2	Amendments from City of Kwinana	BWH	19.01.2012
Version 3	Amendments Satterley	JH	30.01.12
Version 4	Amendments Town of Kwinana	Meeting with ToK staff	03.04.12
Version 5	Amendments City of Kwinana	TW	24.04.12
Version 6	Amendments City of Kwinana	TW	27.06.12
Version 7	Amendments City of Kwinana	TW	16.11.12
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Version 9	Amendments City of Kwinana		18.04.13
Version 10	Amendments City of Kwinana	TW	10.05.13
Version 11	Amendments City of Kwinana	TW	30.05.13
Version 12	Amendments City of Kwinana	Rowe Group	05.05.13

Disclaimer: The measures contained in this fire management plan are considered to be minimum standards and they do not guarantee that a building will not be damaged in a bush fire. 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 FirePlan WA at the time; and achievement of the level of implementation of fire precautions will depend among other things on the actions of the landowners or occupiers over which FirePlan WA has no control. Notwithstanding anything contained therein, FirePlan WA will not, except as the law may require, be liable for any loss or other consequences (whether or not due to the negligence of the consultants, their servants or agents) arising out of the services rendered by the consultants.

1.0 INTRODUCTION

The purpose of this Bushfire Management Plan is to detail the fire management methods and requirements that will be implemented for Wandi North LSP - Honeywood Estate, refer Figure 1: Location Plan. Note this Fire Management Plan becomes effective from when it is approved by the City of Kwinana and will apply to the site effective from that Date. Previous Stages of development of this site will comply with the original approved fire Management Plan.

Although the wetland areas and Public Open Space generally has a bush fire hazard rating of "Moderate-Extreme", this will be offset by:

- Implementation of Building Protection Zones (BPZ) and Hazard Separation Zone (HSZ);
- Increased construction standards of buildings, in accordance with current and adopted AS 3959; and
- Residential area has been cleared.

Also this fire management plan complies with the acceptable solutions detailed in Appendix 2 of Planning for Bush Fire Protection and are summarised in Compliance Checklist for Performance Criteria and Acceptable Solutions at the end of this fire management plan Section 8.

This Fire Management Plan will likewise outline the responsibility and timing for implementing and maintaining the fire protection measures and strategies contained within, allocating these responsibilities between individual land owners, the developers and the City of Kwinana.

As fire management strategies may require altering to meet changing weather, environment and land use needs, it must be advised that the provisions of the *Bush Fires Act 1954* will still be enforced, in addition to this Fire Management Plan.

The City of Kwinana will be responsible for initiating a review of this fire management plan as it may seem necessary to do so.

In the event of large bushfires it is essential that landowners understand that fire appliances may not be available to protect each dwelling.

The City of Kwinana requires the preparation of a 'Bushfire Management Plan' for the proposed development. This document has been prepared to satisfy that requirement.

This Fire Management Plan has been prepared in accordance with Acceptable Solutions detailed in *Planning for Bush Fire Protection* Edition 2 (2010). There has been extensive consultation between the Developer, City of Kwinana and the Department of Environment and Conservation in the preparation of this Fire Management Plan.

In the Foreword of AS 3959- 2009 it states that "It should be borne in mind that the measures contained in this standard cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the degree of vegetation management, the unpredictable nature and behavior of fire and extreme weather conditions."

2.0 AIM

The aim of the Bushfire Management Plan is to reduce the occurrence of and minimise the impact of bush fires thereby reducing the threat to life, property and the environment.

The Fire Management Plan sets out to reduce this threat by:

- Identifying the objectives of this Fire Management Plan (Section 3)
- Describing the site's description, topography, cultural features and land use (Section 4);
- Identifying the site's potential bush fire issues (Section 5); and
- Outlining the fire mitigation strategies for the site, including identifying the parties responsible for undertaking these fire mitigation strategies (Section 6).

The City of Kwinana has the responsibility and powers under the *Bush Fires Act 1954* to ensure that this Fire Management Plan, City of Kwinana Firebreak Notice and any Special orders issued under the *Bush Fires Act 1954* are complied with.

3.0 OBJECTIVES

The objectives of this Fire Management Plan are to:-

- Propose bush fire prevention measures for the site.
- Define the building construction standards for proposed dwellings.
- Identify access for firefighting operations and daily maintenance.
- Identify current and future landowner, developer and City of Kwinana responsibilities for various components of this fire management plan.
- Document in the Appendices section of this Fire Management Plan, the acceptable solutions adopted for the subdivision of Wandi North LSP - Honeywood Estate.

Figure 1 Wandi North Local Structure Plan

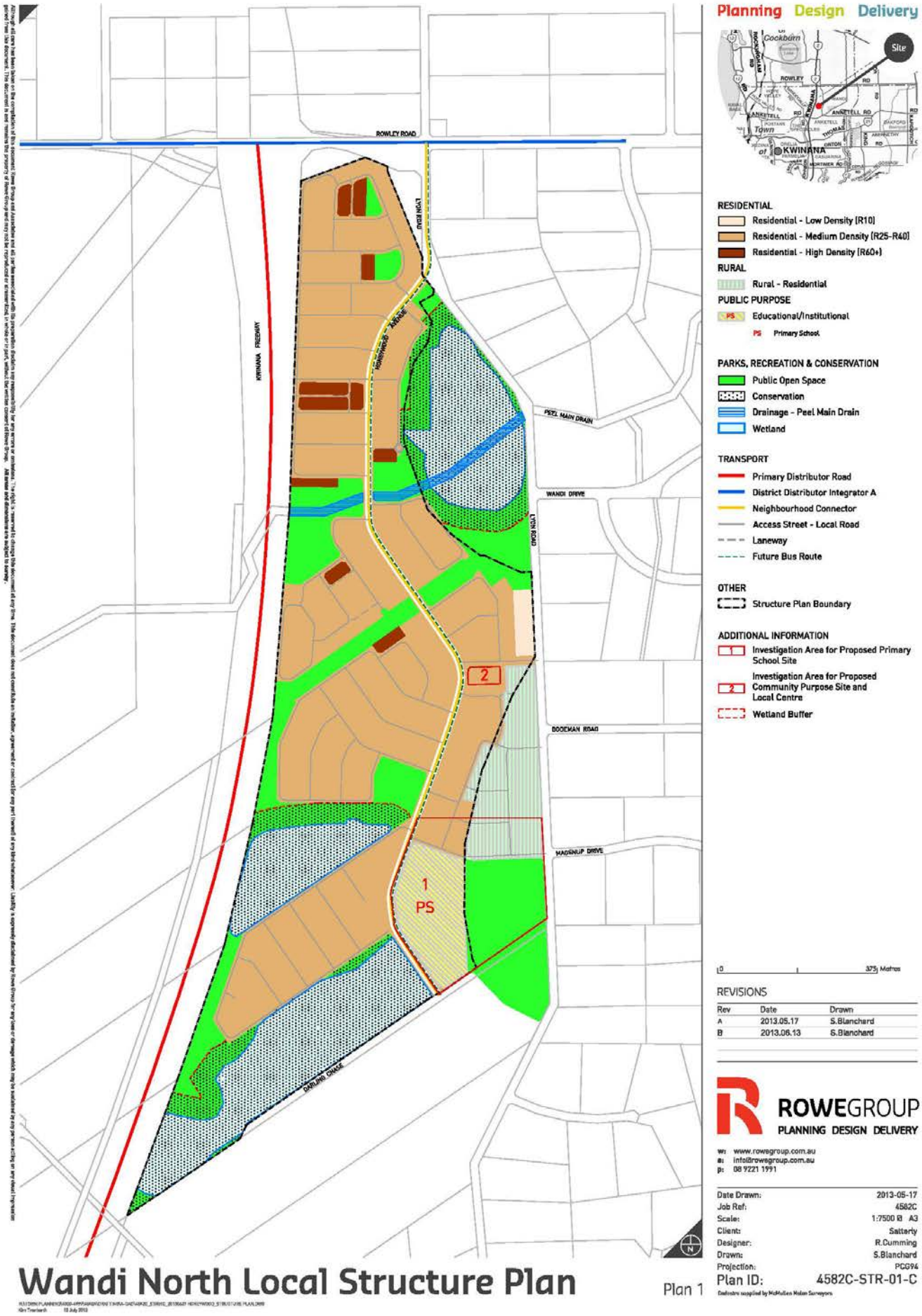
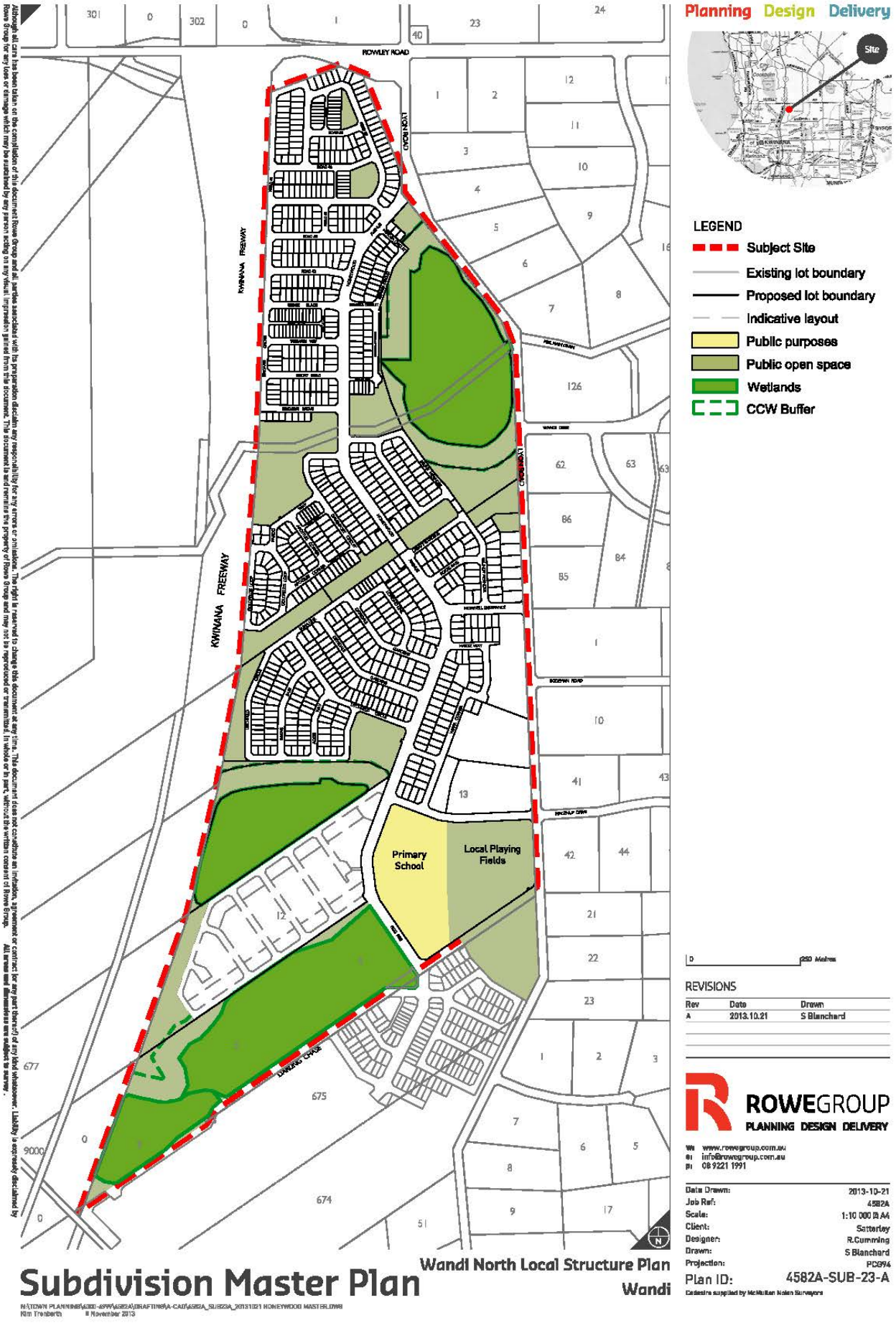


Figure 2 Proposed Subdivision Master Plan



4.0 DESCRIPTION OF THE AREA

4.1 GENERAL

This Fire Management Plan applies to Wandi North LSP - Honeywood Estate which is to be subdivided into urban lots. The area covered by this and the previously approved FMP does not include Lots 677 Figg Close and Lots 1,2, 3, 4, 5, 6, and 7 Darling Chase.

The "Site" was originally covered with Banksia Woodland with several wetland areas being retained as Conservation Category Wetlands (CCW), Resource Enhancement Wetlands (REW) and Public Open Spaces as detailed in the Wandi Local Structure Plan 2009.

The Site is generally surrounded by the Kwinana Freeway along the western boundary, Lyon Rd along the east and Rowley Road along the northern boundary.

At the time of the review of the Fire Management Plan (May 2013) all the Urban Residential area within the "Site" has been cleared.

4.2 CLIMATE

The Mediterranean climate experienced by this area is such that the majority of rain falls in late

The combination of prevailing winds and dry vegetation poses a fire risk and bush fire control is considered essential for the protection of life and property, and to ensure that frequently and uncontrolled burning does not degrade existing and replanted vegetation.

The bush fire season is generally from October to the following May, but is subject to seasonal changes and drought conditions.

4.3 TOPOGRAPHY

The site has gentle slopes of 0º - 5º. The retained vegetation areas contained within CCW, REW and POS have effective slopes that are 0°-5° which will be used to determine BAL ratings. (Section 2.2.3-2.2.4 of AS 3959-2009). See Contour Map Figure 3.

4.4 BUSH FIRE FUELS

The site has been cleared except for the CCW, REW and Public Open Space areas.

The Banksia Woodland (area 15) has bush fire fuels between 6-8 tonnes/ha and parts of the Wetland areas where Paper Bark trees (area 8, 9 and 16) are prevalent could vary between 10 tonnes/ha and 35 tonnes/ha (DFES Visual Fuel Guide). Vegetation area 6a consists of Banksia Woodland (6-8 tonnes/ ha) and has Open Forest consisting of Flooded Gum which has fuel loads of 20-25 tonnes/ha. Areas 11, 12a and 12b have been landscaped with low shrubs and turfed areas and do not increase the bush fire risk for the site and will not influence the BAL Ratings of adjoining buildings. See Figure 4 for POS areas.

Peat type soils may be located the Paper bark wetland in Area 16. See Figure 4.

Figure 3 Contour Map

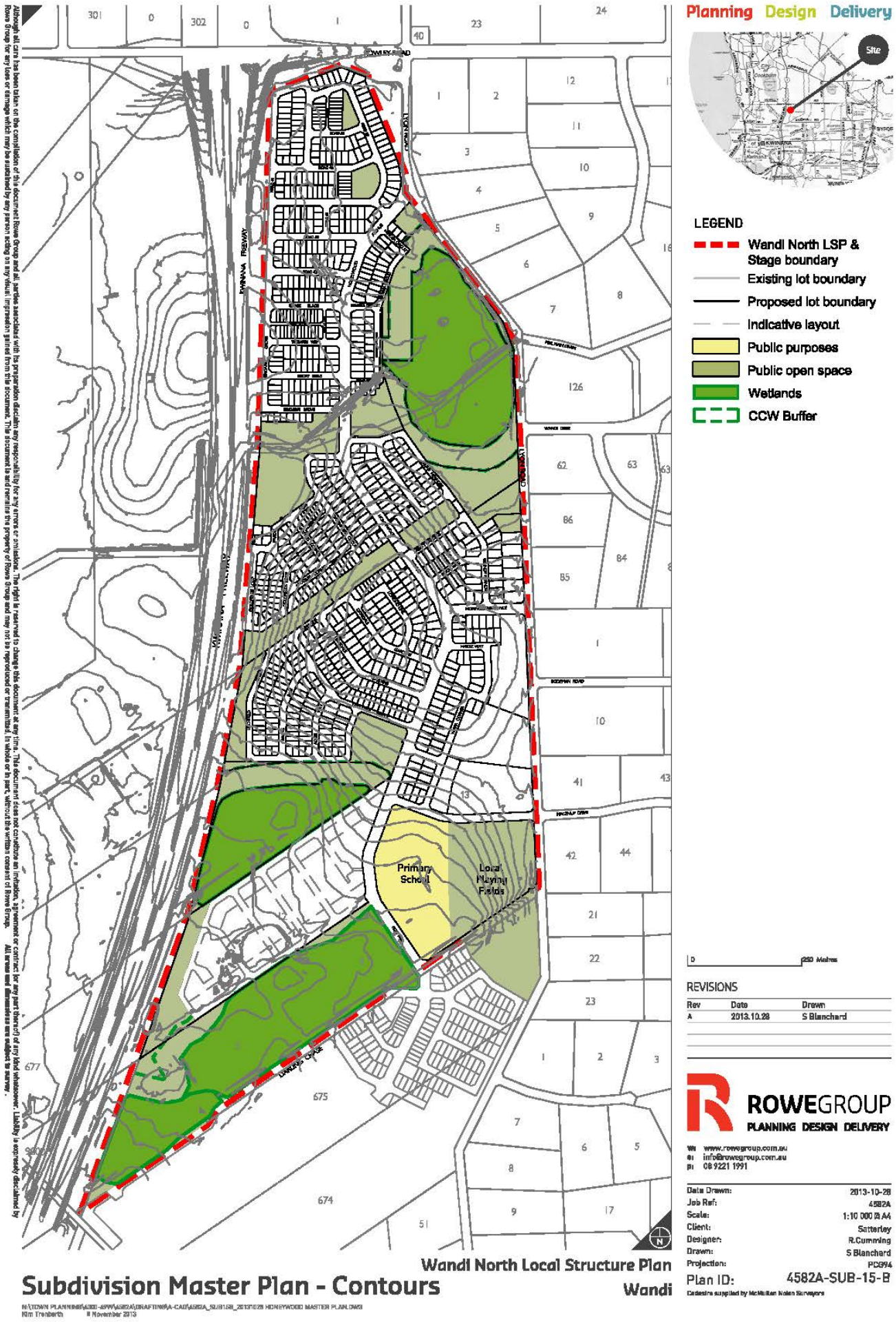
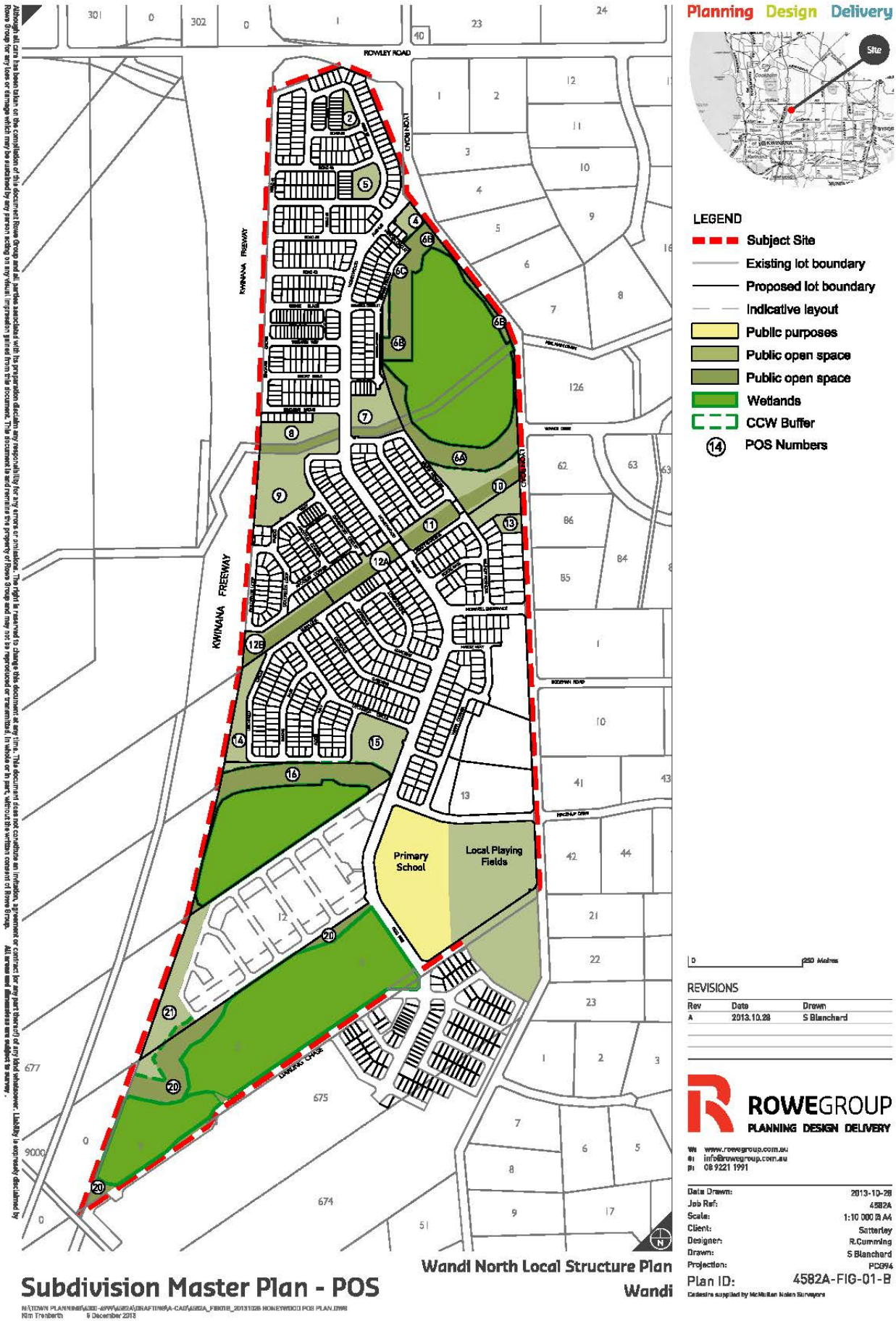


Figure 4 Public Open Space Plan.



4.5 LAND USE

The site is to be developed into Urban Residential lots with lot sizes in the 300-650 square metres range which restricts further development/subdivision of any of the site. If lots are further subdivided in the future a separate Fire Management Plan is required for that subdivision

4.6 ASSETS

The site is bounded by the Kwinana Freeway on the West, Lyon Road on the east, an operational market garden on the south and Rowley Road in the north.

To the north of Rowley Road the area has been subdivided into urban lots, most have had dwellings constructed on them. To the NE of the site rural properties are located.

To the east of Lyon Road the area is Wandi Special Rural Residential area with Lots of approximately 2ha in size and vegetation varying from scrub to Banksia Woodland with houses located on most lots.

The Kwinana Freeway road verges with the Perth Mandurah train line located in the centre of the freeway could catch on fire from ember attack from a fire in the Conservation Category Wetlands and or Public Open Space. Smoke may cause disruption to traffic and train services using the Freeway.

Other assets will include the CCW, REW, Public Open Space, public facilities and proposed dwellings within the development.

4.7 ACCESS

The proposed road system has several entrances off Lyon Road. In most areas an internal road separates areas of CCW, REW and/or Public Open Space, where this does not occur, low fuel areas (landscaped buffer) separates vegetation and dwellings or buildings.

4.8 WATER SUPPLIES

4.8.1 Domestic Water Supplies.

Water supplies for domestic use will be supplied from the Water Corporation mains water supply.

4.8.2 Water for Fire Fighting

Fire Hydrants will be installed along roads and where possible will be located on the road system adjoining CCW, REW and Public Open Space rather then located in side streets.

5.0 BUSH FIRE ASSESSMENT

5.1 BUSH FIRE HISTORY

The site has been subject to infrequent wildfires, the developer had no documented fire history of the site.

5.2 BUSH FIRE RISK

If bush fires occur in the area to the east of Lyon Road or within the CCW, REW and/or Public Open Space, dwellings and buildings may come under ember attack.

With smoke from the fires it may cause disruption to traffic on major local roads of Rowley and Lyon Roads and on the Kwinana Freeway and train services on the Perth-Mandurah line.

Dwellings adjoining (lots within 100 metres) CCW, REW Public Open Space and lots interfacing with rural residential lots on the east side of Lyon Road will comply with construction standards detailed in current and adopted AS 3959 “Construction of Buildings in Bush Fire Prone Areas” standard.

The main damage may be in the CCW and REW where if peat is present (potential in CCW area16) are hard to extinguish and fires may have long term affects on the environment of the wetlands. Banksia Woodland areas that are burnt will generally recovery from a bush fire.

As the majority of bushfires are caused by human activity either by deliberate actions or carelessness, risk can be aligned with human activity and available fuel sources. The combination of people, property and infrastructure systems (transport, communications etc.) is components of the "risk" for the site. As people cause the majority of wildfires in this area and have the assets in some way, shape or form, the table below rates the risk for the site based on the Department of Fire & Emergency Services (DFES) Rural Urban Bush Fire Threat Analysis tool.

Table 1 Bush fire Risk Assessment

Hazard Assessment

Scoring: High or Yes = 1 Low or No = 0

Ratings: Extreme = 6 High = 4 – 5 Medium = 2 – 3 Low = 0 – 1

Hazard Component	High or Yes	Low or No
Likelihood of occurrence (risk of ignition)	*1*	
Fuel load (vegetation) > standard (intensity)	*1*	
Vegetation assessment area with fire hazard (manageability)	*1*	
Hazard reduction <80% of assessment zone		*0*
High visitor usage in area		0
Recent or proposed residential and industrial developments	*1*	

Total 4 = high bush fire risk

Management Assessment

Scoring: High or Yes = 1 Low or No = 0

Ratings: Extreme = 4 High = 3 Medium = 2 Low = 1

Management Component	High or Yes	Low or No
Easily accessible (access roads and trails)	*1*	
Fire agency response time > 30 minutes		*0*
Inadequate water supply		*0*
Inadequate resources	*1*	

Total 2 = Medium management risk

Although the site indicates a high bush fire risk, the Fire Management Plan in conjunction with agency and Local Government requirements, aims at reducing this risk through mitigation works and sound response protocols.

5.3 BUSH FIRE HAZARD

In *Planning for Bush Fire Protection* Appendix 1 methodology for classifying bush fire levels is detailed. The methodology rates bush fire hazard using vegetation type. The methodology is also based on the underlying assumption that land in Western Australia is predominantly undulating. The methodology specifies three bush fire hazard levels "Low", "Moderate" and "Extreme".

This methodology has been used in this Fire Management Plan.

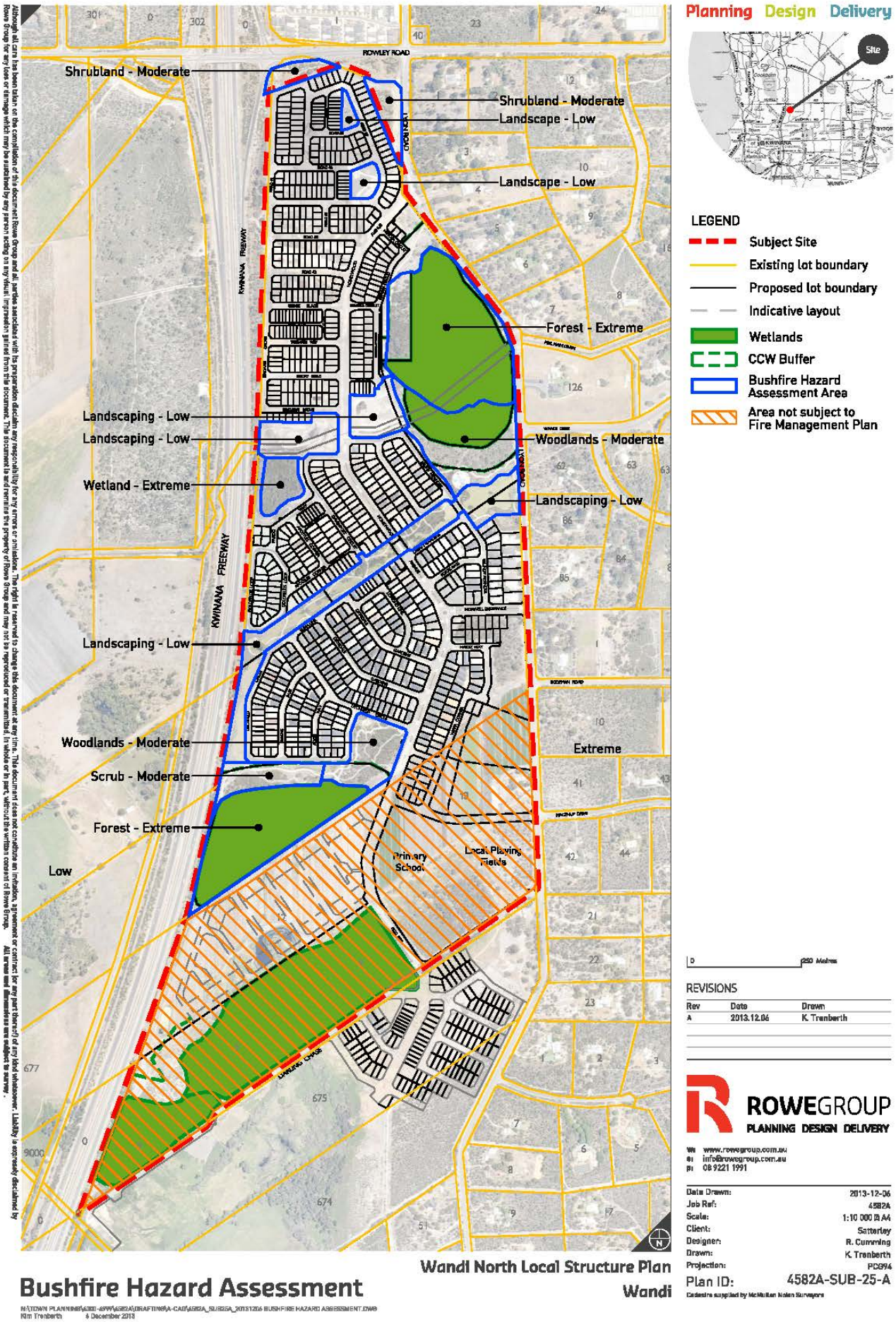
The assessment of fire risk takes into account existing site conditions which include:

- Topography with particular reference to ground slopes and accessibility;
- Vegetation cover – both remnant and likely revegetation; and
- Relationship to surrounding development.

The Bush Fire Hazard Assessment is "Moderate" in retained vegetation areas Classified B – woodland and "Extreme" in Open Forest Vegetation and paper bark areas. The hazard rating for the adjoining properties is "Moderate" and "Extreme" rating on the properties with retained vegetation. Refer to Figure 5

The minimum distance of 100 metres (from vegetation rated 'Moderate' or 'Extreme') may be reduced in compliance with the current and adopted AS 3959. Under the current and adopted AS 3959 as the distance from the vegetation is reduced, the construction standard must be increased. Table 2.4.3 AS 3959-2009 sets out this relationship and Section 2 of AS 3959-2009 details the methodology of determining the Bushfire Attack Level (BAL). See Section 7.3.3 for details.

Figure 5 Bush Fire Hazard Assessment



5.4 BUSH FIRE THREAT

In the area identified for residential development vegetation has been removed and basic survey of roads and services has been completed.

The CCW, REW and Public Open Space are a likely ongoing threat due to the peat soils that may be located in the wetland areas. Fires in peat type fuels (possibly present in CCW areas 9 & 16) are difficult to extinguish as the peat type soils can be deep and are difficult to cool with water. Also the fires may burn for days which may cause residents and transport systems using the Kwinana Freeway to be affected by the smoke. This may cause visibility problems and exacerbate respiratory medical conditions of residents.

5.5 SUMMARY OF BUSH FIRE POTENTIAL ISSUES

The potential bush fire issues that have been identified for the Site are:-

- CCW, REW and POS areas adjoining the development site;
- The reluctance for fire mitigation measures and access within CCW and REW;
- Requirement for setbacks from retained vegetation to proposed buildings;
- Requirement for increased construction standards to current and adopted AS 3959 standards to meet setback requirements from vegetation.

6.0 FIRE MITIGATION

6.1 HAZARD MANAGEMENT

This section outlines the actions and works that are to be undertaken in order to be successfully implement the fire protection strategies of this Fire Management Plan as it applies to the Hazard Management in the site will be controlled by installing a 25 metre Building Protection Zone (BPZ) between CCW, REW or Public Open Space and urban residential dwellings. The BPZ will consist of the front setback of each lot, the road reserve including footpaths and landscaped vegetation areas. See Section 7.3 for Building Protection Zone standard.

The BPZ will be installed by the developer and maintained to the satisfaction of the City of Kwinana prior to the transfer of management to the City of Kwinana who will then continue to maintain the BPZ.

The following statement will be included in the Honey wood Subdivision Wetland Management Plan and Public Open Space Management Plan**.**

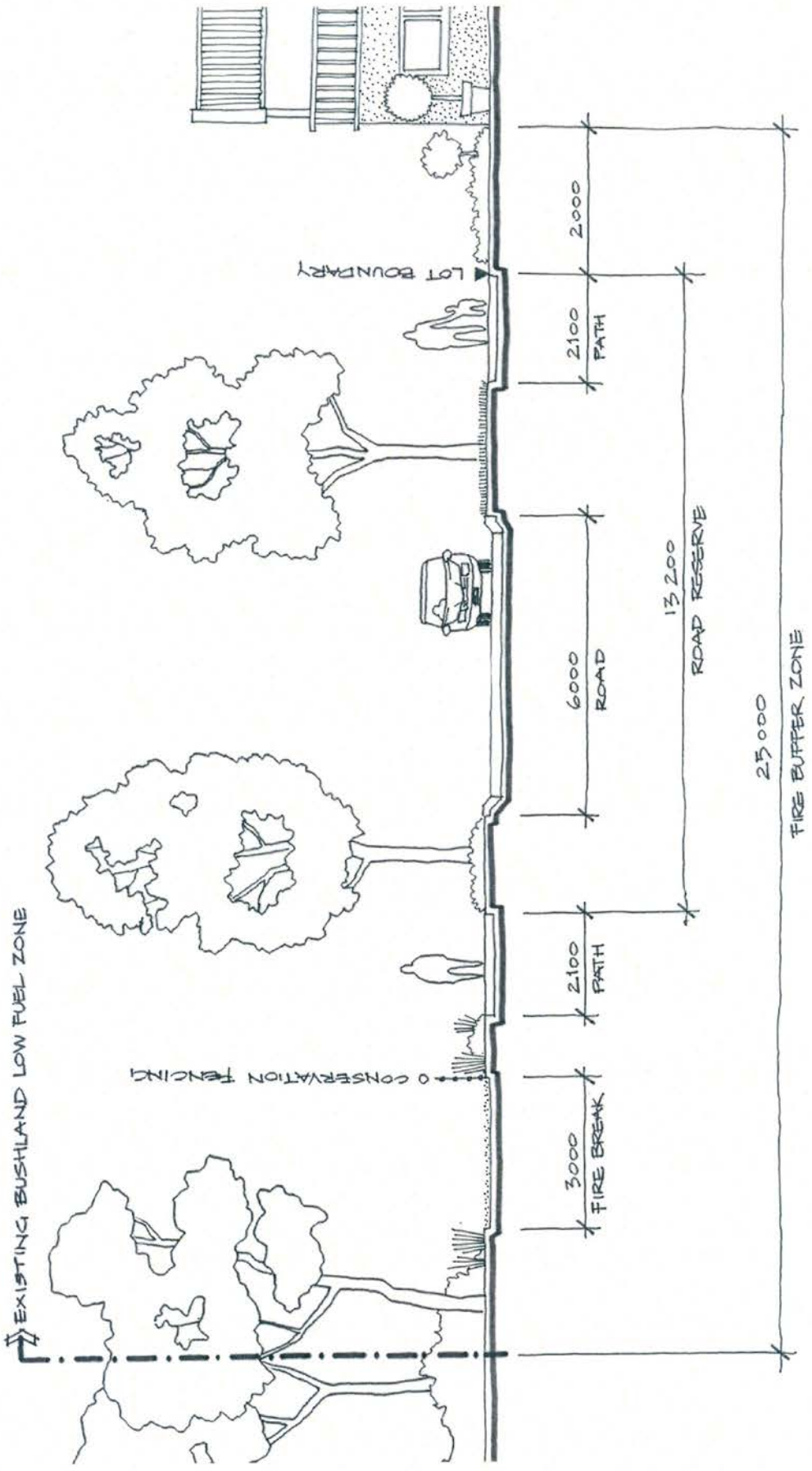
"Where existing tall bush land intrudes within the 25 metre BPZ, specific management of bush fire fuel loads are required. Initial hand and/or machine clearance is to be undertaken of all non-native plants including grass and shrub species. Further techniques including the application of a selective herbicide may be required to ensure removal of invasive species. All standing and prone dead wood is to be removed prior to any re-vegetation work.

Future native re-vegetation and/or amenity planting within the BPZ are to comprise low fuel plant species with mature heights no greater than 1500mm. Regular maintenance of these plants will be required to remove dead or dying leaves or branches ensuring there is no build up of flammable detritus within the zone. All amenity planting adjacent to degraded wetland interfaces will be regularly maintained and irrigated. Plant species for planting within the BPZ will comply with *Plant Guide within the Building Protection Zone for the Swan Coastal Plain of Western Australia* (DFES Publication 2011)

See schematic sketch Figure 6**.**

Each landowner within the site will be required to comply with the City of Kwinana Firebreak Notice which may be amended from time to time. The Firebreak notice applies to all landowners in this site irrespective whether a dwelling has been constructed or not..

Figure 6 Schematic Diagram of Building Protection Zone separating retained Vegetation and Dwellings (Indicative Only).



6.2 BUSH FIRE RISK MANAGEMENT

6.2.1 Total Fire Ban Days

A Total Fire Ban is declared because of the extreme weather conditions or when fires are seriously stretching fire fighting resources. A Total Fire Ban is declared by DFES following consultation with Local Governments.

When a Total Fire Ban is declared it prohibits the lighting of any fires in the open air and any activities that might start a fire.
The ban includes all open fires for the purpose of cooking or camping. It also includes incinerators, welding, grinding soldering and gas cutting.

The Department of Fire and Emergency Services and the City of Kwinana are to continue to educate the public on what a Total Fire Ban means and what actions do the public need to take.

6.2.2 Public Education Program

The City of Kwinana is to continue to provide the community with advice on bush fire prevention and preparedness through brochures, newspaper articles, City of Kwinana Annual Firebreak Notice issued to rate payers and on their web site.

The Developer is to lodge a Section 70A a memorandum on the Title of each property advising that the property is subject to a fire management plan.

Copies of *The Homeowners Bush Fire Survival Manual*, *Prepare Act and Survive*, *City of Kwinana Firebreak Notice* or other suitable documentation and the approved Fire Management Plan will be issued to each property owner by the developer at the sale of the allotment. Responsibilies of the landowner detailed in the Fire Management Plan must be implemented prior to the construction of a dwelling commencing

Other Public Safety and Community information on Bush Fires is available on the Department of Fire and Emergency Services web site www.dfes.wa.gov.au and the City of Kwinana website www.kwinana.wa.gov.au

6.3 FUTURE DEVELOPMENT

This Fire Management Subdivision Plan has been prepared on the basis of the Wandi North Local Structure Plan being developed in accordance with the LSP (Figure 1) and the subdivision layout detailed in Figure 2. Where the LSP is amended to cause inconsistencies or failures in the fire protection requirements of this FMP, it will cause FMP to be reviewed by the developer and subsequently endorsed by Local Government. Any future development that is contrary or on in addition to this subdivision plan will require approval from Local Government and may result in the need to review the provisions of this Fire Management Plan.

6.4 ACCESS, FIREBREAKS AND STAGING OF LAND RELEASES

6.4.1 Road System

The road system will have multiple links to Lyon Road. In most areas an internal road will separate areas of CCW, REW and Public Open Space from urban development. All road access will be designed and constructed to Council specifications and will comply with A2.1, A2.2 & A2.4 of the *Planning for Bushfire Protection Guidelines (2010).* See Section 7.2.1 for minimum Public Road Standards

Where this separation cannot be achieved by mainly a road reserve, a 25 metre Building Protection Zone will separate areas of CCW, REW and Public Open Space from any residential dwellings or other buildings,

to the satisfaction of the City of Kwinana Fire Services Officer's. The specification of the Building Protection Zone is detailed in Section 7.2.2 of this Fire Management Plan.

All of the developable area has been cleared of vegetation and the 25 metre Building Protection Zone is to be implemented within Stages of land release prior to the construction of dwellings on Lots adjoining CCW, REW and POS.

6.4.2 Internal Firebreaks

Notwithstanding the provisions of this Fire Management Plan, all lots within the site must comply with the requirements of the City of Kwinana Firebreak Notice, as published annually.

6.4.3 Private Driveways

Private driveways into residential homes must comply with the City of Kwinana specifications and comply with acceptable solution A2 where Private driveways are greater than 50 metres. Private driveways within this urban residential area will be less than 50 metres long so construction standard will be in accordance with City of Kwinana Specifications.

6.4.4 Fire Protection Requirements around Stages of Development

The main threat to each stage of development from a wildfire (bushfire) is from a fire originating in the public open space or undeveloped areas.

To provide protection to residents in the various stages, each stage is to contain the following bush fire protection requirements:-

- A fire service access is to be constructed on the outside of the development on the alignment of the internal road in the next stage. This access is to be to the standard of a fire service access as detailed in Section 7.2. It may be necessary in some places (heavy sand) to lay road base to provide access for large fire appliances. The whole of the urban area within the "Site" has been cleared of remnant vegetation and this section will only be required when grass growth in the undeveloped area increases to the stage where it creates a fire hazard.

- Landscaping adjoining each Stage of Land release is to be implemented prior to the occupancy of any homes within that Stage unless otherwise agreed to by the Developer and the City of Kwinana

- Fire hydrants are to be installed within each stage in accordance with the *Water Corporations No. 63 Water Reticulation Standard.*

6.4.5 Fire Protection in Undeveloped Areas.

Areas that have not been developed must comply with the City of Kwinana Firebreak Notice.

6.4.6 Fire Protection in Public Open Space-Development Interface

Areas of un-reticulated Public Open Space/retained vegetation are to have fire protection measures implemented to adequately protect the adjoining urban development in the event that these areas will at some stage be affected by wildfire.

The fire protection requirements for the CCW, REW and Public Open Space (POS)-Development interface areas are as follows.

- A road is to be constructed around the outside of the housing area to separate the housing development from the bush areas.

- Where no road is separation the Lots and vegetation a 25 metre building protection zone is to be established between the housing area and the POS. Applies to POS area 8 see Figure 9 for location of Building Protection Zone and landscaping.

- A 25metre building protection zone is to be established between the housing area and CCW/REW/POS to consist, road reserve, footpaths and setback at front of houses facing the CCW/REW/POS. See Section 7.2 for Building Protection Zone Standards.

- Landscaping adjoining each Stage of Land release is to be implemented prior to the occupancy of any homes within that Stage unless otherwise agreed to by the Developer and the City of Kwinana

- Public Open Space Management Plans will need to include a Section on the management of fire and bush fire fuel loads within the areas.

- Fire hydrants are to be installed in accordance with the *Water Corporations No. 63 Reticulation Standard.*

Figure 7 Staging Plan

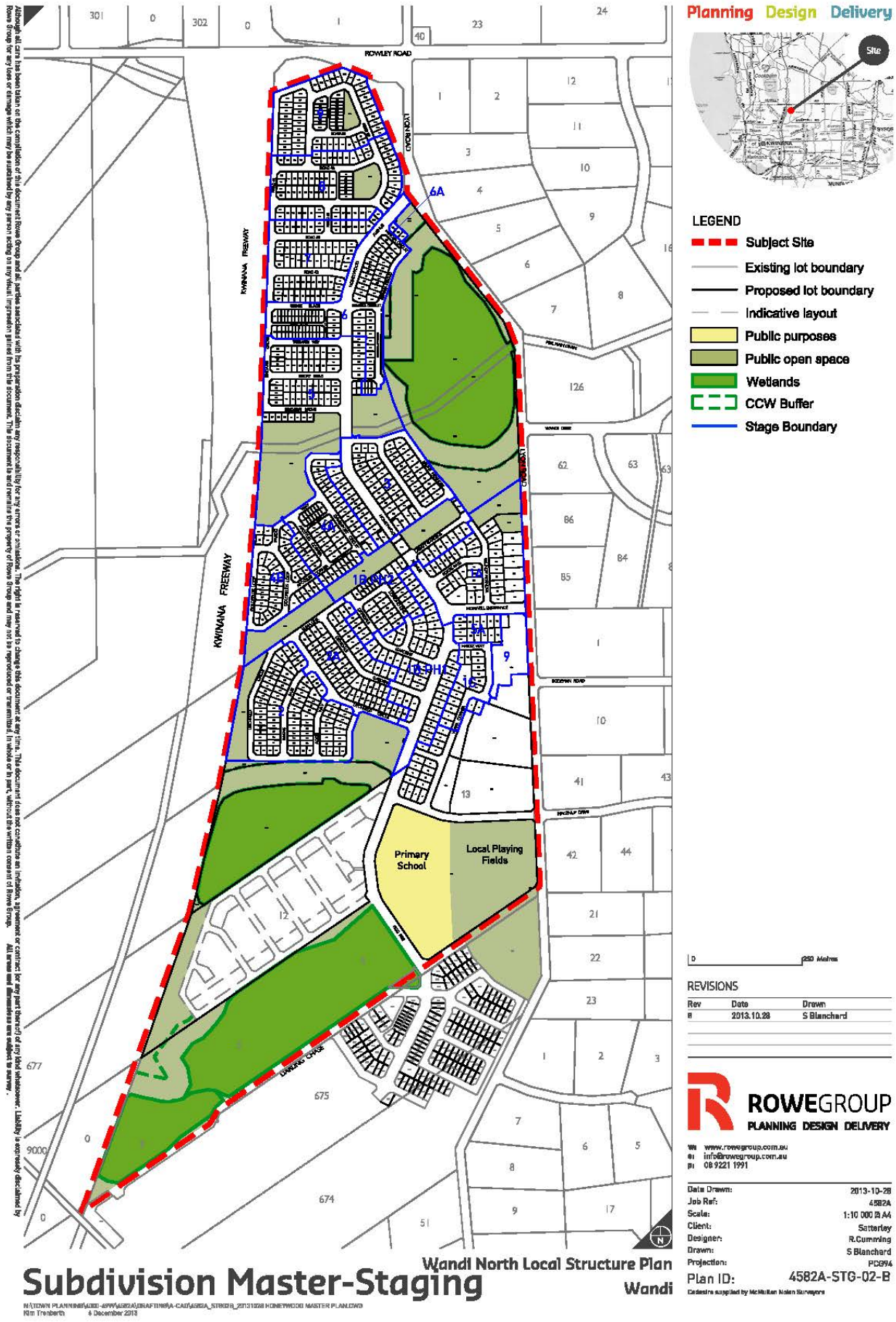


Table 2 Description of CCW/Public Open Space as it relates to Numbering system of these areas as shown in Figure 7

CCW/POS Number	Vegetation Type	Bush Fire Rating	Special Risks
6a	Flooded Gum trees (Forest Class A) with dense understorey	Extreme	
7	Currently cleared as part of Peel Main drain re alignment. To be landscape Turf, amenity planting and appropriate riparian vegetation in drain. (Low Open Shrubland Class G)	Low	
8	Part of Peel Drain realignment. To be landscape Turf, amenity planting and appropriate riparian vegetation in drain. Includes drainage swales. (Low Open Shrubland Class G)	Low	
9	Wetland Some Paper bark trees. (Forest Class A)	Extreme	Potential peat soils
10	Banksia Woodland. (Woodland Class B)	Moderate	
11, 12a & 12b	Landscape areas combination of Turf and shrubs and scattered trees. (Low Open Shrubland Class G)	Low	
13	Landscaped turf Area	Low	
14	Landscape areas combination of Turf and shrubs and scattered trees. (Low Open Shrubland Class G)	Low	
15	Banksia Woodland (Class B) to be landscaped in NW corner including recreational facility	Moderate	
16	Wetland with Eucalyptus and Melaleuca Species (Class A) Northern portion shrubland vegetation (Class D) to 2-3metres to be removed and landscaped	Extreme in wetland portion, moderate in shrubland	Potential Peat soils in wetland area
17-19	These areas are not included in this development application		
20	This area is outside the scope of this Fire Management Plan.		

Figure 8 POS/CCW AREA 6A Northern Section (indicative only)

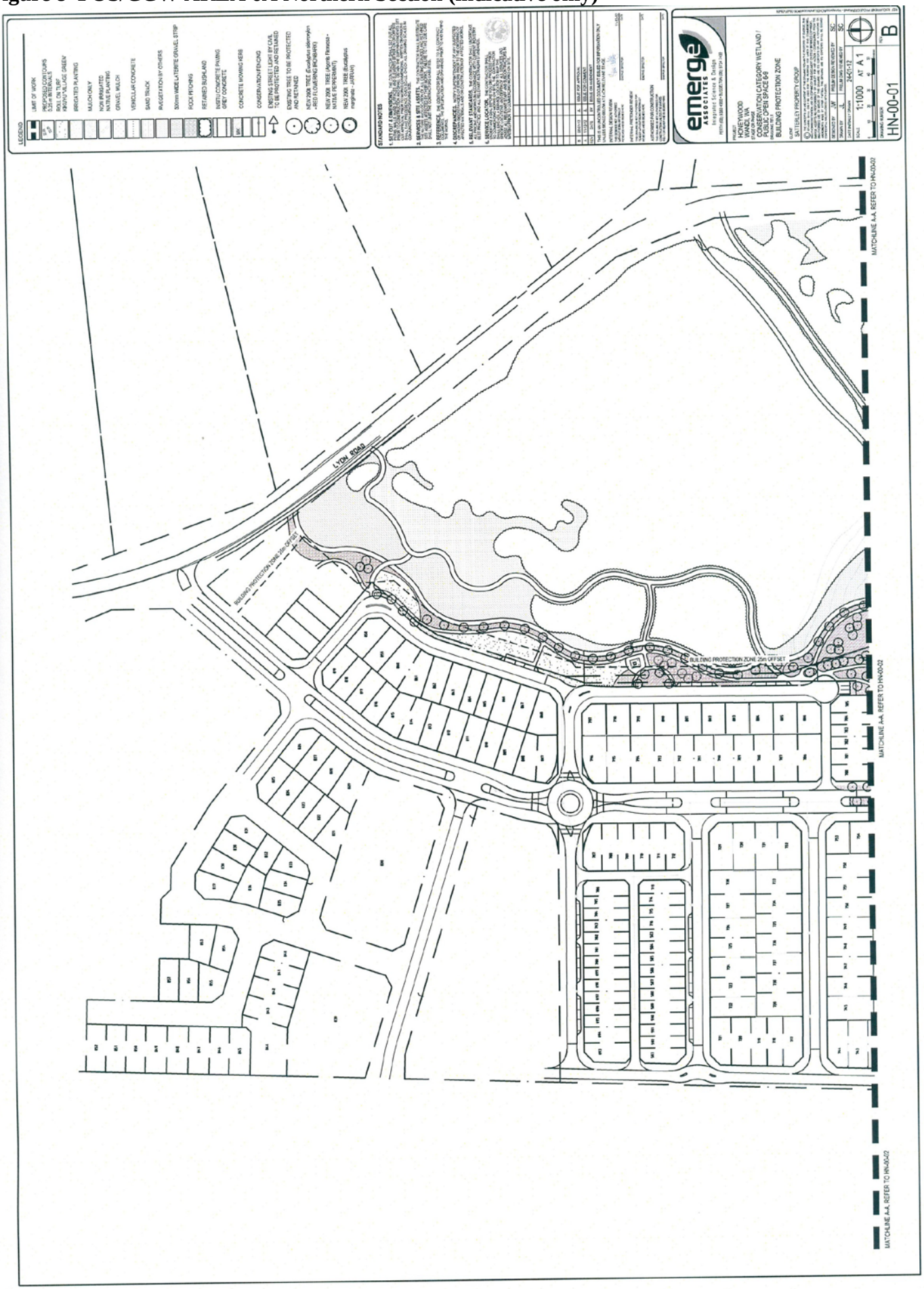


Figure 9 POS/CCW Area 6a Southern Section and areas 7, 8 and 9 (indicative only)

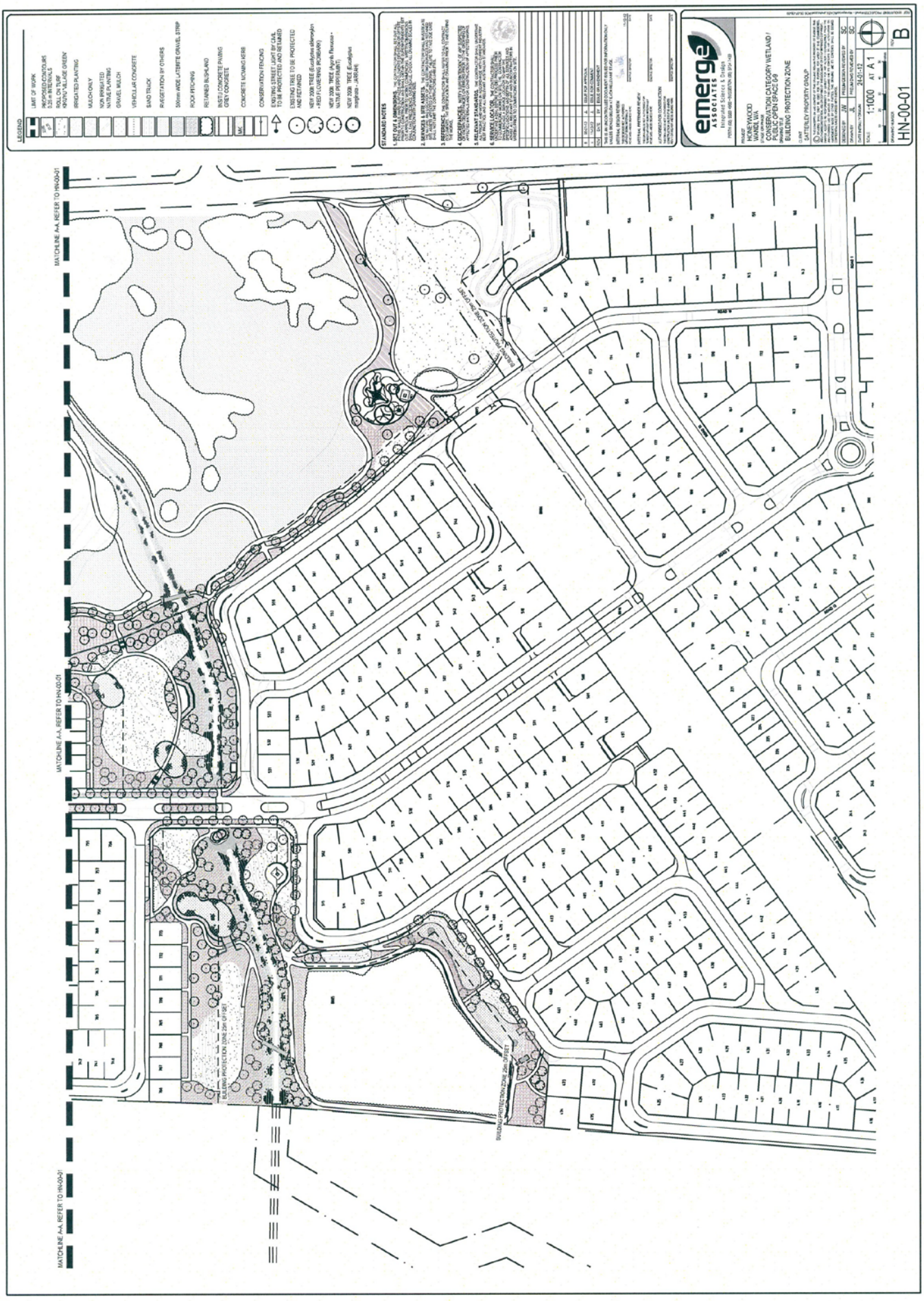
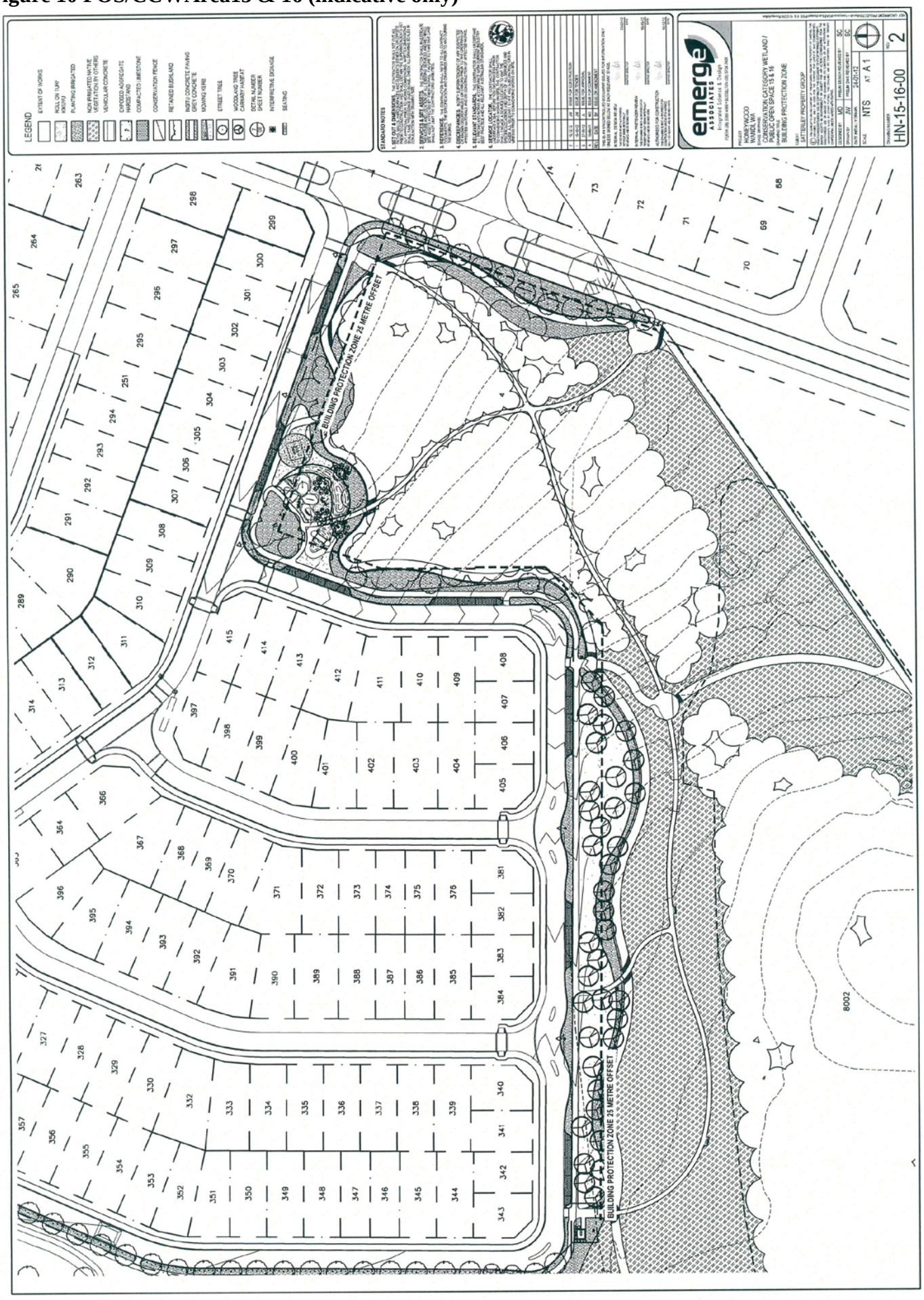


Figure 10 POS/CCWArea15 & 16 (indicative only)



6.5 FIRE SAFER AREAS

In the event of a bush fire, the Incident Controller of Fire Fighting operation will advise if evacuation of residents is necessary and, in conjunction with the City of Kwinana, direct these residents to the Open Safer Refuge Areas as deemed suitable for use by the Incident Controller.

6.6 ASSESSMENT OF FIRE MANAGEMENT STRATEGIES

The implementation of this Fire Management Plan will be a conditional requirement of subdivision for this site and will be implemented at each stage of land release.

It will be the responsibility of the developer to implement all the necessary provisions of this Fire Management Plan prior to being granted subdivision clearance..

Likewise it is the responsibility of the City of Kwinana to ensure that all standards required in this Fire Management Plan are met by the developer prior to clearing any conditions of subdivision relating to this Fire Management Plan.

After any major fires that may occur during or once this development has been completed, the City of Kwinana may conduct a Post Incident Analysis of the fire, which may cause improvements to be inclusive or in addition to the Fire Management Plan as necessary.

6.7 IMPLEMENTATION OF THE FIRE MANAGEMENT PLAN.

This Fire Management Plan becomes operational as a Condition of Subdivision and will be implemented at each stage of land release.

In implementing this Fire Management Plan, the following responsibilities have been determined:

6.7.1 Property Owner's Responsibilities

To maintain the reduced level of risk and threat of fire, the owners/occupiers of all lots created by this proposal will be responsible for undertaking, complying and implementing measures protecting their own assets from the threat and risk of bush fire:

- Maintain the property in good order to minimize potential bushfire fuels to mitigate the risk of fire on the property;
- Ensure that vacant lots to be maintained in accordance with the City of Kwinana Annual Firebreak Notice;
- Ensure that where hydrants are located on private property or their verge, the hydrant is not to be obstructed and remain accessible at all times;
- Ensure any contractor's under direction of or working for the property owner, are notified of relevant hydrant location on the property and the requirement to ensure the hydrant is not obstructed, covered over or damaged at all times.
- Ensure that dwellings are construction to the current and adopted AS 3959 standard where a lot has been identified as requiring and increased construction standard. There will be a Section 70A notification issued on all Land Titles.
- Complying with the instructions of all emergency service personnel in maintaining the property or during the event of a bushfire.
- Be aware of building conditions for lots identified and ensure construction is to current and adopted AS3959 requirements. Where the landowner requests a Bushfire Consultants to reassess their Lot to confirm or re assign a new BAL for their Lot a copy of the report must be submitted to the City of Kwinana as part of the Building Permit Approval.
- Ensure that in the event an evaporative air conditioner is installed at the property, suitable external ember screens are installed to roof mounted units and comply with current and adopted AS 3959 to assist in protection from air borne burning embers.
- Understand what is required when a Building Protection Zone is established as part of the landscaping of a dwelling and be aware that the maintenance and upkeep of the Building Protection Zone on the property is the owners/occupiers responsibility. Gardens and landscaping to be consistent with the BPZ requirements where gardens are not established by the developer.

