Appendix 4

Environmental Assessment and Management Strategy

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emerge ASSOCIATES
Integrated Science & Design

ENVIRONMENTAL ASSESSMENT AND MANAGEMENT STRATEGY

PORTION OF LOT 16 MCDONALD ROAD BALDIVIS

Project Number EP15-057 01

Prepared for Defence Housing Australia
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Executive Summary

The Planning Group TPG on ehalf of Defence Housing Australia has prepared a Structure Plan for the future residential development of a portion of Lot 16 McDonald Road Baldivis. Lot 16 herein referred to as the site is located appro imatel 38 km south of the Perth Central Business District ithin the Cit of Rockingham. Emerge Associates ere engaged to provide a suite of environmental consultanc services to support the preparation of the Structure Plan hich has included various investigations to identif and assess the environmental attri utes and an constraints ithin the site.

The Structure Plan covers onl the portion of Lot 16 that is zoned for ur an land use under the Metropolitan Region Scheme as sho n in **Appendix A** and has een prepared TPG to provide a frame ork for the implementation of the ur an/residential land use. The Structure Plan incorporates the inputs from a multi-disciplinar pro ect team and the outcomes from various technical studies. Emerge Associates has undertaken an assessment of the environmental attri utes of the site the hole of Lot 16 in order to contri ute to the preparation of the Structure Plan.

The site has historicall een completel cleared of remnant vegetation for agricultural land uses. As such e isting remnant environmental values are limited. The environmental attri utes identified ithin the site have een outlined in **Section 2** and include

- The site has een historicall cleared for agricultural purposes primaril associated ith market gardening. The site no supports grassland ith scattered mature trees in the vicinit of an e isting residence in the estern portion of the site.
- Based on site inspections undertaken Emerge otanists remnant vegetation ithin the site is generall in Completel Degraded or Degraded condition ased upon the Bush Forever Condition Scale Government of estern Australia 2000.
- Given the e tent of historic distur ance and su se uent condition of vegetation ithin the site it is highl unlikel that an Threatened Flora or Priorit Flora species Threatened Ecological Communities or Priorit Ecological Communities occur ithin the site.
- There are no Bush Forever sites or Environmentall Sensitive Areas occurring ithin the site.
- Based on the degraded nature of vegetation the site supports limited fauna ha itat values and is unlikel to e utilised fauna other than common species adapted to distur ed environments or mo ile or opportunistic fauna species.
- Landholdings immediatel north of the site ere historicall used for market garden purposes ho ever ased a revie of availa le historic aerial photograph this land use ceased around 2014.
- Some areas of native vegetation est of the site present a permanent ushfire hazard to future residential development.

The Structure Plan has responded to the environmental attri utes of the site and this report outlines an environmental management frame ork that ill e implemented either as part of the future residential planning and development process.

Overall the environmental attri utes and values/constraints of the site have een accommodated ithin the Structure Plan la out or can e managed through the future su division and development stages in accordance ith relevant federal state and local government legislation policies and guidelines and est management practices. As such the proposed future development of the site is not e pected to significantl impact on the environment.

Based on the information contained within this report the following key recommendations should be considered for the implementation of the Structure Plan:

- There are no fundamental environmental constraints for the proposed urban development of the site and the proposed development should be considered environmentally acceptable.
- The site has been historically cleared of remnant vegetation and utilised for agricultural land uses. It is therefore highly unlikely that the site supports any significant flora and vegetation values.
- The site does not experience high groundwater levels or seasonal inundation. The Structure Plan aims to maintain clearance between groundwater and the proposed drainage infrastructure as outlined in the LWMS (Emerge Associates 2016).
- Surface and stormwater runoff infiltrates freely across the site due to the high permeability of underlying sands. The stormwater management strategy for the development aims to mimic the existing hydrology by infiltrating onsite as close to source as practicable. For high rainfall events the Structure Plan has accommodated appropriate treatment and drainage infrastructure within the proposed road network as detailed in the LWMS (Emerge Associates 2016).
- Permanent bushfire hazards occur west of the site within adjacent rural landholdings which require the accommodation of an appropriate APZ and increased construction standards. The Structure Plan has addressed this through the placement of the internal road network to provide an appropriate setback from the adjacent bushfire hazard and by undertaking an indicative BAL assessment to ensure there are no portions of the proposed development exposed to an unacceptable level of bushfire risk.

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Portion of Lot 16 McDonald Road□Baldivis Structure Plan

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Ministerial Statement No. 580 □Decem□er 2001□

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1 Introduction

1.1 Background

The Planning Group (TPG) on behalf of Defence Housing Australia has prepared a Structure Plan for the future residential development of a portion of Lot 16 McDonald Road Baldivis within the City of Rockingham. Lot 16 is herein referred to as the site and is approximately 10 hectares situated 38 km south of the Perth Central Business District (CBD) as shown in **Figure 1**. The site is bound by McDonald Road and existing urban development to the east vacant (Rural) and (Urban) zoned landholdings to the north and west and an existing residential property to the south as shown in **Figure 2**.

The Structure Plan has been prepared for a portion of the site to support residential development in accordance with the City of Rockingham's Baldivis North District Structure Plan (DSP) and the land use zoning over the site. A copy of the Structure Plan has been provided in **Appendix A**.

1.2 Purpose of this report

This report provides a synthesis of information regarding the environmental attributes and values of the site. It is based on a range of information sources including local and regional reports databases and publically available mapping and where necessary (site specific surveys and investigations. Together this information has been used to inform the Structure Plan and the preparation of supporting documentation. Emerge Associates has undertaken an assessment of the environmental attributes of the site (the whole of Lot 16) in order to contribute to the preparation of the Structure Plan over a portion of the site.

The primary purpose of this report is to present the information that has used to inform the Structure Plan outline the potential environmental impacts that could arise from the implementation of the Structure Plan and in response to this and where required outline responses in the Structure Plan to accommodate the environmental attributes of the site and collectively provide an environmental management framework for the future residential subdivision and development process.

1.3 Environmental and site specific investigations

Emerge Associates were engaged to provide a suite of environmental services to support the preparation of the Structure Plan. This has included numerous site specific technical investigations to identify and assess the environmental attributes and values/constraints present within the broader site and those portions of the site which the Structure Plan formally covers.

To date these services include:

- Desktop environmental investigation and site visit to confirm environmental attributes of the site.
- Preparation of a *Local Water Management Strategy* (LWMS) Emerge Associates 2016.
- Preparation of a *Bushfire Management Plan* (BMP) Emerge Associates and Bushfire Safety Consulting 2016.

In addition to the above a *Geotechnical and Preliminary Environmental Study* (Galt Geotechnics 2015) has been undertaken over the site.

2 Existing Environment

2.1 Local context

The site is approximately two hectares and is bound by McDonald Road and existing urban development to the east and undeveloped landholdings to the north south and west as shown in **Figure 2**.

The majority of the site is zoned Urban under the Metropolitan Region Scheme MRS and Development under the City of Rockingham's Local Planning Scheme LPS No. 2 with a small portion in the west of the site zoned for Rural land use under both the MRS and LPS No. 2. The portion of the site covered by the Structure Plan is intended for urban development in accordance with the City of Rockingham's Baldivis North DSP and its MRS zoning. The current MRS zones and reserves for the site and surrounding area are shown in **Figure 3**.

2.2 Climate

The climate of the site which applies to the broader south west region of Western Australia is described as Mediterranean with hot dry summers and moderately wet mild winters. The majority of rainfall within the region occurs between May and October each year and on average is between 600 to 1000 mm per year. However in the last 40 years there has been a marked decrease in rainfall between 10 to 15 decrease with a noticeable shift to a drier climate across the south-west of Western Australia CSIRO 2009.

The closest inland weather station to the site is the Medina Research Centre located approximately 8 km north of the site. Temperature and rainfall statistics recorded at the Medina Research Centre between 1983 and 2015 Bureau of Meteorology 2015 is summarised in **Table 1** below.

Table 1: Rainfall and temperature averages for the Medina Research Centre weather station (1983 to 2015) (BoM 2015)

STATISTICS	J	F	M	A	M	J	J	A	S	O	N	D
Mean Maximum Temperature °C	30.7	31.5	29.3	25.7	22.1	19.4	18.3	18.9	20.3	22.7	26.0	28.2
Mean Minimum Temperature °C	17.1	17.6	16.0	13.4	10.5	9.0	8.2	8.2	9.2	10.4	13.4	15.1
Mean Rainfall mm	11.5	18.8	19.3	39.4	98.5	140.8	145.9	113.0	78.2	40.1	31.4	11.4

2.3 Landform and soils

2.3.1 Topography

Topographical contours indicate that the site is generally flat with elevation ranging from approximately 4 metres Australian Height Datum m AHD in north-west corner and 5 m AHD in the

south-east of the site□□ith a high point of appro□imatel□7 m AHD located in the centre of the site□as sho□n in **Figure 4**.

2.3.2 Regional geomorphology

The site is located on the S□an Coastal Plain□□hich forms the central portion of the Perth □asin. The Perth □asin e□tends from the Darling Fault in the east to the continental slope □est of Rottnest Island□ and from the Murchison River in the north and the Southern Ocean in the south. The Perth □asin is sedimentar□in original and is marginal to the □est of the Australian Shield □Seddon 2004□.

The S□an Coastal Plain is generall□flat and is appro□imatel□20 to 30 km □ide□consisting of a series of geomorphic entities running parallel to the coastline. The □oungest and most □estern of these geomorphic entities is the □uindalup Dunes□follo□ed □□the Spear□ood Dunes and at the most eastern e□tent the Bassendean Dunes. The site is situated □ithin the Spear□ood Dunes s□stem.

2.3.3 Landform and soils

Regional landform mapping □□Church□ard and McArthur □1980□indicates that the site is comprised of the Cottesloe formation. The Cottesloe formation is descri□ed as a lo□ hill□landscape □ith shallo□ □ro□n sand over limestone□□ith much e□posed limestone □Church□ard and McArthur 1980□.

Environmental geolog□□surface soils□across the site has □een mapped □□the Geological Surve□of □ estern Australia □Gozzard 1983□. The geological units are listed in **Table 2** □elo□.

Table 2: Geological units located within the site (Gozzard 1983).

GEOLOGICAL UNIT	EQUIVALENT ON GEOLOGICAL MAPS	DESCRIPTION
S_7	Sand	Sand derived from Tamala Limestone □□ts□ Pale □ello□ish □ro□n□medium to coarse-grained□su□-angular □uartz□trace of feldspar□moderatel□sorted□of residual origin.

