Public Agenda Briefing Forum - 10 July 2018 Attachments

PLANNING FEASIBILITY STUDY

WATTLE GROVE SOUTH

CITY OF KALAMUNDA

24 MAY 2018

Issue 4

BURGESS DESIGN GROUP
TOWN PLANNING + URBAN DESIGN

Wattle Grove South

City of Kalamunda

PLANNING FEASIBILITY STUDY

Issue 4: 24 May 2018

Prepared for: **City of Kalamunda**

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4 (Minor Amendments)	24/05/18	Z. MacDonald	M. Szabo

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1. INTRODUCTION & PURPOSE

Burgess Design Group has been appointed by City of Kalamunda for the provision of town planning and urban design consultancy services to undertake a Planning Feasibility Study for Wattle Grove South (the subject "site" or "land").

1.1 PURPOSE

The Western Australian Planning Commission's (WAPC) North-East Sub-Regional Planning Framework has identified Wattle Grove South as an area to be investigated for the purposes of future urban development.

The purpose of this Planning Feasibility Study is to determine the optimum location, size, opportunities, constraints and risks involved in progressing the rezoning and planning of the Wattle Grove South area for the purposes of urban development.

The Planning Feasibility Study has been formulated by Burgess Design Group, in collaboration with a team of specialist consultants, who have provided technical input in relation to matters as follows:

KCTT	Infrastructure Servicing Report & Transport Impact Assessment
360 Environmental	Environmental Assessments and Hydrology

1.2 SCOPE OF WORKS

The study has addressed the following agreed Scope of Works:

1. Phase 1 – Introduction and Purpose
    - Determine the optimum boundary, size and location of proposed development
    - Identify major elements for consideration to guide future urban development
2. Phase 2 – Regional Contextual Analysis and Map
    - Analyse the planning framework
    - Land supply and demand
    - Major access points, including the proximity of Tonkin Highway (Primary Regional Road) and Welshpool Road East (Other Regional Road)
    - Existing land uses in vicinity of the proposed development area
    - Environmental factors and constraints
3. Phase 3 – Local Contextual Analysis and Map
    - Population and employment self-sufficiency
    - City/civic requirements
    - Local Planning Strategy context
4. Phase 4 – Site Analysis and Map
    - Identify the opportunities / constraints presented by the development and propose investigations / recommendations in the following key areas:
        - Environmental

- Hydrological
- Servicing and Infrastructure (particular focus on deep sewer)
- Forrestfield > Thornlie rail extension and station at Wattle Grove
- Indicative Land Use / Retail Demand

5. Phase 5 – Statutory Process Recommendations

   - MRS rezoning
   - Land resumption requirements
   - LSP3 rezoning
   - District Structure Plan/Local Structure Plan
   - Developer Contributions arrangements

This is a comprehensive research analysis aimed to inform future rezoning and structure planning elements.

This Planning Feasibility Study represents the first element in progressing one of the Urban Expansion Areas originally identified by the Western Australian Planning Commission (WAPC) in its draft North-East Sub-regional Planning Framework and subsequently adopted in an extended form in the final version of this Framework, as released in March 2018.

One of the key elements of the Wattle Grove Urban Expansion Precinct area is the fragmented land ownership. This area is primarily characterised by a range of rural lifestyle lots ranging in area from as small as 1ha. This element will require specific consideration as part of this Planning Feasibility Study process.

1.3 ABBREVIATIONS

Abbreviations used in this report are summarised below for ease of reference:

AHD	Australian Height Datum (AHD)
CCW	Conservation Category
DBCA	Department of Biodiversity, Conservation and Attractions
DRF	Declared Rare Flora
DRF	Declared, Rare and Priority Flora
DSP	District Structure Plan
DWER	Department of Water and Environment Regulation
DWMS	District Water Management Strategy
LPS3	City of Kalamunda Local Planning Scheme No.3
LSP	Local Structure Plan
LWMS	Local Water Management Strategy (LWMS)
MKSEA	Maddington Kenwick Strategic Employment Area
MRS	Metropolitan Region Scheme
PECs	Priority Ecological Communities
POS	Public Open Space
REW	Resource Enhancement wetlands
TECs	Threatened Ecological Communities
TOD	Transit Oriented Development
WAPC	Western Australian Planning Commission

2. REGIONAL CONTEXTUAL ANALYSIS

2.1 SITE DESCRIPTION/DETAILS

2.1.1 Location

The subject land is located within the municipality of the City of Kalamunda, approximately 15 kilometres south-east of the Perth CBD and 14km south of Midland Strategic Metropolitan Centre (refer **Figure 1 – Location Plan**). The land has direct access to Brentwood Road, Victoria Road, Crystal Brook Road, and Welshpool Road East.

2.1.2 Existing and Historical Use and Development

Most of the lots within the study area are rural residential properties or are vacant land (refer **Figure 2 –Aerial Photograph**).

2.1.3 Study Area Boundary

The study area for Wattle Grove South was determined using the North East Sub-regional Planning Framework prepared by the WAPC, as it applies within the municipal boundary of the City of Kalamunda. The total area is approximately 310ha.

A key requirement of this Planning Feasibility Study is to review the appropriateness of the study area in response to the following considerations:

- Demand for developable land within locality
- Existing reports and strategies
- Consideration of opportunities and constraints

This Planning Feasibility Study examined three (3) study area boundaries (refer **Figure 3**):

- Option 1: Boundary as shown on the draft North East Sub-regional Planning Framework.
- Option 2: Reduction in the originally identified 'Urban Expansion' area, reducing this to include only the land south of Crystal Brook Road.
- Option 3: Extension of the 'Urban Expansion' boundary to Fontano Road & Judith Road (eastern boundary), Welshpool Road (northern boundary), and towards the intersection of Tonkin Highway/Welshpool Road East (western boundary).

Option 3 is considered to be the optimal study area boundary.

The final North East Sub-regional Planning Framework was released on 23 March 2018. This Framework amends the 'Urban Expansion' boundary to the extent that it essentially aligns with Option 3 (as outlined further below), confirming the suitability of this adopted study area boundary.

Notwithstanding the above, further discussion is provided below in relation to the alternate study area boundaries.

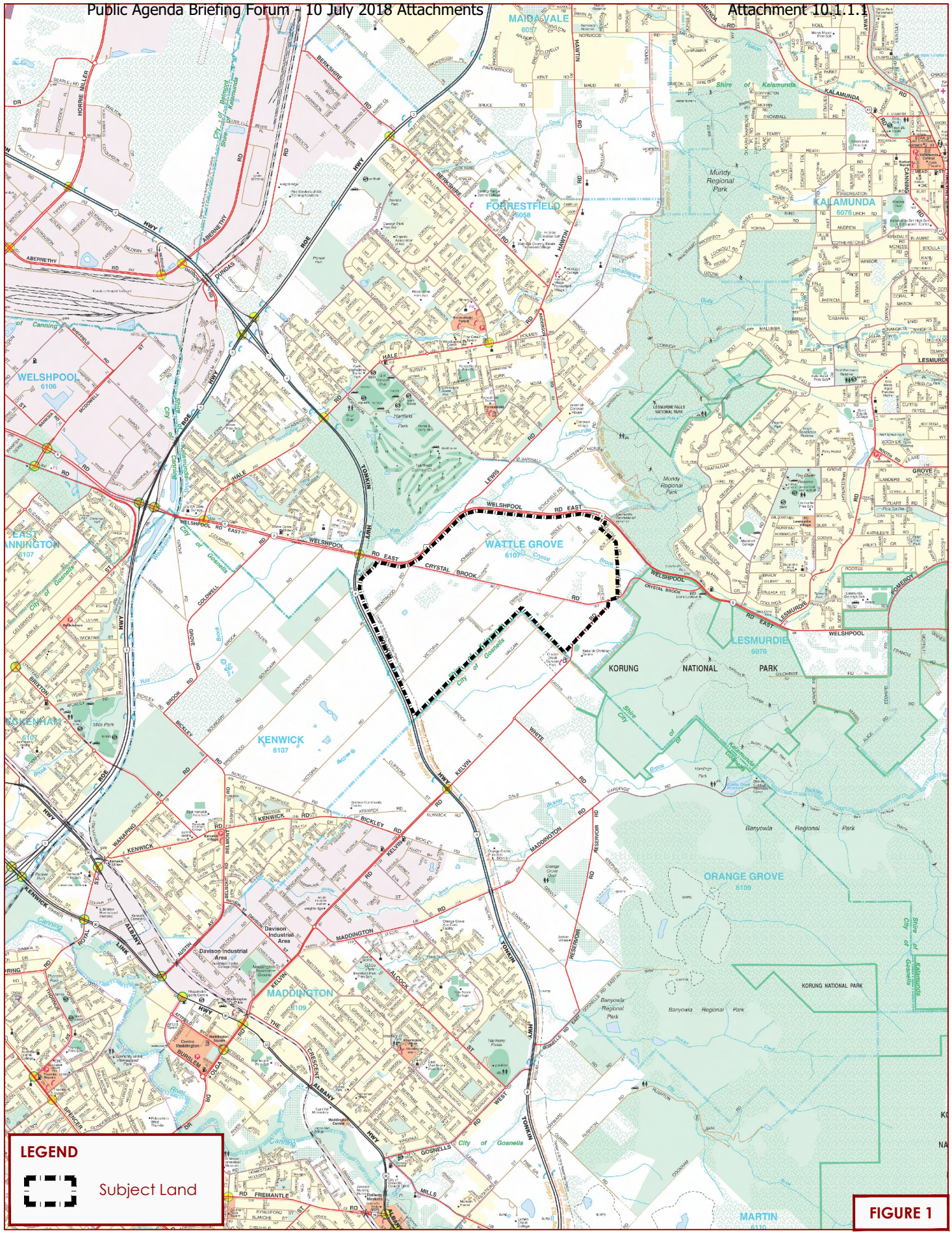

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FIGURE 2

NORTH

0 100 200 300 400 500m

SCALE 1:15,000 (A4)

Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-05

AERIAL PHOTOGRAPH
WATTLE GROVE SOUTH
CITY OF KALAMUNDA

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Option 1: Boundary as shown on the draft North East Sub-regional Planning Framework.

The site has a total land area of approximately 209ha.

The 'Urban Expansion' boundary shown on the draft North East Sub-regional Planning Framework was illogical and traversed a number of lots, rather than following specific lot boundaries. It is unclear why certain lots were excluded from the 'Urban Expansion' area and why the WAPC determined that the eastern boundary of the area should follow the existing powerline easement. Nonetheless, electing to progress the future planning and rezoning of the study area in the manner as shown in the WAPC draft would have been the simplest option given this would then show consistency with the overall (draft) strategic framework.

Given the illogical boundary presented in this option, two alternative study area boundaries were considered to more efficiently round-off the study area, as described below.

Option 2: Reduce the 'Urban Expansion' area to include only the land south of Crystal Brook Road.

Option 2 has a total land area of approximately 162ha.

Option 2 would have resulted in a reduced total site area. This option was conceived to create a more logical northern boundary for the study area, being Crystal Brook Road, as opposed to the illogical boundary identified in the draft Framework.

This option was not considered to be the optimum outcome for the City nor for those landowners with land identified as 'Urban Expansion' under the draft North East Sub-regional Planning Framework located on the north side of Crystal Brook Road. Under this approach, a separate planning process would have been needed, as some future time, to pursue any development of this northern area. It is reasonable to assume that the City and landowners would have had an expectation that future planning of the area would be generally consistent with the draft North-East Sub-regional Planning Framework boundary.

This option was thus not recommended.

Option 3: Extension of the 'Urban Expansion' boundary to Fontano Road & Judith Road (eastern boundary), Welshpool Road (northern boundary), and towards the intersection of Tonkin Highway/Welshpool Road East (western boundary).

Option 3 has a total land area of approximately 310ha.

Option 3 is considered to be the optimum size for future development. The proposed boundary is logical as it is bound by existing roads and is informed by the topographical and environmental characteristics of the site. It has been conceived on a site specific basis.

Extending the boundary in this way would also ensure there are no small rural pockets of land excluded from the rezoning. It is noted that not all lots included within the study area will have increased development potential; however it is favourable for the City of Kalamunda to include the smaller existing 'Special Rural' zoned lots in the 'Residential' zone to assist with applying appropriate development controls.

This larger site area will also incorporate the recently rezoned 'Special Use – Residential Aged Care' site at Lot 500 Gavour Road, Wattle Grove, ensuring that the overall area is considered in a coordinated fashion to facilitate orderly and proper planning.

The timing of development of the eastern most part of the study area (based on anticipated local supply/demand) is anticipated to be longer term, however, the notion of residential development being ultimately bound by the Scarp is logical. Inclusion of this area in overall planning now will ensure that it is approached in a co-ordinated manner, including the long term provision of services and infrastructure.

Additionally, the proposed boundary is consistent with the City's Local Planning Strategy 'Investigation Area' and the recently adopted North-East Sub-regional Planning Framework, as discussed in Sections 2.2.2 & 2.2.6.

The Option 3 study area boundary has thus been adopted for this Planning Feasibility Study.

Opportunities for Conservation

The broadening of the study area boundary will result in additional pockets of remnant vegetation being included within the study area.

Based on a desktop review by 360 Environmental these pockets of remnant vegetation have been identified as being potential Black Cockatoo habitat and Forrestfield Complex, which has less than 30% remaining. There are a number of Environmentally Sensitive Areas (ESA) mapped within and adjacent to the current study area.

These ESA appear to be associated with known occurrences of threatened / priority flora that occur within and adjacent to the site.

The desktop review has also identified that Bush Forever Site 50, which occurs north of Welshpool Road is mapped as an ESA and includes a 500m buffer that that covers a significant portion of the area identified for inclusion. This element will require further investigation during any District Structure Plan formulation process.

Threatened Ecological Community (TEC) 20a – *Banksia attenuata* woodland over species rich dense shrublands is identified as potentially occurring within this Bush Forever site. Another key environmental consideration is Crystal Brook, which transects the northern portion of study area. Therefore any future development will need to consider appropriate foreshore setbacks, reservation and future management, together with stormwater management and water quality.

Whilst, there are a number of key environmental constraints associated with broadening the study area, it may lead to the following significant environmental outcomes for the City:

- Provide the City with an opportunity to identify and prioritise these natural assets for future conservation and protection in the long-term, as opposed to leaving these areas in private property
- Developing and implementing various town planning mechanisms, through scheme provisions and future structure plans, that will allow for these areas to be acquired, set aside for conservation and appropriately managed
- Acknowledging that future urbanisation of the current study area will inevitably lead to increased pressure and edge effects on these natural areas if left

unmanaged, inclusion of the broader area can lead to these natural areas also being appropriately managed to ensure potential impacts from future urbanisation are minimised. This can be done through future environmental management plans, community education and/or funding being allocated to provide controlled access and rehabilitation where required.

2.1.4 Consultation

At a meeting with Department of Planning, Lands and Heritage; City of Kalamunda; and Burgess Design Group on 8 January 2018 the overall planning feasibility of Wattle Grove South was considered and discussed. A summary of the meeting is provided below.

Framework Timing (2022+)

- DPLH officers commented that MRS Amendments/release of urban land should occur in a sequential manner in accordance with Frameworks timeframes
- The timeframes within the Frameworks are not based on constraints such as land assembly/land co-ordination (as assumed by BDG/City). The Department has confirmed it is mostly based on urban land supply and demand
- Justification will be required to progress an MRS Amendment ahead of the Medium-Long Term (2022+) timeframe, as outlined in the Frameworks document

Project Boundary

- The boundary in the Frameworks could be modified if it is supported by technical studies/merit *(we note this has now been adjusted)*
- The Department officers advised that there is a possibility that the boundary can be refined as that document is broad scale
- No further information/justification was given for the current boundary alignment
- Limited feedback occurred on the different boundary options
- The Department officers raised the possibility of an MRS Amendment also including adjacent land within the City of Gosnells. The City/BDG advised that whilst the broader context will be examined, the scope of the works for the planning feasibility study is to solely focus within the City's municipal boundary. This is primarily as any MRS Amendment will also seek to concurrently rezone the land under the City's Local Planning Scheme

Given the above, selection of the Option 3 boundary was considered to be orderly and proper planning.

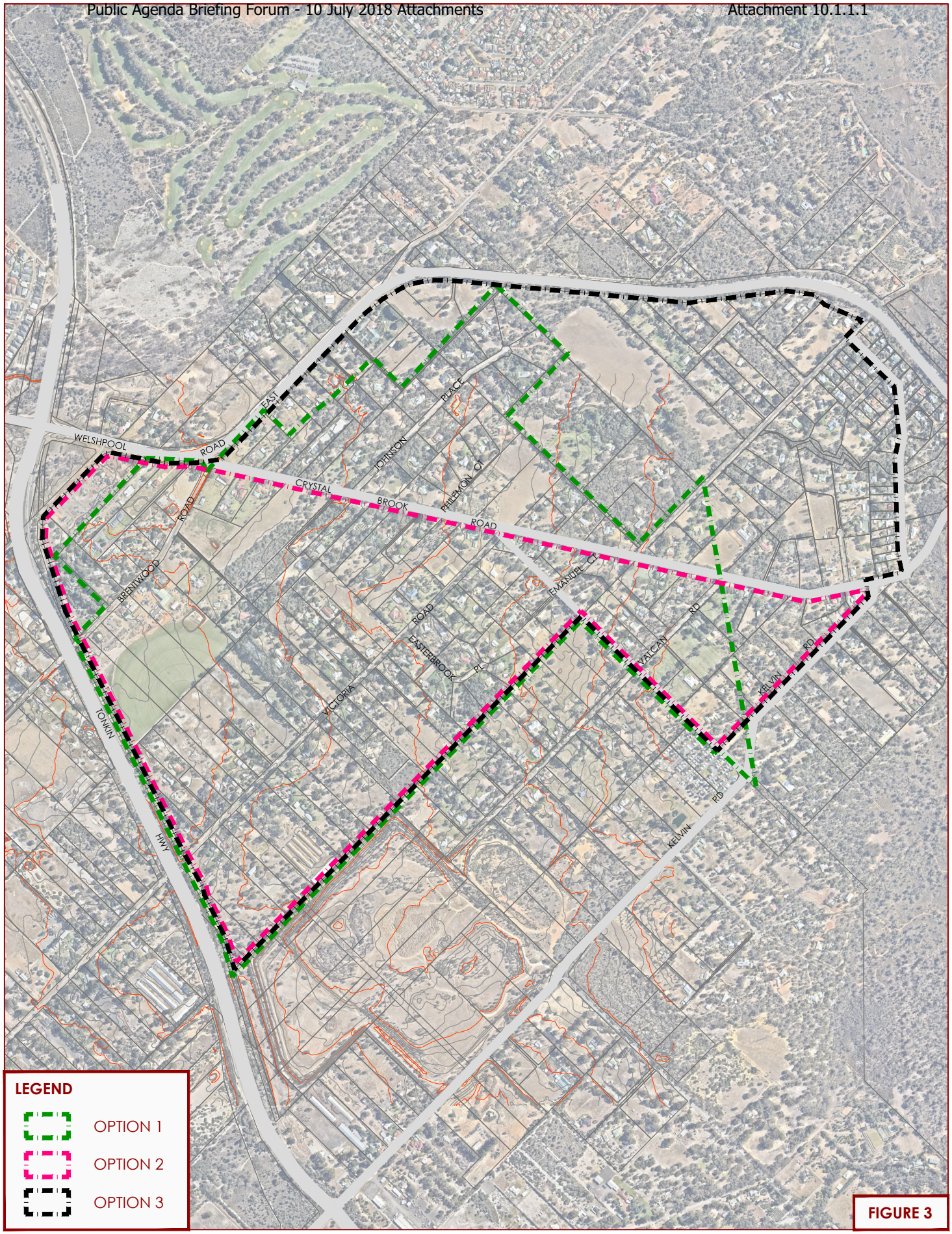

FIGURE 3

NORTH

0 100 200 300 400 500m

SCALE 1:15,000 (A4)

STUDY AREA BOUNDARY OPTIONS

WATTLE GROVE SOUTH

Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-10

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2.1.5 Surrounding Land Use and Development

The subject site is situated within close proximity to established and future residential, commercial, public open space (POS) areas and services including:

- Residential development within the suburb of Forrestfield, located approximately 2km north of the subject site
- Beckenham Train Station located approximately 4.5km south west of the subject site
- Westfield Carousel located approximately 5km south west of the subject site
- Hartfield Park Recreation Centre located approximately 700m north
- Lesmurdie National Park located 1.2km to the north east; and,
- The site is located approximately 6km south of the future Forrestfield Train Station

Development of the site for urban purposes represents the most efficient use of the land given the subject land's strategic location in close proximity to the urban front, the capacity of existing infrastructure and services, the future Forrestfield Train Station and nearby major arterial routes (e.g. Tonkin Highway and Roe Highway).

The subject land abuts the City of Gosnells Maddington Kenwick Strategic Employment Area (MKSEA) a future general industrial/business area.

2.2 PLANNING FRAMEWORK

2.2.1 Metropolitan Region Scheme

The subject site is zoned 'Rural' under the Metropolitan Region Scheme (MRS) (refer **Figure 4 – MRS Map**). The Scope of Works for this Planning Feasibility Study includes preparation of a simple request for the MRS to be rezoned to facilitate the future development of the area.

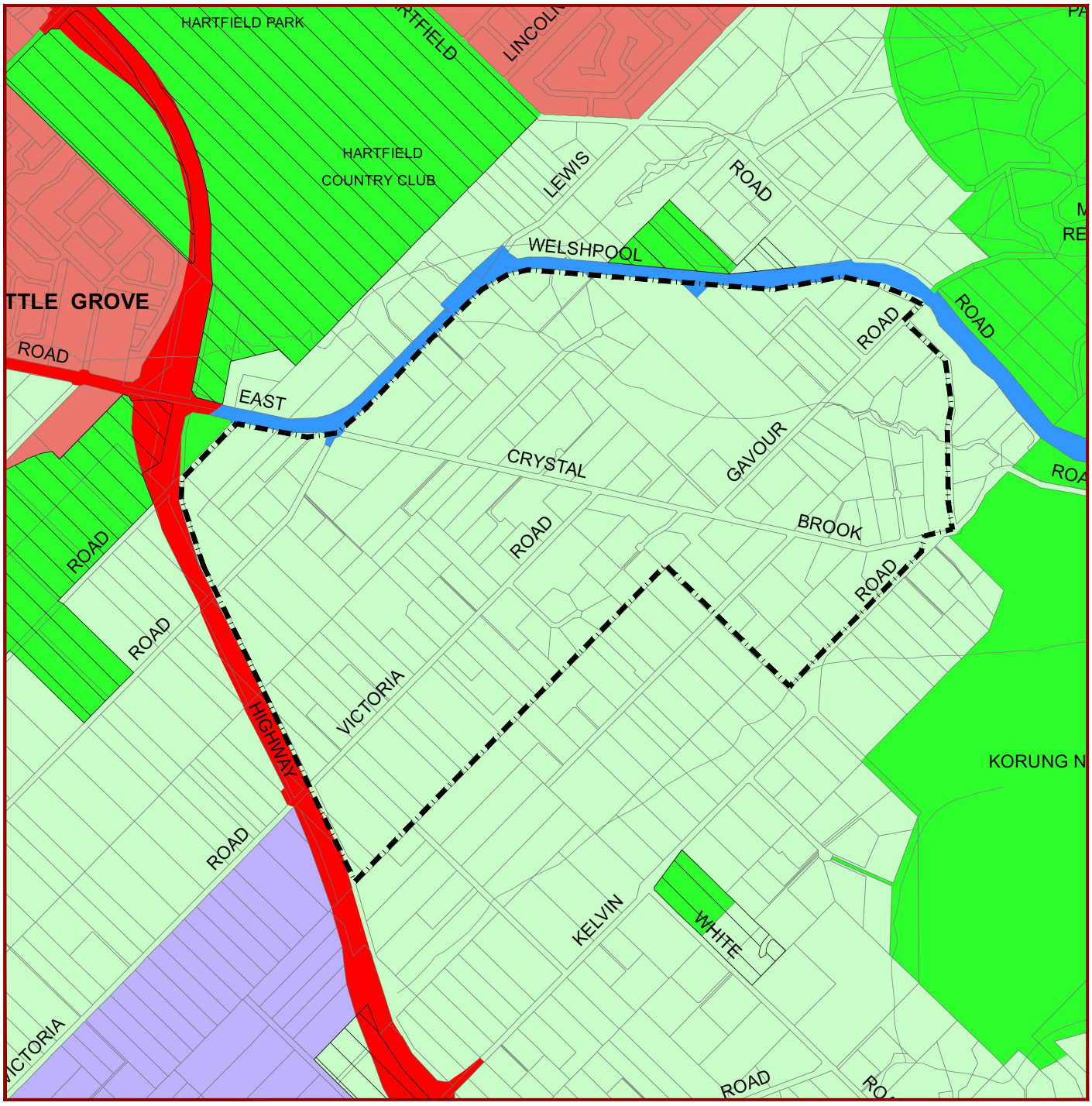
2.2.2 City of Kalamunda Local Planning Scheme No.3

The subject site is zoned 'Special Rural' under the City of Kalamunda Local Planning Scheme No.3 (LPS3) (refer **Figure 5 – LPS3 Map**).

Pursuant to LPS3 clause 4.2.2 the objectives of the 'Special Rural' zone are:

- To enable smaller lot subdivision to provide for uses compatible with rural development
- To retain amenity and the rural landscape in a manner consistent with orderly and proper planning

Rezoning of the land for urban development purposes under LPS3 is proposed to run concurrently with the MRS amendment.