6.7.2 Developer's Responsibilities

Prior to the issuing of Titles the developer shall be required to implement all necessary provisions of this Fire Management Plan to the satisfaction of the City of Kwinana and the Western Australian Planning Commission prior to being granted clearance of Subdivision.

- Developer to ensure submitted DAP's are consistent with the LSP shown in the FMP and POS/CCW hazard fuel assessments

- All internal roads and access ways are to comply with the design requirements of the City of Kwinana except where the cost of completing construction has been bonded with the City of Kwinana;

- Reticulated water supply (including hydrants) to be provided to the satisfaction of the Water Corporation, the Fire and Emergency Services Authority (DFES) and the City of Kwinana. Hydrants are to be identified to DFES standard for both pole and road markings. except where the cost of completing construction has been bonded with the City of Kwinana and/or Water Corporation See Section 7.3.5;

- The developer is required to lodge a Section 70A Notification on each Certificate of Title, proposed by the subdivision to identify the existence of this fire management plan. The notification shall alert purchasers and successors in title of the responsibilities of the Fire Management Plan and bush fire building construction requirements;

- For those lots situated within bush fire risk areas, dwellings are to be constructed in accordance with current and adopted Australian Standard AS 3959 to the relevant bush fire attack level (BAL) specified on Detailed Area Plans (DAP) for the Estate and provided to the City of Kwinana by the Developer and be made readily available to perspective purchasers of land.

- Prior to the issue of titles for any lots at the stage of release, the developer to provide the Building Department City of Kwinana detailed Development Lot plans specifically identifying properties with BAL rating imposed in which the increased building constructions standards will be applicable;

- All vacant land is to comply with the City of Kwinana Firebreak Notice as published annually;

- All purchasers/new property owners are to be advised of the location of any hydrant that is positioned on their Lot or verge and the requirement for the hydrant to remain unobstructed at all times;

- Developer is to notify any landscaping contractor's, under direction of the developer, of relevant hydrant locations and the requirement to ensure the hydrant is not obstructed, covered over or damaged;

- Developer is to ensure that the Landscaping is consistent with the BPZ landscaping guidelines on street landscaping or where landscaping is provided to purchasers as part of land sales packaging;

- Developer to ensure that landscaping contractors are establishing landscapes consistent with the above statement;

- Supply a copy of following;-
  - this Fire Management Plan;
  - *The Homeowners Bush Fire Survival Manual;*
  - *Prepare Act Survive (or similar suitable documentation);* and
  - City of Kwinana Fire Break Notice to each property owner on sale of the Lot.

6.7.3 City of Kwinana

The responsibility for compliance with the law rests with individual property owners and occupiers and the following conditions are not intended to unnecessarily transfer some to the responsibilities to the City of Kwinana.

The City of Kwinana shall be responsible for:

- Endorsing a Section 70A Notification on each Certificate of Title;
- Assess each building license application received against the current AS 3959 to determine suitability of the proposed construction;
- Enforcement of the City of Kwinana Firebreak Notice;
- Once the low fuel buffer has been established and maintained to the standard to the satisfaction of the City of Kwinana by the Developer for the set period take over management the low fuel buffer zones once accepted by the City of Kwinana;
- Maintain the Road Reserve and landscaping to the Building Protection Zone Standard where dwellings adjoin CCW/POS areas as detailed in Section 6.4.6 and 7.3.2
- The conservation Category Wetland and Public Open Space will be managed by the City of Kwinana and those parts of the low fuel buffer are to comply with the requirements of this Fire Management Plan.; and
- Provide fire prevention and preparedness advice to landowners upon request.
- Ensure Compliance with this Fire Management Plan prior to clearance of conditions of subdivision;
- Develop and Maintain Fire Fighting Facilities for the District.

6.7.4 Department of Fire and Emergency Services.

The Department of Fire and Emergency Services shall be responsible for:

- Provide preparedness and preparation advice to landowners on request.

7.0 APPENDICES

7.1 WORKS PROGRAM

The works program required in this Fire Management Plan must be implemented by the developer as a condition of subdivision approval.

Landowners will be responsible for the annual maintenance of Low fuel buffer within there Lot and City of Kwinana Firebreak Control Notice. Once the Conservation Category Wetlands and Public Open Space are handed over to the City of Kwinana, the Council will be responsible for the annual maintenance of the remainder of the low fuel buffer.

Table 3 Works Program Prior to issue of Titles and Ongoing Maintenance

Activity	Responsibility	Maintenance	Responsibility
Installation of Roads S 6.4.1 Standards Section 7.2.2	**Developer**	**Checking of quality of Roads**	**City of Kwinana**
Implement fire protection measures as detailed in Sections 6.4.4 to 6.4.6	**Developer**	**Annually maintenance required until Lots sold.**	**Developer**
Compliance with Firebreak Notice. Details Section 6.4.2	**Developer**	**Compliance with Firebreak Notice annually**	**Landowner**
Installation of Fire Hydrants. Water Corporation Standards. Standard Pole & Rd markings Section 7.2.4	**Developer**	**Water Corporation Standards**	**Water Corporation**
Landscaping/modify bush fire fuels in BPZ between POS/CCW and dwelling S.6.4.6 BPZ standard Section 7.2.4	**Developer**	**Annually Maintain BPZ in perpetuity**	**Developer until Lot is sold then landowner within front setback of Lots. City of Kwinana Road Reserve and landscaping**
Section 70 A notification on Tile of each Lot advising FMP applies to each Lot	**Developer**	**Maintain Lot in accordance with Landowners responsibilities Section 6.71**	**Landowner**
Prior to subdivision clearance implement developer's responsibilities. Section 6.7.2	**Developer**	**Some responsibilities are transferred to Landowners and City of Kwinana after lot is sold or responsibility is transferred to the City**	**Landowner or City of Kwinana.**
Provide a copy of following a sale of Lot:- Fire Management Plan Home Owners Survival Manual Prepare Act Survive Fire Control Notice	**Developer**	**Landowners to familiarise themselves and annually update actions in the event of fire and annual maintenance of the above**	**Landowner**

Works Program Prior to Building Permit

Activity	Responsibility	Maintenance	Responsibility
Provide a map showing BAL ratings for each Stage of land release and give to purchasers of a Lot	**Developer**	**Ensure Building design complies with relevant AS 3959 BAL rating**	**Real Estate Agent to provide to prospective purchaser.**
Landowner may request BAL reassessment to confirm or amend BAL rating. Copy of report to City of Kwinana	**Landowner**	**Ensure building design complies with current and adopted AS 3959 BAL as part of Building Permit Approval**	**Landowner /builder to design & Council to check design compliance**

7.2 GUIDELINES SPECIFICATIONS AND MINIMUM STANDARDS

The following section outlines the required specifications and minimum development standards that are required under this Fire Management Plan.

7.2.1 Public Roads A 2.2- Minimum

Public roads meet the following requirements:

- minimum trafficable surface: 6 metres
- horizontal clearance: 6 metres
- vertical clearance: 4 metres
- maximum grades: 1 in 8
- maximum grade over <50 metres: 1 in 5
- maximum average grade: 1 in 7
- minimum weight capacity: 15 tonnes
- maximum crossfall: 1 in 33
- curves minimum inner radius: 12 metres

7.2.2 Building Protection Zone A4.3

The aim of the Building Protection Zones (BPZ) is to reduce bush fire intensity close to dwellings, and to minimise the likelihood of flame contact with buildings.

The Building Protection Zone is a low fuel area immediately surrounding a building complying with *Planning for Bush Fire Protection* Acceptable Solution A4.3.

The following 25 metre Building Protection Zone is to apply to the interface area between the Conservation Category Wetland and Public Open Space and nearby residential dwellings and along the eastern boundary and must fulfil the following conditions:

- Bush fire fuels must be maintained at or below 2 tonnes per hectare and dry grass must be maintained below a height of 50mm;
- The first 3m at the front of the dwelling is to be cleared of all flammable material. Reticulated gardens may be located in this zone;
- The spacing of trees trunks should be 15-20 metres apart to provide for a separation of 10 metres between crowns when trees mature;
- Trees are to be progressively low pruned at least to a height of 2 metres;
- No tall shrubs or trees are to be planted within 2 metres of a building including windows;
- There are no tree crowns over hanging the building;
- Branches, must be removed at least 2 metres back from the eaves of all buildings;
- Shrubs within the Building Protection Zone have no dead material within the plant;
- Trees in the Building Protection Zone have no dead material within the plant's crown or on the bole (tree trunk);
- Fences within the Building Protection Zone are to be constructed using non combustible materials (e.g. colour bond iron, brick, limestone);

- All leaves, twigs, logs, branches must be removed from within the building protection zone. Annual falls of leaf litter must be raked up and removed or burnt.
- The Building Protection Zone along the Landscape Protection Area interface is to be installed by the developer.
- The road reserve is to be maintained as part of the Building Protection Zone.

The developer is to modify fuel loadings on all Lots within the proposed subdivision so as to achieve the requirements of the Low fuel buffer (to Building Protection Zone standards) prior to the sale of Lots. Landowners are also required to maintain BPZ within their Lot to the Building Protection Zones standard in perpetuity in accordance with this fire management plan.

Once the low fuel buffer has been established and maintained to the standard to the satisfaction of the City of Kwinana by the Developer for the set period takes over management the low fuel buffer zones once accepted by the City of Kwinana.

The above standard is from DFES website.

Removal of bush fire fuels may be carried out by burning or mechanical means. If burning is used is must be carried out in accordance with the provisions of the Bush Fires Act 1954 and the City of Kwinana Firebreak Control Notice.

7.3.3 Dwelling Construction

Individual dwellings on designated lots shall be designed and built to conform with:

- The Building Code of Australia; and
- AS 3959 *Construction of Buildings in a Bushfire Prone Area*;

The minimum distance of 100 metres (from vegetation rated ‘Moderate’ or ‘Extreme’) may be reduced is compliance with current and adopted AS 3959. Under the current and adopted AS 3959 as the distance from the vegetation is reduced, the construction standard must be increased. Table 2.4.3 AS 3959 sets out this relationship and Section 2 of AS 3959-2009 details the methodology of determining the Bushfire Attack Level (BAL).

BAL (Bushfire Attack Level) Determination Using Methodology from Section 2.2.1 of current adopted AS 3959- 2009 and Table 2.4.3 which applies to Lots interfacing the Conservation Category Wetland and Public Open Space is:

Table 4 Summary of Determination of BAL using Fire Danger Index 80

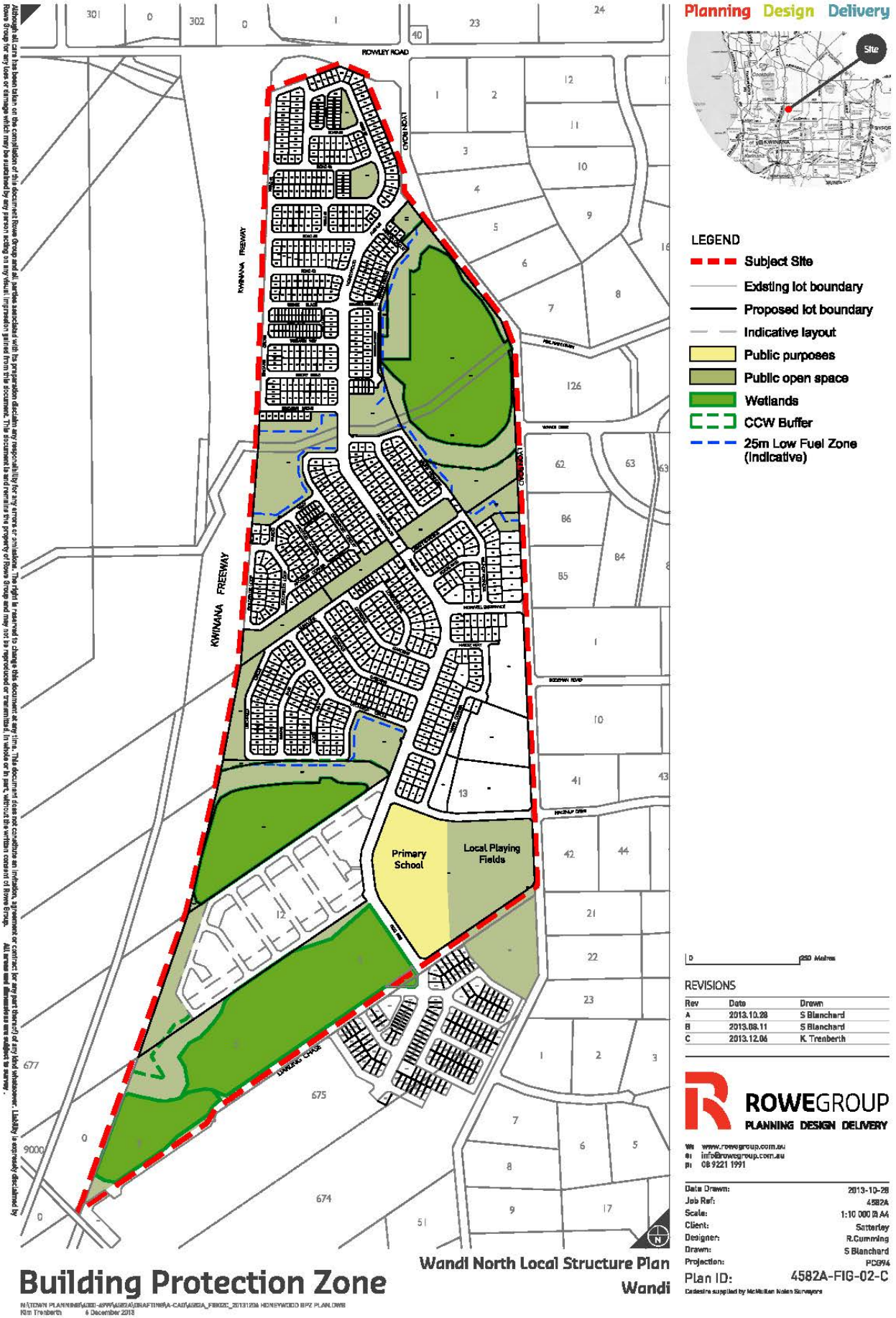
Vegetation Class	Setback from Vegetation (METERS)	Slope	BAL	Construction Standard AS 3959-2009	BPZ (metres)	HSZ (metres)
A Open Forest	25	0°	29	Section 3 & 7	25	0
	31-42	0°	19	Section 3 & 6	Whole of lot	0
	42-100	0°	12.5	Section 3 & 5	Whole of lot	
B Woodland	25-35	0°-5°	19	Section 3 & 6	25	0
	35-100	0-5	12.5	Section 3 & 5	Whole of lot to be managed as BPZ	0

All lots identified in this 'Development' (i.e. Lots within 100 metres of the Conservation Category Wetland and Public Open Space, 25 metre Building Protection Zone line marked on the maps in Figure 11) will be subject to a Section 70A notification being lodged on the Certificate of Title, with future landowners required to construct any structure on these lots in accordance with the constructions standards outlined in current and adopted AS 3959. Compliance with these construction standards will be assessed at the time of building license by the City of Kwinana. BAL ratings for affected Lots will be specified on Detailed Area Maps (DAP) by the developer and submitted to City of Kwinana and provided to purchasers of a Lot at the time of sale.

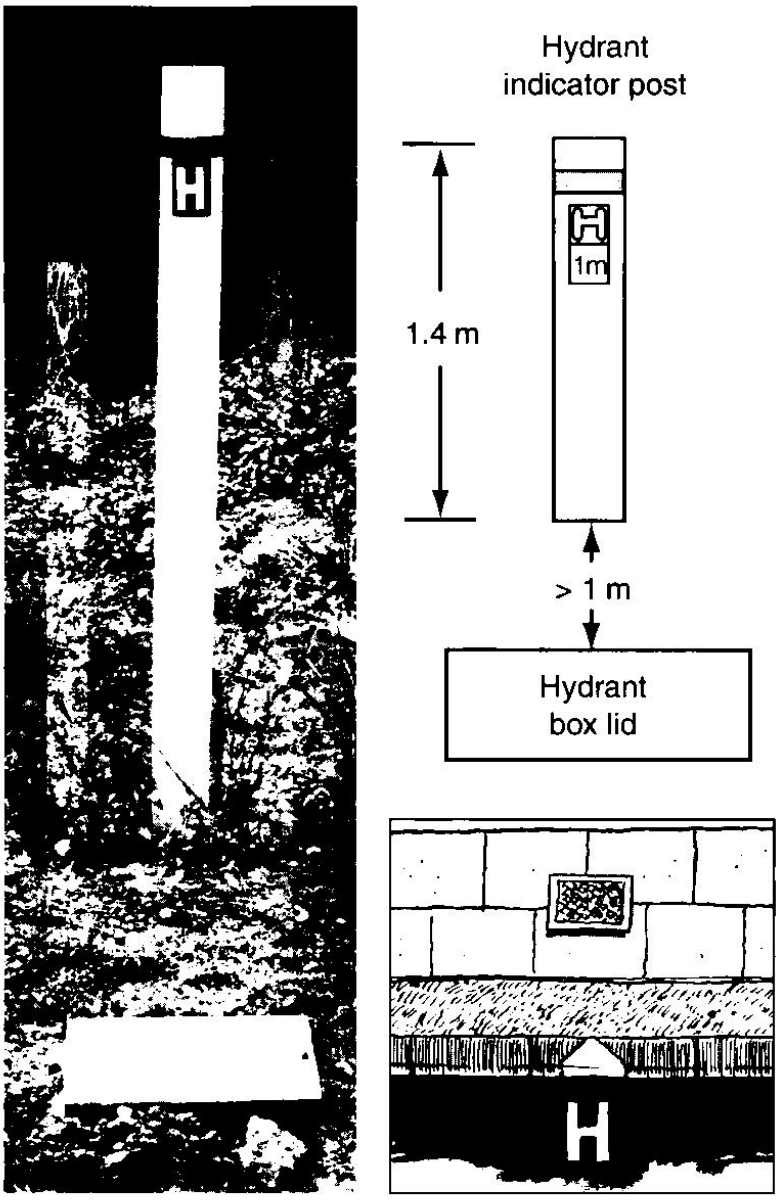
As a result of ember attack Evaporative Air conditioners can be the cause of a fire starting in a dwelling. It is a requirement that the roof unit of an evaporative air conditioner is enclosed in a suitable external ember protection screen. More information is available at www.dfes.wa.gov.au. and in current and adopted AS 3959.

See Figure 5 for areas of Open Forest and Woodland.

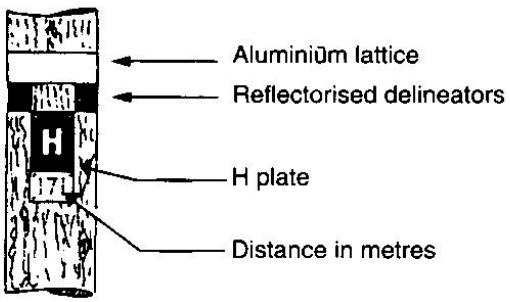
Figure 11 Building Protection Zone Locations



7.2.4 Fire Hydrant Road and Pole Markings.



Hydrant indicators post.

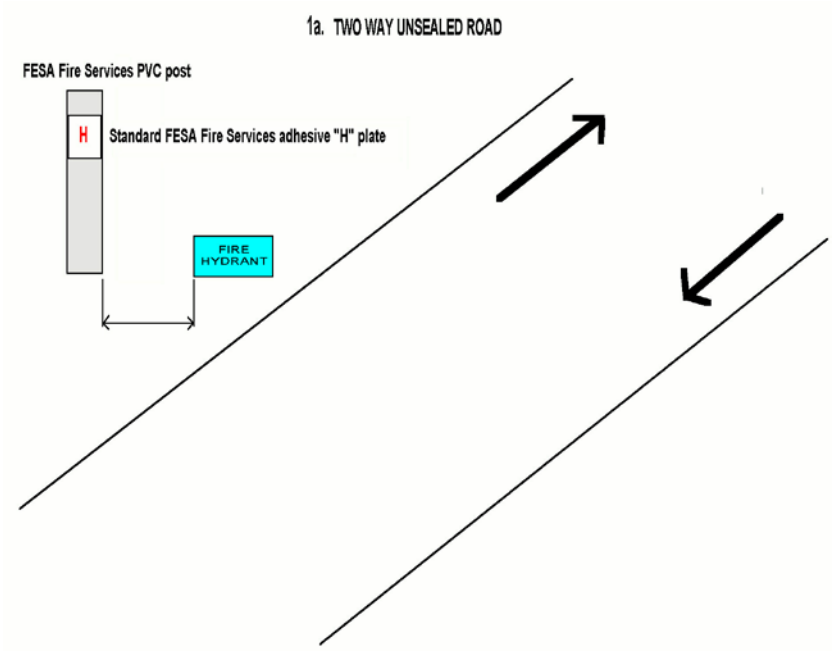


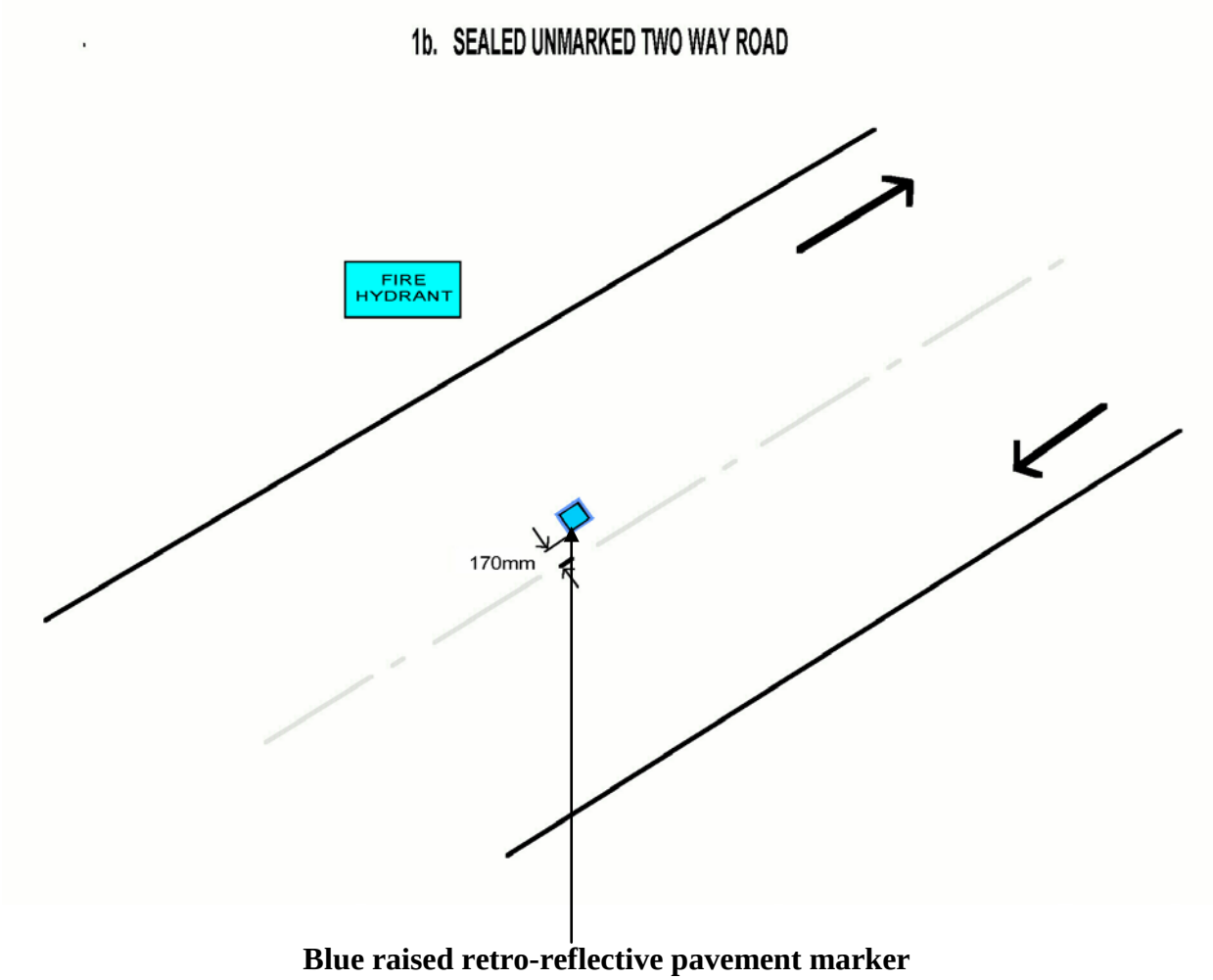
Indicates that the hydrant is on the same side of the street as the pole

Indicates that the hydrant is on the opposite side of the street as the pole

BLUE RAISED RETROREFLECTIVE PAVEMENT MARKER & HYDRANT INDICATING GUIDLINES

The implementation of the blue raised retro reflective pavement marker (RRPM's) and new hydrant indicating regime is designed to provide greater ability for fire fighters to readily identify fire hydrant locations, particularly at night or where smoke affects visibility.





Blue raised retro-reflective pavement marker

7.3 GLOSSARY

Acceptable Solution
A statement describing an acceptable means of complying with the requirements of corresponding performance criteria**.**

Appliance or Fire Appliance
A fire fighting appliance (vehicle) with structural, grass and bush fire fighting capabilities, with either a 2000 litres water capacity (2.4 appliance) or a 3000 litre water capacity (3.4 appliance) and four (4) wheel drive.

Bushfire Attack Level (BAL) – an assessed rating of a site's risk to a bushfire, based on vegetation type, slope of the land and its proximity to buildings.
Building Construction Standard Buffer - An area 100 metres wide Including a Building Protection Zone in which an increase in building construction standard in accordance with AS3959 will apply.

Building Protection Zone (BPZ)
Low fuel area immediately surrounding buildings. Minimum width 20 metres, increasing with slope. Maintained by the landowner.

Bush
Under the Bush Fires Act 1954 the term bush is defined to include trees, bushes, plants, stubble, scrub and undergrowth of a kind whatsoever whether dead or alive and whether standing or not standing.

Bush Fire or Wildfire
A general term used to describe fire in vegetation that is not under control.

Bush Fire Hazard.
The flammability, arrangement and quantity of vegetation, dead or alive, that can be burnt in a bush fire. Development is to be avoided in extreme bush fire hazard designated areas.

Bush fire prone area - for the purposes of this fire management plan, a bush fire prone area is an area that has been declared as such by the relevant local government responsible for an area. Once an area is declared bush fire prone, then AS 3959 applies to new residential development in it.

Bush Fire Risk
The chance of a bush fire starting that will have harmful consequences on life and property. It is measured in terms of consequences and likelihood and arises from the interaction of hazards, communities and the environment.

CCW
Conservation Category Wetland

Development Application
An application for approval to carry out a development under either a local planning scheme or regional planning scheme.

Dwelling setback – the horizontal distance between a wall of the dwelling at any point, and an adjacent lot boundary, measured at right angles (90 degrees) to the boundary.

DFES
Department of Fire and Emergency Services of Western Australia formally Fire and Emergency Services Authority

Emergency Access Way
Road not normally open but available to the public (using two wheel drive vehicles) for evacuation during a bush fire emergency.

Fire Break or Firebreak
Any natural or constructed discontinuity in a fuel bed used to segregate, stop and control the spread of a bush fire or to provide a fire line from which to suppress a bush fire. This is an area cleared to reduce the risk of bush fire damage.

FDI- Fire Danger Index
The chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long and short- term drought effects.

Fire Protection
A generic term used to describe the range of services and systems used to mitigate the impact of fire on the community. It encompasses both fire prevention and emergency response.

Fire Management Plan
Ongoing, dynamic document that sets out the medium to long term mitigation strategies for fire hazards and risks in particular developments within local government areas.

Fire Services Access Route
Accessible by heavy four wheel drive fire fighting vehicles.

Fuel Reduction also Hazard Reduction
Removal and modification of bush fire fuel, or increase in building construction standards or a combination of the two.

Hazard Separation Zone (HSZ)
The fuel reduction area between an area bush fire hazard and the buildings (and associated building protection zones) of a development.

Performance Criteria.
Statement which specifies the outcomes required for the protection of life and property from bush fires.

POS - abbreviation
Public Open Space.

REW – abbreviation
Resource Enhancement Wetland.

Structural Fire
A fire in a building.

8.0 FIRE MANAGEMENT PLAN COMPLIANCE CHECKLIST FOR PERFORMANCE CRITERIA AND ACCEPTABLE SOLUTIONS

PROPERTY DETAILS: Wandi North LSP - Honeywood Estate

Local Government: City of Kwinana

Element 1: Location

Does the proposal comply with the performance criteria by applying acceptable solution A1.1? **Yes** ✓ **No** ☐

Increased dwelling construction and appropriate BPZ.

Element 2: Vehicular Access

Does the proposal comply with the performance criteria by applying acceptable solution A2.1? **Yes** ✓ **No** ☐

Does the proposal comply with performance criteria by applying acceptable solution A2.2? **Yes** ✓ **No** ☐

Does the proposal comply with the performance criteria by applying acceptable solution A2.3? **Yes** ☐ **No** ☐

Not A

Does the proposal comply with the performance criteria by applying acceptable solution A2.4? **Yes** ☐ **No** ☐

Not Applicable

Does the proposal comply with the performance criteria by applying acceptable solution A2.5? **Yes** ✓ **No** ☐

In accordance with City of Kwinana standards

Does the proposal comply with the performance criteria by applying acceptable solution A2.6? **Yes** ☐ **No** ☐

Not Applicable

Does the proposal comply with the performance criteria by applying acceptable solution A2.7? **Yes** ☐ **No** ☐

Not Applicable

Does the proposal comply with the performance criteria by applying acceptable solution A2.8? **Yes** ☐ **No** ☐
Not Applicable

Does the proposal comply with the performance criteria by applying acceptable solution A2.9? **Yes** ✓ **No** ☐

Complying with City of Kwinana Firebreak Notice.

Does the proposal comply with the performance criteria by applying acceptable solution A2.10? **Yes** ☐ **No** ☐

Not Applicable

Element 3: Water

Does the proposal comply with the performance criteria by applying acceptable solution A3.1? **Yes** ✓ **No**

Developer to install fire hydrants

Does the proposal comply with the performance criteria by applying acceptable solution A3.2? **Yes** **No**

Not Applicable

Does the proposal comply with the performance criteria by applying acceptable solution A3.3? **Yes** **No**

Not Applicable

Element 4: Siting of Development

Does the proposal comply with the performance criteria by applying acceptable solution A4.1? **Yes** ✓ **No**

BPZ and increased dwelling construction

Does the proposal comply with the performance criteria by applying acceptable solution A4.2? **Yes** **No**

Not Applicable

Does the proposal comply with the performance criteria by applying acceptable solution A4.3? **Yes** ✓ **No**

Does the proposal comply with the performance criteria by applying acceptable solution A4.4? **Yes** **No**

Not Applicable

Does the proposal comply with the performance criteria by applying acceptable solution A4.5? **Yes** **No**

Not Applicable

Element 5: Design of Development

Does the proposal comply with the performance criteria by applying acceptable solution A5.1? **Yes** ✓ **No**

The development uses acceptable solutions as appropriate to meet the requirements under performance criterion P5.

Does the proposal comply with the performance criteria by applying acceptable solution A5.2? **Yes** **No**

Not Applicable

Applicant Declaration:

I declare that the information provided is true and correct to the best of my knowledge.

Name of Person Preparing the Fire Management Plan:

Full Name: B.W. Harris *for* FirePlan WA **Date:** 05/12/2013

Developer:

Full Name: _____ **Signature:** _____

Date:

FirePlan WA

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10 Bracken Rd
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firepla@bigpond.net.au

ABN 44 116 937 762

12th December 2013

Addendum to the Wandi North (Honeywood) Fire Management Plan

On the 3rd of November FirePlan WA carried out a bush fire hazard assessment of the northern development cell (comprising Stages 7 to 9) within the Wandi North Local Structure Plan, currently subject to amendment. The amendment area is herein referred to as the "site".

Attachment 1 depicts the area subject to this assessment.

1.0 Site Details

There are two small areas of retained vegetation that adjoin the site on its northernmost boundaries. This land is referred to as Lot 51 on Deposited Plan 19399, and is planned to be vested with Main Roads WA for drainage and road widening purposes. The timing for the vesting of this land is unknown at this stage. The land is currently owned by the State of WA. Whilst outside the Honeywood development, Lot 51 is included within this Hazard Assessment.

The Kwinana Freeway reserve adjoins the site on its western boundary. The vegetation within the Freeway reserve is approximately 40 metres at its widest point.

The site has been cleared of vegetation, and is relatively flat.

2.0 Access

Access to the site will be via three intersections with Honeywood Avenue, connecting to Lyon Road at two points. The site is therefore compliant with *Acceptable Solution A2.1* in regard to access. All internal roads will comply, as a minimum, with *Acceptable Solution A2.2*.

Honeywood Avenue is currently approved to a 25.2 metre reserve width. Other subdivisional roads are typically approved at 15.4 metres or 13.2 metres where adjoining public open space.

3.0 Vegetation

The vegetation on the adjoining Lot 51 and Kwinana Freeway reserve is classified as *Shrubland Class D*, with some clumps of trees. However, these are not large enough to affect the fire intensity of a bush fire occurring within the retained vegetation.

The vegetation is generally either upslope or flat from the development boundary.

Refer Attachment 2 for photographs of existing vegetation. Attachment 3 shows the direction of the photographs.

The development site is cleared and therefore does not present any internal bush fire hazard. Notwithstanding, the bush fire hazard for the adjoining Lot 51 and Kwinana Freeway reserve is rated as *Moderate*.

4.0 Lot 51
The existing vegetation on Lot 51, if retained in its current state, will impact the construction standard requirements of dwellings within the site, by way of incurring relatively high BAL ratings.

To reduce the risk of bush fire and therefore reduce the BAL ratings on dwellings, an ongoing management agreement will need to be in place between the City of Kwinana, the State of WA, and Satterley Property Group to ensure bush fire fuel loads are maintained at a low level consistent with the Building Protection Zone requirements detailed in the approved Fire Management Plan.

BAL ratings will be determined for the site based on the existing vegetation types and fuel loads at the time of development.

5.0 Water Supplies
Water supplies for fire fighting will be installed by the Developer in accordance with the Water Corporation's No. 63 reticulation standard, by installing and marking fire hydrants along internal roads.

Fire Hydrant mapping will be provided to the City at the subdivision stage as part of engineering designs.

6.0 Construction Standards of Dwellings Adjoining Areas of Retained Vegetation
The BAL construction standards for dwellings adjoining Lot 51 and the Kwinana Freeway reserve will be determined and mapped by the Developer, on advice from a qualified Bushfire Consultant, and included on the Local Development Plan for each applicable stage of land release. The BAL ratings are to be provided to the City for verification and acceptance prior to lodgement of the Local Development Plan with the City for approval.

The Local Development Plan, BAL mapping and approved Fire Management Plan will be made available to prospective purchasers of land as part of sales documentation.

A Section 70 Notification is to be issued on the Certificate of Title where a BAL is required.

Yours faithfully

B W HARRIS

Attachments:

1. Site Context Plans
2. Photographs of existing vegetation
3. Photograph direction
4. Public Open Space Plan

ATTACHMENT 1 – SITE CONTEXT PLANS

Planning Design Delivery

LEGEND

- Existing Local Structure
- Plan Boundary
- Amendment Area
- Public Open Space
- Primary School

0 37.5 Metres

REVISIONS

Rev	Date	Drawn
A	2013.05.17	S.Blanchard

ROWEGROUP
PLANNING DESIGN DELIVERY

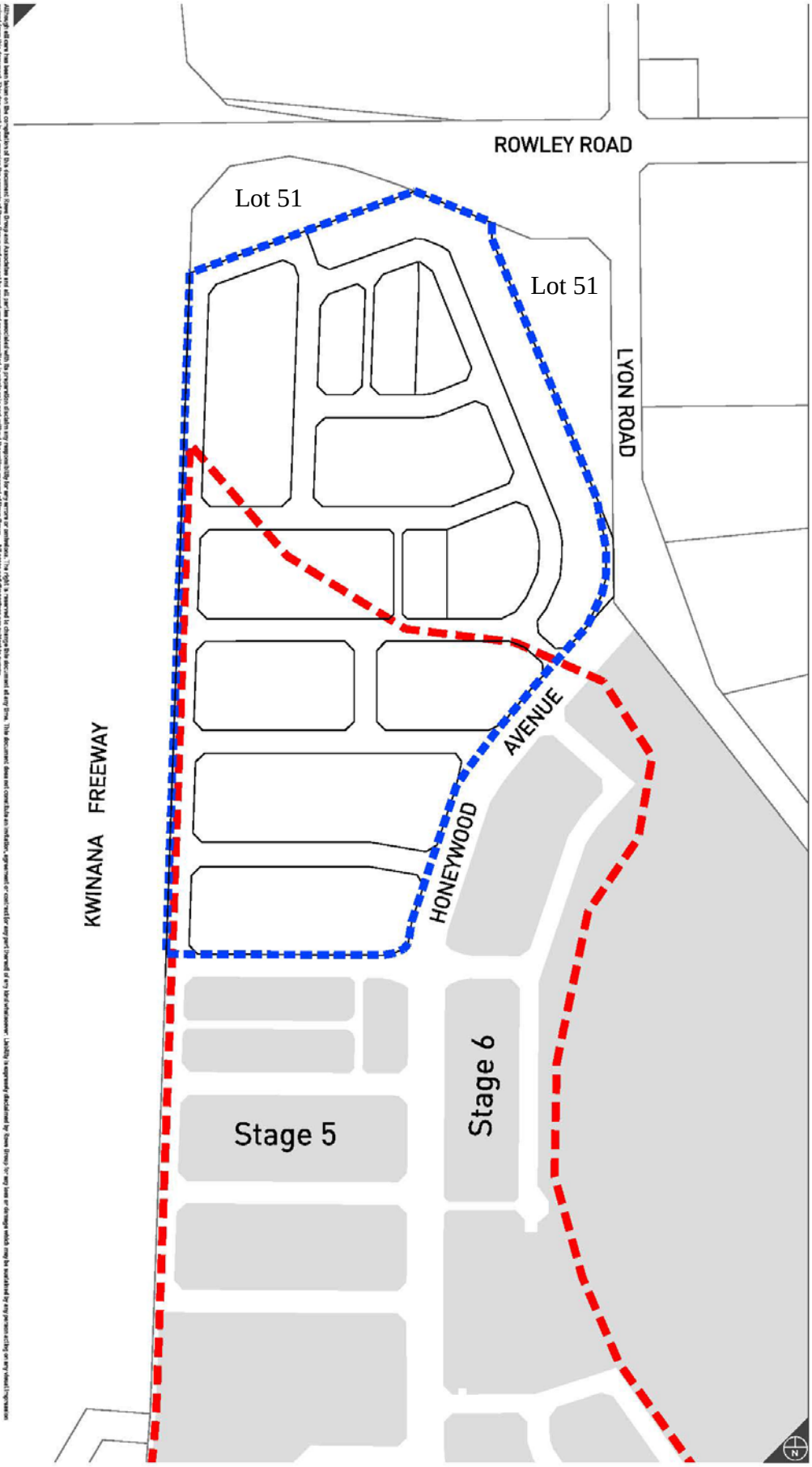
w: www.rowegroup.com.au
e: info@rowegroup.com.au
p: 08 9221 1991

Date Drawn:	2013-05-17
Job Ref:	4582C
Scale:	1:7500 A3
Client:	Satterly
Designer:	R.Cumming
Drawn:	S.Blanchard
Projection:	PCG94
Plan ID:	4582C-FIG06-A

Cadastre supplied by WesternCorp

Amendment Area Context Plan

Figure 1



Amendment Area

Figure 2

Planning Design Delivery

LEGEND

- Existing Local Structure Plan Boundary
- Amendment Area

0 125 Metres

REVISIONS

Rev	Date	Drawn
A	2013.05.17	S.Blanchard
B	2013.05.29	K.Trenberth
C	2013.11.11	S.Blanchard

ROWEGROUP
PLANNING DESIGN DELIVERY
w: www.rowegroup.com.au
e: info@rowegroup.com.au
p: 08 9221 1991

Date Drawn:	2013-05-29
Job Ref:	4582C
Scale:	1:2500 A3
Client:	Satterly
Designer:	R. Cumming
Drawn:	K. Trenberth
Projection:	PCG94
Plan ID:	4582C-FIG07-C

Cadastre supplied by WaterCorp

Planning Design Delivery

LEGEND

Amendment Area

0 125 Metres

REVISIONS

Rev	Date	Drawn
A	2013.05.30	K. Trenberth
B	2013.11.11	S. Blanchard

ROWEGROUP
PLANNING DESIGN DELIVERY

w: www.rowegroup.com.au
e: info@rowegroup.com.au
p: 08 9221 1991

Date Drawn:	2013-05-30
Job Ref:	4582C
Scale:	1:2500 A3
Client:	Satterly
Designer:	R. Cumming
Drawn:	K. Trenberth
Projection:	PCG94
Plan ID:	4582C-FIG-09-B

Aerial Photography captured and supplied by Landgate

Aerial/Site Plan

Figure 5

ATTACHMENT 2 – PHOTOGRAPHS OF EXISTING VEGETATION

Photo 1

Photo 2

Photo 3

Photo 4

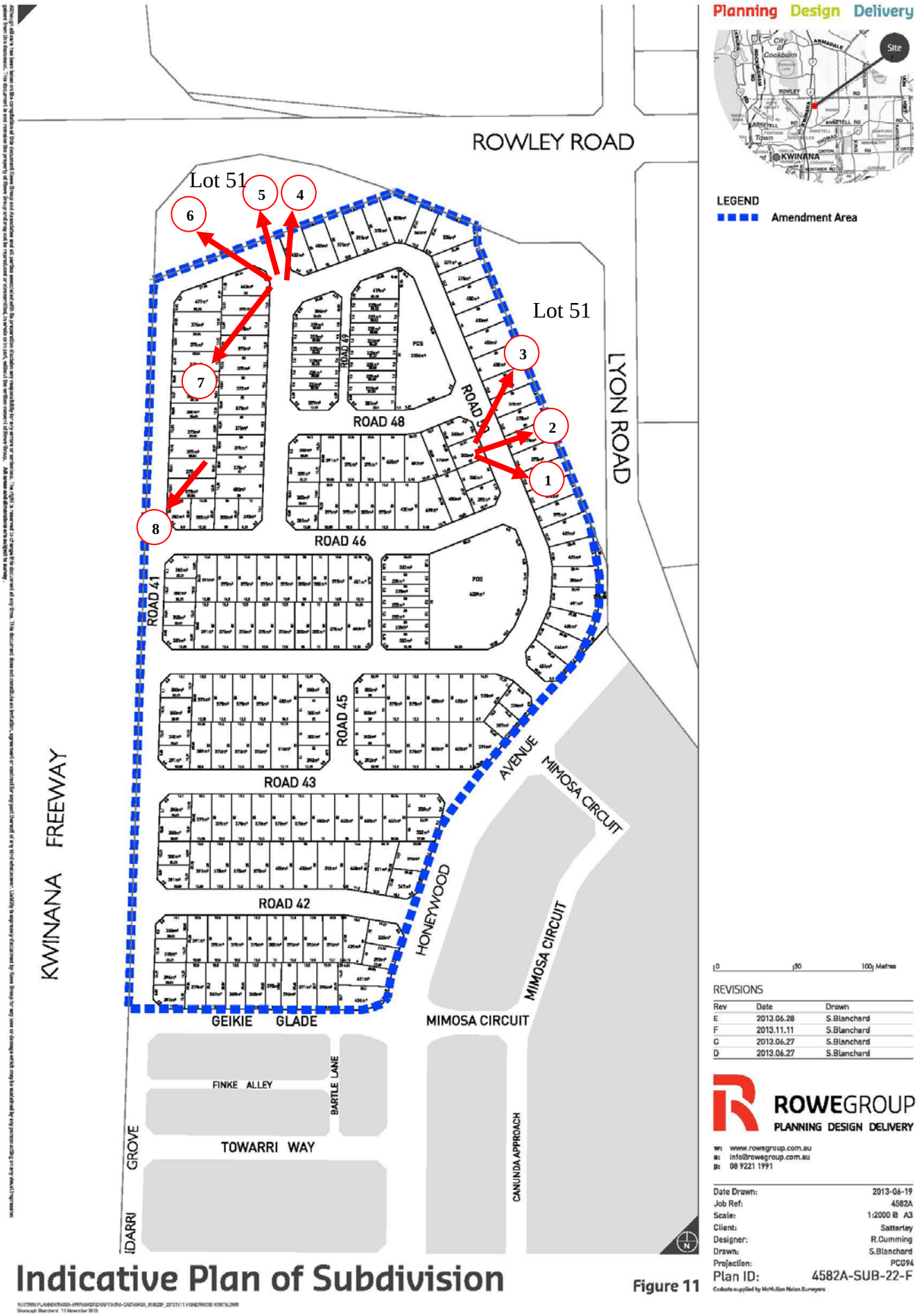
Photo 5

Photo 6

Photo 7

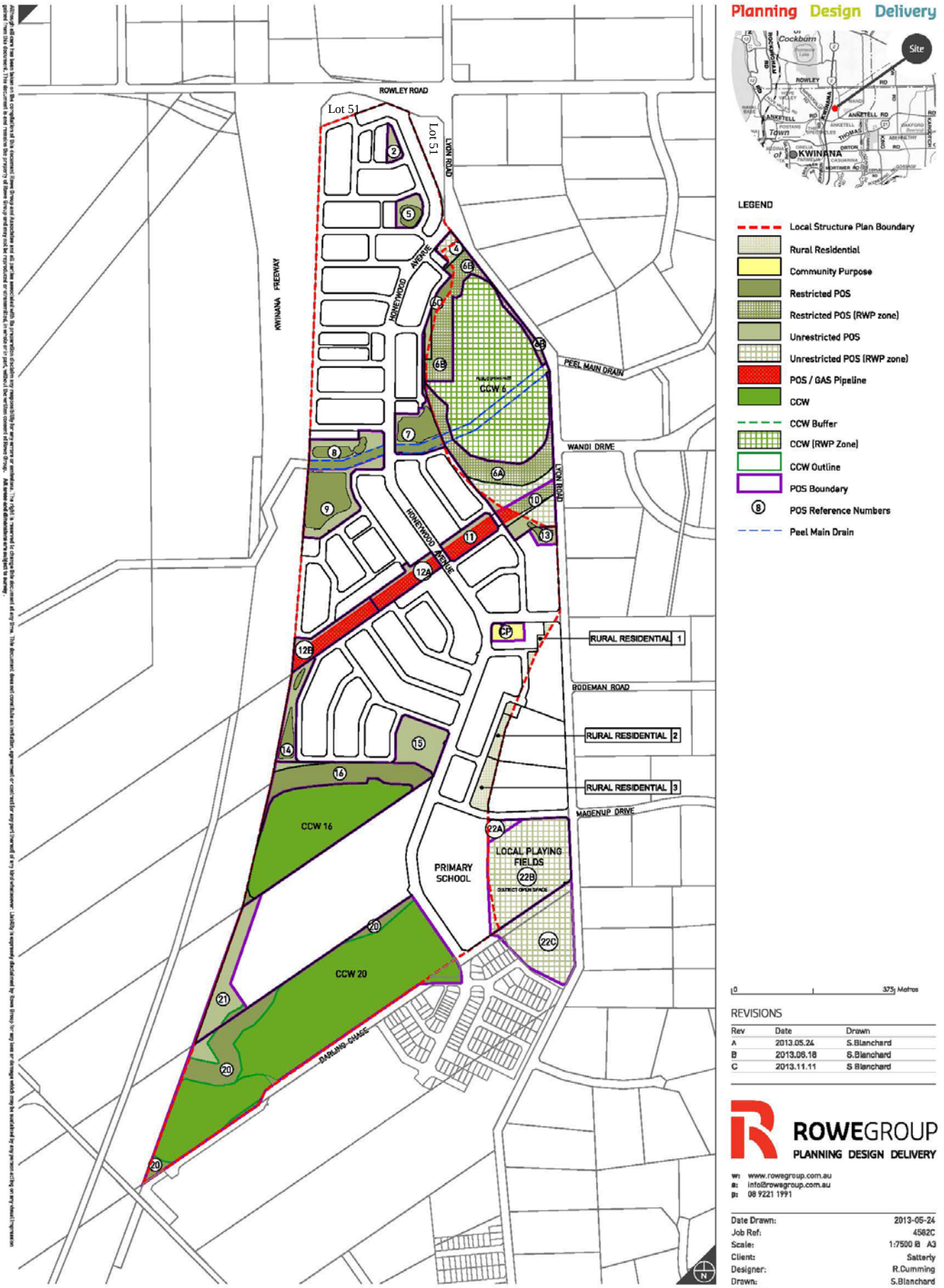
Photo 8

ATTACHMENT 3 – PHOTOGRAPH DIRECTION



Arrow and numbers relate to the position of photographs of the vegetation where taken from, and the number relates to the photographs shown in Attachment 2 of this report.

ATTACHMENT 4 – PUBLIC OPEN SPACE PLAN



Public Open Space

Figure 10

Appendix 5

HERITAGE ASSESSMENT

ROWEGROUP

REPORT ON AN ABORIGINAL HERITAGE ANALYSIS OF

WANDI LAND

Prepared for Greg Rowe and Associates by R. & E.O'Connor Pty. Ltd.

January 2008.

ABSTRACT

In December 2007, Greg Rowe and Associates of Level 3, 369 Newcastle Street, Northbridge, WA 6003, commissioned R. & E.O'Connor Pty. Ltd. to carry out a preliminary Aboriginal heritage analysis of a proposed development area between Rowley Road and Anketell Road in Wandi. The purpose of the preliminary analysis is to establish whether there are any currently known Aboriginal heritage constraints which need to be taken into consideration in advance of development in the Project Area.

The Project Area is covered in part by Aboriginal Site Number 3427, Mandogalup Swamp/The Spectacles. In the author's opinion, this site will be relegated to the status of "Stored Data" when assessed by the ACMC, as it is a geographically extensive area and the information in its regard supplied by the Aboriginal elders who were instrumental in its registration is unlikely to fulfil current requirements for entry on the Permanent Register. However, as it is currently listed on the Interim Register, the provisions of the AHA apply to it, and any actions as described in Section 17 of that Act would be an offence if they are carried out there without prior Ministerial consent pursuant to Section 18.

This report therefore recommends that an application pursuant to Section 18 of the AHA should be made in respect of the Project Area before any development involving ground disturbance takes place there. This recommendation clearly does not refer to that section of the Project Area which is not covered by the footprint of Aboriginal Site Number

3427. However, the imprecise nature of the description of that footprint in the Register makes precise definition difficult in this case. Before the ACMC will consider such an application, they will require evidence that the appropriate Aboriginal persons and groups have been consulted in its regard. Minimally, such a consultative process should include the Gnaala Karla Booja and Ballaruk native title claimant groups.

This report also recommends that, in the light of the findings of the preliminary assessment already carried out, a thoroughgoing archaeological survey of the Project Area should be commissioned and its results submitted to the ACMC in support of the Section 18 application.

Furthermore, as it was noted above that certain types of historical and current land tenure extinguish native title, and that certain forms of land tenure are omitted from the native title application which covers the Project Area, it is also recommended that advice should be sought from a suitably qualified legal practitioner regarding whether native title still exists within the Project area.

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References

Figure One: The Project Area

Plates One to Four

Appendix One and Two: Information on the *Aboriginal Heritage Act* and Aboriginal Sites

Appendix Three: Extracts from Aboriginal Sites Register

1.0 INTRODUCTION

In December 2007, Greg Rowe and Associates of Level 3, 369 Newcastle Street, Northbridge, WA 6003, commissioned R. & E.O'Connor Pty. Ltd. to carry out a preliminary Aboriginal heritage analysis of a proposed development area between Rowley Road and Anketell Road in Wandi ("the Project Area"). The purpose of the preliminary analysis is to establish whether there are any currently known Aboriginal heritage constraints which need to be taken into consideration in advance of development in the Project Area.

2.0 RESEARCH BRIEF

The Project Area is shown in Figure One. It is bounded on the west by the Kwinana Freeway Reserve; on the north by Rowley Road; on the east by Lyon Road; and on the south by Darling Chase. Within this Project Area, Greg Rowe and Associates wishes to determine the presence of any issues that may require detailed investigation and/or action pursuant to the *Aboriginal Heritage Act* ("AHA") in respect of that land in the future. This preliminary investigation was carried out as a "desk top" study, which involved the following research:

1. consideration of the ethnographic database in the Aboriginal Site Register and in relevant unpublished ethnographic reports (where such reports are available);

2. consideration of relevant published articles and other published works;
3. consideration of the readily available archival record - in this case, relevant sections of the notebooks of Daisy Bates and of Professor Tindale;
4. consideration of the Native Title Register;
5. consideration of regional maps;
6. consideration of environmental information;
7. preliminary notification of relevant Aboriginal stakeholders; and
8. a brief on-site inspection.

The research brief also required comment on further tasks required to progress the development of the Project Area.

3.0 ETHNOGRAPHIC BACKGROUND

The research brief requires the identification and assessment of sites of Aboriginal significance in the study region. It is therefore appropriate for the ethnographic section of the study to consider "significance" from an Aboriginal viewpoint. Significance is attributed by Aboriginal people to areas in the Perth Metropolitan Region on the basis of former or current domestic usage, or on the basis of relevance to traditional ritual or mythology. Broadly speaking, this distinction can be viewed as a series of dichotomies between historical and mythological, human and supernatural, or mundane and sacred areas. Thus, one area may be viewed as significant from a historical/human/mundane viewpoint, and another from a mythological/sacred viewpoint.

In addition to the above, a substantial number of Aboriginal sites are mentioned in Hammond (1933), Moore (1885), Bates (numerous dates) and other historical sources. Any sites not known to contemporary Aborigines cannot reasonably be classified as "sites of significance to living Aborigines". However, rediscovery or realisation of the existence of such sites could lead to an attribution of significance. Thus, the neat compartmentalisation resulting from European academic disciplines may not fit absolutely the Aboriginal models; any archaeological or historical site in the study region could also be potentially significant to Aboriginal people.

In the course of previous surveys in the Pinjarra/Mandurah area, however, a further aspect of significance, which the present author terms "generalised significance" was encountered. In this case significance is attributed to an area on the basis of that area's physical or environmental characteristics rather than on the basis of an area-specific reason. Thus, the chain of lakes and swamps between Baldivis and Mandurah was recently claimed as significant by the Aboriginal elders of Mandurah who oversee heritage matters in that region. The given reasons for that claim were as follows.

1. The wetlands were known to have been used as food and water resources by Aboriginal people before European settlement, although the identities of those users are unknown;

2. The shores of the wetlands were known to have been used as camping places by Aboriginal people before European settlement, although in most cases the exact location of such camping places is unknown, as are the identities of campers;

3. The wetlands are current areas of spiritual significance. The Aboriginal elders from the Mandurah area now consider regional wetlands to be spiritual repositories, not in the sense of the ubiquitous Waugal myth, which has been previously recorded in relation to the Murray and Serpentine Rivers, but in a more general sense which draws on the fundamentals of Aboriginal philosophico-religious belief. In this belief system all living creatures, including humans, share a common spiritual essence and therefore, by extension, every living being represents a part of the wider spiritual universe. The region's wetlands, as breeding grounds for numerous living creatures, are therefore repositories of this spiritual essence realised generationally by individuals.

This is clearly a development from the commonly held notion that significance is only attributable specifically. However, it would be difficult to argue that areas to which this generalised significance is attributed are not being described by the Aboriginal people concerned as "sacred" places "of importance and special significance to persons of Aboriginal descent". Nonetheless, the author has been notified by the Department of Indigenous Affairs that the Aboriginal Cultural Material Committee has received legal advice that an attribution of generalised significance by Aboriginal people is insufficient to meet the requirements of Section 5 (b) of the Act. There is therefore a potential dissonance between "Aboriginal sites", as defined by Aboriginal people, and "Aboriginal sites", as defined by the Act.

4.0 ABORIGINAL SITE REGISTER

A search of the Register of Aboriginal Sites for the polygon described by the following coordinate pairs was carried out: 392000E 6439000N; 391500E 6436250N; 393000E 6436250N; 393000E 6439000N (MGA Zone 50). One Aboriginal site has been previously recorded within this polygon (see Appendix Three for Register extract). The individual Site File for this site was researched in the Department of Indigenous Affairs. The results of that research are as follows.

- Site Number 3427; Former DAS Number S02729. "Mandogalup Swamp/The Spectacles", a mythological, hunting place and water source site listed on the Interim Register under Open access status. A copy of the map from the Departmental file is included also in Appendix Three (it should be noted that the map is marked "DIA internal use only", and should not be further distributed). The site is in two sections. The northern boundary of the northern section is approximately fifty metres south of Rowley Road and its southern boundary is in the vicinity of Wandi Drive. It covers the bulk of the land between the Kwinana Freeway Reserve and Lyon Road, with the exception of an area immediately opposite to Bodeman Road which stretches from Lyon Road to the Kwinana Freeway. The southern section of the Aboriginal site takes in Lake Balmanup and the land in the angle between Darling Chase, Fig Rise and the Kwinana Freeway.

It is noted that Site Number 3427 is listed on the Interim rather than Permanent Register. Currently, the Aboriginal Cultural Material Committee ("ACMC") tends not to list geographically extensive and poorly defined sites on the Permanent Register. It is

therefore likely that, if this site is assessed by the ACMC, it will be reduced to the status of "Stored Data", and will therefore no longer be covered by the provisions of the AHA.

5.0 OTHER UNPUBLISHED REPORTS AND PUBLISHED WORKS

Brown (1983), Wall (1976) and O'Connor, Bodney and Quartermaine (1989) were also consulted in the course of the research, but contain no references to the Project Area. Hammond (1933), Bates (1944) and Bates (1992) were also consulted and found to contain no references to the Project Area. The field notebooks of the late Professor Tindale also contain no references to the vicinity of the Project Area. The relevant sections of the field notebooks of Daisy Bates were also considered and found to contain no reference to Aboriginal sites of place-names in the general vicinity of the Project Area.

6.0 NATIVE TITLE

The Project area is covered by two Applications for Determination of Native Title, namely the Gnaala Karla Booja application, Number WC98/58, and the Ballaruk application, Number WC95/86. The legal representative of the Gnaala Karla Booja claim is the South West Aboriginal Land and Sea Council; the Ballaruk claim is represented by Mr Corrie Bodney of 14 Curtis Way, Girrawheen. In accordance with the requirements of

the *Naïve Title Act,* as amended, both claimant groups specifically exclude from the applications lands covered by certain former and current forms of tenure, as follows.

1. To the extent that any minerals, petroleum or gas within the area of the claim are wholly owned by the Crown in the right of the Commonwealth or the State of Western Australia, they are not claimed by the applicants.

2. The applicants do not make a claim to any native title rights or interests which confer possession, occupation, use or enjoyment to the exclusion of all others in respect of any areas in relation to which a previous non-exclusive possession act, as defined by Section 23F of the Act, was done in relation to an area, and either the act was an act attributable to the Commonwealth, or the act was an act attributable to the State of WA and a law of that State has made provision as mentioned in Section 23I in relation to the act.

3. The preceding paragraph is subject to such of the provisions of Sections 47, 47A and 47B of the Act as apply to any part of the area contained within the native title application.

4. The claimed native title rights and interests are not claimed to the exclusion of any other rights or interests validly created by or pursuant to the common law, a law of the State or a law of the Commonwealth.

5. The applicants also exclude from the claim any areas covered by valid acts on or before 23 December 1996 comprising such of the following as are included as extinguishing acts within the Act or Titles Validation Act 1994, as amended, at the time of the Registrar's consideration (under Section 190A of the Act):

Category A past acts, as defined in Sections 228 and 229 of the Act;
Category A intermediate period acts, as defined in Sections 232A and 2322B of the Act.

6. The applicants exclude from the claim any areas in relation to which a previous exclusive possession act, as defined in Section 23B of the Act, was done in relation to an area, and, either the act was an act attributable to the Commonwealth, or the act was an act attributable to the State of WA and a law of that State has made provision as mentioned in Section 23E in relation to the act.

7. The applicants exclude areas in relation to which native title rights and interests have otherwise been extinguished, including areas subject to:

An act authorised by legislation which demonstrates the exercise of permanent adverse dominion in relation to native title; or
Actual use made by the holder of a tenure other than native title which is permanently inconsistent with the continued existence of native title.

8. To avoid uncertainty, the applicants exclude from the claim area any of the areas

contained within the following descriptions of tenures.