A geotechnical assessment □as undertaken for the site □□Galt Geotechnics □2015□□hich found ground conditions to □e generall□as e□pected □ased on the regional mapping outlined a□ove□□ith the follo□ing o□servations noted specific to the site □Galt Geotechnics 2015□□:

- Sand□medium to coarse grained□su□-angular to su□-rounded□□ro□n □ecoming □ello□ □ith depth□trace limestone co□□les and gravel□t□picall□loose to dense□present from surface to depth of □et□een one □1□metre e□tending to the ma□imum depth investigation □2.5 m□.
- Limestone□present □elo□ the sand la□er□rockhead var□ing from depths □et□een a□out one □1□ metre and more than the ma□imum depth of investigation □2.5 m□.

Imported fill □as found to occur in the north-□est of the site□associated □ith the e□isting residence in this portion of the site □Galt Geotechnics 2015□. Further details are provided □ithin the report titled *Geotechnical and Preliminary Environmental Study* □Galt Geotechnics 2015□provided as an attachment to the Structure Plan.

2.3.4 Acid sulfate soils

Acid sulfate soils □ASS□is the name commonl□given to naturall□occurring soils and sediment containing iron sulphide □iron p□rite□materials. In their natural state ASS are generall□present in □aterlogged ano□ic conditions and do not present an□risk to the environment. □ hen o□idised□ASS

produce sulphuric acid which can pose risks to the surrounding environment infrastructure and human health.

Available information (DER 2006) indicates that the site has been classified as having 'no known risk' of ASS occurring within three metres of the natural soil surface. An area of 'moderate to high risk' is mapped south-west of the site as shown in **Figure 5** likely associated with wetlands in this area.

2.4 Biodiversity and natural assets

2.4.1 Flora and vegetation

2.4.1.1 Regional vegetation context

The site lies within the Swan Coastal Plain Interim Biogeographic Regionalisation for Australia (IBRA) region (Thackway and Cresswell 1995). The Swan Coastal Plain IBRA region is broadly compatible with the Swan Coastal Plain (Drummond Botanical Subdistrict/Phytogeographical Subregion as described by Beard (1990). This region is characterised by *Banksia* low woodlands on leached sands; woodlands of tuart (*Eucalyptus gomphocephala*) jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) on less leached soils and Melaleuca swamps.

At a local level vegetation complex mapping for the Swan Coastal Plain (Heddle *et al.* 1980) indicates that the site is characteristic of the Cottesloe Central and South complex. Vegetation complex mapping is based on soil geomorphology and water availability patterns. The Cottesloe Central and South complex is described as a mosaic of woodland of *Eucalyptus gomphocephala* and open forest of *Eucalyptus gomphocephala - Eucalyptus marginata - Corymbia calophylla* closed heath on the limestone outcrops (DEC 1980).

Remnant vegetation extent remaining according to vegetation complexes have been published by the Local Biodiversity Program through the Western Australian Local Government Association (WALGA). This indicates that the pre-European extent of the Cottesloe Central and South complex on the Swan Coastal Plain was 44 900 ha. As of 2013, 15 816 ha (35%) of this remains and 18% of the complex's original extent is under formal or informal protection (DPBP 2013).

On the Swan Coastal Plain portion of the Perth Metropolitan Region EPA Guidance Statement No. 10 (*Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of System 1 region* (EPA 2006) specifies that a biodiversity objective is to retain at least 10% of the pre-European settlement extent of the Heddle et al. 1980 vegetation Complexes.

2.4.1.2 Extent and condition of remnant vegetation

The site has been historically cleared of remnant vegetation to support agricultural land uses and now supports areas of grassland dominated by weeds with a small number of planted non-native trees in the western extent of the site as shown in **Plate 1** and **Plate 2** below.

Due to the complete removal of remnant vegetation from the site, based on a site inspection by Emerge botanists, vegetation is considered to be in 'Completely Degraded' condition based on the Keighery (1994) condition scale and is considered no longer representative of the Cottesloe Central and South complex.

Plate 1: Planted non-native trees over weedy grassland in the west of the site

Plate 2: Planted, non-native trees over weedy grassland in the west of the site

2.4.1.3 *Significant Flora*

Species of flora ac uire Threatened Flora TF or Priorit Flora PF conservation status here populations are restricted geographicall or threatened local processes. The Department of Parks and ildlife DPa recognises these threats and su se uentl applies regulations to ards population protection and species conservation. The DPa enforces regulations under the *Wildlife Conservation Act 1950* C Act to conserve TF species and protect significant populations. PF are descri ed as potentiall rare or threatened species and are classified in order of threat.

The Common ealth *Environment Protection and Biodiversity Conservation Act 1999* EPBC Act promotes the conservation of iodiversit providing statutor protection for plants at a species level. Some TF species listed under the C Act are also listed at a Federal level. Section 178 and 179 of the EPBC Act provides for the lists and categories of threatened species under the Act. Priorit flora species are potentiall rare or threatened and are classified in order of threat ho ever are not afforded direct statutor protection.

Given the e tent of historic distur ance ithin the site there is unlikel to e an significant flora species present ithin the site.

2.4.1.4 *Threatened and/or Priority Ecological Communities*

In estern Australia Threatened Ecological Communities TECs are defined the estern Australian Threatened Ecological Communities Scientific Advisor Committee ATECSAC. Generall these can e descri ed as vegetation communities that are assem lages of species that occur together in a particular t pe of ha itat. The are the sum of species ithin an ecos stem and as a hole provide man of the processes hich support a specific ecos stem. TECs are recognised as specific ecological communities that are rare or under threat.

TECs are not afforded direct statutor protection at a State level ut their significance is ackno ledged through other State environmental approval processes i.e. environmental impact assessment pursuant to Part I of the *Environmental Protection Act 1986* EP Act. nder the State process the Department of Parks and ildlife DPa has een identif ing potential TECs since 1994 using a range of definitions to indicate the level of threat to the TEC in uestion and providing recommendations to ATECSAC. In addition to eing listed at a state level some TECs are afforded federal protection under Section 181 of the EPBC Act.

A communit ma e listed as a Priorit Ecological Communit PEC hich is an ecological communit that is under consideration for listing as a TEC ut does not et meet surve criteria or has not een ade uatel defined.

Given the e tent of historic distur ance ithin the site it is highl unlikel that an areas of TEC or PEC should occur ithin the site.

2.4.2 Bush Forever and conservation reserves

The Government of estern Australia s *Bush Forever Policy* is a strategic plan for conserving regionall significant ushland ithin the S an Coastal Plain portion of the Perth Metropolitan Region. The o ective of Bush Forever is to protect comprehensive representations of all original ecological communities targeting a minimum of 10 of each vegetation comple for protection Government of estern Australia 2000. Bush Forever Sites are representative of regional ecos stems and ha itat and have a ke role in the conservation of Perth s iodiversit .

There are no Bush Forever Sites □ithin the site. The nearest Bush Forever site is situated appro□imatel□370 m south of the site□as sho□n in **Figure 6**.

2.4.3 Ecological Linkages

Ecological linkages allo□ the movement of fauna□flora and genetic material □et□een areas of fragmented remnant ha□itat. The movement of fauna and the e□change of genetic material □et□een vegetation remnants improve the via□ilit□of those remnants □□allo□ing greater access to □reeding partners□food sources□refuge from distur□ances such as fire and maintenance of genetic diversit□of plant communities and populations. Ecological linkages are often continuous or near-continuous as the more fractured a linkage is□the less ease flora and fauna have in moving □ithin the corridor □Mollo□*et al.* 2009□.

Ecological linkages have □een generall□identified □□the State Government in Bush Forever□Perth□s Green□a□s and the S□stem 6 stud□and have □een pu□lished □□the Perth Biodiversit□Pro□ect. These identified linkages reflect the on-ground linkages throughout the Perth Metropolitan area □Mollo□*et al.* 2009□. The dataset is emplo□ed as a conservation tool aimed to conserve and enhance our regional ecological linkages.

There are no mapped ecological linkages □ithin or in the vicinit□of the site. Regional ecological connectivit□is maintained □□large areas of remnant vegetation retained □ithin Bush Forever sites and other conservation reserves south and □est of the site□as sho□n in **Figure 6**.

2.4.4 Environmentally Sensitive Areas

Environmentall□Sensitive Areas □ESAs□are prescri□ed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have □een identified to protect native vegetation values of areas surrounding significant□threatened or scheduled flora□vegetation communities or ecos□stems. E□emptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not appl□□ithin declared ESAs□and the presence of an ESA □ould indicate that the site potentiall□ supports significant environmental values. Ho□ever□e□emptions under Schedule 6 of the *Environmental Protection Act 1986* still appl□□including an□clearing in accordance □ith a su□division approval under the *Planning and Development Act 2005* □a recognised e□emption under the Schedule 6 of the *Environmental Protection Act 1986*□.

There are no declared ESAs □ithin the site. An ESA occurs south-□est of the site□likel□to □e associated □ith a □etland in this area□as sho□n in **Figure 6**.

2.4.5 Terrestrial fauna

Given the e□tent of historic distur□ance □ithin the site□an□fauna species present □ould □e generall□ common and □idespread species □ith non-specific re□uirements □hich allo□ them to persist in highl□ distur□ed ha□itats.

Based on pu□licall□availa□le regional □lack cockatoo ha□itat mapping prepared □□DPa□ □previousl□ Department of Environment and Conservation □DEC□□□the Baldivis area supports potential □lack cockatoo foraging ha□itat as □ell as kno□n roosting and □reeding sites □DEC 2011□. There are no kno□n roosting or □reeding sites located □ithin or in the vicinit□of the site□and □hile areas of remnant vegetation □est of the site are mapped as potential foraging ha□itat □DEC 2011□□as sho□n in **Figure 7**□there is none □ithin the site. Large areas of □lack cockatoo ha□itat are kno□n to alread□ □e

reserved within conservation areas (i.e. Bush Forever) such as the Rockingham Lakes Regional Park network south of the site.

2.5 Hydrology

2.5.1 Groundwater

A Local Water Management Strategy (LWMS) (Emerge Associates 2016) has been prepared that describes the hydrological setting and in particular groundwater conditions within the site. As outlined in the LWMS (Emerge Associates 2016) recent groundwater monitoring data from the adjacent eastern residential subdivision (Chimes) indicate that a maximum groundwater level of 1.38 m AHD was recorded in a bore located approximately 30 m from the south eastern corner of the site in July 2012 (Cardno 2013).