Legend

Reserved lands
- parks and recreation
- primary regional roads
- other regional roads

Zones
- industrial
- rural
- urban

FIGURE 4

LEGEND

Subject Land

NORTH

0 200 400 600 800 1000m

SCALE 1:20,000 (A4)

Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-04

METROPOLITAN REGION SCHEME

WATTLE GROVE SOUTH

CITY OF KALAMUNDA

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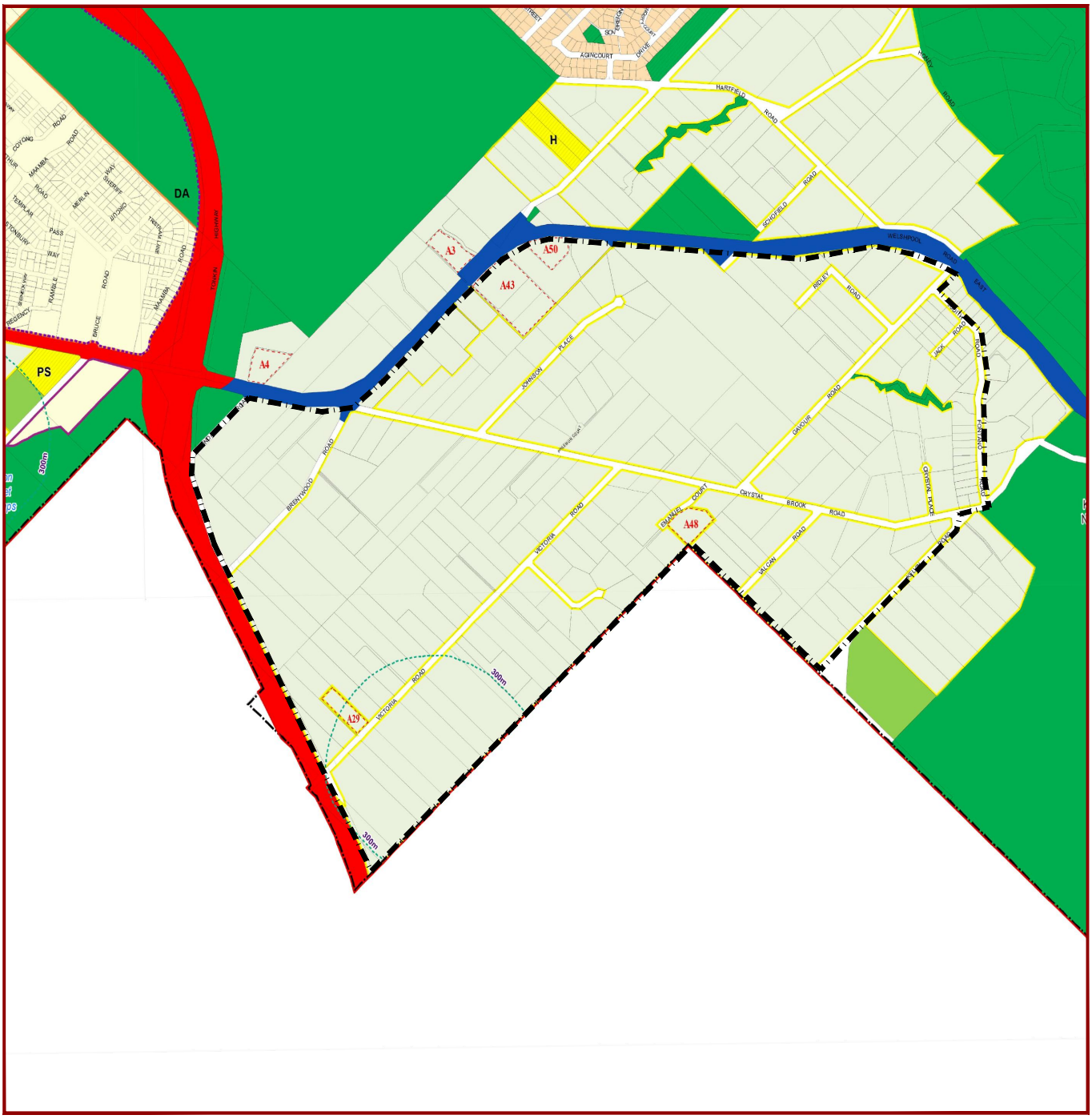

LEGEND

REGION SCHEME RESERVES (MRS)
- Other regional roads
- Primary regional roads
- Parks and recreation

LOCAL SCHEME RESERVES
- H Public purposes : Hall / community centre
- PS Public purposes : Primary school

LOCAL SCHEME ZONES
- Residential
- Special rural
- Private clubs and institutions
- Industrial development
- Urban development

OTHER CATEGORIES
(see scheme text for additional information)
- Scheme boundary
- A1 Additional uses
- Local Government boundary
- DA1 Development area

FIGURE 5

LEGEND

Subject Land

NORTH

0 200 400 600 800 1000m

SCALE 1:20,000 (A4)

Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-03

LOCAL PLANNING SCHEME NO.3
WATTLE GROVE SOUTH
CITY OF KALAMUNDA

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2.2.3 Draft North-East Sub-regional Planning Framework

The draft North East Sub-regional Planning Framework (the Framework) formed part of the draft Towards Perth and Peel @ 3.5 Million strategic suite of planning documents. The draft Framework aimed to establish a long-term and integrated framework for land use and infrastructure provision. The majority of the subject site was identified as 'Urban Expansion' under the draft Framework. The draft Framework stipulated that 'Urban Expansion' land had been identified for potential urban development in preceding planning studies and plans, and represented a 'rounding off' of existing urban areas (refer **Figure 6 – draft North-East Sub-regional Planning Framework**).

Staging and Sequencing

The draft Framework also provided broad guidance in relation to the staged provision/development of urban land based on timeframes as shown on Plan 9 of the draft Framework document. The site was identified as 'Medium-Long Term (2022+)'. BDG prepared a submission in 2015 requesting that part of the Wattle Grove South area be identified as 'Short Term (2015-2021)' given that the site is located only 15 kilometres east of the Perth CBD (connected directly by Welshpool Road/Orrong Road/Graham Farmer Freeway) and represented a logical expansion and consolidation of the existing urban form.

2.2.4 Final North-East Sub-regional Planning Framework

The final North-East Sub-regional Planning Framework was released on 23 March 2018. Most of the subject site is identified under the adopted Framework as 'Urban Expansion' with a portion of the study area identified as 'Urban Investigation' (refer **Figure 7 – Final North-East Sub-regional Planning Framework**).

Urban Expansion

The proposed 'Urban Expansion' areas for residential development include all of the land previously identified in the draft Frameworks document for this purpose. The Frameworks state that this proposal represents a consolidation and 'rounding off' of existing urban areas.

Urban Investigation

The final Frameworks plan expands the previously identified future development area by including a portion of the site as 'Urban Investigation'. This increase in area essentially aligns the Frameworks with our recommended Study Area boundary (being Option 3). The Frameworks state that the 'Urban Investigation' land is not to be construed as a commitment by the WAPC to support any rezoning as this will depend upon the outcome of further planning investigations.

The Framework specifies the following key considerations for the 'Urban Investigation' land:

- Geotechnical analysis/land suitability to provide connections to reticulated wastewater services
- Bushfire risk
- Protection of significant environmental attributes

Staging and Sequencing

The Frameworks set out staging of urban development. The subject land is identified as 'Medium-Long (2022+)'. The Frameworks state as follows:

"the timeframes depicted on the urban staging plan set out the anticipated timing for commencement of development, aligned with planned service provision and should not be construed as preventing further detailed planning from occurring in the interim."

This is important, as detailed planning and approval processes take time. Commencing detailed investigation now will ensure that the planning of this area can be considered within an overall servicing context by the various government assessment agencies (particularly in preparing forward-planning for reticulated water and sewer infrastructure) and formal planning processes can be undertaken, including community consultation.

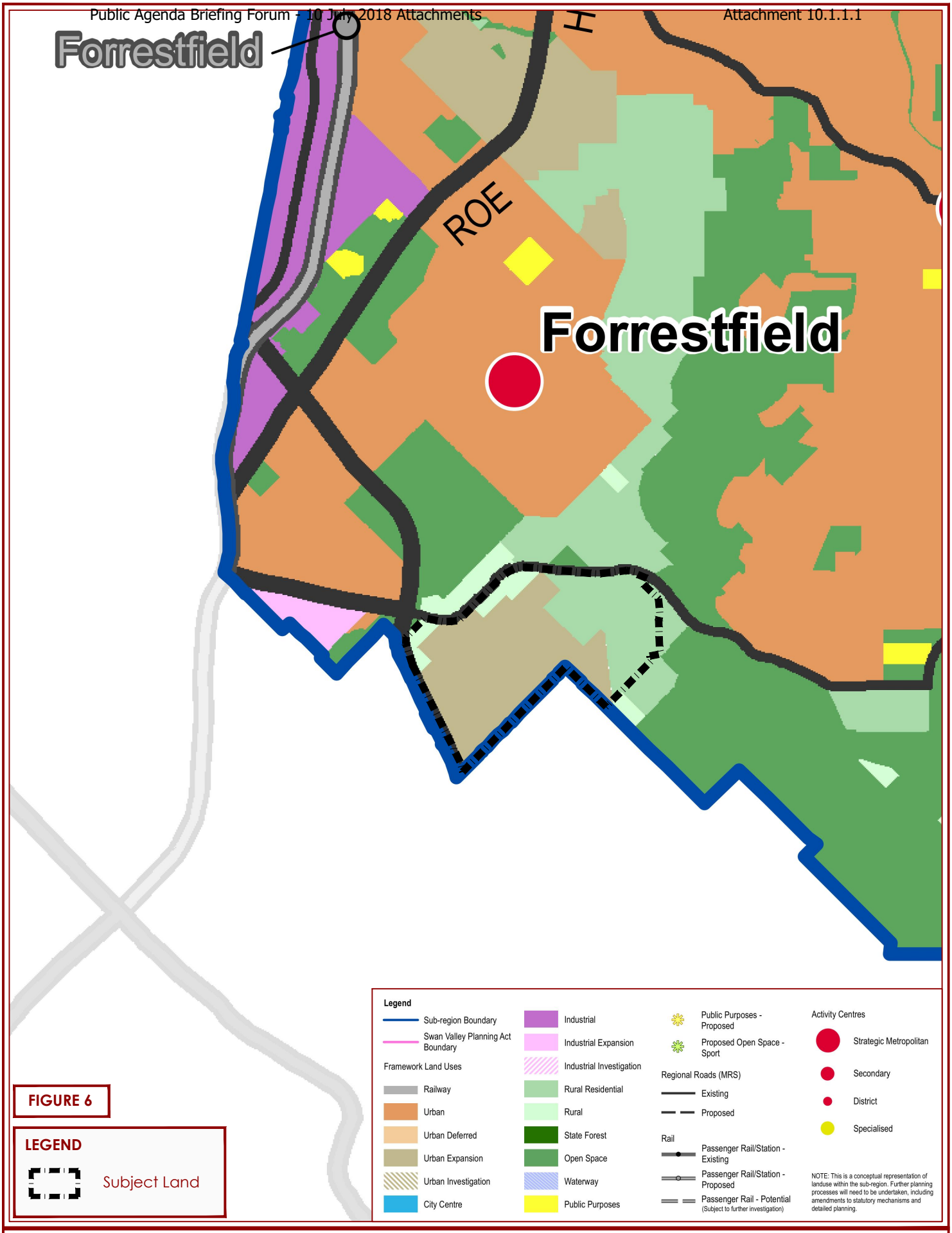

FIGURE 6

LEGEND

Subject Land

NORTH

0 0.5 0.75 1 1.5k

SCALE 1:50,000 (A4)

DRAFT NORTH-EAST SUB-REGIONAL PLANNING FRAMEWORK WATTLE GROVE SOUTH CITY OF KALAMUNDA

Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-02

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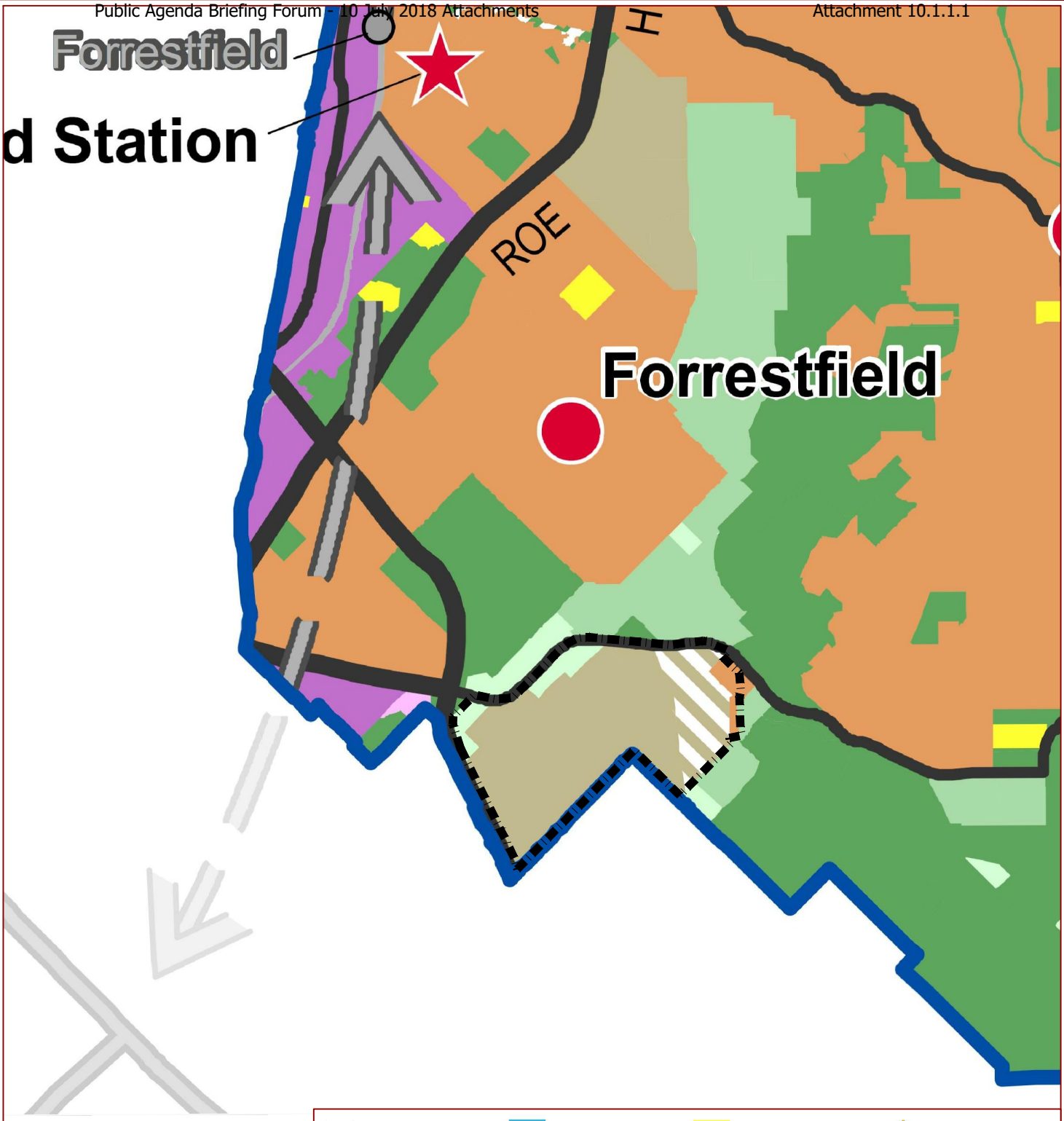

FIGURE 7

LEGEND

Subject Land

Legend

Sub-region boundary

Swan Valley Planning Act boundary

Framework land uses

Railway

Urban

Urban deferred

Urban expansion

Urban investigation (Refer to Table 2 for key considerations)

City centre

Industrial

Industrial expansion

Industrial investigation (Refer to Table 6 for key considerations)

Rural residential

Rural

State forest

Open space

Open space investigation

Public purposes

Waterway

Planning investigation (Refer to Table 3 for key considerations)

Regional roads (MRS)

Existing

Proposed

Rail

Passenger rail/station - existing

Passenger rail/station - proposed Stage 1 METRONET

Passenger rail - further investigation

Freight rail - proposed

NOTE: Transit corridors are shown on Plan 5

Public purposes - proposed

Proposed open space - sport

Activity centres

Strategic metropolitan

Secondary

District

Other (Classificaton to be determined by more detailed planning)

Specialised

NOTE: This is a conceptual representation of broad planning intentions within the sub-region. Further planning processes and decision-making under relevant legislation will need to be undertaken, including with reference to amendment of statutory instruments and detailed planning.

NORTH

0 0.5 0.75 1 1.5k

SCALE 1:50,000 (A4)

FINAL NORTH-EAST SUB-REGIONAL PLANNING FRAMEWORK

WATTLE GROVE SOUTH

CITY OF KALAMUNDA

Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-11

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2.2.5 Draft Perth and Peel Green Growth Plan for 3.5 Million

The draft Green Growth Plan for 3.5 million (GGP) was a whole-of government initiative to provide an unprecedented degree of certainty in relation to future environmental protection and approvals. A portion of the site was mapped in the draft as 'Specific Commitments'. Specific commitments indicate areas to protect, including:

- Threatened flora and threatened ecological communities;
- Conservation category wetlands and wetlands of international importance;
- Vegetation complexes with less than 10 per cent remaining;
- Bush forever areas (excluding those within the 'rural complementary');
- 'Negotiated planning solution' categories;
- Short tongued bee (leioproctus douglasiellus) distribution

A preliminary environmental assessment report has been prepared by 360 Environmental to confirm that these specific commitments can be appropriately dealt with through the structure planning process.

We note that the Draft Perth and Peel Green Growth Plan for 3.5 Million has now been suspended by government.

2.2.6 City of Kalamunda: Local Planning Strategy

The City of Kalamunda's Local Planning Strategy provides a vision and strategic planning direction for the municipality over next 20 years. Scenario 3 is the recommended scenario for the Local Planning Strategy. The subject land is identified in the Strategy as an 'Investigation Area' (refer **Figure 8 – Local Planning Strategy**).

Population Scenario 3:

'Growth by 25,000 people accommodated as in scenarios 1 and 2 plus Residential Bushland development R5 (R2.5) of Special Rural land to the east of Hawtin Road/Lewis Road (R5) and Wattle Grove south of Welshpool Road to a range of densities (R2.5, R5, R20 and R30 in centre) and including a Neighbourhood Centre in Wattle Grove. At current development rates the final part of this scenario (Special Rural land to Urban) would be required by 2025.'

The possible urban development of the subject site is consistent with the City's Local Planning Strategy. Future residential densities will need to be compliant with Liveable Neighbourhoods, and Directions 2031 density targets.

Local Planning Strategy - Spatial Plan: 2031

POPULATION SCENARIO 3 - 25k Growth

Legend

- POTENTIAL FUTURE SEWERAGE
- INVESTIGATION AREAS
- PROPOSED INDUSTRIAL DEVELOPMENT AREAS
- PROPOSED RESIDENTIAL INFILL AREAS
- URBAN DEVELOPMENT AREAS
- PROPOSED URBAN EXPANSION AREAS

Lots: 394
People: 985

Lots: 328
People: 820

U2

MAIDA VALE

KALAMUNDA RD

Lots: 806
People: 2015

HIGH WYCOMBE

Lots: 192
People: 480

Lots: 59
People: 147

Potential P&R

ALEXANDER DR

U4

U6

Lots: 108
People: 270

GOOSEBE

Lots: 2702
People: 6755

Example of Residential Bushland Development at a density of R2.5

WATTLE GROVE

Lots: 525
People: 1312

U7

HAWTIN RD

Lots: 1136
People: 2840

Example of Residential Bushland Streetscape at a density of R2.5

RESERVOIR

Lots: 1333
People: 3332

Lots: 900
People: 2250

FORRESTFIELD

KALAMUNDA

Lots: 464
People: 1160

WALLISTON

U9
WATTLE GROVE

Lots: 1150
People: 2875

Lots: 33
People: 82

CANNING LOCATION 311

Example of Residential Bushland Development at a density of R2.5

CARMEL

Lots: 114
People: 285

Example of Low Density R20 Development

Shire of Kalamunda: Local Planning Strategy - Spatial Plan

SCALE AT A0: 1:17,000

FIGURE 21

Figure 21; Scenario 3; Additional 25,000 Population

FIGURE 8

LEGEND

Subject Land
Wattle Grove South

Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-07

NORTH
SCALE:NTS

LOCAL PLANNING STRATEGY - SPATIAL PLAN 2031

WATTLE GROVE SOUTH

CITY OF KALAMUNDA

BURGESS DESIGN GROUP
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2.2.7 City of Kalamunda: Local Housing Strategy

The Local Housing Strategy adopted by the City of Kalamunda outlines the future housing needs of current and future residents. The Local Housing Strategy has reviewed State Government policies and strategies, to ensure density and dwelling targets are met by the City.

The objectives of the strategy are to ensure new development and infill development is implemented in a manner which complements the amenity of the local region, while providing diverse housing for the community. The strategy outlines areas suitable for an increase in housing stock, as well as promoting affordable housing and the natural landscape. Wattle Grove is specifically mentioned as having strong potential for increased residential development.

2.3 URBAN LAND SUPPLY AND DEMAND

The North-East Sub-regional Planning Framework sets out the minimum infill dwelling targets to 2050. The City of Kalamunda is expected to deliver an additional 11,450 infill dwellings and 25,190 new residents by 2050.

Table 1: Existing and Projected Dwellings and Populations 2011-50

Local government	Existing dwelling (2011)	Existing Population (2011)	Additional dwellings (2050)	Additional population (2050)	Total dwellings (2050)	Total population (2050)
Kalamunda	21,180	56,490	21,040	46,770	42,220	103,260
Source: North-East Sub-Regional Planning Framework						

The Framework projected 21,040 additional dwellings, and a total population of 103,260 by 2050. The Wattle Grove South area is only one 'Urban Expansion' area within the sub-region. The forecast population for the City of Kalamunda is set out in Table 2 below.

Table 2: Forecast population and Residential Development, 2016 to 2036

Kalamunda (S), WA(LGA)	Existing dwelling (2016)	Existing Population (2016)	Additional dwellings (2036)	Additional population (2036)	Total dwellings (2036)	Total population (2036)
ABS Statistics	22,758	57,449	-	-	-	-
.id Statistics	22,996	59,340	6,860 (+29.8%)	16,839	29,856	76,179
Source: .id September 2017						

Residential development forecasts assume the number of dwellings in City of Kalamunda will increase by an average of 343 dwellings per annum to 29,856 in 2036. It should be noted

that this forecast is based on the earlier draft Framework and does not reflect the modified 'Urban Expansion' areas identified within the final Framework.

Table 3: Summary of New Residential Land Supply

Year	Lots Released	Year End Stock	Median Lot Size m^2	Median Lot Price	Land Price $/m^2$
2014	13,373	2,544	420	$262,000	624
2015	11,052	3,074	379	$249,000	657
2016	8,464	3,376	375	$229,250	611
Source: National Land Survey Program					

Current Housing Supply

In accordance with the 2016 National Land Survey Program 8,464 lots were released, and the medium lot size was 375m^2. Whilst market growth has decreased in recent months there is limited new housing supply within the locality. At present, lots are for sale in various small residential estates including:

- Brookside Wattle Grove & Woodlupine Brook Estate on Hale Road, Wattle Grove
- Acacia Parklands Wattle Grove on Welshpool Road East, Wattle Grove

Future Housing Supply

Forrestfield North District Structure Plan

- The State Government instructed the City to prepare a DSP over part of Forrestfield/High Wycombe, in order to identify new land use opportunities arising from the planned Forrestfield Train Station.
- The estimated number of dwellings in Forrestfield North DSP is 4,250 - 5,250 ranging from medium density (R30-R60) to high density (R60+)
- Detailed development yields in Forrestfield North will be established as part of subsequent local structure planning processes

Draft Forrestfield North Residential Precinct Local Structure Plan

- The draft Forrestfield North Residential Precinct LSP proposes a variety of residential densities ranging from Residential R40 – Residential R100
- The outer areas of the LSP are proposed to contain medium residential densities ranging from R40 – R60 representing lot sizes between 120m^2 – 180m^2
- The central areas within close proximity to the proposed Forrestfield Train Station and retail/commercial precinct contain medium/high residential densities ranging from R60 – R100 and represent lot sizes between 100m^2 – 120m^2
- The total estimated number of dwellings in Forrestfield North residential precinct is 3,576
- It is expected that the future Forrestfield Station TOD Precinct will also deliver high density residential development

Maida Vale South

- Maida Vale South has been identified as an 'Urban Expansion Area' in the Western Australian Planning Commission's (WAPC) North-East Sub-Regional Structure Plan
- Burgess Design Group is currently working to progress a Metropolitan Region Scheme (MRS) amendment to rezone the subject land from 'Rural' to 'Urban', and a concurrent amendment to the Shire of Kalamunda Local Planning Scheme No.3 (LPS3), from 'Special Rural' to 'Urban Development' to facilitate the ultimate residential development of the land
- The estimated number of dwellings in Maida Vale South is 2,000 – 2,700 ranging from low density (R20) to high density (R60+)

Dual Density Coded Areas

Council at its OCM Meeting of 27 June 2016 adopted Scheme Amendment 82 – Dual Density Code. The intent of the dual density code is to allow the City to reward landowners/developers with the ability to develop at higher densities where they propose high quality developments that are consistent with criteria specified in LPS3 and Local Planning Policy DEV 54 – Dual Density Design Guidelines.

The dual density codes aim to increase residential densities in strategic locations throughout the City, specifically, in Forrestfield, High Wycombe/Maida Vale and Kalamunda.

The dual density codes are expected to result in approximately 10,000 new dwellings. This increase in infill development represents 87% of the North-East Sub-regional Planning Framework minimum infill target of 11,450 additional dwellings by 2050.

The uptake rate of the higher density development is unknown. It is expected that some dual coded lots will not be subdivided and redeveloped at a higher density. As such, the abovementioned estimated number of new dwellings is likely to be lower. Nonetheless, the dual density codes will deliver new dwellings that will assist the City in achieving the minimum infill targets for the North-East sub-region.

Summary

It is projected that Forrestfield North, Maida Vale South and the dual density coded areas will result in approximately 16,250 – 17,950 new dwellings. In this regard, the City is expected to exceed the minimum infill target of 11,450 additional dwellings by 2050 set by the North-East Sub-regional Planning Framework.

2.4 COMMERCIAL/ INDUSTRIAL LAND SUPPLY

There is limited service commercial/light industrial land available within the City of Kalamunda. This shortage is partially related to the State Government announcement of a rail station in Forrestfield.

The now superseded Economic and Employment Lands Strategy: Non-Heavy Industrial (EELS) identified:

- 71ha of land in Forrestfield Stage 1 as 'Potential non-heavy industrial area – short term'
- 130ha of land in Forrestfield Stages 2 & 3 as a 'Potential non-heavy industrial area – medium term'

However, following the State Government announcement of the Forrestfield Train Station the WAPC requested the City prepare a District Structure Plan that reflected new land use opportunities (such as residential and commercial land uses) to take advantage of the planned train station.

Subsequently, the Forrestfield North District Structure Plan only designates approximately 69ha of land (Forrestfield Stage 1) as 'Light Industry', resulting in a loss of 130ha (Forrestfield Stages 2 & 3) of strategically planned industrial land within the City.

This Planning Feasibility Study provides an opportunity to consider the potential of creating a new service commercial/light industry/mixed business area for bulky goods within Wattle Grove South, given the significant loss of planned future service commercial/light industry land within the City. Service commercial/light industry/mixed business land uses may provide a suitable transition between industrial development (Maddington Kenwick Strategic Employment Area – MKSEA) and the established/future residential areas further north and east.

These land uses would also provide an ideal interface with Tonkin Highway, as they are less noise and vibration sensitive. They would also benefit from the significant exposure provided to business uses along this corridor.

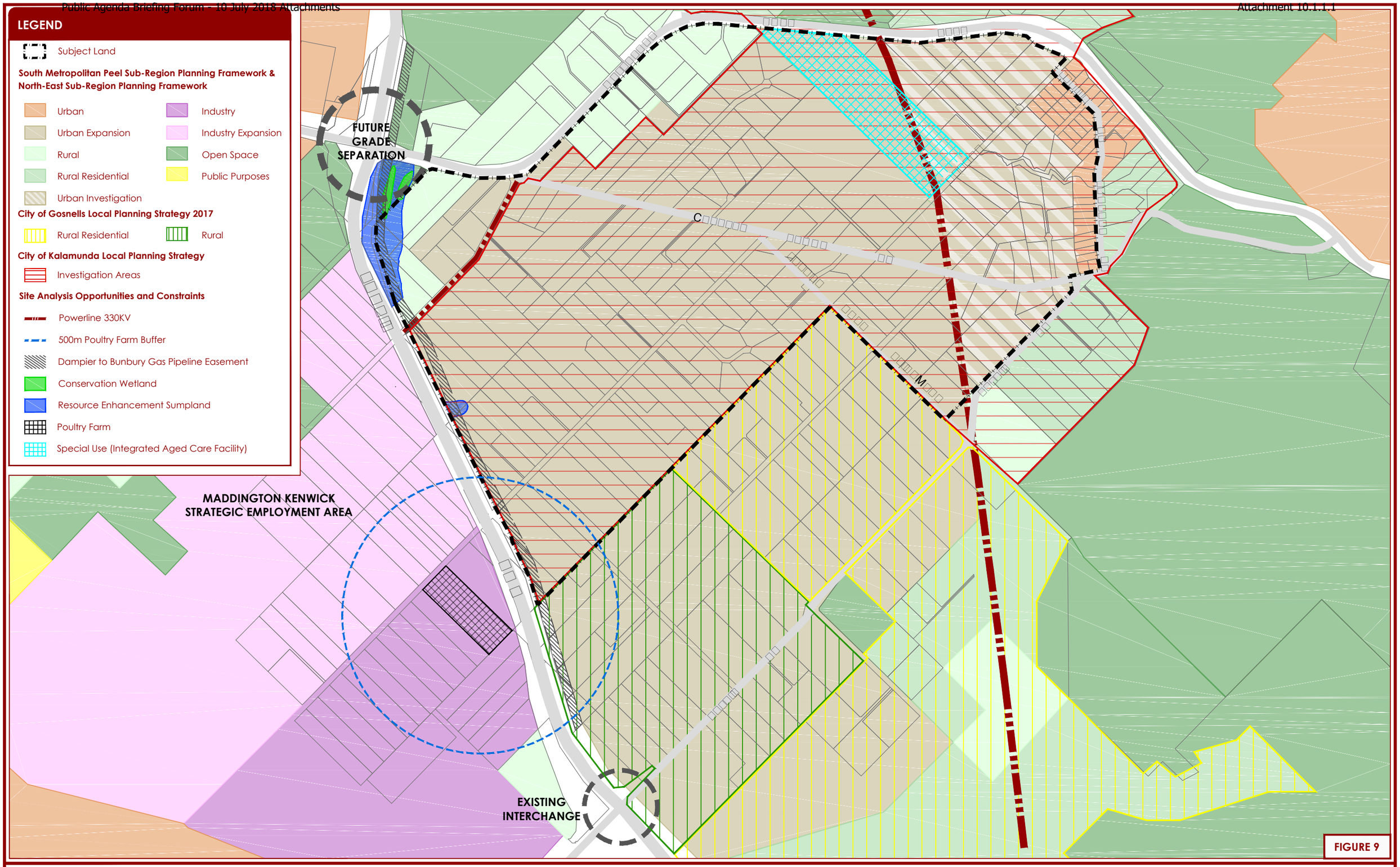
Further investigation is required to determine major access points to confirm the viability of the commercial/light industrial uses.