1. *Any unqualified grant of an estate in fee simple currently in force.*
2. *Any former unqualified grant of an estate in fee simple which has been validly granted and any other freehold land which has been validly granted.*
3. *A lease which is currently in force in respect of an area not exceeding 5,000 square metres, upon which a dwelling house, residence, building or work is constructed, and which comprises: a lease of a Worker's Dwelling under the Workers' Homes Act, 1911-28; a 999 year lease under the Land Act, 1898; a lease of a Town Lot or Suburban Lot pursuant to the Land Act (WA), 1933, Section 117; or a Special Lease under Section 117 of the Land Act (WA), 1933.*
4. *A Conditional Purchase Lease currently in force in the Agricultural Areas of the South West Division under Clauses 46 and 47 of the Land Regulations, 1887, which includes a condition that the lessee resides on the area of the lease and upon which a residence has been constructed.*
5. *A Conditional Purchase Lease of cultivable land currently in force under Part V, Division (1) of the Land Act (WA), 1933, in respect of which habitual residence by the lessee is a statutory condition in accordance with the Division and upon which a residence has been constructed.*
6. *A Perpetual Lease currently in force under the War Service Land Settlement Scheme Act, 1954.*
7. *A permanent public work and "the land or waters on which a public work is constructed, established or situated" within the meaning given to that phrase by Section 251D of the Act.*
8. *An existing public road or street used by the public, or a dedicated road.*

It is therefore possible that sectors of the Project Area are subject to the provisions of the *Native Title Act 1993*. However, whether the Project Area is excluded from lands claimed in the native title applications is a legal rather than an anthropological question and a recommendation in its regard is given below.

7.0 STAKEHOLDERS

As noted in 6.0 above, the legal representative of the Perth Metropolitan Area native title holding group is the South West Aboriginal Land and Sea Council. Accordingly, the Senior Field Officer of the Council, Mr Kevin Fitzgerald, was consulted

in regard to the Project Area by R. & E.O'Connor Pty. Ltd.'s Aboriginal Liaison Associate, Mr Ted Hart and his opinions noted regarding the need for consultation of the Aboriginal groups and what form that consultation should take, if required.

The following Aboriginal stakeholders were also notified of the Project by Mr Hart and their preliminary opinions regarding Aboriginal heritage issues there recorded, along with their aspirations regarding further consultations/surveys.

- Mr Corrie Bodney of the Ballaruk native title group;
- Mr Harry Nannup of the Gnaala Karla Booja group;
- Mr Wayne Bynder of the Gnaala Karla Booja group.

8.0 ENVIRONMENTAL INFORMATION

An on-site inspection was carried out by the author and Mr Ted Hart on 15 January 2008 for the purpose of assessing the environmental condition of the Project Area. Much of the southern sector of the area in question is currently occupied by market gardens. Plate One shows a northeasterly aspect from the northern end of Fig Rise; Plate Two shows a westerly aspect, with the bush surrounding Lake Balmanup in the background. North of the market gardens, the Project Area is largely bushland, with swampy areas in its western sector. A southwest oriented drain cuts through this area. Plate Three shows a westerly view from Lyon Road, near its junction with Bodeman Road. Plate Four is a northwesterly view across the Project Area, with the northern section of Site Number 3427 in the background. Although none was noted in the course

of the brief inspection, it is possible that Aboriginal cultural material may be identified in the vicinity of Lake Balmanup or in the swampy areas in the course of a thoroughgoing archaeological survey. A recommendation in that regard is included below.

9.0 DISCUSSION AND RECOMMENDATIONS

The Project Area is covered in part by Aboriginal Site Number 3427, Mandogalup Swamp/The Spectacles. In the author's opinion, this site will be relegated to the status of "Stored Data" when assessed by the ACMC, as it is a geographically extensive area and the information in its regard supplied by the Aboriginal elders who were instrumental in its registration is unlikely to fulfil current requirements for entry on the Permanent Register. However, as it is currently listed on the Interim Register, the provisions of the AHA apply to it, and any actions as described in Section 17 of that Act (see Appendix One) would be an offence if they are carried out there without prior Ministerial consent pursuant to Section 18.

This report therefore recommends that an application pursuant to Section 18 of the AHA should be made in respect of the Project Area before any development involving ground disturbance takes place there. This recommendation clearly does not refer to that section of the Project Area which is not covered by the footprint of Aboriginal Site Number 3427. However, the imprecise nature of the description of that footprint in the Register makes precise definition difficult in this case. Before the ACMC

will consider such an application, they will require evidence that the appropriate Aboriginal persons and groups have been consulted in its regard. Minimally, such a consultative process should include the Gnaala Karla Booja and Ballaruk native title claimant groups.

This report also recommends that, in the light of the findings of the preliminary assessment already carried out, a thoroughgoing archaeological survey of the Project Area should be commissioned and its results submitted to the ACMC in support of the Section 18 application.

Furthermore, as it was noted above that certain types of historical and current land tenure extinguish native title, and that certain forms of land tenure are omitted from the native title application which covers the Project Area, it is also recommended that advice should be sought from a suitably qualified legal practitioner regarding whether native title still exists within the Project area.

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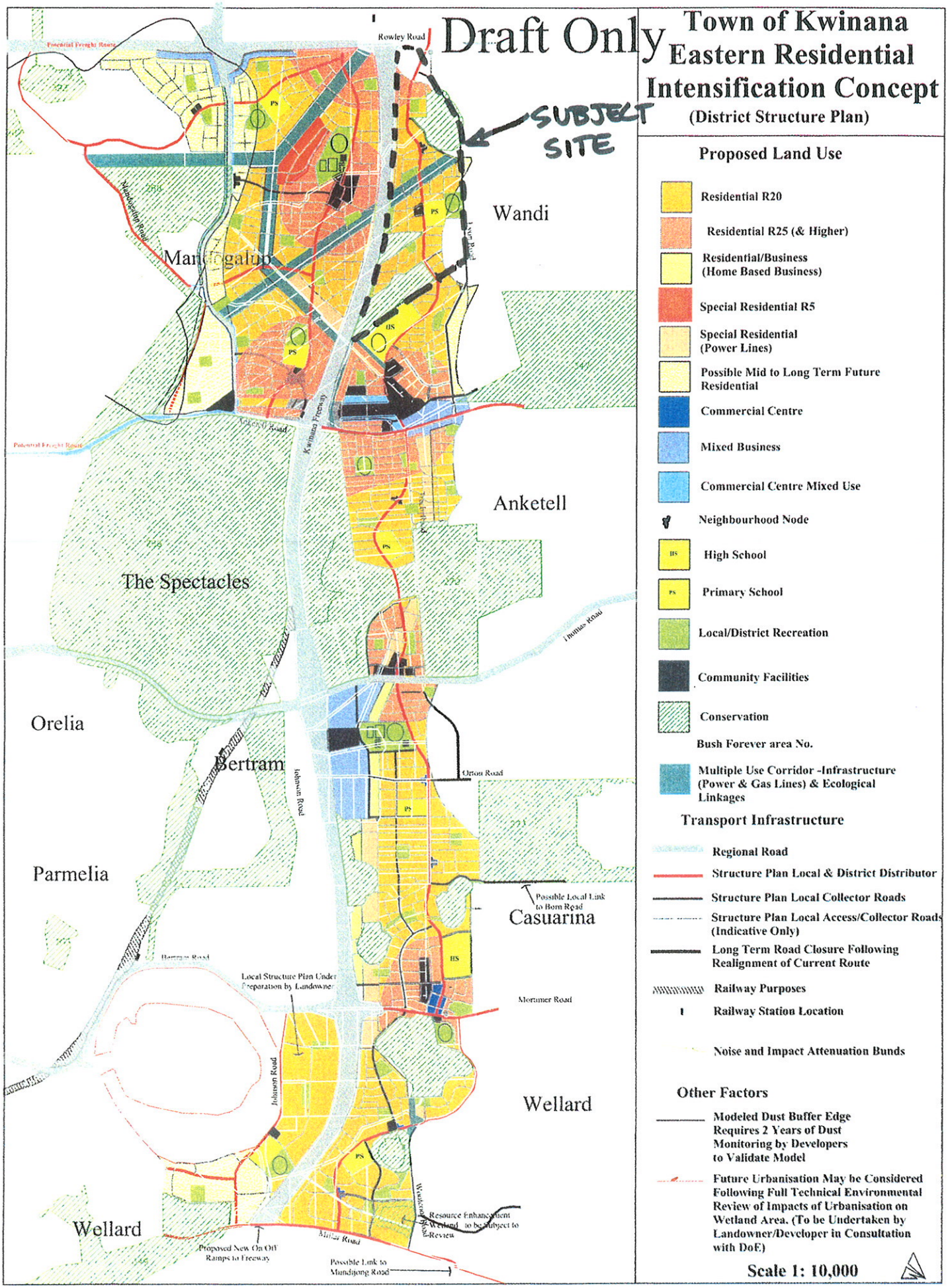
Plates One and Two

Plates Three and Four

Figure One:

Location of Project Area


Draft Only
Town of Kwinana
Eastern Residential
Intensification Concept
(District Structure Plan)
SUBJECT SITE
Rowley Road
Mandogalup
Wandi
Anketell
The Spectacles
Orelia
Bertram
Parmelia
Casuarina
Wellard
Wellard
Kwinana Freeway
Thomas Road
Orton Road
Johnson Road
Mortimer Road
Millar Road
Proposed Land Use
Residential R20
Residential R25 (& Higher)
Residential/Business
(Home Based Business)
Special Residential R5
Special Residential
(Power Lines)
Possible Mid to Long Term Future
Residential
Commercial Centre
Mixed Business
Commercial Centre Mixed Use
Neighbourhood Node
High School
Primary School
Local/District Recreation
Community Facilities
Conservation
Bush Forever area No.
Multiple Use Corridor -Infrastructure
(Power & Gas Lines) & Ecological
Linkages
Transport Infrastructure
Regional Road
Structure Plan Local & District Distributor
Structure Plan Local Collector Roads
Structure Plan Local Access/Collector Roads
(Indicative Only)
Long Term Road Closure Following
Realignment of Current Route
Railway Purposes
Railway Station Location
Noise and Impact Attenuation Bunds
Other Factors
Modeled Dust Buffer Edge
Requires 2 Years of Dust
Monitoring by Developers
to Validate Model
Future Urbanisation May be Considered
Following Full Technical Environmental
Review of Impacts of Urbanisation on
Wetland Area. (To be Undertaken by
Landowner/Developer in Consultation
with DoE)
Scale 1: 10,000

Appendix One:

Notes on the *Aboriginal Heritage Act, 1972*

APPENDIX 1

OBLIGATIONS RELATING TO SITES UNDER THE ABORIGINAL HERITAGE ACT, 1972

Report of Findings

"15. Any person who has knowledge of the existence of anything in the nature of Aboriginal burial grounds, symbols or objects of sacred, ritual of ceremonial significance, cave or rock paintings or engravings, stone structures or arranged stones, carved trees, or of any other place or thing to which this Act applies or to which this Act might reasonably be suspected to apply shall report its existence to the Registrar, or to a police officer, unless he has reasonable cause to believe the existence of the thing or place in question to be already known to the Registrar."

Excavation of Aboriginal Sites

"16. (1) Subject to Section 18, the right to excavate or to remove any thing from an Aboriginal site is reserved to the Registrar.

(2) The Registrar, on the advice of the Committee, may authorise the entry upon and excavating of an Aboriginal site and the examination or removal of any thing on or under the site in such manner and subject to such conditions as the Committee may advise."

Offences Relating to Aboriginal Sites

"17. A person who-

(a) Excavates, destroys, damages, conceals or in any way alters any Aboriginal site; or

(b) In any way alters, damages, removes, destroys, conceals, or who deals with in a manner not sanctioned by relevant custom, or assumes the possession, custody or control of, any object on or under an Aboriginal site,

commits an offence unless he is acting with the authorisation of the Registrar under Section 16 or the consent of the Minister under Section 18."

Consent to Certain Uses

"18. (1) For the purposes of this section, the expression "the owner of any land" includes a lessee from the Crown, and the holder of any mining tenement or mining privilege, or of any right or privilege under the Petroleum Act, 1967, in relation to the land.

(2) Where the owner of any land gives to the Trustees notice in writing that he requires to use the land for a purpose which, unless the Minister gives his consent in this Section, would be likely to result in a breach of Section 17 in respect of any Aboriginal site that might be on the land, the Committee shall, as soon as they are reasonably able, form an opinion as to whether there is any Aboriginal site on the land, evaluate the importance and significance of any such site, and submit the notice to the Minister together with their recommendations in writing as to whether or not the Minister should consent to the use of the land for that purpose, and, where applicable, the extent to which and the conditions upon which his consent should be given.

(3) When the Committee submit a notice to the Minister under subsection (2) of this section he shall consider their recommendation and having regard to the general interest of the community shall either -

(a) Consent to the use of the land the subject of the notice, or a specified part of the land, for the purpose required, subject to such conditions, if any, as he may specify; or

(b) Wholly decline to consent to the use of the land the subject of the notice for the purpose required,

and shall forthwith inform the owner in writing of his decision.

(4) Where the owner of any land has given to the Committee notice pursuant to the subsection (2) of this section and the Committee have not submitted it with their recommendation to the Minister in accordance with that subsection the Minister may require the Committee to do so within a specified time, or may require the Trustees to take such other action as the Minister considers necessary in order to expedite the matter, and the Committee shall comply with any such requirement.

(5) Where the owner of any land is aggrieved by a decision of the Minister made under subsection (3) of this section he may, within the time and in the manner prescribed by the rules of court, appeal from the decision of the Minister to the Supreme Court which may hear and determine an appeal.

(6) In determining an appeal under subsection (5) of this section the Judge hearing the appeal may confirm or vary the decision of the Minister against which the appeal has been made or quash the decision of the Minister, and may make such order as to the costs of the appeal as he sees fit.

(7) Where the owner of the any land gives notice to the Committee under subsection (2) of this section, the Committee may if they are satisfied that it is practicable to do so, direct the removal of any object to which this Act applies from the land to a place of safe custody.

(8) Where consent has been given under this section to a person to use any land for a particular purpose nothing done by or on behalf of that person pursuant to, and in accordance with any conditions attached to, the consent constitute an offence against the Act."

Appendix Two:

Notes on the Recognition of Aboriginal Sites

APPENDIX 2

Notes on the Recognition of Aboriginal Sites

There are various types of Aboriginal Sites, and these notes have been prepared as a guide to the recognition of those types likely to be located in the survey area.

An Aboriginal Site is defined in the Aboriginal Heritage Act, 1972, in Section 5 as:

"(a) Any place of importance and significance where persons of Aboriginal descent have, or appear to have, left any object, natural or artificial, used for, or made for or adapted for use for, any purpose connected with the traditional cultural life of the Aboriginal people, past or present;

(b) Any sacred, ritual or ceremonial site, which is of importance and special significance to persons of Aboriginal descent;

(c) Any place which, in the opinion of the Committee is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the state;

(d) Any place where objects to this Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or removed."

Habitation Sites

These are commonly found throughout Western Australia and usually contain evidence of tool-making, seed grinding and other food processing, cooking, painting, engraving or numerous other activities. The archaeological evidence for some of these activities is discussed in details under the appropriate heading below.

Habitation sites are usually found near an existing or former water source such as a gnamma hole, rock pool, spring or soak. They are generally in the open, but they sometimes occur in shallow rock shelters or caves. It is particularly important that none of these sites be disturbed as the stratified deposits which may be found at such sites can yield valuable information about the inhabitants when excavated by archaeologists.

Seed Grinding

Polished or smoothed areas are sometimes noticed on/near horizontal rock surfaces. The smooth areas are usually 25cm wide and 40 or 50cm long. They are the result of seed grinding by the Aboriginal women and indicate aspects of past economy.

Habitation Structures

Aboriginal people sheltered in simple ephemeral structures, generally made of branches and sometimes of grass. These sites are rarely preserved for more than one occupation period. Occasionally rocks were pushed aside or used to stabilise other building materials. When these rocks patterns are located they provide evidence for former habitation sites.

Middens

When a localised source of shellfish and other foods has been exploited from a favoured camping place, the accumulated ashes, hearth stones, shells, bones and other refuse can form mounds at times several metres high and many metres in diameter. Occasionally these refuse mounds or middens contain stone, shell or bone tools. These are most common near the coast, but examples on inland lake and river banks are not unknown.

Stone Artefact Factory Sites

Pieces of rock from which artefacts could be made were often carried to camp sites or other places for final production. Such sites are usually easily recognisable because the manufacturing process produces quantities of flakes and waste material which are clearly out of context when compared with the surrounding rocks. All rocks found on the sandy coastal plain , for example, must have been transported by human agencies. These sites are widely distributed throughout the State.

Quarries

When outcrops of rock suitable for the manufacture of stone tools were quarried by the Aborigines, evidence of the flaking and chipping of the source material can usually be seen in situ and nearby. Ochre and other mineral pigments used in painting rock surfaces, artefacts and in body decoration are mined from naturally occurring seams, bands and other deposits. This activity can sometimes be recognised by the presence of wooden digging sticks or the marks made by these implements.

Marked Trees

Occasionally trees are located that have designs in the bark which have been incised by Aborigines. Toeholds, to assist the climber, were sometimes cut into the bark and sapwood of trees in the hollow limbs of which possums and other arboreal animals sheltered. Some tree trunks bear scars where section of bark or wood have been removed and which would have been used to make dishes, shield, spearthrowers and other wooden artefacts. In some parts of the state wooden platforms were built in trees to accommodate a corpse during complex rituals following death.

Burials

In the north of the state, it was formerly the custom to place the bones of the dead on a ledge in a cave after certain rituals were completed. The bones were wrapped in sheets of bark and the skull placed beside this. In other parts of Western Australia the dead were buried, the burial position varying according to the customs of the particular area and time. Natural erosion, or mechanical earthmoving equipment occasionally exposes these burial sites.

Stone Structures

If one or more stone are found partly buried or wedged into a position which is not likely to be the result of natural forces, then it is probable that the place is an Aboriginal site and that possibly there are other important sites nearby. There are several different types of stone arrangements ranging simple cairns or piles of stones to more elaborate designs.

Low weirs which detain fish when tides fall are found in coastal areas. Some rivers contain similar structures that trap fish against the current. It seems likely that low stone slab structures in the south west jarrah forests were built to provide suitable environments in which to trap some small animals. Low walls or pits were sometimes made to provide a hide or shelter for a hunter.

Elongated rock fragments are occasionally erected as a sign or warning that a special area is being approached. Heaps or alignments of stones may be naturalistic or symbolic representations of animals, people or mythological figures.

Paintings

These usually occur in rock shelters, caves or other sheltered situations which offer a certain degree of protection from the weather. The best known examples in Western Australia occur in the Kimberley region but paintings are also found through most of the states. One of several coloured ochres as well as other coloured pigments may have been used at a site. Stencilling was a common painting technique used throughout the state. The negative image of an object was created by spraying pigment over the object which was held against the wall.

Engravings

This term described designs which have been carved, pecked or pounded into a rock surface. They form the predominant art form of the Pilbara region but are known to occur in the Kimberleys in the north to about Toodyay in the south. Most engravings occur in the open, but some are situated in rock shelters.

Caches

It was the custom to hide ceremonial objects in niches and other secluded places. The removal of objects from these places, or photography of the places or objects or any other interference with these places is not permitted.

Ceremonial Grounds

At some sites the ground has been modified in some way by the removal of surface pebbles, or the modelling of the soil, or the digging of pits and trenches. In other places there is not noticeable alteration of the ground surface and Aborigines familiar with the site must be consulted concerning its location.

Mythological Sites

Most sites already described have a place in Aboriginal mythology. In addition there are many Aboriginal sites with no man-made features which enable them to be recognised. They are often natural features in the landscape linked to the Aboriginal Account of the formation of the world during the creative "Dreaming" period in the distant past. Many such sites are located at focal points in the creative journeys of mythological spirit beings of the Dreaming. Such sites can only be identified by the Aboriginal people who are familiar with the associated traditions.

Appendix Three:

Register of Aboriginal Sites Extract

Search Criteria

1 sites in a search polygon. The polygon is formed by these points (in order):

MGA Zone 50	
Northing	Easting
6439000	392000
6436250	391500
6436250	393000
6439000	393000

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

Copyright

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Legend

Restriction

N	No restriction
M	Male access only
F	Female access

Access

C	Closed
O	Open
V	Vulnerable

Status

I	Interim register
P	Permanent register
S	Stored data

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[Unreliable]	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
3427	I	O	N	Mandogalup Swamp/spectacles.	Mythological	Hunting Place, Water Source	*Registered Informant names available from DIA.	391457mE 6436663mN Zone 50 [Unreliable]	S02729

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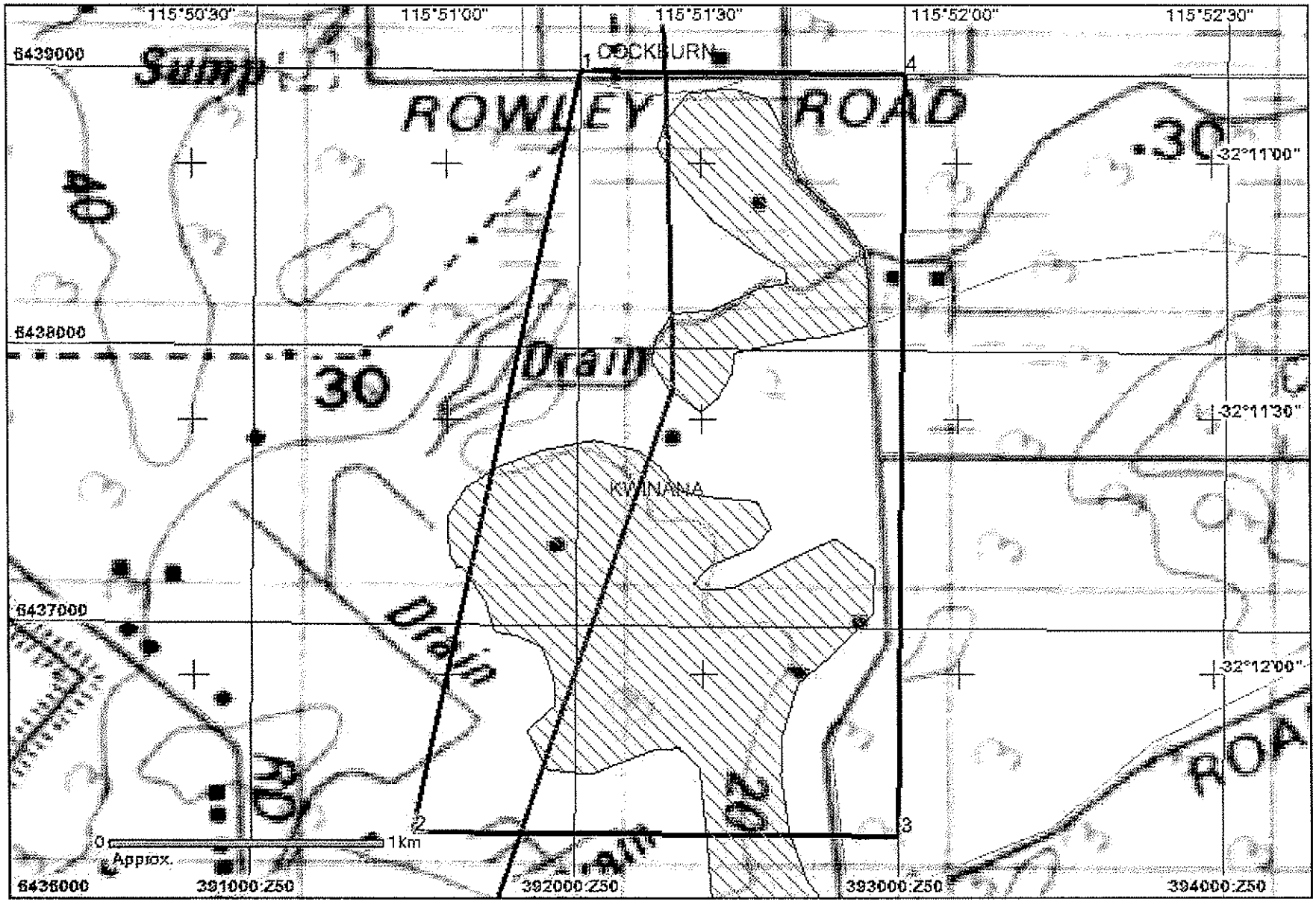

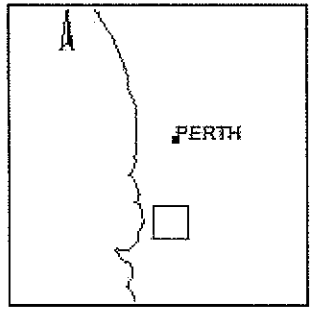

Legend

- Highlighted Area
- Town
- Map Area
- Search Area

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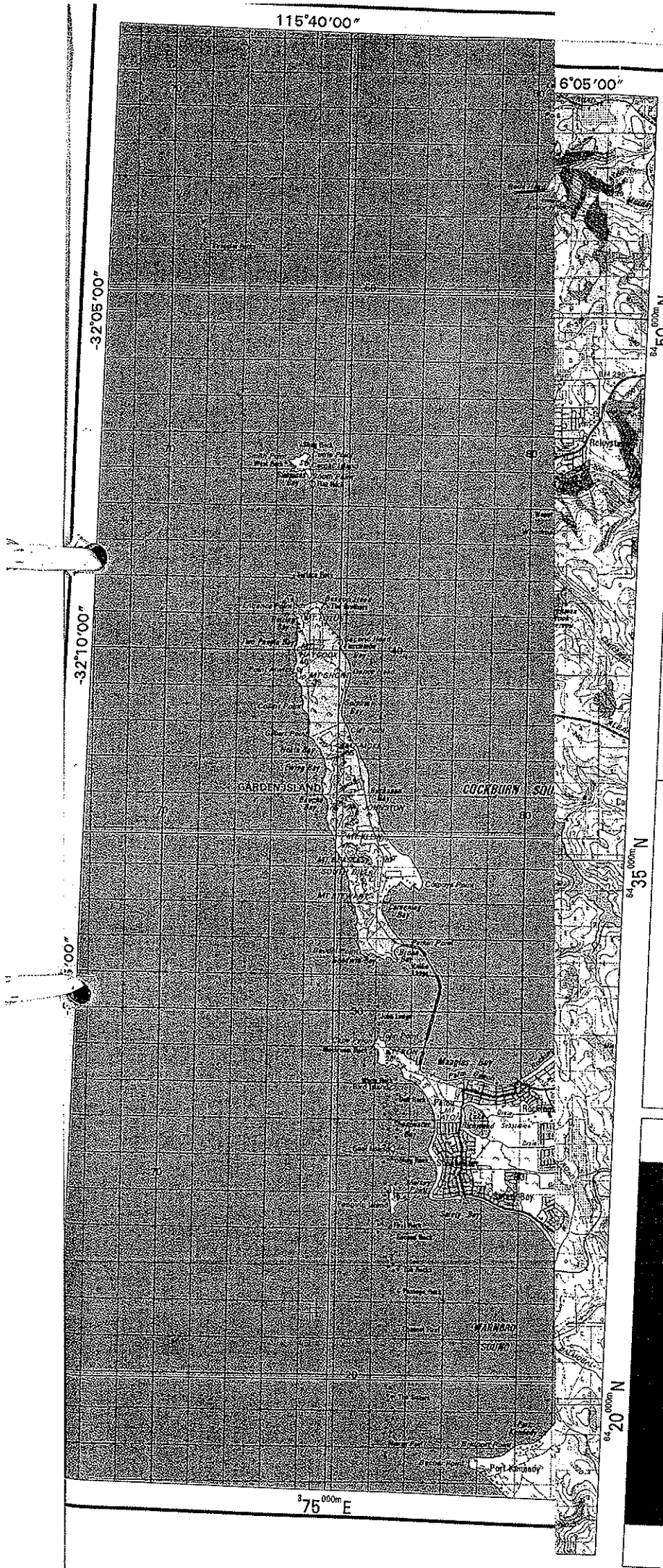


Site No: 3427

Capture Method: Map

Source date: 01/01/1991

Reliability: Unreliable

Circle Radius: N/A

DIA INTERNAL USE ONLY

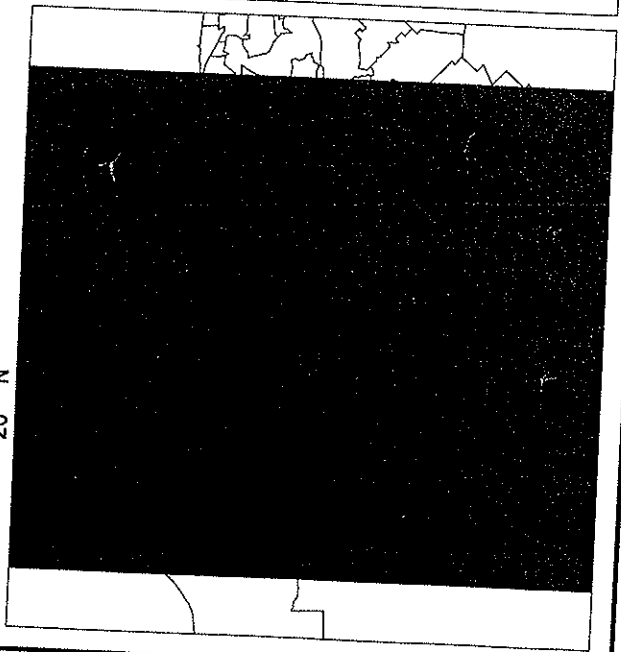
Captured By:.....

QA By:.....

0 5 Km

Scale 1:150000

Date: 19 Feb 04



115°40′00″ 115°45′00″ 115°50′00″ 115°55′00″ 116°00′00″ 116°05′00″

-32°05′00″ -32°10′00″

6435000m N 6420000m N

375000m E 390000m E 405000m E

Site No: 3427

Capture Method: Map

Source date: 01/01/1991

Reliability: Unreliable

Circle Radius: N/A

DIA INTERNAL USE ONLY

Captured By:.....

QA By:.....

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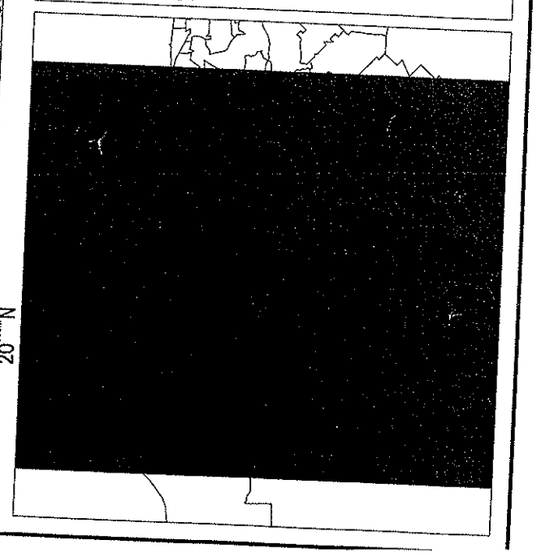
Scale 1:150000

Date: 19 Feb 04



QUARTERMAINE CONSULTANTS

REPORT ON AN ARCHAEOLOGICAL INVESTIGATION FOR ABORIGINAL SITES TOWN OF KWINANA EASTERN RESIDENTIAL INTENSIFICATION CONCEPT - WANDI

Prepared for Greg Rowe & Associates

By Quartermaine Consultants

September 2008

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Prepared for Greg Rowe & Associates

By Gary Quartermaine

September 2008

REPORT ON A PRELIMINARY ARCHAEOLOGICAL INVESTIGATION FOR ABORIGINAL SITES TOWN OF KWINANA EASTERN RESIDENTIAL INTENSIFICATION CONCEPT - WANDI

Prepared for Greg Rowe & Associates

By Gary Quartermaine

ABSTRACT

An archaeological investigation for Aboriginal heritage significance of the Town of Kwinana Eastern Residential Intensification Concept, Wandi, in the South-western Metropolitan Area of Perth, was commissioned by Greg Rowe and Associates. It was conducted so that the developers can comply with the provisions of the W.A. *Aboriginal Heritage Act*, 1972. The archaeological investigation involved a review of previous research in the area of the bridge sites.

As a result of previous surveys and independent research, four Aboriginal sites have been registered with DIA within two kilometres of the project area. Three of these are archaeological sites. None of the archaeological sites are in conflict with the project area.

It is considered that any major surface archaeological sites would have been located given the size, environment and nature of the project area. None of the registered sites are within the designated survey area. As a result of the field survey, no further archaeological sites were discovered within the project area.

Therefore, the project may proceed as it will not affect any archaeological sites.

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1.0 INTRODUCTION

1.1 Background

An archaeological investigation for Aboriginal heritage significance of the Town of Kwinana Eastern Residential Intensification Concept, Wandi, in the South-western Metropolitan Area of Perth, was commissioned by Greg Rowe and Associates and was executed in September, 2008.

The archaeological investigation was carried out by Quartermaine Consultants. The work was undertaken by Gary Quartermaine, BA Honours (Anthropology and Archaeology), who has conducted numerous Aboriginal heritage investigations throughout the state, with the assistance of Ms Vanessa Macri and Ms Rebecca Armitage, archaeologists. This was undertaken in conjunction with the ethnographic component of the investigation, reported upon separately, which was conducted by R & E O'Connor Pty Ltd.

The objective was to conduct an archaeological investigation to facilitate planning of the proposed residential project. The two aspects of the investigation were:

1. The assembly of data from previous work in the region, including information from the Heritage and Culture Division, Department of Indigenous Affairs (DIA) Aboriginal site register and files, previous survey reports and other relevant documents, maps and environmental information.

2. A field inspection and sample survey of the project area and the location of Aboriginal archaeological sites within the designated survey area.

1.2 Location

The survey area is located within the Town of Kwinana, approximately 30 kilometres to the south of Perth (Figure 1). The study area involves an area of land on the immediate eastern side of the Kwinana Freeway bounded by Rowley Road in the north, Lyon Road in the east and Darling Chase in the south (Figure 2). The study area measures 2.3 kilometres north-south by 850 metres east-west (maximum dimensions and encompasses an area of approximately 100 hectares.

1.3 Environmental Context

The climate of the proposed development area is dry Mediterranean characterised by winter rainfall and a dry summer. The average annual rainfall in the region is 883 mm (Beard, 1979:25). Mean monthly temperatures range from 13 degrees Celsius in June to 26 degrees Celsius in February (Beard, 1979:26).

The development is situated on the Swan Coastal Plain. The coastal plain is part of the Perth Basin geological formation. The Perth Basin is a deep trough filled with Phanerozoic sedimentary rock and with a surface mantle of Quaternary deposits. The Swan Coastal Plain is a narrow (20-30 km wide) strip which is generally of low relief. It is composed of Quaternary alluvium and aeolian sediments (Playford, et al, 1975).

The subject land lies on the Bassendean Dune landform. The Bassendean Dunes are characterised by highly leached siliceous sands and interdunal swamps. They are of middle to late Pleistocene age and have been completely leached of calcium carbonate. They are represented by subdued hummocks of quartz sand with intervening swamps (Beard, 1979; and Seddon, 1972).

The chain of lakes, including Bibra Lake, forms a boundary with between the Spearwood and Bassendean Dune landforms. The lake system came into existence when the coastline reached its present formation as a result of rising sea levels. This is estimated to have been about 8,000 years ago (Semeniuk, 1987).

The vegetation of this part of the Swan Coastal Plain is described in the Drummond Subdivision. In this area, the vegetation consists of open stands of stout, spreading Tuart trees (*Eucalyptus gomphocephala*), 20-25 metres tall. A lower level of smaller trees, under 10 metres, comprises *Agonis flexuosa, Banksia attenuata, B. menziesii, Casuarina fraserana, Nuytsia floribunda, Macrozamia riedlei* and *Xanthorrhoea preissii*. Shrubs include species of *Acacia, Hakea, Grevillea,* and *Jacksonia*. The vegetation of the lakes and swamps includes eighteen sedges (*Cyperaceae*) and eight reeds belonging to other families. The paperbark, *Melaleuca rhaphiophylla*, occurs in stands of dense low trees between the sedge and the *Eucalyptus* woodland. In some places, stands of *Banksia verticillata* with *Xanthorrhoea preissii* replace the *Melaleuca* (Beard, 1979:24-26).

2.0 ARCHAEOLOGICAL CONTEXT

2.1 Introduction

The principal aim of an archaeologist is to describe and explain past ways of life with reference to material culture. The general focus of Australian Aboriginal archaeological research has been to describe and explain the history of the occupation of the continent, examining cultural change and adaptations to develop explanatory models to describe how and why the occupation of the Australian continent proceeded.

2.2 Site Definitions

Aboriginal material culture is based, to a large extent, on nondurable materials; such as wood, bark, fibre and skins; that have a limited life in the archaeological record. Stone tools, conversely, remain as often the only evidence of prehistoric activity. Bone; either as a tool, as refuse, or as a burial; falls somewhere between these extremes. Lofgren (1975:7) describes spears, spear-throwers and clubs for men, and digging sticks, wooden carrying dishes and grindstones for women, as the basic implements of Aboriginal life.

Therefore, stone artefact sites reflect only one aspect of Aboriginal material culture which utilised a wide range of materials from the natural environment.

For scientific purposes, an archaeological site is defined as "any place containing traces of past human activity" (Fagan, 1980:7). This is manifested in a number of different site components which may occur singularly or with one or more of the others to form an archaeological site. The most common of these are surface artefact scatters, quarries, art sites, stone arrangements, rockshelters with evidence of occupation, grinding patches, shell middens, burials and marked trees.

The above definition of archaeological sites is a scientific definition. However, registered Aboriginal sites may not meet the scientific criteria on all occasions. The assessment as to whether such sites are covered by the provisions of the W.A. *Aboriginal Heritage Act*, 1972, Section 5, is made for the Minister for Indigenous Affairs by the Aboriginal Cultural Material Committee. Such assessment is usually undertaken as part of a Section 18 application for site disturbance.

Aboriginal archaeological sites are mentioned in the WA *Aboriginal Heritage Act*, 1972, in Section 5, which applies to the following:

"(a) any place of importance and significance where persons of Aboriginal descent have, or appear to have, left any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with the traditional cultural life of the Aboriginal people, past or present;

(b) any sacred, ritual or ceremonial site, which is of importance and special significance to persons of Aboriginal descent;

(c) any place which, in the opinion of the Committee, is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the State;

(d) any place where objects to which this Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or removed."

In order to address the state legislation, an artefact scatter is recorded as a site by this consultant if it contains a concentration of artefacts in contextual association, three or more with a density of at least 1/100m^2. Areas of solitary artefacts, called Isolated Finds, are presently recorded but not registered as Aboriginal sites. This was not always the case in the past and some previously registered sites contain only a solitary artefact, in keeping with the broad scientific definition.

2.3 Previous Archaeological Research

The earliest evidence for prehistoric occupation of the South-West of Australia is dated at 38,000 years ago, for a stratified site at Upper Swan, located 25 km northeast of Perth (Pearce and Barbetti, 1981). Two other sites in the south-west have also yielded Pleistocene dates, Devil's Lair and Helena River. A number of Holocene sequences have yielded data on possible cultural/environmental changes during, and after, the recent transgression of the sea, for the metropolitan region (see Clarke and Dortch, 1977; Hallam, 1974; and Pearce, 1978).

The investigation of an archaeological site at Upper Swan site, DIA id 4299, yielded radio-metrically dated material in association with Aboriginal artefacts in a stratified deposit. This site, on the northern river terrace of the Swan River, gave a date of 38,000 years ago for Aboriginal occupation (Pearce and Barbetti, 1981).

The Upper Swan site is situated on an alluvial terrace of the Swan River at a point 2.5 kilometres west of the Darling Scarp. Extensive down-cutting has resulted in the river bed being presently 10m below the level at the time of Aboriginal occupation.

The series of dates in the high 30,000 years ago is for a relatively sparse artefact assemblage that was subsequently covered by a layer of sediment about 30,000 years ago. Artefacts were made from quartz (71%), quartzite, chert, dolerite, bryozoan chert and granite. Changes in sea levels after this period would have resulted in possible adverse environmental conditions in this area with an increasing distance to the coast-line during the period from 20,000-15,000 years ago (Pearce and Barbetti, 1981; and Pearce, 1983).

Another metropolitan alluvial site that has yielded old dates for Aboriginal occupation is situated on the Helena River, 10 kilometres south of the Upper Swan site. This alluvial terrace site, DIA id 3967, has a date of 29,400+/-2000 years ago from the basal artefact level, 123-143cm below surface level. The artefacts from this level were a quartz flake and a bryozoan chert flake and lump. Another date of 3,750+/-90 years ago from 23-28cm bsl indicates possible usage of this area over an extended period of time (Schwede, 1983, 1991).

Lithic materials at the site include quartz, chert, mylonite and dolerite. Quartz makes up 95% of the surface assemblage. 10% of the assemblage is retouched/utilised and 2% is classified as formal tools. This includes adzes, scrapers and backed blades. Chips make up 60% of the assemblage. Some glass and other historic material are also present (Schwede, 1983, 1991).

Excavations at these and other sites in the south-west have recorded a flaked stone industry with few formal tool types since early occupation. Distinctive microlithic tools appear in such assemblages from approximately 6,000 years ago (Dortch, 1977).

Prehistoric stone tool industries in the South-West have been classified into earlier and later phases (Dortch, 1977). The early phase industries have only been documented from a few well dated sites. They include small thick flake scrapers, bipolar cores, notched-denticulated pieces, flakes from discoidal cores, and single and multi-platform cores. These artefacts have been manufactured from a range of lithic materials, including a distinctive Eocene fossiliferous chert. It appears that access to this chert was lost after the last marine transgression (Dortch, 1977; Glover, 1975). However, some of this chert may have been subject to curation over a period of time and loss of access to the source does not necessarily indicate a complete halt in its use in archaeological assemblages.

Later phase stone industries, generally found in archaeological contexts dating from 4000 years ago, include the addition of geometric microliths, backed blades, and a variety of adze flakes, which are part of the Australian "small tool tradition" (Dortch, 1977; Mulvaney, 1975).

As part of a regional survey of the Metropolitan area, Hallam (1986:5) concludes that the majority of sites lie around the lakes and swamps of the Swan Coastal Plain, and that site numbers double in the last few hundred years. Four phases of occupation are suggested for the Coastal Plain. These are:

a. Early - low number of sites centred towards the coast. Artefacts include steep scrapers on flakes and scrapers made from an Eocene fossiliferous chert. This phase was up to 5000 years ago.

b. Middle - from 5000 - 500 years ago. Showed a contraction of occupation to sites near permanent water. Artefacts were made on quartz and green chert and included backed blades, adzes, scrapers and flakes.

c. Late - from 500 years ago. Concentration of sites on the Coastal Plain. Fabricators (bipolar cores) were introduced and a large percentage of assemblages were made up of quartz flakes, chips and debitage.

d. A recent historic phase, which was characterised by the use of European introduced material, such as glass and pottery, for the manufacture of artefacts, encompasses the last 150 years (Hallam, 1973, 1974 and 1986).

Schwede questions Hallam's Early and Late phase assemblages based on her studies of quartz artefacts in the metropolitan area (Schwede, 1991:243-244). Schwede concludes that the Early Phase covers sites between 4,600 and 40,000 years ago based on the absence of backed blades and the results of the analysis of debitage from sites older than 4,600 BP rather than the presence of fossiliferous chert. Schwede also concludes that quartz rich assemblages are common to all phases not just the Late Phase (Schwede, 1991:243-244). However, the Hallam model remains the most comprehensive study of archaeological sites in the metropolitan area and provides a useful basis to categorise archaeological sites.

Information from a survey of the Swan Coastal Plain to the foothills of the Darling Range and centred on the Swan River gives a picture of Aboriginal prehistoric occupation concentrated on the area immediately west of the foothills (Hallam, 1987). This information includes the results of two east-west transects across this region. These results show that the majority of recorded archaeological sites are located in the Bassendean Dunes and Pinjarra Plain landforms, around the rivers, lakes and swamps (Hallam, 1987:20-23).

The environs of the present survey area were considered rich in resources for both traditional and contemporary Aboriginal people and European settlers. It offered breeding and feeding grounds for wildfowl and kangaroos and river flats for yam and other roots (Hallam, 1975).

Anderson (1984) has proposed a land-use model for prehistoric exploitation of the Swan Coastal Plain, and its hinterland, based on regional research into the relative proportions of variously sized surface artefact scatters and their associated artefact densities. This model suggests that, due to the variation in resources available in the three different environmental zones investigated, there was more intensive use of the coastal plain than either the adjacent forest or open woodland plateau.

This model also suggests a concentration of large numbers of people near the various bodies of water (coast, estuaries, lakes, swamps and rivers) of the coastal plain. In winter and early spring, there was some movement into the jarrah forest in the Darling Ranges. The small size of archaeological sites in this zone points to exploitation by small, mobile groups in an area of less concentrated resources and water sources. By late spring, there was movement back onto the coastal plain.

The seasonal movement of Aboriginal groups relates to the exploitation of the various resources available in the different environmental situations. Hallam (1986) concludes that Aborigines congregated around the estuaries and lagoons of the coastal plain in the summer and dispersed, in small groups, in winter through a wider hinterland which included the area of the Darling Scarp and Plateau.

On the coastal plain, recorded sites are mostly located in disturbed areas, either from natural processes or humanly affected. Because of the nature of the coastal plain, it is postulated that sites may be present but covered by sand and vegetation and only discovered when they are exposed. The rivers, lakes and estuaries in the area would have provided fresh water and a terrestrial resource base for the Aboriginal people camping in this region.

2.4 Area Model

Commercial surveys and academic research have shown that the most common sites in the South West Region are artefact scatters, burial sites, quarries, and scarred trees. Stone arrangements associated with ceremonial sites are also known. It is evident that larger occupation sites are associated with fresh water sources. The preceding data provides a basis for predicting the occurrence of sites, assuming resources as the principal factor in site location. This predictive model of site location can be used to discover sites. The site types which can be expected to occur with the vicinity of the survey area are:

1) Camp sites - small scatters, including brief or sporadic occupation, may occur at task specific sites or ephemeral water sources. Generally these small sites are interpreted as representing ephemeral "dinnertime" camps or task specific sites associated with the daily foraging activities of prehistoric groups. Large sites with high artefact densities commonly occur on the margins of permanent or semi-permanent water sources. These sites typically represent campsite locations that were repeatedly occupied, sometimes for prolonged periods.

2) Burial Sites - Usually located with ethnographic information or due to surface disturbance, and virtually impossible to detect without excavation;

3) Scarred Trees - Resulting from bark removal for carrying bowls, shields and spear throwers; such sites are probably under represented owing to the lack of preservation: trees die and decay.

From the existing information, it is possible to make the following observations:

i. Small, low density surface artefact scatters are the most numerous recorded archaeological sites;

ii. Quartz is the dominant lithic material used for the manufacture of artefacts;

iii. Flakes and chips form the major class of artefact types in the recorded artefact assemblages;

iv. River margins, swamp and lake margins, and areas of devegetated sand are the main locations where sites have been previously recorded; and

v. Burials may be found in sand dunes, mainly on the coast.

On the coastal plain, recorded sites are mostly located in disturbed areas, either from natural processes or humanly affected. Because of the nature of the coastal plain, it is postulated that sites may be present but covered by sand and vegetation and only discovered when they are exposed.

3.0 ARCHAEOLOGICAL RESEARCH

3.1 Archival Research

The W.A. *Aboriginal Heritage Act*, 1972, is administered by the Department of Indigenous Affairs' Division of Heritage and Culture. The DIA maintains a Register in the form of a computerised data base of reported Aboriginal sites. Each registered Aboriginal site is designated by a numerical site id, site type (e.g. engravings, ceremonial, artefacts, etc), site name and its position is recorded by the Map Grid of Australia 1994 (MGA94) coordinates related to the Geocentric Datum of Australia 1994 (GDA94), as well as Longitude and Latitude.

Although the grid references are given in MGA94/GDA94 coordinates, many of these sites were recorded in the period when imperial grid references were used. Since their recording, the grid references have been changed to the metric system on AMG66 then to AMG84 and finally to MGA94. Given that there was likely to be some errors in any imperial recordings, as they were given a grid reference within a one square mile coordinate, the transfer to the present system may have resulted in further errors in site location coordinates. Field verification is, therefore, required to determine the location of any sites near the project areas if there is insufficient information to determine their correct location.

As a result of previous surveys and independent research, four Aboriginal sites have been registered with DIA within two kilometres of the project area. Three of these are archaeological sites. The sites are listed in Table 1 (Appendix 3). None of the archaeological sites are in conflict with the project area.

TABLE 1: Registered Archaeological Sites

DIA Site ID	DIA Site No.	Status *	Grid Ref. GDA94	Site type	Site name
3290	S00186	I	389739.6441299	Hunting place	Thompsons Lake
3427	S02729	S	391457.6436663	Mythological	Spectacles
4360	S00772	S	390989.6437599	Artefacts	Norkett Road
21330	-	S	391707.6440822	Isolated artefacts	Thompsons Lake IFs

* I = Interim register, S = Stored data

3.2 Previous Archaeological Surveys

Several archaeological investigations for Aboriginal sites have been conducted in the vicinity of the subject land.

Larger scale investigations have been conducted by Hallam (1986), Strawbridge (1988) and O'Connor, et al (1989). The subject land was included in these studies but not necessarily inspected during any field investigations.

Site specific investigations include surveys of the following project areas:-

- Dampier to Bunbury Natural Gas Pipeline (Pickering, 1982; Schwede, 1984; Hames, 2003)
- Kwinana Freeway (Reynolds, 1984; O'Connor and Quartermaine, 1987; Quartermaine, 1996)
- Harvey to Kwinana 330kv Transmission line corridor (Quartermaine, 1987)
- Leda subdivision (O'Connor and Quartermaine, 1989)
- South West Corridor Transport Reserve (O'Connor, et al, 1994; Quartermaine, 2001)
- Optus Optic Fibre Cable Route (Quartermaine, 1995)
- Southern Trunk main and other pipelines (Quartermaine, 1998, 2003, 2004)
- Kwinana residue disposal areas (Jackson, 1999)
- Kwinana Motor Complex (Quartermaine, 1999)
- Kwinana Port and Rowley Road access (Quartermaine, 2000)
- James Point port facility (Jackson, 2001)
- Kwinana Desalination Plant Project Pipeline (AIC, 2005)
- Kwinana gas-fired power station site (Ryan, 2005)
- Kwinana Combined Cycle Power Station site (Quartermaine, 2008a)
- High wide load corridor along Rockingham and Anketell Roads (Quartermaine, 2007).
- Kwinana Quay access along Anketell and Rowley Roads (Quartermaine, 2008b)

These surveys have provided an extensive coverage of the general area and a sufficient sample to assess the archaeological signature of the subject land. Little archaeological material was discovered as a result of these surveys which covered areas of land within the Quindalup, Spearwood and Bassendean Dunes Landforms.

4.0 METHODS

4.1 Obligations under the Act

The Western Australian *Aboriginal Heritage Act*, 1972, makes provision for the recording and preservation of places and objects customarily used by, or traditional to, the original settlers of Australia. The Act defines the obligations of the community relating to sites (Sections 15-18, see Appendices 1 and 2).

The archaeological survey should identify the effects of the proposed disturbance of the physical environment on any Aboriginal archaeological sites. In recognition of the significance of this area to living Aboriginal people, an investigation of Aboriginal interests was conducted by R & E O'Connor Pty Ltd.

The consultant is obliged to submit site documentation for any newly recorded sites on appropriate forms for registration with the Aboriginal Affairs Department.

4.2 Survey Strategy

The survey design involved the following stages of operation.

i) Background research - this involved familiarisation with DIA Aboriginal site register and files, survey reports, plus maps and environmental information for the area to be investigated. Previously recorded Aboriginal sites, registered with the Department of Indigenous Affairs, are listed in Table 1.

ii) Survey strategy - this consisted of a sample survey of the potential alignments. The field survey was completed using 1:25,000, 1:100,000, and 1:250,000 topographic maps of the area and plans of the alignment.

The field work was conducted as follows:-

A vehicle was used to gain access to the project area. Pedestrian inspections were made at regular intervals and in areas of good surface visibility. This involved meandering traverses to cover the project area. This enabled a field survey of at least 50% of the project area.

Access was possible to most sections of the project area. Visibility was mostly restricted by ground cover vegetation and disturbance and varied from moderate to low. Disturbance was from previous activities associated with small farms and vegetable gardens, firebreaks and tracks, and was present over most of the study area.

5.0 RESULTS

Conditions of site discovery were moderate. Surface visibility varied due to grasses and ground disturbance, which covered most of the project area. Parts of the surface of the project area have been subject to alteration from vegetable gardens, tracks and firebreaks.

It is considered that any major surface archaeological sites would have been located given the size, environment and nature of the project area. None of the registered sites are within the designated survey area. As a result of the field survey, no further archaeological sites were discovered within the survey area.

The survey area was characterised by dense, almost impenetrable vegetation over approximately 80% of its area and marshy ground in the southern half. As such, access was gained through use of pre-existing walk trails located throughout the area and all accessible areas with some surface visibility were closely inspected for archaeological material. In this case it was impossible to conduct a methodical survey due to the nature of the vegetation and landscape.

A market garden and residential properties were located within the survey area, just north of Darling Chase. These areas were not inspected during the current survey, however the band of bushland north of Darling Chase and south of the market garden/residential properties were inspected as far as possible. This area was characterised by an extremely dense understorey of bracken and weeds with paper barks, Acacias and Banksias overlooking a swamp. Ground surface visibility was at less than 5% in some areas and 0% over most. The area north of the market garden was similar in vegetation and landscape, however, there were more open grassy areas that were able to be inspected. This area has also been quite heavily disturbed in places by vehicles and graders.

6.0 CONCLUSIONS

6.1 Discussion

An archaeological investigation for Aboriginal heritage significance of the Town of Kwinana Eastern Residential Intensification Concept, Wandi, in the South-western Metropolitan Area of Perth, was commissioned by Greg Rowe and Associates.

The survey area is located within the Town of Kwinana, approximately 30 kilometres to the south of Perth. The study area involves an area of land on the immediate eastern side of the Kwinana Freeway bounded by Rowley Road in the north, Lyon Road in the east and Darling Chase in the south. The study area measures 2.3 kilometres north-south by 850 metres east-west (maximum dimensions and encompasses an area of approximately 100 hectares.

The archaeological investigation involved the assembly of data from previous work in the region, including information from the Heritage and Culture Division, Department of Indigenous Affairs (DIA) Aboriginal site register and files, previous survey reports and other relevant documents, maps and environmental information.

As a result of previous surveys and independent research, four Aboriginal sites have been registered with DIA within two kilometres of the project area. Three of these are archaeological sites. None of the archaeological sites are in conflict with the project area.

Several archaeological investigations have been conducted in the vicinity of the project area. These surveys have provided a good coverage of general area and a sufficient sample to assess the archaeological signature of the area. Little archaeological material was discovered as a result of these surveys which covered areas of land within the Quindalup, Spearwood and Bassendean Dunes Landforms.

It is considered that any major surface archaeological sites would have been located given the size, environment and nature of the project area. None of the registered sites are within the designated survey area. As a result of the field survey, no further archaeological sites were discovered within the project area.

Therefore, the project may proceed as it will not affect any archaeological sites.

6.2 Recommendations

The recommendations which follow are based on field observations and investigations of previously recorded sites in the area.

1) It is recommended that, where possible, activities be directed to avoid disturbance of archaeological sites.

2) It is considered that sufficient survey work has been undertaken for the project area and no further archaeological surveys are warranted. Therefore, the project may proceed as it will not affect any archaeological sites.

3) Should any archaeological sites be affected by future development, permission for use of the relevant land, under Section 18 of the W.A. *Aboriginal Heritage Act*, 1972, must be obtained before any disturbance occurs. This can be done by written application to the Registrar of Aboriginal Sites for the consent by the Minister for Indigenous Affairs to use the land containing the site under the above Section.

4) If any Aboriginal material is uncovered as a result of earthmoving activities, it should be reported to the relevant authorities. Stone artefacts are the most likely archaeological material to be discovered while burials may also be present.

5) It is pointed out that human interference to Aboriginal sites is an offence, unless authorized under the Act, as outlined in Section 17 of the W.A. *Aboriginal Heritage Act*, 1972. Therefore, it is recommended that the Proponents take adequate measures to inform any project personnel of this requirement.

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Figure 1: Location Plan

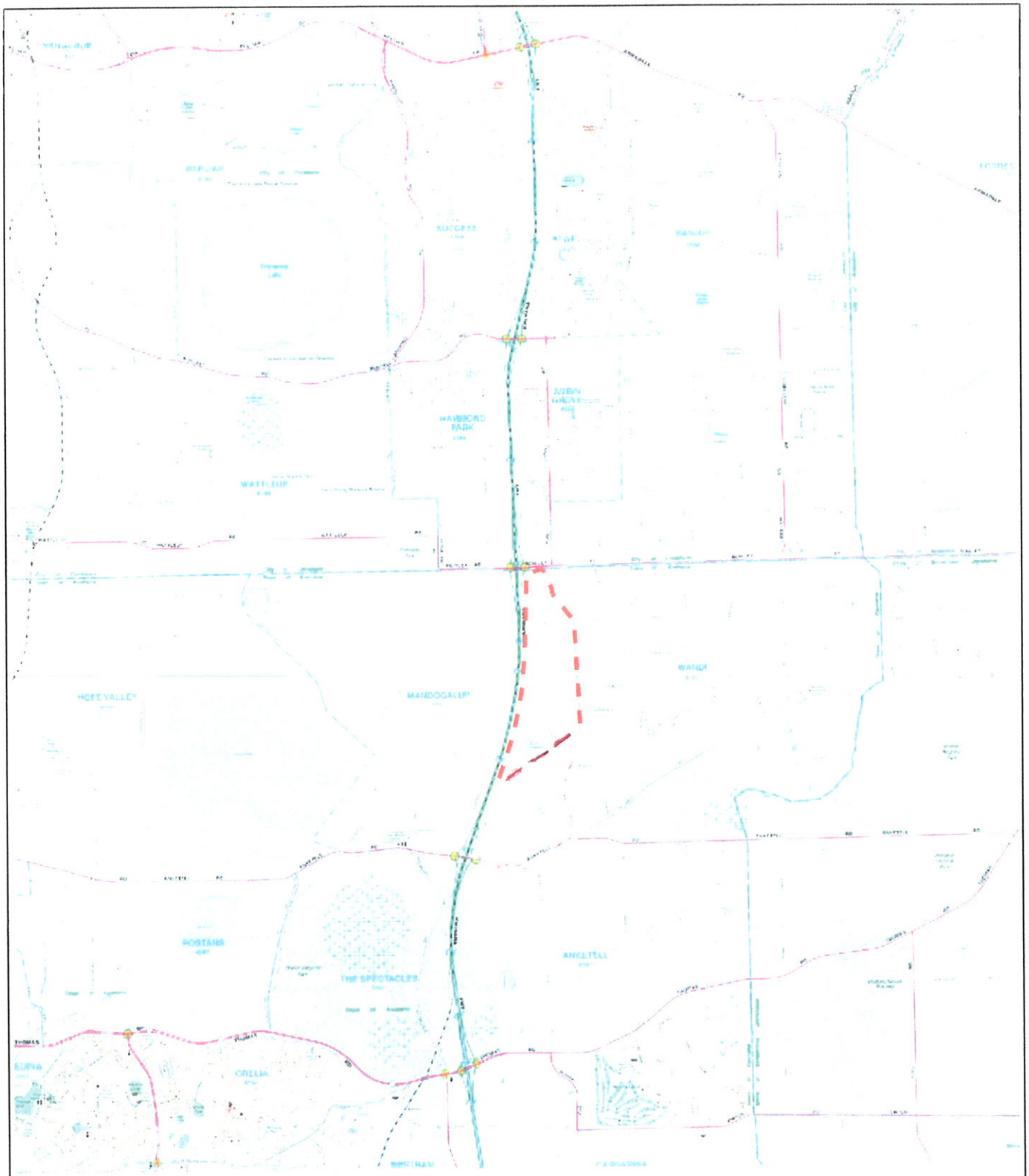

FIGURE 3

title regional location

address wandi cell, wandi

date	25 September '08	job no.	4582
scale	not to scale	e ref	080803
designer	K Kyle	drawn	S Jeleric
client			

GREG ROWE

TOWN PLANNING PROJECT MANAGEMENT

SUBJECT SITE

3, 369

6003

Figure 2: Project Area

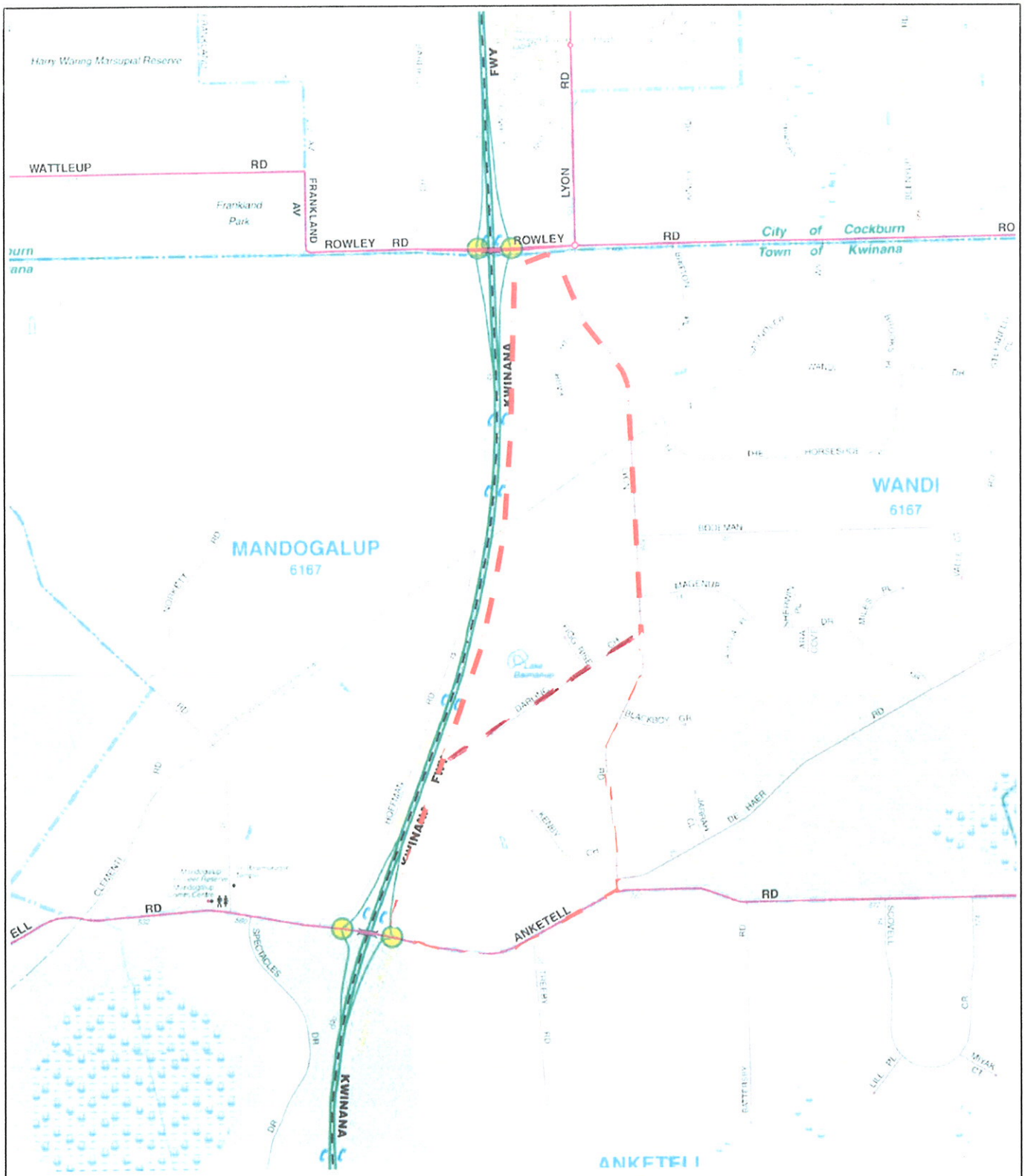

FIGURE 2

title **local location**

address **wandi cell,**
wandi

date	25 September '08	job no.	4582
scale	not to scale	e ref	080802
designer	K Kyle	drawn	S Jeleric
client			

SUBJECT SITE

3, 369

6993

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TOWN PLANNING PROJECT MANAGEMENT

APPENDIX 1

OBLIGATIONS RELATING TO SITES UNDER THE ABORIGINAL HERITAGE ACT, 1972

Report of Findings

"15. Any person who has knowledge of the existence of anything in the nature of Aboriginal burial grounds, symbols or objects of sacred, ritual of ceremonial significance, cave or rock paintings or engravings, stone structures or arranged stones, carved trees, or of any other place or thing to which this Act applies or to which this Act might reasonably be suspected to apply shall report its existence to the Registrar, or to a police officer, unless he has reasonable cause to believe the existence of the thing or place in question to be already known to the Registrar."