It is inferred that depth to MGL ranges between 2.38 m below ground level (BGL) in the north western corner of the site (i.e. beneath a corner of the future rural area) and 5.38 m BGL in the proposed residential (south eastern) portion of the site as outlined in the LWMS (Emerge Associates 2016).

Information on groundwater from the Department of Water (Online Water Register) (DoW 2016) indicates that groundwater beneath the site is a multi-layered system comprised of the following:

- Perth Superficial Swan
- Perth Leederville
- Perth Yarragadee North.

The site is located in the Stakehill groundwater area) within the Tamworth Swamp sub-area. The DoW (Online Water Register) indicates that there is allocation available within the Perth-Superficial Swan aquifer (DoW 2016). There is currently no existing groundwater licences for abstraction within the site.

2.5.2 Surface water

No surface water features have been observed within the site and no external surface water catchments direct surface water flows into the site. Any rainfall would infiltrate freely across the site due to the high permeability of the underlying sands.

2.5.3 Wetlands

Based on Department of Parks and Wildlife's (DPaW) (Geomorphic Wetland series mapping (DPaW) 2014) there are no wetlands within the site. A Conservation Category) Wetland) (FI 6400) occurs approximately 75m south-west of the site as shown in **Figure 8**.

2.5.4 Public Drinking Water Sources

Public Drinking Water Source Areas (PDWSAs) are surface water catchments or groundwater recharge areas that have been identified as drinking water sources) proclaimed as water reserves) in the Dow (DoW 2009)) and protected) under government legislation. PDWSAs provide the majority of Western Australia's drinking water supplies and can be vulnerable to contamination from a range of land uses and water based activities (DoW 2009a) therefore consideration needs to be given to the intended land use and associated activities to ensure that they are appropriate in meeting the water protection qualityobjectives of the area.

The site is not located within an) proclaimed PDWSA.

2.6 Heritage

2.6.1 Indigenous heritage

Based on a review of the Department of Aboriginal Affairs Aboriginal Heritage Inquiry System online database (DAA 2016) there are no registered Indigenous heritage sites within or immediately adjacent to the site.

2.6.2 Non-Indigenous heritage

A desktop search of the City of Rockingham's local municipal heritage list (City of Rockingham 2015), the State Heritage Office database (Heritage Council 2012) and the Australian Heritage Database (Department of Environment 2013) indicated there are no registered European heritage sites within or in close proximity to the site.

2.7 Land use considerations

2.7.1 Historical land uses and potential contamination

A search of the Department of Environment Regulation's (DER) Contaminated Sites Database and Register found there to be no registered contaminated sites within or immediately adjacent to the site (DER 2016).

Based on a review of historic aerial photographs the site was cleared of native vegetation prior to 1953 (earliest available aerial image) for agricultural purposes and to allow for subsequent market garden land uses. Market garden land uses are generally considered to have a low risk of contamination but are listed in *Potentially Contaminating Activities, Industries and Landuses* guideline (DER 2004).

As part of the geotechnical investigation undertaken for the site (Galt Geotechnics 2015) limited contamination investigations were also undertaken involving a desktop assessment and review of historic aerial photographs, excavation of test pits and bore holes and the laboratory testing of soil samples for heavy metals and organochlorine and organophosphate pesticides (Galt Geotechnics 2015). These investigations indicated that there was no evidence of soil contamination within the site as a result of historic market garden land uses and therefore it is unlikely that soils within the site have been impacted to an extent that would restrict development for urban purposes (Galt Geotechnics 2015).

2.7.2 Surrounding land uses

2.7.2.1 Parmelia high pressure gas pipeline

The Parmelia high pressure natural gas pipeline easement occurs approximately 100m south-west of the site. The WAPC's Planning Bulletin No. 87 *High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region* (Planning Bulletin No. 87) specifies a minimum 65 m setback between the Parmelia gas pipeline and residential lots, therefore there will be no impact on development within the site from the gas pipeline.

2.7.2.2 Poultry farm

An existing poultry farm is situated approximately 850 m south-east of the site. Based on EPA Guidance Statement No. 3 *Separation Distances between Industrial and Sensitive Land Uses* (EPA)

2005), there is a recommended generic separation distance of 300-1000m (depending on the size of the operation) between poultry farming facilities and sensitive land uses.

A detailed and site specific odour impact assessment (The Odour Unit (WA) Pty Ltd 2010) was undertaken for the poultry farm as part of local structure planning for the landholdings within the East Baldivis DSP area, east of Baldivis Road. The purpose of this assessment was to understand the extent to which this land use could impact on proposed urban development, and to derive recommended buffer requirements (The Odour Unit (WA) Pty Ltd 2010). The assessment indicated an off-site odour impact of up to 100m in any direction from the poultry sheds based on the specific operations of the poultry farm and the existing site conditions. This recommended separation distance will not result in any consideration for the site or Structure Plan area.

2.7.2.3 Market gardens

Based on a review of publically available historic aerial photography, landholdings to the north of the site have been subject to extensive historic market garden activities. This area is zoned 'Urban' under the MRS and is intended for future urban development under the City of Rockingham's Baldivis (North) DSP. It is understood that the landowner is currently progressing planning for the urban development of this area, therefore this historic land use is not a key consideration or constraint to urban development within the site.

2.8 Natural hazards

2.8.1 Bushfire hazards

Portions of the site have been identified as 'Bushfire Prone Areas' under the state-wide *Map of Bushfire Prone Areas* recently released by the Office of Bushfire Risk Management (OBRM), as shown in **Figure 9**. The identification of Bushfire Prone Areas within any portion of the site requires a further assessment of the bushfire hazard implications on development proposed within the site to be undertaken in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (WAPC *et al.* 2015). This has been addressed through the preparation of a *Bushfire Management Plan* (Emerge Associates and Bushfire Safety Consulting 2016), in accordance with the WAPC's *Guidelines for Planning in Bushfire Prone Areas* and the Australian Standard *AS3959-2009 Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia 2009). The Bushfire Management Plan (BMP) aims to address bushfire management issues within the Structure Plan and through this, minimise the impact of bushfires within and surrounding the site, thereby reducing the threat to life, property and the environment.

All areas within the site and surrounding 100 m have been assessed for the presence of bushfire prone vegetation and, where it occurs, its classification as per Table 2.4.3 of AS 3959 (Standards Australia 2009) to determine the associated bushfire hazard rating levels.

The permanent bushfire hazard features which are relevant for the site include vegetation within rural landholdings east of the site. All areas within 100m of these determined permanent hazards are considered 'Bushfire Prone Areas' of the site, and will require further assessment as part of future subdivision. The bushfire hazard assessment is outlined in detail within the BMP (Emerge Associates and Bushfire Safety Consulting 2015).

3 Structure Plan and Planning Approval Framework

3.1 Historical planning and environmental assessment context

The site formed part of the Cit□of Rockingham□s To□n Planning Scheme No. 1 Amendment No. 300 □hich □as initiated to rezone the site and surrounding area from □Rural□to □Development□in line □ith the MRS. The amendment □as formall□assessed □□the EPA in 2001 and it □as determined that the proposal could □e implemented su□□ect to conditions. The approval and associated conditions are outlined in Ministerial Statement No. 580 □dated 19th Decem□er 2001□□hich has □een attached as **Appendix B**.

The conditions outlined in Ministerial Statement No. 580 relate to the development of the follo□ing management plans as part of the land use planning process□

- Drainage and Nutrient Management Plan □addressed through the preparation of an L□ MS □Emerge Associates 2016□in accordance □ith the Department of □ ater□s □Do□ □Better □r□an □ ater Management Guidelines □Do□ □2008□□.
- Soil and Ground□ater Investigation and Remediation Plan □addressed through the preliminar□ assessment undertaken as part of the *Geotechnical and Preliminary Environmental Study* □Galt Geotechnics 2015□
- Pipeline Protection Plan □not relevant for the site□as the site falls outside of the set□ack distances re□uired under □ APC□s Planning Bulletin No. 87 and the Ministerial Statement No.580.
- Spra□Drift Investigation and Management Plan □not relevant for the site□as no active market garden operations occur in the vicinit□of the site.
- □egetation Management Plan □not relevant for the site□as the site is not located in the vicinit□ of regionall□significant vegetation □i.e. Bush Forever Site 356□

3.2 Portion of Lot 16 McDonald Road Structure Plan

The Structure Plan has □een prepared for a portion of the site to provide a frame□ork for the implementation of the proposed residential land use. The Structure Plan incorporates the inputs from a multi-disciplinar□pro□ect team and the outcomes from various technical studies. The Structure Plan□ attached in **Appendix A**□provides a frame□ork for the future development of□

- 29 lo□ densit□residential lots
- Road reserves to service the 29 residential lots.

The remainder of the site □ill retain its rural zoning and □ill □e used for long term rural/rural residential land uses in accordance □ith its land use zoning.

Emerge has undertaken various environmental investigations and o□tained information from previous site investigations in order to determine the environmental attri□utes and values □ithin the site as outlined in **Section 2**. This information has □een used to ensure that an□identified environmental attri□utes and values □ere appropriatel□accommodated in the Structure Plan.

3.3 Future planning approval process

Follo□ing the lodgement and approval of the Structure Plan□residential development □ill □e progressed in accordance □ith the Structure Plan□as provided in **Appendix A**. It is usual for the residential su□division and development process to involve the imposition of su□division approval conditions□in accordance □ith the □ APC□s *Model Subdivision Conditions Schedule* □□ APC 2012□□ and these generall□cover the follo□ing relevant areas□

- Amenit□
- Buildings and use
- Drainage and site □orks
- Electricit□and gas pipelines
- Environmental conditions
- Fire and emergenc□
- Lot design
- Reserves
- Transport roads and access
- □ ater and se□ers.

This condition frame□ork provides a future environmental management frame□ork for the Structure Plan area throughout su□division and development□and is discussed further in **Section 4**.

3.4 Relevant environmental factors and considerations

Table 3 lists the full suite of environmental factors that have □een investigated for the site□and summarises those that re□uire further specific attention in **Section 4**.