2.5 MAJOR ACCESS POINTS

Existing major access points and road reserves are shown on **Plan 1 - KCTT Existing Traffic Counts and Figure 9**.

The key existing road and movement features are summarised as follows:

- Access to the subject land is currently available via the existing roads of Tonkin Highway (classified as a Primary Regional Road), Welshpool Road East (classified as a Distributor A road), and Kelvin Road (classified as a Distributor Broad).



Client: City of Kalamunda
Date: 24.05.18
Plan No: KAL WAT 7-02c-06c

NORTH
0 50 100 200 300 400 500
SCALE 1:12,500 (A3)

SITE ANALYSIS
OPPORTUNITIES AND CONSTRAINTS
WATTLE GROVE SOUTH

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CITY OF KALAMUNDA

3. LOCAL CONTEXTUAL ANALYSIS

3.1 POPULATION GENERATION AND EMPLOYMENT SELF-SUFFICIENCY

Table 4: Age Demographics 2016

Age	Kalamunda (S)	%	Western Australia	%
0-4 years	3,523	6.1	161,727	6.5
5-9 years	3,889	6.8	164,153	6.6
10-14 years	3,763	6.5	150,806	6.1
15-19 years	3,906	6.8	149,997	6.1
20-24 years	3,315	5.8	160,332	6.5
25-29 years	3,350	5.8	184,908	7.5
30-34 years	3,734	6.5	194,267	7.9
35-39 years	3,761	6.5	173,041	7.0
40-44 years	3,916	6.8	171,996	7.0
45-49 years	4,078	7.1	172,520	7.0
50-54 years	3,895	6.8	162,438	6.6
55-59 years	3,593	6.3	149,899	6.1
60-64 years	3,326	5.8	132,145	5.3
65-69 years	3,246	5.6	116,755	4.7
70-74 years	2,313	4.0	82,911	3.4
75-79 years	1,721	3.0	61,509	2.5
80-84 years	1,211	2.1	42,590	1.7
85 years and over	922	1.6	42,420	1.7
Source: Australian Bureau of Statistics - Kalamunda (S) (Local Government Area)				

The median age of the population in Kalamunda (S) (Local Government Areas) was 39 years. Children aged 0 - 14 years made up 19.4% of the population and people aged 65 years and over made up 16.4% of the population.

3.1.1 Employment Self-Sufficiency

Table 5: Employment Self-Sufficiency 2011–50

Indicator	2011	2021	2031	2050	Total change	Total % change
Population	209,156	278,234	339,445	450,590	241,434	115.4%
Labour force	102,612	133,079	163,043	224,860	122,248	119.1%
Jobs	82,79	106,117	134,090	187,986	105,607	128.2%
Employment self-sufficiency	80.3%	79.7%	82.2%	83.6%	3.3%	-
Source: North East Sub-regional Planning Framework						

Overall, there are 29,326 people in the labour force within the City of Kalamunda. The three most popular industry sectors are:

- Health Care and Social Assistance (2,841 people or 10.4%)
- Construction (2,819 people or 10.3%)
- Retail Trade (2,513 people or 9.2%)

In combination, these three industries employed 8,173 people in total or 30.0% of the total employed resident population.

Self-sufficiency is defined as the percentage of an LGA or region's working population (working in the LGA) who also live within the boundaries of the LGA or region.

Of the 14,441 people who work in the City of Kalamunda, 6,757 people also live in the area. This equates to 23% self-sufficiency of the total labour force within the City of Kalamunda.

The Kalamunda Advancing: Strategic Community Plan to 2020 sets a target to increase the employment self-sufficiency every five years. The objective is to support industries and businesses within the LGA.

Providing land for employment activities, such as service commercial/light industry/mixed business will assist in meeting these targets.

3.2 CITY/CIVIC REQUIREMENTS

It is assumed the City of Kalamunda will provide its requirements for civic, community and cultural land uses (if any) into the future planning of the Strategic District Structure Plan.

3.3 INDUSTRIAL DEVELOPMENT

The City's Local Planning Strategy (2010) refers to the *Economic and Employment Lands Strategy (EELS),* which has now essentially been superseded by the adopted WAPC Frameworks. The EELS Strategy identified land bound by Maida Vale Road, Raven Street, Milner Road and Dundas Road to be rezoned to 'Light Industry' to complement existing and proposed industrial areas in Forrestfield and High Wycombe. As discussed in Section 2.5, this area is planned to be mostly medium and high density housing under the North Forrestfield District Structure Plan. As such, there is a shortfall in commercial/light industrial zoned land within the City.

The proposed Wattle Grove South locality is comparable to Forrestfield in terms access to major highways and distance from other metropolitan centres. In this regard, it is considered to be a viable location for these commercial and light industrial uses. As such, there is an opportunity for the City to consider creating a new zone to allow for the development of commercial and bulky goods land uses.

There are examples from other local governments that have created a new zoning under their respective Schemes to facilitate commercial and light industrial development. The table below compares these zones and uses adopted by other Local Councils.

The current 'Light Industry' zone under LPS3 allows the City to consider various uses that may not be suited to the area, such as 'Industry – Rural', 'Salvage Yard', and 'Motor Vehicle Wrecking'. Should the City decide to pursue service commercial/light industry/bulky goods and/or mixed business uses we recommend planning officers review these zones and the permissible uses to develop a new zoning that is suitable for the site.

A key element in establishing the feasibility of such a zone or land use precinct will be access. The study area is afforded high visual exposure to Tonkin Highway and Welshpool Road, however, direct and efficient access from these roads is yet to be determined.

Table 6: Comparable Light Industry/Commercial Zones

LOCAL GOVERNMENT AREA	ZONE	OBJECTIVES OF THE ZONES	RELEVANT PERMITTED AND DISCRETIONARY USES
City of Cockburn	Light and Service Industry	To provide for light and service industries and associated uses which are compatible with and acceptable with close proximity to, residential uses.	'P' uses: ▪ Office ▪ Showroom ▪ Industry - Light ▪ Industry - Service ▪ Warehouse ▪ Transport Depot ▪ Trade Display 'D' uses: ▪ Motor Vehicle Repair ▪ Hardware Store
City of Swan	Highway Service	The objectives of the Highway Service Zone are to – a) secure the development of low intensity commercial uses along selected major arterial roads outside the Strategic Regional Centre which can benefit from the high exposure offered by the major traffic thoroughfares; and car based comparison shopping for bulky goods; b) ensure commercial activity within the zone is complementary to development in other commercial zones and does not detract from the viability or integrity of development in either the Strategic Regional Centre or the Commercial zones; c) ensure development contributes towards the	'D' uses: ▪ Industry- Service ▪ Office ▪ Showroom ▪ Shop ▪ Warehouse

		image of the city through high quality design and development with consistent and well landscaped setbacks from street frontages; d) promote shared use of vehicular access and car parking facilities where such arrangements will result in improved traffic management, more efficient use of land and more attractive development; e) ensure car parking and vehicular access facilities are located, designed and landscaped so as not to detract from the amenities of the road frontages or of adjacent development; f) ensure any on-site advertising is integrated with the overall site development and does not detract from the amenities of the road frontages or of adjacent development.	
City of Gosnells	Highway Commercial	To provide for a range of commercial development, including particularly bulk retailing and open air display, which is suitable for a highway frontage location.	'D' uses: ▪ Industry - Service ▪ Office ▪ Shop ▪ Showroom ▪ Warehouse

This Planning Feasibility Study represents an opportunity for the City to consider future land uses and the ultimate rezoning and structure planning of the land. The opportunities presented by creating a new service commercial/light industry area are discussed in detail in section 6.1, Table 8.

4. ENVIRONMENTAL

An Environmental Assessment Report (EAR) prepared by 360 Environmental provides an overview of the general environmental features of the Study Area and includes an overview of the Site's remaining biological and social environment including:

- Wetlands
- Aboriginal and non-Aboriginal Heritage sites
- Regional soil types
- Hydrology
- Geomorphology
- Flora, vegetation and fauna
- Planning context
- Social environment.

A summary of the report is provided below.

4.1 TOPOGRAPHY

The elevation across the site ranges from 21 m Australian Height Datum (AHD) to 79 m AHD, increasing in elevation from the west to the east and south-east.

4.2 ACID SULPHATE SOILS

The entire Site has a 'Moderate to Low' risk of acid sulphate soils (ASS) risk within 3 m of natural soil surface and 'High to Moderate' risk beyond 3m.

4.3 CONTAMINATED SITES

A review of DWER's Contaminated Sites Database has identified there are no registered contaminated sites within the Study Area, however, there are four contaminated sites within a 1 km radius, located on:

- Lot 804 on Plan 59983, Kenwick
- Lot 9005 on Plan 40777, Maddington
- Lot 7, Former Caltex Service Station, Welshpool Rd, Wattle Grove
- Lot 566 Orchard Road, Maddington

4.4 ENVIRONMENTALLY SENSITIVE AREAS

A number of Environmentally Sensitive Areas (ESAs) impact the Site. DWER's online Clearing Permit System has identified the following Declared Rare Flora (DRF) or a Threatened Ecological Community across the site;

- Wavy Smoke-bush (*Conospermum undulatum*); and,
- Summer Honeypot (*Banksia mimica*).

4.5 BROAD VEGETATION TYPES

Vegetation mapping of the Swan Coastal Plain subregion of WA was completed on a broad scale (1:250,000) by Beard (1980). These vegetation units were re-assessed by Shepherd et al. (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

The Site is within three vegetation units as described below:

- Pinjarra 3: Medium forest; Jarrah – Marri;
- West Darling 4: Medium woodland; Marri and Wandoo; and
- Pinjarra 968: Medium woodland; Jarrah, Marri and Wandoo.

Vegetation complexes of the Southwest botanical district have been mapped by Heddle *et al*. (1980). Four vegetation complexes exist across the site which relate to the underlying soil profile:

- Guildford Complex: Open forest to tall open forest and woodland;
- Southern River Complex: Open woodland;
- Forrestfield Complex: Open forest and fringing woodland; and
- Darling Scarp Complex: Low open woodland to lichens.

4.6 DECLARED, RARE AND PRIORITY FLORA

A review of the database searches identified 75 conservation significant flora species as potentially occurring within the site and a likelihood assessment of the species was undertaken.

The results of the assessment indicated that 24 flora species were considered 'Likely' to occur due to the presence of suitable habitat and close proximity to previously recorded sites. 35 species were considered 'Possible' and 4 considered 'Unlikely' to occur within the site. 12 species had an unknown likelihood of occurrence due to the lack of available data.

Several occurrences of the following five (5) DRF species have been identified as occurring within or close to the boundary of the site based on the DBCA Threatened Priority Flora database search:

- Conospermum undulatum;
- Isopogon drummondii;
- Banksia mimica;
- Lasiopetalum glutinosum subsp. glutinosum; and
- Thelymitra magnifica.

Given the above, site specific flora and vegetation surveys would be required to confirm the presence or absence of these DRF species which would provide a better indication of the land available for development. A Flora and Vegetation Management Plan may be required at the subdivision stage.

4.7 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

Desktop searches of the DBCA's Threatened and Priority Ecological Communities dataset identified several TECs or TEC buffers occurring within and surrounding the site, including;

- Banksia Dominated Woodlands of the Swan Coastal Plain;
- SCP20a - *Banksia attenuata* woodlands over species rich dense shrublands;
- SCP3a -*Eucalypt calophylla – Kingia australis* woodlands on heavy soils, Swan Coastal Plain;
- SCP3b - *Eucalyptus calophylla – eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain;
- Shrublands and woodlands on Muchea Limestone;
- Herb rich shrublands in clay pans;
- SCP10a - Shrublands on dry clay flats; and
- Central Granite Shrublands Community.

These TECs mapped are based on the DBCA's likelihood of TEC occurrences and are not based on actual recorded data. These TECs appear to correspond with patches of possible remnant vegetation which is likely to be associated with the Banksia Woodlands TEC, Eucalyptus calophylla-Kingia australis woodlands and Shrublands TEC and Woodlands on Muchea Limestone TEC.

Flora and vegetation surveys of these patches of vegetation will be required to determine the presence or absence of these TECs or PECs. Should these TECs be identified as occurring within the site, clearing or potential impacts to the TECs will require approval from the DBCA and DWER. A Flora and Vegetation Management Plan may be required at the subdivision stage.

4.8 THREATENED AND PRIORITY FAUNA

Due to the site being mostly cleared of native vegetation and used for rural purposes, it is not likely that the site would offer large areas of valuable intact habitat.

Some fauna species may utilise the minor watercourse that traverses the site which appears to have intact vegetation along the foreshore area and within remaining patches. However, fauna are more likely to utilise surrounding larger areas of intact vegetation to the east.

4.9 ABORIGINAL HERITAGE

A desktop search has identified two Registered Aboriginal Heritage Sites and one Lodged Aboriginal Heritage Site intersecting the Site, including:

- Brentwood Road Swamp (No.4343)
- Brentwood Road Quarry (No.342)
- Brentwood Road NW (No.4341)

4.10 EUROPEAN HERITAGE

A desktop search of the State Heritage Office has identified there are no State Heritage Sites within the Site.

4.11 LAND USE BUFFERS

The site is constrained by generic or imposed buffers on prescribed premises (Poultry farms, turf farm and kennels). The opportunity for land development within the site is recommended to be split into two separate land uses. The area to the south of Crystal Brook Road may be more suitable for continued rural uses or industrial development. The area to the north of Crystal Brook Road has the potential to be developed for urban residential - should the generic buffers be reduced. Site specific studies and modelling would be required to determine any appropriate buffers.

4.12 HYDROLOGY

There are several tributaries which traverse the site, as well as a wetland located along the western boundary of the site. A DWMS will be required as part of any future rezoning under the MRS, as well as groundwater monitoring to inform the Local Water Management Strategy (LWMS) and local structure planning stage.

4.12.1 Groundwater

Data from the Perth Groundwater Map indicates the groundwater table ranges between 12m Australian Height Datum (AHD) and 17m AHD. Groundwater flows from east to west. The Site is not within a Public Drinking Water Source Area.

4.12.2 Surface Water

Yule Brook, a major tributary, exists 55 m to the north of the site, separated by Welshpool Road East. An un-named minor non-perennial watercourse traverses the northern portion of the site connecting to Yule Brook in the northeast. In addition, another minor perennial watercourse traverses along the boundary in the south-western corner of the site. The site also contains three constructed earth dams and two perennial lakes. A constructed minor drain extends south of Crystal Brook Road to a constructed dam. The site is not within a mapped 100 Year ARI Floodplain Area.

4.12.3 Wetlands

Desktop mapping has identified that small portions along the western boundary of the Site along Tonkin Highway are mapped as Conservation Category (CCW) and Resource Enhancement wetlands (REW). As such, there is the potential for their associated buffers to impinge on the south-western portion of the site. A buffer distance of 30 – 50m is generally imposed on REWs and a minimum 50m buffer is generally imposed on CCWs. However, as the vegetation within the mapped wetlands and the corresponding buffers does not appear to be intact and has been subject to clearing, it is likely that smaller buffer distances from the wetlands could be negotiated.

Alternatively, there is a potential opportunity to reclassify the wetlands within and surrounding the site to increase the developable potential of the site. Site specific surveys would be required to assess the vegetation remaining and the condition of the wetlands. A Wetland and Wetland Buffer Management Plan may be required at subdivision stage.

4.12.4 Foreshore Area

The minor non-perennial watercourse that traverses through the northern portion of the site would likely require a biophysical assessment to identify the extent of the foreshore area. The extent of the foreshore area would impact on the developable potential of the surrounding area. A Foreshore Management Plan may be required at the structure planning or subdivision stage.

4.12.5 District Water Management Strategy

A District Water Management Strategy will be required to support any future urban rezoning under the MRS. The key objective of the DWMS will be to demonstrate that the land is capable of supporting the change in land use and is able to achieve appropriate urban water management outcomes.

It is recommended that following the City's decision on the final boundary of the study area, and prior to the MRS Amendment being initiated, the preparation of a District Water Management Strategy is prepared and submitted with DWER for approval to ensure the project's timeframes are achieved.

5. SERVICING

KCTT has prepared an Infrastructure and Servicing Report to assess the current capacity of services and future servicing requirements for development (refer to **Appendix 2**). The report confirms that there are no identified servicing constraints that prevent the land from being developed for urban purposes. The site is capable of being provided with all essential services and infrastructure. A summary of the report is provided below.

5.1 WATER

The Water Corporation confirmed there are significant water assets which run adjacent to the Study Area inclusive of the Canning Trunk Main, with the Canning Foothills Trunk Main branching off at Hale Road. KCTT consider that a network of local infrastructure can be planned pending detailed future development yields and road layouts at Structure Planning stage.

5.2 POWER

Existing services are present nearby and extensions will be undertaken to service the subject land.

High Voltage overhead 3 phase power infrastructure is currently available through most of the Wattle Grove South area as follows:

- Hale Road to Mundy Regional Park (132kV)
- West of Hawtin Road (330kV) near the Canning Foothills Trunk Main water alignment
- 66kV assets on the south-eastern boundary of the Investigation Area.

From an analysis of Western Power's Network Capacity Mapping Tool, KCTT has indicated that the catchment between Welshpool Road and Tonkin Highway generally has a forecast capacity of 20 to 25MVA in the year 2034.

5.3 GAS

Minimal existing infrastructure is available in Wattle Grove South, however existing services are in reasonable proximity to the study area.

5.4 TELECOMMUNICATIONS

Wattle Grove South has existing telecommunications assets. There are no NBN rollouts currently planned in this area. NBN Co has a charter to work with local governments and developers, particularly for larger scale developments (+100 lots). In this regard, provision of suitable services can be negotiated.

5.5 INFRASTRUCTURE

5.5.1 Bridges (Welshpool Road East / Tonkin Highway Interchange)

The Wattle Grove South Area is reliant on some significant improvements to road connectivity, with consideration needed for the impact of the proposed Welshpool Road East grade separation on the development potential in the western third of the Study Area.

Any bridge over the Tonkin Highway will have the following minimum requirements:

- Min depth of bridge structure = 1.7 metres
- Min clearance to Tonkin Highway carriageways = 6.5 metres

KCTT recommends a Preliminary Concept Design Drawing is completed for the eastern approach on Welshpool Road East, with the area of the bridge approach and the bridge abutment clearly delineated and the area of land impacted calculated for further consideration in the Wattle Grove MRS Amendment Planning.

The cost of this bridge will not be the responsibility of the MRS Amendment Area, however costs to realign Welshpool Road East will need to be considered in the develop of a DCP.

5.6 TRAFFIC

The existing transport network in the vicinity of the site is described in the following sub-sections. KCTT has prepared a Transport Impact Assessment to identify any potential traffic issues, constraints and opportunities to future development (refer **Appendix 3**).

5.6.1 Road Network

Tonkin Highway is classified as a Primary Distributor road under the Main Roads WA (MRWA) Road Hierarchy for Western Australia. Welshpool Road East is classified as a District Distributor A road. Crystal Brook Road is classified as an Access Road, which is the lowest order road.

5.6.2 Existing Traffic Counts

- Tonkin Highway (South of Welshpool Road East) carries approximately 47,882 vehicles per day
- Welshpool Road East (East of Tonkin Highway) carries approximately 20,314 vehicles per day
- Crystal Brook Road (250m east of Brentwood Road) carries approximately 2,168 vehicles per day (refer **Plan 1 - KCTT Existing Traffic Counts**).

Future development and ultimate trip generation would be subject to detailed proposals at Structure Plan or subdivision stages. A more detailed Transport Assessment of the proposed land uses using WAPC guidelines would need to be completed at Structure Planning Stage.

15,116 AM 07:15 – 2,647 PM 15:30 – 1,626 2017
NORTH OF HALE ROAD (SLK 17.27)NB

15,960 AM 08:00 – 875 PM 16:45 – 1,054 2017
EAST OF TONKIN HIGHWAY (SLK 1.76)

11,730 AM 08:00 – 875 PM 16:45 – 1,054 2016
NORTH OF WELSHPOOL ROAD EAST (SLK 0.81)

22,702 AM 07:30 – 1,957 PM 16:45 – 1,721 2016
WEST OF TONKIN HIGHWAY (SLK 9.90)

VPD 17,998
AM 08:00 – 1,386
PM 17:00 – 1,477

40,695 AM 07:15 – 3,410 PM 15:30 – 3,566 2017
NORTH OF WELSHPOOL ROAD EAST (SLK 17.44)

VPD 40,237
AM 08:00 – 3,336
PM 17:00 – 3,380

20,314 AM 07:45 – 1,622 PM 16:45 – 1,917 2015
EAST OF TONKIN HIGHWAY (SLK 0.24)

VPD 16,546
AM 08:00 – 1,501
PM 17:00 – 1,699

2,168 AM 07:00 – 208 PM 15:00 – 215 2017
250M EAST OF BRENTWOOD ROAD

47,882 AM 06:15 – 3,503 PM 16:00 – 3,904 2015
SOUTH OF WELSHPOOL ROAD EAST (SLK 19.45)

VPD 42,791
AM 08:00 – 3,256
PM 17:00 – 3,738

5,290 AM 08:00 – 481 PM 16:00 – 518 2016
460M SOUTH WEST OF CRYSTAL BROOK ROAD

VPD 39,620
AM 08:00 – 3,014
PM 17:00 – 3,594

5,963 AM 07:30 – 535 PM 16:00 – 539 2014
NORTH OF TONKIN HIGHWAY (SLK 3.60)

VPD 39,620
AM 08:00 – 3,014
PM 17:00 – 3,594

VPD 44,716
AM 08:00 – 3,580
PM 17:00 – 3,795

43,124 AM 07:00 – 3,141 PM 16:15 – 3,909 2016
SOUTH OF KELVIN ROAD (SLK 22.51)

17,823 AM 07:30 – 1,433 PM 15:30 – 1,677 2016
WEST OF TONKIN HIGHWAY (SLK 3.02)

VPD 44,716
AM 08:00 – 3,580
PM 17:00 – 3,795

13,392 AM 07:15 – 983 PM 15:15 – 1,131 2014
WEST OF BICKLEY ROAD (SLK 2.38)

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION
STRUCTURE PLAN AREA
FORRESTFIELD SUBURB
CITY OF KALAMUNDA LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY

TRAFFIC DATA
5,512 NUMBER OF VEHICLES PER DAY
AM 1145 – 381 PM 1630 – 480 NUMBER OF VEHICLES PER AM PEAK HOUR / NUMBER OF VEHICLES PER PM PEAK HOUR
2014 YEAR
EAST OF HARLOW RD LOCATION

TRAFFIC VOLUMES DERIVED FROM SCATS
VPD 17,998 NUMBER OF VEHICLES PER DAY
AM 08:00 – 1,386 NUMBER OF VEHICLES PER AM PEAK HOUR
PM 17:00 – 1,477 NUMBER OF VEHICLES PER PM PEAK HOUR
ALL DATED - SEPT 2017

Certified System Quality ISO 9001 SAI GLOBAL

LEGEND

No	DATE	AMENDMENT
A	16-10-2017	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE LANDHOLDINGS

TITLE: EXISTING TRAFFIC COUNTS - 2,000M RADIUS

DRAWING NUMBER: KC00381.000_ S05

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
PH: 08 9441 2700
WEB: www.kctt.com.au
kctt

6. POTENTIAL LAND USES

6.1 WORKSHOP WITH CITY OF KALAMUNDA'S PLANNING OFFICERS

The City of Kalamunda's planning officers, attended a meeting at Burgess Design Group on 31 January 2018. The purpose of this meeting was to discuss different land use options for Wattle Grove South. The project team considered the following two (2) land use options:

- Option 1: Residential Development

Under this option, the whole Wattle Grove South area would be concurrently zoned 'Urban' under the Metropolitan Region Scheme, and 'Urban Development' under the City of Kalamunda Local Planning Scheme No.3 (LPS3) and developed for residential purposes (refer **Figure 10**).

The intent of the 'Urban Development' zone under LPS3 is to provide orderly and proper planning through the requirement to prepare and adopt a Structure Plan to facilitate the development of land for residential purposes and other associated uses.

Option 1 is consistent with the North-East Sub-regional Planning Framework; however the 'Medium-Long Term (2022+)' timeframe set out in the Frameworks is expected to delay the initiation of an MRS Amendment. Officers of the Department of Planning, Lands & Heritage have indicated that this land may not be suitable for development (given the availability of other zoned land within the Perth Metropolitan Region), until beyond 2030. As such, this is not the recommended option.

- Option 2: Residential and Industrial Development

Under this option, two (2) separate MRS amendments would be submitted, one (1) for the land generally north of Crystal Brook Road, and one (1) for land south of Crystal Brook Road. The MRS amendments will seek concurrent amendments to rezone the land to 'Urban Development' and/or 'Industrial Development' under the Local Planning Scheme.

It is envisioned that land generally south of Crystal Brook Road will be designated as commercial/light industry zone under the Structure Plan. Whilst land generally north of Crystal Brook Road will be designated for residential development (refer **Figure 10**). This is the recommended option.

The intent of the 'Industrial Development' zone is to provide for orderly and proper planning through the requirement to prepare and adopt a Local Structure Plan. It should be noted, the permissible land uses set out in LPS3 Table 1 - Zoning Table are not envisioned for Wattle Grove South. It is recommended that a new zone is created and adopted under LPS3, and applied through the Local Structure Plan.

In this context, 'Industrial' development is defined as light and service industries, bulky goods, commercial uses which are compatible with and acceptable with close proximity to, residential uses. Heavy industrial uses are not considered to be acceptable. The creation and approval of a new zone will facilitate the development of these abovementioned uses within this precinct (refer Section 3.3).