Excavation of Aboriginal Sites

"16. (1) Subject to Section 18, the right to excavate or to remove any thing from an Aboriginal site is reserved to the Registrar.

(2) The Registrar, on the advice of the Committee, may authorise the entry upon and excavating of an Aboriginal site and the examination or removal of any thing on or under the site in such manner and subject to such conditions as the Committee may advise."

Offences Relating to Aboriginal Sites

"17. A person who-

(a) Excavates, destroys, damages, conceals or in any way alters any Aboriginal site; or

(b) In any way alters, damages, removes, destroys, conceals, or who deals with in a manner not sanctioned by relevant custom, or assumes the possession, custody or control of, any object on or under an Aboriginal site,

commits an offence unless he is acting with the authorisation of the Registrar under Section 16 or the consent of the Minister under Section 18."

Consent to Certain Uses

"18. (1) For the purposes of this section, the expression "the owner of any land" includes a lessee from the Crown, and the holder of any mining tenement or mining privilege, or of any right or privilege under the Petroleum Act, 1967, in relation to the land.

(2) Where the owner of any land gives to the Trustees notice in writing that he requires to use the land for a purpose which, unless the Minister gives his consent in this Section, would be likely to result in a breach of Section 17 in respect of any Aboriginal site that might be on the land, the Committee shall, as soon as they are reasonably able, form an opinion as to whether there is any Aboriginal site on the land, evaluate the importance and significance of any such site, and submit the notice to the Minister together with their recommendations in writing as to whether or not the Minister should consent to the use of the land for that purpose, and, where applicable, the extent to which and the conditions upon which his consent should be given.

(3) When the Committee submit a notice to the Minister under subsection (2) of this section he shall consider their recommendation and having regard to the general interest of the community shall either -

(a) Consent to the use of the land the subject of the notice, or a specified part of the land, for the purpose required, subject to such conditions, if any, as he may specify; or

(b) Wholly decline to consent to the use of the land the subject of the notice for the purpose required,

and shall forthwith inform the owner in writing of his decision.

(4) Where the owner of any land has given to the Committee notice pursuant to the subsection (2) of this section and the Committee have not submitted it with their recommendation to the Minister in accordance with that subsection the Minister may require the Committee to do so within a specified time, or may require the Trustees to take such other action as the Minister considers necessary in order to expedite the matter, and the Committee shall comply with any such requirement.

(5) Where the owner of any land is aggrieved by a decision of the Minister made under subsection (3) of this section he may, within the time and in the manner prescribed by the rules of court, appeal from the decision of the Minister to the Supreme Court which may hear and determine an appeal.

(6) In determining an appeal under subsection (5) of this section the Judge hearing the appeal may confirm or vary the decision of the Minister against which the appeal has been made or quash the decision of the Minister, and may make such order as to the costs of the appeal as he sees fit.

(7) Where the owner of the any land gives notice to the Committee under subsection (2) of this section, the Committee may if they are satisfied that it is practicable to do so, direct the removal of any object to which this Act applies from the land to a place of safe custody.

(8) Where consent has been given under this section to a person to use any land for a particular purpose nothing done by or on behalf of that person pursuant to, and in accordance with any conditions attached to, the consent constitute an offence against the Act."

APPENDIX 2

Notes on the Recognition of Aboriginal Sites

There are various types of Aboriginal Sites, and these notes have been prepared as a guide to the recognition of those types likely to be located in the survey area.

An Aboriginal Site is defined in the Aboriginal Heritage Act, 1972, in Section 5 as:

"(a) Any place of importance and significance where persons of Aboriginal descent have, or appear to have, left any object, natural or artificial, used for, or made for or adapted for use for, any purpose connected with the traditional cultural life of the Aboriginal people, past or present;

(b) Any sacred, ritual or ceremonial site, which is of importance and special significance to persons of Aboriginal descent;

(c) Any place which, in the opinion of the Committee is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the state;

(d) Any place where objects to this Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or removed."

Habitation Sites

These are commonly found throughout Western Australia and usually contain evidence of tool-making, seed grinding and other food processing, cooking, painting, engraving or numerous other activities. The archaeological evidence for some of these activities is discussed in details under the appropriate heading below.

Habitation sites are usually found near an existing or former water source such as a gnamma hole, rock pool, spring or soak. They are generally in the open, but they sometimes occur in shallow rock shelters or caves. It is particularly important that none of these sites be disturbed as the stratified deposits which may be found at such sites can yield valuable information about the inhabitants when excavated by archaeologists.

Seed Grinding

Polished or smoothed areas are sometimes noticed on/near horizontal rock surfaces. The smooth areas are usually 25cm wide and 40 or 50cm long. They are the result of seed grinding by the Aboriginal women and indicate aspects of past economy.

Habitation Structures

Aboriginal people sheltered in simple ephemeral structures, generally made of branches and sometimes of grass. These sites are rarely preserved for more than one occupation period. Occasionally rocks were pushed aside or used to stabilise other building materials. When these rocks patterns are located they provide evidence for former habitation sites.

Middens

When a localised source of shellfish and other foods has been exploited from a favoured camping place, the accumulated ashes, hearth stones, shells, bones and other refuse can form mounds at times several metres high and many metres in diameter. Occasionally these refuse mounds or middens contain stone, shell or bone tools. These are most common near the coast, but examples on inland lake and river banks are not unknown.

Stone Artefact Factory Sites

Pieces of rock from which artefacts could be made were often carried to camp sites or other places for final production. Such sites are usually easily recognisable because the manufacturing process produces quantities of flakes and waste material which are clearly out of context when compared with the surrounding rocks. All rocks found on the sandy coastal plain , for example, must have been transported by human agencies. These sites are widely distributed throughout the State.

Quarries

When outcrops of rock suitable for the manufacture of stone tools were quarried by the Aborigines, evidence of the flaking and chipping of the source material can usually be seen in situ and nearby. Ochre and other mineral pigments used in painting rock surfaces, artefacts and in body decoration are mined from naturally occurring seams, bands and other deposits. This activity can sometimes be recognised by the presence of wooden digging sticks or the marks made by these implements.

Marked Trees

Occasionally trees are located that have designs in the bark which have been incised by Aborigines. Toeholds, to assist the climber, were sometimes cut into the bark and sapwood of trees in the hollow limbs of which possums and other arboreal animals sheltered. Some tree trunks bear scars where section of bark or wood have been removed and which would have been used to make dishes, shield, spearthrowers and other wooden artefacts. In some parts of the state wooden platforms were built in trees to accommodate a corpse during complex rituals following death.

Burials

In the north of the state, it was formerly the custom to place the bones of the dead on a ledge in a cave after certain rituals were completed. The bones were wrapped in sheets of bark and the skull placed beside this. In other parts of Western Australia the dead were buried, the burial position varying according to the customs of the particular area and time. Natural erosion, or mechanical earthmoving equipment occasionally exposes these burial sites.

Stone Structures

If one or more stone are found partly buried or wedged into a position which is not likely to be the result of natural forces, then it is probable that the place is an Aboriginal site and that possibly there are other important sites nearby. There are several different types of stone arrangements ranging simple cairns or piles of stones to more elaborate designs.

Low weirs which detain fish when tides fall are found in coastal areas. Some rivers contain similar structures that trap fish against the current. It seems likely that low stone slab structures in the south west jarrah forests were built to provide suitable environments in which to trap some small animals. Low walls or pits were sometimes made to provide a hide or shelter for a hunter.

Elongated rock fragments are occasionally erected as a sign or warning that a special area is being approached. Heaps or alignments of stones may be naturalistic or symbolic representations of animals, people or mythological figures.

Paintings

These usually occur in rock shelters, caves or other sheltered situations which offer a certain degree of protection from the weather. The best known examples in Western Australia occur in the Kimberley region but paintings are also found through most of the states. One of several coloured ochres as well as other coloured pigments may have been used at a site. Stencilling was a common painting technique used throughout the state. The negative image of an object was created by spraying pigment over the object which was held against the wall.

Engravings

This term described designs which have been carved, pecked or pounded into a rock surface. They form the predominant art form of the Pilbara region but are known to occur in the Kimberleys in the north to about Toodyay in the south. Most engravings occur in the open, but some are situated in rock shelters.

Caches

It was the custom to hide ceremonial objects in niches and other secluded places. The removal of objects from these places, or photography of the places or objects or any other interference with these places is not permitted.

Ceremonial Grounds

At some sites the ground has been modified in some way by the removal of surface pebbles, or the modelling of the soil, or the digging of pits and trenches. In other places there is not noticeable alteration of the ground surface and Aborigines familiar with the site must be consulted concerning its location.

Mythological Sites

Most sites already described have a place in Aboriginal mythology. In addition there are many Aboriginal sites with no man-made features which enable them to be recognised. They are often natural features in the landscape linked to the Aboriginal Account of the formation of the world during the creative "Dreaming" period in the distant past. Many such sites are located at focal points in the creative journeys of mythological spirit beings of the Dreaming. Such sites can only be identified by the Aboriginal people who are familiar with the associated traditions.

APPENDIX 3

SITE REGISTER LIST

Search Criteria

4 sites in a search polygon. The polygon is formed by these points (in order):

MGA Zone 50	
Northing	Easting
6435000	390000
6441000	390000
6441000	395000
6435000	395000

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Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

Copyright

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Legend

Restriction

N	No restriction
M	Male access only
F	Female access

Access

C	Closed
O	Open
V	Vulnerable

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[Unreliable	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status

L	Lodged
I	Insufficient Information
P	Permanent register
S	Stored data

IR	Insufficient Information (as assessed by Site Assessment Group)
PR	Permanent register (as assessed by Site Assessment Group)
SR	Stored data (as assessed by Site Assessment Group)

Site Assessment Group (SAG)

Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not to be considered the final assessment.

Final assessment will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
3290	I	O	N	Thomsons Lake.		Hunting Place		389739mE 6441299mN Zone 50 [Unreliable]	S00186
3427	S	O	N	Mandogalup Swamp/spectacles.	Mythological	Hunting Place, Water Source	*Registered Informant names available from DIA.	391457mE 6436663mN Zone 50 [Unreliable]	S02729
4360	S	O	N	Norkett Road	Artefacts / Scatter			390989mE 6437599mN Zone 50 [Reliable]	S00772
21330	S	O	N	Thompsons Lake Isolated Artefacts	Artefacts / Scatter	[Other: 6 Isolated Artefacts]		391707mE 6440822mN Zone 50 [Unreliable]	

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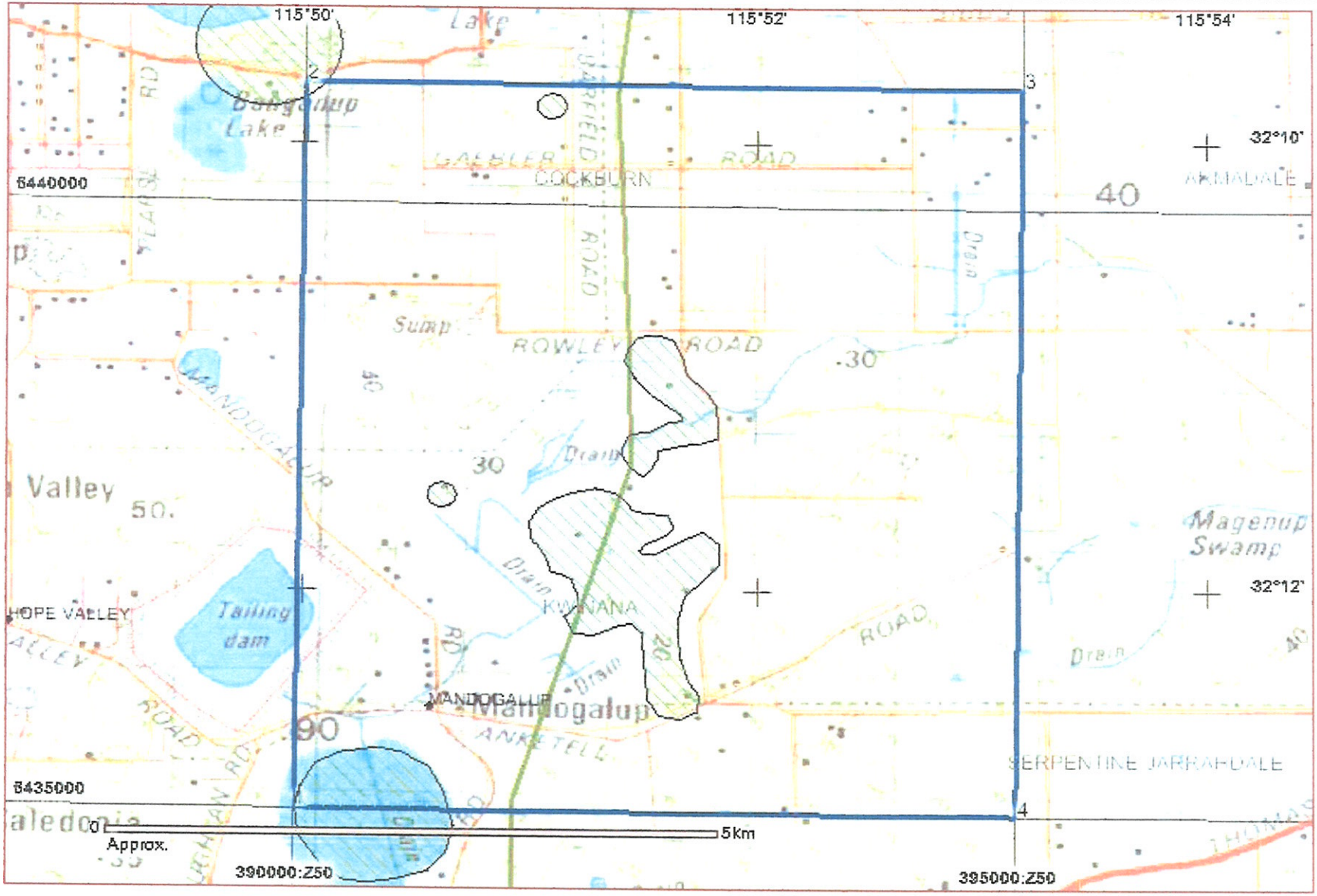

Legend

- Highlighted Area
- Town
- Map Area
- Search Area

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Copyright for Native Title Land Claim, Local Government Authority, Mining Tenement boundaries shall at all times remain the property of the State of Western Australia, All rights reserved.

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Appendix 6

LANDSCAPE MASTER PLAN

ROWEGROUP

ROWLEY ROAD

KWINANA FREEWAY

LYON ROAD

LYON ROAD

HONEYWOOD AVENUE

POCKET PARK A:
- Pedestrian links to adjacent residential areas
- Mix of hard and soft landscape treatments
- Small play area
- Planting of predominantly native species
- Seating

POCKET PARK B:
- Pedestrian links to adjacent residential areas
- Mix of hard and soft landscape treatments
- Shelter and BBQ
- Informal kickabout space
- Stormwater treatment/nutrient stripping basin
- Planting of predominantly native species
- Seating
- Irrigation bore

LEGEND

Scope of LSP Lots

Street Trees
Differentiation of neighbourhoods by species.

Bubbleup Pit

Pocket Playground

LSP Amendment Boundary

Appendix 7

TRANSPORT ASSESSMENT REPORT

ROWEGROUP

WANDI NORTH LOCAL STRUCTURE PLAN AMENDMENT

TRANSPORT ASSESSMENT

transport planning • traffic engineering • project management

Wandi North Local Structure Plan Amendment

Transport Assessment

Prepared for:
Satterley Property Group

July 2013

Prepared by:
TRANSCORE PTY LTD
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Client: Satterley Property Group

Name of project: Wandi North LSP Amendment

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Project number: t13.086

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1 Introduction

In April 2009, Transcore prepared a traffic assessment report for Wandi North Local Structure Plan (LSP). The 2009 LSP did not cover the northernmost portion of the LSP area, given this area was not zoned urban under the MRS in 2009. Therefore it was excluded from the LSP area, but currently this area is zoned urban. Accordingly the existing approved LSP has been amended to cover this area and a traffic assessment report is required to support the proposed amendment to the existing approved LSP.

Figure 1 illustrates the amended area to the existing LSP.

Figure 1: Amendment Area Plan

For the purpose of this traffic report the previously (2009) established EMME transport model for Wandi District Structure Plan (DSP) was utilised. The 2009 EMME model assumed about 138 residential lots for the northern part of the amended area plan to reflect the potential urbanisation of this land. The new residential lots for this part of the amended area plan is estimated to be 113 lots which is 25 lots lower than what was assumed in 2009 EMME model. Accordingly the impact of the amended area plan to the LSP traffic projections are considered marginal and it is not expected to alter the reported traffic projections in the 2009 traffic report for the Wandi LSP area.

2 Proposed Subdivision for Amendment Area Plan

The proposed subdivision for the LSP amendment area plan is shown in **Figure 2.** The amended area is anticipated to yield approximately 208 residential lots.

Figure 2. Proposed Subdivision of the Amendment Area Plan

3 Existing Situation

3.1 Existing Road Network

Lyon Road

Lyon Road is classified as a District Distributor type B road in the Main Roads WA Functional Road Hierarchy. It is currently constructed to a rural standard with a 7.0 metre wide carriageway. It provides a north-south link through the suburbs of Wandi, Mandogalup and Atwell connecting Rowley Road to the north to Anketell Road to the south.

Historical traffic data for the locality indicates traffic volumes of less than 1,000 vehicles per day (vpd) on Lyon Road, which is predominantly generated by local residents. As would be expected of a road parallel to a freeway, Lyon Road is not significantly attractive to through traffic.

Rowley Road

Rowley Road is classified as a District Distributor A Road in the Main Roads WA Functional Road Hierarchy and is constructed as a rural standard single carriageway road. Traffic data provided by City of Cockburn (2011) indicates 6,451vpd on Rowley Road east of the Kwinana Freeway with 11.2% heavy vehicles.

Rowley Road provides an east-west connection between South Western Highway (via Eleventh Road in Armadale), Tonkin Highway, Kwinana Freeway and Rockingham Road in Wattleup (via Wattleup Road). The link has been identified as a primary freight route to the Naval Base / Kwinana Beach industrial areas, although it is understood that this has not been formalised at the present time. Should Rowley Road be a designated freight route, changes to local intersections will be required to accommodate large trucks.

3.2 Public Transport

There are no current bus routes adjacent to the subject land. Route 527 servicing Aubin Grove is the closest service and uses Lyon Road to the north of Rowley Road and provides a service through to Cockburn Central. **Figure 3** illustrates route 527 along Lyon road through Aubin Grove development. This route currently terminates immediately north of Rowley Road.

Figure 3: Existing Bus Route

3.3 Pedestrian and Cyclist Facilities

There are no existing footpaths or cycle facilities on Lyon Road or Rowley Road in the vicinity of the Wandi LSP area.

3.4 *Changes to Surrounding Road Network*

According to the Wandi North LSP, the central spine road (Honeywood Avenue) would connect to Lyon Road in the form of a priority T-intersection. The amended LSP area plan is not expected to introduce changes to the surrounding road network.

3.5 *Public Transport Network Planning*

It would be expected that route 527 would be extended south along Lyon Road to service the LSP area along central spine road (Honeywood Avenue). The Wandi North LSP proposes bus routes along the central spine road (Honeywood Avenue).

4 Proposed Transport Network

4.1 *Road Hierarchy*

The hierarchy of roads within the amended LSP area is illustrated in **Figure 4** using the road hierarchy defined in *Liveable Neighbourhoods (LN 2007).*

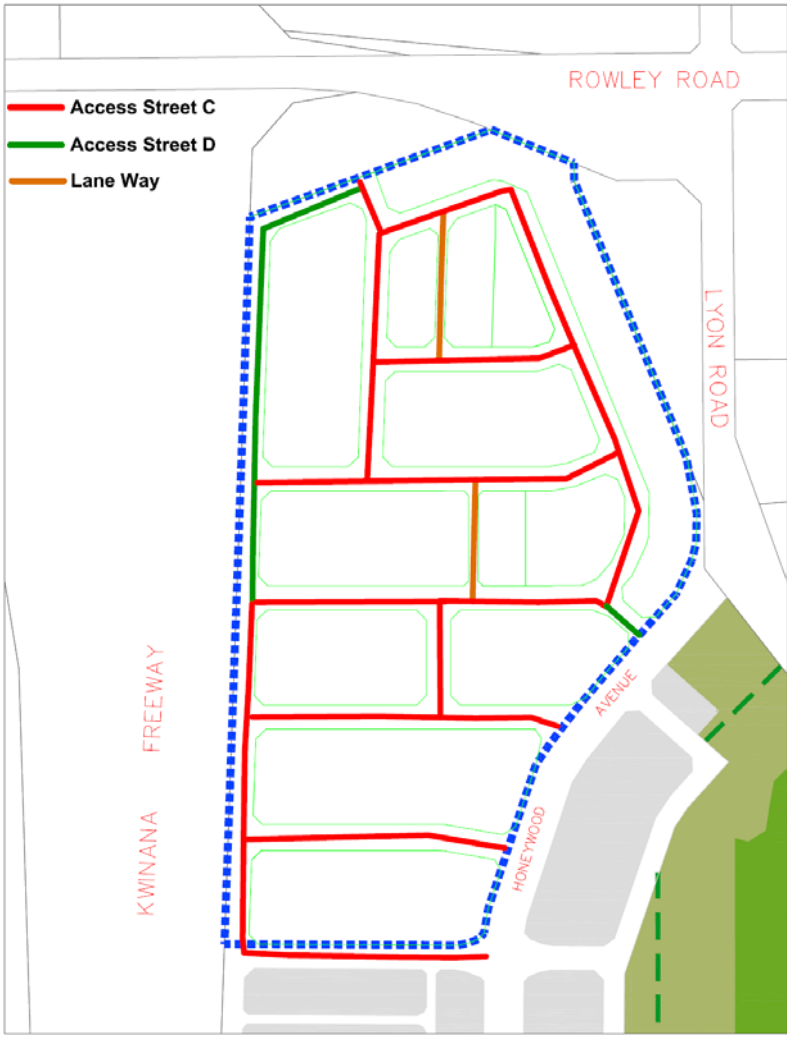


Figure 4. Road Hierarchy

Some key characteristics of the relevant road classifications have been summarised in Table 1 below. These are generally based on Liveable Neighbourhoods guidelines although the proposed widths do vary slightly from the standard Liveable Neighbourhoods cross-section diagrams.

Table 1. Road Hierarchy

Road Classification	Indicative upper volume (vpd)	Indicative road reserve width (m)	Indicative road pavement width (m)
Access Street C	3,000	15.4m	6m (plus embayed parking) or 7.2m (with no embayed parking
Access Street D	1,000	13.2m	6m
Laneway	300	6m	6m typical

It must be noted that the projected traffic volumes are expected to be less than 1000vpd for all roads in the amended LSP area and therefore Access Street D roads with typical road reserve of 14.2m would accommodate the projected traffic volumes. However due to the drainage requirements wider road reserves have been considered for the majority of the amended LSP roads. Some sections of road adjacent to the Kwinana Freeway road reserve will have development and associated underground services only on one side so a reduced verge is proposed on the other side resulting in reduction of the proposed road reserve to 13.2m on these streets.

4.2 Public Transport

Existing bus services in this area are described in section 3.3 of this report. Current planning anticipates a future bus route running north south through the LSP area along the central spine road (Honeywood Avenue).

4.3 Pedestrian and Cyclist Facilities

The existing approved LSP proposes a shared path along the central spine road (Honeywood Avenue).

Footpaths should be provided on at least one side of all streets within the amended LSP area, with the possible exception of short cul-de-sacs and laneways. Footpaths should be provided on both sides of streets that may serve greater numbers of pedestrians.

5 Integration with Surrounding Area

The road network of the amended LSP area will connect to the central spine road (Honeywood Avenue), which will provide access to Lyon Road which then connects to Rowley Road.

6 Analysis of the Transport Network

6.1 Assessment Period

The assessment year that has been adopted for this analysis is 2031, with full development of Wandi DSP.

6.2 Traffic generation and distribution

Transcore has developed a traffic model of weekday traffic flows for the Wandi DSP using the EMME transport modelling software package. This model has been developed in more detail for various projects in this area including Anketell north and south LSPs.

The daily traffic generation rate used in the amended LSP area for this transport assessment is 8 vehicle trips per day (vpd) per dwelling, which corresponds to peak hour trip generation rates recommended in the Western Australian Planning Commission (WAPC) *Transport Assessment Guidelines for Development* (2006).

The anticipated 208 dwellings of the amended LSP area will therefore generate approximately 1,664vpd.

The distribution of these trips is based on the assumptions documented in the 2009 traffic report for the Wandi North LSP.

6.3 Traffic Flow Forecasts

Figure 4 illustrates future total daily traffic flows anticipated on the road network of the amended LSP area.

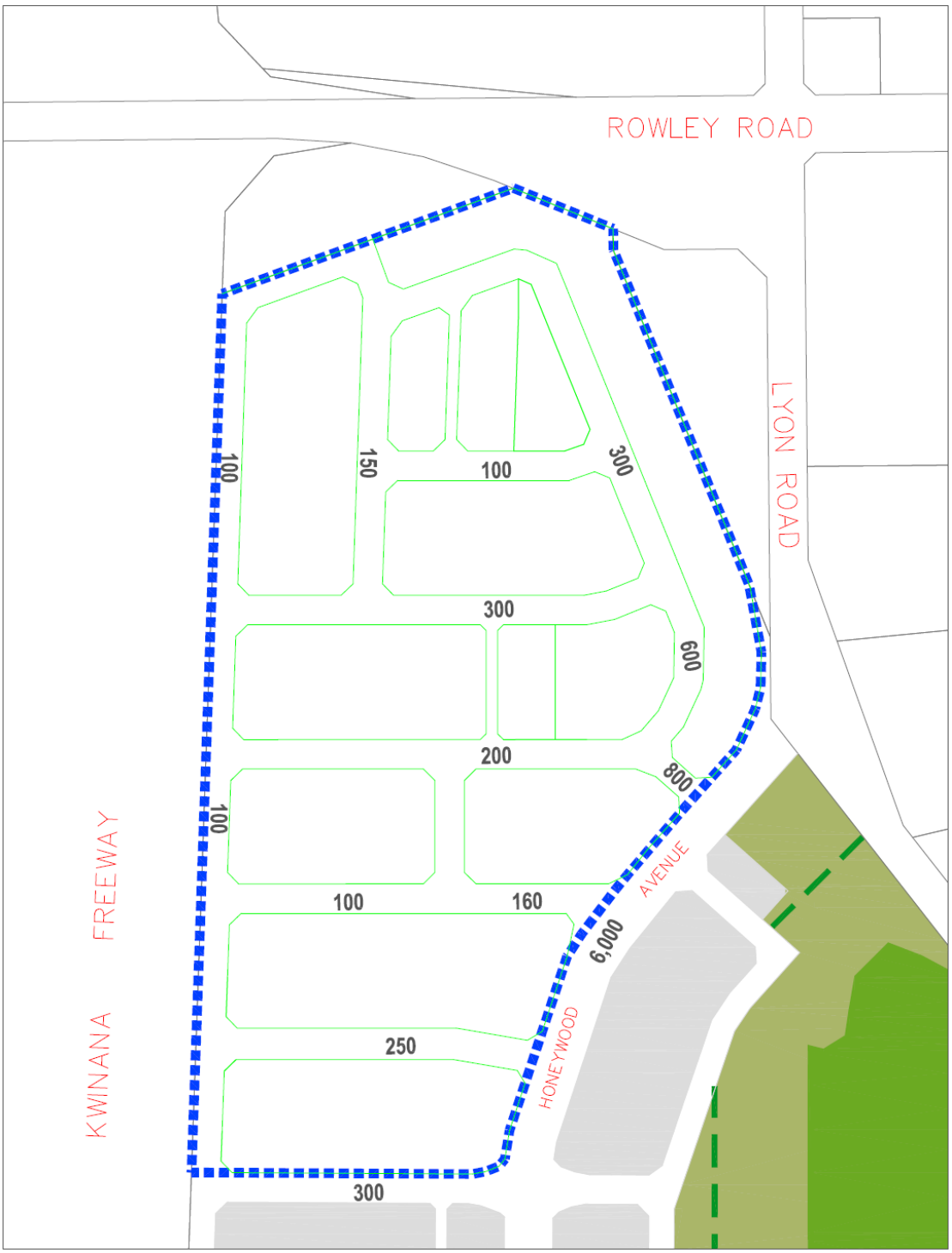


Figure 4. Future Daily Traffic Volumes

6.4 Roads and Intersections

The proposed road network to accommodate these traffic volumes has been detailed in section 4 of this transport assessment, including the details of the proposed road hierarchy in section 4.1.

Figure 5 details the proposed intersection controls for intersections along the central spine road (Honeywood Avenue) in the vicinity of the amended LSP area.

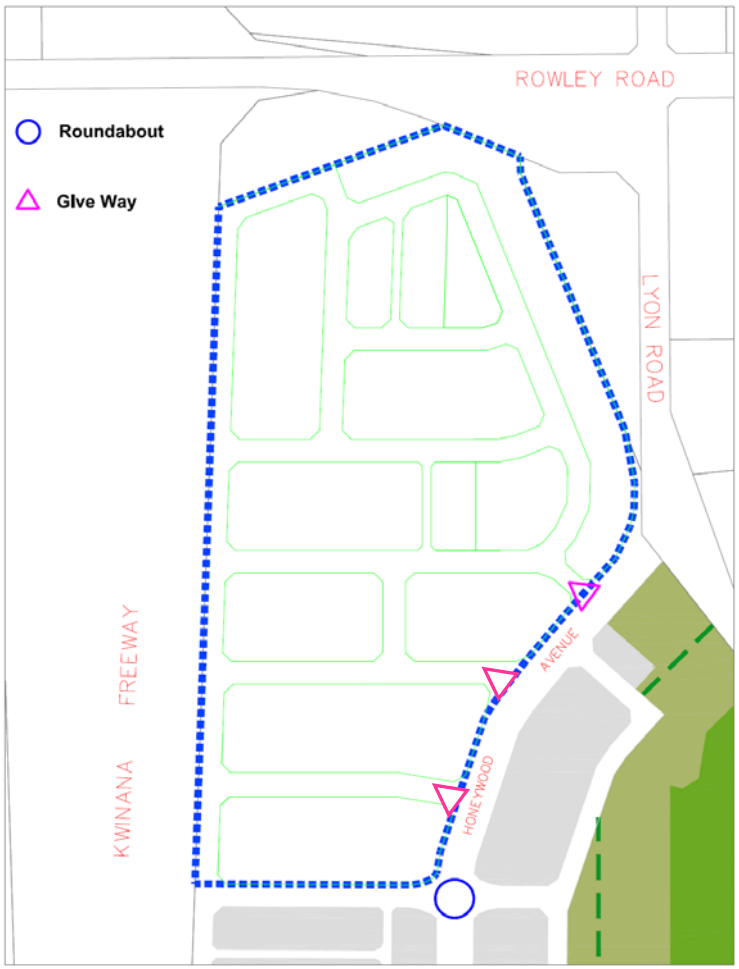


Figure 9. Intersection treatments

A roundabout is proposed for the four-way intersection to the south of the amended LSP area. The rest of the intersections along the central spine road (Honeywood Avenue) are considered to operate as priority T-intersections. The staggered distance for the northern T-intersection needs to be a minimum of 40m to satisfy the requirements of the WAPC *Liveable Neighbourhoods* policy.

6.5 Intersection Analysis

Intersection capacity analysis has been undertaken for the northern LSP intersection with the central spine road (Honeywood Avenue) as it carries higher traffic volume compared with the other two give way intersections. The analysis is undertaken for the typical peak hour flows that correspond to the modelled 2031 daily traffic flows in **Figure 4**.

Capacity analysis of these intersections has been undertaken using the SIDRA computer software package. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- Degree of Saturation is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for infrequent traffic flow up to one for saturated flow or capacity.
- Level of Service is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- Average Delay is the average of all travel time delays for vehicles through the intersection.
- 95% Queue is the queue length below which 95% of all observed queue lengths fall.

Table 2 summarises the results of the SIDRA analysis for the northern intersection of the amended LSP area.

Table 2. SIDRA results for northern intersection

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
North East: Honeywood N											
25	T	316	2.0	0.190	1.4	LOS A	1.4	9.6	0.47	0.00	51.6
26	R	34	0.0	0.190	9.8	LOS A	1.4	9.6	0.47	0.91	49.1
Approach		349	1.8	0.190	2.2	NA	1.4	9.6	0.47	0.09	51.4
North West: Access Road											
27	L	34	0.0	0.059	10.6	LOS B	0.2	1.4	0.43	0.69	46.4
29	R	11	0.0	0.059	10.8	LOS B	0.2	1.4	0.43	0.80	46.3
Approach		44	0.0	0.059	10.7	LOS B	0.2	1.4	0.43	0.72	46.3
South West: Honeywood S											
30	L	11	0.0	0.170	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
31	T	316	2.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		326	1.9	0.170	0.3	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		720	1.8	0.190	1.8	NA	1.4	9.6	0.25	0.10	54.4

The SIDRA analysis indicates that the northern intersection of the amended LSP area would work satisfactorily and within the capacity as a simple priority T-intersection. The level of service of A and B is reported for all the movements at this intersection. Considering that this intersection is the busiest intersection of the amended LSP area then the rest of the priority T-intersections along the central spine road (Honeywood Avenue) and fronting the amended LSP area would operate satisfactorily as well.

6.6 Pedestrian / Cycle Networks

The proposed Amended LSP area road network will be connected to the propose shared path along the central spine road (Honeywood Avenue). This shared path will provide a good level of accessibility and permeability for pedestrians and cyclists within the Wandi north LSP area, and connections to neighbouring precincts at strategic locations.

6.7 Access to Public Transport

According to the Wandi North LSP report, it is proposed to provide a future bus route along the central spine road (Honeywood Avenue). The WAPC *Transport Assessment Guidelines for Developments* (2006) suggest that it is desirable for at least 90 per cent of dwellings to be within 400m straight line distance of a bus route. On this basis it is suggested that a bus stop be provided along central spine road (Honeywood Avenue) in the vicinity of the amended LSP area.

7 Conclusion

This transport assessment report is an amendment to the traffic report prepared by Transcore in April 2009 for Wandi North LSP.

The 2009 EMME model established for Wandi DSP area assumed about 138 residential lots for the northern part of the amended area plan to reflect the potential urbanisation of this land. The new residential lots for this part of the amended area plan is estimated to be 113 lots which is 25 lots lower than what was assumed in 2009 EMME model. Accordingly the impact of the amended area plan to the LSP traffic projections are considered marginal and it is not expected to alter the reported traffic projections in the 2009 traffic report for the Wandi LSP area.

The amended area plan includes 208 residential lots which are expected to generate about 1,664vpd trips.

The projected traffic volumes for all of the roads in the amended area are expected to be less than 1000vpd and they will be designed as “Access Streets”.

Appendix 8

LOCAL WATER MANAGEMENT STRATEGY (ADDENDUM)

ROWEGROUP

Wandi (North) Local Water Management Strategy (LWMS)

(Report dated January 2009, JDA report reference J4106d, for Satterley Property Group)

ADDENDUM 1

(24 June 2013)

A revised Local Structure Plan (LSP) is being prepared as a major amendment to the existing Wandi North Local Structure Plan. The following key changes to the LSP are being sought under the amendment:

- Modification to the LSP boundary to include the northern area previously zoned for Water Protection (now zoned urban);
- Deletion of the train station and associated TOD requirements
- Reconfiguration of the road layout and POS/drainage
- Reduction in density
- Deletion of the Local Centre or potential relocation to Stage 5A – this is subject to further investigation
- Relocation of the Community Centre to Stage 5A or adjacent to the Primary School – this is also subject to further investigation

This addendum to the Wandi North Local Water Management Strategy is provided to address these changes to the LSP.

Replacement text for Chapter 4, Section 4.3.1, Sub-section: *District sub-catchments and modelled peak outflows* (pages 20-21):

District sub-catchments and modelled peak outflows

The Study Area is located in sub-catchments CAT20, CAT21, CATR1C and CATR1A of the district modelling presented in the DWMP (DoW, 2009). The DWMP specified where proposed developments are part of one or more of the sub-catchments presented, the storage requirements should be calculated based on the surface area as a percentage of total sub-catchment surface area.

CAT20 covers the majority of the northern part of the proposed Study Area and incorporates detention storage (labelled Lyon CB) with up to 0.07m^3/s peak discharge to the main drain. The most northern part of the Study Area (6.2ha) is part of the 283ha district sub-catchment CAT21. The 100 yr ARI peak discharge from this basin into the Peel Main Drain is 0.63 m^3/s. Based on a pro-rata approach, 6.2ha of the Study Area forms 2.2% of CAT21 and the allowed outflow is 0.014m^3/s (14L/s) to the Peel Main Drain.

A small portion of the Study Area (1.8ha) was mapped within district sub-catchment CATR1C assumed to have no access to the main drain and therefore all rainfall was assumed to infiltrate.

The southern part of the Study Area (49ha) is part of the 131.2 ha district sub-catchment CATR1A which includes a detention storage named Darling Chase CB. The 100 yr ARI peak discharge from this basin into the Peel R sub-drain is 0.14m^3/s, with a tailwater of 13.5mAHD. Based on a pro-rata

approach, 49ha of the Study Area forms 37.3% of CATR1A and the pro-rata outflow allowed is 0.052m^3/s (52L/s) to the Peel R sub-drain.

The district model assumed overland flow from the entire catchment to the sub-drain, but if an overland flow path does not exist and is not plausible, runoff may be assumed to infiltrate.

Replacement text for Chapter 4, Section 4.3.2.1, Sub-section: *Detention Storages* (page 22):

Detention Storages

Sub-catchments A, B, C and D, shown in Figure 14 are located in the north of the Study Area and are to have detention storages for flood management with outlets to the Peel Main drain.

The storages have been modelled using XP-SWMM. Storage areas were designed to contain runoff from the 100 year ARI storm event, with discharge for the 100 year ARI event designed not to exceed estimated pre-development (existing) flow. The combine peak outflow from the three detention storages is up to 84 L/s to the main drain in accordance with DWMP. The backwaters used are consistent with those presented in Figure 13 for the partial realignment of the Peel MD.

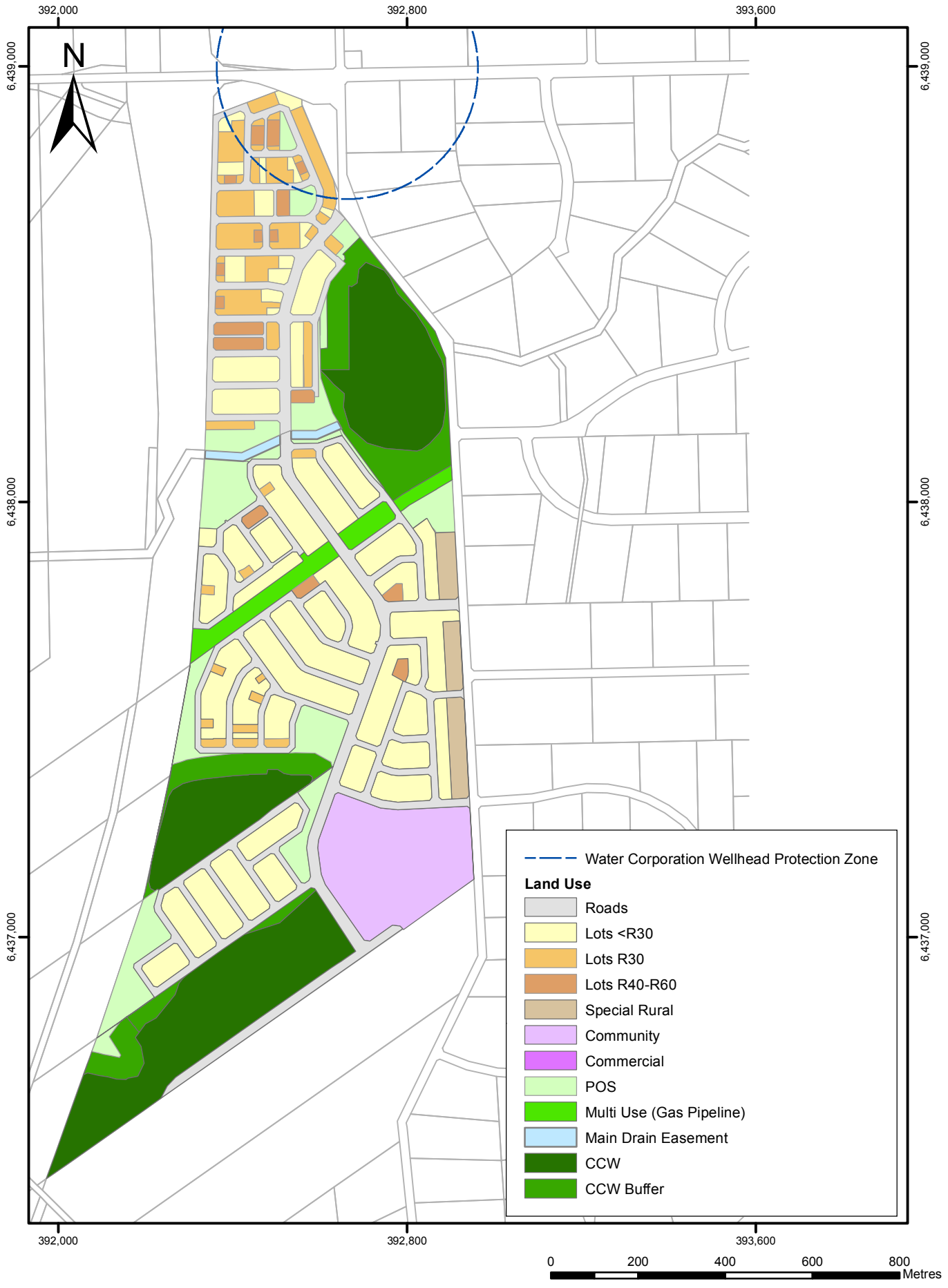
Storage locations were determined based on existing topographic contours, depth to groundwater mapping, and local structure plan constraints. Storage elevations have been assumed at least 0.3m above the design groundwater level for modelling purposes. Storage outlets for this modelling were set at or above storage inverts, at least 0.3m above the design groundwater level. Side slopes of 1 in 6 (v:h) have been adopted for all storages.

Replacement text for Chapter 4, Section 4.3.2.1, Table 7 (page 24):

TABLE 7: XP-SWMM MODEL RESULTS FOR DETENTION STORAGES

Post-Development Catchment	A	B	C	D
Catchment Area (ha)	12.30	6.57	2.13	12.14
Catchment Data				
POS Area (ha)	0.74	0.36	0.82	2.50
Residential R20 – R40 (ha)	7.28	4.06	0.87	6.48
Residential R40 – R60 (ha)	-	-	-	-
Community/Commercial (ha)	-	-	-	-
Road & Road Reserve (ha)	4.29	2.14	0.44	3.18
Catchment Slope (ha)	0.03	0.015	0.024	0.56
Storage Data				
Design Water Level	21.0	21.0	21.0	20.5
Storage Invert (mAHD)	21.6	23.8	21.5	20.25
Side Slopes (v:h)	1:6	1:6	1:6	Appx.1:20
Storage Outlet Level (mAHD)	21.6	23.8	21.5	20.7
Outlet Discharge to Drain Level (mAHD)	21.6	-	21.5	20.63
Storage Outlet Control Diameter (mm)	185	100	150	80
Connectivity to Peel Main Drain	offline	offline	offline	offline
5 Year ARI				
Top Water Level Area (ha)	0.47	0.20	0.31	0.98
Flood Storage (m3)	1610	970	700	4990
Flood Rise (m)	0.70	0.55	0.60	0.60
Peak Outflow (m^3/s)	0.047	0.021	0.011	0.005
Critical Duration (hrs)	24	24	24	36
100 Year ARI				
Top Water Level Area (ha)	0.52	0.26	0.35	1.05
Flood Storage (m^3)	3100	1820	1640	6960
Flood Rise (m)	1.0	1.0	0.9	0.75
Peak Outflow (m^3/s)	0.060	0.029[1]	0.013	0.009
Critical Duration (hrs)	72	24	72	36

Notes: 1. Catchment B storage discharges to Catchment A storage. Combined outflow to Peel Main Drain is Catchments A, C and D.



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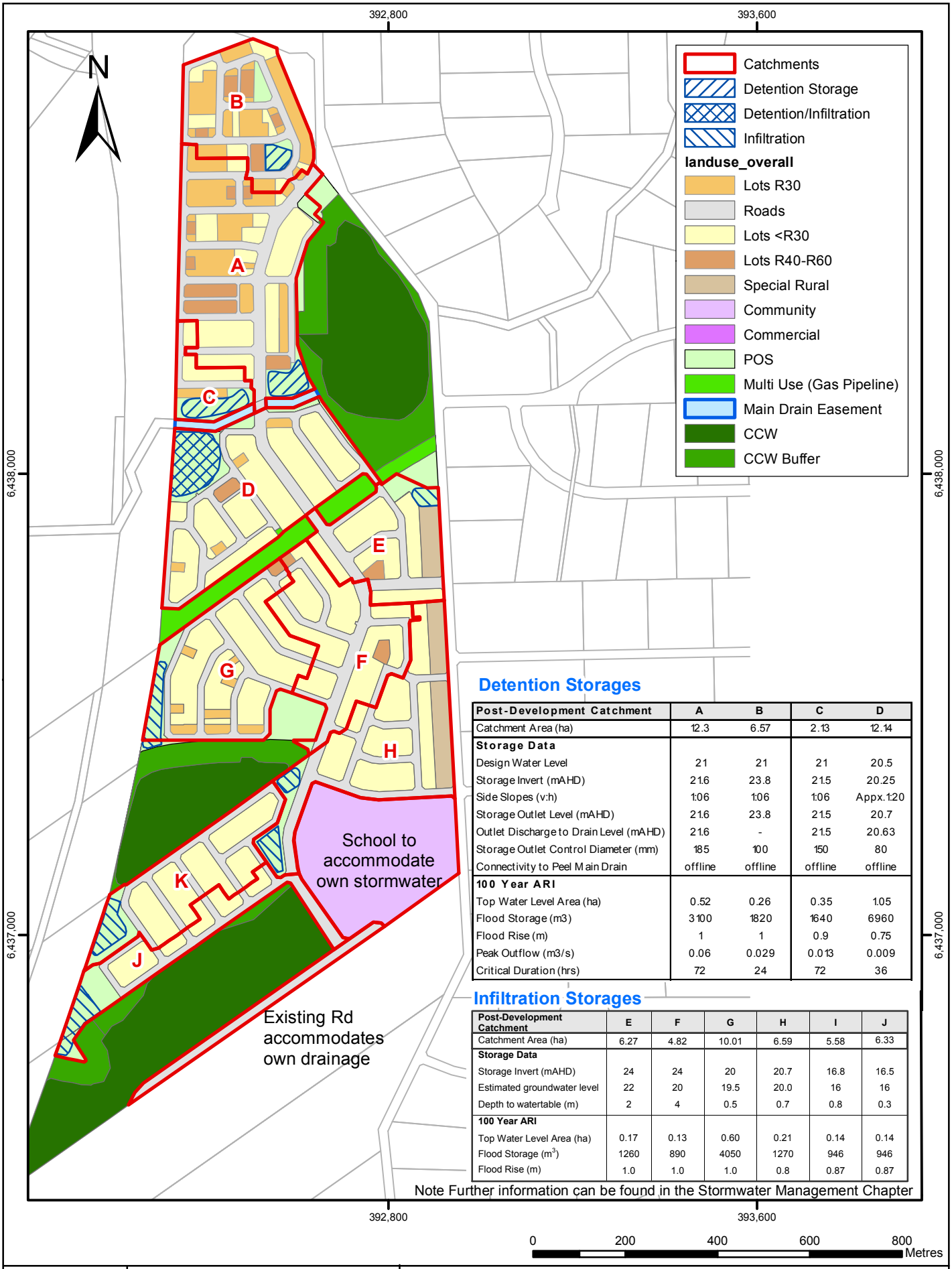
Wandi North LWMS Addendum

Figure 11: Proposed Structure Plan



Detention Storages

Post-Development Catchment	A	B	C	D
Catchment Area (ha)	12.3	6.57	2.13	12.14
Storage Data				
Design Water Level	21	21	21	20.5
Storage Invert (mAHD)	21.6	23.8	21.5	20.25
Side Slopes (v:h)	1:06	1:06	1:06	Appx.1:20
Storage Outlet Level (mAHD)	21.6	23.8	21.5	20.7
Outlet Discharge to Drain Level (mAHD)	21.6	-	21.5	20.63
Storage Outlet Control Diameter (mm)	185	100	150	80
Connectivity to Peel Main Drain	offline	offline	offline	offline
100 Year ARI				
Top Water Level Area (ha)	0.52	0.26	0.35	1.05
Flood Storage (m3)	3100	1820	1640	6960
Flood Rise (m)	1	1	0.9	0.75
Peak Outflow (m3/s)	0.06	0.029	0.013	0.009
Critical Duration (hrs)	72	24	72	36

Infiltration Storages

Post-Development Catchment	E	F	G	H	I	J
Catchment Area (ha)	6.27	4.82	10.01	6.59	5.58	6.33
Storage Data						
Storage Invert (mAHD)	24	24	20	20.7	16.8	16.5
Estimated groundwater level	22	20	19.5	20.0	16	16
Depth to watertable (m)	2	4	0.5	0.7	0.8	0.3
100 Year ARI						
Top Water Level Area (ha)	0.17	0.13	0.60	0.21	0.14	0.14
Flood Storage (m^3)	1260	890	4050	1270	946	946
Flood Rise (m)	1.0	1.0	1.0	0.8	0.87	0.87

Note Further information can be found in the Stormwater Management Chapter

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Figure 14: Catchments and Key Control Points for the Stormwater Management Strategy

Appendix 9

DEPARTMENT OF WATER APPROVAL – LWMS ADDENDUM

ROWEGROUP

Government of **Western Australia**
Department of **Water**

looking after all our water needs

Your ref: J5104b
Our ref: RF5109-03
SRS: 34110
Enquiries: Brett Dunn

6 November 2013

JDA & Associates
PO Box 117
SUBIACO WA 6008

Attention: Riccardo Divita

Dear Riccardo

RE: WANDI NORTH LOCAL WATER MANAGEMENT STRATEGY ADDENDUM 1

Thank you for the addendum to the Wandi North Local Water Management Strategy (LWMS), received with correspondence dated 27 September 2013. The Department of Water (DoW) has reviewed the LWMS and wishes to advise it is satisfied with the document to inform local structure planning.

Please note, should the City of Kwinana have any comments the LWMS should be amended accordingly.

Please contact the undersigned at the DoW's Mandurah office on (08) 9550 4202 with any further enquires.

Yours sincerely

Brett Dunn
Program Manager – Urban Water Management
Peel Region

CC: Nino Scidone
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wa.gov.au

XDWAL005

Appendix 10

LOCAL CENTRE ASSESSMENT REPORT

ROWEGROUP

Wandi North Local Structure Plan

Honeywood Local Centre Strategy

Satterley and Rowe Group

May 2013
1312

Contact

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Version Control

Document Name	Date	Description	Prepared
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Distribution Control

Document Name	Date	Distribution	Format	Delivery
1312-Wandi Honeywood Local Centre-T4 Paper-03	May 2013	RC - GRA	PDF	email

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EXECUTIVE SUMMARY

This report provides advice in relation to the market demand for commercial activity in the Honeywood Estate, Wandi North (Honeywood).

Previous planning for Honeywood considered commercial activity in respect to the likely location of a Railway station at Mandogalup. Government advice suggests that a railway station is no longer planned for Mandogalup. The findings in this report therefore reflect the market demand for local commercial activity without the potential patronage and travel behaviour of railway station consumer markets.

Local Centre

The resident Honeywood market would be capable of supporting a Local Centre of 750sqm of retail floor space by 2021 and 1,250sqm by 2031. This centre could contain a deli, cafe/takeaway and restaurant.

The successful operation of the centre would be best suited to the highest volume intersection associated within Honeywood traffic movement, which is likely to be the corner of Lyon and Rowley Road.

A Local Centre is already planned for this intersection, albeit on the north side of Rowley Road. This site has been adopted by the City of Cockburn and is physically capable of accommodating a centre of 750sqm – 1,250sqm.

Commercial opportunities for a small Local Centre to serve Honeywood residents could therefore be achieved through:

a) Delivery of a Local Centre site of 2,000sqm on the south side of Rowley Road on the Lyon Road entry to Honeywod.
b) Reliance on the delivery of the Local Centre planned on the north side of Rowley Road.
c) provide for a centre further into the middle of Honeywood

An additional centre on the southern site will duplicate and compete with the planned centre to the north of Rowley Road, and is likely to fragment the retail offer for the area rather than enhance it.

Relying on the currently allocated site on the northern intersection of the Lyon Road and Rowley Road appears to be the most commercially efficient and equitable provision of commercial activity to serve Honeywood residents.

Honeywood developers should satisfy themselves that the Local Centre is intended to be developed and ensure that direct and safe pedestrian access is facilitated for Honeywood residents crossing Rowley Road.

Providing a Local Centre 'deeper' within Honeywood would represent a significant commercial risk as the exposure and catchment would be significantly reduced – especially to residents north of Rowley Road.

1 INTRODUCTION

1.1 Purpose

This report provides advice in relation to the market demand for commercial activity in the Honeywood Estate, Wandi North (Honeywood).

Previous planning for Honeywood considered commercial activity in respect to the likely location of a Railway station at Mandogalup. Government advice suggests that a railway station is no longer planned for Mandogalup. The findings in this report therefore reflect the market demand for local commercial activity without the potential patronage and travel behaviour of railway station consumer markets.

1.2 Objectives

In particular, advice focuses on identifying the size and nature, components and configuration, location, land area, timing and staging and commercial risks associated with the delivery of a Local Centre in Honeywood.

1.3 Tasks

Findings are based on analysis of:

1. the extent and needs of each market likely to utilise tenants at the centre
2. the spending capacity and potential sales contribution from each market
3. the floor space, tenant types and land area and timing and staging
4. the most commercially suitable location and configuration to maximise the performance and value of the centre to the community

2 COMPETITION

Demand for a local retail centre in Honeywood will be influenced by the location, role and major tenants in the surrounding retail centre network. State Planning Policy 4.2 categorises the distribution of retail activity in Secondary Centres and District centres.

2.1 Secondary Centres

Honeywood is located mid way between two existing Secondary Centres, Cockburn Central and Kwinana Town Centre.

Cockburn Centre

Cockburn Gateway is 5.5km north of Honeywood. The centre currently accommodates Woolworths, Supa IGA and BigW. It will ultimately be expected to accommodate all of the major tenants which in turn will attract a large number of major brand and national chain retailers.

Direct access and egress to the freeway at both Rowley Road and Armadale Road will create convenient access to Cockburn from Honeywood. Cockburn Gateway will subsequently represent a significant and frequent drawcard for the Honeywood community.

Kwinana Town Centre

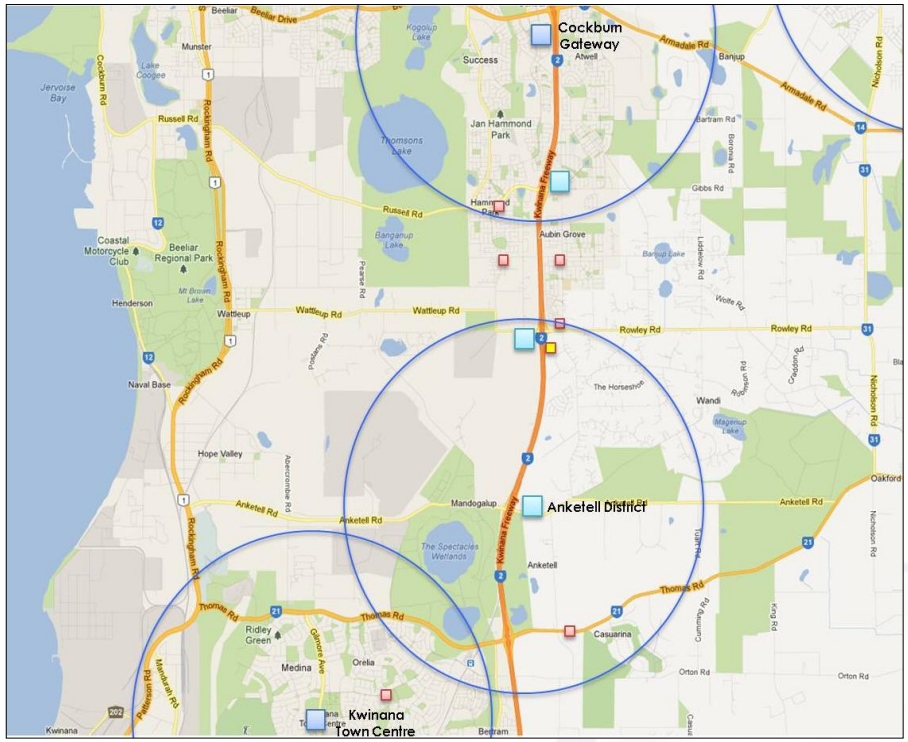
The Kwinana Town Centre has recently been redeveloped and now accommodates a full line supermarket and a Discount Department Store (BigW). It is likely to ultimately accommodate another major tenant. Whilst further for Honeywood residents to access, Kwinana will still represent an option for their wider shopping experiences.

2.2 District Centres

A District Centre should be capable of sustaining a DDS and at least one full line supermarket. A spatial opportunity exists for a District Centre to be developed between Cockburn Gateway and Kwinana. A District Centre is designated in SPP 4.2 and will be located between Anketell Road and Rowley Road to cater for the population growth expected in these areas.

Commercial and market drivers would support the inclusion of the centre on Anketell Road as close as possible to the freeway access.

Honey wood residents are located only 3.5km directly north of Anketell Road and will subsequently have direct access to this centre via local and district distributor roads. The location and role of this planned centre will reduce the need for further District Centre needs closer to Honeywood residents.



Google/Taktics4

2.3 Neighbourhood Centres

Neighbourhood supermarket based centres are planned for Harvest Lakes (Atwell), located on Russell Road near the freeway entrance 3km to the north of Honeywood. It will contain a national chain supermarket operator and will primarily serve a community within a 1.5km radius.

Another neighbourhood centre on Rowley Road is planned as a full line supermarket based centre, similar to that proposed for Harvest Lakes. A local Honeywood centre would operate within the immediate catchment of this centre.

2.4 Local Centres

A number of smaller Local Centres have already been planned for communities north of Rowley Road.