Table 3: Relevant environmental factors and considerations for the Structure Plan

ENVIRONMENTAL FACTOR	RELEVANT CONSIDERATIONS
Climate	No issues posed and therefore no further consideration is re□uired.
Topograph□	No issues posed and therefore no further consideration is re□uired.
Geolog□	No issues posed and therefore no further consideration is re□uired.
Landforms and soils	No issues posed and therefore no further consideration is re□uired.
Acid Sulfate Soils	There is currentl□□no kno□n risk□of ASS occurring □ithin three metres of the natural soil surface. No further consideration is re□uired.
Flora and vegetation	The site has historicall□□een completel□cleared of remnant vegetation□and is highl□unlikel□to support an□remnant flora and vegetation values. No further consideration is re□uired.
Bush Forever and conservation reserves	No Bush Forever sites occur □ithin or in close pro□imit□to the site□and therefore no further consideration is re□uired.
Ecological linkages	No ecological linkages occur □ithin or in close pro□imit□to the site□and therefore no further consideration is re□uired.
Environmentall□Sensitive Areas □ESAs□	The site does not fall □ithin a declared ESA□and therefore no further consideration is re□uired.
Terrestrial fauna	The site has historicall□□een completel□cleared of remnant vegetation□and is

ENVIRONMENTAL FACTOR	RELEVANT CONSIDERATIONS
	highl□unlikel□to support an□significant fauna ha□itat values. No further consideration is re□uired.
Ground□ater	Pre-development ground□ater levels and □ualit□ □ill need to □e maintained throughout and post residential development. This is addressed further in **Section 4**.
Surface □ater	There are no surface □ater features □ithin the site□therefore no further consideration is re□uired. Post development storm□ater flo□s □ill □e managed as part of future residential development and is addressed in the L□ MS □Emerge Associates 2016□ This is addressed further in **Section 4**.
□ etlands	The site does not contain an□areas of □etland□and development □ill not impact on □etlands surrounding the site. No further consideration is re□uired.
Pu□lic Drinking □ ater Source Areas □PD□ SAs□	The site is not located □ithin a declared PD□ SA□and therefore no further consideration is re□uired.
Indigenous heritage	There are no kno□n Indigenous heritage values □ithin or in close pro□imit□to the site□and therefore no further consideration is re□uired.
Non-Indigenous heritage	There are no kno□n non-Indigenous heritage values □ithin or in close pro□imit□to the site□and therefore no further consideration is re□uired.
Historic land uses	Preliminar□contamination investigations at the site indicated that there □as no evidence of soil contamination □ithin the site as a result of historic market garden land uses□and therefore it is unlikel□that soils □ithin the site have □een impacted to an e□tent that □ould restrict development for ur□an purposes □Galt Geotechnics 2015□ No further consideration is re□uired.
Surrounding land uses	A poultr□farm and a high pressure gas pipeline are located in the vicinit□of the site□ ho□ever the site is located outside of the recommended separation distances for these land uses□therefore no further consideration is re□uired.
Bushfire hazard	Classified vegetation surrounding the site poses Moderate to E□treme □ushfire hazard considerations for future residential development. This is addressed further in **Section 4**.

4 Environmental Assessment and Management Framework

This section discusses in detail the spatial response of the Structure Plan to the environmental attri□utes and values/constraints □ithin the site□and also outlines an□future environmental management considerations that □ill □e re□uired as part of future residential su□division and development □ithin the Structure Plan area. This section addresses onl□those environmental aspects that re□uire specific consideration □ased on their relevance to the site and Structure Plan□in accordance □ith applica□le legislation and polic□re□uirements□and □ere identified in **Section 3**.

4.1 Hydrology – groundwater

4.1.1 Policy framework and management objective

The EPA□s *Environmental Assessment Guideline No. 8 Environmental factors and objectives* □EPA 2015□outlines the follo□ing ke□o□ectives for the management of ground□ater□

- To maintain the h□drological regimes of ground□ater so that e□isting and potential uses□ including ecos□stem maintenance□are protected.
- To maintain the □ualit□of ground□ater□sediment and □iota so that the environmental values□ □oth ecological and social□are protected.

State Planning Policy 2.9 Water Resources □□ APC 2006□outlines the follo□ing ke□polic□o□ectives□

- Protect□conserve and enhance □ater resources that are identified as having significant economic□social□cultural and/or environmental values.
- Assist in ensuring the availa□ilit□of suita□le □ater resources to maintain essential re□uirements for human and all other □iological life □ith attention to maintaining or improving the □ualit□and □uantit□of □ater resources.
- Promote and assist in the management and sustaina□le use of □ater resources.

The Cit□of Rockingham□s *Planning Procedure 1.8 Water Sensitive Urban Design* aims to provide direction for the protection and conservation of all □ater resources □ithin the Cit□of Rockingham□as □ell as □etland and □ushland areas □including the Peel Harve□Estuar□□. The Cit□of Rockingham re□uires different t□pes of □ater management plans at the various levels of development planning□in order to address ground□ater level and □ualit□management as part of land use planning and development.

4.1.2 Structure Plan considerations for groundwater

The ground□ater management strateg□for the site is documented □ithin the L□ MS □Emerge Associates 2016□prepared in accordance □ith the a□ove policies. The ground□ater management approach is passive and aims to avoid an□intersection □ith ground□ater□and therefore an□ modification or manipulation of e□isting ground□ater levels. Depth to ground□ater across the site is significant and no su□soil drains are proposed.

The main o□□ective for the management of the ground□ater □ualit□is to maintain or improve the e□isting ground□ater □ualit□. This can □e achieved □□reducing the total nutrient load into the ground□ater that originates from the development compared to historic and e□isting land uses. Improving ground□ater □ualit□can □e achieved □□the treatment of surface runoff prior to infiltrating to

ground ater and this ill e undertaken through the development of the site as descri ed in the L MS Emerge Associates 2016.

Further information is provided in the L MS Emerge Associates 2016.

4.1.3 Future groundwater management requirements

As part of implementing the future residential land use ithin the site an r an ater Management Plan MP ill e re uired to support su division in order to address APC s standard model su division condition D2 APC 2012 hich states

Prior to the commencement of subdivisional works, an urban water management plan is to be prepared and approved, in consultation with the Department of Water, consistent with any approved Local Water Management Strategy. (Local Government).

The MP ill provide information on the implementation of the L MS through detailed civil and landscape design.

In addition to the a ove a ground ater licence ill e re uired for non-pota le ater supplies to manage dust associated ith residential su division ithin the site and an ground ater a straction for orks ithin the site ill e undertaken in accordance ith the approved licence. There are no areas of pu lic open space proposed ithin the site and therefore no future irrigation re uirements.

4.1.4 Predicted environmental outcomes

The L MS provides the frame ork for the management of ground ater levels and ualit in a contemporar est-practice approach utilising ater sensitive ur an design o ectives and in accordance ith the APC and EPA guidelines and polic frame orks. The preparation of a MP to satisf su division approval ill provide design details that ill ensure the sustaina le use of ground ater resources.

4.2 Hydrology – surface water

4.2.1 Policy framework and management objective

The *State Water Strategy* Government of A 2003 and *Better Urban Water Management* APC 2008 endorse the promotion of integrated ater c cle management and application of ater sensitive ur an design S D principles to provide improvements in the management of storm ater and to increase the efficient use of other e isting ater supplies.

The ke principles of integrated ater c cle management include

- Considering all ater sources including aste ater storm ater and ground ater.
- Integrating ater and land use planning.
- Allocating and using ater sustaina l and e uita l.
- Integrating ater use ith natural ater processes.
- Adopting a hole of catchment integration of natural resource use and management.

The EPA s *Environmental Assessment Guideline No. 8 Environmental factors and objectives* EPA 2015 outlines the follo ing ke o ectives for the management of surface ater

- To maintain the hydrological regimes of surface water so that existing and potential uses including ecosystem maintenance are protected.
- To maintain the quality of surface water sediment and biota so that the environmental values both ecological and social are protected

State Planning Policy 2.9 Water Resources (WAPC 2006) outlines the following key policy objectives:

- Protect conserve and enhance water resources that are identified as having significant economic social cultural and/or environmental values.
- Assist in ensuring the availability of suitable water resources to maintain essential requirements for human and all other biological life with attention to maintaining or improving the quality and quantity of water resources.
- Promote and assist in the management and sustainable use of water resources

The City of Rockingham's *Planning Procedure 1.8 Water Sensitive Urban Design* aims to provide direction for the protection and conservation of all water resources within the City of Rockingham as well as wetland and bushland areas including the Peel Harvey Estuary. The City of Rockingham requires different types of water management plans at the various levels of development planning in order to address groundwater level and quality management as part of land use planning and development.

4.2.2 Structure Plan considerations for surface water

The surface water/stormwater management strategy for the site is documented within the LWMS (Emerge Associates 2016). The main focus for surface water management is to maintain the existing hydrology by retaining surface flows and to infiltrate stormwater runoff within the site as close to source as possible.

There will be no runoff from the development up to the 100 year average recurrence interval (ARI) event consistent with the pre-development environment. Further non-structural measures will also be adopted and will be detailed in the future Urban Water Management Plan (UWMP). Runoff from lots up to the 1 year 1 hour ARI event will either infiltrate directly at-source or in large rainfall events (i.e. approximately a 5 year ARI event) may discharge to the road network. Runoff from impervious areas will be directed to soakwells where it will infiltrate into the sandy fill and ultimately to groundwater. Infiltration of runoff through the underlying soils will provide treatment through adsorption of nutrients to sand particles prior to reaching groundwater (Emerge Associates 2016).

Further information is provided in the LWMS (Emerge Associates 2016).

4.2.3 Future management requirements for surface water

As part of implementing the future residential land use within the site an UWMP will be required for subdivision stage in order to address DAPC's standard model subdivision condition D2 (WAPC 2012) which states:

Prior to the commencement of subdivisional works, an urban water management plan is to be prepared and approved, in consultation with the Department of Water, consistent with any approved Local Water Management Strategy. (Local Government).

The UWMP will provide information on the implementation of the LWMS through detailed civil and landscape design.

4.2.4 Predicted environmental outcomes

The L MS provides the frame ork for the Structure Plan to manage surface ater including storm ater flo s in a contemporar est-practice approach utilising S D o ectives and in accordance ith the APC and EPA guidelines and polic frame orks. The preparation of a MP to satisf su division approval ill provide design details that ill ensure the sustaina le use of surface ater resources.