6.2 APPROACH

In order to determine the best land use option, a pros and cons analysis was undertaken in collaboration with the City of Kalamunda planning officers. The following elements were considered:

- Planning/Development
- Community
- Infrastructure
- Economic Costs
- Environment

Table 7: Option 1 - Residential Development Pros/Cons

PROS	CONS
▪ The site is well located within 15km of the CBD	▪ Timeframe for development is long term in the context of DPLH feedback (post 2030+)
▪ There is an opportunity for significant areas of vegetation (currently in private ownership) to be set aside for conservation through Public Open Space (POS)	▪ The site has the potential to be impacted by a future flight path. High residential densities are likely to be restricted to minimise public exposure to aircraft noise.
▪ The site has good access to Perth CBD and surrounding highways and Perth Airport	▪ Compatibility/interface issues with Tonkin Highway
▪ Residential development will provide a better interface with Gosnells 'Urban Expansion' area	▪ Setbacks to Dampier-Bunbury gas pipeline will be required ▪ Limited development will be permitted within the pipeline corridor
▪ Improved financial capacity to deliver services and community facilities	▪ Residential population may increase demands on existing services (e.g. libraries, waste, community facilities)
▪ Opportunity for greenfield TOD if station location is realigned in a timely manner	▪ Increased POS areas may have increased associated maintenance costs and liabilities
▪ Assist with increasing active open space areas within the City	
▪ Aligns directly with state government strategic plans for urban development (albeit post 2022+)	
▪ Aligns with City's Local Planning Strategy	
▪ The topography of the site is flat and relatively unconstrained for urban development	
▪ Opportunity for a Neighbourhood Centre	

▪ Primary school for future residents	

Table 8: Option 2 - Industrial Development Pros/Cons

PROS	CONS
▪ Opportunity to make up for the shortfall of industrial land in Forrestfield North precinct (130ha)	▪ Possible community concern and opposition to industrial land uses
▪ Limited alternative locations for industrial development areas within the City	▪ Impact projected resident population growth (although this could be off-set given the increase in the development area with the 'Urban Investigation' land identified under the Frameworks)
▪ The land is well positioned within close proximity to transport infrastructure, including: – Tonkin Highway – Northlink – Gateway – Roe Highway which has access to the port – Direct access to Roe Hwy when the existing Hale Road connection is closed – Welshpool Road – Opportunity at Kelvin / Crystal Brook Road for freight vehicle movements	▪ Fewer opportunities for conservation POS areas given that industrial development has no POS requirements. Noting there will be some conservation in the industrial area given the need to retain some existing vegetation
▪ The study area is within close proximity to Perth airport	▪ Landowner expectation that the area is Urban
▪ The study area is within close proximity to PTA rail yards	▪ Create interface issues with Gosnells future urban expansion area
▪ Opportunity to make up for land environmentally constrained by Yule Brook and wetlands in MKSEA	▪ Lost opportunity for a greenfield TOD as part of Metronet plan. Noting that the rerouting of rail required for a TOD that has not been committed to by the state
▪ Compatible use/ suitable interface with existing landfill site to the south	▪ Access arrangement with Tonkin Hwy / Welshpool Road
▪ Doesn't compete with 'urban supply' ▪ Opportunity to commence development prior to 2022+ timeframe	▪ Visual impacts from the hills and Tonkin Highway
▪ Appropriate interface with Tonkin Highway / future industrial land uses (MKSEA)	
▪ Industrial development is not constrained by the Dampier-Bunbury gas pipeline that	

runs along the southern boundary	
▪ Stimulate economic activity and create employment opportunities	
▪ Industrial rate payers do not require the provision of community infrastructure and resources (e.g. libraries, POS, community facilities and services)	
▪ Will provide goods and services for the broader community	
▪ Opportunity for 'bulky goods' uses	
▪ Located within a growing catchment for employment	
▪ Industrial land use is typically a faster development process	
▪ Industrial land use more compatible with Perth Airport flight path	
▪ Flat and relatively unconstrained for industrial development	
▪ Less infrastructure required by utilising the existing road pattern	

6.3 SUMMARY

It was agreed by the project team that Option 2: 'Urban Development' and 'Industrial Development' is the preferred land use option. Discussions with the City of Kalamunda officers confirmed that this Planning Feasibility Study should provide such an analysis and then make any necessary recommendations on the next steps/implementation based on this option being suitable.

This land use configuration was selected based upon the above pros and cons analysis and primarily due to the following:

1. Need for industrial land within the City of Kalamunda
2. Location/proximity
3. Land use integration/compatibility
4. Land use potential
5. Timing of development
6. Economic sustainability
7. Less demanding on City services
8. Site landform
9. Availability of services
10. Availability of additional land for residential development

6.3.1 Need

The City lost a significant area of future industrial land through the development of a large portion of Forrestfield North for residential purposes. This land was well located adjacent to the Perth Airport, marshalling yards and local highways.

There is limited opportunity in other areas of the municipality for industrial land use with such a high level of access to services and transport.

The City also has limited bulky good/mixed business land use opportunities.

The portion of Wattle Grove South to the south of Crystal Brook Road is of a suitable size to provide for a strategic industrial/bulky good/mixed business area.

6.3.2 Location

Wattle Grove South is very well located in close proximity to:

- Perth CBD
- Perth airport
- Forrestfield marshalling yards
- Abutting highways
- Services and infrastructure

The land use exposure provided by Tonkin Highway is also a key opportunity.

6.3.3 Land Use Integration

Located abutting a major highway and high capacity gas pipeline, being impacted by a poultry farm buffer and being situated in close proximity to services and infrastructure, confirms that the use of the land for industrial purposes represents an ideal integration with surrounding development.

Crystal Brook Road also provides an ideal northern boundary to the industrial precinct, creating a clear delineation between this land use and the future residential development area to the north.

6.3.4 Land Use Potential

Creation of an industrial precinct also provides the City with potential to introduce a range of other land uses to the area, including:

- Light industry
- Bulky goods and showrooms
- Mixed business

6.3.5 Timing of Development

Officers of the Department of Planning, Lands & Heritage have indicated that planning approvals (zoning and local structure plan) may not be supported for Wattle Grove South in the short to medium term.

This is based on the timeframes shown in the adopted Frameworks (2022+) and the officers specifically suggesting that development may not be appropriate prior to 2030 – based upon the availability of other zoned residential land within the Perth Metropolitan Region.

Dividing the Study Area into a southern 'industrial' precinct and a northern 'residential' precinct addresses this timing issue.

Industrial land can be progressed more quickly to meet perceived demands, with the residential land being longer term – if required. It is also important to note that demand for the residential land will increase as larger areas of the site are developed for business activities, creating employment opportunities.

An MRS 'Urban' zoning can be progressed over both the industrial and residential precincts concurrently, together with 'Industrial Development' and 'Urban Development' zoning under the Local Planning Scheme No.3.

6.3.6 Economic Sustainability

Planning for economic development is an important aspect when building strong, sustainable local economies. The City has an important role in facilitating economic development and supporting its residents through the provision of jobs and services. The recommended development Option 2 to create an industrial development precinct is consistent with the City's goals set out in the Kalamunda Advancing 2027: Strategic Community Plan to increase employment self-sufficiency, and achieve greater economic sustainability.

6.3.7 City Services

The City has also advised that industrial land uses create less of a demand for community services and facilities, thus reducing the financial burden placed on the City in comparison to a residential use of the land.

6.3.8 Site Landform

The portion of the Study Area south of Crystal Brook Road is generally flat or only slightly undulating, with little vegetation of any value. Further, it has good access to existing roads. It is thus ideally suited for industrial development.

It is also likely that less land fill will be required for industrial development of the land, resulting in environmental and economic cost savings.

6.3.9 Availability of Services

The engineering services report included within this Planning Feasibility Study indicates that services and infrastructure are available to the site to support the land uses as proposed.

Given the high level of access to the site and its proximity to such services, it is considered ideally suited for land uses of an industrial nature.

6.3.10 Additional Residential Land

The adopted WAPC Framework shows additional land in the north-eastern part of the Study Area for 'Urban Investigation'.

This is land that we considered ideally suited for inclusion within the 'Urban Expansion' area as it generally represented a rounding off of the precinct, bound by Welshpool Road, the Darling Scarp, the municipal boundary to the south and Tonkin Highway to the west.

Burgess Design Group recommended the inclusion of this land to the City and in turn both parties made the same suggestion to the WAPC.

Inclusion of this land in the adopted WAPC Frameworks increases the total land area to be considered for residential development, as outlined below:

Original area of 'Urban Expansion' land in draft Framework	196ha
'Urban Expansion'/'Urban Investigation'/'Urban' land in adopted Framework	287ha
Original area of 'Urban Expansion' land north of Crystal Brook Road	80ha
Final area of 'Urban Expansion/Investigation' north of Crystal Brook Road	170ha

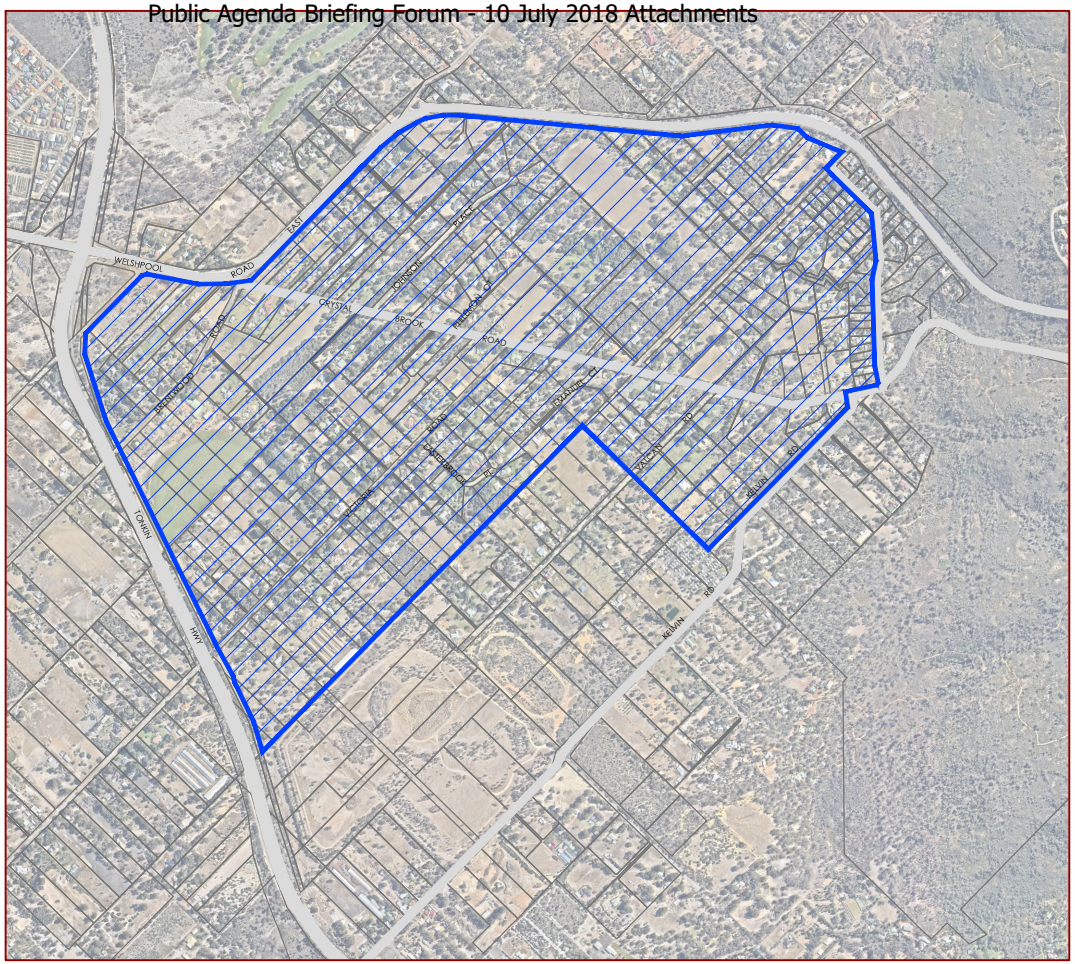
Thus, the potential zoning of approximately 135ha of industrial land within Wattle Grove South has only reduced the total (original) area of 'Urban Expansion' land by 26ha.

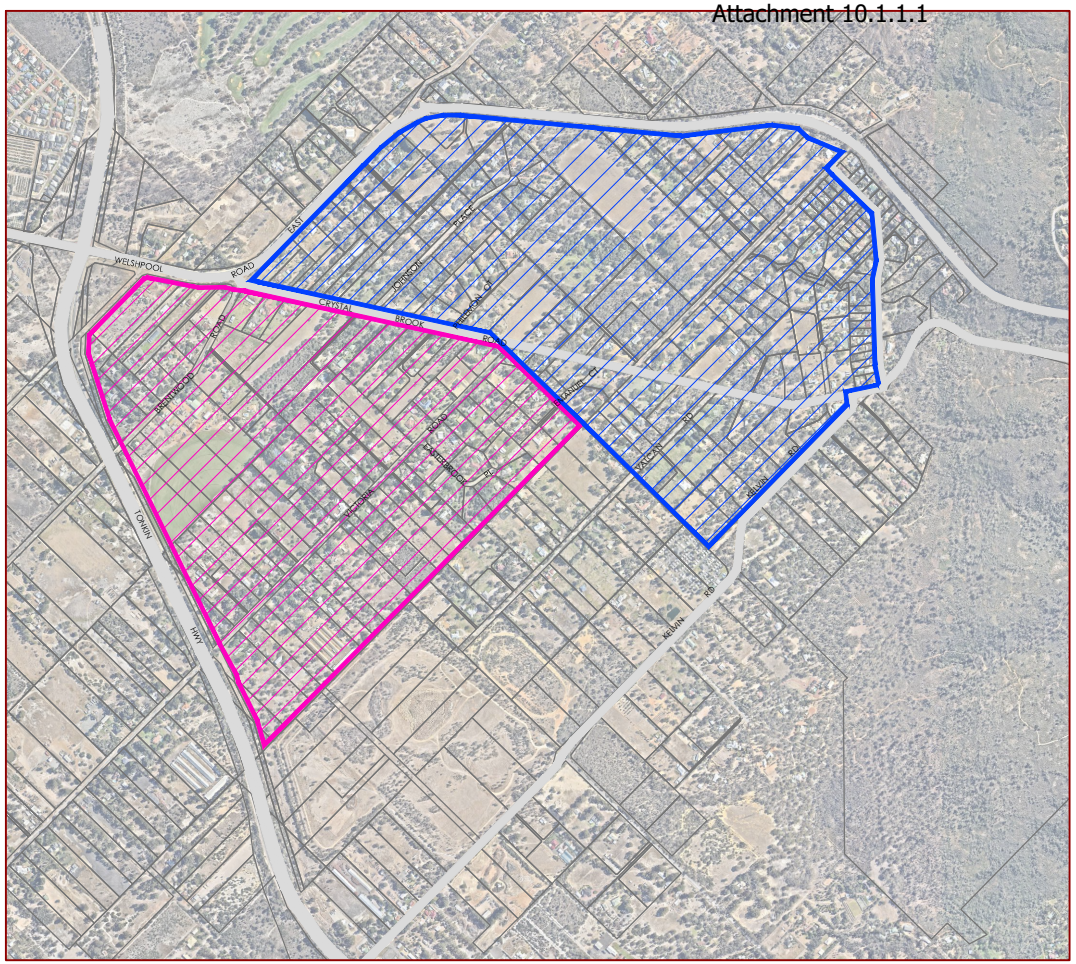
This is important, as the City's housing/population estimates for Wattle Grove South based on the original Frameworks (assuming 122.5ha developable land) were in the order of 4,777.5 persons (assuming 15 lots per ha).

The proposal to develop part of the Study Area for industrial purposes reduces the land available for residential development to 156ha (net), however, this still provides for a potential residential population of 3,802.5 persons (assumes 15 lots per ha), which is only 975 less than originally proposed, or approximately 20%. A greater yield per hectare could also be used to reduce this deficit.

Thus the impact of integrating an industrial precinct within the Study Area on future population growth is marginal, yet the benefits (as outlined above) are significant.

The City is supporting increased residential infill with adopted Amendment 82 – Dual Density Code, Forrestfield North and Maida Vale South areas (refer Section 2.3). In this regard, the reduction in residential land within Wattle Grove South is considered to be inconsequential given the City is likely to exceed the additional dwellings infill target of 11,450 specified in the Framework.





DEVELOPMENT OPTION 1: RESIDENTIAL DEVELOPMENT

Residential

DEVELOPMENT OPTION 2: RESIDENTIAL & LIGHT INDUSTRY DEVELOPMENT

Residential

Commercial / Light Industry

FIGURE 10

All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.

NORTH

0 0.25 0.5 0.75 1km

SCALE 1:25,000 (A4)

DEVELOPMENT OPTIONS
WATTLE GROVE SOUTH

BURGESS DESIGN GROUP
TOWN PLANNING + URBAN DESIGN
Level 1, 369 Newcastle Street Northbridge Perth Business Centre 6849
www.burgessdesigngroup.com.au
P (08) 9328 6411
F (08) 9328 4062

Date: 24.05.18
Plan No: KAL WAT 7-02c-12

Client: City of Kalamunda

6.4 DEVELOPMENT POTENTIAL

Option 1: Residential Development

The development potential of the subject land is calculated based on the following assumptions:

- Total land area (excludes existing roads): 292ha
- 10% POS + 2.5% drainage: 36.5ha
- 25% roads: 73ha
- Total developable area: 182.5ha

Estimated Population

- @15 lots per ha and 2.6 persons per dwelling: 2,737.5 lots = 7,117.5 persons
- @20 households per hectare and 2.6 person per dwelling: 3,650 lots = 9,490 persons
- @450m^2 lots (developable area) and 2.6 persons per dwelling = 4,055.56 lots = 10,544.4 persons

The total projected dwellings and population projections above are based on the assumption that the whole area will be residential. It does not exclude land required for a future commercial uses (neighbourhood centres), community facilities, or any schools (at least 1 primary school site will be required). It also assumes only 10% public open space. More land for recreation and conservation may be required pending further environmental analysis.

Primary and High Schools

Burgess Design Group met with the Department of Education in 2015 to discuss the future urban development of Wattle Grove South area. The Department advised that:

- Primary school sites are provided based on the standard requirement of one site per 1,500-1,800 dwellings for government schools (thus likely two schools required)
- The future school sites would ideally centrally located to each catchment (potentially one north and one south of Crystal Brook Road
- No high school site is required due to the study areas proximity to Darling Range College

Option 2: Residential and Industrial Development

- Total land area (excludes existing roads): 292ha

Residential Development (generally north of Crystal Brook Road)

- Total residential area: 156ha
- 10% POS + 2.5% drainage: 19.5ha
- 25% roads: 39ha
- Total developable area: 97.5ha

Estimated Population

- @15 lots per ha and 2.6 persons per dwelling: 1,462.5 lots = 3,802.5 persons
- @20 households per hectare and 2.6 person per dwelling: 1,950 lots = 5,070 persons
- @450m^2 lots (developable area) and 2.6 persons per dwelling = 2,166.67 lots = 4,333.33 persons

Industrial Development (generally south of Crystal Brook Road)

- Industrial area: 136ha

7. STATUTORY PROCESS RECOMMENDATIONS

7.1 PREPARATION OF CONCURRENT MRS/LPS3 AMENDMENTS

Scenario 1: Urban Development Zone

Prepare two (2) separate MRS amendments, one (1) for the residential area generally north of Crystal Brook Road and one (1) for the commercial/light industrial area south of Crystal Brook Road. Both MRS Amendments to the Metropolitan Region Scheme (MRS), will rezone the subject land from the 'Rural' zone to 'Urban' zone with a concurrent amendment to the City of Kalamunda Local Planning Scheme No.3 (LPS3) to rezone the land from 'Special Rural' and 'Rural' to 'Urban Development'.

Section 126 (3) of the Planning and Development Act 2005 allows for the concurrent amendment of a LPS where land is to be transferred to the 'Urban' zone in the MRS.

These amendments will facilitate the ultimate development of the Study Area for residential and/or light industrial uses following subsequent detailed structure planning and development approval.

Separate MRS amendment requests are proposed given the feedback received from the DPLH that the 'medium-long term (2022+)' timeframe for residential development will likely delay the initiation, advertising and consideration of the MRS amendment. It is expected that separate amendment processes will ensure that the commercial/light industrial area is not unduly delayed by the 'medium-long term (2022+)' residential timeframe.

Scenario 2: Urban and Industrial Development Zones

Prepare two (2) separate MRS amendments, one (1) for the residential area generally north of Crystal Brook Road and one (1) for the commercial/light industrial area south of Crystal Brook Road.

The first MRS Amendment will seek to rezone the a portion of the study area from the 'Rural' zone to 'Urban' zone, and a concurrent amendment and land generally south of Crystal Brook Road to 'Industrial Development'.

The second Metropolitan Region Scheme (MRS) amendment will seek to rezone the a portion of the study area from the 'Rural' zone to 'Urban' zone, and request a concurrent amendment to the City of Kalamunda Local Planning Scheme No.3 (LPS3) to rezone land generally north of Crystal Brook Road from 'Special Rural' and 'Rural' to 'Urban Development',

Under LPS3 separate development zones are proposed to give the WAPC and the City increased certainty that the land generally south of Crystal Brook Road (refer to Figure 10) will be developed for light industrial/commercial uses, as recommended. The 'Industrial Development' zone will provide for orderly and proper planning through the preparation and adoption of a Structure Plan, and allow the City to consider uses in accordance with LPS3 zoning table in the interim. The ultimate preparation of a structure plan and creation of a new zone (through a local planning scheme amendment process) for this area will ensure that heavy industrial uses are not permitted.

The 'Urban Development' zone will require the preparation and adoption of a Structure Plan over the proposed residential area (refer to Figure 10). This Structure Plan will facilitate the ultimate subdivision and/or development of land for residential purposes and for commercial and other uses normally associated with residential development.

7.2 TECHNICAL REPORTS/STUDIES

The following reports/studies will be required to support the rezoning of the site to 'Urban' under the MRS and to 'Urban Development' under the LPS3. They will also support the preparation of the Strategic District Structure Plan.

- Environmental Assessment (including Spring Flora and Fauna Survey)
- District or local water management strategy (monitoring for two (2) winters)
- Bushfire hazard assessment and management plans
- Civil Engineering
- Traffic Engineering
- Acoustic Assessment
- Economic/Retail Strategy

7.2.1 Environmental Assessment

A spring Flora and Fauna Survey is required to support the concurrent MRS/LPS amendment and subsequent District Structure Plan (DSP). The purpose of the Flora and Fauna Survey is to identify major vegetation, flora and fauna constraints within the Study Area to inform the DSP. The commencement of this scope of works is imperative to progress development. To meet EPA requirements surveys and assessments need to be undertaken during spring (September – November).

7.2.2 District or Local Water Management Strategy

A District Water Management Strategy (DWMS) is required to support a concurrent MRS/LPS amendment and subsequent District Structure Plan (DSP). The purpose of the DWMS is to demonstrate that the site is suitable for the change in land use and identify areas that require further investigations as part of future land use planning and/or development. To meet the Department of Water and Environment Regulation standard requirements for two (2) winters of pre-development monitoring the appointment of a sub-consultant to undertake this work is critical to progress future development.

7.2.3 Bushfire Hazard Level Assessment and Management Plan

A Bushfire Hazard Level Assessment and Management Plan will be required in accordance with State Planning Policy 3.7 - Planning in Bushfire Prone Areas (SPP 3.7). A Bushfire Hazard Level Assessment will determine if the site has a low, moderate or extreme bushfire hazard level. If the site contains a moderate or extreme hazard level a Bushfire Management Plan will be required. The BMP will need to address how the hazard level will be initially reduced and subsequently maintained for the life of the development.

7.2.4 Economic/Retail Analysis

There are limited retail/bulky goods uses within the City of Kalamunda. To determine the optimal size of the future commercial/light industrial area an economic or retail analysis may be required and is recommended.

7.3 LSP3 AMENDMENTS

A Scheme Amendment will need to be prepared to designate the land on the scheme map as a 'Development Contribution Area' and include the area in Schedule 12 – Development Contribution Areas.

A separate Scheme Amendment will be required create a new Service Commercial/Light Industry zone (the exact name and details are still to be determined). This Amendment will need to be prepared concurrently with the Local Structure Plan given that a Structure Plan must be consistent with the Local Planning Scheme zones.

7.4 DISTRICT STRUCTURE PLAN

We recommend the City of Kalamunda prepares a Strategic District Structure Plan (defined under the 'Guidelines') to support the MRS amendments. This District Structure Plan (DSP) will need to address any 'fatal flaws' of a potential development area and provide for the major structural elements, including major roads, open space networks, commercial and industrial areas, and environmental conditions. Additionally, the District Structure Plan will address timing of development, specifically in relation to the area for residential and related uses.

7.5 LOCAL STRUCTURE PLANS

Preparation and adoption of two (2) separate Structure Plans, one (1) for land generally north of Crystal Brook Road, and one (1) for the land generally south of Crystal Brook Road under LPS3 is required. The preparation of two separate structure plans is recommended given the 'medium-long term (2022+)' timeframe under the Sub-regional Planning Framework for residential development within Wattle Grove South. It is recommended that the preparation of Structure Plans be undertaken by proponents. As such, no allowance in the City of Kalamunda's budget is required for these elements.

7.5.1 Effect of a Structure Plan

It should be noted that a Structure Plan is a non-statutory document. The Planning and Development (Local Planning Schemes) Regulations 2015 Schedule 2, Part 4 Cl. 27 (1) states: *'A decision-maker for an application for development approval or subdivision approval in an area that is covered by a structure plan that has been approved by the Commission is to have due regard to, but is not bound by, the structure plan when deciding the application.'*

7.6 STATE AND LOCAL LAND RESUMPTION REQUIREMENTS PRE-ZONING

It is considered highly unlikely that there will be any state and/or local land resumption requirements pre-zoning. Any land resumptions required for development will be either included in the Development Contribution Plan, or be part of a separate acquisition process (e.g. high schools site, primary school sites etc.).

7.7 DEVELOPER CONTRIBUTIONS ARRANGEMENTS

A Development Contribution Plan will need to be prepared in accordance with the provisions of *State Planning Policy 3.6 Development Contributions for Infrastructure* and the provisions of clause 6 of LPS3.

This will need to be prepared at the Local Structure Plan phase of the project in consultation with the proponent of the Structure Plan.

It is recommended that the City commence preliminary analysis of the elements associated with a DCP for Wattle Grove South to continue to inform the planning approval process.

7.8 BUDGET

The following budget has been prepared to provide preliminary guidance to the City for the next phases of the planning process. It is an estimate only for budgeting purposes.

TECHNICAL REPORTS/STUDIES	COST ESTIMATES
– Planning report for concurrent MRS/LPS amendments and technical team coordination – Preparation of a Strategic District Structure Plan (DSP)	$60,000.00
District Water Management Strategy (DWMS)	$45,000.00
Water monitoring	$50,000.00
Environmental Assessment Report	$50,000.00
Bushfire Management Plan	$20,000.00
Civil Engineering Services	$25,000.00
TIA And Transport / Traffic Modelling	$35,000.00
Acoustic Consultants (Noise Modelling)	$15,000.00
TOTAL	**$300,000.00**

8. CONCLUSION

The Western Australian Planning Commission's (WAPC) North-East Sub-Regional Planning Framework identified Wattle Grove South as an area to be investigated for the purposes of future urban development. The draft Framework identified approximately 196ha of land for 'Urban Expansion'. The final adopted Framework includes an expanded development area, with land shown as both 'Urban Expansion' and 'Urban Investigation' totalling approximately 287ha.

The purpose of this Planning Feasibility Study was to determine the optimum location, size, opportunities, constraints and risks involved in progressing the rezoning and planning of the Wattle Grove South area for the purposes of urban development.

The Study was undertaken by Burgess Design Group, in collaboration with specialist consultants 360 Environmental and KCTT (civil and traffic engineering).

8.1 SCOPE OF WORKS

The Study has addressed the following agreed Scope of Works:

1. Phase 1 – Introduction and Purpose

    - Determine the optimum boundary, size and location of a future development area
    - Identify major elements for consideration to guide future urban development

2. Phase 2 – Regional Contextual Analysis and Map

    - Analyse the planning framework
    - Land supply and demand
    - Major access points, including the proximity of Tonkin Highway (Primary Regional Road) and Welshpool Road East (Other Regional Road)
    - Existing land uses in vicinity of the proposed development area
    - Environmental factors and constraints
    - Land assembly matters and those related to fragmented land ownership

3. Phase 3 – Local Contextual Analysis and Map

    - Population and employment self-sufficiency
    - City/civic requirements
    - Local Planning Strategy context

4. Phase 4 – Site Analysis and Map

    - Identify the opportunities / constraints presented by future development and propose investigations / recommendations in the following key areas:

        - Environmental
        - Hydrological
        - Servicing and Infrastructure (particular focus on deep sewer)
        - Forrestfield > Thornlie rail extension and station at Wattle Grove
        - Indicative Land Use / Retail Demand

5. Phase 5 – Statutory Process Recommendations

   - MRS rezoning
   - Land resumption requirements
   - LSP3 rezoning
   - District Structure Plan/Local Structure Plan
   - Developer contribution arrangements

8.2 OUTCOMES

8.2.1 Study Area

Phase One of this Study was focussed on determining a suitable location 'area' and 'size' for potential future development within Wattle Grove South. The results of the initial analysis recommended that the area shown in the WAPC draft Framework should be expanded to include additional land to the north and east, generally bound by Welshpool Road.