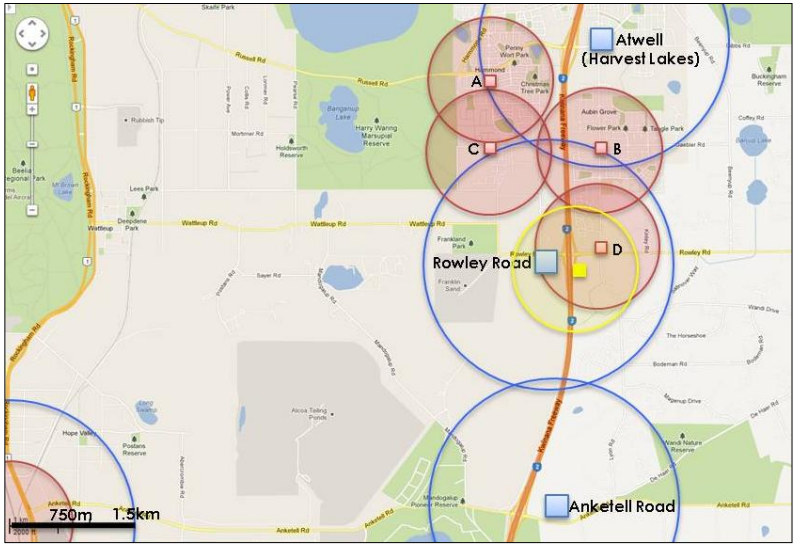
a. An existing IGA based Local Centre is located on the corner of Russell Road and Macquarie Boulevard that serves the suburbs of Success and Hammond Park.
b. An existing IGA based centre on the corner of Gaebler and Lyon Road 1.5km immediately north of Honeywood.

Two more Local Centres have been allocated as part of Local Structure plans adopted by the City of Cockburn.

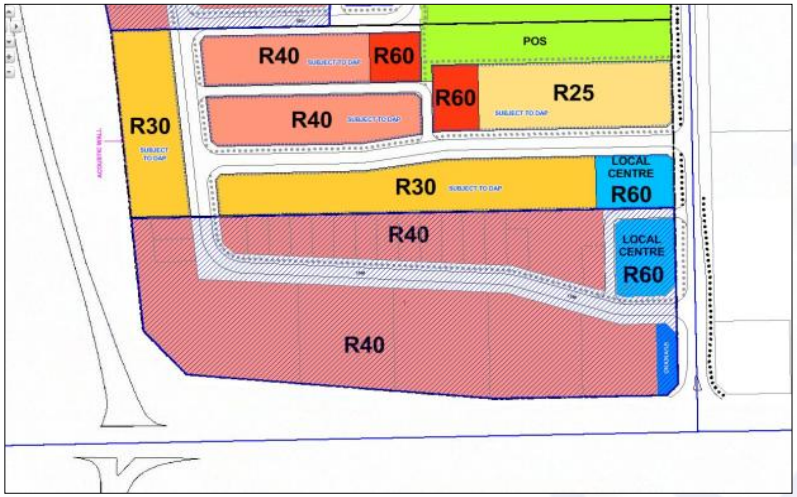
c. Gaebler Road west of the freeway is intended to serve the southern part of Success.
d. The corner of Rowley Road and Lyon Street immediately north of Honeywood on the intersection where Honeywood residents will use to access the estate on a day to day basis.

This last centre in particular will have a significant influence over the future demand for retail activity in Honeywood.

NEIGHBOURHOOD AND LOCAL CENTRES



LOCAL CENTRE (D) CORNER OF LYON AND ROWLEY ROADS



City of Cockburn – (LSP – Mapping 2012)

2.5 Summary

Honeywood residents will be very well served by the existing and planned retail network and distribution of centres. However, two centres which will have the biggest influence on the demand for retail centres in Honeywood are yet to be developed. Subsequently the demand will depend on if and when each centre is developed.

A Local Centre adjacent to Honeywood may make a Local Centre in Honeywood redundant. Whilst a neighbourhood centre on Rowley Road immediately west of the Freeway will be expected to satisfy the main food and grocery supermarket needs of the Honeywood community. However if that centre does not proceed it may strengthen the opportunity for a larger centre to be developed in Honeywood.

3 CONSUMER MARKETS

Based on the location and intended role of retail centres around Honeywood the consumer markets for a Local Centre would be derived predominantly from local residents predominantly within a 1 kilometre of the site.

3.1 Local Residents

Existing

The 1km resident catchment is contained within four statistical suburbs. These four suburbs currently contain 7,450 residents. Nearly ninety percent of the existing population is located north of Rowley Road reflecting the residential development front moving from the north.

Suburb	2011	Distribution
Hammond Park/Wattleup	2,450	33%
Aubin Grove/Banjup	4,150	56%
Mandogalup	50	1%
Wandi	800	10%
Total	**7,450**	**100%**

Census ABS 2011

Commercial activity in northern communities should become viable more quickly and be able to establish habit forming trading patterns from early population arrivals to the southern communities.

Forecast

The southern communities will contribute more residents to the catchment over the next ten years. However, the communities south of Rowley Road will contribute 27% of catchment residents by 2021 and 42% of catchment residents by 2031.

Suburb	2021	2021 Distribution	2031	2031 Distribution
Hammond Park/Wattleup	8,350	35%	9,250	30%
Aubin Grove/Banjup	9,000	38%	8,600	28%
Mandogalup	3,798	16%	7,595	25%
Wandi	2,558	11%	5,115	17%
Total	**23,705**	**100%**	**30,560**	100%

id consulting (Kwinana and Cockburn web sites 2012)

Immediate Catchment

The communities north of Rowley Road (Hammond Park and Success) stretch to the north and will be serviced by centres either developed or planned in these communities. Similarly the southern communities will also stretch further south and ultimately be serviced by other centres. The population within the designated local 1km catchment is therefore estimated to be 6,450 in 2021 and 8,650 by 2031.

Suburbs	% of suburb in catchment	2021	2031	2021 distribution
Hammond Park/Wattleup	25%	2,100	2,300	32%
Aubin Grove/Banjup	25%	2,250	2,150	35%
Mandogalup	33%	1,250	2,500	20%
Wandi	33%	850	1,700	13%
Total	**27%**	**6,450**	**8,650**	**100%**

Taktics4

Notwithstanding these population scenarios the distribution of residents in the catchment will remain reliant on the resident communities north of Rowley Road.

4 MARKET CAPACITY

4.1 Demographic Profiles

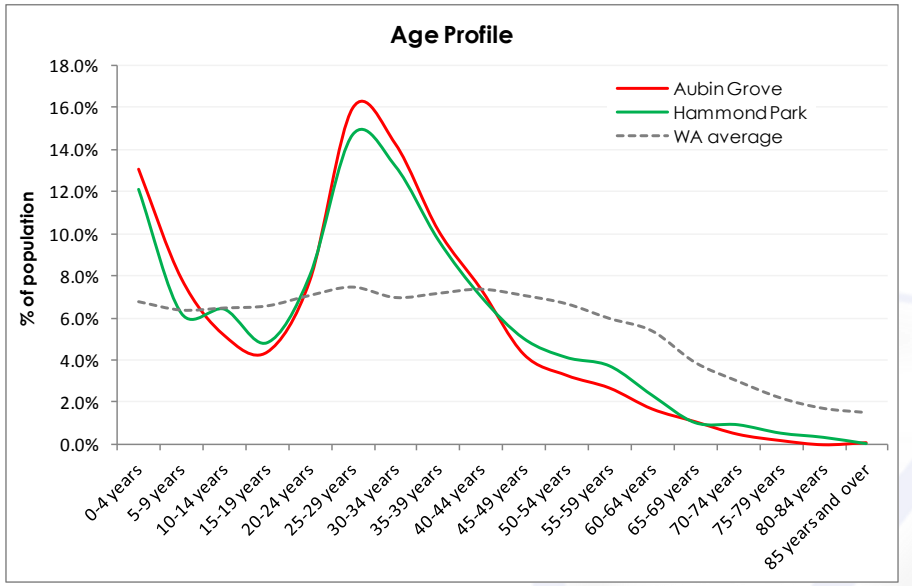
There is not enough current population in the Wandi and Mandogalup suburbs to profile effectively. However, the community planned for the local community can expect to be reflected by the demographic profiles of communities immediately north of the catchment.

These profiles indicate

- A young population presenting opportunities for increasing income and spending over time
- More people per household reflecting a higher spending especially on food and grocery
- Significantly higher household incomes supported by more employed persons per household
- Income levels are offset to some extent by above average mortgage and rent commitments although housing stress remains below average
- Larger houses which support opportunities to accommodate additional population
- More motor vehicles per dwelling which reflects greater mobility and flexibility for retail trips

Profile	Aubin Grove	variation from WA average	Hammond Park	variation from WA average	WA average
Average Age	28	-22%	29	-19%	36
Average Children per family	1.8	-5%	1.8	-5%	1.9
Average Persons per household	2.9	12%	2.8	8%	2.6
Median Household income	$2,240	58%	$2,150	52%	$1,415
Employed persons per household	1.6	33%	1.5	25%	1.2
Median mortgage repayments	$2,600	33%	$2,550	31%	$1,950
Median weekly rent	$430	43%	$395	32%	$300
Mortgage/Rent ratio	4.9	145%	4.3	115%	2.0
Rent is >30%, of hhold income	4%	-56%	7%	-22%	9%
Mortgage is >30%, of hhold income	26%	160%	20%	100%	10%
Average Bedrooms per dwelling	3.8	15%	3.7	12%	3.3
households with 2+ motor vehicles	76%	23%	75%	21%	62%

Population and Household census (ABS 2011)



Population and Household census (ABS 2011)

4.2 Spending Capacity

Overall, the demographic profiles are conducive to strong retail spending profiles, and reflect household spending patterns consistent across the middle 20% of Australian households.

SPENDING FOR THIRD QUINTILE OF AUSTRALIAN HOUSEHOLDS

Retail Spending Category	Annual Retail Spending (p.a.)	Spending Distribution	Catchment spending
Food & grocery Spending	$4,505	42%	$34M p.a.
Cafes, Restaurants, Takeaway	$1,477	14%	$11M p.a.
Other Retail Spending	$4,684	44%	$36M p.a.
Total Retail Spending	**$10,667**	**100%**	**$81M p.a.**

Household Expenditure Survey (ABS 200/10)

The local catchment is therefore estimated to generate $81M p.a. in total retail spending by 2021 of which food and grocery spending represents $34M p.a. Another $11.2M p.a. is expected to be captured by cafes/restaurants and takeaway outlets. The remaining retail spending is dedicated to discretionary and non convenience based spending and is therefore likely to be captured by larger centres.

The majority (80%) of food and grocery sales ($27.4M p.a.) will be expected to be captured by major supermarket operators developed in the area, leaving a relatively small amount for non supermarket spending.

4.3 Market Capture

The planned full line supermarket based centre on Rowley Road will be expected to capture the vast majority of food and grocery related spending from the local catchment.

The Local Centres planned north of Rowley Road will also capture a share of the remaining spending in this category. Subsequently a Local Centre in Honeywood could only expect to capture 5%-10% of food and grocery and takeaway spending.

4.4 Summary

Local residents from immediately north and south of Rowley Road have the potential to contribute $4.3M p.a. to a Local Centre in Honeywood by 2021 and $6.9M p.a. by 2031.

5 COMMERCIAL OPPORTUNITIES

Analysis of retail competition, consumer markets and market capacity in Honeywood produces the following commercial opportunities.

5.1 Local Centre

The resident Honeywood market would be capable of supporting a Local Centre of 750sqm of retail floor space by 2021 and 1,250sqm by 2031. This centre could contain a deli, cafe/takeaway and restaurant.

The successful operation of the centre would be best suited to the highest volume intersection associated within Honeywood traffic movement, which is likely to be the corner of Lyon and Rowley Road.

A Local Centre is already planned for this intersection, albeit on the north side of Rowley Road. This site has been adopted by the City of Cockburn and is physically capable of accommodating a centre of 750sqm – 1,250sqm.

Commercial opportunities for a small Local Centre to serve Honeywood residents could therefore be achieved through:

d) Delivery of a Local Centre site of 2,000sqm on the south side of Rowley Road on the Lyon Road entry to Honeywod.
e) Reliance on the delivery of the Local Centre planned on the north side of Rowley Road.
f) provide for a centre further into the middle of Honeywood

An additional centre on the southern site will duplicate and compete with the planned centre to the north of Rowley Road, and is likely to fragment the retail offer for the area rather than enhance it.

Relying on the currently allocated site on the northern intersection of the Lyon Road and Rowley Road appears to be the most commercially efficient and equitable provision of commercial activity to serve Honeywood residents.

Honeywood developers should satisfy themselves that the Local Centre is intended to be developed and ensure that direct and safe pedestrian access is facilitated for Honeywood residents crossing Rowley Road.

Providing a Local Centre 'deeper' within Honeywood would represent a significant commercial risk as the exposure and catchment would be significantly reduced – especially to residents north of Rowley Road.

5.2 Summary

There is a commercial risk associated with developing a local commercial centre at Honeywood.

Honeywood residents will be better served by the development of a local centre provided immediately north of the community on Rowley Road and Lyon Road.

Appendix 11

ENGINEERING SERVICES REPORT

ROWEGROUP

SATTERLEY PROPERTY GROUP

Honeywood North Local Structure Plan
Stages 7, 8 and 9
Engineering Services Report

Project No.: BC130179P

Document No.: D000069183 0001 A

Report Date: June 2013

Document Control Record

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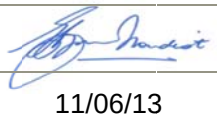
Signed:	
Date:	11/06/13

Approved by:	Enzo Biagioni-Froudist
Position:	Principal, Civil
Signed:	
Date:	11/06/13

REVISION STATUS

Revision No.	Description of Revision	Date	Approved
A	First Issue	11/06/13	

Recipients are responsible for eliminating all superseded documents in their possession.

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2.1. **Site Geology** 4
2.2. **Ground Water Level** 4
2.3. **Site Grading & Bulk Earthwork** 5
3. **ROAD NETWORK** 5
4. **STORMWATER DRAINAGE** 5
5. **WASTEWATER DISPOSAL** 5
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1. INTRODUCTION

BCA Consulting Engineers was commissioned by Satterley Property Group Ltd to provide input in regard to the Engineering and servicing requirements associated with the assessment and formulation of a Local Structure Plan for the final Stages of development of Honeywood North forming part of the clients Wandi landholding. Wandi is within the Wandi / Mandogalup landholding south of Rowley Road and north of Anketell Road on the eastern and western sides of The Freeway

This report has been prepared for Satterley Property Group as supporting documentation for the Local Structure Plan Report prepared by Rowe Group.

Requirements covering site works, roads, drainage, sewerage, water supply and public utility services have been assessed as they relate to the Structure Plan proposal.

This report has been compiled based on the following terms of reference:

- Briefing discussions and regular meetings with the client and the Consultant team.
- Site inspection with the Consultant team after formulation of the preliminary District Structure plan to further refine concepts and development strategies.
- Site data and documents included in the Appendices to this report.
- Servicing concepts and Regional Strategic Infrastructure planning by the regulatory authorities.

2. SITE EVALUATION

The site has had clearing and some minor earthworks within Stage 7 and part of Stage 8, with relatively undisturbed vegetation for the remainder of Stage 8 and all of Stage 9. The site is situated north of the Water Corporation's Peel Main Drain and south of Rowley Road. The land is relatively flat with the elevation being between RL 23.0 AHD and RL 25.0 AHD. Gradients across the site range between 1 in 200 to 1 in 6 with an average gradient of 1 in 100

2.1. Site Geology

The soils consist primarily of deep Bassendean Sands (S8), with pockets of shallow Bassendean Sands over Guildford Formation clays (S10) and Sandy Silt swamp deposits (Msg).

Geotechnical investigation by Golder Associates recommends a site classification of "Class A" will be applicable, providing that their recommended site preparation procedures are undertaken.

2.2. Ground Water Level

Estimated groundwater mapping of the water table presented by JDA urban water management Plan (April 2013) indicates that the water table underlying the subject site is approximately

RL21.0m AHD. This corresponds with the groundwater level being approximately about 2.0 metres below the surface in the localised low areas to more than 4m below ground level elsewhere. The grade of the water table surface indicates a general east to west groundwater flow direction.

2.3. Site Grading & Bulk Earthwork

General Principles & Approach

The subject land requires filling to ensure adequate grades and cover to drainage and sewerage and to provide acceptable slopes and pads for building in accordance with marketing and maximum allowable engineering grades.

It is anticipated that the majority of the required fill would need to be imported.

3. ROAD NETWORK

Refer to Traffic / Transport report prepared by Transcore and to the Transport section of Structure Plan Report.

4. STORMWATER DRAINAGE

Refer to the LWMS prepared by Jim Davies and Associates.

Stage 7 and the western half of Stage 8 will drain south towards the system provided as part of the Stage 5/6 design and incorporated in POS 7-9 as part of the Peel Main Drain re-alignment strategy

It is intended that the remaining eastern half of Stage 8 and all of Stage 9 will drain to a Public Open Space located near the south western corner of Stage 8 near Honeywood Avenue, overflowing to POS 7-9 and to the Peel Main Drain system.

5. WASTEWATER DISPOSAL

The Water Corporation has made provision for a reticulated sewerage scheme for the Wandi Cell in its planning for servicing the south-east corridor. The site is located within the Water Corporation's "Thomson's Lake" sewerage catchment which is connected to the Bibra Lake Main sewer that discharges into the Woodman Point Wastewater Treatment Plant.

The whole of the site is located within a sub-catchment of the "Thomson's Lake" sewerage catchment that discharges to an existing permanent sewage pump station located on Lot 666 west of the Freeway ("Thomson's Lake Interim Pump Station No 902-63 Darling Chase"). Effluent is pumped from this pump station north via a pressure main into an existing gravity sewer located near Hammond Road and Jackadder Avenue. This system is constructed and operating under the management and maintenance responsibility of the Water Corporation.

Stages 7, 8 and 9 will be served by a 150/225mm dia gravity system which heads south towards the system provided as part of the Stage 5/6 design

There is an existing 250mm dia sewer pressure main traversing Stage 7 which will require a realignment of approximately 200m to tie in with proposed road layout.

Refer to Appendix B for the Sewerage Strategy for the area adopted by the Water Corporation.

6. WATER SUPPLY

Overview

The Water Corporation has made provision for water supply to the Wandi Cell in its planning for servicing the south-east corridor. The site is located within the Water Corporation's "Thomson's Lake" Gravity water supply scheme fed from existing water storage facilities located on Henderson Road, Beeliar.

In accordance with the scheme layout a recent 375mm dia and 600mm dia extension of existing water distribution mains north of Rowley Road, southward to Rowley Road has been completed. A 250mm dia main has also been constructed for the length of Honeywood Avenue through to Darling Chase.

Stages 7, 8 and 9 will have 100 to 200mm dia reticulation being connected to the existing 250mm dia main in Honeywood Avenue.

There will some realignment of a 200mm branch from Honeywood Avenue as part of the Stage 7 works.

Water Corporation planning indicates the need for a future 700mm dia distribution main from the connection left off the 600mm/375mm watermain at the intersection of Honeywood Ave and Lyon Road, heading south along Honeywood Avenue, then west through Stage 7 to Mandogalup, it is anticipated that this will be undertaken by the Water Corporation at a later date. This future work would mean excavation along the kerb and pavement of Honeywood Avenue and the east, west road of Stage 7.

See Appendix C for Water Servicing Strategy.

7. POWER, TELECOMMUNICATION & GAS

7.1. Western Power

All lots within the proposed development will be served with underground power. The cost of this work will be met in full by the developer.

Standard Western Power requirements will apply.

The street lighting throughout the development shall provide effective illumination for both pedestrian and vehicles.

The following criteria was used as a basis for the street lighting design.

1. Street lighting shall be provided to the entire development.
2. Lighting levels will vary from major to minor roads.
3. Street lighting cable shall be installed underground.

Roadway lighting will generally be at low elevations.

Low height luminaires up to 6.5m metres high are generally used on all minor roadways and 10.5m high along both sides of Honeywood Avenue, and these also provide general amenity lighting to pedestrian pathways. Lighting should be suitably designed to co-ordinate with other streetscape elements such as roads, pathways, landscape, street furniture etc.

7.2. Telecommunication Services

A private telecommunications network is being implemented, it is therefore anticipated that all lots within the proposed development will be served with Telecommunication services by Service Elements Pty Ltd utilizing their own pit and pipe network installed by the developer.

Service Elements will design (developer to pay) and provide details for the installation of a pit and pipe network at the cost of the developer the new telecommunication network facilities to the proposed lots. Alternatively, where cable routes match Horizon Power underground power supply routes, Service Elements will wherever possible use the Western Power trenches in lieu of the developer providing additional trenching.

Service Elements will cable the development once housing has commenced in the area and applications are made by individual owners for communications services to their lots.

Headwork charges for Telecommunication services extensions are anticipated.

7.3. Gas Supply

The provision of a reticulated gas supply to the site will be from existing mains in Honeywood Avenue to the south via the system provided as part of the Stage 5/6 design

8. CONCLUSIONS & RECOMMENDATIONS

In conclusion, we do not envisage any major servicing constraints for the proposed development.

The site is capable of being serviced with all essential services, has no identifiable problematic soil conditions based on detailed geotechnical studies of the site and with careful considered design would result in a high quality development.

The precinct has all the attributes necessary to serve a vibrant urban residential Community with proposed access upgrades capable of delivering all the necessary requirements of a modern development serviced with all essential services and facilities.

Appendices

- **Appendix A1 - Proposed Subdivisional Plan**
- **Appendix A2 - Proposed Zoning Plan**
- **Appendix A3 - Topographical Features Plan**
- **Appendix A4 - Bulk Earthworks Strategy**
- **Appendix A5 - Sewerage Strategy Plan**
- **Appendix A6 - Water Supply Strategy Plan**

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Planning Design Delivery

LEGEND

URBAN ZONE BOUNDARY

AMENDMENT BOUNDARY

ROWLEY ROAD

LYON ROAD

KWINANA FREEWAY

HONEYWOOD AVENUE (25.2m)

(15.4m)

(13.2m)

(25.2m)

0 50 100 Metres

REVISIONS

Rev	Date	Drawn
A	2013.05.27	S.Blanchard
B	2013.05.28	S.Blanchard

ROWEGROUP
PLANNING DESIGN DELIVERY

w: www.rowegroup.com.au
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p: 08 9221 1991

Date Drawn:	2013-05-27
Job Ref:	4582A
Scale:	1:2000 A3
Client:	Satterley
Designer:	R.Cumming
Drawn:	S.Blanchard
Projection:	PCG94
Plan ID:	4582A-SUB-20-B

DRAFT

Cadaste supplied by McMullen Nolan surveyors

A1

Proposed Subdivision

Honeywood Avenue
Wandi

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Kim Trenberth 29 May 2013

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Planning Design Delivery

LEGEND

- AMENDMENT AREA
- RESIDENTIAL R30
- RESIDENTIAL R40
- RESIDENTIAL R60

LOCAL RESERVES

- PARKS, RECREATION & DRAINAGE

0 125 Metres

Proposed Zoning

Honeywood Ave
Wandi

REVISIONS

Rev	Date	Drawn
A	2013.05.20	S.Blanchard
B	2013.05.30	K.Trenberth

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PLANNING DESIGN DELIVERY

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e: info@rowegroup.com.au
p: 08 9221 1991

Date Drawn:	2013-05-20
Job Ref:	4582C
Scale:	1:2500 A3
Client:	Satterly
Designer:	R.Cumming
Drawn:	S.Blanchard
Projection:	PCG94
Plan ID:	4582C-REZ01-B

Cadaste supplied by McMullen Nolan Surveyors

A2

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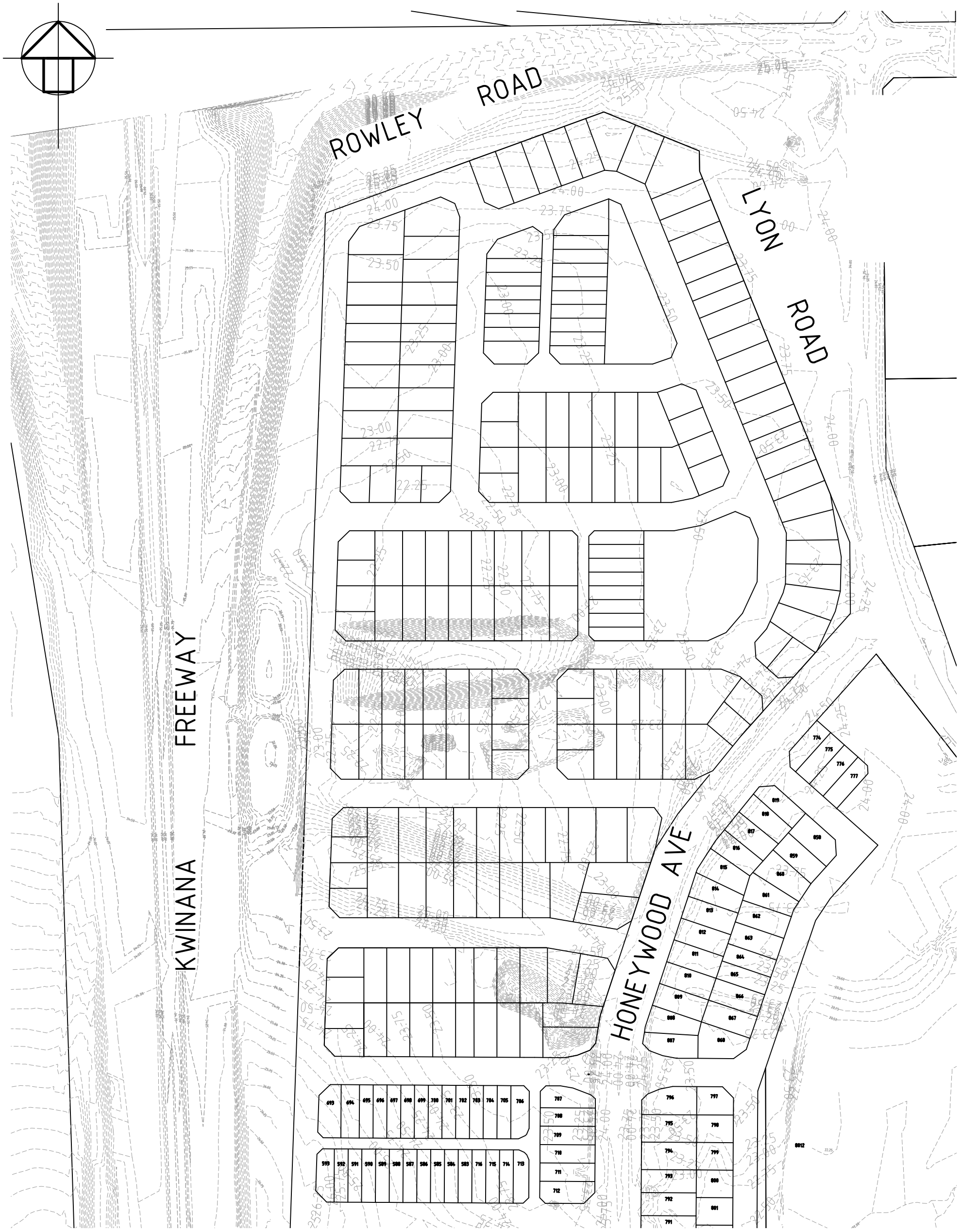
Kim Trenberth 30 May 2013



HONEYWOOD NORTH
STAGE 7, 8 AND 9

TOPOGRAPHICAL FEATURES

5.06.13
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APPENDIX A3
5.06.13

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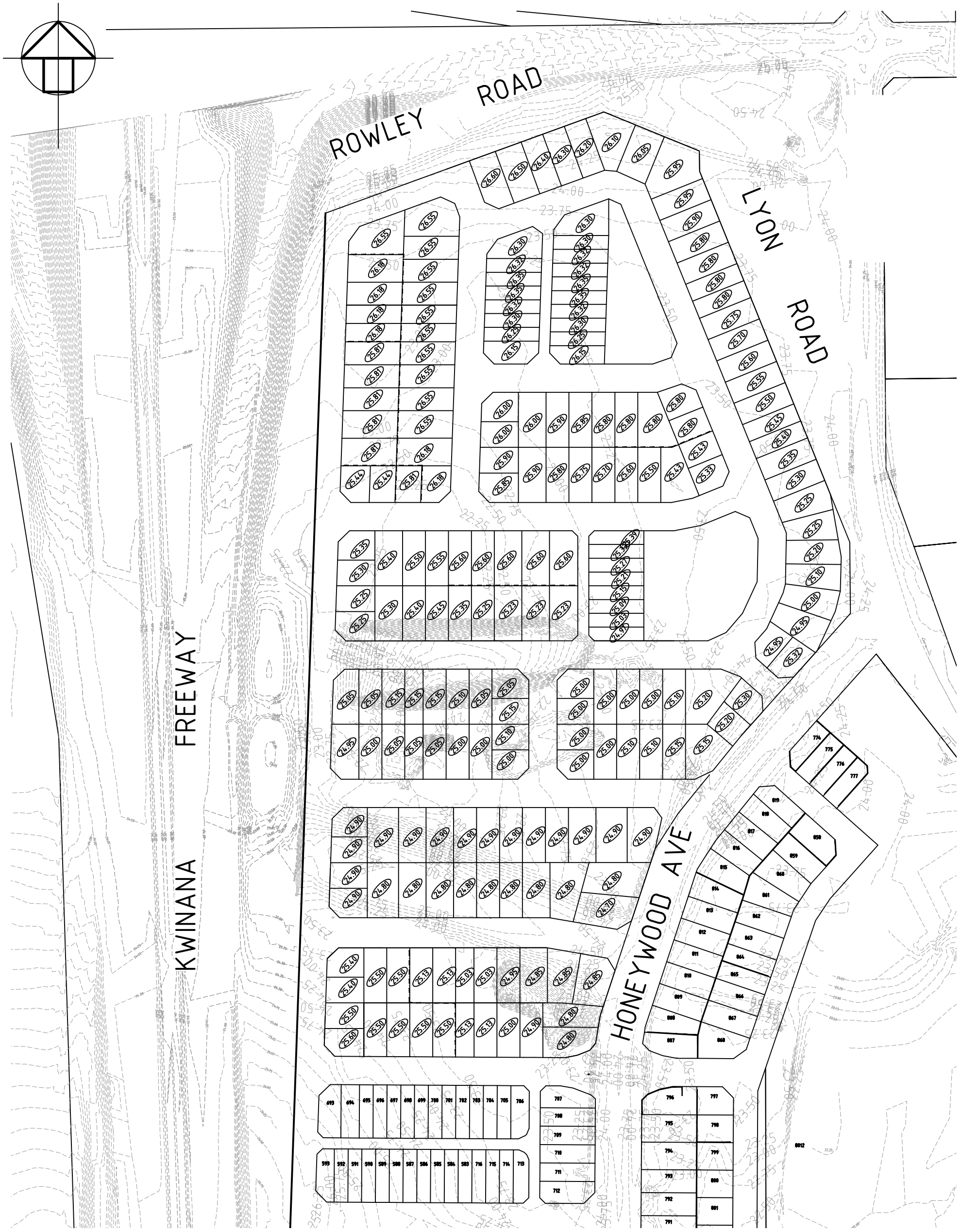

HONEYWOOD NORTH
STAGE 7, 8 AND 9

EARTHWORKS STRATEGY

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HONEYWOOD NORTH
STAGE 7, 8 AND 9

SEWERAGE STRATEGY

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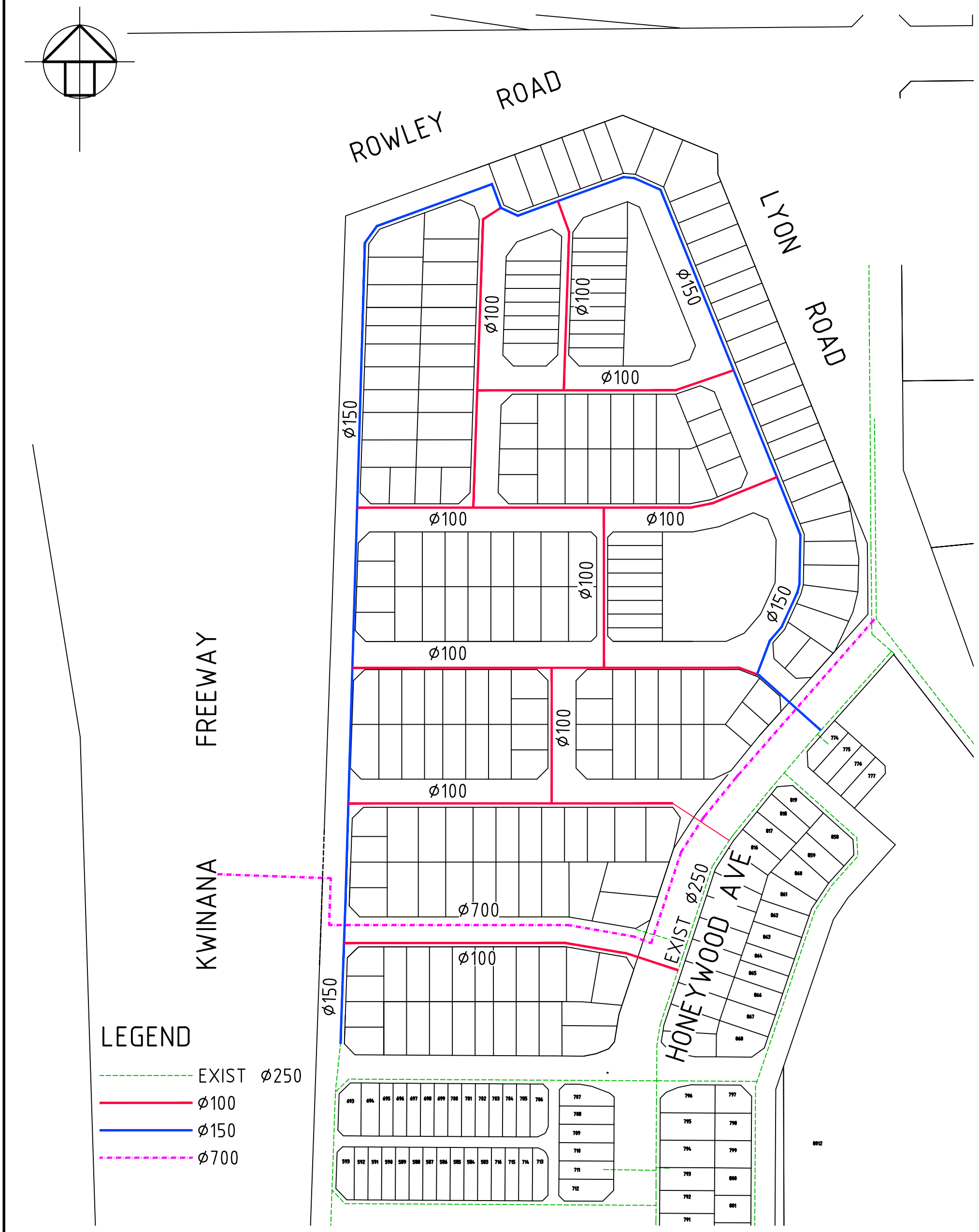

HONEYWOOD NORTH
STAGE 7, 8 AND 9

WATER STRATEGY

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A6

Appendix 12

TRAFFIC NOISE IMPACT ASSESSMENT

ROWEGROUP

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Enquiries: James McCallum on (08) 9323 4214
Our Ref: 04/11616-10 (D14#172998)
Your Ref: Honeywood Estate Stages 7 8 and 9

3 April, 2014

ATP Consulting Engineers
PO Box 3766
Level 8 Australia Fair Tower
Southport QLD 4215

ATTENTION: Sasho Temelkoski

Dear Sasho

UPDATED RESPONSE – REQUEST FOR ENDORSEMENT – HONEYWOOD ESTATE STAGES 7, 8 AND 9 – NOISE ASSESSMENT VERSION 2

Thank you for your email dated the 2nd of April, 2014 providing Main Roads with a revised noise assessment addressing Main Roads concerns from our letter dated the 28th of March, 2014 (D14#161574).

Main Roads considers that the noise assessment has been updated to our satisfaction and hereby provides endorsement for the noise assessment for the Honeywood Estate Stages 7, 8 and 9.

If you require any further assistance or would like to query the above information, please contact James McCallum on (08) 9323 4214. In reply would you please quote reference number 04/11616-10 (D14#172998).

Yours faithfully

Lang Fong

PLANNING INFORMATION MANAGER

Traffic Noise Impact Assessment

Honeywood Estate, Wandi – Stages 7, 8 and 9

Satterley Property Group

Project No.: ATP131211

Project Name: Honeywood Estate, Wandi

Document No.: ATP131211-R-TNIA-02

April 2014

Document Control Record

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Signed:	
Date:	02.04.2014

Approved by:	Sasho Temelkoski
Position:	Principal Engineer
Signed:	
Date:	02.04.2014

REVISION STATUS

Revision No.	Description of Revision	Date	Approved
0	Issue 1	12.02.2014	S. Temelkoski RPEQ 13551
1	Issue 2 – Amendments as per MRWA comments	02.04.2014	S. Temelkoski RPEQ 13551

Recipients are responsible for eliminating all superseded documents in their possession.

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Executive Summary

ATP Consulting Engineers was engaged by Satterley Property Group to prepare a Traffic Noise Impact Assessment Report (Noise Assessment) for the proposed Honeywood Estate in Wandi. This report specifically addresses the potential traffic noise impacts from the Kwinana Freeway and Rowley Road on Stages 7, 8 and 9 of the Honeywood Estate, within a planning horizon of 20 years (year 2035).

The results of the traffic noise propagation modelling, using SoundPLAN model validated on the basis of site specific noise measurements, indicate that the road traffic noise from Kwinana Freeway and Rowley Road, within a planning horizon of 20 years (year 2035), has the potential to impact on the noise amenity of single storey and two-storey residences at Stages 7, 8 and 9 of Honeywood Estate. In accordance with the approved transport noise mitigation strategy for the overall Honeywood Estate, a 2.5 metre high noise barrier wall will be constructed along the boundaries with Kwinana Freeway and Rowley Road. The recommended noise barrier wall is designed to reduce transport noise to manageable levels for further acoustic treatment to the building envelopes.

ATP Consulting carried out detailed acoustic design for a floor plan of a typical low-set dwelling already constructed at previous stages of 'Honeywood Estate' to determine the weighted noise reduction indices (R_w) for the construction elements of the future dwellings on the traffic noise impacted allotments. Based on the traffic noise attenuation for building components (TNA_C) calculations, 'deemed to comply' insulation packages 'A' and 'B' were adopted for houses within a zone of traffic noise impact of 60 to 67dB(A) and 68 to 74dB(A)$L_{eq(16\text{-}hour)}$ respectively.

The allotments that are subject to further planning noise mitigation measures in accordance with the Western Australia State Planning Policy 5.4 are presented in Table 6.1 and Appendix H of this report. For traffic noise impacted allotments, outdoor living areas must be located along the most protected façade of the proposed house. When this solution is impractical, in accordance with noise insulation packages 'A' and 'B', the outdoor living areas can be protected by 2.0m to 2.4m high solid fences.

Provided the recommended engineering and planning noise mitigation measures, as presented in this report, are fully implemented in the detailed design and construction, the transport noise from Kwinana Freeway and Rowley Road should not impose any further constraints on the establishment of the proposed Stages 7, 8 and 9 of the Honeywood Estate residential development.

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Appendices

Appendix A Development Layout
Appendix B Noise Measurement Results
Appendix C SoundPLAN Validation
Appendix D Traffic Noise Levels (SoundPLAN Results)
Appendix E Traffic Noise Propagation Contours (SoundPLAN)

1. Introduction

1.1 Background

ATP Consulting Engineers was engaged by Satterley Property Group to prepare a Traffic Noise Impact Assessment Report (Noise Assessment) for the proposed Honeywood Estate in Wandi.

This report specifically addresses the potential traffic noise impacts from the Kwinana Freeway and Rowley Road on Stages 7, 8 and 9 of the Honeywood Estate, within a planning horizon of 20 years (year 2035).

1.2 Study Objectives

Study objectives are as follows:

- Site visit and establishment of traffic noise monitoring location at the nearest boundary of the proposed development to Kwinana Freeway and to Rowley Road.
- Validation of the SoundPLAN traffic noise calculation model based on the site specific traffic noise measurements undertaken in September 2013. SoundPLAN calculates traffic noise as per the procedure specified in the UK DoT Welsh Office '*Calculation of Road Traffic Noise'* (CoRTN'88).
- Development of appropriate outdoor noise criteria as per the requirements specified in *State Planning Policy 5.4 – 'Road and Rail Transport Noise and Freight Considerations in Land Use Planning'* dated 22nd of September 2009.
- Assessment of the traffic noise impact on Stages 7, 8 and 9 of Honeywood Estate considering the set-back distances and noise emissions from Kwinana Freeway and Rowley Road.
- Calculation of the future $L_{Aeq(16\text{-}hour)}$ and $L_{Aeq(8\text{-}hour)}$ traffic noise levels at dwellings within stages 7, 8 and 9 based on the expected traffic flows on Kwinana Freeway (north & southbound) and Rowley Road within a planning horizon of 20 years (year 2035).
- Recommendation of appropriate noise mitigation measures including noise barrier walls and 'Quiet House' design to ensure that the indoor noise levels from the *State Planning Policy 5.4* are met at the future dwellings on the allotments within Stages 7, 8 and 9 of Honeywood Estate.
- Identification of the allotments subject to acoustic design of future residences and recommendations for appropriate house design and orientation to ensure compliance with the noise criteria at the outdoor living areas of the future residences within the zone of noise impact from the transport corridor.

1.3 Description of the Subject Site

1.3.1 Location

The subject site, located on the eastern side of the Kwinana Freeway in the vicinity of the intersection with Rowley Road, is known as Honeywood Estate. A small parcel of land between the northern boundary of the proposed development and Rowley Road is a vacant site likely to be subject of future development. The proposed development site is shown in Figure 1.1.

Figure 1.1 Site Locality Plan

1.3.2 Description of the Development

The proposed residential estate, to be developed in stages, comprises of approximately eight hundred and fifty-seven (857) allotments. The access is by an internal road network and a number of recreational areas are provided throughout the development.

The proposed layout of Stages 7, 8 and 9 at Honeywood Estate is presented in Appendix A.

2. Existing Noise Amenity

2.1 Noise Measurement Location

Unattended traffic noise measurements were carried out at the subject site to obtain data for validation of the SoundPLAN traffic noise calculation model. The monitoring was carried out at two locations to gain information about the specific traffic noise levels from Kwinana Freeway and Rowley Road. The measurements were taken over a period of approximately three weeks from the 30th of August 2013 (Friday) to the 23rd of September 2013 (Monday). The noise measurement locations were selected as presented in Figure 2.1.

One of the noise loggers was located at a distance of 60 metres from Kwinana Freeway, while the other was at a distance of 10 metres from Rowley Road. Both loggers were programmed to collect noise samples at 15-minute intervals to obtain representative information about the existing $L_{A10(18\text{-}hour)}$, $L_{Aeq(16\text{-}hour)}$ and $L_{Aeq(8\text{-}hour)}$ traffic noise levels.

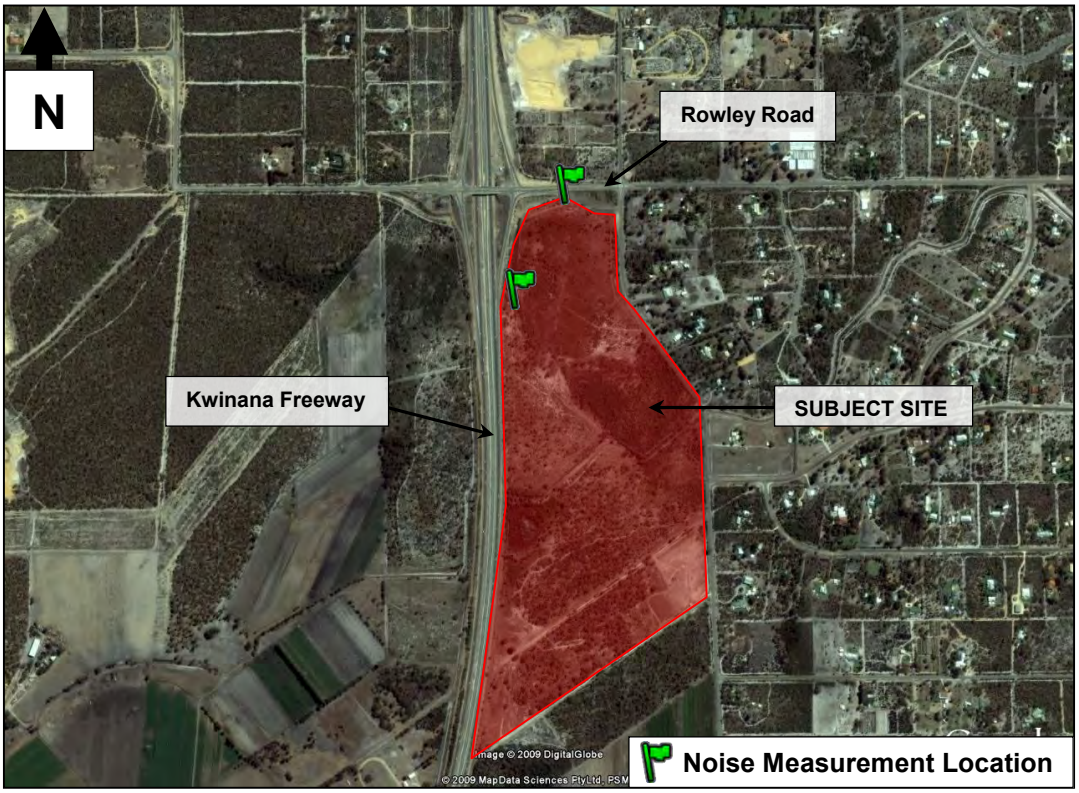

Figure 2.1 Noise Measurement Location

2.2 Equipment Used

Noise levels were measured using the following equipment:

- EL-316 Environmental Noise Logger by Acoustic Research Laboratories, AS1259 Type 1, AS 2064 Class A.
- Sound Level Calibrator, Rion, NC-74, 94dB/1000Hz.

The noise measurement instruments conform to ASIEC61672.1-2004 and the measurements were undertaken in general accordance with AS1055–1997 and AS2702-1984. Calibration was undertaken during set up and downloading of the data from the noise logger. The maximum calibration drift recorded was <0.1dB(A).

2.3 Noise Measurement Results

The results of the traffic noise measurements recorded near Kwinana Freeway from the 30th of August 2013 (Friday) to the 9th of September 2013 (Monday)[1] are presented in Table 2.1 and in Appendix B.

Table 2.1 Traffic Noise Measurement Results – Kwinana Freeway

Date	$L_{A10(18\text{-hour})}$* dB(A)	$L_{Aeq(16\text{-hour})}$* dB(A)	$L_{Aeq(8\text{-hour})}$* dB(A)
2 September 2013 (Monday)	64	62	55
5 September 2013 (Thursday)	65	63	57
6 September 2013 (Friday)	64	62	55
Average	**64**	**62**	**56**

**Free-field*

The results of the traffic noise measurements recorded near Rowley Road from the 16th of September 2013 (Monday) to the 20th of September 2013 (Friday)[2] are presented in Table 2.2 and in Appendix B.

Table 2.2 Traffic Noise Measurement Results – Rowley Road

Date	$L_{A10(18\text{-hour})}$* dB(A)	$L_{Aeq(16\text{-hour})}$* dB(A)	$L_{Aeq(8\text{-hour})}$* dB(A)
16 September 2013 (Monday)	66	64	56
17 September 2013 (Tuesday)	65	63	54
18 September 2013 (Wednesday)	66	64	54
19 September 2013 (Thursday)	66	64	53
20 September 2013 (Friday)	67	65	56
Average	**66**	**64**	**55**

**Free-field*

All noise measurements were carried out over a period of minimum 7 days, however only normal workdays (Monday to Friday) with full 24 hour noise data and with fine weather were considered as per the requirements from the *Implementation Guidelines for State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning*.

[1] Only traffic noise data on normal workdays (Monday to Friday) and unaffected by meteorological conditions were considered in the determination of the typical noise amenity.

[2] Ibid.

3. Road Transport Noise Criteria

3.1 Outdoor Noise Criteria

The transport noise criteria were derived from the State Planning Policy 5.4 – '*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*' (SPP 5.4) dated 22nd of September 2009. Since Honeywood Estate is a new noise-sensitive development in the vicinity of a major transport corridor (primary freight road under Main Roads jurisdiction), the outdoor noise criteria from Table 1 of the policy is applicable.

The outdoor noise criteria are presented in Table 3.1.

Table 3.1 Outdoor Noise Criteria

Time of Day	Noise Target[3]	Noise Limit
Day 6:00am – 10:00pm	$L_{Aeq(Day)}$ = 55dB(A)*	$L_{Aeq(Day)}$ = 60dB(A)*
Night 10:00pm – 6:00am	$L_{Aeq(night)}$ = 50dB(A)*	$L_{Aeq(night)}$ = 55dB(A)*

**Façade adjusted*

3.2 Internal Design Noise Levels

Section 5.3.1 of SPP 5.4 specifies indoor noise levels for residential buildings in cases where indoor spaces will face outdoor areas that are above the noise limit. The indoor noise levels for residential buildings are presented in Table 3.2.

Table 3.2 Indoor Noise Levels (Residential Buildings)

Indoor Area	Noise Level
Living and Work Areas	40dB(A) $L_{Aeq(Day)}$
Bedrooms	35dB(A) $L_{Aeq(Night)}$

[3] The outdoor noise criteria applies at 1m from the most exposed habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.

4. Road Transport Noise Assessment

4.1 Road Transport Noise Calculation Methodology

The road transport noise levels, within a planning horizon of 20 years (year 2035), were calculated using the noise propagation software SoundPLAN. Calculations are based on the procedures developed by the U.K. Department of Transport, Welsh Office, issued as '*Calculation of Road Traffic Noise'* (CoRTN'88).

The '*Calculation of Road Traffic Noise'* (CoRTN'88) calculates traffic noise in terms of $L_{A10(1\text{-hour})}$ and $L_{A10(18\text{-hour})}$ descriptors. In contrast, the Western Australia State Planning Policy 5.4 expresses the noise criteria in terms of $L_{Aeq(16\text{-hour})}$ and $L_{Aeq(8\text{-hour})}$, thus adjustments have to be made to the calculated traffic noise levels.

In accordance with the policy, the relationship between these parameters was determined from the site-specific noise measurements along Kwinana Freeway as presented in Table 2.1 and Table 2.2. To convert the traffic noise levels calculated in terms of $L_{A10(18\text{-hour})}$ to $L_{Aeq(16\text{-hour})}$ and $L_{Aeq(8\text{-hour})}$ descriptors it is necessary to apply an appropriate conversion factor. Based on site-specific noise measurements the following conversion factors are applicable:

$$L_{Aeq(16\text{-hour})} = L_{A10(18\text{-hour})} - 2\text{dB(A)}^{4}$$

$$L_{Aeq(8\text{-hour})} = L_{A10(18\text{-hour})} - 8\text{dB(A)}^{5}$$

4.2 SoundPLAN Model Validation

Validation of the SoundPLAN model was carried out based on the traffic noise levels ($L_{10(18\text{-hour})}$) measured at the subject site and considering the traffic flows along Kwinana Freeway and Rowley Road at the time the noise measurements were carried out (September 2013).

The traffic noise levels measured at the subject site were used to validate the accuracy of the SoundPLAN traffic noise calculation model prior to undertaking calculations of the future road traffic noise levels for the 2035 planning horizon.

The traffic flow along Kwinana Freeway (south of Rowley Road), at the time of the noise measurements, was estimated based on the observed growth between the two most recent traffic surveys carried out by MRWA (2007-08 and 2011-12).

The traffic flow data for 2007-08, 2011-12 and 2013, as considered in the SoundPLAN traffic noise validation model, is presented in Table 4.1.

---

[4] Conversion factor is the difference between the measured $L_{A10\ (18\text{-hour})}$ and the measured $L_{Aeq\ (16\text{-hour})}$ levels as presented in Table 2.1and Table 2.2.

[5] Conversion factor is the lesser of the differences between the measured $L_{A10\ (18\text{-hour})}$ and the measured $L_{Aeq\ (8\text{-hour})}$ levels as presented in Table 2.1and Table 2.2.

Table 4.1 Traffic Flow Data for Validation

Road Segment	2008 Traffic Flow AAWT	2011 Traffic Flow AAWT	2013 Traffic Flow AAWT	Heavy Vehicles (%)	Road Surface
Kwinana Fwy NB – South of Rowley Road	33,940[6]	37,300[7]	38,191[8]	9.4	Open Graded Asphalt
Kwinana Fwy SB – South of Rowley Road	33,270	37,460	38,587	9.2	Open Graded Asphalt
Kwinana Fwy SB – Onramp from Rowley Rd	*no data*	1,223[9]	1,298	9.2	Dense Graded Asphalt
Rowley Road Combined – West of Nicholson Rd	*no data*	*no data*	4,385[10]	15.1	Dense Graded Asphalt

Traffic flows for year 2013 (AAWT) were scaled down by a factor of 0.95 to represent the traffic flow in an 18 hour period from 6.00am to midnight.

The following factors were considered in the validation model:

- The speed of the vehicles on the Kwinana Freeway and on ramp is 100 km/h while the speed of the vehicles on Rowley Road is 70 km/h.
- The road surface on Kwinana Freeway past the subject site is Open Graded Asphalt (OGA) which requires an adjustment of -2.5dB(A) to be applied to the calculated road noise emissions (WAPC, 2009).
- The road surface on Rowley Road is dense graded asphalt with no adjustment applicable.
- The noise data has been recorded at a free field location with a microphone height of 1.2m above ground level.

The noise measurement results and the SoundPLAN validation results are presented in Table 4.2 and in Appendix C.

Table 4.2 Traffic Noise Model Validation Results

Calculation Point	Measured* $L_{10(18\text{-hour})}$ dB(A)	Calculated* $L_{10(18\text{-hour})}$ dB(A)	Difference dB(A)	Validation Factor
Kwinana Freeway	64	64	-	N/A
Rowley Road	66	66	-	N/A

**Free-field.*

[6] Traffic flow is for July 2007 to June 2008 from MRWA Metropolitan Traffic Digest 2003/04 – 2008/09 (MRWA, 2013).

[7] Traffic flow is for July 2011 to June 2012 (Kwinana Freeway – South of Rowley Road/North of Anketell Road) as advised by MRWA.

[8] Applied traffic growth rate of 2.39% per annum for Northbound and 3.01% per annum for Southbound based on observed traffic growth rate between July 2007 and June 2012.

[9] As per Weekly Class Report for Rowley Road on to Kwinana Fwy (Southbound) Sept/Oct 2011 (MRWA, 2014).

[10] As per Weekly Class Report for Rowley Road W of Nicholson Rd June 2013 (MRWA, 2014).

The calculated road traffic noise levels are within the acceptable calibration drift of ±2dB(A) therefore no validation factor is required.

4.3 Traffic Noise Calculation Model

A digital terrain model of the subject site was developed from the terrain survey and the civil design drawings of Stages 7, 8 and 9 as prepared by *Peritas Group* civil engineers.

To obtain conservative results, the road traffic noise calculations were carried out considering a 20 year planning horizon for the traffic flow along Kwinana Freeway and Rowley Road. The traffic flows for the ultimate planning horizon of 2035 are presented in Table 4.3.

Table 4.3 Traffic Flow Data for Noise Calculation

Description	2035[11] Traffic Flow AAWT	2035[12] Traffic Flow (18-hour)	Heavy Vehicles
Kwinana Freeway (Northbound)	64,186	60,977	9.4%
Kwinana Freeway (Southbound)	74,093	70,389	9.2%
Rowley Road ramp to Kwinana Fwy SB	2,486	2,362	9.2%
Rowley Road (Combined)	8,402	7,982	15.1%

The following additional factors were considered in the model:

- The speed of the vehicles on the Kwinana Freeway and on ramp is 100 km/h while the speed of the vehicles on Rowley Road is 70 km/h.
- The road surface on Kwinana Freeway past the subject site is Open Graded Asphalt (OGA) which requires an adjustment of -2.5dB(A) to be applied to the calculated road noise emissions (WAPC, 2009).
- The road surface on Rowley Road is dense graded asphalt with no adjustment applicable.
- An adjustment of -2dB(A) was applied to the calculated $L_{10(18\text{-hour})}$ traffic noise levels to express the results in terms of $L_{Aeq,(16\text{-hour})}$ for the day-time period (6:00am – 10:00pm).
- An adjustment of -8dB(A) was applied to the calculated $L_{10(18\text{-hour})}$ traffic noise levels to express the results in terms of $L_{Aeq,(8\text{-hour})}$ for the night-time period (10:00pm – 6:00am).
- Receivers were located on the most exposed façades of the future houses considered in the model at an elevation of 1.5m above the finished floor level of each floor.
- SoundPLAN adds +2.5dB(A) to the calculated traffic noise levels when the receiver is attached to the building, thus the tabulated traffic noise calculation results, presented in Appendix D, are façade adjusted by addition of +2.5dB(A).

[11] Traffic flow along Kwinana Freeway (AAWT in 24-hour period) for 2035 calculated using growth rates of 2.39% per annum for Northbound and 3.01% per annum for Southbound based on observed traffic growth rate between July 2007 and June 2012. Traffic flows for Rowley Road and Kwinana Freeway on ramp estimated using a growth rate of 3.0% per annum from data presented in Table 4.1.

[12] 18-hour traffic flow by year 2035, considered to be 95% of the 24-hour traffic flow.

- An adjustment factor of +2.5dB(A) was applied to the SoundPLAN graphical output module, thus the graphical presentations of the calculated noise levels (noise contours) for the ground levels (1.5m above ground floor level) and the upper floors (1.5m above the upper floor level) of the future dwellings are façade adjusted.
- The SoundPLAN grid spacing is 5m while the increment for angle of view is 1º.

4.4 Road Transport Noise Mitigation Measures

As per the recommendations in the initial road transport noise assessment by VDM Consulting (now ATP Consulting Engineers), and with consideration of the detailed civil design of the development layout for Stages 7, 8 and 9, a 2.5 metre high noise barrier wall along the boundaries with Kwinana Freeway and Rowley Road was considered in the model.

The recommended noise barrier wall is designed to reduce the road transport noise to manageable levels on the allotments nearest to Kwinana Freeway and Rowley Road as well as in the interior of the development.

The alignment of the noise barrier wall for Stages 7, 8 and 9 is presented in Figure 4.1.

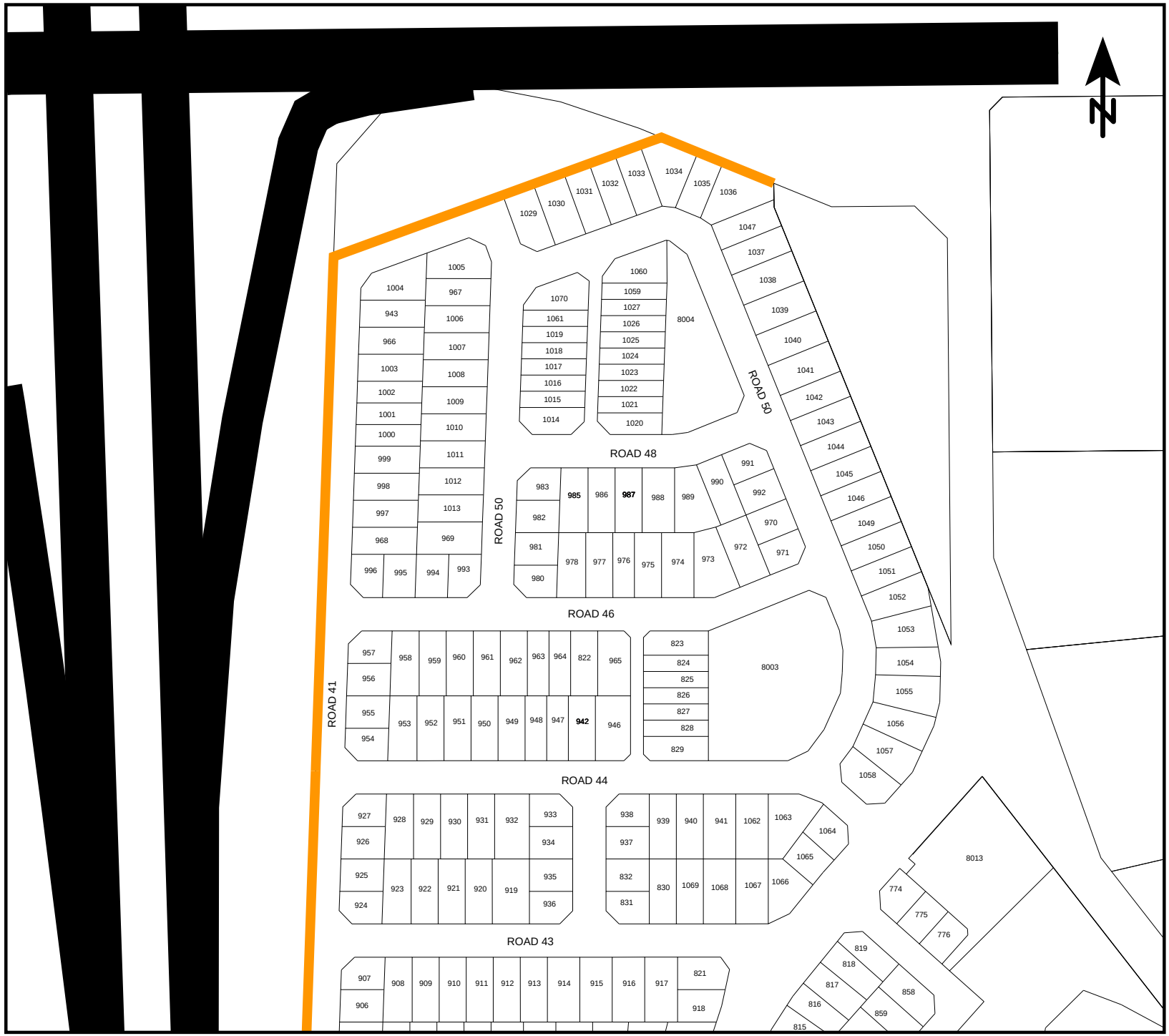

Figure 4.1

Alignment of Noise Barrier Wall

Stages 7, 8, and 9
Honeywood Estate, Wandi

Legend

2.5 m High Noise Barrier Wall

Scale 1:2500

0 12.5 25 50 75 100 m

ATP CONSULTING ENGINEERS

4.5 Calculated Road Transport Noise Levels

The highest calculated noise levels at the most exposed façades of the future dwellings within Stage 7 of Honeywood Estate, for day-time (6am to 10pm) and night-time period (10pm to 6am), are presented in Table 4.4.