4.3 Natural hazards – bushfire management

4.3.1 Policy framework and management objective

The *Guidelines for Planning in Bushfire Prone Areas* APC *et al.* 2015 have een prepared the APC and DFES and provide the foundation for ushfire risk management planning on private land in estern Australia. These guidelines have superseded the previous *Planning for Bush Fire Protection Guidelines – Edition 2* APC et al. 2010. The guidelines address important ushfire risk management and planning issues and set out performance criteria and accepta le solutions to minimise the risk of ushfires in ne su divisions and developments. The guidelines also address management issues including location design the development site set ack re uirements Bushfire Attack Level BAL ratings vehicular access and ater re uirements.

The DoP and APC have recentl released *State Planning Policy 3.7 Planning in Bushfire Prone Areas* Decem er 2015 SPP 3.7. For planning provisions specificall relating to ushfire SPP 3.7 is intended to supersede SPP 3.4 *Natural Hazards and Disasters* and aims to inform and guide decision makers referral authorities and proponents to achieve accepta le ushfire protection outcomes including e pectations at the different stages of the planning process. SPP 3.7 makes provision for further detailed ushfire hazard assessment to e undertaken for areas identified as ushfire prone areas ithin the state *Map of Bushfire Prone Areas* in order to provide a complete and site specific ushfire risk assessment for proposed development of vulnera le land uses.

egetation ithin and surrounding the site has een classified according to AS 3959. egetation that is to e permanentl retained surrounding the site ill pose permanent ushfire hazard considerations. In the same a vegetation that is to e cleared for future ur an purposes in the short to medium term ill pose onl temporar ushfire management considerations.

4.3.2 Structure Plan considerations for bushfire management

A Bushfire Management Plan BMP has een prepared hich aims to address ushfire management issues ithin the Structure Plan and through this minimise the impact of ushfires ithin and surrounding the site there reducing the threat to life propert and the environment. As outlined in the BMP Emerge Associates and Bushfire Safet Consulting 2016 the permanent ushfire hazard considerations for the site are associated ith oodland forest and grassland vegetation ithin rural landholdings est of the site hich pose an E treme ushfire hazard to development ithin the site.

The Structure Plan has accommodated the surrounding areas of ushfire hazard through the placement of road reserves in the est of the site to provide an appropriate set ack or Asset Protection one et een future d ellings and the ad acent ushfire hazard. In addition to AP re uirements surrounding vegetation is likel to present increased Bushfire Attack Levels BALs hich influences uilding standards for d ellings at the construction stage. An indicative BAL assessment has een undertaken as part of the BMP Emerge Associates and Bushfire Safet 2016.

4.3.3 Future bushfire management considerations

As outlined above and in the BMP prepared to support the Structure Plan (Emerge Associates and Bushfire Safety Consulting 2016), development within 100 m of an (Extreme or (Moderate) hazard which is not classified as (Low) Threat) will require site-specific AS 3959 BAL assessment prior to dwelling construction. The BMP proposes the BAL assessment be undertaken as part of the subdivision process for the site. By deferring BAL assessment until development, the location, structure and slope of any vegetation can be more accurately evaluated and surrounding hazards may have been removed with the development of neighbouring lots), which may reduce the hazard and subsequent AS 3959 construction requirements.

In addition to the above, the WAPC model subdivision conditions relating to bushfire hazard management (model subdivision conditions F2 and F3)) WAPC 2012) include the following requirements:

- *A fire management plan being prepared, approved and relevant provisions implemented during subdivisional works, in accordance with the WAPC's* Guideline Planning for Bushfire Protection Edition 2, May 2010 *(in particular Appendix 3) to the specifications of the local government and/or the Fire and Emergency Services Authority. (Fire and Emergency Services Authority) OR (Local Government).*
- *A notification, pursuant to Section 70A of the* Transfer of Land Act 1893 *is to be placed on the certificate(s) of title of the proposed lot(s). Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows: "The lot(s) is/are subject to a fire management plan." (Local Government).*

4.3.4 Predicted environmental outcomes

By utilising the BMP at this early stage of planning process, the Structure Plan has been able to incorporate bushfire hazard management considerations into the design of the development, ensuring that, if there is a bushfire within or near the site, the threat to residents, property and emergency response personnel will be reduced.

5 Summary and Recommendations

5.1 Summary

TPG on ehalf of Defence Housing Australia has prepared a Structure Plan for the proposed residential development of a portion of the site ithin the Cit of Rockingham. Emerge Associates have een engaged to provide a suite of environmental consultanc services to support the preparation of the Structure Plan hich has included various investigations to identif and assess the environmental attri utes and an constraints ithin the site.

The Structure Plan attached in **Appendix A** has een prepared TPG to provide a frame ork for the implementation of the ur an/residential land use. The Structure Plan incorporates the inputs from a multi-disciplinar pro ect team and the outcomes from various technical studies.

The environmental attri utes and values identified ithin the site have een outlined in **Section 2** and include

- The site has een historicall cleared for agricultural purposes primaril market gardening. The site no supports grassland ith scattered mature trees in the vicinit of the e isting residence in the est of the site.
- Based on site inspections undertaken Emerge otanists remnant vegetation ithin the site is generall in Completel Degraded or Degraded condition ased upon the Bush Forever Condition Scale Government of estern Australia 2000.
- Given the e tent of historic distur ance and su se uent condition of vegetation ithin the site it is highl unlikel that an Threatened Flora or Priorit Flora species Threatened Ecological Communities or Priorit Ecological Communities occur ithin the site.
- There are no Bush Forever sites or Environmentall Sensitive Areas occurring ithin the site.
- Based on the degraded nature of vegetation the site supports limited fauna ha itat values and is unlikel to e utilised fauna other than common species adapted to distur ed environments or mo ile or opportunistic fauna species.
- Landholdings immediatel north of the site ere historicall used for market garden purposes ho ever ased a revie of availa le historic aerial photograph this land use ceased around 2014. These areas are currentl undergoing separate structure planning processes to support ur an development.
- Some areas of native vegetation est of the site present a permanent ushfire hazard to future residential development.

The Structure Plan has responded to the relevant environmental values and attri utes of the site and this report outlines an environmental management frame ork that ill e implemented either as part of the future residential planning and development process.

The APC s *Model Subdivision Conditions Schedule* APC 2012 provide a planning frame ork for the management of environmental factors throughout the implementation of the Structure Plan at future su division and development stages including

- Preparation of an r an ater Management Plan in accordance ith model su division condition D2 APC 2012.
- Preparation of further detailed ushfire hazard and risk assessment and management plan/s as part of future su division or detailed design.

Overall the environmental attributes and values/constraints of the site have been accommodated within the Structure Plan layout or can be managed through the future subdivision and development stages in accordance with relevant federal state and local government legislation policies and guidelines and best management practices. As such the proposed future development of a portion of the site is not expected to significantly impact on the environment.

5.2 Recommendations

Based on the information contained within this report the following key recommendations should be considered for the implementation of the Structure Plan

- There are no fundamental environmental constraints for the proposed urban development of the site and the proposed development should be considered environmentally acceptable.
- The site has been historically cleared of remnant vegetation and utilised for agricultural land uses. It is therefore highly unlikely that the site supports any significant flora and vegetation values.
- The site does not experience high groundwater levels or seasonal inundation. The proposed development aims to maintain clearance between groundwater and the proposed drainage infrastructure as outlined in the LWMS (Emerge Associates 2016).
- Surface and stormwater runoff infiltrates freely across the site due to the high permeability of underlying sands. The stormwater management strategy for the development aims to mimic the existing hydrology by infiltrating onsite as close to source as practicable. For high rainfall events the Structure Plan has accommodated appropriate treatment and drainage infrastructure within the proposed road network as detailed in the LWMS (Emerge Associates 2016).
- Permanent bushfire hazards occur west of the site within adjacent rural landholdings which require the accommodation of an appropriate APZ and increased construction standards. The Structure Plan has addressed this through the placement of the internal road network to provide an appropriate setback from the adjacent bushfire hazard and by undertaking an indicative BAL assessment to ensure there are no portions of the proposed development exposed to an unacceptable level of bushfire risk.

6 References

6.1 General References

Beard S. 1990 *Plant Life of Western Australia* angaroo Press Pt Ltd. enthurst N.S. .

Cardno 2013 *The Chimes Fifty Road, Baldivis Urban Water Management Plan*.

Church ard H. M. and McArthur . M. 1980 *'Landforms and Soils of the Darling System, Western Australia'* in Department of Conservation and Environment ed. *Atlas of Natural Resources Darling System Western Australia* Department of Conservation and Environment Perth.

Department of Conservation and Environment DEC 1980 *Atlas of Natural Resources, Darling System, Western Australia. Perth, Pinjarra and Collie Sheets* Department of Conservation and Environment estern Australia.

Department of Environment Regulation DER 2004 *Potentially Contaminating Activities, Industries and Land uses* Department of Environment Regulation estern Australia.

Department of Environment Regulation DER 2006 *Acid Sulfate Soil Risk Map, Swan Coastal Plain* Department of Environment Regulation Perth.

Department of ater Do 2009a *Water Quality Protection Note 36. Protecting public drinking water source areas* Department of ater Perth.

Department of ater Do 2009 *Water Quality Protection Note No. 75. Proclaimed public drinking water source areas* Government of estern Australia Perth.

Environmental Protection Authorit EPA 2006 *Guidance Statement No. 10. Level of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region* Environmental Protection Authorit Perth.

Environmental Protection Authorit EPA 2015 *Environmental Assessment Guideline No. 8. Environmental principles, factors and objectives* Environmental Protection Authorit Perth.

Government of A 2003 *A State Water Strategy for Western Australia* Government of estern Australia Perth.

Gozzard R. 1983 *Rockingham, Sheets 2033 III and 2033 II* Geological Surve of estern Australia Perth.

Heddle E. M. Loneragan O. . and Havel . 1980 *'Vegetation Complexes of the Darling System Western Australia'* in Department of Conservation and Environment ed. *Atlas of Natural Resources Darling System Western Australia,* Department of Conservation and Environment Perth.

Mollo S. ood Hall S. allrodt S. and hisson G. 2009 *South West Regional Ecological Linkages Technical Report* estern Australian Local Government Association and Department of Environment and Conservation Perth.

Perth Biodiversit Pro ect PBP 2013 *2013 Native Vegetation extent by Vegetation complexes on the Swan Coastal Plain south of Moore River* estern Australian Local Government Association Perth.

Seddon G. 2004 *A Sense of Place: a response to an environment, the Swan Coastal Plain Western Australia* Blooming Books Mel ourne.