This recommendation was presented to the City's planning officers and then jointly to the planning officers of the Department of Planning, Lands & Heritage. Ultimately, the final adopted WAPC Framework includes the larger extended area for future development, with 287ha of land identified. This is generally consistent with our recommended Study Area boundary.

8.2.2 Regional Context

The subject land is ideally located for future urban development, given its proximity to:

- Perth CBD
- Airports
- Forrestfield marshalling yards
- Major highway and freight routes
- Existing employment centres
- Recreational areas (both active and passive)
- Retail and commercial areas

The land is also relatively flat and unconstrained for development purposes.

The Site Analysis Map included herewith at Figure 9 illustrates the high connectivity of the site, surrounding land uses and the primary environmental factors.

The investigations also note that the Study Area is characterised by fragmented land ownership. Coordination of landowners will be an important element of the planning and development process. Burgess Design Group specialises in landowner coordination and can assist with this element as required.

8.2.3 Opportunities and Constraints

The Study provides an overview of the area's opportunities and constraints from planning, engineering and environmental perspectives and has determined that the Wattle Grove South area is ideally suited for urban development purposes.

One of the constraints identified in the analysis was the anticipated timing of development included in the WAPC Frameworks. This potentially puts development of the area around 2030 or beyond (2022+ in the document, with Department officers suggesting this could mean 2030+).

The increase in size of the Study Area, combined with the location of the site and the need for additional employment land has created an opportunity to incorporate a non-residential component within the development footprint.

The Study recommends the area generally south of Crystal Brook Road be utilised for 'industrial development' purposes, which could include bulky goods/showrooms and mixed business uses. The high level of exposure to Tonkin Highway, the site's landform and the availability of services support this potential land use. Such uses also represent an appropriate interface to the highway.

The creation of such an employment activity area, particularly given the loss of such land in Forrestfield North, represents a significant opportunity for Wattle Grove South.

This land use opportunity may also address the timing constraint raised by the WAPC. The industrial land could be developed in the short term, then supporting the future residential development of the remainder of the Study Area, north of Crystal Brook Road.

This Study also provides technical input to inform any discussion with the WAPC on the 'Urban Investigation' area. The WAPC specifically advised that the technical analysis of 'Urban Investigation' land was to be undertaken by the Department, or potentially a local government, but could not be 'proponent' (or developer) driven. Given this Study has been prepared for the City, it should form part of any such investigation process.

8.3 RECOMMENDATIONS

This Study makes the following recommendations.

8.3.1 Study Area

1. Adopt the Study Area boundary shown in the final WAPC Frameworks

8.3.2 Land Uses

2. Land proposed for industrial development generally south of Crystal Brook Road

3. Land proposed for residential development generally north of Crystal Brook Road

8.3.3 Zoning

4. Propose an amendment to the MRS to rezone the area south of Crystal Brook Road to 'Urban', and concurrently rezone this area to 'Industrial Development' zone under Local Planning Scheme No.3.

5. Propose an amendment to the MRS to rezone the area north of Crystal Brook Road to 'Urban', and concurrently rezone this area to 'Urban Development' zone under Local Planning Scheme No.3.

Two separate amendments are recommended, as it is possible the development of the industrial land may be supported earlier than the residential land, given the timing indicated in the WAPC Frameworks and that part of the residential land is shown in the Frameworks as 'Urban Investigation'.

6. Propose an amendment to create a Developer Contribution Area (DCA) under Local Planning Scheme No.3.

8.3.4 District Structure Plan

7. Propose the preparation of a Strategic District Structure Plan (DSP) over the whole Study Area to guide future development. This should be prepared for submission concurrently with the MRS amendment requests, as it will also guide these zoning processes.

The DSP will also provide some clarity on land uses, particularly within the area south of Crystal Brook Road.

8.3.5 Local Structure Plans

8. It is recommended that the preparation of Local Structure Plans be driven/undertaken by existing or prospective landowners/developers. The DSP may include indicative Local Structure Plan boundaries.

8.3.6 Developer Contributions Plan

Future development of the Wattle Grove South area will require a Developer Contributions Plan (DCP) to provide for the equitable provision of services and infrastructure.

9. It is recommended that a DCP be prepared and that consideration of the elements to be included in any DCP be undertaken as part of the District Structure Planning process.

8.4 IMPLEMENTATION

The recommended steps for implementation of the outcomes of this Study are as follows:

1. Council review, assess and adopt this Study (with or without modifications) to guide future planning of the area

2. The Study be presented to the Department of Planning, Lands & Heritage for review and comment

3. Community consultation with landowners within the Study Area be undertaken to discuss the elements raised herein, including the final WAPC Frameworks, extended development area and various land use proposals

4. Preparation of a Strategic District Structure Plan to guide potential rezoning amendments and future development

5. Preparation of two (2) separate amendments to the MRS, with concurrent rezoning of the Local Planning Scheme

6. Preparation of an amendment to the Local Planning Scheme to include the area within a Development Contributions Area

7. Preparation of a Developer Contributions Plan for the Study Area

8. Local Structure Plans to be prepared by proponents (landowners/developers)

This Planning Feasibility Study has successfully addressed the Scope of Works provided by the City of Kalamunda and outlined the Outcomes and Recommendations necessary to implement the broad proposals for the Study Area included within the adopted WAPC Frameworks.

APPENDIX 1:
360 Environmental, Environmental Assessment Report

360 environmental

Various Lots, Wattle Grove

Environmental Assessment Report

Prepared for:

Burgess Design Group

April 2018

people • planet • professional

Document Reference	Revision	Prepared by	Reviewed by	Admin Review	Submitted to Client	
					Copies	Date
2188AB	1 INTERNAL DRAFT	CM	KC	-	1x electronic	12/03/18
2188AB	2 CLIENT DRAFT	CM	-	NL	1x electronic	13/03/18
2188AB	3 CLIENT FINAL	CM	KC	NL	1x electronic	24/04/18

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1 Introduction

1.1 Background

360 Environmental Pty Ltd was commissioned by Burgess Design Group Pty Ltd on behalf of the City of Kalamunda to prepare an environmental assessment report (EAR) for various lots bound by Tonkin Highway, Kelvin Road, Welshpool Road East, Fontano Road, Judith Road and Crystal Brook Road in Wattle Grove ('the site').

The purpose of this EAR is to inform a feasibility study on the future rezoning of the site from 'Rural' to 'Urban' under the Metropolitan Region Scheme (MRS).

The site is approximately 325 ha in size and is located approximately 14.75 km southeast of Perth's Central Business District (CBD). The site is situated within the City of Kalamunda local government area and is zoned 'Special Rural' and 'Rural Composite' under the City's Local Planning Scheme No. 3 (LPS 3).

1.2 Environmental Assessment Objectives

This Environmental Assessment Report (EAR) provides an overview of the general environmental features of the Site and includes an overview of the Site's remaining biological and social environment including wetlands, Aboriginal and non-Aboriginal Heritage sites, regional soil types, hydrology, geomorphology, flora, vegetation and fauna, planning context and social environment as determined through a review of existing information.

1.3 Scope of Works

The scope of works for this study is as follows:

- Literature review of relevant environmental and planning documents;
- Desktop review of geology, regional surface hydrology and groundwater information using databases and digital mapping information;
- Preliminary acid sulfate soils (ASS) assessment, including review of ASS risk mapping and local soil types;
- Desktop site assessment of contamination and review of historical and current land uses;
- Detailed desktop assessment of flora, vegetation, fauna from searches of the Department of Biodiversity, Conservation and Attractions' (DBCAs) Threatened and Priority searches, NatureMap and the Commonwealth's Protected Matters Search Tool;
- Review of mapped conservation areas;

- Desktop heritage (Aboriginal and non-Aboriginal) assessment;
- Identification of other environmental issues associated with proposed rezoning; and
- Formulation of a report detailing the above.

2 Key Environmental Legislation and Policies

2.1 Commonwealth Legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the central piece of environmental legislation which protects Matters of National Environmental Significant (MNES) and broadly, to conserve Australia's biodiversity. If a proposed action is likely to have a significant impact on any MNES, a referral to the Commonwealth Department of the Environment and Energy (DEE) is required.

2.2 State Legislation

2.2.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) is the key legislative tool for environmental protection in Western Australia. It is administered by the Environmental Protection Authority (EPA) and the Minister for Environment. Under Part IV of the EP Act, the EPA undertakes environmental impact assessment of proposals and schemes to provide advice on environmental acceptability of developments. The environment impact assessment process provides an orderly and systematic evaluation of a proposal and its potential impact on the environment. A critical component of the assessment is the consideration of ways in which the implemented proposal could avoid or reduce any potential impact on the environment.

2.2.2 Relevant Legislation and Regulations

All future rezoning and development will be required to comply with the requirements of other relevant state legislation and regulations. Table 1 provides a summary of the key state legislation and regulations relevant to the proposed residential development.

Table 1. Key State Legislation

Key Legislation	Responsible Government Agency	Aspect
Aboriginal Heritage Act 1972	Department of Planning, Lands and Heritage	Archaeological and ethnographic heritage
Aboriginal Heritage Regulations 1974	Department of Planning, Lands and Heritage	Archaeological and ethnographic heritage

KEY LEGISLATION	RESPONSIBLE GOVERNMENT AGENCY	ASPECT
Agricultural and Related Resources Protection Act 1976	Department of Primary Industries and Regional Development	Weeds and feral animals
Biosecurity and Agriculture Management Act 2007	Department of Primary Industries and Regional Development	Weeds / pests / diseases
Bush Fires Act 1954	Department of Fires and Emergency Services	Bush fire control
Conservation and Land Management Act 1984	Department of Biodiversity Conservation and Attractions Department of Agriculture	Flora and fauna / habitat / weeds / pests / diseases
Conservation and Land Management Regulations 2002	Department of Biodiversity Conservation and Attractions Department of Agriculture	Flora and fauna / habitat / weeds / pests / diseases
Contaminated Sites Act 2003	Department of Water and Environmental Regulation	Management of contaminated soils and water
Environmental Protection Act 1986	Environmental Protection Authority Department of Water and Environmental Regulation	Part IV – Environmental Impact Assessment Part V – Works Approvals and Licences
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Department of Water and Environmental Regulation	Clearing of native vegetation
Planning and Development Act 2005	Department of Planning, Lands and Heritage	Structure planning and subdivision approval
Rights in Water and Irrigation Act 1914	Department of Water and Environmental Regulation	Governs management of the use, service and health of water and watercourses (including beds and banks). Water licensing is required in all proclaimed areas and for all artesian groundwater wells throughout the state.

KEY LEGISLATION	RESPONSIBLE GOVERNMENT AGENCY	ASPECT
Wildlife Conservation Act 1950	Department of Biodiversity Conservation and Attractions	Wildlife conservation and protection

2.2.3 Relevant Standards, Guidelines and Policies

Future development is subject to compliance with applicable standards, guidelines and policies developed by the State's regulators to assist proponents in understanding the minimum requirements for environmental protection. The following table details the key standards, guidelines and State Planning Policies relevant to future residential development of the site (Table 2).

Table 2. Relevant Standards, Guidelines and Policies

DOCUMENT	DESCRIPTION
EPA Policies and Guidance	
Statement of Environmental Principles, Factors and Objectives (EPA 2016a)	This statement communicates the EPA considers the object and principles of the EP Act, uses environmental factors and objectives to organise and systemise environmental impact assessment, taking a holistic view of the environment and considering significance of a proposal.
Environmental Factor Guideline – Flora and Vegetation (EPA 2016b)	Provides guidance to protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Environmental Factor Guideline – Terrestrial Environmental Quality (EPA 2016c)	Provides guidance with the objective to maintain the quality of land and soils so that environmental values are protected.
Environmental Factor Guideline – Terrestrial Fauna (EPA 2016d)	Provides guidance with the objective to protect terrestrial fauna so that biological diversity and ecological integrity at maintained.
Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016e)	Provides technical guidance to ensure adequate flora and vegetation data of an appropriate standard are obtained and used in environmental impact assessment.
Technical Guidance – Terrestrial Fauna Surveys (EPA 2004)	Provides technical on the direction and information on general standards and protocols for terrestrial fauna surveys for environmental impact assessment.
Guidance Statement No. 3: *Separation Distances between Industrial and Sensitive Land Uses* (EPA 2005)	Provides guidance on the generic separation (buffer) distances between Industrial and Sensitive land uses to avoid conflicts between these land uses.
Guidance Statement No. 6: *Rehabilitation of Terrestrial Ecosystems* (EPA 2006)	Provides guidance to ensure the return of biodiversity in rehabilitated areas by increasing the quality, uniformity, and efficiency of standards and processes for rehabilitation of native vegetation in Western Australia and to allow more effective monitoring and auditing of outcomes.
Guidance Statement No. 33: *Environmental Guidance for Planning and Development* (EPA	Provides information and advice to assist land use planning and development processes to protect, conserve and enhance the environment.

DOCUMENT	DESCRIPTION
2008)	Describes the processes the EPA may apply under the EP Act to land use planning and development in Western Australia, and the environmental impact assessment process applied by the EPA to schemes.
Guidance Statement No. 41: *Aboriginal Heritage Assessment* (EPA 2004b)	Provides guidance on the EPA's position on the assessment of Aboriginal heritage and information that the EPA will consider when assessing proposals where Aboriginal heritage is a relevant environmental factor.
Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004d)	Provides guidance and information on the EPA's expected standards and protocols for terrestrial flora and vegetation surveys to environmental consultants and proponents.
WA Environmental Offsets Policy (EPA 2011)	Seeks to protect and conserve environmental and biodiversity values for present and future generations. The policy ensures that economic and social development may occur while supporting long term environmental and conservation values.
EPA Bulletins	
Environmental Protection Bulletin No. 1: *Environmental Offsets* (EPA 2014b)	Clarifies how the EPA will consider offsets through the environmental impact assessment process.
State Planning Policies	
State Planning Policy 2.8: *Bushland Policy for the Perth Metropolitan Region* (WAPC 2010)	Provide policy and implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision making. Ensure the long-term protection of biodiversity and associated environmental values.
State Planning Policy 2.9: *Water Resources* (WAPC 2006)	Provides clarification and additional guidance to planning decision-makers for consideration of water resources identified as having significant economic, social, cultural or environmental values.
State Planning Policy 3.7: *Planning in Bushfire Prone Areas* (WAPC 2015)	Provides guidance on the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and

DOCUMENT	DESCRIPTION
	infrastructure.
Road and Rail Transport Noise and Freight Considerations in Land Use Planning (WAPC 2009)	Provides guidance to promote a system in which sustainable land use and transport are mutually compatible.
Department of Water and Environmental Regulation (DWER) Guidelines	
Assessment and management of contaminated sites Guideline (DER 2014)	Provides guidance on the assessment and management of contaminated sites in Western Australian within legislative framework of the Contaminated Sites Act 2003 and the Contaminated Sites Regulations 2006.
Identification and investigation of acid sulfate soils and acidic landscapes (DER 2013)	Provides guidance to assist with the identification, assessment and management of acid sulfate soils in Western Australia.

3 Planning Context

3.1.1 Shire of Kalamunda Local Planning Scheme No. 3

Under the City of Kalamunda's LPS 3, the site is zoned 'Special Rural' or 'Rural Composite'.

3.1.2 Draft Perth and Peel @3.5 Million Sub-regional Planning Framework

The draft Perth and Peel @ 3.5 million suite of strategic land use planning documents aim to accommodate 3.5 million people by the year 2050. The WAPC identified part of the Site as 'Urban Expansion' in the draft Metropolitan Perth and Peel Sub-regional Planning Framework (WAPC 2015).

3.1.3 Draft Perth and Peel Green Growth Plan for 3.5 million

In response to the draft Perth and Peel Sub-Regional Frameworks, the draft Perth and Peel Green Growth Plan for 3.5 million (draft GGP) has been prepared. The draft Green Growth Plan proposes to secure upfront Commonwealth environmental approvals and streamline State environmental approvals for development required to support growth to 3.5 million people. The Plan also aims to provide protection of bushland, rivers, wildlife and wetlands through implementation of a strategic conservation plan (DPC 2016).

The site has been identified under the draft GGP as having areas identified within the:

- Urban class of action area; or
- Rural Residential class of action area; or
- Area not within the Urban, Industrial or Rural Residential classes of action (DCP 2016).

The site has also been identified as having areas mapped as Broad and Specific Commitments and Values under the draft GGP (DCP 2016).

The draft Broad Commitments and Values relate to seeking an overall conservation outcome where further work is needed to determine when intervention is required to reach an outcome. Draft Broad Commitments and Values include the following environmental aspects (DoP 2017):

- Threatened fauna habitat;
- Vegetation complexes of more than 10 % and less than 30 % remaining;
- Negotiated planning solution and rural complementary Bush Forever areas with three classes of action mapped;

- Resource Enhancement Wetlands with remnant vegetation and a 50 m buffer; and
- Conservation Category Wetlands 50 m buffer.

The draft Specific commitments relate to draft commitments for protecting a specific occurrence of an environmental value, including (DPC 2016):

- Threatened flora;
- Threatened Ecological Communities;
- Conservation Category Wetlands;
- Vegetation complexes with less than 10 % remaining;
- Bush Forever areas within three classes of action mapped (excluding those within the 'rural complementary' or 'negotiated planning solution' categories); and
- Short-tongued Bee *(Leioproctus douglasiellus*) distribution.

Some areas within the site have known existing approvals where the draft commitments do not apply (while such approvals remain valid). These approvals include Part IV or V Division 2 of the *Environmental Protection Act 1986* or under subdivision approval; or for matters of national environmental significance under Part 9 of the EPBC Act.

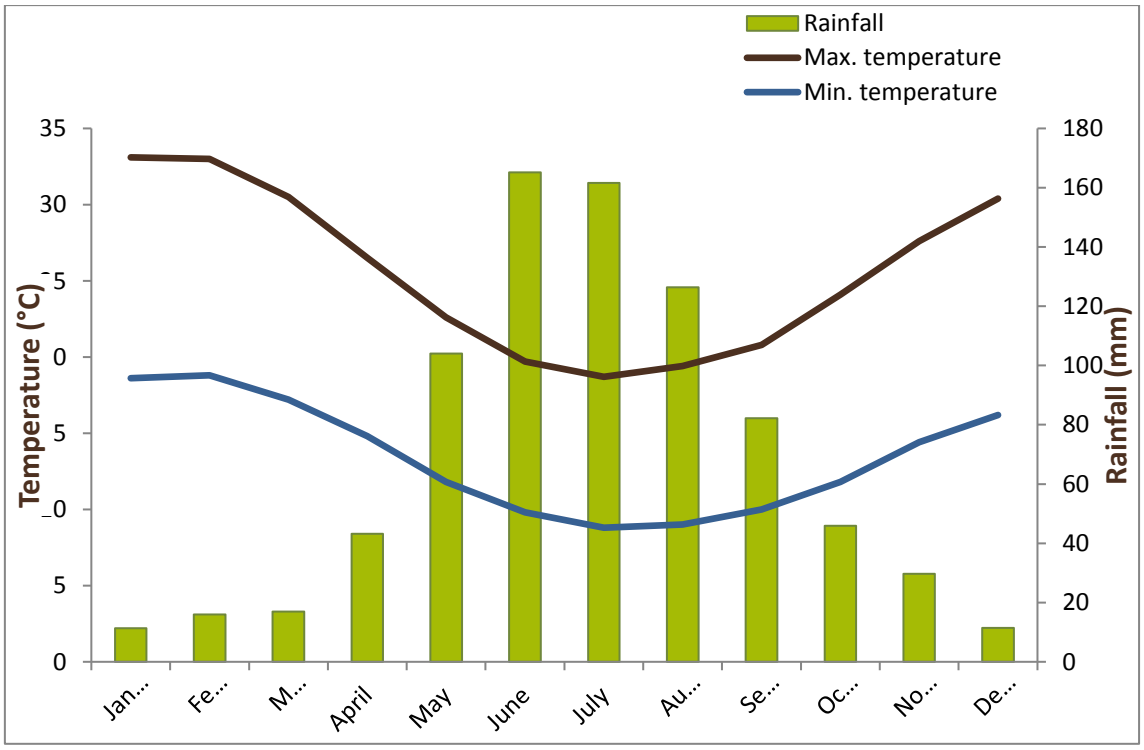
3.1.4 City of Kalamunda Local Biodiversity Strategy

The City of Kalamunda's Local Biodiversity Strategy has been developed in anticipation of future urban development encroaching into natural assets. The Strategy aims to strategically plan natural area protection to ensure biodiversity conservation is incorporated into decision making processes. The Strategy focusses on protection of natural areas containing endemic species or ecological communities that are described as having high biodiversity values (Local Natural Areas (LNAs)). LNAs are natural areas outside of management by the DBCA and Bush Forever Sites, where Local Government Authorities can exercise the most control. The site does not contain any LNAs (Shire of Kalamunda 2008).

4 Site Environmental Features

4.1 Climate

The Site is within a warm Mediterranean climate with warm summers and cool winters. Weather data was collected between 1961 and 2017 from the Gosnells City Station (#009106) located approximately 5.7 km southeast from the Site. The annual mean maximum temperature is 25.5 °C and the annual mean minimum temperature is 13.4 °C. The annual mean rainfall was recorded at 820.3 mm (BoM 2017) (Graph 1).



Graph 1: Climate Statistics for 1961 and 2017 Gosnells City Station (BoM 2017)

4.2 Topography

The elevation across the site ranges from 21 m Australian Height Datum (AHD) to 79 m AHD, falling from the east to the west (Figure 2) (DoW 2010).

4.3 Regional Geology and Soils

Surface geology profile mapping at 1: 250 000 indicates the geology of the Site is typically basal conglomerate overlain by dune quartz with heavy mineral concentrations associated with the Kwinana Group and the Yoganup Formation, and alluvial sand and clay with shallow-marine and estuarine lenses and local basal conglomerate associated with the Guildford formation (GSWA 2008):

Soil Landscapes and Land Systems mapping has identified the Site is within the following land systems (DAFWA 2012):

- **Pinjarra System:** Poorly drained coastal plain with variable alluvial and Aeolian sands; and
- **Forrestfield System:** Duplex sandy gravels, pale deep sands and grey deep sandy duplexes.

The (then) Department of Agriculture and Food (DAFWA) Soil Subsystems mapping indicates the Site is within the following soil subsystems (DAFWA 2008):

- Pinjarra Gf3 Phase: Level to very gently sloping plain. Poorly drained mottled yellow earths with loamy topsoil;
- Pinjarra Gf6 Phase: Seasonally inundated swamps with very poorly drained uniform non-cracking clays;
- Pinjarra Gf7 Phase: Minor rises with deep rapidly drained brownish, siliceous or bleached sands underlain by mottled yellow clay;
- Forrestfield (D Range) F1 Phase: Foot and low slopes (<10%) with deep rapidly drained siliceous yellow brown sands, and pale or bleached sands with yellow-brown subsoil;
- Forrestfield (D Range) F2 Phase: Well drained foot and low slopes. Gravelly yellow or brown duplex soils with sandy topsoil;
- Forrestfield F4 Phase: Incised stream channels within gentle slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths; and
- Forrestfield (D Range) F8 Phase: Slopes 3-15%. Moderately well drained gravelly duplex soils with sandy loam to loam topsoil.

4.4 Hydrogeology

4.4.1 Groundwater

Data from the Perth Groundwater Map indicates the groundwater table ranges between 12 m Australian Height Datum (AHD) and 17 m AHD. Groundwater flows from east to west (DWER 2017a).

The Site is not within a Public Drinking Water Source Area (DWER 2017a).

4.4.2 Surface Water

Yule Brook, a major tributary, exists 55 m to the north of the site, separated by Welshpool Road East (Figure 4) (DoW 2012a).

An un-named minor non-perennial watercourse traverses the northern portion of the site connecting to Yule Brook in the northeast. In addition, another minor perennial

watercourse traverses along the boundary in the south-western corner of the site (DoW 2012a)

The site also contains three constructed earth dams and two perennial lakes. A constructed minor drain extends south of Crystal Brook Road to a constructed dam (Figure 4) (DoW 2012a).

The site is not within a mapped 100 Year ARI Floodplain Area (DoW 2015).

4.4.3 Wetlands

A wetland is defined in Schedule 5 of the *Environmental Protection Act 1986* as a 'an area of seasonally, intermittently or permanently waterlogged or inundated land, whether natural or otherwise, and includes a lake, swamp, marsh, spring, dampland, tidal flat or estuary' (Hill *et al.* 1996).

Desktop mapping has identified that small portions along the western boundary of the Site (along Tonkin Highway) are mapped as Conservation Category (CCW) and Resource Enhancement wetlands (Figure 4) (DPaW 2017).

Wetland categories and their management objectives are described within Table 3 below:

Table 3. Wetland Categories and Management Objectives (WAPC 2005)

CATEGORY	CATEGORY DESCRIPTION	MANAGEMENT OBJECTIVES
Conservation Category	High conservation and ecological value	To preserve the wetlands (natural) attributes and functions
Resource Enhancement	Moderate natural and human use attributes that can be restored or enhanced	To restore wetlands through maintenance and enhancement of wetland functions and attributes
Multiple Use	Little remaining important wetland attributes, functions and ecological value	To use, develop and manage wetlands in the context of water, town and environmental planning

4.5 Contamination

4.5.1 Acid Sulfate Soils

Desktop mapping has identified the entire Site as having 'Moderate to Low' risk of acid sulfate soils (ASS) risk within 3 m of natural soil surface and 'High to Moderate' risk beyond 3 m (DER 2014) (Figure 5).

4.5.2 Contaminated Sites

Under the *Contaminated Sites Act 2003*, contaminated sites must be reported to the DWER, investigated and, if necessary, remediated.

Review of DWER's Contaminated Sites Database has identified there are no registered contaminated sites within the Site, however, there are four contaminated sites within a 1 km radius (DWER 2017b) (Table 4) (Figure 5):

Table 4. Contaminated Sites Within the Vicinity of the Site (DWER 2017b)

Lot	Nature and Extent of Contamination	Status	Distance from site (km)
Lot 804 on Plan 59983, Kenwick	Fragments of asbestos containing material (ACM) are present within the soils at the Site	Contaminated – Restricted Us	0.41
Lot 9005 on Plan 40777, Maddington	Landfill gases have been identified along the eastern boundary and the southwest corner of the Site. Hydrocarbon-impacted groundwater was identified across the majority of the Site. Asbestos impacted fill was identified beneath the landfill capping layer across a majority of the Site.	Contaminated – Restricted Use	1.61
Lot 7, Former Caltex Service Station, Welshpool Rd, Wattle Grove.	Surface and subsurface soils are impacted with hydrocarbons. Groundwater beneath the Source and Affected Sites is impacted with hydrocarbons.	Contaminated – remediation required	0.90
Lot 566 Orchard Road, Maddington	Hydrocarbons (such as from petrel or diesel) are present in groundwater beneath the south-western portion of the Site.	Remediated for Restricted Use	1.40

4.6 Reserves and Conservation Areas

Desktop mapping has identified that the Site is not within any conservation areas. However, there are a number of conservation areas abutting the site and within a 2 km radius (Figure 6). Five Bush Forever sites (ID: 50, 51, 53, 320 and 387) exist within 2 km of the site to the north, south and west (DoP 2014).