Table 4.4 Calculated Traffic Noise Levels – Stage 7 Allotments

Lot Number	Floor	Facade	Day-time* $L_{eq\ (16\text{-}hour)}$ dB(A)	Night-time* $L_{eq\ (8\text{-}hour)}$ dB(A)	Noise Target/Limit dB(A)	
					Day	Night
878	Ground	W	65	59	55/60	50/55
	Upper	W	70	64		
879	Ground	W	65	59		
	Upper	W	70	64		
880	Ground	W	66	60		
	Upper	W	70	64		
881	Ground	W	66	60		
	Upper	W	70	64		
904	Ground	W	66	60		
	Upper	W	70	64		
905	Ground	W	66	60		
	Upper	W	70	64		
906	Ground	W	66	60		
	Upper	W	70	64		
907	Ground	W	66	60		
	Upper	W	70	64		
924	Ground	W	66	60		
	Upper	W	70	64		
925	Ground	W	66	60		
	Upper	W	70	64		

**Façade adjusted*

The highest calculated noise levels at the most exposed façades of the future dwellings within Stage 8 of Honeywood Estate, for day-time (6am to 10pm) and night-time period (10pm to 6am), are presented in Table 4.5.

Table 4.5 Calculated Traffic Noise Levels – Stage 8 Allotments

Lot Number	Floor	Facade	Day-time* $L_{Aeq(16\text{-}hour)}$ dB(A)	Night-time* $L_{Aeq(8\text{-}hour)}$ dB(A)	Noise Target/Limit dB(A)	
					Day	Night
926	Ground	W	67	61	55/60	50/55
	Upper	W	70	64		
927	Ground	W	67	61		
	Upper	W	70	64		
954	Ground	W	67	61		
	Upper	W	69	63		
955	Ground	W	67	61		
	Upper	W	69	63		
956	Ground	W	67	61		
	Upper	W	69	63		
957	Ground	W	67	61		
	Upper	W	69	63		
996	Ground	W	66	60		
	Upper	W	68	62		

**Façade adjusted*

The highest calculated noise levels at the most exposed façades of the future dwellings within Stage 9 of Honeywood Estate, for day-time (6am to 10pm) and night-time period (10pm to 6am), are presented in Table 4.6.

Table 4.6 Calculated Traffic Noise Levels – Stage 9 Allotments

Lot Number	Floor	Facade	Day-time* $L_{Aeq(16\text{-hour})}$ dB(A)	Night-time* $L_{Aeq(8\text{-hour})}$ dB(A)	Noise Target/Limit dB(A)	
					Day	Night
968	Ground	W	66	60	55/60	50/55
	Upper	W	68	62		
997	Ground	W	66	60		
	Upper	W	68	62		
998	Ground	W	66	60		
	Upper	W	68	62		
999	Ground	W	65	59		
	Upper	W	67	61		
1000	Ground	W	65	59		
	Upper	W	67	61		
1001	Ground	W	65	59		
	Upper	W	67	61		
1002	Ground	W	65	59		
	Upper	W	67	61		
1003	Ground	W	65	59		
	Upper	W	67	61		
966	Ground	W	65	59		
	Upper	W	67	61		
943	Ground	W	64	58		
	Upper	W	67	61		
1004	Ground	W	63	57		
	Upper	W	67	61		

**Façade adjusted*

The highest calculated noise levels at the most exposed façades of the future dwellings within Stage 9 of Honeywood Estate, in the first row facing Rowley Road for day-time (6am to 10pm) and night-time period (10pm to 6am), are presented in Table 4.7.

Table 4.7 Calculated Noise Levels (Allotments Nearest to Rowley Road) – Stage 9

Lot Number	Floor	Facade	Day-time* $L_{Aeq(16\text{-hour})}$ dB(A)	Night-time* $L_{Aeq(8\text{-hour})}$ dB(A)	Noise Target/Limit dB(A)	
					Day	Night
1029	Ground	N	61	55	55/60	50/55
	Upper	N	64	58		
1030	Ground	N	61	55		
	Upper	N	64	58		
1031	Ground	N	61	55		
	Upper	N	64	58		
1032	Ground	N	61	55		
	Upper	N	64	58		
1033	Ground	N	61	55		
	Upper	N	64	58		
1034	Ground	N	61	55		
	Upper	N	64	58		
1035	Ground	N	61	55		
	Upper	N	64	58		
1036	Ground	N	60	54		
	Upper	N	63	57		

**Façade adjusted*

Full SoundPLAN result for the traffic noise impacted allotments at Stages 7, 8 and 9 are presented in Appendix D.

Graphical presentations of the calculated road traffic noise levels for the day-time and night-time conditions, considering receivers at ground (1.8m AGL) and upper (4.6m AGL) floors of the future dwellings, are presented in Appendix E.

4.6 Outdoor Living Areas

Due to the elevated road transport noise levels at the building facades, any outdoor living areas have to be located along the protected façades (the façades facing away from the noise source) as per section 4.4.1 of the SP5.4 implementation guidelines.

The highest calculated noise levels at the most protected facades (corresponding with the outdoor living areas) of the future dwellings at Lot 880 (Stage 7), Lot 926 (Stage 8), Lot 968 (Stage 9), and Lot 1029 (Stage 9) are presented in Table 4.8.

Table 4.8 Road Traffic Noise Levels – Outdoor Living Areas

Lot Number	Floor	Facade	Day-time* $L_{Aeq(16\text{-hour})}$ dB(A)	Night-time* $L_{Aeq(8\text{-hour})}$ dB(A)	Noise Target/Limit dB(A)	
					Day	Night
880	Ground	E	54	48	55/60	50/55
926	Ground	E	54	48		
968	Ground	E	53	47		
1029	Ground	E	54	48		

**Façade adjusted*

These four allotments represent the worst case scenario for each Stage of the development considered in this report. Full results of traffic noise levels at the outdoor living areas can be found in Appendix D (tabulated SoundPLAN results) and in the graphical presentations (grid noise maps) in Appendix E.

5. Compliance with Internal Noise Levels ('Quiet House' Design)

The future residences to be established on the allotments within the traffic noise affected zone should be constructed using the 'Quiet House' design principles. The *Implementation Guidelines to the Western Australia State Planning Policy 5.4* requires implementation of the following noise amelioration measures:

- Provision of at least one protected outdoor area; and
- Minimisation of the extent of noise insulation needed to meet the indoor noise level standards.

To reduce the extent of noise insulation, the *Implementation Guidelines to the Western Australia State Planning Policy 5.4*, recommends interior layout whereby the bedrooms, entertainment rooms and living areas are situated away from the noise source. Where, practical, the service areas such as garages, store rooms, bathrooms and laundries should be situated between the noise source and the habitable rooms.

The other option for reduction of the requirements for noise insulation, is reduction of the size of the openings (windows, sliding doors) facing the noise source.

The upgrade of the building envelope is the final measure to achieve the internal noise limits. The building envelope upgrade (acoustic design) includes the following:

- Provision of mechanical ventilation or air-conditioning so windows can remain closed (bypassing of the windows when providing air exchange in the habitable rooms);
- Upgraded glazing using denser laminated glass;
- Solid core doors that open from habitable rooms to outdoors or in case of sliding glass doors upgraded glazing using denser laminated glass; and
- Provision of roof insulation.

In accordance with the approved transport noise mitigation strategy for the overall Honeywood Estate, a 2.5 metre high noise barrier wall will be constructed along the boundaries with Kwinana Freeway and Rowley Road. The recommended noise barrier wall is designed to reduce transport noise to manageable levels for further acoustic treatment to the building envelopes.

Under the *Western Australia State Planning Policy 5.4*, the 'deemed to comply' packages should be considered where external noise levels are within the noise limit (Package 'A') and up to 3dB(A) above the noise limit (Package 'B').

Since the commencement of acoustic investigations for 'Honeywood Estate' (Stages 1 to 6), the 'deemed to comply' insulation packages 'A' and 'B' were adopted to provide consistent acoustic design specifications applicable on the allotments within a zone of traffic noise impact. This approach was accepted by Main Roads WA, because detailed traffic noise attenuation calculations (TNA_c), demonstrated that the design specifications under packages 'A' and 'B' can be applied to dwellings exposed to higher traffic noise levels.

In this case, ATP Consulting carried out detailed acoustic design for a floor plan of a typical low-set dwelling already constructed at previous stages of 'Honeywood Estate'. Although the house is low-

set (as most of the houses to be constructed at Stages 7, 8 and 9), the highest calculated traffic noise level that correspond with an upper floor of a house were used to calculate the traffic noise reduction. The purpose of the detailed traffic noise attenuation calculations (TNA_c) was to determine the weighted noise reduction indices (R_w[13]) for the construction elements of the future dwellings on the traffic noise impacted allotments. Multiple TNA_c calculations were carried out with consideration of allotments nearest to the transport corridor (traffic noise of 68 to 74dB(A)) and in the interior of the development (traffic noise of 60 to 67dB(A)).

The floor plan and R_w ratings of the construction components for a typical house[14] are presented in Appendix F.

For the houses located in a zone of traffic noise impact from 68 to 74dB(A), the highest calculated R_w rating for a window with direct view to the transport noise corridor is 37, with R_w 34 applicable to the windows 'side-on corridor'. This is in agreement with the 'deemed to comply' specifications under Package 'B'.

In the interior of the development with traffic noise lesser than 67, the highest calculated R_w rating for a window with direct view to the transport noise corridor is 31. This is in agreement with the 'deemed to comply' specifications under Package 'A'.

The typical STC/R_w ratings of awning windows with 6mm and 10mm[15] laminated glass are presented in Appendix G.

Based on the above, in order to provide consistent acoustic design specifications, 'deemed to comply' insulation packages 'A' and 'B' were adopted for houses within a zone of traffic noise impact of 60 to 67dB(A) and 68 to 74dB(A)$L_{eq(16\text{-}hour)}$ respectively[16]. This approach has been adopted consistently for all stages of Honeywood Estate.

[13] R_w (Weighted noise reduction index) is a measure of the noise insulation performance of a building element. The higher the R_w number the better the insulation performance.

[14] The floor plan of a low-set house constructed at Lot 347, within Stage 2 of 'Honeywood Estate' was used to calculate the R_w ratings with consideration of the highest traffic noise levels applicable to the upper floor of a two-storey house.

[15] These are nominal thicknesses for laminated glass, with the actual thickness 6.38mm and 10.38mm respectively.

[16] The extent of noise insulation Packages 'A' and 'B' at Stages 7, 8 and 9 of Honeywood Estate are determined on the basis of the highest external traffic noise calculated on the upper floor of a two-storey house. The ground floors of these houses are exposed to lesser noise as they are protected by the noise barrier wall and by screening from the houses on the allotments in-front of them.

5.1 'Deemed to Comply' Noise Insulation Packages 'A' and 'B'

The acoustic design specifications under noise insulation package 'B' are presented in Table 5.1.

Table 5.1 Noise Insulation Package 'B'

Area Type	Orientation	Package 'B' Measures
Indoors		
Bedrooms	Facing road/rail corridor	• 10mm laminated glazing • Casement or awning windows • No external doors • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/air-conditioning*
	Side-on to corridor	• 6mm laminated glazing • Casement or awning windows • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/air-conditioning
	Away from corridor	No requirements
Living and work areas	Facing corridor	• 10mm laminated glazing • Casement or awning windows • 40mm (minimum) solid core external doors with acoustic seals • Sliding doors must be fitted with acoustic seals • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/air-conditioning
	Side-on to corridor	• 6mm laminated glazing • Casement or awning windows • Closed eaves • Mechanical ventilation/air-conditioning
	Away from corridor	No requirements
Other Indoor areas	Any	No requirements
Outdoors		
Outdoor living area	Facing corridor	• Minimum 2.4m solid fence (e.g. brick, limestone or Hardifence) • Colorbond and picket fences are not acceptable
	Side-on to corridor	
	Away from corridor	No requirements

**Both packages 'A' and 'B' require mechanical ventilation or air-conditioning to ensure that windows can remain closed in order to achieve the indoor noise standards.*

The acoustic design specifications under noise insulation package 'A' are presented in Table 5.2.

Table 5.2 Noise Insulation Package 'A'

Area Type	Orientation	Package 'A' Measures
Indoors		
Bedrooms	Facing road/rail corridor	• 6mm laminated glazing • Casement or awning windows • No external doors • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/air-conditioning*
	Side-on to corridor	• 6mm laminated glazing • Closed eaves • Mechanical ventilation/air-conditioning
	Away from corridor	No requirements
Living and work areas	Facing corridor	• 6mm laminated glazing • Casement or awning windows • 35mm (minimum) solid core external doors with acoustic seals • Sliding doors must be fitted with acoustic seals • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/air-conditioning
	Side-on to corridor	• 6mm glazing • Closed eaves • Mechanical ventilation/air-conditioning
	Away from corridor	No requirements
Other Indoor areas	Any	No requirements
Outdoors		
Outdoor living area	Facing corridor	• Minimum 2.0m high solid fence (e.g. Hardifence, Pinelap, or Colorbond) • Picket fences are not acceptable
	Side-on to corridor	
	Away from corridor	No requirements

**Both packages 'A' and 'B' require mechanical ventilation or air-conditioning to ensure that windows can remain closed in order to achieve the indoor noise standards.*

5.2 Compliance with Noise Criteria for Outdoor Living Areas

The results of the noise propagation modelling show that locating the outdoor living areas on the protected side of the future residences (high or low-set houses) will ensure compliance with the noise limits for outdoors from the *Western Australia State Planning Policy 5.4.* These results confirm the noise control measures for outdoor areas away from the transport corridor, as presented in the noise insulation Packages 'A' and 'B' are appropriate.

The recommended location of the outdoor living areas is dependent on the orientation of the future residences relative to the noise source (transport corridor). To demonstrate the recommended

location of the outdoor living areas typical floor plans of residences with four cardinal orientations were considered.

When it is impractical to locate the outdoor living areas along the protected façade, in accordance with noise insulation packages 'A' and 'B', the outdoor living areas can be protected by 2.0m to 2.4m high solid fences.

5.2.1 Recommended Outdoor Living Areas – West-East Alignment

Among the first row of allotments nearest to the Kwinana Freeway, there are number of allotments with West-East alignment (entry from the western boundary). The future houses on the allotments with West-East alignment will have entry and garages facing west and backyards (outdoor living areas) along the eastern facades. The location and orientation of a future house at Lot 880 within Stage 7 was used to demonstrate compliance with the noise limit at the outdoor living areas on allotments with West-East alignment.

The calculated road transport noise levels at Lot 880 indicate that the proposed dwelling will be impacted by transport noise, but the outdoor living area, located along the eastern facade (shielded from Kwinana Freeway), complies with the noise limit without a need for any additional noise control measures.

Figure 5.1 presents a typical layout and a floor plan of a low-set dwelling on an allotment with West-East alignment. This is a typical house with an outdoor living area to the rear (eastern facade) protected from the noise source.

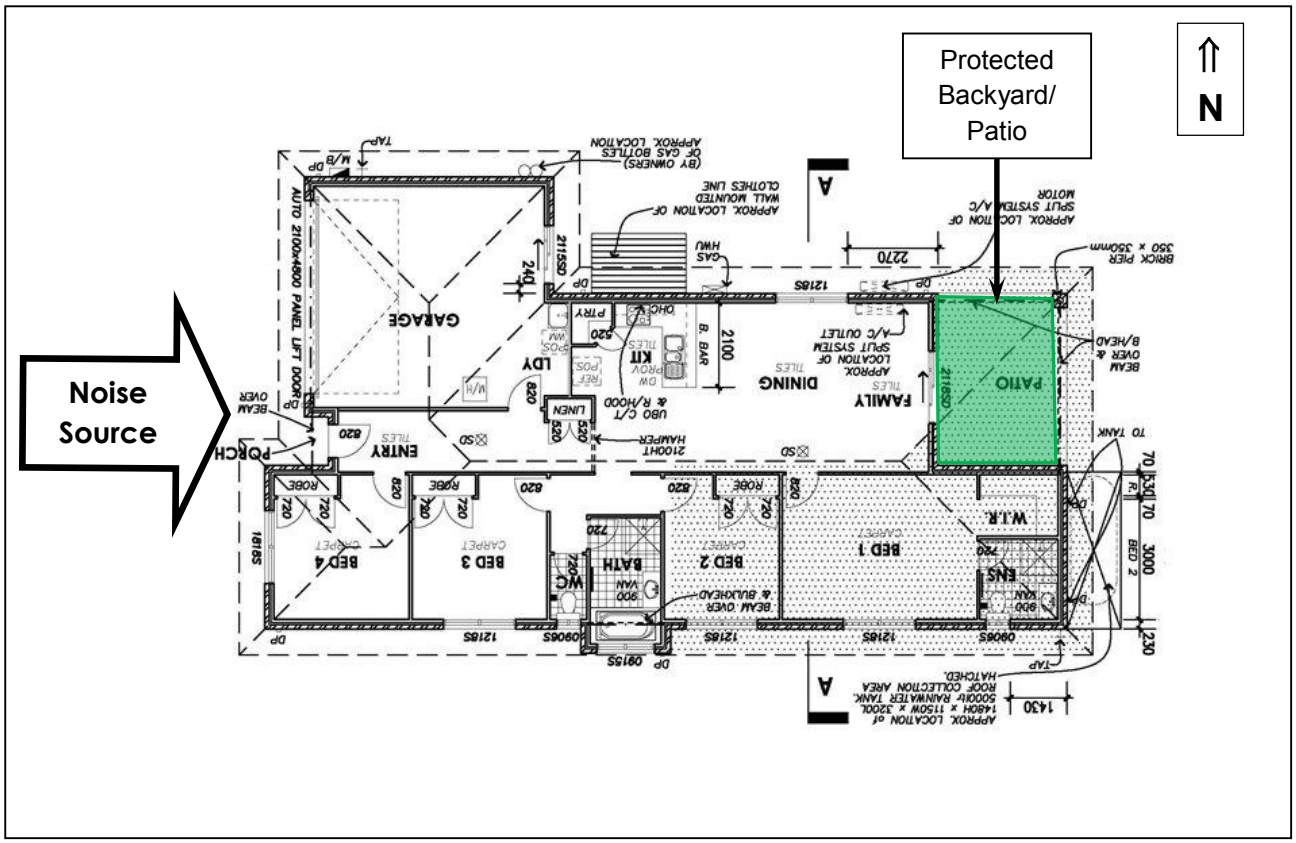

Figure 5.1 Typical house with protected outdoor living area – West-East Alignment

5.2.2 Recommended Outdoor Living Areas – East-West Alignment

The future houses on the allotments with East-West alignment will have entry and garages facing east and backyards (outdoor living areas) along the western facades. The location and orientation of a future house at Lot 1,005 within Stage 9 was used to demonstrate compliance with the noise limit at the outdoor living areas on allotments with East-West alignment.

To ensure compliance with the required noise limit at the outdoor living area on Lot 1,005, as well as at any other traffic noise impacted allotments with the same alignment, the building structures should be designed to shield the courtyards and open space areas from the transport corridor.

Figure 5.2 presents a typical layout and a floor plan of a low-set dwelling on an allotment with East-West alignment which incorporates a courtyard (protected from the noise source) along the southern facade.

Figure 5.2 Typical house with protected outdoor living area – East-West Alignment

According to SPP5.4 it is essential to have at least one outdoor living area within the 'target noise level'. The layout and floor plan of the dwelling presented in Figure 5.2 has been developed with consideration of the requirement to provide outdoor living area protected from traffic noise. In this case the dwelling is a low-set (single-storey) house which has two outdoor living areas ('alfresco' and a 'courtyard'). Whilst the 'alfresco' is not fully protected from transport noise, this area can be used as an outdoor living area whenever the external noise levels are considered acceptable.

This type of design (dwelling with a courtyard outdoor living area) is equally applicable to single and to two-storey houses. The same floor plan can be used in a mirror-reverse layout.

5.2.3 Recommended Outdoor Living Areas – North-South Alignment

The future residences on the allotments with North-South alignment will have entry and garages facing north and backyards (outdoor living areas) along the southern facades. The location and orientation of a future house at Lot 882 within Stage 7 was used to demonstrate compliance with the noise limit at the outdoor living areas on allotments with North-South alignment.

To ensure compliance with the required noise limit at the outdoor living area on Lot 882, as well as at any other traffic noise impacted allotments with the same alignment, the building structures should be designed to shield the outdoor living area from the transport corridor.

Figure 5.3 presents a typical layout and a floor plan of a low-set dwelling on an allotment with a North-South alignment which incorporates a courtyard along the eastern facade protected from the noise source.

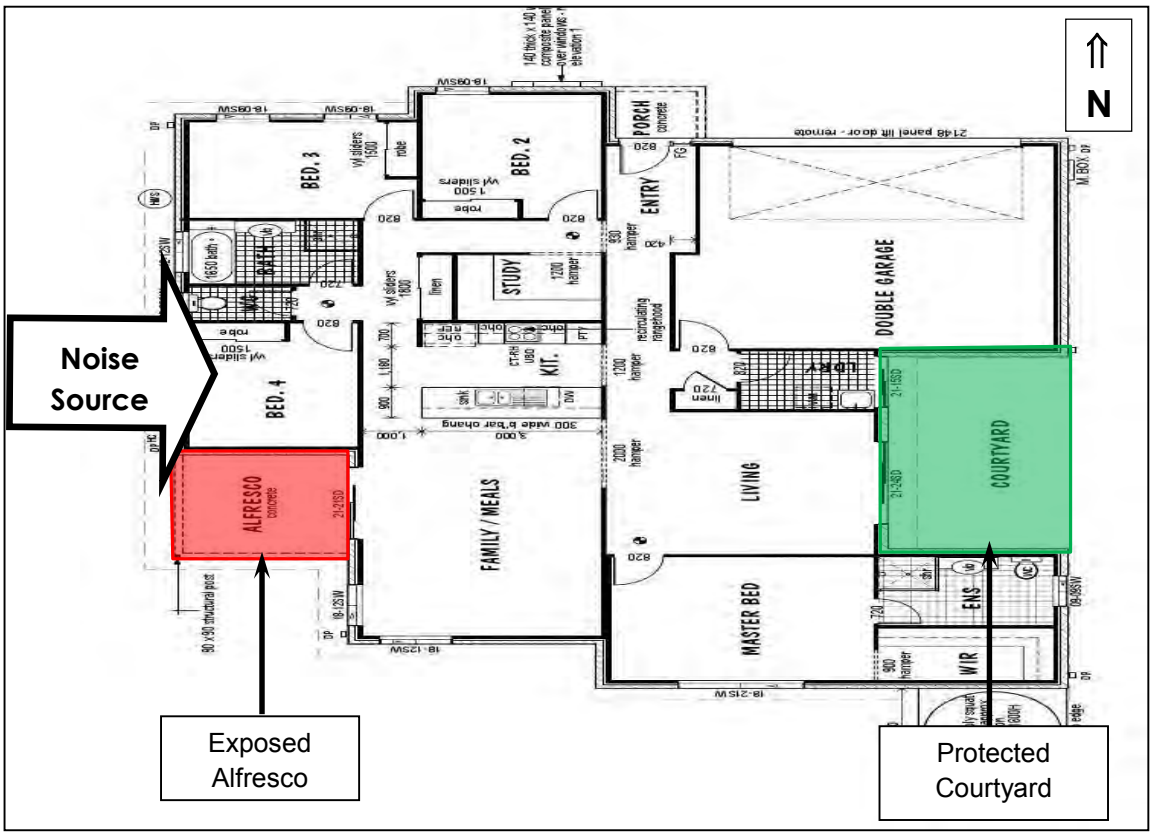

Figure 5.3 Typical house with protected outdoor living area – North-South Alignment

According to SPP5.4 it is essential to have at least one outdoor living area within the 'target noise level'. The layout and floor plan of the dwelling presented in Figure 5.3 has been developed with consideration of the requirement to provide outdoor living area protected from traffic noise.

In this case the dwelling is a low-set (single-storey) house which has two outdoor living areas ('alfresco' and a 'courtyard'). Whilst the 'alfresco', along the western facade, is not protected from transport noise, this area can be used as an outdoor living area whenever the external noise levels are considered acceptable. The same floor plan can be used in a mirror-reverse layout, whereby the exposed alfresco area will be located along the protected eastern facade.

5.2.4 Recommended Outdoor Living Areas – South-North Alignment

The future residences with South-North alignment will have entry and garages from the southern boundary. Whilst having a lot of similarities with the future houses to be located on the allotments with North-South alignment, the advantage of the houses to be established on the allotments with South-North alignment is that the outdoor living areas can be located along the protected eastern facade without a need for courtyard. Figure 5.4 presents a typical layout and a floor plan of a low-set dwelling on an allotment with South-North alignment. The floor plan of this house is typical for a house with an outdoor living area to the back of the house (northern facade) protected from the noise source.

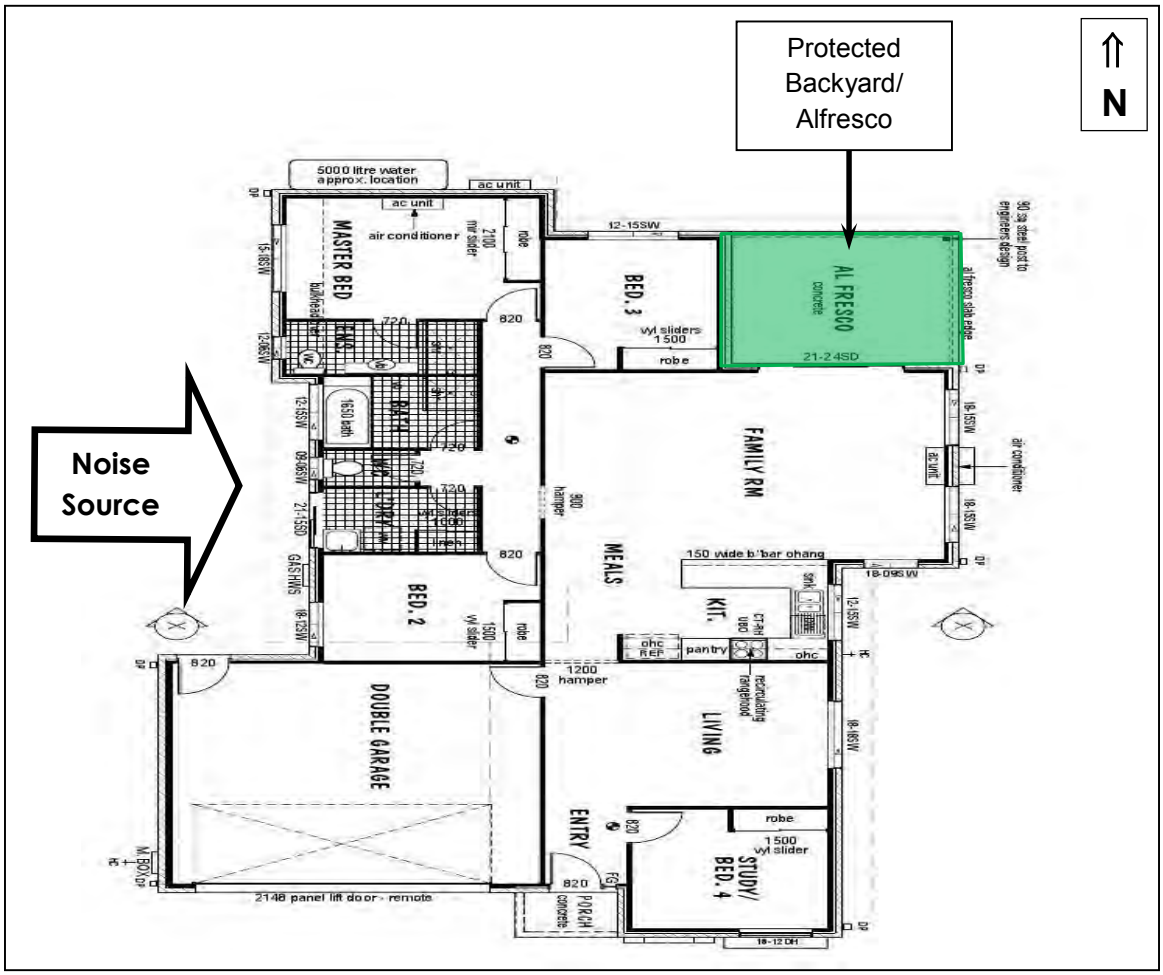

Figure 5.4 Typical house with protected outdoor living area – South-North Alignment

The calculated transport noise levels demonstrate that the residences on the allotments with South-North alignment can have typical outdoor living areas along the shielded north-eastern facade. This type of design (dwelling with an outdoor living area along the north-eastern facade) is equally applicable to single and to two-storey houses.

This floor plan cannot be used in a mirror-reverse layout, because the reversal will expose the outdoor living area to the traffic noise impacted western facade.

6. Discussion and Recommendations

The road traffic noise propagation modelling indicates that the traffic noise from Kwinana Freeway and Rowley Road, within a planning horizon of 20 years (year 2035), has the potential to impact on the noise amenity of single and two-storey residences at Stage 7, 8 and 9 of Honeywood Estate.

The engineering noise mitigation measures (including a 2.5 m high noise barrier wall), that have been incorporated in the civil design of Stage 7, 8 and 9 provide significant reduction in the overall traffic noise.

Despite these measures there is residual traffic noise and further planning noise mitigation measures are required. The planning measures are notification on title and specifications of a type of dwelling to be constructed on the noise affected allotments.

The allotments that are subject to further planning noise mitigation measures in accordance with the *Western Australia State Planning Policy 5.4* are presented in Table 6.1 and in Appendix H.

Table 6.1 Allotments Subject to Notification under Certificate of Title

Allotments*	Advice
Stage 7 878 – 881; 904 – 907; 924 – 925 **Stage 8** 926 – 927; 954 – 957; 996 **Stage 9** 968; 997 - 998	Potential noise impact from major road. Allotments subject to construction as per noise insulation Package 'B'. Outdoor living areas to be located along the protected facades as specified in Section 5.4.
Stage 7 820 – 821; 830 – 832; 869 – 877; 882 – 890, 891, 892, 893, 894, 895 - 903; 908 – 919; 935 – 936; 1067 – 1069 **Stage 8** 822 – 829; 920 – 923; 928 – 934; 937 – 942; 946 – 953; 958 – 965; 973 – 978; 980 – 981; 993 – 995 **Stage 9** 943; 966; 967; 969; 982 – 983; 985 – 990; 999 – 1027; 1029 – 1039; 1040, 1041, 1042, 1043, 1047; 1058, 1059 – 1061; 1070	Potential noise impact from major road. Allotments subject to construction as per noise insulation Package 'A'. Outdoor living areas to be located along the protected facades as specified in Section 5.4.

**all ranges are inclusive*

The planning noise mitigation measures will be summarised in a noise management plan for Stages 7, 8 and 9.

7. Conclusions

Based on the results of the traffic noise impact assessment for the proposed Stages 7, 8 and 9 of the Honeywood Estate in Wandi, with consideration of the requirements by Main Roads WA and based on extensive acoustic design experience, the following conclusions are made:

- The road traffic noise from Kwinana Freeway and Rowley Road, within a planning horizon of 20 years (year 2035), has the potential to impact on the noise amenity of single storey and two-storey residences at Stages 7, 8 and 9 of Honeywood Estate.
- In accordance with the approved transport noise mitigation strategy for the overall Honeywood Estate, a 2.5 metre high noise barrier wall will be constructed along the boundaries with Kwinana Freeway and Rowley Road. The recommended noise barrier wall is designed to reduce transport noise to manageable levels for further acoustic treatment to the building envelopes.
- ATP Consulting Engineers (previously known as VDM Consulting) carried out detailed acoustic design for a floor plan of a typical low-set dwelling already constructed at previous stages of 'Honeywood Estate' to determine the weighted noise reduction indices (R_w) for the construction elements of the future dwellings on the traffic noise impacted allotments.
- Based on the Traffic Noise Attenuation for building Components (TNA_C) calculations, 'deemed to comply' insulation packages 'A' and 'B' were adopted for houses within a zone of traffic noise impact of 60 to 67dB(A) and 68 to 74dB(A)$L_{eq(16\text{-}hour)}$ respectively.
- The allotments that are subject to further planning noise mitigation measures in accordance with the *Western Australia State Planning Policy 5.4* are presented in Table 6.1 and Appendix H of this report.
- For traffic noise impacted allotments, outdoor living areas must be located along the most protected façade of the proposed house. When this solution is impractical, in accordance with noise insulation packages 'A' and 'B', the outdoor living areas can be protected by 2.0m to 2.4m high solid fences.
- Provided the recommended engineering and planning noise mitigation measures, as presented in this report, are fully implemented in the detailed design and construction, the transport noise from Kwinana Freeway and Rowley Road, should not impose any further constraints on the establishment of the proposed Stages 7, 8 and 9 of the Honeywood Estate residential development.

8. References

- Standard Australia (1997) *AS1055.1-1997* (*Acoustics - Description and Measurement of Environmental Noise Part 1: General Procedures*)

- Standards Australia (1984) *AS2702-1984* (*Acoustics – Methods for the measurement of road traffic noise*)

- Standards Australia (1989) *AS3671-1989* (*Acoustics – Road Traffic Noise Intrusion – Building siting and construction*)

- Standards Australia (2004) *ASIEC61672.1-2004* (*Electroacoustics - Sound level meters – Specifications*)

- Western Australian Planning Commission (2009) *State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning*

- Western Australian Planning Commission (2009) *Implementation Guidelines for State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning*

Appendix A Development Layout

LAND USE / STATISTICS				
STAGE 7		WAPC Ref:-		
PARCEL TYPE	MAP SYMBOL	NUMBER OF PARCELS	TOTAL DWELLINGS	AREA (ha)
Traditional Lots (Total)		36	36	1.3718
single		36	36	1.3718
Cottage Lots (Total)	★	34	37	1.2055
single	★	31	31	1.0719
duplex	★	3	6	0.1336
Public Open Space	P.O.S.	0		0
Roads (inc. truncations)				0.9128
STAGE TOTAL		70	73	3.4901

LAND USE / STATISTICS				
STAGE 8		WAPC Ref:-		
PARCEL TYPE	MAP SYMBOL	NUMBER OF PARCELS	TOTAL DWELLINGS	AREA (ha)
Traditional Lots (Total)		43	43	1.5908
single		43	43	1.5908
Cottage Lots (Total)	★	22	28	0.7904
single	★	16	16	0.5101
duplex	★	6	12	0.2803
Medium Density Lots (Total)	#	7	9	0.1791
single	#	5	5	0.1125
duplex	#	2	4	0.0666
Public Open Space	P.O.S.	1		0.4038
Roads (inc. truncations)				1.2518
STAGE TOTAL		73	80	4.2159

LAND USE / STATISTICS				
STAGE 9		WAPC Ref:-		
PARCEL TYPE	MAP SYMBOL	NUMBER OF PARCELS	TOTAL DWELLINGS	AREA (ha)
Traditional Lots (Total)		28	28	1.1099
single		28	28	1.1099
Cottage Lots (Total)	★	21	25	0.7906
single	★	17	17	0.6056
duplex	★	4	8	0.1850
Medium Density Lots (Total)	#	18	22	0.4575
single	#	14	14	0.3150
duplex	#	4	8	0.1425
Public Open Space	P.O.S.	1		0.2054
Roads (inc. truncations)				1.0714
STAGE TOTAL		68	75	3.6347

LAND USE / STATISTICS				
UNSTAGED1		WAPC Ref:- NOT YET ISSUED		
PARCEL TYPE	MAP SYMBOL	NUMBER OF PARCELS	TOTAL DWELLINGS	AREA (ha)
Public Open Space	P.O.S.	0		0
Road Widenings	ROAD WIDENING	1		0.0392
STAGE TOTAL		0	0	0.0392

STAGE 9

STAGE 8

STAGE 7

UNSTAGED1
Road Widening
392m²

Ver.	Description	Drawn	Date	Checked
A	Initial Issue	LKS	06/11/2013	SDW

FILES
mapCOGO:- Plan-328.cpl
Ustation:- 93834pr-328a.dgn

PRECAL LEGEND
See below Lot Stats table for further information
Stage Boundary
Vehicle Access Restriction
(15) Potential Dwellings / Lot

N

HONEYWOOD ESTATE
STAGE 7 - 9
Wandi

CLIENT: Satterley.com.au

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

SCALE 1 : 1000 @ A1 - 1 : 2000 @ A3
20 0 80
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A1 with the Paging Scaling set to None.

PLANNER'S DESIGN SOURCE for Rev A
Planner :- Greg Rowe
Received date:- 06 / 11 / 2013
File name:- 20131105154014.pdf

ENGINEER'S DESIGN SOURCE for Rev
Engineer :-
Received date:-
Data purpose:-

All areas and dimensions depicted on this plan are subject to survey and Landgate registration. All cadastral information external to the stage/s which form the subject of this plan are not guaranteed and are supplied as a guide only.

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Project Mngr. Matthew Webb | Datum PCG94

93834 - 328 - A
Job Number | Plan Number | Version

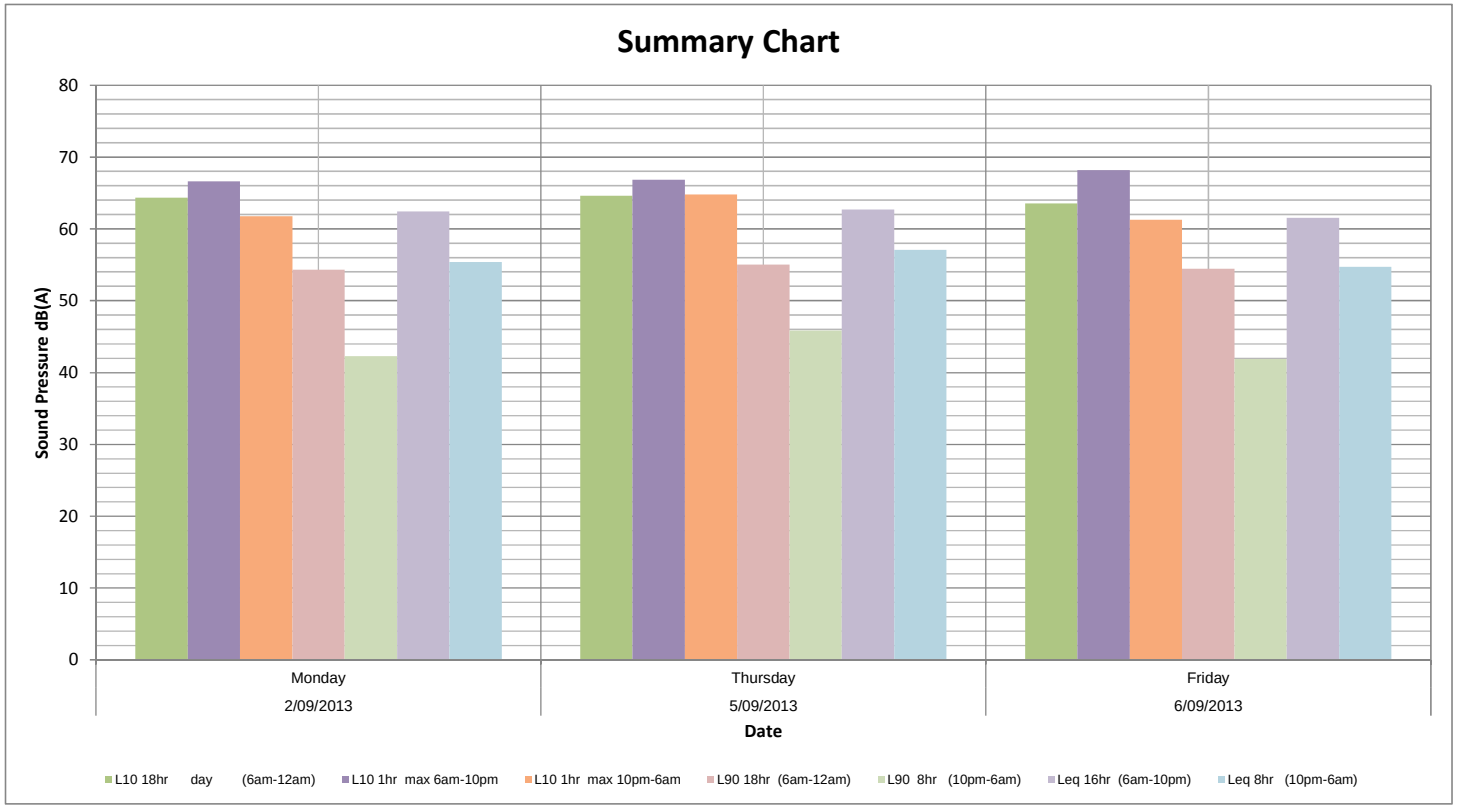
Appendix B Noise Measurement Results

ATP131211
Wandi Estate - Stages 7, 8 and 9
Traffic Noise - Kwinana Freeway

Use for average	Date	Day	L10 18hr day (6am-12am)	L10 1hr max 6am-10pm	Time for L10 1hr max 6am -10pm	L10 1hr max 10pm-6am	Time for L10 1hr max 10pm -6am	L90 18hr (6am-12am)	L90 8hr (10pm-6am)	Leq 16hr (6am-10pm)	Leq 8hr (10pm-6am)
√	2/09/2013	Monday	64	67	7:45	62	5:45	54	42	62	55
√	5/09/2013	Thursday	65	67	6:45	65	5:45	55	46	63	57
√	6/09/2013	Friday	64	68	6:45	61	22:45	54	42	62	55
AVERAGE			64	67		63		55	43	62	56

Acoustic Research Laboratories Pty Ltd - Type 1 Noise Logger

Logger Serial Number	16-707-017
Measurement Title	WANDI 2
Measurement started at	29/08/2013 15:27
Measurement stopped at	9/09/2013 10:18
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 minutes
Auxiliary Power	Disabled
Tape Recorder	Disabled
Short Term Leq	Disabled
Short Term Leq Length	N/A
Start Trigger	N/A
Stop Trigger	N/A
Master Timer	N/A
Sub Timer	N/A
Pre-measurement Reference	94
Post-measurement Reference	93.9
Engineering Units	dB SPL



ATP131211

Honeywood Estate Stages 7, 8 and 9

Traffic Noise - Rowley Road

Use for average	Date	Day	L10 18hr day (6am-12am)	L10 1hr max 6am-10pm	Time for L10 1hr max 6am -10pm	L10 1hr max 10pm-6am	Time for L10 1hr max 10pm -6am	L90 18hr (6am-12am)	L90 8hr (10pm-6am)	Leq 16hr (6am-10pm)	Leq 8hr (10pm-6am)
√	16/09/2013	Monday	66	71	15:45	67	5:45	57	48	64	56
√	17/09/2013	Tuesday	65	70	6:45	66	5:45	54	43	63	54
√	18/09/2013	Wednesday	66	70	6:45	66	5:45	56	45	64	54
√	19/09/2013	Thursday	66	70	11:45	65	5:45	56	43	64	53
√	20/09/2013	Friday	67	74	8:45	62	5:45	59	46	65	56
AVERAGE			66	71		65		56	45	64	55

Acoustic Research Laboratories Pty Ltd - Type 1 Noise Logger

Logger Serial Number	16-707-017
Measurement Title	Wandi 3 Rowley
Measurement started at	9/10/2013 10:27
Measurement stopped at	<In Progress>
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 minutes
Auxiliary Power	Disabled
Tape Recorder	Disabled
Short Term Leq	Disabled
Short Term Leq Length	N/A
Start Trigger	N/A
Stop Trigger	N/A
Master Timer	N/A
Sub Timer	N/A
Pre-measurement Reference	94
Post-measurement Reference	94
Engineering Units	dB SPL

Appendix C SoundPLAN Validation

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Model Validation 2013 Situation

Calculation Point	SPL L10(18h) dB(A)
Noise Logger near Kwinana Freeway	64
Noise Logger near Rowley Road	66

Appendix D Traffic Noise Levels (SoundPLAN Results)

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 820	GF	N	59
	1.FL		67
Stage 7 Lot 820	GF	W	61
	1.FL		67
Stage 7 Lot 820	GF	S	61
	1.FL		67
Stage 7 Lot 820	GF	E	53
	1.FL		67
Stage 7 Lot 821	GF	N	55
	1.FL		60
Stage 7 Lot 821	GF	W	54
	1.FL		60
Stage 7 Lot 821	GF	S	53
	1.FL		60
Stage 7 Lot 821	GF	E	49
	1.FL		59
Stage 7 Lot 830	GF	N	55
	1.FL		60
Stage 7 Lot 830	GF	W	56
	1.FL		61
Stage 7 Lot 830	GF	S	56
	1.FL		61
Stage 7 Lot 830	GF	E	50
	1.FL		60
Stage 7 Lot 831	GF	W	58
	1.FL		61
Stage 7 Lot 831	GF	N	54
	1.FL		61
Stage 7 Lot 831	GF	E	50
	1.FL		61
Stage 7 Lot 831	GF	S	56
	1.FL		61
Stage 7 Lot 832	GF	E	50
	1.FL		61
Stage 7 Lot 832	GF	S	55
	1.FL		61
Stage 7 Lot 832	GF	N	55
	1.FL		61
Stage 7 Lot 832	GF	W	58
	1.FL		61
Stage 7 Lot 869	GF	N	55
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 869	GF	W	57
	1.FL		62
Stage 7 Lot 869	GF	S	54
	1.FL		61
Stage 7 Lot 869	GF	E	50
	1.FL		61
Stage 7 Lot 870	GF	N	54
	1.FL		61
Stage 7 Lot 870	GF	W	58
	1.FL		62
Stage 7 Lot 870	GF	S	58
	1.FL		61
Stage 7 Lot 870	GF	E	50
	1.FL		61
Stage 7 Lot 871	GF	E	51
	1.FL		62
Stage 7 Lot 871	GF	S	58
	1.FL		62
Stage 7 Lot 871	GF	W	57
	1.FL		62
Stage 7 Lot 871	GF	N	55
	1.FL		62
Stage 7 Lot 872	GF	E	51
	1.FL		62
Stage 7 Lot 872	GF	S	58
	1.FL		63
Stage 7 Lot 872	GF	W	57
	1.FL		63
Stage 7 Lot 872	GF	N	55
	1.FL		63
Stage 7 Lot 873	GF	E	51
	1.FL		63
Stage 7 Lot 873	GF	S	59
	1.FL		63
Stage 7 Lot 873	GF	W	57
	1.FL		63
Stage 7 Lot 873	GF	N	56
	1.FL		63
Stage 7 Lot 874	GF	E	52
	1.FL		63
Stage 7 Lot 874	GF	S	59
	1.FL		63

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 874	GF	W	58
	1.FL		64
Stage 7 Lot 874	GF	N	56
	1.FL		63
Stage 7 Lot 875	GF	E	52
	1.FL		64
Stage 7 Lot 875	GF	S	60
	1.FL		64
Stage 7 Lot 875	GF	W	59
	1.FL		64
Stage 7 Lot 875	GF	N	57
	1.FL		64
Stage 7 Lot 876	GF	S	60
	1.FL		65
Stage 7 Lot 876	GF	W	59
	1.FL		65
Stage 7 Lot 876	GF	N	57
	1.FL		65
Stage 7 Lot 876	GF	E	52
	1.FL		65
Stage 7 Lot 877	GF	E	53
	1.FL		65
Stage 7 Lot 877	GF	S	61
	1.FL		66
Stage 7 Lot 877	GF	W	60
	1.FL		66
Stage 7 Lot 877	GF	N	58
	1.FL		66
Stage 7 Lot 878	GF	E	54
	1.FL		68
Stage 7 Lot 878	GF	N	60
	1.FL		69
Stage 7 Lot 878	GF	W	65
	1.FL		70
Stage 7 Lot 878	GF	S	62
	1.FL		69
Stage 7 Lot 879	GF	W	65
	1.FL		70
Stage 7 Lot 879	GF	S	61
	1.FL		69
Stage 7 Lot 879	GF	E	54
	1.FL		68

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 879	GF	N	61
	1.FL		69
Stage 7 Lot 880	GF	E	54
	1.FL		68
Stage 7 Lot 880	GF	N	61
	1.FL		69
Stage 7 Lot 880	GF	W	66
	1.FL		70
Stage 7 Lot 880	GF	S	60
	1.FL		69
Stage 7 Lot 881	GF	W	66
	1.FL		70
Stage 7 Lot 881	GF	N	64
	1.FL		69
Stage 7 Lot 881	GF	E	54
	1.FL		68
Stage 7 Lot 881	GF	S	60
	1.FL		69
Stage 7 Lot 882	GF	E	53
	1.FL		66
Stage 7 Lot 882	GF	N	61
	1.FL		67
Stage 7 Lot 882	GF	W	61
	1.FL		67
Stage 7 Lot 882	GF	S	58
	1.FL		67
Stage 7 Lot 883	GF	W	58
	1.FL		66
Stage 7 Lot 883	GF	S	57
	1.FL		66
Stage 7 Lot 883	GF	E	53
	1.FL		65
Stage 7 Lot 883	GF	N	60
	1.FL		66
Stage 7 Lot 884	GF	N	59
	1.FL		65
Stage 7 Lot 884	GF	W	57
	1.FL		65
Stage 7 Lot 884	GF	S	56
	1.FL		64
Stage 7 Lot 884	GF	E	52
	1.FL		64

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 885	GF	S	56
	1.FL		64
Stage 7 Lot 885	GF	W	57
	1.FL		64
Stage 7 Lot 885	GF	N	59
	1.FL		64
Stage 7 Lot 885	GF	E	52
	1.FL		63
Stage 7 Lot 886	GF	W	56
	1.FL		63
Stage 7 Lot 886	GF	N	58
	1.FL		63
Stage 7 Lot 886	GF	E	51
	1.FL		63
Stage 7 Lot 886	GF	S	55
	1.FL		63
Stage 7 Lot 887	GF	S	55
	1.FL		63
Stage 7 Lot 887	GF	W	56
	1.FL		63
Stage 7 Lot 887	GF	N	57
	1.FL		63
Stage 7 Lot 887	GF	E	51
	1.FL		63
Stage 7 Lot 888	GF	E	51
	1.FL		62
Stage 7 Lot 888	GF	S	55
	1.FL		62
Stage 7 Lot 888	GF	N	57
	1.FL		62
Stage 7 Lot 888	GF	W	56
	1.FL		62
Stage 7 Lot 889	GF	S	55
	1.FL		62
Stage 7 Lot 889	GF	W	56
	1.FL		62
Stage 7 Lot 889	GF	N	57
	1.FL		62
Stage 7 Lot 889	GF	E	50
	1.FL		62
Stage 7 Lot 890	GF	E	50
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 890	GF	S	55
	1.FL		62
Stage 7 Lot 890	GF	N	56
	1.FL		61
Stage 7 Lot 890	GF	W	56
	1.FL		62
Stage 7 Lot 891	GF	N	55
	1.FL		61
Stage 7 Lot 891	GF	W	56
	1.FL		61
Stage 7 Lot 891	GF	S	54
	1.FL		61
Stage 7 Lot 891	GF	E	50
	1.FL		61
Stage 7 Lot 892	GF	E	50
	1.FL		61
Stage 7 Lot 892	GF	S	54
	1.FL		61
Stage 7 Lot 892	GF	W	56
	1.FL		61
Stage 7 Lot 892	GF	N	54
	1.FL		61
Stage 7 Lot 893	GF	E	50
	1.FL		60
Stage 7 Lot 893	GF	S	54
	1.FL		60
Stage 7 Lot 893	GF	W	56
	1.FL		60
Stage 7 Lot 893	GF	N	54
	1.FL		60
Stage 7 Lot 894	GF	N	53
	1.FL		60
Stage 7 Lot 894	GF	E	51
	1.FL		60
Stage 7 Lot 894	GF	S	56
	1.FL		60
Stage 7 Lot 894	GF	W	56
	1.FL		60
Stage 7 Lot 895	GF	W	57
	1.FL		61
Stage 7 Lot 895	GF	S	56
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 895	GF	E	50
	1.FL		61
Stage 7 Lot 895	GF	N	54
	1.FL		61
Stage 7 Lot 896	GF	E	50
	1.FL		61
Stage 7 Lot 896	GF	S	55
	1.FL		61
Stage 7 Lot 896	GF	W	56
	1.FL		61
Stage 7 Lot 896	GF	N	55
	1.FL		61
Stage 7 Lot 897	GF	N	55
	1.FL		62
Stage 7 Lot 897	GF	W	57
	1.FL		62
Stage 7 Lot 897	GF	S	56
	1.FL		62
Stage 7 Lot 897	GF	E	50
	1.FL		61
Stage 7 Lot 898	GF	E	51
	1.FL		62
Stage 7 Lot 898	GF	S	57
	1.FL		62
Stage 7 Lot 898	GF	W	57
	1.FL		62
Stage 7 Lot 898	GF	N	56
	1.FL		62
Stage 7 Lot 899	GF	W	57
	1.FL		63
Stage 7 Lot 899	GF	S	57
	1.FL		63
Stage 7 Lot 899	GF	E	51
	1.FL		63
Stage 7 Lot 899	GF	N	56
	1.FL		63
Stage 7 Lot 900	GF	E	52
	1.FL		63
Stage 7 Lot 900	GF	S	58
	1.FL		64
Stage 7 Lot 900	GF	W	57
	1.FL		64

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 900	GF	N	57
	1.FL		64
Stage 7 Lot 901	GF	S	58
	1.FL		64
Stage 7 Lot 901	GF	W	58
	1.FL		65
Stage 7 Lot 901	GF	E	52
	1.FL		64
Stage 7 Lot 901	GF	N	57
	1.FL		64
Stage 7 Lot 902	GF	S	59
	1.FL		65
Stage 7 Lot 902	GF	W	58
	1.FL		66
Stage 7 Lot 902	GF	N	58
	1.FL		65
Stage 7 Lot 902	GF	E	53
	1.FL		65
Stage 7 Lot 903	GF	W	60
	1.FL		67
Stage 7 Lot 903	GF	S	60
	1.FL		67
Stage 7 Lot 903	GF	E	53
	1.FL		66
Stage 7 Lot 903	GF	N	59
	1.FL		67
Stage 7 Lot 904	GF	S	62
	1.FL		69
Stage 7 Lot 904	GF	W	66
	1.FL		70
Stage 7 Lot 904	GF	N	61
	1.FL		69
Stage 7 Lot 904	GF	E	54
	1.FL		68
Stage 7 Lot 905	GF	N	62
	1.FL		69
Stage 7 Lot 905	GF	W	66
	1.FL		70
Stage 7 Lot 905	GF	S	61
	1.FL		69
Stage 7 Lot 905	GF	E	54
	1.FL		68

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 906	GF	N	62
	1.FL		69
Stage 7 Lot 906	GF	E	54
	1.FL		68
Stage 7 Lot 906	GF	S	61
	1.FL		69
Stage 7 Lot 906	GF	W	66
	1.FL		70
Stage 7 Lot 907	GF	S	61
	1.FL		69
Stage 7 Lot 907	GF	E	54
	1.FL		68
Stage 7 Lot 907	GF	W	66
	1.FL		70
Stage 7 Lot 907	GF	N	63
	1.FL		69
Stage 7 Lot 908	GF	N	61
	1.FL		67
Stage 7 Lot 908	GF	E	53
	1.FL		67
Stage 7 Lot 908	GF	S	59
	1.FL		67
Stage 7 Lot 908	GF	W	61
	1.FL		67
Stage 7 Lot 909	GF	S	58
	1.FL		65
Stage 7 Lot 909	GF	E	53
	1.FL		65
Stage 7 Lot 909	GF	N	60
	1.FL		66
Stage 7 Lot 909	GF	W	58
	1.FL		66
Stage 7 Lot 910	GF	N	59
	1.FL		65
Stage 7 Lot 910	GF	E	52
	1.FL		64
Stage 7 Lot 910	GF	W	58
	1.FL		65
Stage 7 Lot 910	GF	S	57
	1.FL		64
Stage 7 Lot 911	GF	S	57
	1.FL		64

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 911	GF	E	52
	1.FL		64
Stage 7 Lot 911	GF	N	58
	1.FL		64
Stage 7 Lot 911	GF	W	57
	1.FL		64
Stage 7 Lot 912	GF	N	58
	1.FL		63
Stage 7 Lot 912	GF	E	51
	1.FL		63
Stage 7 Lot 912	GF	S	56
	1.FL		63
Stage 7 Lot 912	GF	W	57
	1.FL		63
Stage 7 Lot 913	GF	E	51
	1.FL		62
Stage 7 Lot 913	GF	S	56
	1.FL		62
Stage 7 Lot 913	GF	W	57
	1.FL		63
Stage 7 Lot 913	GF	N	57
	1.FL		63
Stage 7 Lot 914	GF	E	51
	1.FL		62
Stage 7 Lot 914	GF	S	56
	1.FL		62
Stage 7 Lot 914	GF	W	56
	1.FL		62
Stage 7 Lot 914	GF	N	57
	1.FL		62
Stage 7 Lot 915	GF	E	50
	1.FL		61
Stage 7 Lot 915	GF	S	55
	1.FL		61
Stage 7 Lot 915	GF	W	56
	1.FL		61
Stage 7 Lot 915	GF	N	57
	1.FL		61
Stage 7 Lot 916	GF	N	56
	1.FL		61
Stage 7 Lot 916	GF	W	55
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 916	GF	S	55
	1.FL		61
Stage 7 Lot 916	GF	E	50
	1.FL		61
Stage 7 Lot 917	GF	E	50
	1.FL		60
Stage 7 Lot 917	GF	S	54
	1.FL		60
Stage 7 Lot 917	GF	W	55
	1.FL		60
Stage 7 Lot 917	GF	N	56
	1.FL		60
Stage 7 Lot 918	GF	N	53
	1.FL		60
Stage 7 Lot 918	GF	E	49
	1.FL		59
Stage 7 Lot 918	GF	S	53
	1.FL		60
Stage 7 Lot 918	GF	W	54
	1.FL		60
Stage 7 Lot 919	GF	S	58
	1.FL		63
Stage 7 Lot 919	GF	E	51
	1.FL		63
Stage 7 Lot 919	GF	N	56
	1.FL		63
Stage 7 Lot 919	GF	W	57
	1.FL		63
Stage 7 Lot 924	GF	W	66
	1.FL		70
Stage 7 Lot 924	GF	N	61
	1.FL		69
Stage 7 Lot 924	GF	E	54
	1.FL		68
Stage 7 Lot 924	GF	S	63
	1.FL		69
Stage 7 Lot 925	GF	N	61
	1.FL		69
Stage 7 Lot 925	GF	E	54
	1.FL		68
Stage 7 Lot 925	GF	S	61
	1.FL		69

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 925	GF	W	66
	1.FL		70
Stage 7 Lot 935	GF	E	51
	1.FL		62
Stage 7 Lot 935	GF	N	55
	1.FL		62
Stage 7 Lot 935	GF	W	56
	1.FL		63
Stage 7 Lot 935	GF	S	54
	1.FL		62
Stage 7 Lot 936	GF	S	57
	1.FL		62
Stage 7 Lot 936	GF	E	51
	1.FL		62
Stage 7 Lot 936	GF	N	54
	1.FL		62
Stage 7 Lot 936	GF	W	56
	1.FL		63
Stage 7 Lot 1064	GF	NW	55
	1.FL		59
Stage 7 Lot 1064	GF	SW	54
	1.FL		59
Stage 7 Lot 1064	GF	SE	52
	1.FL		59
Stage 7 Lot 1064	GF	NE	51
	1.FL		59
Stage 7 Lot 1065	GF	SW	55
	1.FL		59
Stage 7 Lot 1065	GF	NW	55
	1.FL		59
Stage 7 Lot 1065	GF	SE	52
	1.FL		59
Stage 7 Lot 1065	GF	NE	50
	1.FL		59
Stage 7 Lot 1066	GF	S	55
	1.FL		59
Stage 7 Lot 1066	GF	W	54
	1.FL		59
Stage 7 Lot 1066	GF	N	53
	1.FL		59
Stage 7 Lot 1066	GF	E	48
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 7 Lot 1067	GF	N	54
	1.FL		60
Stage 7 Lot 1067	GF	W	55
	1.FL		60
Stage 7 Lot 1067	GF	S	56
	1.FL		60
Stage 7 Lot 1067	GF	E	49
	1.FL		60
Stage 7 Lot 1068	GF	N	54
	1.FL		60
Stage 7 Lot 1068	GF	W	55
	1.FL		60
Stage 7 Lot 1068	GF	S	55
	1.FL		60
Stage 7 Lot 1068	GF	E	49
	1.FL		60
Stage 7 Lot 1069	GF	N	54
	1.FL		60
Stage 7 Lot 1069	GF	W	54
	1.FL		60
Stage 7 Lot 1069	GF	S	56
	1.FL		60
Stage 7 Lot 1069	GF	E	49
	1.FL		60
Stage 8 Lot 822	GF	N	56
	1.FL		62
Stage 8 Lot 822	GF	W	56
	1.FL		62
Stage 8 Lot 822	GF	S	55
	1.FL		62
Stage 8 Lot 822	GF	E	50
	1.FL		61
Stage 8 Lot 823	GF	N	55
	1.FL		60
Stage 8 Lot 823	GF	E	49
	1.FL		60
Stage 8 Lot 823	GF	S	53
	1.FL		60
Stage 8 Lot 823	GF	W	57
	1.FL		60
Stage 8 Lot 824	GF	E	49
	1.FL		60