Standards Australia 2009 *AS 3959-2009 Construction of buildings in bushfire-prone areas* S dne .

Thackway R. and Cresswell I.D. (Eds) 1995 *An Interim Biogeographical Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0* Australian Nature Conservation Agency Canberra.

The Odour Unit (WA) Pty Ltd 2010 *Odour Impact Assessment & Dispersion Modelling Study: Layertech Services Baldivis WA* Perth Western Australia.

Western Australian Planning Commission (WAPC) 2006 *State Planning Policy 2.9: Water Resources* Gazetted in December 2006. Western Australian Planning Commission Perth.

Western Australian Planning Commission (WAPC) 2008 *Better Urban Water Management* Western Australian Planning Commission Perth.

Western Australian Planning Commission (WAPC) 2012 *Model Subdivision Conditions Schedule* Department of Planning Perth.

6.2 Online References

Bureau of Meteorology 2015 Climate Averages viewed April 2015 http://www.bom.gov.au/climate/data/

CSIRO 2009 Groundwater yields in south-west Western Australia Factsheet 2 Available World Wide Web URL http://www.clw.csiro.au/publications/waterforahealthycountry/swsy/pdf/SWSY-Factsheet-Groundwater.pdf

Department of Aboriginal Affairs (DAA) 2014 Aboriginal Heritage Enquiry System viewed April 2015 http://www.dia.wa.gov.au/AHIS/default.aspx

Department of Environment (DoE) 2013 Australian Heritage Database viewed April 2015 http://www.environment.gov.au/heritage/ahdwi/index.html

Heritage Council of WA 2012 Places Database viewed April 2015 http://register.heritage.wa.gov.au/

FIGURES

Figure 1:	**Location Plan**	**Plan Number: EP15-057(01)--F23a**	
Pro□ect□	Environmental Assessment and Management Strateg□ Portion of Lot 16 McDonald Road□Baldivis	Dra□n□ □NM	Date□ 11/02/2016
Client□	Defence Housing Australia	Approved□ □DH	Date□ 11/02/2016
		Checked□ □M□	Scale□ 1□5□000@A4

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□hile Emerge Associates makes ever□ attempt to ensure the accurac□ and completeness of data□Emerge accepts no responsi□ilit□ for e□ternall□ sourced data used

Figure 2:	**Site Plan**
Pro□ect□	Environmental Assessment and Management Strateg□ Portion of Lot 16 McDonald Road□Baldivis
Client□	Defence Housing Australia

Plan Number: EP15-057(01)--F24a		
Dra□n□	□NM	Date□ 11/02/2016
Approved□	□DH	Date□ 11/02/2016
Checked□	□M□	Scale□ 1□2□250@A4

0 20 40 80 Metres

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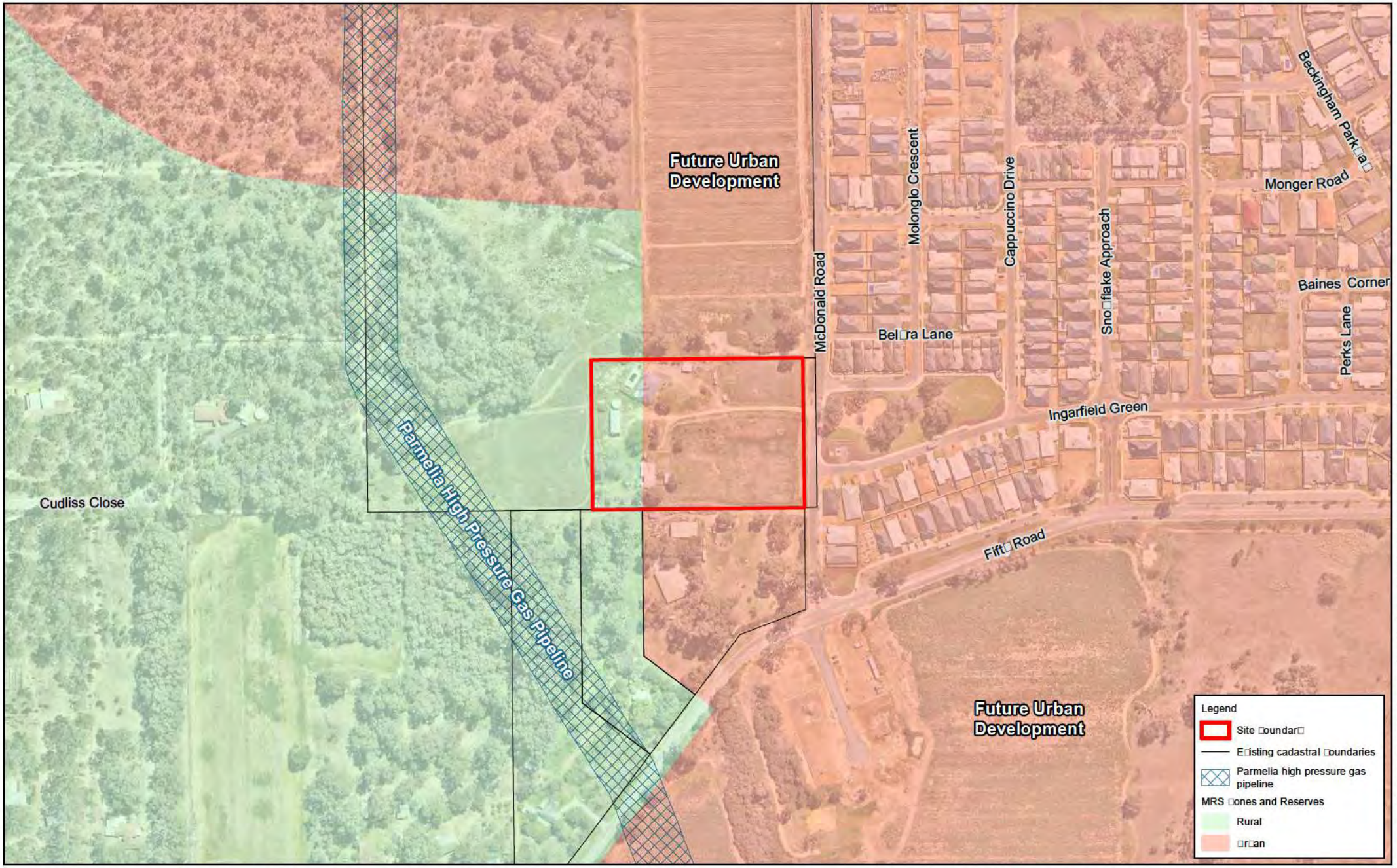

Figure 3:	**Current Metropolitan Region Scheme Mapping**
Pro□ect□	Environmental Assessment and Management Strateg□ Portion of Lot 16 McDonald Road□Baldivis
Client□	Defence Housing Australia

Plan Number: EP15-057(01)--F25a		
Dra□n□	□NM	Date□ 11/02/2016
Approved□	□DH	Date□ 11/02/2016
Checked□	□M□	Scale□ 1□4□000@A4

0 25 50 100 150 Metres

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Figure 4:	**Site Topography**
Pro□ect□	Environmental Assessment and Management Strateg□ Portion of Lot 16 McDonald Road□Baldivis
Client□	Defence Housing Australia

Plan Number: EP15-057(01)--F26a		
Dra□n□	□NM	Date□ 11/02/2016
Approved□	□DH	Date□ 11/02/2016
Checked□	□M□	Scale□1□1□000@A4

0 10 20 40 Metres

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□hile Emerge Associates makes ever□ attempt to ensure the accurac□and completeness of data□Emerge accepts no responsi□ili□□for e□temall□sourced data used

Figure 5: Acid Sulfate Soil Risk Mapping

Project: Environmental Assessment and Management Strategy
Portion of Lot 16 McDonald Road, Baldivis

Client: Defence Housing Australia

Plan Number: EP15-057(01)--F27a		
Drawn:	NM	Date: 11/02/2016
Approved:	DH	Date: 11/02/2016
Checked:	M	Scale: 1:4,000@A4

0 25 50 100 150 Metres

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Figure 6:	**Bush Forever ESAs and Ecological Lin ages**
Pro ect	Environmental Assessment and Management Strateg Portion of Lot 16 McDonald Road Baldivis
Client	Defence Housing Australia

Plan Number: EP15-057(01)--F28a		
Dra n	NM	Date 11/02/2016
Approved	DH	Date 11/02/2016
Checked	M	Scale 1 7 500@A4

0 50 100 200 300 Metres

emerge ASSOCIATES Integrated Science & Design

hile Emerge Associates makes ever attempt to ensure the accurac and completeness of data Emerge accepts no responsi ilit for e ternall sourced data used