Several lots outside of the site boundary have been identified as DBCA Managed Lands that are managed and vested under the Conservation and Land Management Act 1984 (CALM Act) (DPaW 2016) (Figure 6).

4.6.1 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are identified and protected under the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*. Under the Notice, it is an offence to kill or destroy vegetation within an ESA without a Native Vegetation Clearing Permit (NVCP).

A number of Environmentally Sensitive Areas (ESAs) impinge the site (Figure 6) (DER 2014b). DWER's online Clearing Permit System has identified that the ESAs across the Site refer to the presence of the following; Declared Rare Flora (DRF) or a Threatened Ecological Community (DWER 2017c).

Cross referencing data obtained from DBCA's Threatened and Priority Flora database and the TEC/PEC database search, these ESA's refer to the location of the following two DRF and the area of vegetation within 50 m of the DRF location:

- Wavy Smoke-bush (*Conospermum undulatum*); and
- Summer Honeypot (*Banksia mimica*).

4.7 Flora and Vegetation

4.7.1 Bioregion

The Site is located within the Swan Coastal Plain and the Jarrah Forest bioregions of the Interim Biogeographic Regionalisation of Australia (IBRA).

The Swan Coastal Plain Perth subregion (SWA02) is a low lying coastal plain composed of colluvial and Aeolian sands, alluvial river flats and coastal limestone rising to duricrusted Mesozoic sediments in the east. Outwash plains are extensive only in the south, while a complex series of seasonal wetlands and swamps extends from north to south. Vegetation comprises heath and/or Tuart woodlands on limestone, Banksia and Jarrah- Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvial soils, *Casuarina obesa* on out-wash plains, and paperbark (*Melaleuca spp*.) in wetland areas (Mitchell *et al.* 2002).

The Northern Jarrah Forest subregion (JF1) incorporates the area east of the Darling Scarp, overlying Archaean granite and metamorphic rocks of an average elevation of 300 m, capped by an extensive lateritic duricrust, dissected by later drainage and broken by occasional granite hills. In the east, the laterite becomes deeply dissected until it compresses isolated remnants. Rainfall is from 1300 mm on the scarp to approximately 700 mm in the east and north. Vegetation comprises Jarrah – Marri forest in the west with Bullich and Blackbutt in the valleys grading to Wandoo and Marri woodlands in the east with Powder bark on breakaways. There are extensive but localised sand sheets

with *Banksia* low woodlands. Heath is found on granite rocks and as a common understorey of forests and woodlands in the north and east. The majority of the diversity in the communities occurs on the lower slopes or near granite soils where there are rapid changes in site conditions (Williams *et al.* 2001).

4.7.2 Broad Vegetation Types

Vegetation mapping of the Swan Coastal Plain subregion of WA was completed on a broad scale (1:250,000) by Beard (1980). These vegetation units were re-assessed by Shepherd et al. (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

The Site is within three vegetation units described below (Shepherd *et al. 2001*) (Figure 7):

- **Pinjarra 3:** Medium forest; Jarrah – Marri;
- **West Darling 4:** Medium woodland; Marri and Wandoo; and
- **Pinjarra 968:** Medium woodland; Jarrah, Marri and Wandoo.

Remnant vegetation statistics of the IBRA region and the above vegetation association is detailed in Table 5.

Table 5. Remnant Vegetation Statistics (Government of Western Australia 2016)

	Pre–European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
IBRA Region Swan Coastal Plain	1,501,221.93	578,432.17	38.53	37.85
IBRA Region Jarrah Forest	4,506,660.26	2,416,018.14	53.61	69.17
State wide				
Beard Veg Assoc No. 3	2,661,405.06	1,806,812.23	67.89	81.22
Beard Veg Assoc No. 4	1,054,279.89	293,367.54	27.83	22.78
Beard Veg Assoc No. 968	296,877.84	95,642.43	32.22	57.30
In IBRA Sub-region SWA02				
Beard Veg Assoc No. 3	16,754.96	2,798.11	16.70	12.66
Beard Veg Assoc No. 4	13,107.83	1,903.81	14.52	13.36

	Pre–European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
Beard Veg Assoc No. 968	136,188.20	8,967.05	6.58	21.83
In IBRA Sub-region JF01				
Beard Veg Assoc No. 3	908,099.69	723,075.06	79.63	83.87
Beard Veg Assoc No. 4	614,200.81	198,940.05	32.39	30.36
Beard Veg Assoc No. 968	72,007.43	53,204.08	73.89	60.30
Local Government Authority – City of Kalamunda				
Beard Veg Assoc No. 3	26,414.55	21,061.60	79.73	89.46
Beard Veg Assoc No. 4	2,882.29	2,046.48	71.00	58.89
Beard Veg Assoc No. 968	663.60	95.65	14.41	1.25

The biodiversity conservation goals are based on the national targets for biodiversity conservation as set out in *The National Objectives and Targets for Biodiversity Conservation 2001 – 2005*, which aim to:

- Prevent clearing of ecological communities with **less than 30%** of the original extent remaining;
- Recover ecological communities with **less than 10%** of the original extent remaining; and
- Protect threatened species and ecological communities.

The State Government acknowledges that 30% representation of the original extent of each vegetation type is regarded as the threshold level below which species loss appears to accelerate exponentially at an ecosystem level, and 10% representation of the original extent of each vegetation type is regarded as the level representing 'endangered' (WAPC 2011). Based on the figures provided above for representation across the State, all vegetation types, except **West Darling 4** are above the 30% target. Within the City of Kalamunda, all vegetation types except **Pinjarra 968** are above the 30% target. However, it is important to note that in comparison, there is a small proportion of **Pinjarra 968** within the City of Kalamunda's boundary.

Vegetation complexes of the Southwest botanical district have been mapped by Heddle *et al*. (1980). Four vegetation complexes exist across the site which relates to the underlying soil profile (Figure 7):

- **Guildford Complex:** Open forest to tall open forest and woodland;
- **Southern River Complex:** Open woodland;
- **Forrestfield Complex:** Open forest and fringing woodland; and
- **Darling Scarp Complex:** Low open woodland to lichens.

4.7.3 Declared, Rare and Priority Flora

Database searches were undertaken to identify the conservation significant flora species occurring or potentially occurring within a 5 km radius of the site. The searches included the DEE's Protected Matters Search Tool (PMST), DBCA's NatureMap database and DBCA's Threatened and Priority Flora database request (DEE 2017; DBCA 2017a; DBCA 2017b).

Review of the database searches identified 75 conservation significant flora species as potentially occurring within the site and a likelihood assessment of the species was undertaken (Table 6) (Figure 8).

Table 6. Likelihood Assessment of Conservation Significant Fauna Species Occurring Within the Site (DEE 2017; DBCA 2017a; b)

TAXON	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE IN SITE
	EPBC	DBCA	
Calectasia cyanea	Critically Endangered	Threatened	Possible
Grevillea thelemanniana subsp. thelemanniana	Critically Endangered	Threatened	Possible
Ptilotus pyramidatus	Critically Endangered	Threatened	Unknown
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	Critically Endangered	Threatened	Likely
Andersonia gracilis	Endangered	Threatened	Possible
Austrostipa bronwenae	Endangered	Threatened	Likely
Banksia mimica	Endangered	Threatened	Unknown
Caladenia huegelii	Endangered	Threatened	Unknown
Calytrix breviseta subsp. breviseta	Endangered	Threatened	Likely
Chamelaucium sp. Gingin	Endangered	Threatened	Possible
Darwinia apiculata	Endangered	Threatened	Possible
Diuris drummondii	Endangered	Threatened	Unknown
Diuris purdiei	Endangered	Threatened	Unknown
Drakaea elastica	Endangered	Threatened	Likely
Eremophila glabra subsp. chlorella	Endangered	Threatened	Likely
Eucaluptus x balanites	Endangered	Threatened	Likely
Grevilea curviloba subsp. incurva	Endangered	Threatened	Likely
Lasiopetalum pterocarpum	Endangered	Threatened	Possible

Taxon	Conservation Status		Likelihood of occurrence in site
	EPBC	DBCA	
Lepidosperma rostratum	Endangered	Threatened	Likely
Macarthuria keigheryi	Endangered	Threatened	Possible
Thelymitra stellata	Endangered	Threatened	Likely
Acacia anomala	Vulnerable	Threatened	Possible
Acacia aphylla	Vulnerable	Threatened	Possible
Conospermum undulatum	Vulnerable	Threatened	Likely
Diuris micrantha	Vulnerable	Threatened	Possible
Drakaea micrantha	Vulnerable	Threatened	Unknown
Eleocharis keigheryi	Vulnerable	Threatened	Possible
Amanita quenda	-	Priority 1	Possible
Calandrinia sp. Piawaning	-	Priority 1	Likely
Schoenus sp. Beaufort (G.J. Keighery 6291)	-	Priority 1	Possible
Thelymitra magnifica	-	Priority 1	Likely
Comesperma griffinii	-	Priority 2	Likely
Comesperma rhadinocarpum	-	Priority 2	Unknown
Isotropis cuneifolia subsp. glabra	-	Priority 2	Possible
Lepyrodia curvescens	-	Priority 2	Possible
Melaleuca viminalis	-	Priority 2	Possible
Schoenus loliaceus	-	Priority 2	Possible
Acacia horridula	-	Priority 3	Likely
Amanita wadjukiorum	-	Priority 3	Likely
Babingtonia urbana	-	Priority 3	Unlikely
Banksia pteridifolia subsp. vernalis	-	Priority 3	Unlikely
Byblis gigantea	-	Priority 3	Unlikely
Chamaescilla gibsonii	-	Priority 3	Possible
Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)	-	Priority 3	Likely
Eryngium sp. Subdecumbens (G.J. Keighery 5390)	-	Priority 3	Likely
Haemodorum loratum	-	Priority 3	Likely
Isopogon drummondii	-	Priority 3	Possible
Lasiopetalum glutinosum subsp. glutinosum	-	Priority 3	Likely
Meionectes tenuifolia	-	Priority 3	Possible
Myriophyllum echinatum	-	Priority 3	Possible
Pithocarpa corymbulosa	-	Priority 3	Possible
Platysace ramosissima	-	Priority 3	Possible

Taxon	Conservation Status		Likelihood of occurrence in site
	EPBC	DBCA	
Schoenus benthamii	-	Priority 3	Possible
Schoenus capillifolius	-	Priority 3	Possible
Schoenus pennisetis	-	Priority 3	Possible
Stylidium aceratum	-	Priority 3	Possible
Stylidium periscelianthum	-	Priority 3	Possible
Styphelia filifolia	-	Priority 3	Unknown
Thysanotus anceps	-	Priority 3	Possible
Acacia oncinophylla subsp. patulifolia	-	Priority 4	Likely
Aponogeton hexatepalus	-	Priority 4	Likely
Boronia tenuis	-	Priority 4	Unlikely
Centrolepis caespitosa	-	Priority 4	Unknown
Cyanicula ixioides subsp. ixioides	-	Priority 4	Unknown
Drosera occidentalis subsp. occidentalis	-	Priority 4	Unknown
Hibbertia montana	-	Priority 4	Possible
Hydrocotyle lemnoides	-	Priority 4	Likely
Lasiopetalum bracteatum	-	Priority 4	Likely
Ornduffia submersa	-	Priority 4	Unknown
Pimelea rara	-	Priority 4	Possible
Schoenus natans	-	Priority 4	Possible
Senecio leucoglossus	-	Priority 4	Possible
Stylidium longitubum	-	Priority 4	Possible
Stylidium striatum	-	Priority 4	Possible
Verticordia lindleyi subsp. lindleyi	-	Priority 4	Likely

24 flora species were considered Likely to occur due to the presence of suitable habitat and close proximity to previous records. 35 species were considered Possible and four considered Unlikely to occur within the site. 12 species had an unknown likelihood of occurrence due to the lack of available data.

Several occurrences of the following five DRF species have been identified as occurring within or close to the boundary of the site based on the DBCA Threatened Priority Flora database search (DBCA 2017a) (Figure 8):

- *Conospermum undulatum;*
- *Isopogon drummondii;*
- *Banksia mimica;*
- *Lasiopetalum glutinosum subsp. glutinosum;* and

- *Thelymitra magnifica*.

Given the above, site specific flora and vegetation surveys will be required to confirm the presence of DRF within the site.

4.7.4 Threatened and Priority Ecological Communities

Desktop searches of the DBCA's Threatened and Priority Ecological Communities dataset identified several TECs or TEC buffers occurring within and surrounding the site. The dataset provided by the DBCA has generic buffers of 200 m or 500 m surrounding the TECs or PECs (DBCA 2017c) (Figure 9):

- Banksia Dominated Woodlands of the Swan Coastal Plain;
- SCP20a - *Banksia attenuata* woodlands over species rich dense shrublands;
- SCP3a -*Eucalypt calophylla – Kingia australis* woodlands on heavy soils, Swan Coastal Plain;
- SCP3b - *Eucalyptus calophylla – eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain;
- Shrublands and woodlands on Muchea Limestone;
- Herb rich shrublands in clay pans;
- SCP10a - Shrublands on dry clay flats; and
- Central Granite Shrublands Community.

Given the above, site specific flora and vegetation surveys will be required to identify the presence of TECs or PECs within the site.

4.7.5 Weeds

A desktop search of the EPBC PMST has identified a total of 19 introduced species that may occur within a 5 km radius of the Site (Table 7) (DEE 2017).

Of these 19 weed species, nine are Declared under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and 15 are listed as Weeds of National Significance (WONS).

Table 7. Introduced Flora Recorded in the Survey Area.

Taxon	(Common Name)	Declared BAM Act	WONS
**Anredera cordifolia*	Madeira Vine	-	Yes
**Asparagus asparagoides*	Bridal Creeper	s22(2) C3	Yes
**Brachiaria mutica*	Para Grass	-	-
**Cenchrus ciliaris*	Buffel-grass	-	-
**Chrysanthemoides monilifera*	Bitou Bush	s12 C2	Yes

TAXON	(COMMON NAME)	DECLARED BAM ACT	WONS
**Chrysanthemoides monilifera subsp. monilifera*	Boneseed	s12 C2	Yes
**Eichhornia crassipes*	Water Hyacinth	s12 C2	Yes
**Genista linifolia*	Flax-leaved Broom	-	Yes
**Genista monspessulana*	Cape Broom	-	Yes
**Genista sp. X Genista monspessulana*	Broom	-	Yes
**Lantana camara*	White Sage	s22(2) C3	Yes
**Lycium ferocissimum*	African Boxthorn	-	Yes
**Olea europaea*	Olive	-	-
**Pinus radiata*	Pine	-	-
**Rubus fruticosus aggregate*	Blackberry	-	Yes
**Sagittaria platyphylla*	Slender Arrowhead	s22(2) C3	Yes
**Salix spp. except S. babylonica, S.x calodendron & S. x reichardtii*	Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow	s12 C1	Yes
**Salvinia molesta*	Giant Salvinia	s12 C1	Yes
**Tamarix aphylla*	Athel Pine	s22(2) C3	Yes

*The (then) Department of Agriculture and Food WA (DAFWA) maintains a list of Declared Plants for Western Australia under the Biosecurity and Agriculture Management Act 2007 (BAM Act). If a plant is declared for the whole of the State or for particular Local Government Areas, all landholders are obliged to comply with the relevant species-specific control measures.

*The DAFWA maintains a list of Declared Plants for Western Australia under the BAM Act. If a plant is declared for the whole of the State or for particular Local Government Areas, all landholders are obliged to comply with the relevant species-specific control measures.

[1]Declared Pest - s22(2)

Declared pests must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia.

Under the BAM Act, all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management).

C1 category (Exclusion) - Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.

C2 category (Eradication) – Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.

C3 category (Management) – Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest (DAFWA 2017).

4.8 Fauna

4.8.1 Threatened and Priority Fauna

Conservation significant fauna potentially occurring within a 5 km radius of the Site were determined through desktop searches using DEE's PMST, DBCA's NatureMap search tool and DBCA's Threatened and Priority Fauna databases.

A number of species returned in the databases were historical records of locally extinct species (e.g. Malleefowl) and these have been omitted from further discussion.

A likelihood assessment was undertaken to determine the likelihood of these species occurring within the Site based on suitable habitat present and the species known distribution based on the following criteria:

The Likelihood of each species is based on the following criteria:

- Recorded: Recorded during the field survey or site reconnaissance;
- Likely: Suitable habitat is present in the Survey Area and the Survey Area is in the species' known distribution;
- Possible: Limited or no suitable habitat is present in Survey Area, but is nearby. The species has good dispersal abilities and is known from the general area; and
- Unlikely: No suitable habitat is present in Survey Area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however, the Survey Area is outside of the species' known distribution.

Table 8. Likelihood Assessment of Conservation Significant Fauna Occurring Within the Site (DEE 2017) (DBCA 2017a;d)

Species	Conservation Status		Likelihood of Occurrence
	DBCA	EPBC	
Australasian Bittern (*Botaurus poiciloptilus*)	Threatened	Endangered	Unlikely
Brush-tailed Bettong (*Bettongia penicillata ogilbyi*)	Threatened	Critically Endangered	Unlikely
Eastern Curlew (*Numenius madagascariensis*)	Threatened	Critically Endangered	Unlikely
Curlew Sandpiper (*Calidris ferruginea*)	Threatened	Critically Endangered	Unlikely
Australian Painted Snipe (*Rostratula australis*)	Threatened	Endangered	Possible
Western Ringtail Possum (*Pseudocheirus occidentalis*)	Threatened	Vulnerable	Unlikely
Quokka (*Setonix brachyurus*)	Threatened	Vulnerable	Unlikely

Species	Conservation Status		Likelihood of Occurrence
	DBCA	EPBC	
Baudin's Cockatoo (*Calyptorhynchus baudinii*)	Threatened	Vulnerable	Possible
Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	Threatened	Vulnerable	Likely
Carnaby's Cockatoo (*Calyptorhynchus latirostris*)	Threatened	Endangered	Likely
Chuditch (*Dasyurus geoffroii*)	Threatened	Vulnerable	Unlikely
Short-tongued Bee (*Leioproctus douglasiellus*)	Threatened	Critically Endangered	Unlikely
Western Swamp Tortoise (*Pseudemydura umbrina*)	Threatened	Critically Endangered	Unlikely
South Western Phascogale (*Phascogale tapoatafa wambenger*)	Conservation Dependent Fauna	-	Unknown
Great Egret (*Ardea modesta*)	International Agreement	Marine	Possible
Rainbow Bee-eater (*Merops ornatus*)	International Agreement	Marine	Possible
Wood Sandpiper (*Tringa glareola*)	International Agreement	Marine/Migratory	Possible
Common Sandpiper (*Tringa hypoleucos*)	International Agreement	Marine/Migratory	Possible
Common Greenshank (*Tringa nebularia*)	International Agreement	Marine/Migratory	Possible
Marsh Sandpiper (*Tringa stagnatilis*)	International Agreement	Marine/Migratory	Possible
Peregrine Falcon (*Falco peregrinus*)	Other Specially Protected Fauna	-	Unlikely
Western Swamp Tortoise (*Pseudemydura umbrina*)	Threatened	-	Unlikely
Scorpionfly (*Austromerope poultoni*)	Priority 2	-	Unknown
A short-tongued bee (*Leioproctus bilobatus*)	Priority 2	-	Unknown
Southern Death Adder (*Acanthophis antarcticus*)	Priority 3	-	Unlikely
Black Striped Snake (*Neelaps colonotos*)	Priority 3	-	Possible
Water-rat (*Hydromys chrysogaster*)	Priority 4	-	Possible
Southern Brown Bandicoot (*Isoodon obesulus fusciventer*)	Priority 4	-	Likely
Western Brush Wallaby (*Macropus irma)*	Priority 4	-	Possible
Blue billed Duck	Priority 4	-	Unlikely

Species	Conservation Status		Likelihood of Occurrence
	DBCA	EPBC	
(*Oxyura australis*)			

Due to the site being mostly cleared of native vegetation and used for rural purposes, it is not likely that the site would offer large areas of valuable intact habitat. The surrounding environment is also representative of clearing and rural land uses containing limited vegetation to the north, west and south of the site. Large areas of intact vegetation area located to the east of the site and therefore, may provide better fauna habitat than the site itself.

Some fauna species may utilise the minor watercourse that traverses the site which appears to have intact vegetation along the foreshore area and within remaining patches. However, fauna are more likely to utilise surrounding larger areas of intact vegetation to the east.

4.9 Heritage

4.9.1 Aboriginal Heritage

In Western Australia, the *Aboriginal Heritage Act 1972* protects places and objects customarily used by or traditional to the original habitants of Australia or their descendants. A register of such places and objects are maintained under the Act, however, all sites are protected under the Act whether they are registered or not (DPLH 2017).

A desktop search has identified two Registered Aboriginal Heritage Sites and one Lodged Aboriginal Heritage Site intersecting the Site and three Registered sites located within 1 km of the site (Table 9; Figure 10) (DPLH 2017).

Table 9. Aboriginal Heritage Sites Within or in the Vicinity of the Site (DPLH 2017)

Number	Site Name	Type	Status	Distance from site (m)
4343	Brentwood Road Swamp	Artefacts / Scatter	Registered	0
4342	Brentwood Road Quarry	Artefacts / Scatter, Quarry	Registered	0
4341	Brentwood Road NW	Artefacts / Scatter	Lodged	0
3264	White Road, Orange Grove	Artefacts/Scatter, Skeletal Material/Burial	Registered	679

Number	Site Name	Type	Status	Distance from site (m)
3631	Yule Brook A & B	Artefacts/Scatter	Registered	420
3773	Welshpool Reserve	Camp	Registered	275

4.9.2 European Heritage

A desktop search of the State Heritage Office has identified there are no State Heritage Sites within the Site or within a 2 km radius of the Site (SHO 2017). No World Heritage or National Heritage places are located within a 5 km radius of the Site (DEE 2017).

The Site does contain one Shire of Kalamunda Municipal Heritage place, Mrs Wright's Home (former) located at 150 Crystal Brook Road, Wattle Grove. This site is not registered under State Legislation. However, it is graded as Category 4 which states 'Photographically record prior to major development or demolition. Recognise and interpret the site if possible' (SHO 2017) (Figure 10).

The Site contains one heritage site listed as 'Other Heritage Sites', White's home & store located at 80 Crystal Brook Road, Wattle Grove. The site is currently a single storey residence and there are no other details regarding this Site with the State Heritage Office (SHO 2017) (Figure 10).

4.10 Site History

4.10.1 Historical Aerial Imagery

Review of historical aerial imagery was undertaken to identify and assess land use and development changes within the area over time. The earliest available aerial of the site was taken in 1953 and more recent aerial images (from approximately 10 year intervals up to present) were viewed (Figures 11a-h).

The review of historical aerial imagery has identified substantial clearing of majority of vegetation within the site and surrounding areas occurred prior to 1953 and subdivided for rural land uses including market gardens, agricultural/animal grazing and pastures. Portions in the south-west of the site were identified as wet during this time. Some patches of remnant vegetation remained until prior to 1974. It appears potential sand extraction activities were undertaken in the northern and south-eastern portions of the site and adjacent areas which expanded between 1953 and 1974.

Further clearing of remnant native vegetation occurred by 1974 and some rural residential dwellings were constructed. It appears some vegetation regrowth or planting has occurred prior to 1974. Development and rural land uses replaced the sand extraction areas by 1985. During this time, further rural residential development occurred

within the site and surrounding areas. Majority of the clearing within the site occurred by 1995 and some regeneration and plantation occurred between 1995 and 2010.

Urban residential developments began between 2010 and 2017 to the north, north-west and north-east of the site boundary.

4.10.2 WIN Groundwater Bore Database Search

A search of the (then) Department of Water (DoW)'s WIN Groundwater bore database has identified 51 bores within the site boundary (Figure 12) (DoW 2017). These operational statuses and current owners of these bores are unknown. Information on each WIN bore's ID, purpose, status, drill depth, drill date and owner are provided in Appendix C.

4.11 Surrounding Land Uses

The Lesmurdie Reserve exists to the east of the site. Pockets of residential developments exist to the north, west, south-west and east of the site beyond the rural areas. The Hartfield Country Club Golf Course is located 236 m to the north. An industrial and commercial precinct is located to the south-west of the site in Kenwick.

4.12 Industrial Separation Distances

Under the EPA's *Guidance Statement No. 3: Separation Distances between Industrial and Sensitive Land Uses,* all new industries, infrastructure and estates in the vicinity of proposed/existing sensitive land uses, and vice versa, require a suitable separation distance. Sensitive land uses are defined by the EPA as; residential developments, hospitals, hotels, motels, hostels, caravan parks, schools, nursing homes, child care facilities, institutions, shopping centres (EPA 2005). This Guidance Statement outlines the generic buffer distances between sensitive and industrial land uses in the absence of site-specific technical investigations (EPA 2005).

4.12.1 Kennels

Three kennels exist to the west of the site (Figure 13). The EPA's Guidance Statement No. 3 provides a generic buffer distance of 500 m from sensitive land uses within rural zones and a 1000 m buffer in or nearby urban areas in the absence of site specific investigations (EPA 2005). Kennels have associated odour and noise impacts. It is to be noted that separation distances are not required to other industrial land uses under GS3.

Proposed zoning of the site to Urban will require a generic 1000 m buffer distance between the existing kennels and future residential and sensitive land use developments. A buffer of 1000 m from all three kennels will impinge the western portion of the site (Figure 13). Site specific noise and odour modelling would be required to determine a more appropriate buffer distance in negotiation with the City of Kalamunda.

Lots 24, 25, 26 and 36 Welshpool Road East, Wattle Grove have been identified as having an additional use under the LPS 3 for dog kennels. Despite provision within the Scheme, it does not appear the lots are currently used for dog kennels. Current uses of these lots include a garden centre and veterinary hospital.

4.12.2 Poultry Farms

One poultry farm exists within the southern portion of the site (Poultry Farm 1) and two poultry farm exists to the south and west of the site (Poultry Farm 2 and 3 respectively) (Figure 13). Under GS3, the generic buffer distance for Poultry Farms ranges from 300 m – 1000 m (EPA 2005). Under the City of Kalamunda's LSP, a 300 m buffer is mapped from Poultry Farm 1 and 3. Under the City of Gosnell's Town Planning Scheme No. 6 (TSP 6) a buffer of 500 m has been applied to Poultry Farm 2 (Figure 13). Buffers of Poultry Farm 1 and 2 impact the developable potential of the site for sensitive land uses, however, industrial development are unaffected by poultry farm buffers.

4.12.3 Turf Farms

One turf farm is located within the south-western portion of the site (Figure 13). Under GS3, a generic buffer distance of 500 m from turf farm is applicable from sensitive land uses or developments. This buffer distance only impinges the site south of Crystal Brook Road (Figure 13). Industrial development to the south of Crystal Brook Road is unlikely to be affected by the turf farm buffer.

5 Potential Site Environmental Constraints

The potential key environmental issues associated with the existing development include:

- Wetlands and wetland buffers;
- Watercourse and Foreshore Areas;
- Declared Rare Flora;
- Threatened Ecological Communities;
- Water Management; and
- Industrial separation buffers.

5.1 Wetlands and Wetland Buffers

Under the Western Australian Planning Commission's *Guideline for the Determination of Wetland Buffer Requirements* (2005), the consideration of wetlands is required during a change in land use or a proposed development in the immediate vicinity of a wetland where the future land use is likely to conflict with the established wetland management objectives. Under the guidelines, an appropriate buffer distance should be identified to achieve an acceptable planning outcome. Buffer distances determined based on the wetland's category and no development is permitted within buffers (WAPC 2005).

As the site contains and is within the vicinity of wetlands, there is the potential for their associated buffers to impinge on the south-western portion of the site and decrease the developable potential of the site. A minimum buffer distance of 50 m from a CCW and a 30 – 50 m buffer from REWs is generally applicable. Figure 14 identifies the worst case scenario of the area of land onsite that may be impinged by wetland buffers of 50 m. This would equate to approximately 8.44 ha of land within the site to be sterilised from future development.