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 824	GF	S	53
	1.FL		60
Stage 8 Lot 824	GF	N	53
	1.FL		60
Stage 8 Lot 824	GF	W	56
	1.FL		60
Stage 8 Lot 825	GF	S	53
	1.FL		60
Stage 8 Lot 825	GF	W	56
	1.FL		60
Stage 8 Lot 825	GF	N	53
	1.FL		60
Stage 8 Lot 825	GF	E	49
	1.FL		60
Stage 8 Lot 826	GF	S	53
	1.FL		60
Stage 8 Lot 826	GF	W	56
	1.FL		60
Stage 8 Lot 826	GF	N	53
	1.FL		60
Stage 8 Lot 826	GF	E	49
	1.FL		60
Stage 8 Lot 827	GF	E	49
	1.FL		60
Stage 8 Lot 827	GF	N	53
	1.FL		60
Stage 8 Lot 827	GF	W	56
	1.FL		60
Stage 8 Lot 827	GF	S	53
	1.FL		60
Stage 8 Lot 828	GF	E	49
	1.FL		60
Stage 8 Lot 828	GF	S	54
	1.FL		60
Stage 8 Lot 828	GF	W	56
	1.FL		60
Stage 8 Lot 828	GF	N	53
	1.FL		60
Stage 8 Lot 829	GF	E	49
	1.FL		60
Stage 8 Lot 829	GF	S	55
	1.FL		60

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 829	GF	N	53
	1.FL		60
Stage 8 Lot 829	GF	W	57
	1.FL		60
Stage 8 Lot 920	GF	E	52
	1.FL		64
Stage 8 Lot 920	GF	S	59
	1.FL		64
Stage 8 Lot 920	GF	N	57
	1.FL		64
Stage 8 Lot 920	GF	W	58
	1.FL		64
Stage 8 Lot 921	GF	W	58
	1.FL		65
Stage 8 Lot 921	GF	S	60
	1.FL		65
Stage 8 Lot 921	GF	E	52
	1.FL		65
Stage 8 Lot 921	GF	N	57
	1.FL		65
Stage 8 Lot 922	GF	S	60
	1.FL		66
Stage 8 Lot 922	GF	N	58
	1.FL		66
Stage 8 Lot 922	GF	E	53
	1.FL		66
Stage 8 Lot 922	GF	W	58
	1.FL		66
Stage 8 Lot 923	GF	S	62
	1.FL		67
Stage 8 Lot 923	GF	E	53
	1.FL		67
Stage 8 Lot 923	GF	W	61
	1.FL		67
Stage 8 Lot 923	GF	N	59
	1.FL		67
Stage 8 Lot 926	GF	W	66
	1.FL		70
Stage 8 Lot 926	GF	E	54
	1.FL		68
Stage 8 Lot 926	GF	S	61
	1.FL		69

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 926	GF	N	61
	1.FL		69
Stage 8 Lot 927	GF	N	63
	1.FL		69
Stage 8 Lot 927	GF	E	54
	1.FL		68
Stage 8 Lot 927	GF	W	66
	1.FL		70
Stage 8 Lot 927	GF	S	61
	1.FL		69
Stage 8 Lot 928	GF	E	53
	1.FL		66
Stage 8 Lot 928	GF	W	60
	1.FL		67
Stage 8 Lot 928	GF	S	59
	1.FL		67
Stage 8 Lot 928	GF	N	61
	1.FL		67
Stage 8 Lot 929	GF	E	53
	1.FL		65
Stage 8 Lot 929	GF	S	58
	1.FL		66
Stage 8 Lot 929	GF	W	58
	1.FL		66
Stage 8 Lot 929	GF	N	60
	1.FL		66
Stage 8 Lot 930	GF	N	59
	1.FL		65
Stage 8 Lot 930	GF	E	52
	1.FL		64
Stage 8 Lot 930	GF	S	57
	1.FL		65
Stage 8 Lot 930	GF	W	58
	1.FL		65
Stage 8 Lot 931	GF	E	52
	1.FL		64
Stage 8 Lot 931	GF	S	57
	1.FL		64
Stage 8 Lot 931	GF	W	57
	1.FL		64
Stage 8 Lot 931	GF	N	58
	1.FL		64

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 932	GF	N	58
	1.FL		63
Stage 8 Lot 932	GF	E	51
	1.FL		63
Stage 8 Lot 932	GF	S	56
	1.FL		63
Stage 8 Lot 932	GF	W	57
	1.FL		63
Stage 8 Lot 933	GF	E	51
	1.FL		62
Stage 8 Lot 933	GF	S	55
	1.FL		62
Stage 8 Lot 933	GF	W	56
	1.FL		62
Stage 8 Lot 933	GF	N	56
	1.FL		62
Stage 8 Lot 934	GF	N	54
	1.FL		62
Stage 8 Lot 934	GF	E	51
	1.FL		62
Stage 8 Lot 934	GF	S	55
	1.FL		62
Stage 8 Lot 934	GF	W	56
	1.FL		62
Stage 8 Lot 937	GF	N	55
	1.FL		61
Stage 8 Lot 937	GF	W	58
	1.FL		61
Stage 8 Lot 937	GF	S	55
	1.FL		61
Stage 8 Lot 937	GF	E	50
	1.FL		61
Stage 8 Lot 938	GF	N	56
	1.FL		61
Stage 8 Lot 938	GF	W	58
	1.FL		61
Stage 8 Lot 938	GF	S	55
	1.FL		61
Stage 8 Lot 938	GF	E	50
	1.FL		61
Stage 8 Lot 939	GF	E	50
	1.FL		60

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 939	GF	S	55
	1.FL		60
Stage 8 Lot 939	GF	W	56
	1.FL		61
Stage 8 Lot 939	GF	N	55
	1.FL		60
Stage 8 Lot 940	GF	E	49
	1.FL		60
Stage 8 Lot 940	GF	S	54
	1.FL		60
Stage 8 Lot 940	GF	W	54
	1.FL		60
Stage 8 Lot 940	GF	N	55
	1.FL		60
Stage 8 Lot 941	GF	E	49
	1.FL		60
Stage 8 Lot 941	GF	S	54
	1.FL		60
Stage 8 Lot 941	GF	W	54
	1.FL		60
Stage 8 Lot 941	GF	N	55
	1.FL		60
Stage 8 Lot 942	GF	N	54
	1.FL		61
Stage 8 Lot 942	GF	E	50
	1.FL		61
Stage 8 Lot 942	GF	S	57
	1.FL		62
Stage 8 Lot 942	GF	W	56
	1.FL		62
Stage 8 Lot 946	GF	E	50
	1.FL		61
Stage 8 Lot 946	GF	N	54
	1.FL		61
Stage 8 Lot 946	GF	W	56
	1.FL		61
Stage 8 Lot 946	GF	S	56
	1.FL		61
Stage 8 Lot 947	GF	N	55
	1.FL		62
Stage 8 Lot 947	GF	W	56
	1.FL		62

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 947	GF	S	57
	1.FL		62
Stage 8 Lot 947	GF	E	51
	1.FL		62
Stage 8 Lot 948	GF	W	56
	1.FL		62
Stage 8 Lot 948	GF	N	55
	1.FL		62
Stage 8 Lot 948	GF	E	51
	1.FL		62
Stage 8 Lot 948	GF	S	58
	1.FL		63
Stage 8 Lot 949	GF	S	58
	1.FL		63
Stage 8 Lot 949	GF	W	57
	1.FL		63
Stage 8 Lot 949	GF	N	56
	1.FL		63
Stage 8 Lot 949	GF	E	51
	1.FL		63
Stage 8 Lot 950	GF	S	59
	1.FL		64
Stage 8 Lot 950	GF	W	57
	1.FL		64
Stage 8 Lot 950	GF	N	56
	1.FL		64
Stage 8 Lot 950	GF	E	52
	1.FL		63
Stage 8 Lot 951	GF	N	57
	1.FL		65
Stage 8 Lot 951	GF	W	58
	1.FL		65
Stage 8 Lot 951	GF	S	59
	1.FL		65
Stage 8 Lot 951	GF	E	52
	1.FL		64
Stage 8 Lot 952	GF	S	60
	1.FL		66
Stage 8 Lot 952	GF	W	58
	1.FL		66
Stage 8 Lot 952	GF	N	58
	1.FL		65

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 952	GF	E	52
	1.FL		65
Stage 8 Lot 953	GF	W	60
	1.FL		67
Stage 8 Lot 953	GF	N	58
	1.FL		66
Stage 8 Lot 953	GF	E	53
	1.FL		66
Stage 8 Lot 953	GF	S	61
	1.FL		67
Stage 8 Lot 954	GF	E	53
	1.FL		67
Stage 8 Lot 954	GF	S	63
	1.FL		68
Stage 8 Lot 954	GF	N	60
	1.FL		68
Stage 8 Lot 954	GF	W	66
	1.FL		69
Stage 8 Lot 955	GF	N	61
	1.FL		68
Stage 8 Lot 955	GF	E	53
	1.FL		67
Stage 8 Lot 955	GF	S	60
	1.FL		68
Stage 8 Lot 955	GF	W	66
	1.FL		69
Stage 8 Lot 956	GF	E	53
	1.FL		67
Stage 8 Lot 956	GF	N	60
	1.FL		68
Stage 8 Lot 956	GF	S	61
	1.FL		68
Stage 8 Lot 956	GF	W	66
	1.FL		69
Stage 8 Lot 957	GF	E	53
	1.FL		67
Stage 8 Lot 957	GF	N	61
	1.FL		68
Stage 8 Lot 957	GF	S	60
	1.FL		68
Stage 8 Lot 957	GF	W	65
	1.FL		69

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 958	GF	N	60
	1.FL		66
Stage 8 Lot 958	GF	S	59
	1.FL		66
Stage 8 Lot 958	GF	E	53
	1.FL		66
Stage 8 Lot 958	GF	W	60
	1.FL		67
Stage 8 Lot 959	GF	W	58
	1.FL		65
Stage 8 Lot 959	GF	S	57
	1.FL		65
Stage 8 Lot 959	GF	E	52
	1.FL		65
Stage 8 Lot 959	GF	N	59
	1.FL		65
Stage 8 Lot 960	GF	E	52
	1.FL		64
Stage 8 Lot 960	GF	N	58
	1.FL		64
Stage 8 Lot 960	GF	W	57
	1.FL		65
Stage 8 Lot 960	GF	S	57
	1.FL		64
Stage 8 Lot 961	GF	S	57
	1.FL		64
Stage 8 Lot 961	GF	E	52
	1.FL		64
Stage 8 Lot 961	GF	N	58
	1.FL		64
Stage 8 Lot 961	GF	W	58
	1.FL		64
Stage 8 Lot 962	GF	E	51
	1.FL		63
Stage 8 Lot 962	GF	N	57
	1.FL		63
Stage 8 Lot 962	GF	W	57
	1.FL		63
Stage 8 Lot 962	GF	S	56
	1.FL		63
Stage 8 Lot 963	GF	S	56
	1.FL		63

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 963	GF	E	51
	1.FL		62
Stage 8 Lot 963	GF	N	57
	1.FL		62
Stage 8 Lot 963	GF	W	56
	1.FL		63
Stage 8 Lot 964	GF	N	56
	1.FL		62
Stage 8 Lot 964	GF	S	56
	1.FL		62
Stage 8 Lot 964	GF	E	51
	1.FL		62
Stage 8 Lot 964	GF	W	56
	1.FL		62
Stage 8 Lot 965	GF	N	55
	1.FL		61
Stage 8 Lot 965	GF	W	55
	1.FL		61
Stage 8 Lot 965	GF	E	50
	1.FL		61
Stage 8 Lot 965	GF	S	55
	1.FL		61
Stage 8 Lot 970	GF	N	53
	1.FL		59
Stage 8 Lot 970	GF	W	54
	1.FL		59
Stage 8 Lot 970	GF	S	52
	1.FL		59
Stage 8 Lot 970	GF	E	49
	1.FL		59
Stage 8 Lot 971	GF	W	55
	1.FL		59
Stage 8 Lot 971	GF	N	53
	1.FL		59
Stage 8 Lot 971	GF	E	49
	1.FL		59
Stage 8 Lot 971	GF	S	54
	1.FL		59
Stage 8 Lot 972	GF	E	49
	1.FL		59
Stage 8 Lot 972	GF	N	54
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 972	GF	W	55
	1.FL		59
Stage 8 Lot 972	GF	S	54
	1.FL		59
Stage 8 Lot 973	GF	S	55
	1.FL		60
Stage 8 Lot 973	GF	E	49
	1.FL		59
Stage 8 Lot 973	GF	W	54
	1.FL		60
Stage 8 Lot 973	GF	N	53
	1.FL		60
Stage 8 Lot 974	GF	E	49
	1.FL		60
Stage 8 Lot 974	GF	S	56
	1.FL		60
Stage 8 Lot 974	GF	W	55
	1.FL		60
Stage 8 Lot 974	GF	N	53
	1.FL		60
Stage 8 Lot 975	GF	N	54
	1.FL		60
Stage 8 Lot 975	GF	E	50
	1.FL		60
Stage 8 Lot 975	GF	S	56
	1.FL		61
Stage 8 Lot 975	GF	W	55
	1.FL		61
Stage 8 Lot 976	GF	N	54
	1.FL		61
Stage 8 Lot 976	GF	W	55
	1.FL		61
Stage 8 Lot 976	GF	S	56
	1.FL		61
Stage 8 Lot 976	GF	E	50
	1.FL		61
Stage 8 Lot 977	GF	W	56
	1.FL		61
Stage 8 Lot 977	GF	S	56
	1.FL		61
Stage 8 Lot 977	GF	E	50
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 977	GF	N	54
	1.FL		61
Stage 8 Lot 978	GF	W	56
	1.FL		62
Stage 8 Lot 978	GF	S	57
	1.FL		62
Stage 8 Lot 978	GF	E	51
	1.FL		62
Stage 8 Lot 978	GF	N	54
	1.FL		62
Stage 8 Lot 980	GF	E	51
	1.FL		62
Stage 8 Lot 980	GF	S	57
	1.FL		62
Stage 8 Lot 980	GF	W	59
	1.FL		63
Stage 8 Lot 980	GF	N	55
	1.FL		62
Stage 8 Lot 981	GF	N	55
	1.FL		62
Stage 8 Lot 981	GF	E	51
	1.FL		62
Stage 8 Lot 981	GF	S	56
	1.FL		62
Stage 8 Lot 981	GF	W	59
	1.FL		63
Stage 8 Lot 993	GF	W	57
	1.FL		65
Stage 8 Lot 993	GF	N	56
	1.FL		64
Stage 8 Lot 993	GF	E	52
	1.FL		64
Stage 8 Lot 993	GF	S	58
	1.FL		65
Stage 8 Lot 994	GF	W	58
	1.FL		66
Stage 8 Lot 994	GF	N	57
	1.FL		65
Stage 8 Lot 994	GF	E	52
	1.FL		65
Stage 8 Lot 994	GF	S	60
	1.FL		65

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 995	GF	S	61
	1.FL		67
Stage 8 Lot 995	GF	W	60
	1.FL		67
Stage 8 Lot 995	GF	N	57
	1.FL		66
Stage 8 Lot 995	GF	E	53
	1.FL		66
Stage 8 Lot 996	GF	W	65
	1.FL		68
Stage 8 Lot 996	GF	E	53
	1.FL		67
Stage 8 Lot 996	GF	S	63
	1.FL		68
Stage 8 Lot 996	GF	N	59
	1.FL		68
Stage 8 Lot 1045	GF	N	53
	1.FL		58
Stage 8 Lot 1045	GF	E	50
	1.FL		58
Stage 8 Lot 1045	GF	S	52
	1.FL		58
Stage 8 Lot 1045	GF	W	56
	1.FL		59
Stage 8 Lot 1046	GF	S	52
	1.FL		58
Stage 8 Lot 1046	GF	E	50
	1.FL		58
Stage 8 Lot 1046	GF	N	52
	1.FL		58
Stage 8 Lot 1046	GF	W	56
	1.FL		58
Stage 8 Lot 1049	GF	S	52
	1.FL		58
Stage 8 Lot 1049	GF	W	56
	1.FL		58
Stage 8 Lot 1049	GF	N	53
	1.FL		58
Stage 8 Lot 1049	GF	E	49
	1.FL		58
Stage 8 Lot 1050	GF	N	52
	1.FL		58

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 1050	GF	E	49
	1.FL		58
Stage 8 Lot 1050	GF	W	56
	1.FL		58
Stage 8 Lot 1050	GF	S	52
	1.FL		58
Stage 8 Lot 1051	GF	W	56
	1.FL		58
Stage 8 Lot 1051	GF	S	52
	1.FL		58
Stage 8 Lot 1051	GF	E	49
	1.FL		58
Stage 8 Lot 1051	GF	N	52
	1.FL		58
Stage 8 Lot 1052	GF	NE	48
	1.FL		57
Stage 8 Lot 1052	GF	S	52
	1.FL		58
Stage 8 Lot 1052	GF	SW	56
	1.FL		58
Stage 8 Lot 1052	GF	N	52
	1.FL		58
Stage 8 Lot 1053	GF	E	48
	1.FL		57
Stage 8 Lot 1053	GF	S	52
	1.FL		57
Stage 8 Lot 1053	GF	W	56
	1.FL		58
Stage 8 Lot 1053	GF	N	52
	1.FL		57
Stage 8 Lot 1054	GF	E	47
	1.FL		57
Stage 8 Lot 1054	GF	S	52
	1.FL		58
Stage 8 Lot 1054	GF	W	56
	1.FL		58
Stage 8 Lot 1054	GF	N	52
	1.FL		58
Stage 8 Lot 1055	GF	W	56
	1.FL		58
Stage 8 Lot 1055	GF	N	52
	1.FL		58

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 1055	GF	E	47
	1.FL		58
Stage 8 Lot 1055	GF	S	53
	1.FL		58
Stage 8 Lot 1056	GF	E	49
	1.FL		58
Stage 8 Lot 1056	GF	S	53
	1.FL		58
Stage 8 Lot 1056	GF	NW	56
	1.FL		58
Stage 8 Lot 1056	GF	N	51
	1.FL		58
Stage 8 Lot 1057	GF	SE	51
	1.FL		58
Stage 8 Lot 1057	GF	SW	53
	1.FL		58
Stage 8 Lot 1057	GF	NW	56
	1.FL		58
Stage 8 Lot 1057	GF	NE	51
	1.FL		58
Stage 8 Lot 1058	GF	NE	51
	1.FL		58
Stage 8 Lot 1058	GF	SE	52
	1.FL		58
Stage 8 Lot 1058	GF	NW	56
	1.FL		58
Stage 8 Lot 1058	GF	SW	56
	1.FL		58
Stage 8 Lot 1062	GF	E	49
	1.FL		59
Stage 8 Lot 1062	GF	S	54
	1.FL		59
Stage 8 Lot 1062	GF	W	54
	1.FL		59
Stage 8 Lot 1062	GF	N	55
	1.FL		59
Stage 8 Lot 1063	GF	E	48
	1.FL		59
Stage 8 Lot 1063	GF	S	53
	1.FL		59
Stage 8 Lot 1063	GF	W	54
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 8 Lot 1063	GF	N	55
	1.FL		59
Stage 9 Lot 943	GF	E	53
	1.FL		65
Stage 9 Lot 943	GF	S	58
	1.FL		66
Stage 9 Lot 943	GF	N	58
	1.FL		66
Stage 9 Lot 943	GF	W	64
	1.FL		67
Stage 9 Lot 966	GF	E	53
	1.FL		65
Stage 9 Lot 966	GF	N	58
	1.FL		66
Stage 9 Lot 966	GF	S	58
	1.FL		66
Stage 9 Lot 966	GF	W	64
	1.FL		67
Stage 9 Lot 967	GF	E	53
	1.FL		64
Stage 9 Lot 967	GF	S	56
	1.FL		64
Stage 9 Lot 967	GF	W	59
	1.FL		65
Stage 9 Lot 967	GF	N	56
	1.FL		64
Stage 9 Lot 968	GF	E	53
	1.FL		66
Stage 9 Lot 968	GF	S	59
	1.FL		67
Stage 9 Lot 968	GF	N	59
	1.FL		67
Stage 9 Lot 968	GF	W	65
	1.FL		68
Stage 9 Lot 969	GF	E	52
	1.FL		64
Stage 9 Lot 969	GF	S	57
	1.FL		65
Stage 9 Lot 969	GF	W	59
	1.FL		66
Stage 9 Lot 969	GF	N	56
	1.FL		65

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 982	GF	E	51
	1.FL		62
Stage 9 Lot 982	GF	N	55
	1.FL		62
Stage 9 Lot 982	GF	W	59
	1.FL		63
Stage 9 Lot 982	GF	S	55
	1.FL		62
Stage 9 Lot 983	GF	E	51
	1.FL		62
Stage 9 Lot 983	GF	S	55
	1.FL		62
Stage 9 Lot 983	GF	W	58
	1.FL		62
Stage 9 Lot 983	GF	N	56
	1.FL		62
Stage 9 Lot 985	GF	N	56
	1.FL		62
Stage 9 Lot 985	GF	W	56
	1.FL		62
Stage 9 Lot 985	GF	S	55
	1.FL		62
Stage 9 Lot 985	GF	E	51
	1.FL		61
Stage 9 Lot 986	GF	E	50
	1.FL		61
Stage 9 Lot 986	GF	S	54
	1.FL		61
Stage 9 Lot 986	GF	W	55
	1.FL		61
Stage 9 Lot 986	GF	N	55
	1.FL		61
Stage 9 Lot 987	GF	N	55
	1.FL		61
Stage 9 Lot 987	GF	E	50
	1.FL		61
Stage 9 Lot 987	GF	S	54
	1.FL		61
Stage 9 Lot 987	GF	W	55
	1.FL		61
Stage 9 Lot 988	GF	S	54
	1.FL		60

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 988	GF	E	50
	1.FL		60
Stage 9 Lot 988	GF	N	55
	1.FL		60
Stage 9 Lot 988	GF	W	55
	1.FL		60
Stage 9 Lot 989	GF	S	54
	1.FL		60
Stage 9 Lot 989	GF	E	50
	1.FL		60
Stage 9 Lot 989	GF	N	54
	1.FL		60
Stage 9 Lot 989	GF	W	54
	1.FL		60
Stage 9 Lot 990	GF	N	55
	1.FL		60
Stage 9 Lot 990	GF	W	55
	1.FL		59
Stage 9 Lot 990	GF	S	53
	1.FL		59
Stage 9 Lot 990	GF	E	50
	1.FL		59
Stage 9 Lot 991	GF	N	55
	1.FL		59
Stage 9 Lot 991	GF	W	55
	1.FL		59
Stage 9 Lot 991	GF	S	52
	1.FL		59
Stage 9 Lot 991	GF	E	50
	1.FL		59
Stage 9 Lot 992	GF	N	53
	1.FL		59
Stage 9 Lot 992	GF	W	54
	1.FL		59
Stage 9 Lot 992	GF	S	53
	1.FL		59
Stage 9 Lot 992	GF	E	50
	1.FL		59
Stage 9 Lot 997	GF	E	53
	1.FL		66
Stage 9 Lot 997	GF	S	59
	1.FL		67

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 997	GF	W	65
	1.FL		68
Stage 9 Lot 997	GF	N	59
	1.FL		67
Stage 9 Lot 998	GF	N	58
	1.FL		66
Stage 9 Lot 998	GF	W	65
	1.FL		68
Stage 9 Lot 998	GF	S	59
	1.FL		66
Stage 9 Lot 998	GF	E	53
	1.FL		65
Stage 9 Lot 999	GF	N	58
	1.FL		66
Stage 9 Lot 999	GF	E	53
	1.FL		65
Stage 9 Lot 999	GF	S	59
	1.FL		66
Stage 9 Lot 999	GF	W	65
	1.FL		67
Stage 9 Lot 1000	GF	E	53
	1.FL		65
Stage 9 Lot 1000	GF	S	58
	1.FL		66
Stage 9 Lot 1000	GF	W	65
	1.FL		67
Stage 9 Lot 1000	GF	N	58
	1.FL		66
Stage 9 Lot 1001	GF	E	53
	1.FL		65
Stage 9 Lot 1001	GF	S	58
	1.FL		66
Stage 9 Lot 1001	GF	W	65
	1.FL		67
Stage 9 Lot 1001	GF	N	58
	1.FL		66
Stage 9 Lot 1002	GF	E	53
	1.FL		65
Stage 9 Lot 1002	GF	S	58
	1.FL		66
Stage 9 Lot 1002	GF	W	65
	1.FL		67

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1002	GF	N	58
	1.FL		66
Stage 9 Lot 1003	GF	E	53
	1.FL		65
Stage 9 Lot 1003	GF	S	58
	1.FL		66
Stage 9 Lot 1003	GF	W	65
	1.FL		67
Stage 9 Lot 1003	GF	N	58
	1.FL		66
Stage 9 Lot 1004	GF	N	61
	1.FL		66
Stage 9 Lot 1004	GF	W	63
	1.FL		67
Stage 9 Lot 1004	GF	S	58
	1.FL		66
Stage 9 Lot 1004	GF	E	54
	1.FL		65
Stage 9 Lot 1005	GF	W	61
	1.FL		65
Stage 9 Lot 1005	GF	N	60
	1.FL		64
Stage 9 Lot 1005	GF	E	54
	1.FL		64
Stage 9 Lot 1005	GF	S	55
	1.FL		64
Stage 9 Lot 1006	GF	S	56
	1.FL		64
Stage 9 Lot 1006	GF	W	59
	1.FL		65
Stage 9 Lot 1006	GF	N	56
	1.FL		64
Stage 9 Lot 1006	GF	E	53
	1.FL		63
Stage 9 Lot 1007	GF	N	56
	1.FL		64
Stage 9 Lot 1007	GF	W	59
	1.FL		65
Stage 9 Lot 1007	GF	S	56
	1.FL		64
Stage 9 Lot 1007	GF	E	53
	1.FL		63

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1008	GF	E	52
	1.FL		63
Stage 9 Lot 1008	GF	S	56
	1.FL		64
Stage 9 Lot 1008	GF	W	59
	1.FL		65
Stage 9 Lot 1008	GF	N	56
	1.FL		64
Stage 9 Lot 1009	GF	E	52
	1.FL		64
Stage 9 Lot 1009	GF	S	56
	1.FL		64
Stage 9 Lot 1009	GF	W	60
	1.FL		65
Stage 9 Lot 1009	GF	N	56
	1.FL		64
Stage 9 Lot 1010	GF	E	52
	1.FL		64
Stage 9 Lot 1010	GF	S	56
	1.FL		64
Stage 9 Lot 1010	GF	W	60
	1.FL		65
Stage 9 Lot 1010	GF	N	56
	1.FL		64
Stage 9 Lot 1011	GF	E	52
	1.FL		64
Stage 9 Lot 1011	GF	S	56
	1.FL		65
Stage 9 Lot 1011	GF	W	60
	1.FL		65
Stage 9 Lot 1011	GF	N	57
	1.FL		64
Stage 9 Lot 1012	GF	N	56
	1.FL		65
Stage 9 Lot 1012	GF	W	59
	1.FL		66
Stage 9 Lot 1012	GF	S	56
	1.FL		65
Stage 9 Lot 1012	GF	E	52
	1.FL		64
Stage 9 Lot 1013	GF	N	56
	1.FL		65

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1013	GF	W	60
	1.FL		66
Stage 9 Lot 1013	GF	S	57
	1.FL		65
Stage 9 Lot 1013	GF	E	52
	1.FL		64
Stage 9 Lot 1014	GF	S	56
	1.FL		62
Stage 9 Lot 1014	GF	W	58
	1.FL		62
Stage 9 Lot 1014	GF	N	54
	1.FL		62
Stage 9 Lot 1014	GF	E	51
	1.FL		61
Stage 9 Lot 1015	GF	E	51
	1.FL		61
Stage 9 Lot 1015	GF	S	55
	1.FL		62
Stage 9 Lot 1015	GF	W	59
	1.FL		62
Stage 9 Lot 1015	GF	N	54
	1.FL		62
Stage 9 Lot 1016	GF	W	59
	1.FL		62
Stage 9 Lot 1016	GF	N	54
	1.FL		62
Stage 9 Lot 1016	GF	E	51
	1.FL		61
Stage 9 Lot 1016	GF	S	54
	1.FL		62
Stage 9 Lot 1017	GF	S	54
	1.FL		62
Stage 9 Lot 1017	GF	E	51
	1.FL		61
Stage 9 Lot 1017	GF	N	54
	1.FL		62
Stage 9 Lot 1017	GF	W	59
	1.FL		62
Stage 9 Lot 1018	GF	S	54
	1.FL		62
Stage 9 Lot 1018	GF	W	59
	1.FL		62

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1018	GF	N	54
	1.FL		62
Stage 9 Lot 1018	GF	E	51
	1.FL		61
Stage 9 Lot 1019	GF	E	51
	1.FL		62
Stage 9 Lot 1019	GF	N	54
	1.FL		62
Stage 9 Lot 1019	GF	W	59
	1.FL		62
Stage 9 Lot 1019	GF	S	54
	1.FL		62
Stage 9 Lot 1020	GF	E	50
	1.FL		60
Stage 9 Lot 1020	GF	N	53
	1.FL		61
Stage 9 Lot 1020	GF	W	57
	1.FL		61
Stage 9 Lot 1020	GF	S	55
	1.FL		61
Stage 9 Lot 1021	GF	S	54
	1.FL		61
Stage 9 Lot 1021	GF	W	57
	1.FL		61
Stage 9 Lot 1021	GF	N	53
	1.FL		61
Stage 9 Lot 1021	GF	E	50
	1.FL		61
Stage 9 Lot 1022	GF	E	50
	1.FL		61
Stage 9 Lot 1022	GF	N	53
	1.FL		61
Stage 9 Lot 1022	GF	W	57
	1.FL		61
Stage 9 Lot 1022	GF	S	53
	1.FL		61
Stage 9 Lot 1023	GF	S	53
	1.FL		61
Stage 9 Lot 1023	GF	E	51
	1.FL		61
Stage 9 Lot 1023	GF	N	53
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1023	GF	W	57
	1.FL		61
Stage 9 Lot 1024	GF	E	51
	1.FL		61
Stage 9 Lot 1024	GF	W	57
	1.FL		61
Stage 9 Lot 1024	GF	S	53
	1.FL		61
Stage 9 Lot 1024	GF	N	53
	1.FL		61
Stage 9 Lot 1025	GF	E	51
	1.FL		61
Stage 9 Lot 1025	GF	N	53
	1.FL		61
Stage 9 Lot 1025	GF	W	57
	1.FL		61
Stage 9 Lot 1025	GF	S	53
	1.FL		61
Stage 9 Lot 1026	GF	E	51
	1.FL		61
Stage 9 Lot 1026	GF	S	53
	1.FL		61
Stage 9 Lot 1026	GF	W	57
	1.FL		61
Stage 9 Lot 1026	GF	N	53
	1.FL		61
Stage 9 Lot 1027	GF	E	51
	1.FL		61
Stage 9 Lot 1027	GF	N	53
	1.FL		61
Stage 9 Lot 1027	GF	W	57
	1.FL		61
Stage 9 Lot 1027	GF	S	53
	1.FL		61
Stage 9 Lot 1029	GF	E	55
	1.FL		64
Stage 9 Lot 1029	GF	S	56
	1.FL		63
Stage 9 Lot 1029	GF	W	60
	1.FL		64
Stage 9 Lot 1029	GF	N	61
	1.FL		64

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1030	GF	W	55
	1.FL		62
Stage 9 Lot 1030	GF	S	54
	1.FL		62
Stage 9 Lot 1030	GF	E	54
	1.FL		63
Stage 9 Lot 1030	GF	N	60
	1.FL		64
Stage 9 Lot 1031	GF	N	59
	1.FL		64
Stage 9 Lot 1031	GF	E	54
	1.FL		63
Stage 9 Lot 1031	GF	W	56
	1.FL		62
Stage 9 Lot 1031	GF	S	54
	1.FL		62
Stage 9 Lot 1032	GF	E	54
	1.FL		63
Stage 9 Lot 1032	GF	N	59
	1.FL		64
Stage 9 Lot 1032	GF	W	56
	1.FL		62
Stage 9 Lot 1032	GF	S	54
	1.FL		62
Stage 9 Lot 1033	GF	S	54
	1.FL		62
Stage 9 Lot 1033	GF	E	56
	1.FL		63
Stage 9 Lot 1033	GF	N	58
	1.FL		64
Stage 9 Lot 1033	GF	W	56
	1.FL		63
Stage 9 Lot 1034	GF	E	53
	1.FL		63
Stage 9 Lot 1034	GF	N	57
	1.FL		64
Stage 9 Lot 1034	GF	W	59
	1.FL		63
Stage 9 Lot 1034	GF	S	55
	1.FL		62
Stage 9 Lot 1035	GF	E	53
	1.FL		62

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1035	GF	S	56
	1.FL		62
Stage 9 Lot 1035	GF	N	58
	1.FL		64
Stage 9 Lot 1035	GF	W	57
	1.FL		63
Stage 9 Lot 1036	GF	W	55
	1.FL		62
Stage 9 Lot 1036	GF	N	56
	1.FL		63
Stage 9 Lot 1036	GF	E	53
	1.FL		62
Stage 9 Lot 1036	GF	S	55
	1.FL		61
Stage 9 Lot 1037	GF	E	55
	1.FL		61
Stage 9 Lot 1037	GF	S	52
	1.FL		60
Stage 9 Lot 1037	GF	W	56
	1.FL		60
Stage 9 Lot 1037	GF	N	54
	1.FL		60
Stage 9 Lot 1038	GF	E	54
	1.FL		60
Stage 9 Lot 1038	GF	S	52
	1.FL		60
Stage 9 Lot 1038	GF	W	56
	1.FL		60
Stage 9 Lot 1038	GF	N	54
	1.FL		60
Stage 9 Lot 1039	GF	E	53
	1.FL		60
Stage 9 Lot 1039	GF	S	52
	1.FL		59
Stage 9 Lot 1039	GF	W	56
	1.FL		60
Stage 9 Lot 1039	GF	N	54
	1.FL		60
Stage 9 Lot 1040	GF	E	53
	1.FL		59
Stage 9 Lot 1040	GF	S	53
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1040	GF	W	57
	1.FL		59
Stage 9 Lot 1040	GF	N	54
	1.FL		59
Stage 9 Lot 1041	GF	N	54
	1.FL		59
Stage 9 Lot 1041	GF	W	57
	1.FL		59
Stage 9 Lot 1041	GF	S	53
	1.FL		59
Stage 9 Lot 1041	GF	E	52
	1.FL		59
Stage 9 Lot 1042	GF	N	53
	1.FL		59
Stage 9 Lot 1042	GF	W	56
	1.FL		59
Stage 9 Lot 1042	GF	S	52
	1.FL		59
Stage 9 Lot 1042	GF	E	51
	1.FL		59
Stage 9 Lot 1043	GF	E	51
	1.FL		59
Stage 9 Lot 1043	GF	S	52
	1.FL		59
Stage 9 Lot 1043	GF	W	56
	1.FL		59
Stage 9 Lot 1043	GF	N	53
	1.FL		59
Stage 9 Lot 1044	GF	E	50
	1.FL		59
Stage 9 Lot 1044	GF	S	52
	1.FL		59
Stage 9 Lot 1044	GF	W	56
	1.FL		59
Stage 9 Lot 1044	GF	N	53
	1.FL		59
Stage 9 Lot 1047	GF	W	57
	1.FL		61
Stage 9 Lot 1047	GF	S	52
	1.FL		61
Stage 9 Lot 1047	GF	E	56
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 16 h)

Receiver	Floor	Facade	SPL Leq (16 hour) dB(A)
Stage 9 Lot 1047	GF	N	56
	1.FL		61
Stage 9 Lot 1059	GF	S	53
	1.FL		61
Stage 9 Lot 1059	GF	E	51
	1.FL		61
Stage 9 Lot 1059	GF	N	55
	1.FL		61
Stage 9 Lot 1059	GF	W	58
	1.FL		62
Stage 9 Lot 1060	GF	S	53
	1.FL		61
Stage 9 Lot 1060	GF	W	58
	1.FL		62
Stage 9 Lot 1060	GF	N	57
	1.FL		62
Stage 9 Lot 1060	GF	E	52
	1.FL		61
Stage 9 Lot 1061	GF	E	51
	1.FL		62
Stage 9 Lot 1061	GF	N	54
	1.FL		62
Stage 9 Lot 1061	GF	S	54
	1.FL		62
Stage 9 Lot 1061	GF	W	59
	1.FL		62
Stage 9 Lot 1070	GF	W	59
	1.FL		62
Stage 9 Lot 1070	GF	N	57
	1.FL		62
Stage 9 Lot 1070	GF	E	52
	1.FL		62
Stage 9 Lot 1070	GF	S	54
	1.FL		62

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 820	GF	N	53
	1.FL		61
Stage 7 Lot 820	GF	W	55
	1.FL		61
Stage 7 Lot 820	GF	S	55
	1.FL		61
Stage 7 Lot 820	GF	E	47
	1.FL		61
Stage 7 Lot 821	GF	N	49
	1.FL		54
Stage 7 Lot 821	GF	W	48
	1.FL		54
Stage 7 Lot 821	GF	S	47
	1.FL		54
Stage 7 Lot 821	GF	E	43
	1.FL		53
Stage 7 Lot 830	GF	N	49
	1.FL		54
Stage 7 Lot 830	GF	W	50
	1.FL		55
Stage 7 Lot 830	GF	S	50
	1.FL		55
Stage 7 Lot 830	GF	E	44
	1.FL		54
Stage 7 Lot 831	GF	W	52
	1.FL		55
Stage 7 Lot 831	GF	N	48
	1.FL		55
Stage 7 Lot 831	GF	E	44
	1.FL		55
Stage 7 Lot 831	GF	S	50
	1.FL		55
Stage 7 Lot 832	GF	E	44
	1.FL		55
Stage 7 Lot 832	GF	S	49
	1.FL		55
Stage 7 Lot 832	GF	N	49
	1.FL		55
Stage 7 Lot 832	GF	W	52
	1.FL		55
Stage 7 Lot 869	GF	N	49
	1.FL		55

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 869	GF	W	51
	1.FL		56
Stage 7 Lot 869	GF	S	48
	1.FL		55
Stage 7 Lot 869	GF	E	44
	1.FL		55
Stage 7 Lot 870	GF	N	48
	1.FL		55
Stage 7 Lot 870	GF	W	52
	1.FL		56
Stage 7 Lot 870	GF	S	52
	1.FL		55
Stage 7 Lot 870	GF	E	44
	1.FL		55
Stage 7 Lot 871	GF	E	45
	1.FL		56
Stage 7 Lot 871	GF	S	52
	1.FL		56
Stage 7 Lot 871	GF	W	51
	1.FL		56
Stage 7 Lot 871	GF	N	49
	1.FL		56
Stage 7 Lot 872	GF	E	45
	1.FL		56
Stage 7 Lot 872	GF	S	52
	1.FL		57
Stage 7 Lot 872	GF	W	51
	1.FL		57
Stage 7 Lot 872	GF	N	49
	1.FL		57
Stage 7 Lot 873	GF	E	45
	1.FL		57
Stage 7 Lot 873	GF	S	53
	1.FL		57
Stage 7 Lot 873	GF	W	51
	1.FL		57
Stage 7 Lot 873	GF	N	50
	1.FL		57
Stage 7 Lot 874	GF	E	46
	1.FL		57
Stage 7 Lot 874	GF	S	53
	1.FL		57

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 874	GF	W	52
	1.FL		58
Stage 7 Lot 874	GF	N	50
	1.FL		57
Stage 7 Lot 875	GF	E	46
	1.FL		58
Stage 7 Lot 875	GF	S	54
	1.FL		58
Stage 7 Lot 875	GF	W	53
	1.FL		58
Stage 7 Lot 875	GF	N	51
	1.FL		58
Stage 7 Lot 876	GF	S	54
	1.FL		59
Stage 7 Lot 876	GF	W	53
	1.FL		59
Stage 7 Lot 876	GF	N	51
	1.FL		59
Stage 7 Lot 876	GF	E	46
	1.FL		59
Stage 7 Lot 877	GF	E	47
	1.FL		59
Stage 7 Lot 877	GF	S	55
	1.FL		60
Stage 7 Lot 877	GF	W	54
	1.FL		60
Stage 7 Lot 877	GF	N	52
	1.FL		60
Stage 7 Lot 878	GF	E	48
	1.FL		62
Stage 7 Lot 878	GF	N	54
	1.FL		63
Stage 7 Lot 878	GF	W	59
	1.FL		64
Stage 7 Lot 878	GF	S	56
	1.FL		63
Stage 7 Lot 879	GF	W	59
	1.FL		64
Stage 7 Lot 879	GF	S	55
	1.FL		63
Stage 7 Lot 879	GF	E	48
	1.FL		62

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 879	GF	N	55
	1.FL		63
Stage 7 Lot 880	GF	E	48
	1.FL		62
Stage 7 Lot 880	GF	N	55
	1.FL		63
Stage 7 Lot 880	GF	W	60
	1.FL		64
Stage 7 Lot 880	GF	S	54
	1.FL		63
Stage 7 Lot 881	GF	W	60
	1.FL		64
Stage 7 Lot 881	GF	N	58
	1.FL		63
Stage 7 Lot 881	GF	E	48
	1.FL		62
Stage 7 Lot 881	GF	S	54
	1.FL		63
Stage 7 Lot 882	GF	E	47
	1.FL		60
Stage 7 Lot 882	GF	N	55
	1.FL		61
Stage 7 Lot 882	GF	W	55
	1.FL		61
Stage 7 Lot 882	GF	S	52
	1.FL		61
Stage 7 Lot 883	GF	W	52
	1.FL		60
Stage 7 Lot 883	GF	S	51
	1.FL		60
Stage 7 Lot 883	GF	E	47
	1.FL		59
Stage 7 Lot 883	GF	N	54
	1.FL		60
Stage 7 Lot 884	GF	N	53
	1.FL		59
Stage 7 Lot 884	GF	W	51
	1.FL		59
Stage 7 Lot 884	GF	S	50
	1.FL		58
Stage 7 Lot 884	GF	E	46
	1.FL		58

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 885	GF	S	50
	1.FL		58
Stage 7 Lot 885	GF	W	51
	1.FL		58
Stage 7 Lot 885	GF	N	53
	1.FL		58
Stage 7 Lot 885	GF	E	46
	1.FL		57
Stage 7 Lot 886	GF	W	50
	1.FL		57
Stage 7 Lot 886	GF	N	52
	1.FL		57
Stage 7 Lot 886	GF	E	45
	1.FL		57
Stage 7 Lot 886	GF	S	49
	1.FL		57
Stage 7 Lot 887	GF	S	49
	1.FL		57
Stage 7 Lot 887	GF	W	50
	1.FL		57
Stage 7 Lot 887	GF	N	51
	1.FL		57
Stage 7 Lot 887	GF	E	45
	1.FL		57
Stage 7 Lot 888	GF	E	45
	1.FL		56
Stage 7 Lot 888	GF	S	49
	1.FL		56
Stage 7 Lot 888	GF	N	51
	1.FL		56
Stage 7 Lot 888	GF	W	50
	1.FL		56
Stage 7 Lot 889	GF	S	49
	1.FL		56
Stage 7 Lot 889	GF	W	50
	1.FL		56
Stage 7 Lot 889	GF	N	51
	1.FL		56
Stage 7 Lot 889	GF	E	44
	1.FL		56
Stage 7 Lot 890	GF	E	44
	1.FL		55

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 890	GF	S	49
	1.FL		56
Stage 7 Lot 890	GF	N	50
	1.FL		55
Stage 7 Lot 890	GF	W	50
	1.FL		56
Stage 7 Lot 891	GF	N	49
	1.FL		55
Stage 7 Lot 891	GF	W	50
	1.FL		55
Stage 7 Lot 891	GF	S	48
	1.FL		55
Stage 7 Lot 891	GF	E	44
	1.FL		55
Stage 7 Lot 892	GF	E	44
	1.FL		55
Stage 7 Lot 892	GF	S	48
	1.FL		55
Stage 7 Lot 892	GF	W	50
	1.FL		55
Stage 7 Lot 892	GF	N	48
	1.FL		55
Stage 7 Lot 893	GF	E	44
	1.FL		54
Stage 7 Lot 893	GF	S	48
	1.FL		54
Stage 7 Lot 893	GF	W	50
	1.FL		54
Stage 7 Lot 893	GF	N	48
	1.FL		54
Stage 7 Lot 894	GF	N	47
	1.FL		54
Stage 7 Lot 894	GF	E	45
	1.FL		54
Stage 7 Lot 894	GF	S	50
	1.FL		54
Stage 7 Lot 894	GF	W	50
	1.FL		54
Stage 7 Lot 895	GF	W	51
	1.FL		55
Stage 7 Lot 895	GF	S	50
	1.FL		55

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 895	GF	E	44
	1.FL		55
Stage 7 Lot 895	GF	N	48
	1.FL		55
Stage 7 Lot 896	GF	E	44
	1.FL		55
Stage 7 Lot 896	GF	S	49
	1.FL		55
Stage 7 Lot 896	GF	W	50
	1.FL		55
Stage 7 Lot 896	GF	N	49
	1.FL		55
Stage 7 Lot 897	GF	N	49
	1.FL		56
Stage 7 Lot 897	GF	W	51
	1.FL		56
Stage 7 Lot 897	GF	S	50
	1.FL		56
Stage 7 Lot 897	GF	E	44
	1.FL		55
Stage 7 Lot 898	GF	E	45
	1.FL		56
Stage 7 Lot 898	GF	S	51
	1.FL		56
Stage 7 Lot 898	GF	W	51
	1.FL		56
Stage 7 Lot 898	GF	N	50
	1.FL		56
Stage 7 Lot 899	GF	W	51
	1.FL		57
Stage 7 Lot 899	GF	S	51
	1.FL		57
Stage 7 Lot 899	GF	E	45
	1.FL		57
Stage 7 Lot 899	GF	N	50
	1.FL		57
Stage 7 Lot 900	GF	E	46
	1.FL		57
Stage 7 Lot 900	GF	S	52
	1.FL		58
Stage 7 Lot 900	GF	W	51
	1.FL		58

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 900	GF	N	51
	1.FL		58
Stage 7 Lot 901	GF	S	52
	1.FL		58
Stage 7 Lot 901	GF	W	52
	1.FL		59
Stage 7 Lot 901	GF	E	46
	1.FL		58
Stage 7 Lot 901	GF	N	51
	1.FL		58
Stage 7 Lot 902	GF	S	53
	1.FL		59
Stage 7 Lot 902	GF	W	52
	1.FL		60
Stage 7 Lot 902	GF	N	52
	1.FL		59
Stage 7 Lot 902	GF	E	47
	1.FL		59
Stage 7 Lot 903	GF	W	54
	1.FL		61
Stage 7 Lot 903	GF	S	54
	1.FL		61
Stage 7 Lot 903	GF	E	47
	1.FL		60
Stage 7 Lot 903	GF	N	53
	1.FL		61
Stage 7 Lot 904	GF	S	56
	1.FL		63
Stage 7 Lot 904	GF	W	60
	1.FL		64
Stage 7 Lot 904	GF	N	55
	1.FL		63
Stage 7 Lot 904	GF	E	48
	1.FL		62
Stage 7 Lot 905	GF	N	56
	1.FL		63
Stage 7 Lot 905	GF	W	60
	1.FL		64
Stage 7 Lot 905	GF	S	55
	1.FL		63
Stage 7 Lot 905	GF	E	48
	1.FL		62

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 906	GF	N	56
	1.FL		63
Stage 7 Lot 906	GF	E	48
	1.FL		62
Stage 7 Lot 906	GF	S	55
	1.FL		63
Stage 7 Lot 906	GF	W	60
	1.FL		64
Stage 7 Lot 907	GF	S	55
	1.FL		63
Stage 7 Lot 907	GF	E	48
	1.FL		62
Stage 7 Lot 907	GF	W	60
	1.FL		64
Stage 7 Lot 907	GF	N	57
	1.FL		63
Stage 7 Lot 908	GF	N	55
	1.FL		61
Stage 7 Lot 908	GF	E	47
	1.FL		61
Stage 7 Lot 908	GF	S	53
	1.FL		61
Stage 7 Lot 908	GF	W	55
	1.FL		61
Stage 7 Lot 909	GF	S	52
	1.FL		59
Stage 7 Lot 909	GF	E	47
	1.FL		59
Stage 7 Lot 909	GF	N	54
	1.FL		60
Stage 7 Lot 909	GF	W	52
	1.FL		60
Stage 7 Lot 910	GF	N	53
	1.FL		59
Stage 7 Lot 910	GF	E	46
	1.FL		58
Stage 7 Lot 910	GF	W	52
	1.FL		59
Stage 7 Lot 910	GF	S	51
	1.FL		58
Stage 7 Lot 911	GF	S	51
	1.FL		58

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 911	GF	E	46
	1.FL		58
Stage 7 Lot 911	GF	N	52
	1.FL		58
Stage 7 Lot 911	GF	W	51
	1.FL		58
Stage 7 Lot 912	GF	N	52
	1.FL		57
Stage 7 Lot 912	GF	E	45
	1.FL		57
Stage 7 Lot 912	GF	S	50
	1.FL		57
Stage 7 Lot 912	GF	W	51
	1.FL		57
Stage 7 Lot 913	GF	E	45
	1.FL		56
Stage 7 Lot 913	GF	S	50
	1.FL		56
Stage 7 Lot 913	GF	W	51
	1.FL		57
Stage 7 Lot 913	GF	N	51
	1.FL		57
Stage 7 Lot 914	GF	E	45
	1.FL		56
Stage 7 Lot 914	GF	S	50
	1.FL		56
Stage 7 Lot 914	GF	W	50
	1.FL		56
Stage 7 Lot 914	GF	N	51
	1.FL		56
Stage 7 Lot 915	GF	E	44
	1.FL		55
Stage 7 Lot 915	GF	S	49
	1.FL		55
Stage 7 Lot 915	GF	W	50
	1.FL		55
Stage 7 Lot 915	GF	N	51
	1.FL		55
Stage 7 Lot 916	GF	N	50
	1.FL		55
Stage 7 Lot 916	GF	W	49
	1.FL		55

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 916	GF	S	49
	1.FL		55
Stage 7 Lot 916	GF	E	44
	1.FL		55
Stage 7 Lot 917	GF	E	44
	1.FL		54
Stage 7 Lot 917	GF	S	48
	1.FL		54
Stage 7 Lot 917	GF	W	49
	1.FL		54
Stage 7 Lot 917	GF	N	50
	1.FL		54
Stage 7 Lot 918	GF	N	47
	1.FL		54
Stage 7 Lot 918	GF	E	43
	1.FL		53
Stage 7 Lot 918	GF	S	47
	1.FL		54
Stage 7 Lot 918	GF	W	48
	1.FL		54
Stage 7 Lot 919	GF	S	52
	1.FL		57
Stage 7 Lot 919	GF	E	45
	1.FL		57
Stage 7 Lot 919	GF	N	50
	1.FL		57
Stage 7 Lot 919	GF	W	51
	1.FL		57
Stage 7 Lot 924	GF	W	60
	1.FL		64
Stage 7 Lot 924	GF	N	55
	1.FL		63
Stage 7 Lot 924	GF	E	48
	1.FL		62
Stage 7 Lot 924	GF	S	57
	1.FL		63
Stage 7 Lot 925	GF	N	55
	1.FL		63
Stage 7 Lot 925	GF	E	48
	1.FL		62
Stage 7 Lot 925	GF	S	55
	1.FL		63

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 925	GF	W	60
	1.FL		64
Stage 7 Lot 935	GF	E	45
	1.FL		56
Stage 7 Lot 935	GF	N	49
	1.FL		56
Stage 7 Lot 935	GF	W	50
	1.FL		57
Stage 7 Lot 935	GF	S	48
	1.FL		56
Stage 7 Lot 936	GF	S	51
	1.FL		56
Stage 7 Lot 936	GF	E	45
	1.FL		56
Stage 7 Lot 936	GF	N	48
	1.FL		56
Stage 7 Lot 936	GF	W	50
	1.FL		57
Stage 7 Lot 1064	GF	NW	49
	1.FL		53
Stage 7 Lot 1064	GF	SW	48
	1.FL		53
Stage 7 Lot 1064	GF	SE	46
	1.FL		53
Stage 7 Lot 1064	GF	NE	45
	1.FL		53
Stage 7 Lot 1065	GF	SW	49
	1.FL		53
Stage 7 Lot 1065	GF	NW	49
	1.FL		53
Stage 7 Lot 1065	GF	SE	46
	1.FL		53
Stage 7 Lot 1065	GF	NE	44
	1.FL		53
Stage 7 Lot 1066	GF	S	49
	1.FL		53
Stage 7 Lot 1066	GF	W	48
	1.FL		53
Stage 7 Lot 1066	GF	N	47
	1.FL		53
Stage 7 Lot 1066	GF	E	42
	1.FL		53

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 7 Lot 1067	GF	N	48
	1.FL		54
Stage 7 Lot 1067	GF	W	49
	1.FL		54
Stage 7 Lot 1067	GF	S	50
	1.FL		54
Stage 7 Lot 1067	GF	E	43
	1.FL		54
Stage 7 Lot 1068	GF	N	48
	1.FL		54
Stage 7 Lot 1068	GF	W	49
	1.FL		54
Stage 7 Lot 1068	GF	S	49
	1.FL		54
Stage 7 Lot 1068	GF	E	43
	1.FL		54
Stage 7 Lot 1069	GF	N	48
	1.FL		54
Stage 7 Lot 1069	GF	W	48
	1.FL		54
Stage 7 Lot 1069	GF	S	50
	1.FL		54
Stage 7 Lot 1069	GF	E	43
	1.FL		54
Stage 8 Lot 822	GF	N	50
	1.FL		56
Stage 8 Lot 822	GF	W	50
	1.FL		56
Stage 8 Lot 822	GF	S	49
	1.FL		56
Stage 8 Lot 822	GF	E	44
	1.FL		55
Stage 8 Lot 823	GF	N	49
	1.FL		54
Stage 8 Lot 823	GF	E	43
	1.FL		54
Stage 8 Lot 823	GF	S	47
	1.FL		54
Stage 8 Lot 823	GF	W	51
	1.FL		54
Stage 8 Lot 824	GF	E	43
	1.FL		54

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 824	GF	S	47
	1.FL		54
Stage 8 Lot 824	GF	N	47
	1.FL		54
Stage 8 Lot 824	GF	W	50
	1.FL		54
Stage 8 Lot 825	GF	S	47
	1.FL		54
Stage 8 Lot 825	GF	W	50
	1.FL		54
Stage 8 Lot 825	GF	N	47
	1.FL		54
Stage 8 Lot 825	GF	E	43
	1.FL		54
Stage 8 Lot 826	GF	S	47
	1.FL		54
Stage 8 Lot 826	GF	W	50
	1.FL		54
Stage 8 Lot 826	GF	N	47
	1.FL		54
Stage 8 Lot 826	GF	E	43
	1.FL		54
Stage 8 Lot 827	GF	E	43
	1.FL		54
Stage 8 Lot 827	GF	N	47
	1.FL		54
Stage 8 Lot 827	GF	W	50
	1.FL		54
Stage 8 Lot 827	GF	S	47
	1.FL		54
Stage 8 Lot 828	GF	E	43
	1.FL		54
Stage 8 Lot 828	GF	S	48
	1.FL		54
Stage 8 Lot 828	GF	W	50
	1.FL		54
Stage 8 Lot 828	GF	N	47
	1.FL		54
Stage 8 Lot 829	GF	E	43
	1.FL		54
Stage 8 Lot 829	GF	S	49
	1.FL		54

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 829	GF	N	47
	1.FL		54
Stage 8 Lot 829	GF	W	51
	1.FL		54
Stage 8 Lot 920	GF	E	46
	1.FL		58
Stage 8 Lot 920	GF	S	53
	1.FL		58
Stage 8 Lot 920	GF	N	51
	1.FL		58
Stage 8 Lot 920	GF	W	52
	1.FL		58
Stage 8 Lot 921	GF	W	52
	1.FL		59
Stage 8 Lot 921	GF	S	54
	1.FL		59
Stage 8 Lot 921	GF	E	46
	1.FL		59
Stage 8 Lot 921	GF	N	51
	1.FL		59
Stage 8 Lot 922	GF	S	54
	1.FL		60
Stage 8 Lot 922	GF	N	52
	1.FL		60
Stage 8 Lot 922	GF	E	47
	1.FL		60
Stage 8 Lot 922	GF	W	52
	1.FL		60
Stage 8 Lot 923	GF	S	56
	1.FL		61
Stage 8 Lot 923	GF	E	47
	1.FL		61
Stage 8 Lot 923	GF	W	55
	1.FL		61
Stage 8 Lot 923	GF	N	53
	1.FL		61
Stage 8 Lot 926	GF	W	60
	1.FL		64
Stage 8 Lot 926	GF	E	48
	1.FL		62
Stage 8 Lot 926	GF	S	55
	1.FL		63

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 926	GF	N	55
	1.FL		63
Stage 8 Lot 927	GF	N	57
	1.FL		63
Stage 8 Lot 927	GF	E	48
	1.FL		62
Stage 8 Lot 927	GF	W	60
	1.FL		64
Stage 8 Lot 927	GF	S	55
	1.FL		63
Stage 8 Lot 928	GF	E	47
	1.FL		60
Stage 8 Lot 928	GF	W	54
	1.FL		61
Stage 8 Lot 928	GF	S	53
	1.FL		61
Stage 8 Lot 928	GF	N	55
	1.FL		61
Stage 8 Lot 929	GF	E	47
	1.FL		59
Stage 8 Lot 929	GF	S	52
	1.FL		60
Stage 8 Lot 929	GF	W	52
	1.FL		60
Stage 8 Lot 929	GF	N	54
	1.FL		60
Stage 8 Lot 930	GF	N	53
	1.FL		59
Stage 8 Lot 930	GF	E	46
	1.FL		58
Stage 8 Lot 930	GF	S	51
	1.FL		59
Stage 8 Lot 930	GF	W	52
	1.FL		59
Stage 8 Lot 931	GF	E	46
	1.FL		58
Stage 8 Lot 931	GF	S	51
	1.FL		58
Stage 8 Lot 931	GF	W	51
	1.FL		58
Stage 8 Lot 931	GF	N	52
	1.FL		58

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 932	GF	N	52
	1.FL		57
Stage 8 Lot 932	GF	E	45
	1.FL		57
Stage 8 Lot 932	GF	S	50
	1.FL		57
Stage 8 Lot 932	GF	W	51
	1.FL		57
Stage 8 Lot 933	GF	E	45
	1.FL		56
Stage 8 Lot 933	GF	S	49
	1.FL		56
Stage 8 Lot 933	GF	W	50
	1.FL		56
Stage 8 Lot 933	GF	N	50
	1.FL		56
Stage 8 Lot 934	GF	N	48
	1.FL		56
Stage 8 Lot 934	GF	E	45
	1.FL		56
Stage 8 Lot 934	GF	S	49
	1.FL		56
Stage 8 Lot 934	GF	W	50
	1.FL		56
Stage 8 Lot 937	GF	N	49
	1.FL		55
Stage 8 Lot 937	GF	W	52
	1.FL		55
Stage 8 Lot 937	GF	S	49
	1.FL		55
Stage 8 Lot 937	GF	E	44
	1.FL		55
Stage 8 Lot 938	GF	N	50
	1.FL		55
Stage 8 Lot 938	GF	W	52
	1.FL		55
Stage 8 Lot 938	GF	S	49
	1.FL		55
Stage 8 Lot 938	GF	E	44
	1.FL		55
Stage 8 Lot 939	GF	E	44
	1.FL		54

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 939	GF	S	49
	1.FL		54
Stage 8 Lot 939	GF	W	50
	1.FL		55
Stage 8 Lot 939	GF	N	49
	1.FL		54
Stage 8 Lot 940	GF	E	43
	1.FL		54
Stage 8 Lot 940	GF	S	48
	1.FL		54
Stage 8 Lot 940	GF	W	48
	1.FL		54
Stage 8 Lot 940	GF	N	49
	1.FL		54
Stage 8 Lot 941	GF	E	43
	1.FL		54
Stage 8 Lot 941	GF	S	48
	1.FL		54
Stage 8 Lot 941	GF	W	48
	1.FL		54
Stage 8 Lot 941	GF	N	49
	1.FL		54
Stage 8 Lot 942	GF	N	48
	1.FL		55
Stage 8 Lot 942	GF	E	44
	1.FL		55
Stage 8 Lot 942	GF	S	51
	1.FL		56
Stage 8 Lot 942	GF	W	50
	1.FL		56
Stage 8 Lot 946	GF	E	44
	1.FL		55
Stage 8 Lot 946	GF	N	48
	1.FL		55
Stage 8 Lot 946	GF	W	50
	1.FL		55
Stage 8 Lot 946	GF	S	50
	1.FL		55
Stage 8 Lot 947	GF	N	49
	1.FL		56
Stage 8 Lot 947	GF	W	50
	1.FL		56