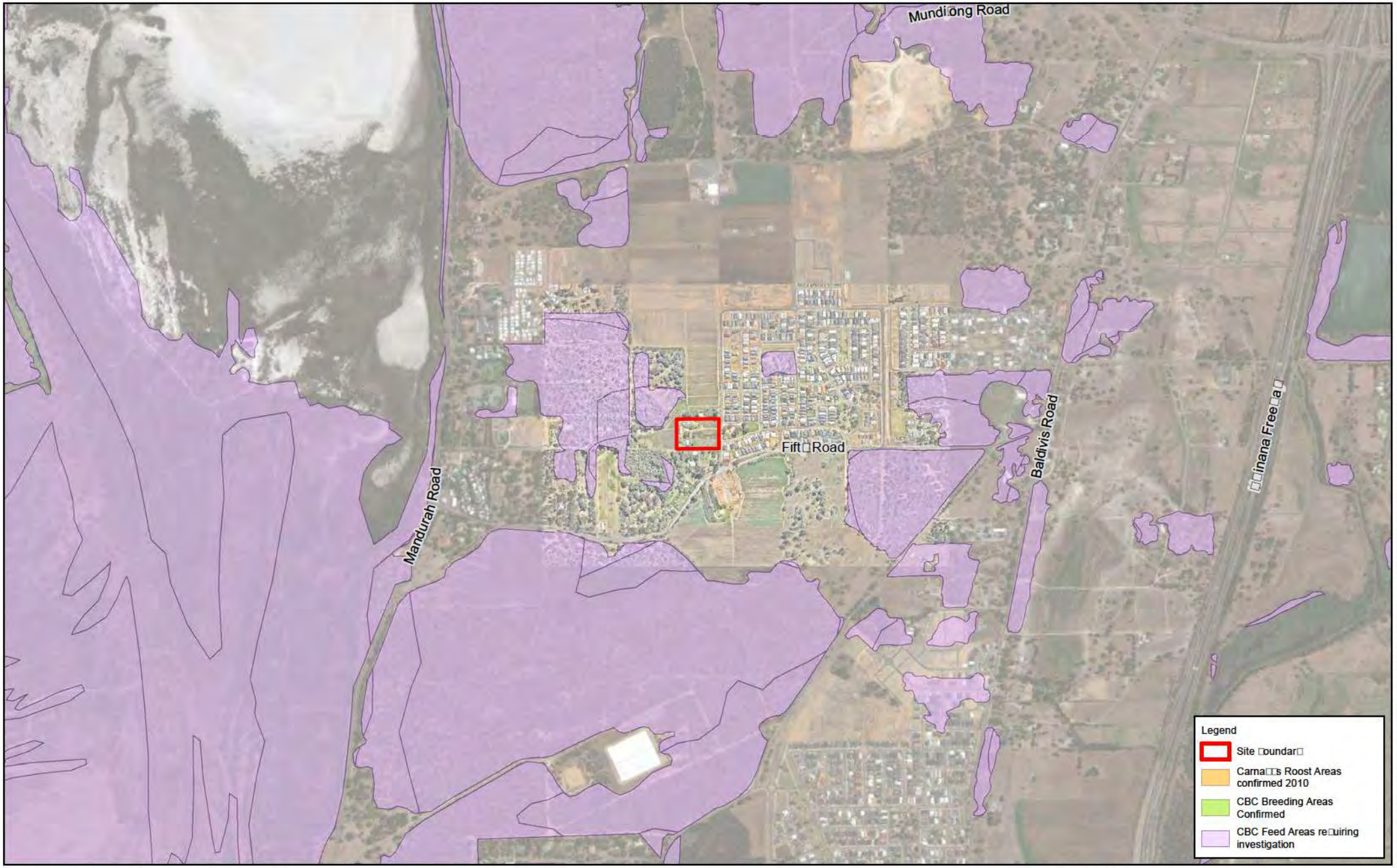

Figure 7:	**Regional Black Cockatoo Habitat Mapping**		**Plan Number: EP15-057(01)--F29a**
Project:	Environmental Assessment and Management Strategy Portion of Lot 16 McDonald Road, Baldivis		Drawn: NM Date: 11/02/2016 Approved: DH Date: 11/02/2016 Checked: M Scale: 1:20,000@A4
Client:	Defence Housing Australia		0 137.5 275 550 825 Metres

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While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for errors, omissions or inaccuracies in third party sourced data used

Figure 8:	**Geomorphic Wetlands**
Project:	Environmental Assessment and Management Strategy Portion of Lot 16 McDonald Road, Baldivis
Client:	Defence Housing Australia

Plan Number: EP15-057(01)--F30a			
Drawn:	NM	Date:	11/02/2016
Approved:	DH	Date:	11/02/2016
Checked:	M	Scale:	1:4,000@A4

0 25 50 100 150 Metres

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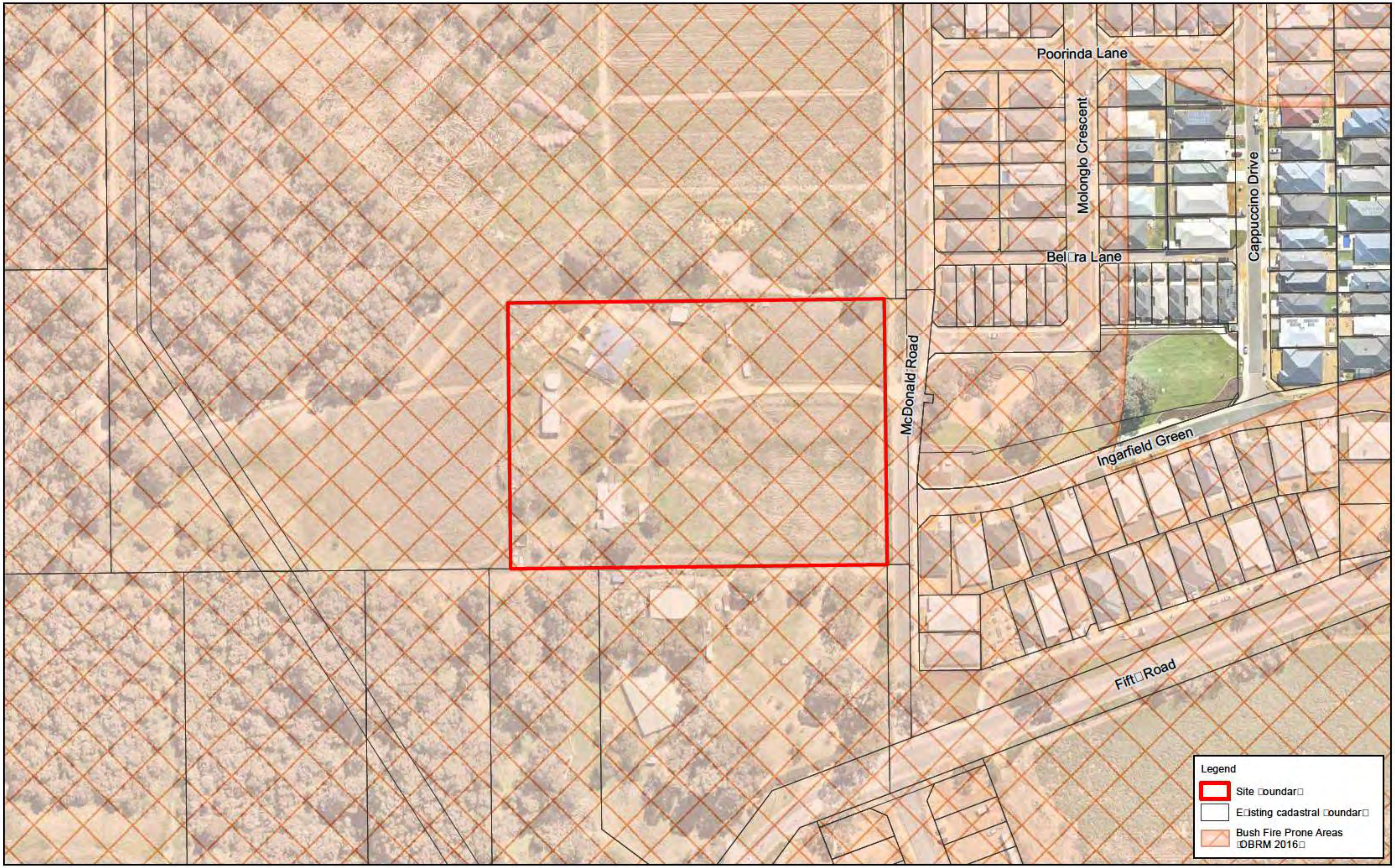

Figure 9:	**Map o□Bush□ire Prone Areas**
Pro□ect□	Environmental Assessment and Management Strateg□ Portion of Lot 16 McDonald Road□Baldivis
Client□	Defence Housing Australia

Plan Number: EP15-057(01)--F31b

Dra□n□	□NM	Date□	05/09/2016
Approved□	□DH	Date□	05/09/2016
Checked□	□M□	Scale□	1□2□250@A4

0 20 40 80 Metres

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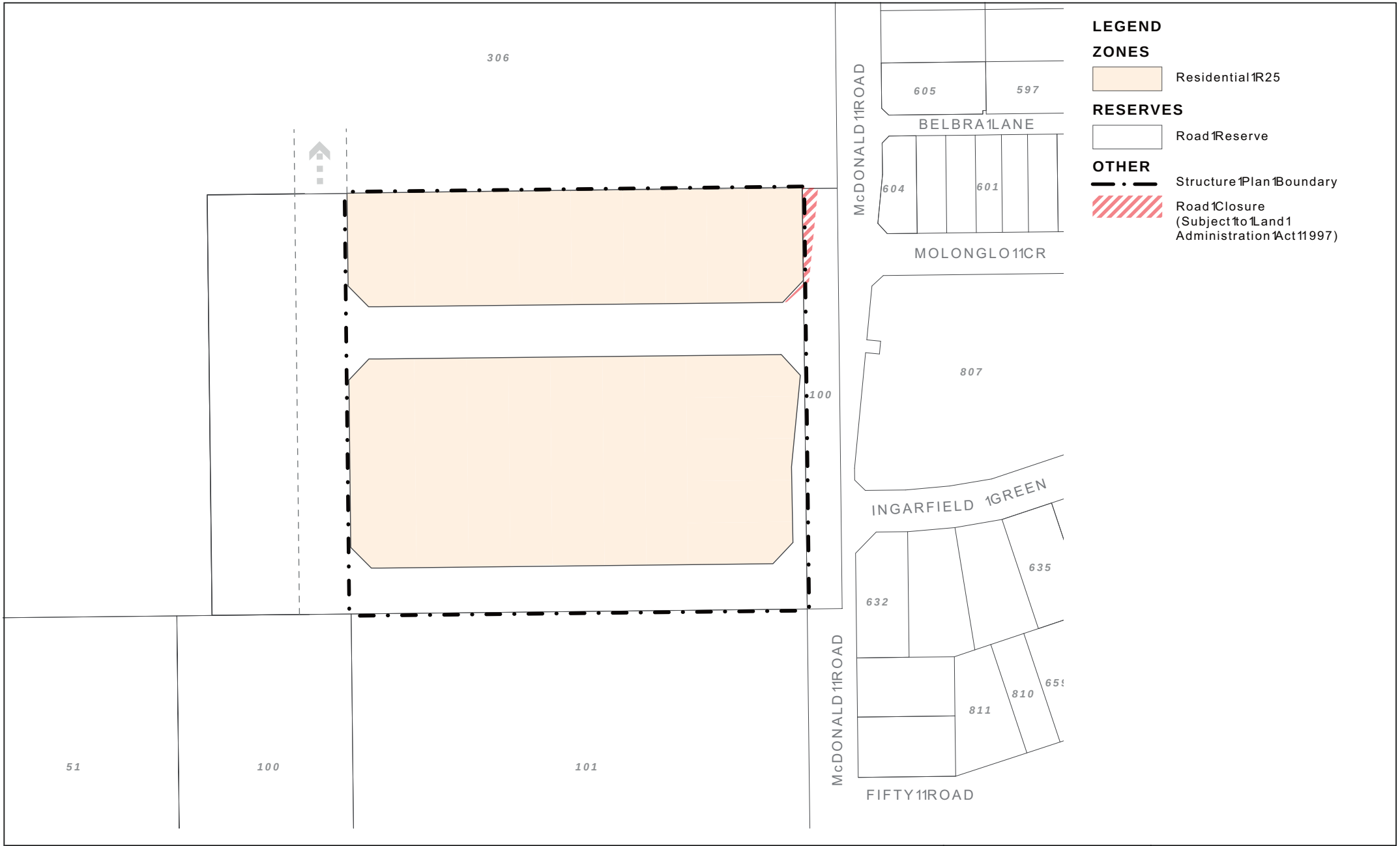
APPENDIX A

PORTION OF LOT 16 MCDONALD ROAD, BALDIVIS STRUCTURE PLAN

TPG (2016)



Plan 1 - Structure Plan

Portion 1of 1161 1McDonald 1Road, 1Baldivis

Project 1Manager: 1GM Date: 110 1Feb 1016

Drawn: 1GW Scale: 1:1,000 1@ 1A3

Checked: 1MH Drawing 1No. 716-059 1SP-01A

TOWN PLANNING
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ABN 156 597 1275 222

Subdivision Concept Plan

161 McDonald Road, Baldivis

APPENDIX B

MINISTERIAL STATEMENT NO. 580 (DECEMBER 2001)

MINISTER FOR THE ENVIRONMENT AND HERITAGE

Statement No.