However, the REW's located within the site appear to have been historically cleared of most vegetation. Reclassification of the REWs to MUWs may be possible and this would remove this wetland area as a constraint to future development (approximately 8.44 ha). Development within MUWs is generally permissible as they have little remaining ecological wetland attributes and function, provided adequate depth to groundwater is established as part of future development.

A CCW located south of the Tonkin Highway and Welshpool Road East intersection, at worst case, would have a minimum 50 m buffer applicable (see Figure 14). However, as the area within the site and within a potential 50 m buffer has already been cleared, developed and is separated by a road reserve, it is considered unlikely that a buffer would be required.

5.1.1 Further Investigations and Management Requirements

The vegetation of the mapped wetlands within the site and the applicable buffers is representative of previous land uses and historical clearing. It is likely that these areas would include patches of non-endemic species and plantings. Ground surveys would be required to assess the vegetation within the site to determine the impacts of mapped wetlands and associated buffers to future urban development.

A Wetland and Wetland Buffer Management Plan (WWBMP) will be required for the lots located within or adjacent to wetlands at the local structure planning or subdivision stage.

5.2 Watercourse and Foreshore Areas

The minor non-perennial stream watercourse that traverses the northern portion of the site is likely to require a defined foreshore area due to the vegetation along the watercourse in accordance with DoW's Operational Policy 4.3: *Identifying and establishing waterways foreshore areas* (2012). Development within the foreshore area of a watercourse is generally not permitted and therefore has the potential to reduce the developable potential of the site.

There are no standard foreshore widths and should be determined in discussion with DWER and other relevant agencies. Generally, the foreshore area can be defined as the furthest extent of riparian vegetation and other associated riverine landforms and functions. Figure 14 identifies a potential foreshore area; however, groundtruthing is required through survey work to identify watercourses, and determine foreshore areas and watercourse buffer zones. Watercourses, foreshore areas and watercourse buffer zones require protection through the creation of easements for drainage and water management purposes, specify approved and un-approved land uses and activities within the zones and providing Watercourse and Foreshore Management Plans detailing these.

5.2.1 Further Investigations and Management Requirements

As part of future structure planning, identification of watercourses and foreshore area, will be undertaken as part of a biophysical assessment. The biophysical assessment will be undertaken in accordance with the (then) Department of Water's (DoW's) *Operational Policy 4.3: Identifying and establishing waterways foreshore areas* (2012) and the (then) Water and Rivers Commission policy *Determining Foreshore Reserves* (2001).

To ensure these watercourses and their associated foreshore area and buffer zone is appropriately protected and managed, the following will be required as part of future development:

- The creation of easements for the purpose of drainage and water management;
- Specifying approved or unapproved activities within the buffer zone; and

- Preparation of a Watercourse and Foreshore Management Plan at the local structure planning or subdivision stage.

5.3 Declared Rare Flora

Several occurrences of the Wavy Smoke Bush (*Conospermum undulatum*) and the Summer Honeypot (*Banksia mimica*) have been identified as occurring within the site based on DBCA database searches. These species and the vegetation within 50 m of the DRF are protected under the EPBC Act.

The occurrences of both these DRFs throughout the site are considered a potential constraint to development as the DRF and vegetation within 50 m of the flora are protected under the EPBC Act (Figure 14).

5.3.1 Further Investigations and Management Requirements

It is likely a Flora and Vegetation survey would be required to confirm the presence and locations of these DRF species to inform future rezoning and structure planning. In addition, an EPBC referral would likely be required at structure planning stage to address potential impacts associated with urban development near DRFs.

A Flora and Vegetation Management Plan may be required at the subdivision stage.

5.4 Threatened Ecological Communities

Portions within the site have been mapped by DBCA as the Banksia Woodlands of the Swan Coastal Plain TEC, *Eucalyptus calophylla-Kingia australis* woodlands and Shrublands and Woodlands on Muchea Limestone listed as Endangered under the EPBC Act (Figure 9). However, the DBCA's mapping is based on the Commonwealth's 'likely to occur' areas and represents broad scale vegetation units that are most likely to contain the ecological communities.

5.4.1 Further Investigations and Management Requirements

Site specific flora and vegetation surveys will be required to identify the presence of TECs or PEC, which will inform the structure planning stage. Depending on the potential impacts, the presence of TECs within the site may require the project to be referred to the DEE under the EPBC Act for an assessment of potential impacts associated with urban development within or nearby TECs.

A Flora and Vegetation Management Plan may be required at the subdivision stage for the protection of identified TECs or PECs.

5.5 Water Management

The Site has a few tributaries which traverse the site and there are small portions of CCW and REW along the western boundary of the site. It should be noted that development proposals within 200 m of the boundary of a CCW or REW should be

referred to DBCA for advice where the quality or volume of water flowing into the wetland may be affected by a development.

5.5.1 Further Investigations and Management Requirements

A District Water Management Strategy (DWMS) will be required to support any future MRS Amendment. The purpose this document will be to provide a coordinating framework that guides the key requirements for water sensitive urban design. It will also demonstrate that Site can support urban and/or industrial development and best practice urban water management.

A groundwater monitoring program will also be required prior to the development of a Local Water Management Strategy at the local structure planning stage.

5.6 Industrial Separation Buffers

The presence of prescribed premises, including poultry farms, kennels and a turf farm, within and adjacent to the site has the potential to impact on the type of future land uses within the site (should these premises remain in operation).

The three surrounding kennels, poultry farms and turf farm buffers impinge on the site. However, the buffers are only applicable for sensitive land uses. Majority of the land use buffers impinge across the southern half of the site (south of Crystal Brook Road) which would identify this portion to be potentially used for future industrial development (Figure 13).

5.6.1 Further Investigations and Management Requirements

The portion of the site to the north of Crystal Brook Road is impinged by fewer buffers and may have a better potential for residential development (Figure 13). However, site specific odour and noise modelling would need to be undertaken to identify opportunities with reduced buffers from surrounding land uses. In addition, management and mitigation measures may be required to support urban residential development in this area.

6 Summary

6.1 Outcome and Key Findings of Assessment

The site is currently used for rural land uses and has been historically cleared of majority of native vegetation. A desktop review of the environmental aspects of the site has determined the following are relevant:

- **Wetlands and Wetland Buffers:** As the site is mapped as containing and within the vicinity of geomorphic wetlands, there is the potential for their associated buffers to impinge on the south-western portion of the site. A buffer distance of 30 – 50 m is generally imposed on REWs and a minimum 50 m buffer is generally imposed on CCWs. However, as the vegetation within the mapped wetlands and the corresponding buffers does not appear to be intact and has been subject to clearing, it is likely that smaller buffer distances from the wetlands could be negotiated. Alternatively, there is a potential opportunity to reclassify the wetlands within and surrounding the site to increase the developable potential of the site. Site specific surveys would be required to assess the vegetation remaining and the condition of the wetlands. A Wetland and Wetland Buffer Management Plan may be required at subdivision.
- **Watercourse and Foreshore Area:** The minor non-perennial watercourse that traverses through the northern portion of the site would likely require a biophysical assessment to identify the extent of the foreshore area. The extent of the foreshore area would impact on the developable potential of the surrounding area. A Watercourse and Foreshore Management Plan may be required at the structure planning or subdivision stage. Additionally, the creation of easements for the foreshore and buffer area for the purpose of drainage and water management, as well as specifying the approved and unapproved activities within the buffer zone will provide further protection and management.
- **Declared Rare Flora:** There are several historical occurrences of DRF within the site. The species and the vegetation within 50 m of the occurrence are protected under Federal legislation. Flora and vegetation surveys would be required to confirm the presence or absence of these DRF species which would provide a better indication of the land available for development. A Flora and Vegetation Management Plan may be required at the subdivision stage.
- **Threatened Ecological Communities:** The site is mapped as having several TECs and associated buffers across the site. These mapped TECs are based on the DEE's likelihood of TEC occurrences and are not based on actual recorded data. These TECs appear to correspond with patches of possible remnant vegetation which is likely to be associated with the Banksia Woodlands TEC, *Eucalyptus*

calophylla-Kingia australis woodlands and Shrublands TEC and Woodlands on Muchea Limestone TEC. Flora and vegetation surveys of these patches of vegetation would be required to determine the presence or absence of these TECs. Should these TECs be identified as occurring within the site, clearing or potential impacts to the TECs will require approval from the DEE and the DWER. A Flora and Vegetation Management Plan may be required at the subdivision stage.

- **Water Management:** There are several tributaries which traverse the site, as well as wetland located along the western boundary of the site. A DWMS will be required as part of any future rezoning under the MRS, as well as groundwater monitoring to inform the LWMS at the local structure planning stage.
- **Land Use Buffers:** The site is constrained by generic or imposed buffers on prescribed premises (Poultry farms, turf farm and kennels). The opportunities for land development within the site is recommended to be split into two land uses, the area to the south of Crystal Brook Road would be more suitable for continued rural uses or industrial development. While the area to the north of Crystal Brook Road has the potential to be developed to urban residential - should the generic buffers be reduced. Site specific studies and modelling would be required to determine appropriate buffers from the surrounding.

7 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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FIGURES

Legend

Site Location (325 ha)

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GDA 1994 MGA Zone 50

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Various Lots, Wattle Grove

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Figure 1
Site Location

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F1 Site Location.mxd

Legend

- Site Location
- Topographical Contours 1m

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- ELEVATION SOURCED DOW 2012
- LOCALITY MAP SOURCED LANDGATE 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
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Figure 2
Topography

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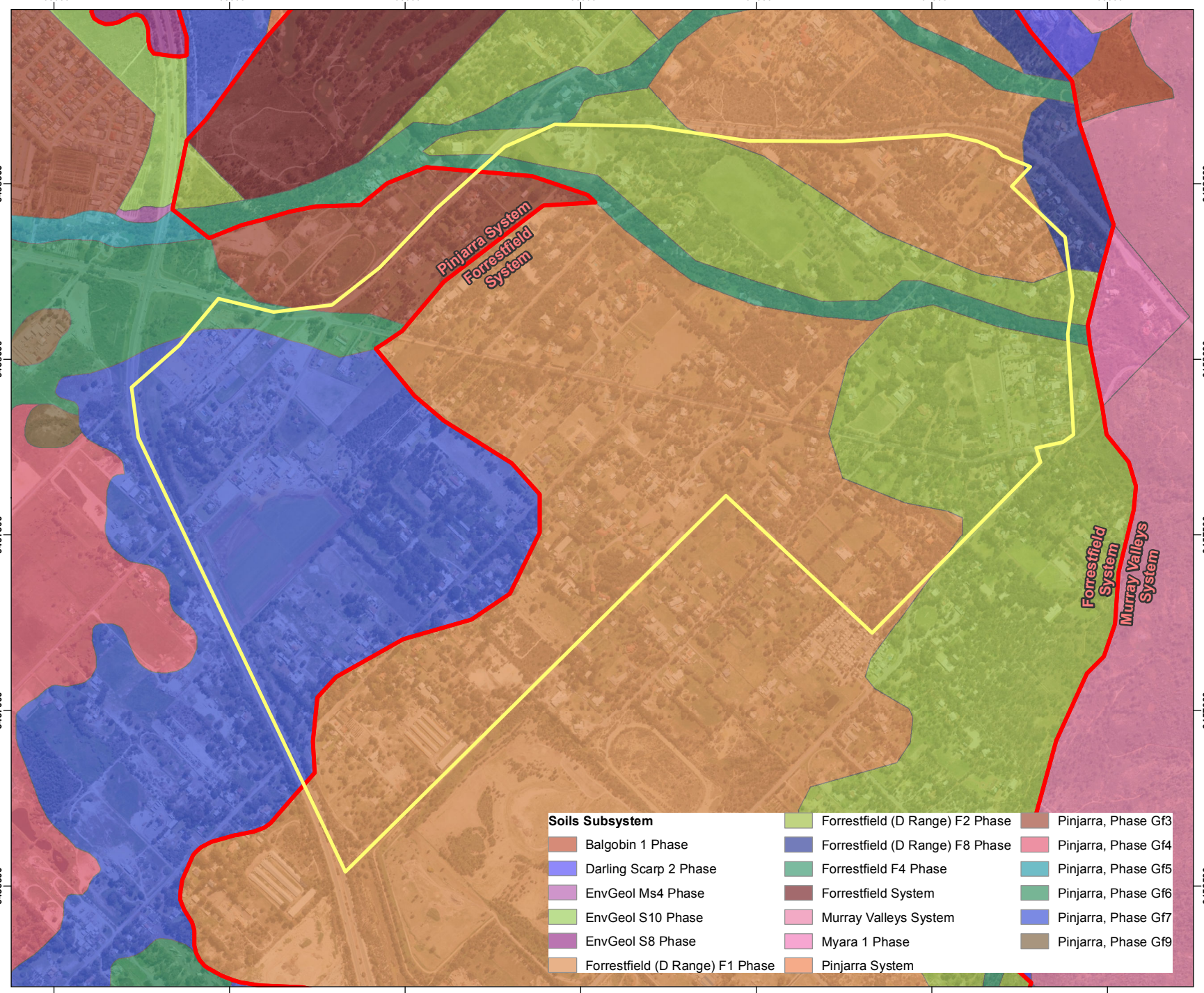

Legend

- Site Location
- Soil Landscapes and Land Systems

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- SOIL SYSTEM SOURCED DAFWA 2012
- LOCALITY MAP SOURCED LANDGATE 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
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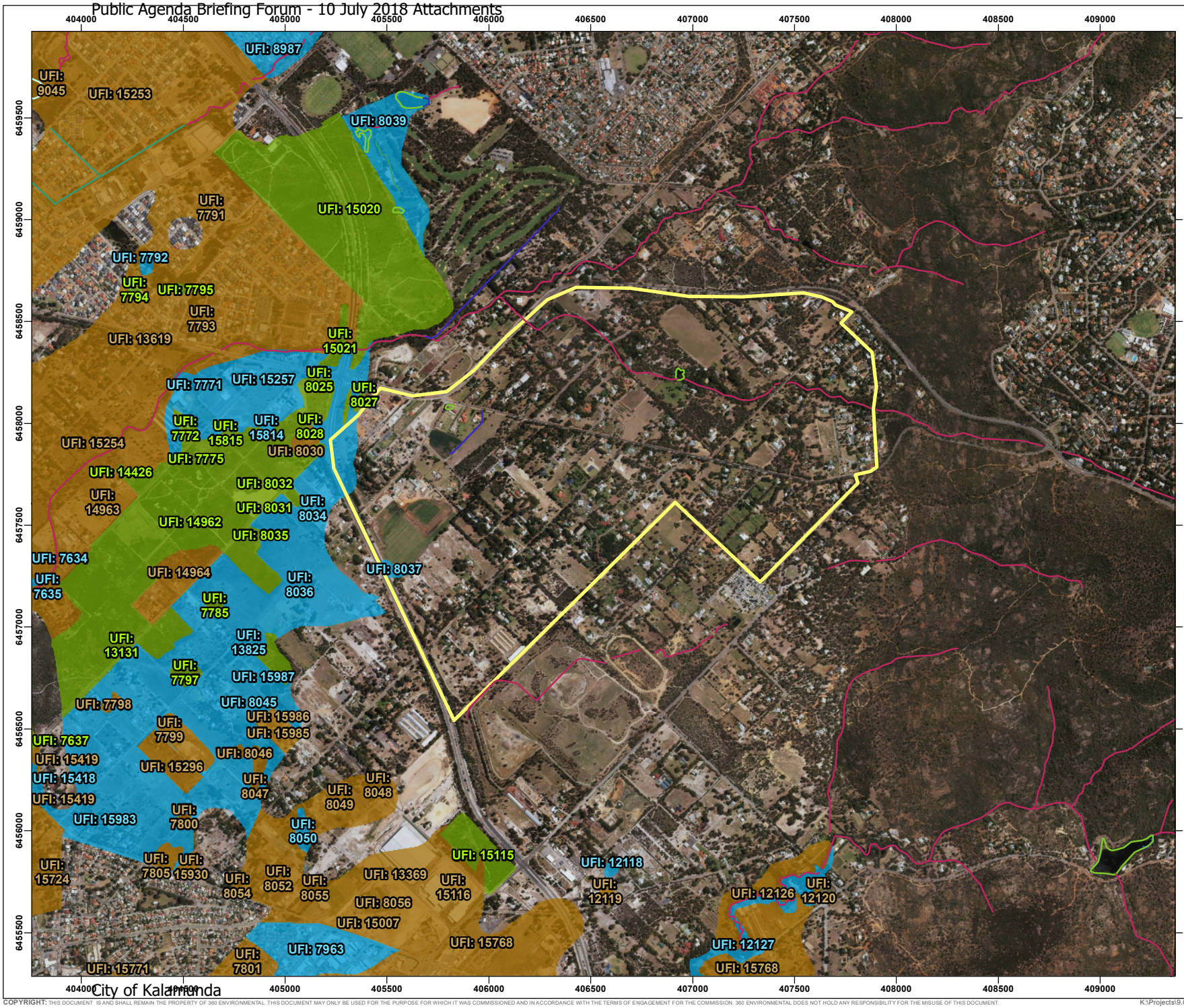
Figure 3
Geology and Soils

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F3 Geology and Soils.mxd



Legend

- Site Location

Geomorphic Wetlands

- Conservation
- Resource Enhancement
- Multiple Use

Hydrography

- Drain - major
- Drain - minor
- Lake - perennial
- Marine Construction - wharf/jetty
- Swamp - perennial
- Watercourse - minor, non-perennial
- Watercourse - minor, perennial

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- SURFACE WATER DATA SOURED DOW 2018
- LOCALITY MAP SOURCED LANDGATE 2017
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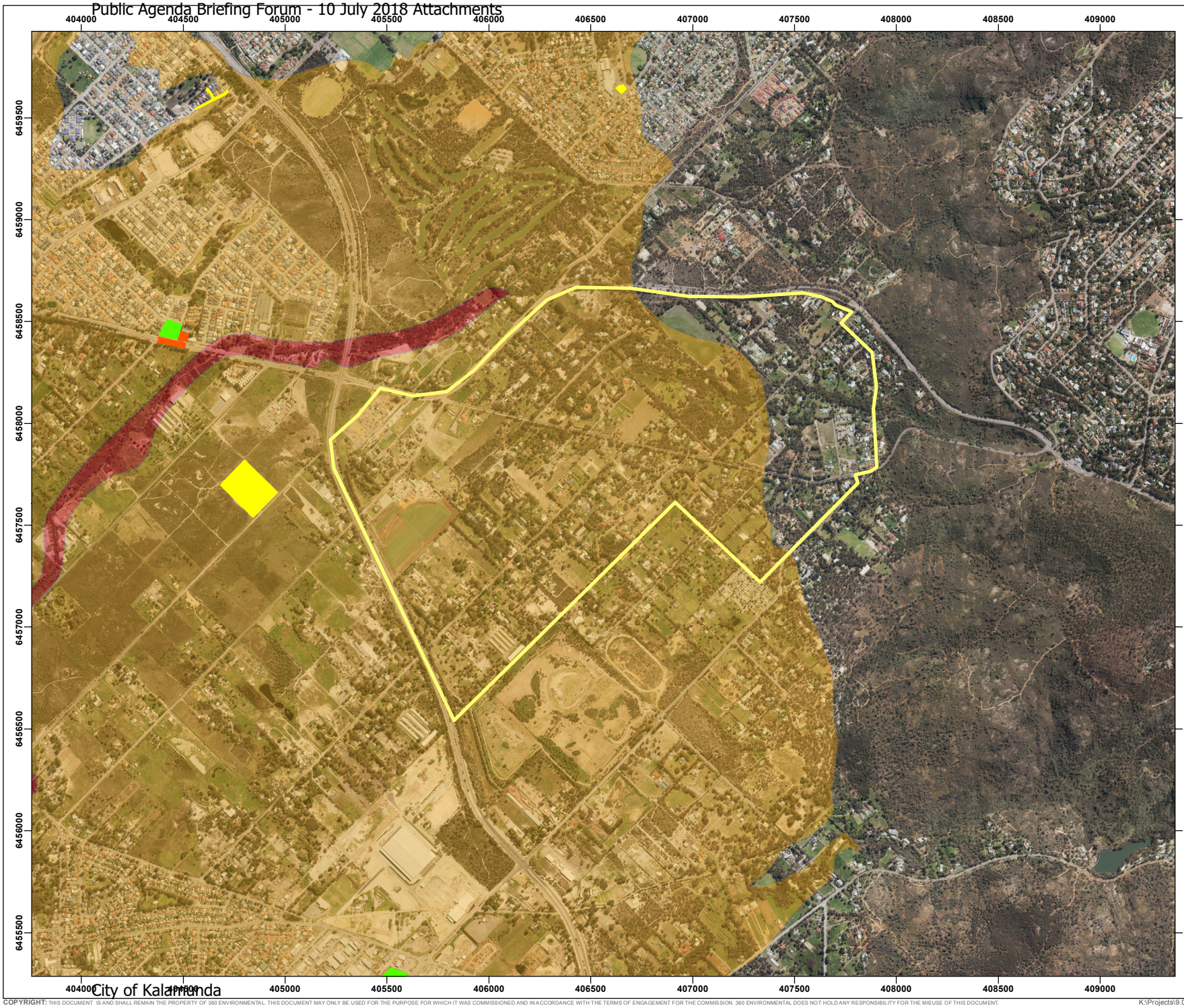
Figure 4
Surface Hydrology 111

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F5 Surface Water.mxd



Legend

Site Location

Contaminated Sites

- Remediated for Restricted Use
- Contaminated: Restricted Use
- Contaminated: Remediation Required

Acid Sulfate Soils

- High to Moderate risk
- Moderate to Low risk

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- ASS AND CONTAMINATED SITES SOURCED DWER 2018
- LOCALITY MAP SOURCED LANDGATE 2017
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Figure 5
Contamination

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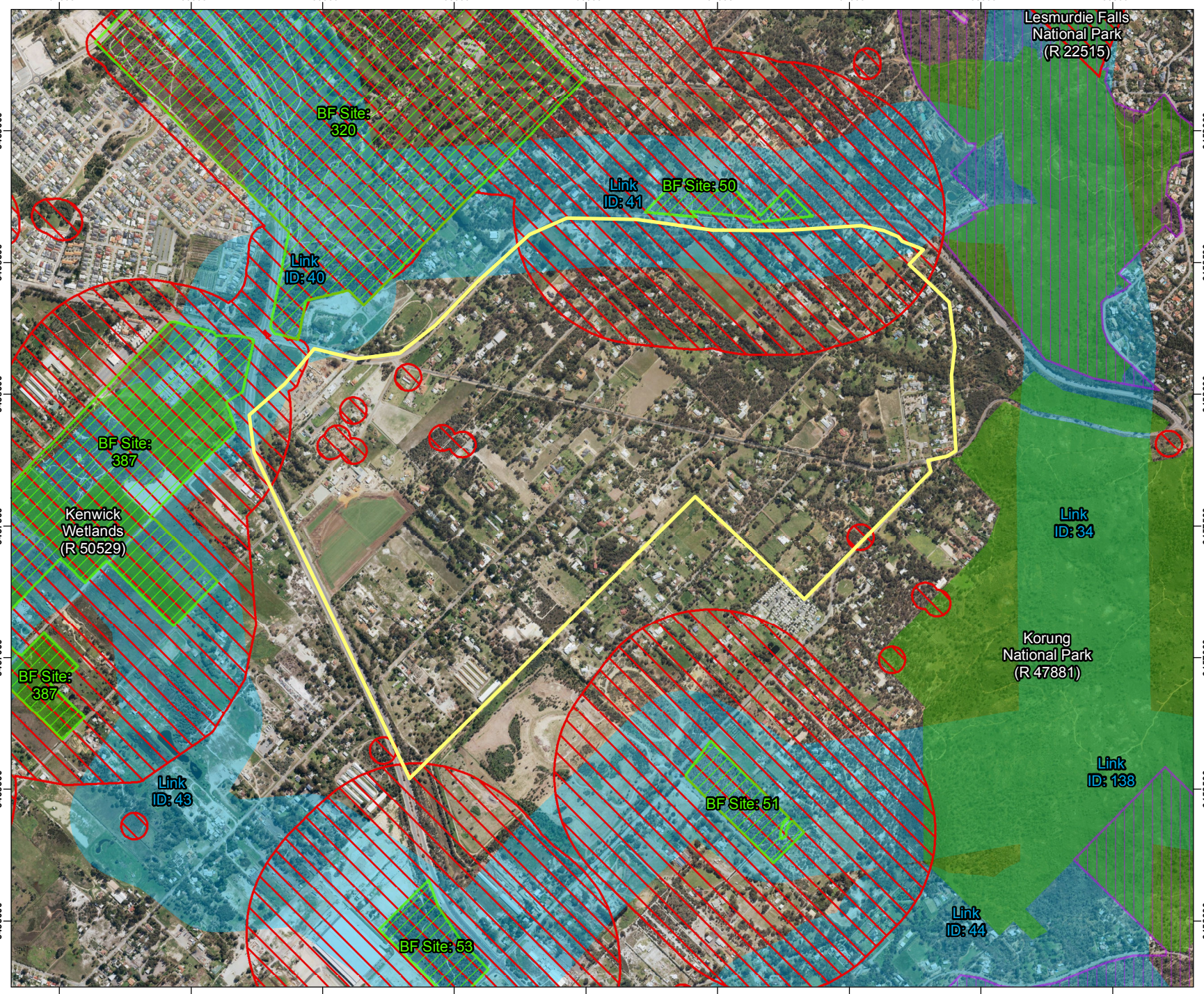

Legend

- Site Location
- Bush Forever Sites
- Environmentally Sensitive Areas
- DBCA Managed Lands
- Regional Parks
- Perth Regional Ecological Linkages

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- CONSERVATION SOURCED DBCA 2018
- LOCALITY MAP SOURCED LANDGATE 2017
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Figure 6

Conservation Areas

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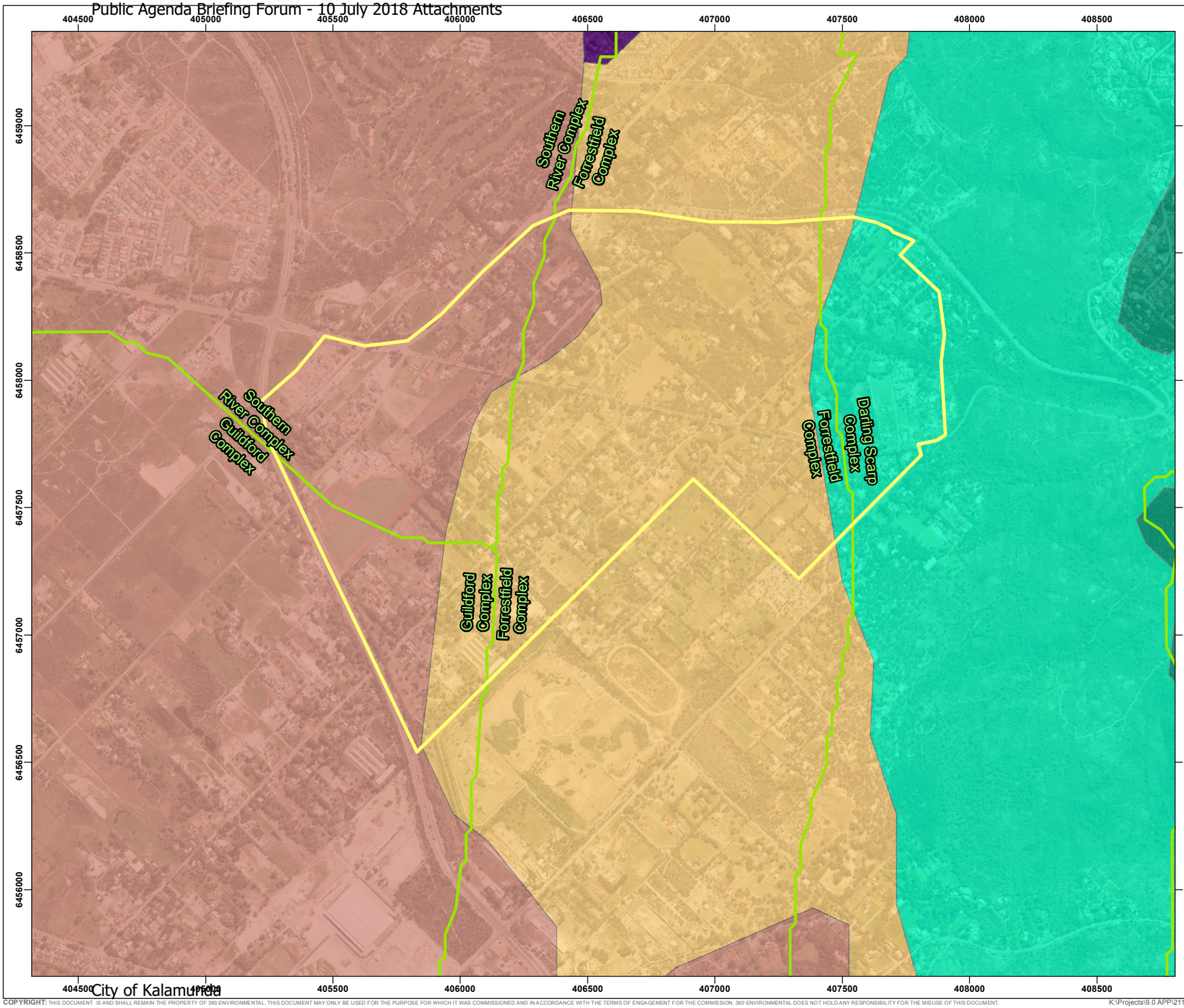