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 947	GF	S	51
	1.FL		56
Stage 8 Lot 947	GF	E	45
	1.FL		56
Stage 8 Lot 948	GF	W	50
	1.FL		56
Stage 8 Lot 948	GF	N	49
	1.FL		56
Stage 8 Lot 948	GF	E	45
	1.FL		56
Stage 8 Lot 948	GF	S	52
	1.FL		57
Stage 8 Lot 949	GF	S	52
	1.FL		57
Stage 8 Lot 949	GF	W	51
	1.FL		57
Stage 8 Lot 949	GF	N	50
	1.FL		57
Stage 8 Lot 949	GF	E	45
	1.FL		57
Stage 8 Lot 950	GF	S	53
	1.FL		58
Stage 8 Lot 950	GF	W	51
	1.FL		58
Stage 8 Lot 950	GF	N	50
	1.FL		58
Stage 8 Lot 950	GF	E	46
	1.FL		57
Stage 8 Lot 951	GF	N	51
	1.FL		59
Stage 8 Lot 951	GF	W	52
	1.FL		59
Stage 8 Lot 951	GF	S	53
	1.FL		59
Stage 8 Lot 951	GF	E	46
	1.FL		58
Stage 8 Lot 952	GF	S	54
	1.FL		60
Stage 8 Lot 952	GF	W	52
	1.FL		60
Stage 8 Lot 952	GF	N	52
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 952	GF	E	46
	1.FL		59
Stage 8 Lot 953	GF	W	54
	1.FL		61
Stage 8 Lot 953	GF	N	52
	1.FL		60
Stage 8 Lot 953	GF	E	47
	1.FL		60
Stage 8 Lot 953	GF	S	55
	1.FL		61
Stage 8 Lot 954	GF	E	47
	1.FL		61
Stage 8 Lot 954	GF	S	57
	1.FL		62
Stage 8 Lot 954	GF	N	54
	1.FL		62
Stage 8 Lot 954	GF	W	60
	1.FL		63
Stage 8 Lot 955	GF	N	55
	1.FL		62
Stage 8 Lot 955	GF	E	47
	1.FL		61
Stage 8 Lot 955	GF	S	54
	1.FL		62
Stage 8 Lot 955	GF	W	60
	1.FL		63
Stage 8 Lot 956	GF	E	47
	1.FL		61
Stage 8 Lot 956	GF	N	54
	1.FL		62
Stage 8 Lot 956	GF	S	55
	1.FL		62
Stage 8 Lot 956	GF	W	60
	1.FL		63
Stage 8 Lot 957	GF	E	47
	1.FL		61
Stage 8 Lot 957	GF	N	55
	1.FL		62
Stage 8 Lot 957	GF	S	54
	1.FL		62
Stage 8 Lot 957	GF	W	59
	1.FL		63

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 958	GF	N	54
	1.FL		60
Stage 8 Lot 958	GF	S	53
	1.FL		60
Stage 8 Lot 958	GF	E	47
	1.FL		60
Stage 8 Lot 958	GF	W	54
	1.FL		61
Stage 8 Lot 959	GF	W	52
	1.FL		59
Stage 8 Lot 959	GF	S	51
	1.FL		59
Stage 8 Lot 959	GF	E	46
	1.FL		59
Stage 8 Lot 959	GF	N	53
	1.FL		59
Stage 8 Lot 960	GF	E	46
	1.FL		58
Stage 8 Lot 960	GF	N	52
	1.FL		58
Stage 8 Lot 960	GF	W	51
	1.FL		59
Stage 8 Lot 960	GF	S	51
	1.FL		58
Stage 8 Lot 961	GF	S	51
	1.FL		58
Stage 8 Lot 961	GF	E	46
	1.FL		58
Stage 8 Lot 961	GF	N	52
	1.FL		58
Stage 8 Lot 961	GF	W	52
	1.FL		58
Stage 8 Lot 962	GF	E	45
	1.FL		57
Stage 8 Lot 962	GF	N	51
	1.FL		57
Stage 8 Lot 962	GF	W	51
	1.FL		57
Stage 8 Lot 962	GF	S	50
	1.FL		57
Stage 8 Lot 963	GF	S	50
	1.FL		57

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 963	GF	E	45
	1.FL		56
Stage 8 Lot 963	GF	N	51
	1.FL		56
Stage 8 Lot 963	GF	W	50
	1.FL		57
Stage 8 Lot 964	GF	N	50
	1.FL		56
Stage 8 Lot 964	GF	S	50
	1.FL		56
Stage 8 Lot 964	GF	E	45
	1.FL		56
Stage 8 Lot 964	GF	W	50
	1.FL		56
Stage 8 Lot 965	GF	N	49
	1.FL		55
Stage 8 Lot 965	GF	W	49
	1.FL		55
Stage 8 Lot 965	GF	E	44
	1.FL		55
Stage 8 Lot 965	GF	S	49
	1.FL		55
Stage 8 Lot 970	GF	N	47
	1.FL		53
Stage 8 Lot 970	GF	W	48
	1.FL		53
Stage 8 Lot 970	GF	S	46
	1.FL		53
Stage 8 Lot 970	GF	E	43
	1.FL		53
Stage 8 Lot 971	GF	W	49
	1.FL		53
Stage 8 Lot 971	GF	N	47
	1.FL		53
Stage 8 Lot 971	GF	E	43
	1.FL		53
Stage 8 Lot 971	GF	S	48
	1.FL		53
Stage 8 Lot 972	GF	E	43
	1.FL		53
Stage 8 Lot 972	GF	N	48
	1.FL		53

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 972	GF	W	49
	1.FL		53
Stage 8 Lot 972	GF	S	48
	1.FL		53
Stage 8 Lot 973	GF	S	49
	1.FL		54
Stage 8 Lot 973	GF	E	43
	1.FL		53
Stage 8 Lot 973	GF	W	48
	1.FL		54
Stage 8 Lot 973	GF	N	47
	1.FL		54
Stage 8 Lot 974	GF	E	43
	1.FL		54
Stage 8 Lot 974	GF	S	50
	1.FL		54
Stage 8 Lot 974	GF	W	49
	1.FL		54
Stage 8 Lot 974	GF	N	47
	1.FL		54
Stage 8 Lot 975	GF	N	48
	1.FL		54
Stage 8 Lot 975	GF	E	44
	1.FL		54
Stage 8 Lot 975	GF	S	50
	1.FL		55
Stage 8 Lot 975	GF	W	49
	1.FL		55
Stage 8 Lot 976	GF	N	48
	1.FL		55
Stage 8 Lot 976	GF	W	49
	1.FL		55
Stage 8 Lot 976	GF	S	50
	1.FL		55
Stage 8 Lot 976	GF	E	44
	1.FL		55
Stage 8 Lot 977	GF	W	50
	1.FL		55
Stage 8 Lot 977	GF	S	50
	1.FL		55
Stage 8 Lot 977	GF	E	44
	1.FL		55

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 977	GF	N	48
	1.FL		55
Stage 8 Lot 978	GF	W	50
	1.FL		56
Stage 8 Lot 978	GF	S	51
	1.FL		56
Stage 8 Lot 978	GF	E	45
	1.FL		56
Stage 8 Lot 978	GF	N	48
	1.FL		56
Stage 8 Lot 980	GF	E	45
	1.FL		56
Stage 8 Lot 980	GF	S	51
	1.FL		56
Stage 8 Lot 980	GF	W	53
	1.FL		57
Stage 8 Lot 980	GF	N	49
	1.FL		56
Stage 8 Lot 981	GF	N	49
	1.FL		56
Stage 8 Lot 981	GF	E	45
	1.FL		56
Stage 8 Lot 981	GF	S	50
	1.FL		56
Stage 8 Lot 981	GF	W	53
	1.FL		57
Stage 8 Lot 993	GF	W	51
	1.FL		59
Stage 8 Lot 993	GF	N	50
	1.FL		58
Stage 8 Lot 993	GF	E	46
	1.FL		58
Stage 8 Lot 993	GF	S	52
	1.FL		59
Stage 8 Lot 994	GF	W	52
	1.FL		60
Stage 8 Lot 994	GF	N	51
	1.FL		59
Stage 8 Lot 994	GF	E	46
	1.FL		59
Stage 8 Lot 994	GF	S	54
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 995	GF	S	55
	1.FL		61
Stage 8 Lot 995	GF	W	54
	1.FL		61
Stage 8 Lot 995	GF	N	51
	1.FL		60
Stage 8 Lot 995	GF	E	47
	1.FL		60
Stage 8 Lot 996	GF	W	59
	1.FL		62
Stage 8 Lot 996	GF	E	47
	1.FL		61
Stage 8 Lot 996	GF	S	57
	1.FL		62
Stage 8 Lot 996	GF	N	53
	1.FL		62
Stage 8 Lot 1045	GF	N	47
	1.FL		52
Stage 8 Lot 1045	GF	E	44
	1.FL		52
Stage 8 Lot 1045	GF	S	46
	1.FL		52
Stage 8 Lot 1045	GF	W	50
	1.FL		53
Stage 8 Lot 1046	GF	S	46
	1.FL		52
Stage 8 Lot 1046	GF	E	44
	1.FL		52
Stage 8 Lot 1046	GF	N	46
	1.FL		52
Stage 8 Lot 1046	GF	W	50
	1.FL		52
Stage 8 Lot 1049	GF	S	46
	1.FL		52
Stage 8 Lot 1049	GF	W	50
	1.FL		52
Stage 8 Lot 1049	GF	N	47
	1.FL		52
Stage 8 Lot 1049	GF	E	43
	1.FL		52
Stage 8 Lot 1050	GF	N	46
	1.FL		52

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 1050	GF	E	43
	1.FL		52
Stage 8 Lot 1050	GF	W	50
	1.FL		52
Stage 8 Lot 1050	GF	S	46
	1.FL		52
Stage 8 Lot 1051	GF	W	50
	1.FL		52
Stage 8 Lot 1051	GF	S	46
	1.FL		52
Stage 8 Lot 1051	GF	E	43
	1.FL		52
Stage 8 Lot 1051	GF	N	46
	1.FL		52
Stage 8 Lot 1052	GF	NE	42
	1.FL		51
Stage 8 Lot 1052	GF	S	46
	1.FL		52
Stage 8 Lot 1052	GF	SW	50
	1.FL		52
Stage 8 Lot 1052	GF	N	46
	1.FL		52
Stage 8 Lot 1053	GF	E	42
	1.FL		51
Stage 8 Lot 1053	GF	S	46
	1.FL		51
Stage 8 Lot 1053	GF	W	50
	1.FL		52
Stage 8 Lot 1053	GF	N	46
	1.FL		51
Stage 8 Lot 1054	GF	E	41
	1.FL		51
Stage 8 Lot 1054	GF	S	46
	1.FL		52
Stage 8 Lot 1054	GF	W	50
	1.FL		52
Stage 8 Lot 1054	GF	N	46
	1.FL		52
Stage 8 Lot 1055	GF	W	50
	1.FL		52
Stage 8 Lot 1055	GF	N	46
	1.FL		52

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 1055	GF	E	41
	1.FL		52
Stage 8 Lot 1055	GF	S	47
	1.FL		52
Stage 8 Lot 1056	GF	E	43
	1.FL		52
Stage 8 Lot 1056	GF	S	47
	1.FL		52
Stage 8 Lot 1056	GF	NW	50
	1.FL		52
Stage 8 Lot 1056	GF	N	45
	1.FL		52
Stage 8 Lot 1057	GF	SE	45
	1.FL		52
Stage 8 Lot 1057	GF	SW	47
	1.FL		52
Stage 8 Lot 1057	GF	NW	50
	1.FL		52
Stage 8 Lot 1057	GF	NE	45
	1.FL		52
Stage 8 Lot 1058	GF	NE	45
	1.FL		52
Stage 8 Lot 1058	GF	SE	46
	1.FL		52
Stage 8 Lot 1058	GF	NW	50
	1.FL		52
Stage 8 Lot 1058	GF	SW	50
	1.FL		52
Stage 8 Lot 1062	GF	E	43
	1.FL		53
Stage 8 Lot 1062	GF	S	48
	1.FL		53
Stage 8 Lot 1062	GF	W	48
	1.FL		53
Stage 8 Lot 1062	GF	N	49
	1.FL		53
Stage 8 Lot 1063	GF	E	42
	1.FL		53
Stage 8 Lot 1063	GF	S	47
	1.FL		53
Stage 8 Lot 1063	GF	W	48
	1.FL		53

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 8 Lot 1063	GF	N	49
	1.FL		53
Stage 9 Lot 943	GF	E	47
	1.FL		59
Stage 9 Lot 943	GF	S	52
	1.FL		60
Stage 9 Lot 943	GF	N	52
	1.FL		60
Stage 9 Lot 943	GF	W	58
	1.FL		61
Stage 9 Lot 966	GF	E	47
	1.FL		59
Stage 9 Lot 966	GF	N	52
	1.FL		60
Stage 9 Lot 966	GF	S	52
	1.FL		60
Stage 9 Lot 966	GF	W	58
	1.FL		61
Stage 9 Lot 967	GF	E	47
	1.FL		58
Stage 9 Lot 967	GF	S	50
	1.FL		58
Stage 9 Lot 967	GF	W	53
	1.FL		59
Stage 9 Lot 967	GF	N	50
	1.FL		58
Stage 9 Lot 968	GF	E	47
	1.FL		60
Stage 9 Lot 968	GF	S	53
	1.FL		61
Stage 9 Lot 968	GF	N	53
	1.FL		61
Stage 9 Lot 968	GF	W	59
	1.FL		62
Stage 9 Lot 969	GF	E	46
	1.FL		58
Stage 9 Lot 969	GF	S	51
	1.FL		59
Stage 9 Lot 969	GF	W	53
	1.FL		60
Stage 9 Lot 969	GF	N	50
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 982	GF	E	45
	1.FL		56
Stage 9 Lot 982	GF	N	49
	1.FL		56
Stage 9 Lot 982	GF	W	53
	1.FL		57
Stage 9 Lot 982	GF	S	49
	1.FL		56
Stage 9 Lot 983	GF	E	45
	1.FL		56
Stage 9 Lot 983	GF	S	49
	1.FL		56
Stage 9 Lot 983	GF	W	52
	1.FL		56
Stage 9 Lot 983	GF	N	50
	1.FL		56
Stage 9 Lot 985	GF	N	50
	1.FL		56
Stage 9 Lot 985	GF	W	50
	1.FL		56
Stage 9 Lot 985	GF	S	49
	1.FL		56
Stage 9 Lot 985	GF	E	45
	1.FL		55
Stage 9 Lot 986	GF	E	44
	1.FL		55
Stage 9 Lot 986	GF	S	48
	1.FL		55
Stage 9 Lot 986	GF	W	49
	1.FL		55
Stage 9 Lot 986	GF	N	49
	1.FL		55
Stage 9 Lot 987	GF	N	49
	1.FL		55
Stage 9 Lot 987	GF	E	44
	1.FL		55
Stage 9 Lot 987	GF	S	48
	1.FL		55
Stage 9 Lot 987	GF	W	49
	1.FL		55
Stage 9 Lot 988	GF	S	48
	1.FL		54

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 988	GF	E	44
	1.FL		54
Stage 9 Lot 988	GF	N	49
	1.FL		54
Stage 9 Lot 988	GF	W	49
	1.FL		54
Stage 9 Lot 989	GF	S	48
	1.FL		54
Stage 9 Lot 989	GF	E	44
	1.FL		54
Stage 9 Lot 989	GF	N	48
	1.FL		54
Stage 9 Lot 989	GF	W	48
	1.FL		54
Stage 9 Lot 990	GF	N	49
	1.FL		54
Stage 9 Lot 990	GF	W	49
	1.FL		53
Stage 9 Lot 990	GF	S	47
	1.FL		53
Stage 9 Lot 990	GF	E	44
	1.FL		53
Stage 9 Lot 991	GF	N	49
	1.FL		53
Stage 9 Lot 991	GF	W	49
	1.FL		53
Stage 9 Lot 991	GF	S	46
	1.FL		53
Stage 9 Lot 991	GF	E	44
	1.FL		53
Stage 9 Lot 992	GF	N	47
	1.FL		53
Stage 9 Lot 992	GF	W	48
	1.FL		53
Stage 9 Lot 992	GF	S	47
	1.FL		53
Stage 9 Lot 992	GF	E	44
	1.FL		53
Stage 9 Lot 997	GF	E	47
	1.FL		60
Stage 9 Lot 997	GF	S	53
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 997	GF	W	59
	1.FL		62
Stage 9 Lot 997	GF	N	53
	1.FL		61
Stage 9 Lot 998	GF	N	52
	1.FL		60
Stage 9 Lot 998	GF	W	59
	1.FL		62
Stage 9 Lot 998	GF	S	53
	1.FL		60
Stage 9 Lot 998	GF	E	47
	1.FL		59
Stage 9 Lot 999	GF	N	52
	1.FL		60
Stage 9 Lot 999	GF	E	47
	1.FL		59
Stage 9 Lot 999	GF	S	53
	1.FL		60
Stage 9 Lot 999	GF	W	59
	1.FL		61
Stage 9 Lot 1000	GF	E	47
	1.FL		59
Stage 9 Lot 1000	GF	S	52
	1.FL		60
Stage 9 Lot 1000	GF	W	59
	1.FL		61
Stage 9 Lot 1000	GF	N	52
	1.FL		60
Stage 9 Lot 1001	GF	E	47
	1.FL		59
Stage 9 Lot 1001	GF	S	52
	1.FL		60
Stage 9 Lot 1001	GF	W	59
	1.FL		61
Stage 9 Lot 1001	GF	N	52
	1.FL		60
Stage 9 Lot 1002	GF	E	47
	1.FL		59
Stage 9 Lot 1002	GF	S	52
	1.FL		60
Stage 9 Lot 1002	GF	W	59
	1.FL		61

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1002	GF	N	52
	1.FL		60
Stage 9 Lot 1003	GF	E	47
	1.FL		59
Stage 9 Lot 1003	GF	S	52
	1.FL		60
Stage 9 Lot 1003	GF	W	59
	1.FL		61
Stage 9 Lot 1003	GF	N	52
	1.FL		60
Stage 9 Lot 1004	GF	N	55
	1.FL		60
Stage 9 Lot 1004	GF	W	57
	1.FL		61
Stage 9 Lot 1004	GF	S	52
	1.FL		60
Stage 9 Lot 1004	GF	E	48
	1.FL		59
Stage 9 Lot 1005	GF	W	55
	1.FL		59
Stage 9 Lot 1005	GF	N	54
	1.FL		58
Stage 9 Lot 1005	GF	E	48
	1.FL		58
Stage 9 Lot 1005	GF	S	49
	1.FL		58
Stage 9 Lot 1006	GF	S	50
	1.FL		58
Stage 9 Lot 1006	GF	W	53
	1.FL		59
Stage 9 Lot 1006	GF	N	50
	1.FL		58
Stage 9 Lot 1006	GF	E	47
	1.FL		57
Stage 9 Lot 1007	GF	N	50
	1.FL		58
Stage 9 Lot 1007	GF	W	53
	1.FL		59
Stage 9 Lot 1007	GF	S	50
	1.FL		58
Stage 9 Lot 1007	GF	E	47
	1.FL		57

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1008	GF	E	46
	1.FL		57
Stage 9 Lot 1008	GF	S	50
	1.FL		58
Stage 9 Lot 1008	GF	W	53
	1.FL		59
Stage 9 Lot 1008	GF	N	50
	1.FL		58
Stage 9 Lot 1009	GF	E	46
	1.FL		58
Stage 9 Lot 1009	GF	S	50
	1.FL		58
Stage 9 Lot 1009	GF	W	54
	1.FL		59
Stage 9 Lot 1009	GF	N	50
	1.FL		58
Stage 9 Lot 1010	GF	E	46
	1.FL		58
Stage 9 Lot 1010	GF	S	50
	1.FL		58
Stage 9 Lot 1010	GF	W	54
	1.FL		59
Stage 9 Lot 1010	GF	N	50
	1.FL		58
Stage 9 Lot 1011	GF	E	46
	1.FL		58
Stage 9 Lot 1011	GF	S	50
	1.FL		59
Stage 9 Lot 1011	GF	W	54
	1.FL		59
Stage 9 Lot 1011	GF	N	51
	1.FL		58
Stage 9 Lot 1012	GF	N	50
	1.FL		59
Stage 9 Lot 1012	GF	W	53
	1.FL		60
Stage 9 Lot 1012	GF	S	50
	1.FL		59
Stage 9 Lot 1012	GF	E	46
	1.FL		58
Stage 9 Lot 1013	GF	N	50
	1.FL		59

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1013	GF	W	54
	1.FL		60
Stage 9 Lot 1013	GF	S	51
	1.FL		59
Stage 9 Lot 1013	GF	E	46
	1.FL		58
Stage 9 Lot 1014	GF	S	50
	1.FL		56
Stage 9 Lot 1014	GF	W	52
	1.FL		56
Stage 9 Lot 1014	GF	N	48
	1.FL		56
Stage 9 Lot 1014	GF	E	45
	1.FL		55
Stage 9 Lot 1015	GF	E	45
	1.FL		55
Stage 9 Lot 1015	GF	S	49
	1.FL		56
Stage 9 Lot 1015	GF	W	53
	1.FL		56
Stage 9 Lot 1015	GF	N	48
	1.FL		56
Stage 9 Lot 1016	GF	W	53
	1.FL		56
Stage 9 Lot 1016	GF	N	48
	1.FL		56
Stage 9 Lot 1016	GF	E	45
	1.FL		55
Stage 9 Lot 1016	GF	S	48
	1.FL		56
Stage 9 Lot 1017	GF	S	48
	1.FL		56
Stage 9 Lot 1017	GF	E	45
	1.FL		55
Stage 9 Lot 1017	GF	N	48
	1.FL		56
Stage 9 Lot 1017	GF	W	53
	1.FL		56
Stage 9 Lot 1018	GF	S	48
	1.FL		56
Stage 9 Lot 1018	GF	W	53
	1.FL		56

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1018	GF	N	48
	1.FL		56
Stage 9 Lot 1018	GF	E	45
	1.FL		55
Stage 9 Lot 1019	GF	E	45
	1.FL		56
Stage 9 Lot 1019	GF	N	48
	1.FL		56
Stage 9 Lot 1019	GF	W	53
	1.FL		56
Stage 9 Lot 1019	GF	S	48
	1.FL		56
Stage 9 Lot 1020	GF	E	44
	1.FL		54
Stage 9 Lot 1020	GF	N	47
	1.FL		55
Stage 9 Lot 1020	GF	W	51
	1.FL		55
Stage 9 Lot 1020	GF	S	49
	1.FL		55
Stage 9 Lot 1021	GF	S	48
	1.FL		55
Stage 9 Lot 1021	GF	W	51
	1.FL		55
Stage 9 Lot 1021	GF	N	47
	1.FL		55
Stage 9 Lot 1021	GF	E	44
	1.FL		55
Stage 9 Lot 1022	GF	E	44
	1.FL		55
Stage 9 Lot 1022	GF	N	47
	1.FL		55
Stage 9 Lot 1022	GF	W	51
	1.FL		55
Stage 9 Lot 1022	GF	S	47
	1.FL		55
Stage 9 Lot 1023	GF	S	47
	1.FL		55
Stage 9 Lot 1023	GF	E	45
	1.FL		55
Stage 9 Lot 1023	GF	N	47
	1.FL		55

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1023	GF	W	51
	1.FL		55
Stage 9 Lot 1024	GF	E	45
	1.FL		55
Stage 9 Lot 1024	GF	W	51
	1.FL		55
Stage 9 Lot 1024	GF	S	47
	1.FL		55
Stage 9 Lot 1024	GF	N	47
	1.FL		55
Stage 9 Lot 1025	GF	E	45
	1.FL		55
Stage 9 Lot 1025	GF	N	47
	1.FL		55
Stage 9 Lot 1025	GF	W	51
	1.FL		55
Stage 9 Lot 1025	GF	S	47
	1.FL		55
Stage 9 Lot 1026	GF	E	45
	1.FL		55
Stage 9 Lot 1026	GF	S	47
	1.FL		55
Stage 9 Lot 1026	GF	W	51
	1.FL		55
Stage 9 Lot 1026	GF	N	47
	1.FL		55
Stage 9 Lot 1027	GF	E	45
	1.FL		55
Stage 9 Lot 1027	GF	N	47
	1.FL		55
Stage 9 Lot 1027	GF	W	51
	1.FL		55
Stage 9 Lot 1027	GF	S	47
	1.FL		55
Stage 9 Lot 1029	GF	E	49
	1.FL		58
Stage 9 Lot 1029	GF	S	50
	1.FL		57
Stage 9 Lot 1029	GF	W	54
	1.FL		58
Stage 9 Lot 1029	GF	N	55
	1.FL		58

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1030	GF	W	49
	1.FL		56
Stage 9 Lot 1030	GF	S	48
	1.FL		56
Stage 9 Lot 1030	GF	E	48
	1.FL		57
Stage 9 Lot 1030	GF	N	54
	1.FL		58
Stage 9 Lot 1031	GF	N	53
	1.FL		58
Stage 9 Lot 1031	GF	E	48
	1.FL		57
Stage 9 Lot 1031	GF	W	50
	1.FL		56
Stage 9 Lot 1031	GF	S	48
	1.FL		56
Stage 9 Lot 1032	GF	E	48
	1.FL		57
Stage 9 Lot 1032	GF	N	53
	1.FL		58
Stage 9 Lot 1032	GF	W	50
	1.FL		56
Stage 9 Lot 1032	GF	S	48
	1.FL		56
Stage 9 Lot 1033	GF	S	48
	1.FL		56
Stage 9 Lot 1033	GF	E	50
	1.FL		57
Stage 9 Lot 1033	GF	N	52
	1.FL		58
Stage 9 Lot 1033	GF	W	50
	1.FL		57
Stage 9 Lot 1034	GF	E	47
	1.FL		57
Stage 9 Lot 1034	GF	N	51
	1.FL		58
Stage 9 Lot 1034	GF	W	53
	1.FL		57
Stage 9 Lot 1034	GF	S	49
	1.FL		56
Stage 9 Lot 1035	GF	E	47
	1.FL		56

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1035	GF	S	50
	1.FL		56
Stage 9 Lot 1035	GF	N	52
	1.FL		58
Stage 9 Lot 1035	GF	W	51
	1.FL		57
Stage 9 Lot 1036	GF	W	49
	1.FL		56
Stage 9 Lot 1036	GF	N	50
	1.FL		57
Stage 9 Lot 1036	GF	E	47
	1.FL		56
Stage 9 Lot 1036	GF	S	49
	1.FL		55
Stage 9 Lot 1037	GF	E	49
	1.FL		55
Stage 9 Lot 1037	GF	S	46
	1.FL		54
Stage 9 Lot 1037	GF	W	50
	1.FL		54
Stage 9 Lot 1037	GF	N	48
	1.FL		54
Stage 9 Lot 1038	GF	E	48
	1.FL		54
Stage 9 Lot 1038	GF	S	46
	1.FL		54
Stage 9 Lot 1038	GF	W	50
	1.FL		54
Stage 9 Lot 1038	GF	N	48
	1.FL		54
Stage 9 Lot 1039	GF	E	47
	1.FL		54
Stage 9 Lot 1039	GF	S	46
	1.FL		53
Stage 9 Lot 1039	GF	W	50
	1.FL		54
Stage 9 Lot 1039	GF	N	48
	1.FL		54
Stage 9 Lot 1040	GF	E	47
	1.FL		53
Stage 9 Lot 1040	GF	S	47
	1.FL		53

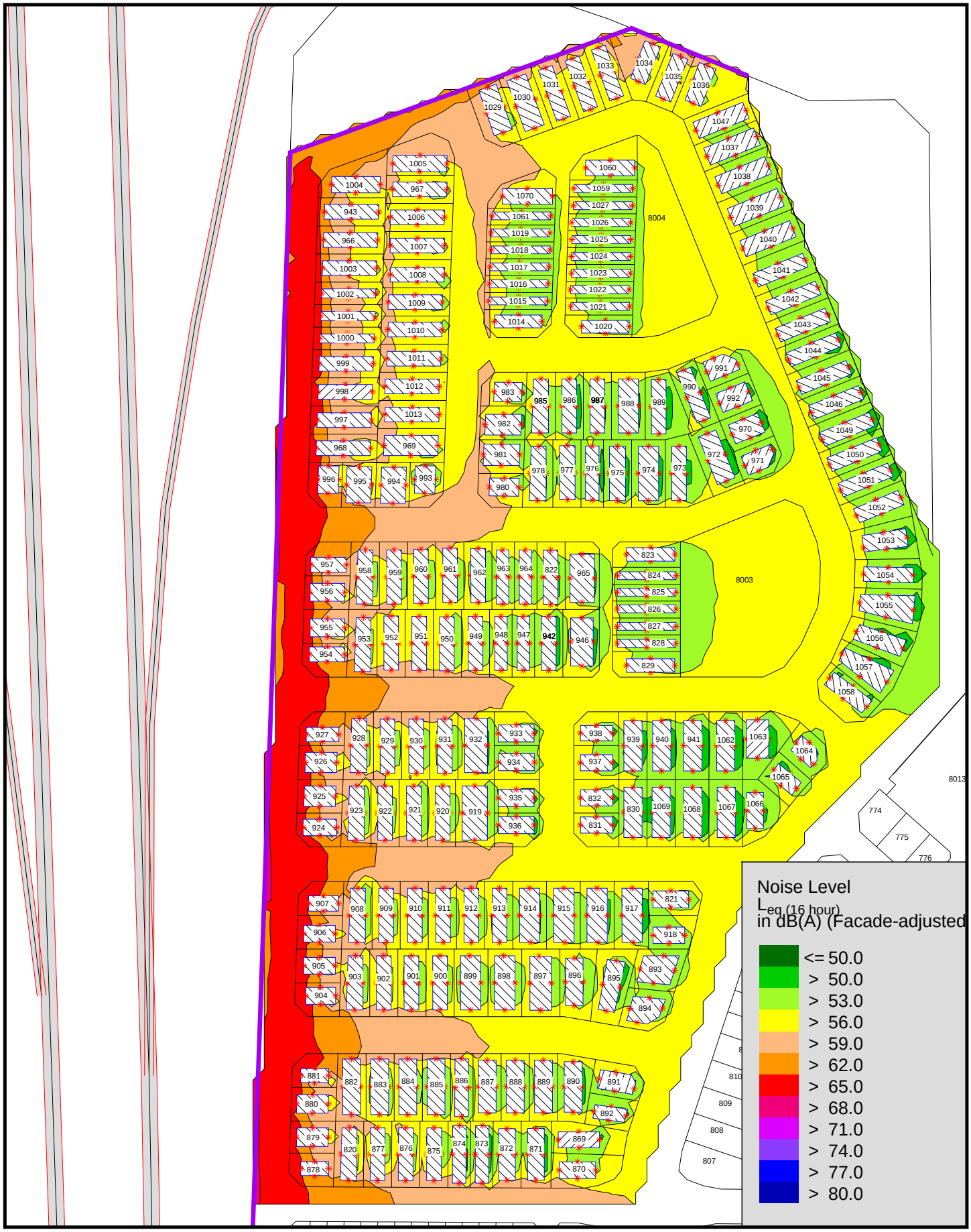
Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1040	GF	W	51
	1.FL		53
Stage 9 Lot 1040	GF	N	48
	1.FL		53
Stage 9 Lot 1041	GF	N	48
	1.FL		53
Stage 9 Lot 1041	GF	W	51
	1.FL		53
Stage 9 Lot 1041	GF	S	47
	1.FL		53
Stage 9 Lot 1041	GF	E	46
	1.FL		53
Stage 9 Lot 1042	GF	N	47
	1.FL		53
Stage 9 Lot 1042	GF	W	50
	1.FL		53
Stage 9 Lot 1042	GF	S	46
	1.FL		53
Stage 9 Lot 1042	GF	E	45
	1.FL		53
Stage 9 Lot 1043	GF	E	45
	1.FL		53
Stage 9 Lot 1043	GF	S	46
	1.FL		53
Stage 9 Lot 1043	GF	W	50
	1.FL		53
Stage 9 Lot 1043	GF	N	47
	1.FL		53
Stage 9 Lot 1044	GF	E	44
	1.FL		53
Stage 9 Lot 1044	GF	S	46
	1.FL		53
Stage 9 Lot 1044	GF	W	50
	1.FL		53
Stage 9 Lot 1044	GF	N	47
	1.FL		53
Stage 9 Lot 1047	GF	W	51
	1.FL		55
Stage 9 Lot 1047	GF	S	46
	1.FL		55
Stage 9 Lot 1047	GF	E	50
	1.FL		55

Honeywood Estate Wandi
Assessed Receiver Levels
Traffic Noise Levels 2035 (Leq 8 h)

Receiver	Floor	Facade	SPL Leq (8 hour) dB(A)
Stage 9 Lot 1047	GF	N	50
	1.FL		55
Stage 9 Lot 1059	GF	S	47
	1.FL		55
Stage 9 Lot 1059	GF	E	45
	1.FL		55
Stage 9 Lot 1059	GF	N	49
	1.FL		55
Stage 9 Lot 1059	GF	W	52
	1.FL		56
Stage 9 Lot 1060	GF	S	47
	1.FL		55
Stage 9 Lot 1060	GF	W	52
	1.FL		56
Stage 9 Lot 1060	GF	N	51
	1.FL		56
Stage 9 Lot 1060	GF	E	46
	1.FL		55
Stage 9 Lot 1061	GF	E	45
	1.FL		56
Stage 9 Lot 1061	GF	N	48
	1.FL		56
Stage 9 Lot 1061	GF	S	48
	1.FL		56
Stage 9 Lot 1061	GF	W	53
	1.FL		56
Stage 9 Lot 1070	GF	W	53
	1.FL		56
Stage 9 Lot 1070	GF	N	51
	1.FL		56
Stage 9 Lot 1070	GF	E	46
	1.FL		56
Stage 9 Lot 1070	GF	S	48
	1.FL		56

Appendix E Traffic Noise Propagation Contours (SoundPLAN)



Appendix E1

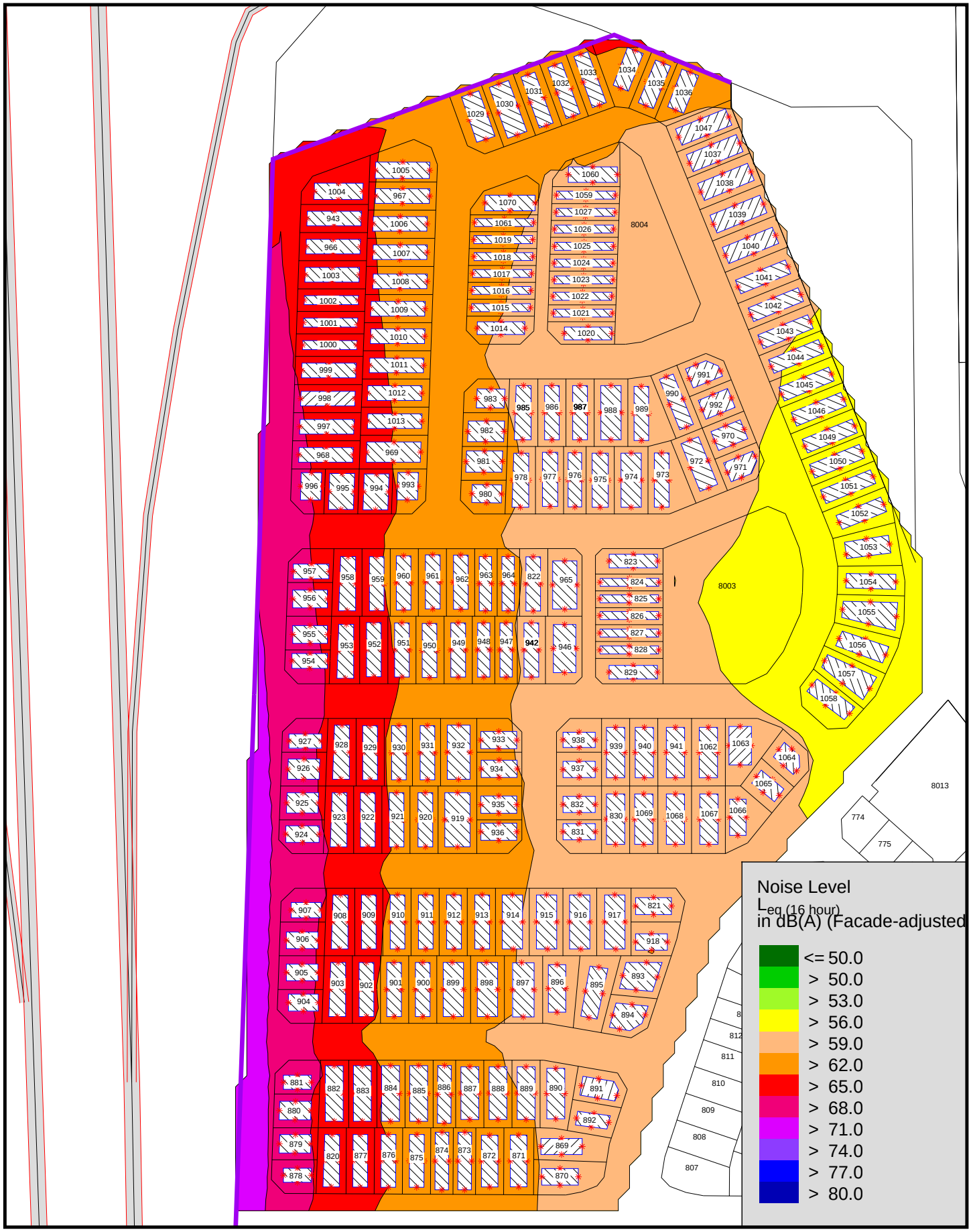
Honeywood Estate - Stages 7, 8, and 9
Road Traffic Noise Levels
Leq, 16hr @ 1.8m (AGL)
Facade Adjusted

Signs and symbols

- Road Emission Line
- Future House
- 2.5m Noise Wall
- Point Receiver

Scale 1:2250

0 10 20 40 60 80



Appendix E2

Honeywood Estate - Stages 7, 8, and 9
Road Traffic Noise Levels
Leq, 16hr @ 4.6m (AGL)
Facade Adjusted

Signs and symbols

- Road Emission Line
- Future House
- 2.5m Noise Wall
- Point Receiver

Scale 1:2250

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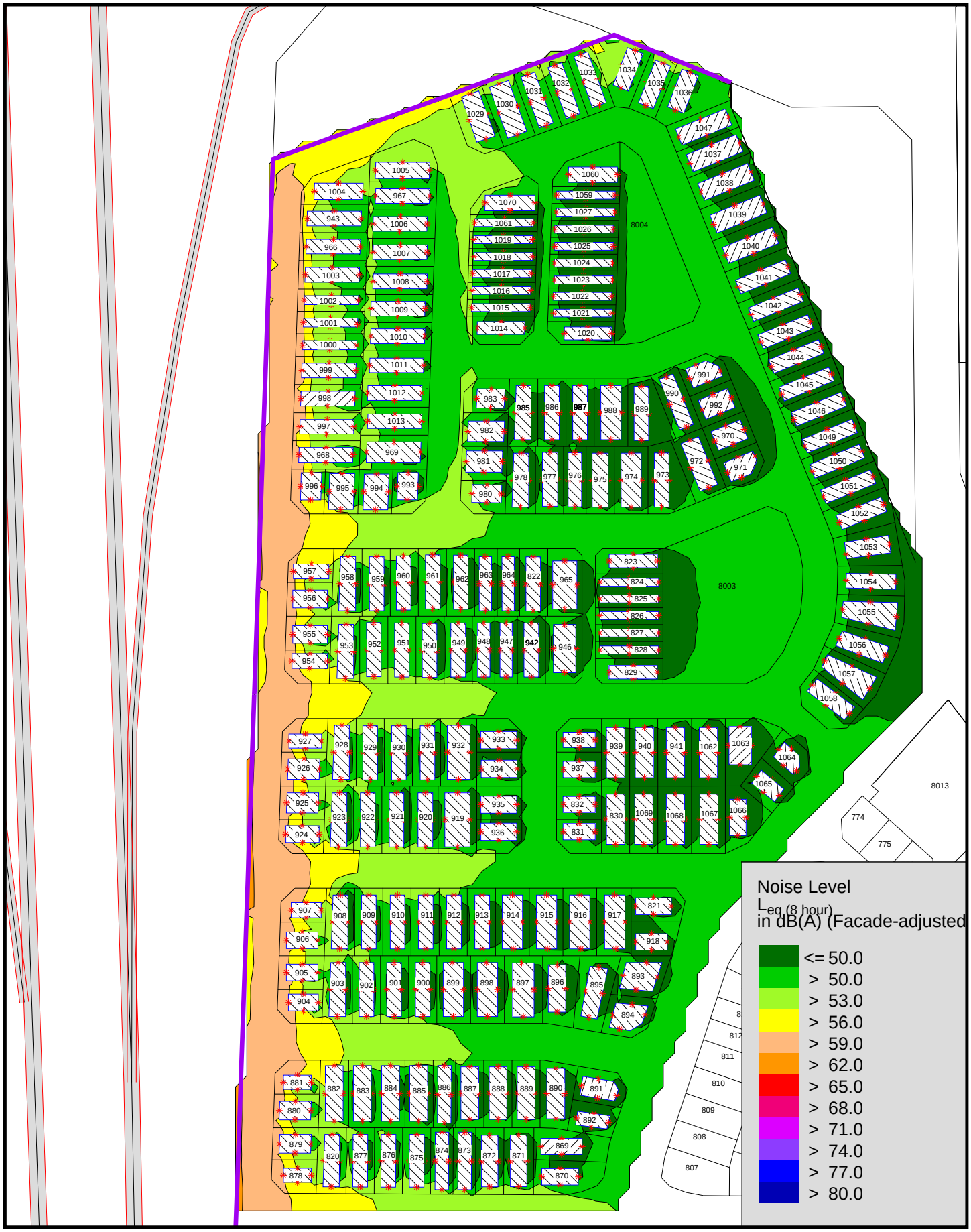

Appendix E3

Honeywood Estate - Stages 7, 8, and 9
Road Traffic Noise Levels
Leq, 8hr @ 1.8m (AGL)
Facade Adjusted

Signs and symbols

- Road Emission Line
- Future House
- 2.5m Noise Wall
- Point Receiver

N

Scale 1:2250

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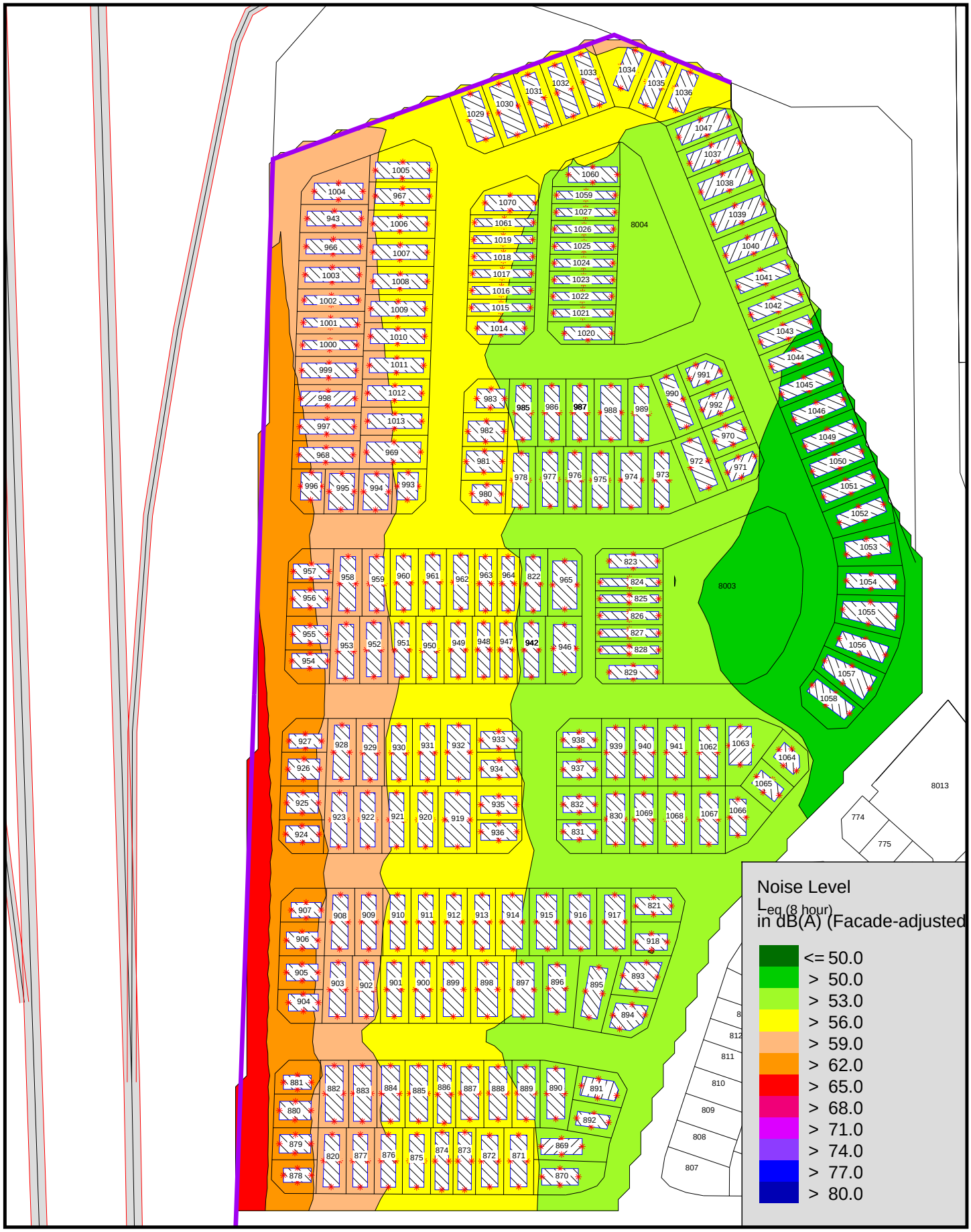


Appendix E4

Honeywood Estate - Stages 7, 8, and 9
Road Traffic Noise Levels
Leq, 8hr @ 4.6m (AGL)
Facade Adjusted

Signs and symbols

- Road Emission Line
- Future House
- 2.5m Noise Wall
- Point Receiver

N

Scale 1:2250

0 10 20 40 60 80

Appendix F Floor Plan of Typical House and TNAc Calculations

31c HIGH CEILINGS TO FAMILY, MEALS & KITCHEN

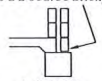
28c HIGH CEILINGS THROUGHOUT UNLESS NOTED OTHERWISE

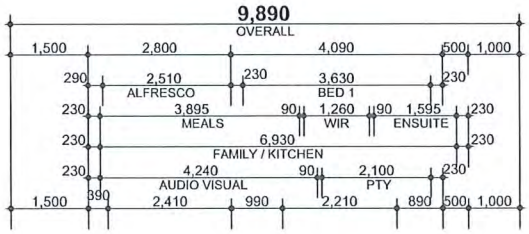
BRIEF OVERVIEW Signed:.....

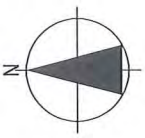
DETAILED OVERVIEW Signed:.....

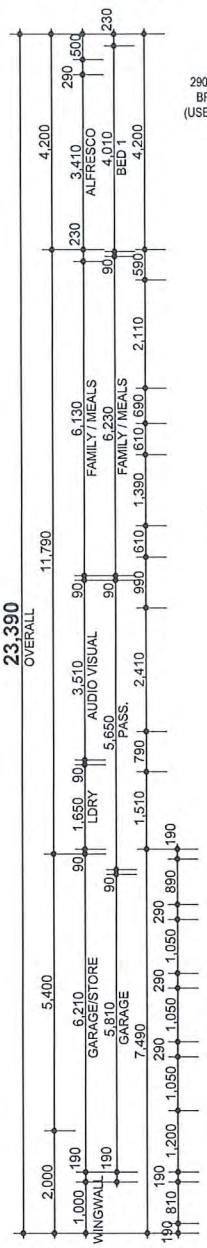
Signed:.....

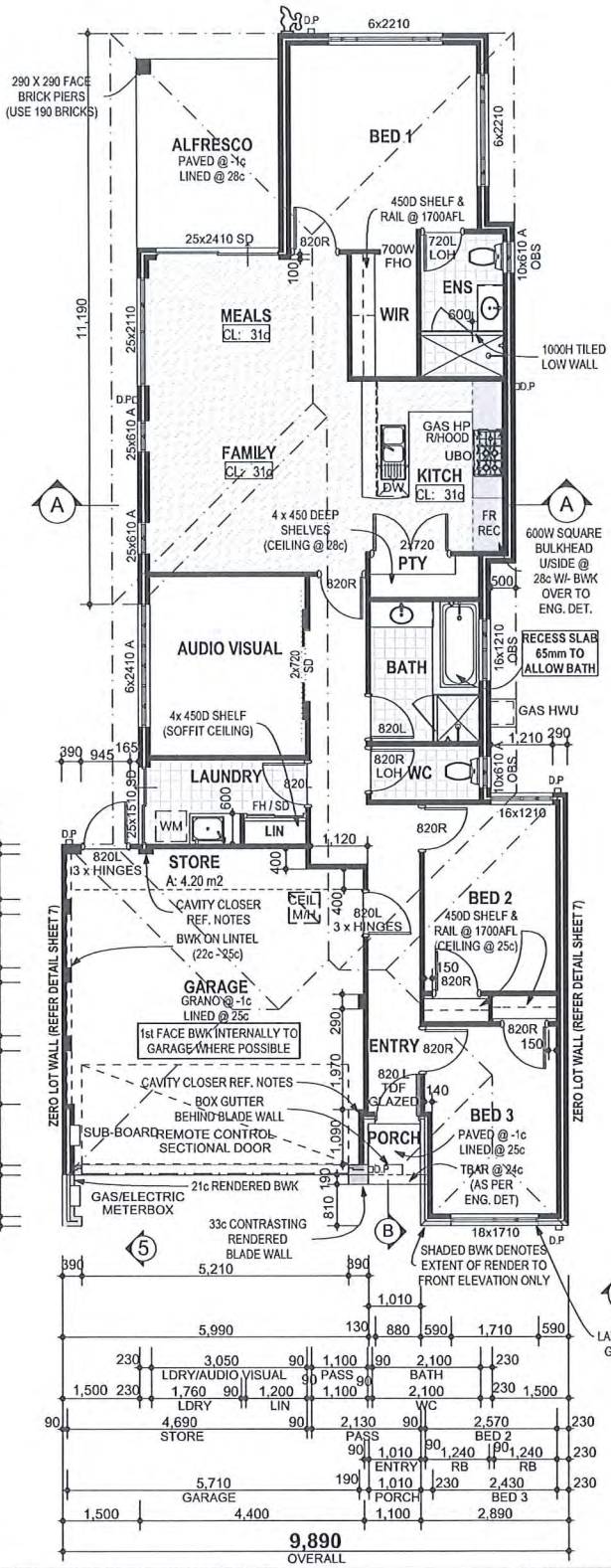
BRICK LAYER NOTE: EXTERNAL BRICKS TO BE 290 x 162 x 90 (1st external course to be a 2 course brick)

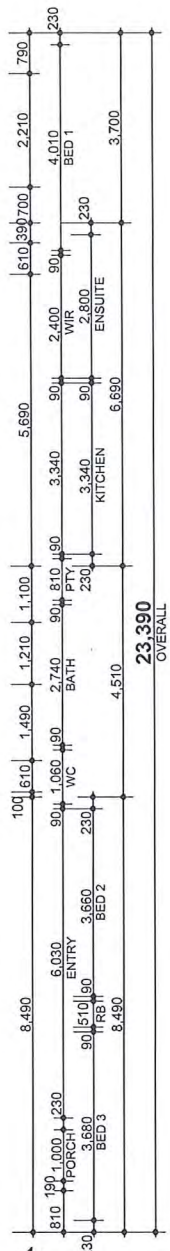












Area Name	Measured Area	Perimeter
PORCH	1.20	5.62
STORE	4.41	14.01
ALFRESCO	10.36	13.96
GARAGE	33.09	23.60
PROPOSED RESIDENCE	131.21	65.78
ROOF	194.03	66.64

FLOOR PLAN
1:100

NOTES:
- EXTERNAL WALLS CONSIST OF 230 WIDE CAVITY BRICK CONST., UNLESS NOTED OTHERWISE. 90mm EXTERNAL LEAF & 90mm INTERNAL LEAF
- ALL INTERNAL WALLS ARE PLASTERED UNLESS NOTED OTHERWISE.
- R1.3 CAVITY INSULATION AS REQUIRED - REFER SHEET 8
- R 4.0 FIBREGLASS BATT CEILING INSULATION TO HOUSE AND GARAGE AREAS ONLY AND VERTICALLY WHERE REQUIRED
- CAVITY BREACHES - BRICKLAYER TO BUILD IN CONCEALED, FULL HEIGHT FLASHING BETWEEN CAVITY CLOSER & INTERNAL LEAF.
- PROVIDE COLD WATER PLUMBING ONLY TO DW REC
- WINDOW TREATMENTS AND FLOOR COVERINGS AS PER ADDENDA
- EUROPEAN BORER: TREATMENT PROTECTION FOR ALL TIMBER ROOF FRAMING TO BE H2 HAZARD LEVEL IN ACCORDANCE WITH A.S. 1604

Honeywood, Wandi
Conditional Approval
Date: 28.2.13
By:
Subject to compliance with the Sale Contract Conditions including the Honeywood Restrictive Covenants, the requirements of The Town of Kwinana and any additional items as noted on the attached drawings

nuhomes.com.au

11 DELAWNEY STREET, BALCATTA W.A. 6021
PHONE : (08) 6241 4888
FACSIMILE : (08) 6241 4800

www.nuhomes.com.au

Nu Homes Pty Ltd reserves the right to vary dimensions and materials from those on display. Please check plans, specification and addenda carefully. All dimensions to take preference over scaling.

THIS IS ONE OF THE DRAWINGS REFERRED TO IN THE CONTRACT

DATED: ...../...../.....

OWNER ..... WITNESS .....

OWNER ..... WITNESS .....

BUILDER ..... WITNESS .....

HOUSE NAME	DRAWING NAME	SHEET No.	REVISION No.	JOB No.
THE EUREKA	FLOOR PLAN	3 OF 8	A	12183bnu

Spec ESSENTIALS

The home will be built to the dimensions on the working drawings within a reasonable tolerance

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VARIATIONS

Rev No.	Variation:	Date Drn:	By:
-	-	-	-

CLIENT NAME: Clark

SITE ADDRESS: LOT 347 Litchfield Circle Wandi

SHIRE: Kwinana

Drawn By	Date Drawn.	Salesperson.
GO	FEB- 13	LC

PRINTED : 28/02/2013 | DATE SAVED : 28/02/2013 9:50 AM | BY : gloria.oliveira | TO: F:\Client Documents\12100\12183BNU-Clark\Drawings\12183bnu Clark .pln

EVALUATION OF BUILDING COMPONENTS ***AS3671-1989***

Low-set House Similar to House at Lot 347

Package 'A' Required

Bedroom 1	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*38*	Directivity fct.	**STC/Rw Final**
External Wall	*40*	0	**40**
Window - Directly facing road	*30*	0	**30**
Window - Perpendicular to road	*30*	-3	**27**

Bedroom 2	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*38*	Directivity fct.	**STC/Rw Final**
External Wall	*37*	0	**37**
Window - Perpendicular to road	*30*	-3	**27**

Bedroom 3	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*38*	Directivity fct.	**STC/Rw Final**
External Wall	*39*	0	**39**
Window - Perpendicular to road	*32*	-3	**29**

Audio Visual	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*39*	Directivity fct.	**STC/Rw Final**
External Wall	*38*	0	**38**
Window - Perpendicular to road	*30*	-3	**27**

Meals/Family/Kitchen	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*39*	Directivity fct.	**STC/Rw Final**
External Wall	*33*	0	**33**
Window - Perpendicular to road	*34*	-3	**31**

EVALUATION OF BUILDING COMPONENTS ***AS3671-1989***

Low-set House Similar to House at Lot 347

Package 'B' Required

Bedroom 1	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*45*	Directivity fct.	**STC/Rw Final**
External Wall	*47*	0	**47**
Window - Directly facing road	*37*	0	**37**
Window - Perpendicular to road	*37*	-3	**34**

Bedroom 2	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*45*	Directivity fct.	**STC/Rw Final**
External Wall	*44*	0	**44**
Window - Directly facing road	*37*	0	**37**

Bedroom 3	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*45*	Directivity fct.	**STC/Rw Final**
External Wall	*46*	0	**46**
Window - Directly facing road	*37*	0	**37**

Audio Visual	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*42*	Directivity fct.	**STC/Rw Final**
External Wall	*41*	0	**41**
Window - Shielded from Road	*33*	-8	**25**

Meals/Family/Kitchen	Ground floor	Construction	
Item	***STC/Rw Req***	*Requirement*	
Ceiling/Roof	*42*	Directivity fct.	**STC/Rw Final**
External Wall	*36*	0	**36**
Window - Shielded from Road	*37*	-8	**29**

Appendix G STC/R_w Rating of Various Window Systems

Architectural Information

'SoundOUT' Secondary Glazing

Typical Product Performance

STC Rating dB(A)	Product
20 - 25	Sliding window with 3mm float glass rates 22 dB(A).
	Double-hung window with 3mm float glass rates 24 dB(A).
26 - 30	Double-hung window with 6.38mm laminated glass rates 27 dB(A).
	Sliding door with 4 or 5mm toughened glass rates 27 dB(A)
	Awning window with 3mm float glass rates 30 dB(A).
31 - 35	Sliding window with 6.38mm laminated glass rates 31 dB(A).
	Hinged door with 6.38mm laminated glass rates 31 dB(A).
	Sliding door with 6.38mm laminated glass rates 32 dB(A).
	Awning window with 6.38mm laminated glass rates 34 dB(A).
36 - 40	Awning window with 10.38mm laminated glass rates 37 dB(A).
	'SoundOUT' sliding door with 4mm toughened glass behind 4mm toughened prime door 40 dB(A).
41 - 45	'SoundOUT' sliding window with 6.38mm laminated glass behind 3mm float prime window 42 dB(A).
	'SoundOUT' sliding door with 6.38mm laminated glass behind 4mm toughened prime door 44 dB(A).
	'SoundOUT' casement with 6.38mm laminated glass behind 3mm float prime window 45 dB(A).
46 - 50	'SoundOUT' casement with 10.38mm laminated glass behind 3mm float prime window 50 dB(A).

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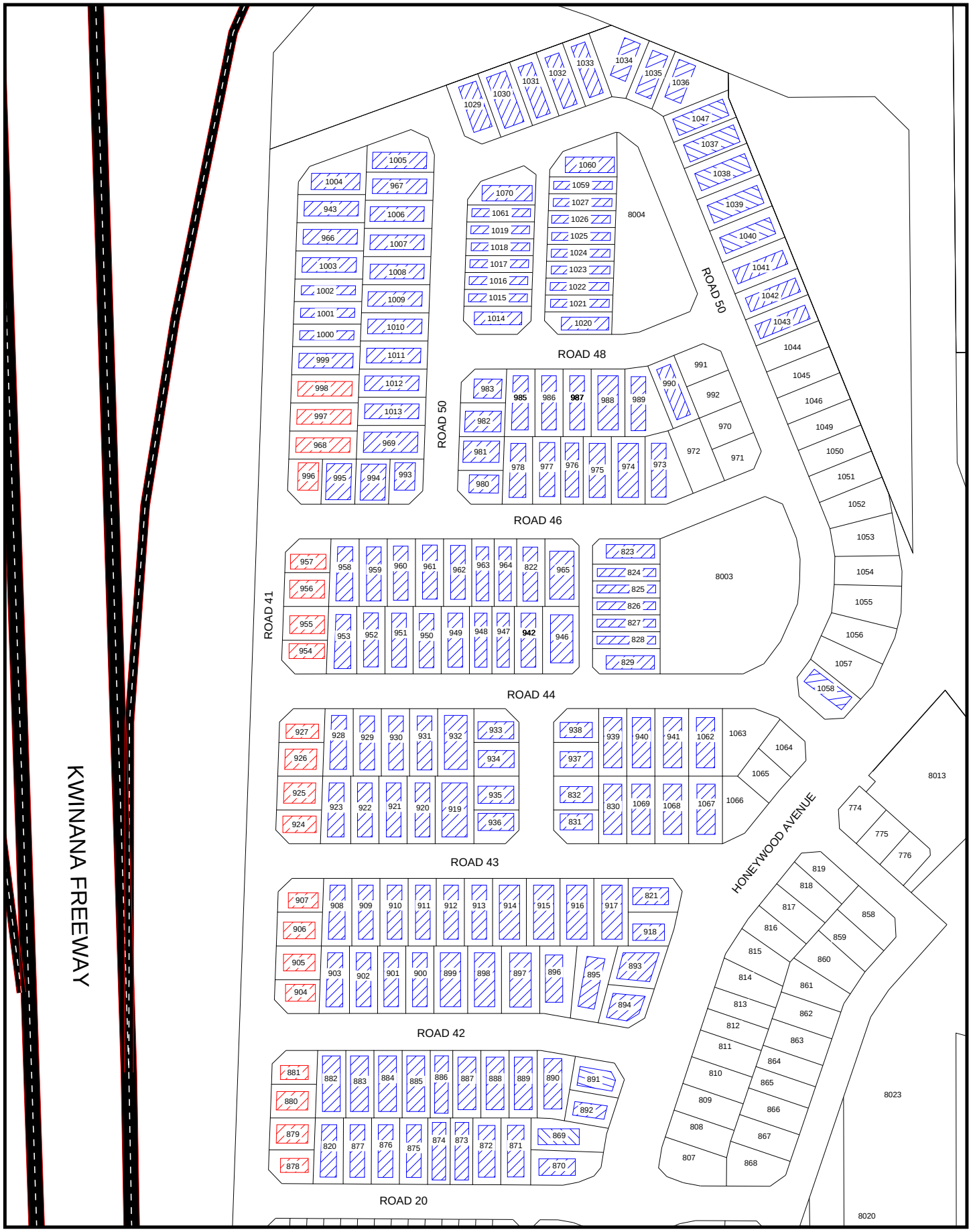
Appendix H Allotments Subject to Notification for Noise Control



Appendix H

Honeywood Estate - Stages 7, 8, and 9

Allotments subject to notification under Certificate of Title and "deemed to comply" noise insulation measures

Signs and symbols

Package 'A'

Package 'B'

N

Scale 1:2250

0 10 20 40 60 80

ATP CONSULTING ENGINEERS