000580

STATEMENT THAT A SCHEME MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF DIVISION 3 OF PART IV OF THE ENVIRONMENTAL PROTECTION ACT 1986)

CITY OF ROCKINGHAM TOWN PLANNING SCHEME NO. 1 AMENDMENT NO. 300 ("DEVELOPMENT" ZONE, PT LOTS 306 & 16, AND LOTS 313 & 774, FIFTY ROAD, BALDIVIS)

Scheme Purpose: To rezone Pt Lot 306, Pt Lot 16, and Lots 313 and 774 Fifty Road, Baldivis from "Rural" to "Development" zone.

Responsible Authority: City of Rockingham

Responsible Authority Address: PO Box 2142, Rockingham WA 6967

Assessment Number: 1227

Report of the Environmental Protection Authority: Bulletin 1018

Subject to the following conditions, there is no known environmental reason why the town planning scheme amendment to which the above report of the Environmental Protection Authority relates should not be implemented:

CONDITIONS TO BE INCORPORATED INTO THE SCHEME BY INSERTION OF PROVISIONS IN SCHEME TEXT

1 Environmental Management Plans

1-1 The following Environmental Management Plans shall be prepared in accordance with the specifications set out in Attachment 1 in the Minister for the Environment and Heritage's "Statement that a Scheme may be Implemented" No. [insert relevant Statement Number] published on [insert date], and shall be subsequently implemented in accordance with the provisions of the Plans:

Published on

19 DEC 2001

29th FLOOR, ALLENDALE SQUARE, 77 ST. GEORGE'S TERRACE, PERTH 6000 TELEPHONE: (08) 9220 5050 FACSIMILE: (08) 9221 4665/8
E-MAIL: judy-edwards@dpc.wa.gov.au

- Drainage and Nutrient Management Plan;
- Soil and Groundwater Contamination Investigation and Remediation Plan;
- Pipeline Protection Plan;
- Spray Drift Investigation and Management Plan; and
- Vegetation Management Plan.

2 High Pressure Natural Gas Pipeline

2-1 The following activities, land uses and developments are prohibited within the high pressure natural gas pipeline easement:

- Ground-disturbing activities, other than for the purposes for which the easement was created, and for uses and developments that comply with condition 2-2 below;
- Temporary residence (including caravans, camping and similar);
- Storage of materials and equipment;
- Fires and barbecues;
- Explosives, inflammables and corrosives (including storage of liquefied petroleum gas and fuel oil);
- Refuse disposal and landfill;
- Service stations, fuel lines and storage of fuel;
- Vegetation with an expected growth exceeding one metre in height, and plantings within one metre of the centre of the pipeline (with the exception of lawn); and
- Large obstructions to the line of sight along the easement.

Note: For the high pressure natural gas pipeline easement, the relevant Australian Standard is AS 2885.3.

2-2 The following land uses and developments may be permitted within the high pressure natural gas pipeline easement, with the written approval of the local government on advice of the pipeline operator, subject to compliance with the Pipeline Protection Plan referred to in condition 1-1 above:

- Cycleways and footpaths;
- Road crossings and services (with minimum depth of cover over the pipeline of 1.2 metres);
- Public open space;
- Signage and other facilities that are necessary to comply with the Pipeline Protection Plan referred to in condition 1-1 above; and
- Car parking during the time that the adjoining land is being developed (with minimum depth of cover over the pipeline of 1.2 metres).

2-3 Minimum setbacks for land uses and developments from the centre of the high pressure natural gas pipeline shall be:

- 96 metres, in the case of sensitive development as determined by the local government on advice of the Department of Environmental Protection and the pipeline operator, and including aged persons' accommodation, child care centres, schools and hospitals;
- 32 metres to the boundary of each residential lot, in the case of residential development; and
- at the local government's discretion, following consultation with the Department of Environmental Protection and the pipeline operator, in the case of all other land uses and developments which facilitate the gathering of people, within 96 metres of the centre of the pipeline.

3 Development in Proximity to Market Gardens

3-1 If the market gardens adjacent to Pt Lots 306 and 16 are continuing to operate at the time of subdivision, noise attenuation measures shall be designed and implemented so that noise impacts on the amendment area are in accordance with the *Environmental Protection (Noise) Regulations 1997*.

CONDITIONS TO BE INCORPORATED INTO THE SCHEME BY MODIFICATIONS TO THE SCHEME MAP

4 Scheme Map

4-1 The Scheme Map for the City of Rockingham Town Planning Scheme No. 1 shall be amended by inserting the symbol EC and an appropriate modification to the legend of the Scheme Map, to show that environmental conditions apply to part of Pt Lot 306, part of Lot 16, Lots 774 and 313 Fifty Road, Baldivis.

ATTACHMENT 1 - OF STATEMENT THAT A SCHEME MAY BE IMPLEMENTED - CITY OF ROCKINGHAM TOWN PLANNING SCHEME NO. 1 AMENDMENT NO. 300

SPECIFICATIONS FOR ENVIRONMENTAL MANAGEMENT PLANS

1 Drainage and Nutrient Management Plan

1-1 Prior to commencement of site works for subdivision or development, the subdivider or developer shall prepare a Drainage and Nutrient Management Plan to ensure that the rate, quantity and quality of water leaving the Amendment area will not adversely impact on Opwin and Spot Swamps, the Rockingham Groundwater Area groundwater supply, and the Peel-Harvey Estuarine System, to the requirements of the local government and on advice of the Water and Rivers Commission.

1-2 This Plan shall:

- Define the catchment of Opwin and Spot Swamps in relation to the Amendment area;
- Provide measures to facilitate the removal of pollutants and nutrients in accordance with the Water Sensitive Urban Design Best Practices;
- Incorporate Best Practice Water Sensitive Urban Design principles to maximise onsite water infiltration generally;
- Provide measures to prevent surface water runoff from entering the Opwin or Spot Swamps;
- Provide mechanisms to minimise erosion during and after the development phase;
- Provide a monitoring program, including definition of performance criteria and analysis procedures, to measure the performance of the Plan against objectives and performance criteria;
- Provide contingency plans in the event that criteria are not achieved; and
- Identify responsibilities for implementation of the Plan.

2 Soil and Groundwater Contamination Investigation and Remediation Plan

2-1 Prior to the commencement of site works for subdivision or development on any land that has previously been used for horticultural purposes, the subdivider or developer shall prepare and implement a Soil and Groundwater Contamination Investigation and Remediation Plan to the requirements of the local government and on advice of the Department of Environmental Protection.

2-2 This Plan shall

- Include soil and groundwater investigation procedures to define the nature and extent of any soil or groundwater contamination, and identify areas where

contamination levels exceed criteria recognised by the Department of Environmental Protection; and

- In the event that the investigation finds unacceptable soil or groundwater contamination, describe procedures for further investigation of contamination, a detailed methodology for remediation prior to development, the standards to which any contaminated soil or groundwater will be remediated, and a management plan for contaminated areas, where necessary.

3 Pipeline Protection Plan

3-1 Prior to subdivision or development on any land within or abutting the high pressure natural gas pipeline easement, the subdivider or developer shall prepare a Pipeline Protection Plan to ensure protection of the pipeline during construction activities, to the requirements of local government, on advice of the Department of Mineral and Petroleum Resources and the pipeline operator.

3-2 This Plan shall

- Detail measures to ensure public safety and protection of the high pressure natural gas pipeline in accordance with the *Petroleum Pipelines Act 1969-70*, the Australian Pipeline Code AS 2885-1997, SAA HB105 and the Environmental Protection Authority guidance statement for achieving its risk criteria for development in proximity to existing and proposed high pressure gas transmission pipelines, or the most recent equivalents recognised by the Environmental Protection Authority; and

- Identify responsibilities for implementation of the Plan.

4 Spray Drift Investigation and Management Plan

4-1 Prior to the approval of subdivision or development, the subdivider or developer shall prepare and implement a Spray Drift Investigation and Management Plan to the requirements of the local government, on advice of the Department of Health, the Department of Agriculture and the Department of Environmental Protection.

4-2 This Plan shall

- Require undertaking investigations of spray drift from all rural or semi-rural activities occurring within the proximity of the Amendment area, to clearly define impacts on the health and amenity of future residents; and

- In the event that the investigations find that unacceptable health or amenity impacts are likely to affect the residents within the Amendment area, provide

management strategies to ensure that impacts on the health and amenity of future residents are acceptable.

5 Vegetation Management Plan

5-1 Prior to subdivision approval, the subdivider shall prepare a Vegetation Management Plan that protects the regionally significant vegetation abutting the Amendment area, particularly *Bush Forever* Site No. 356, from direct and indirect impacts associated with the development, through the provision of a hard edge along the amendment boundary and the implementation of appropriate construction and access management measures.

5-2 The Vegetation Management Plan shall be prepared to the satisfaction of the local government and on advice of the Department of Conservation and Land Management and the Department of Environmental Protection.

Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT AND HERITAGE

19 DEC 2001