Legend

- Site Location
- Heddle Vegetation Complexes

Pre European Vegetation Types

- BASSENDEAN_1009
- PINJARRA_3
- PINJARRA_968
- WEST DARLING_3
- WEST DARLING_4

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- CONSERVATION SOURCED DBCA 2018
- LOCALITY MAP SOURCED LANDGATE 2017
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Figure 7
Broad Vegetation Types

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Legend

- *Banksia mimica*
- *Conospermum undulatum*
- *Isopogon drummondii*
- *Lasiopetalum glutinosum* subsp. *glutinosum*
- *Thelymitra magnifica*

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- FLORA SOURCED DBCA 2018
- LOCALITY MAP SOURCED LANDGATE 2017
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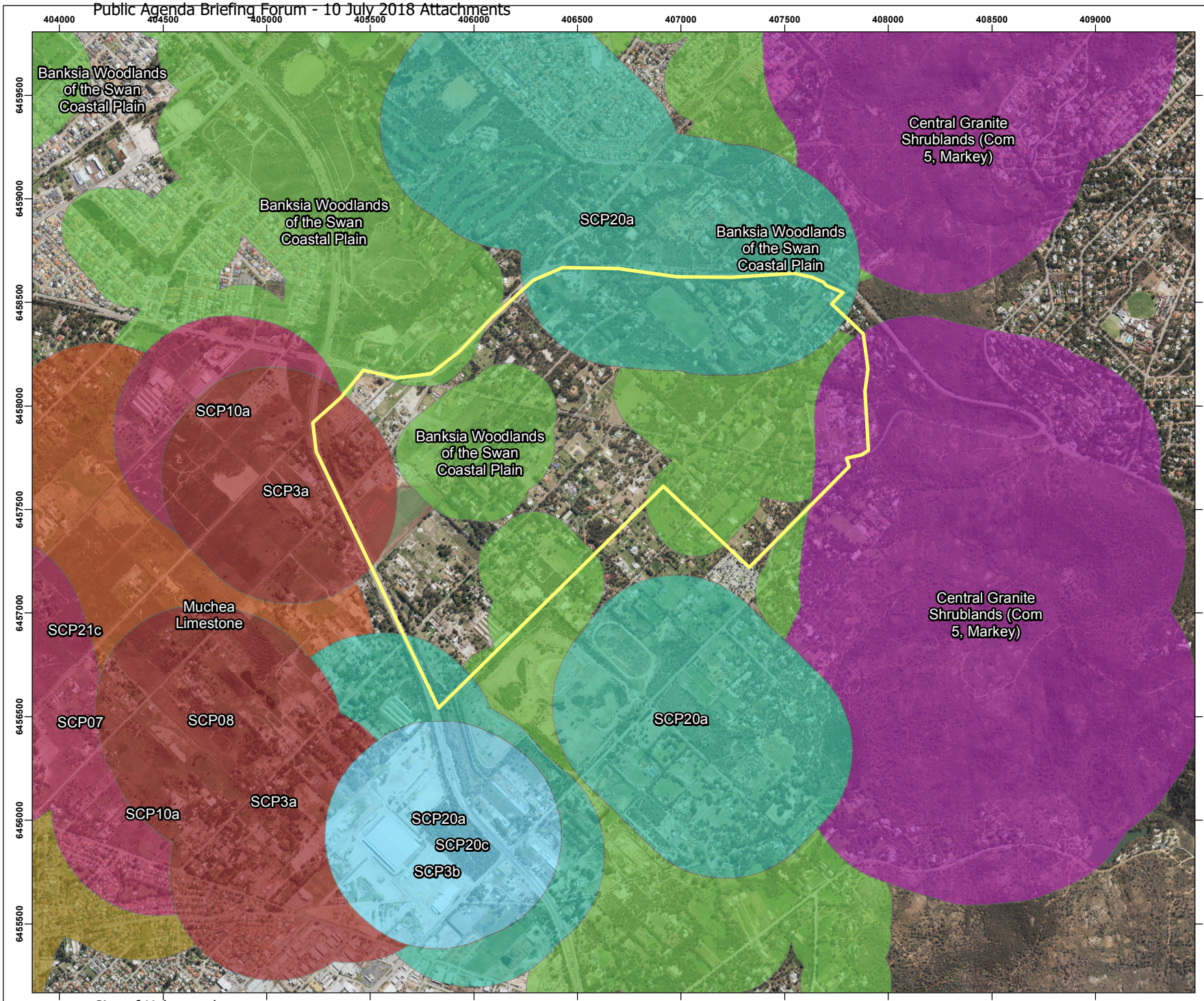
Figure 8
Declared Rare Flora 115

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F9 Declared Rare Flora.mxd



Legend

- Site Location

TECs and PECs

- Banksia Woodlands of the Swan Coastal Plain
- Central Granite Shrublands (Com 5, Markey)
- Muchea Limestone
- SCP07
- SCP08
- SCP10a
- SCP20a
- SCP20c
- SCP21c
- SCP3a
- SCP3b

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- HERITAGE SOURCED DAA AND SHO 2018
- LOCALITY MAP SOURCED LANDGATE 2017
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Figure 9
Threatened and Priority Ecological Communities

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Legend

- Site Location
- State Heritage Office Registered Sites
- Aboriginal Heritage Sites - Registered
- Aboriginal Heritage Sites - Lodged

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- HERITAGE SOURCED DAA AND SHO 2018
- LOCALITY MAP SOURCED LANDGATE 2017
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GDA 1994 MGA Zone 50

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Figure 10
Heritage

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F11 Heritage.mxd

Legend

Site Location

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Various Lots, Wattle Grove

Environmental Assessment Report

Figure 11a
Historical Aerial - 1953

City of Kalamunda

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F12 Historical Aerials.mxd

Legend

Site Location

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LOCALITY MAP

PROJECT ID	DATE
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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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Various Lots, Wattle Grove

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Figure 11b
Historical Aerial - 1965

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F12 Historical Aerials.mxd

Legend

Site Location

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PROJECT ID	DATE
2118	6/03/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	CM	KC	1

Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 11c
Historical Aerial -1974

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F12 Historical Aerials.mxd

Legend

Site Location

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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LOCALITY MAP

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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 11d
Historical Aerial -1985

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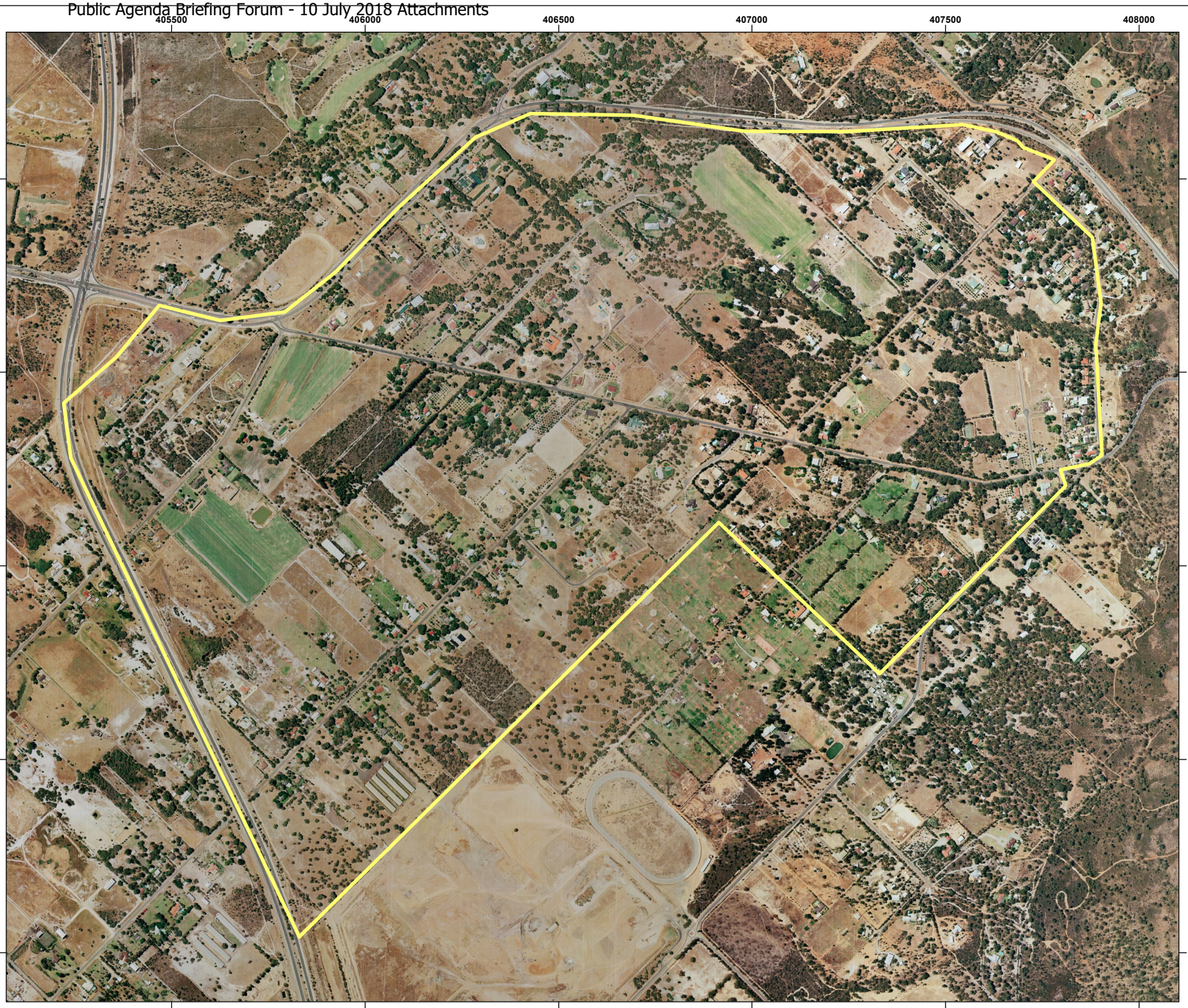

Legend

Site Location

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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LOCALITY MAP

PROJECT ID	DATE
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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 11e
Historical Aerial - 1995

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Legend

Site Location

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LOCALITY MAP

PROJECT ID	DATE
2118	6/03/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

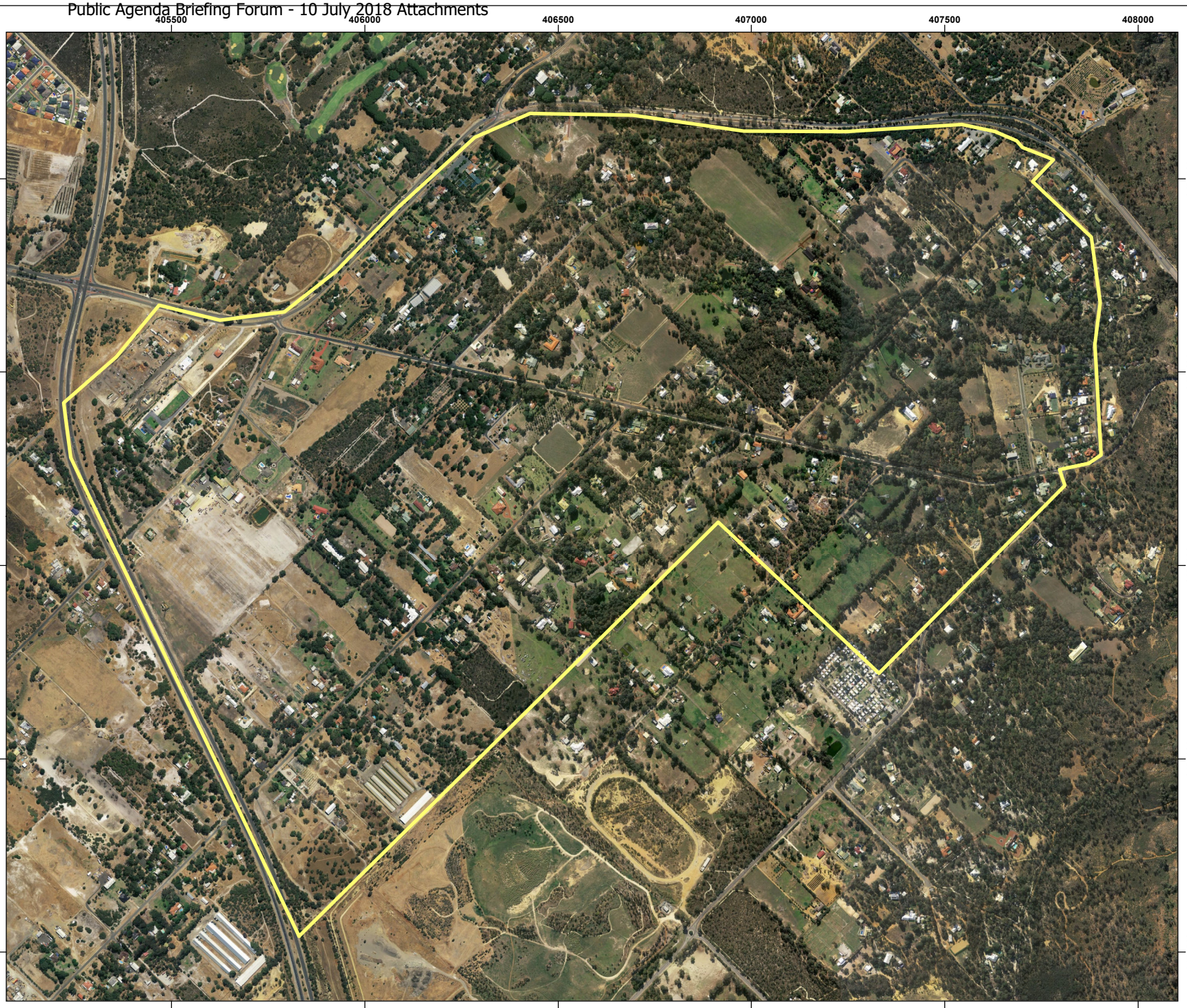
CREATED	CHECKED	APPROVED	REVISION
SL	CM	KC	1

Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 11f
Historical Aerial - 2001

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F12 Historical Aerials.mxd



Legend

Site Location

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
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LOCALITY MAP

PROJECT ID	DATE
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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	CM	KC	1

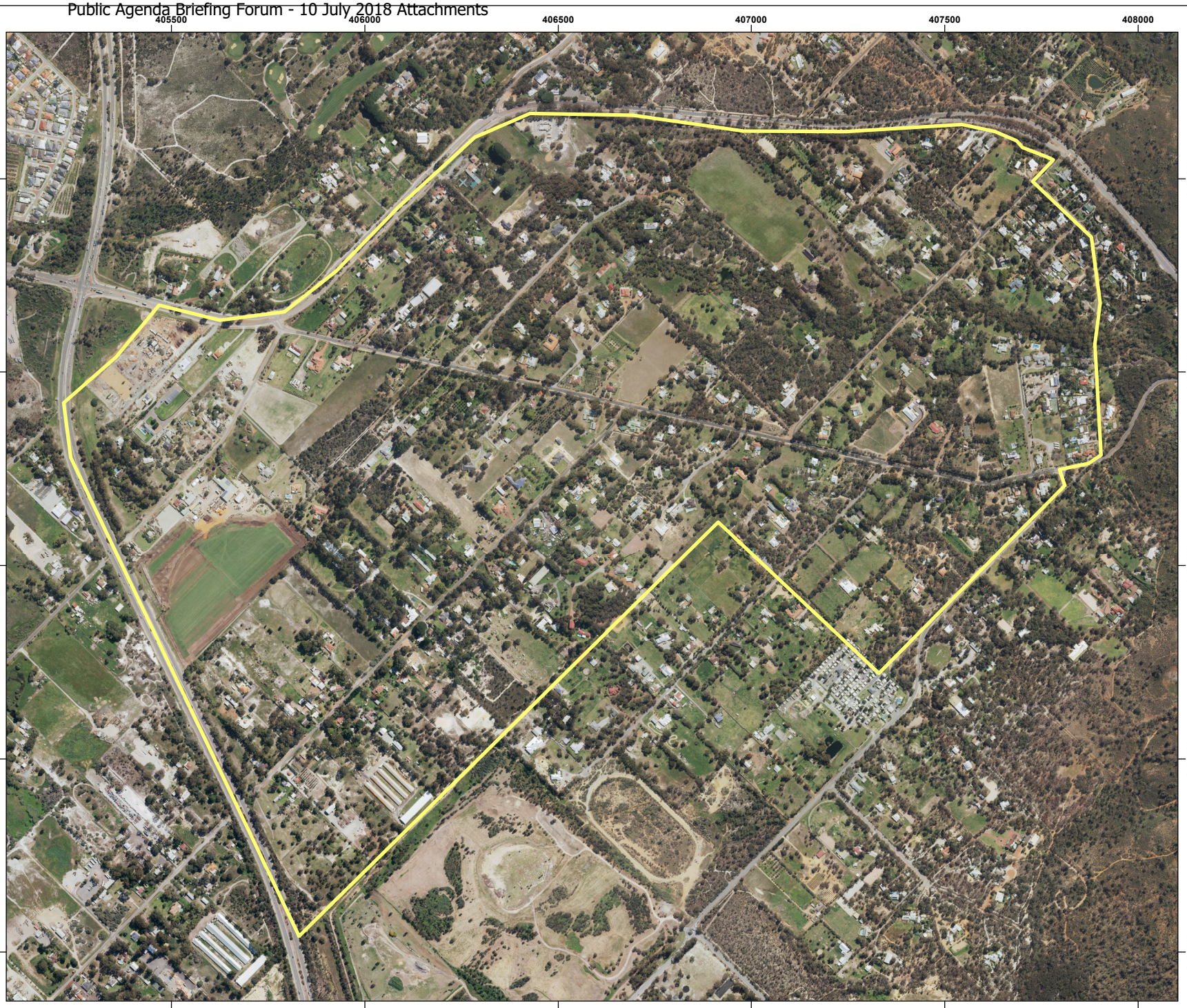
Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 11g

Historical Aerial - 2017

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F12 Historical Aerials.mxd



Legend

Site Location

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
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LOCALITY MAP

PROJECT ID	DATE
2118	6/03/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	CM	KC	1

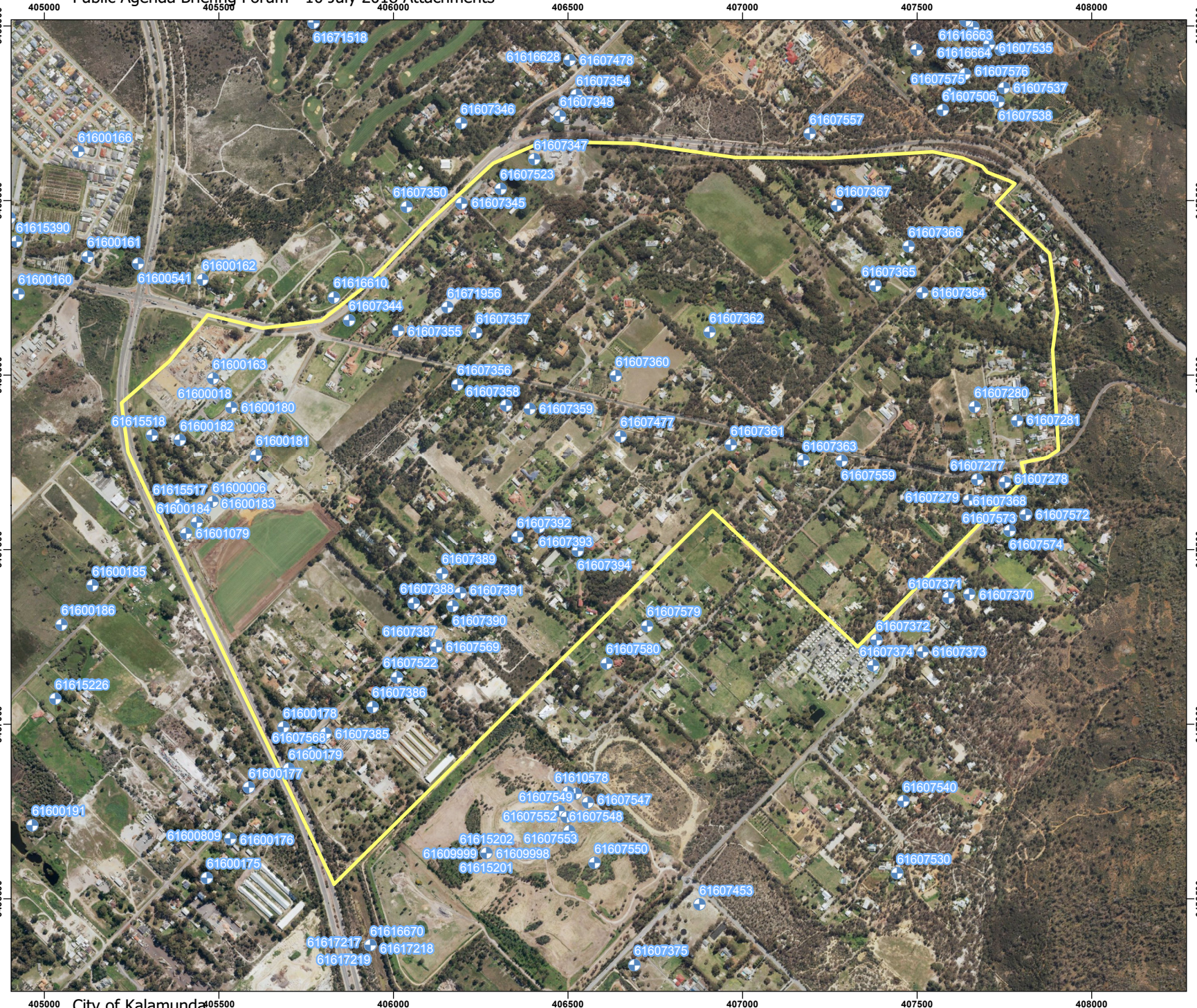
Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 11h

Historical Aerials 2017

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 F12 Historical Aerials.mxd



Legend

- Site Location
- WIN Groundwater Bores

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- WIN BORES SOURCED DOW 2018
- LOCALITY MAP SOURCED LANDGATE 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
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LOCALITY MAP

PROJECT ID	DATE
2118	6/03/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	CM	KC	1

Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 12
WIN Groundwater Bores

City of Kalamunda

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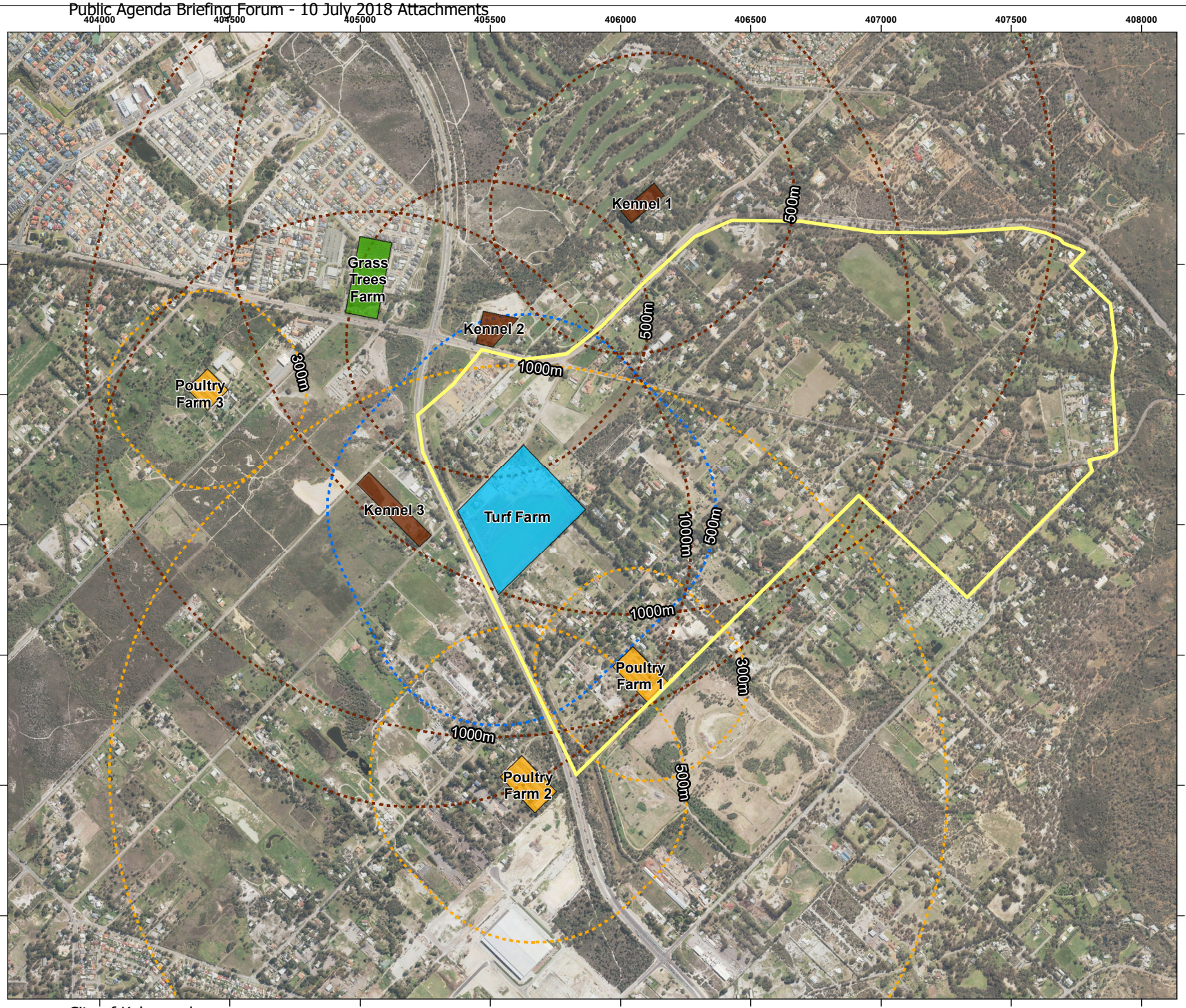

Legend

- Site Boundary
- Grass Trees Farm
- Kennels
- Poultry Farms
- Turf Farm

Land Use Buffers

- Kennel
- Poultry Farm
- Turf Farm

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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LOCALITY MAP

PROJECT ID	DATE
2118	12/03/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

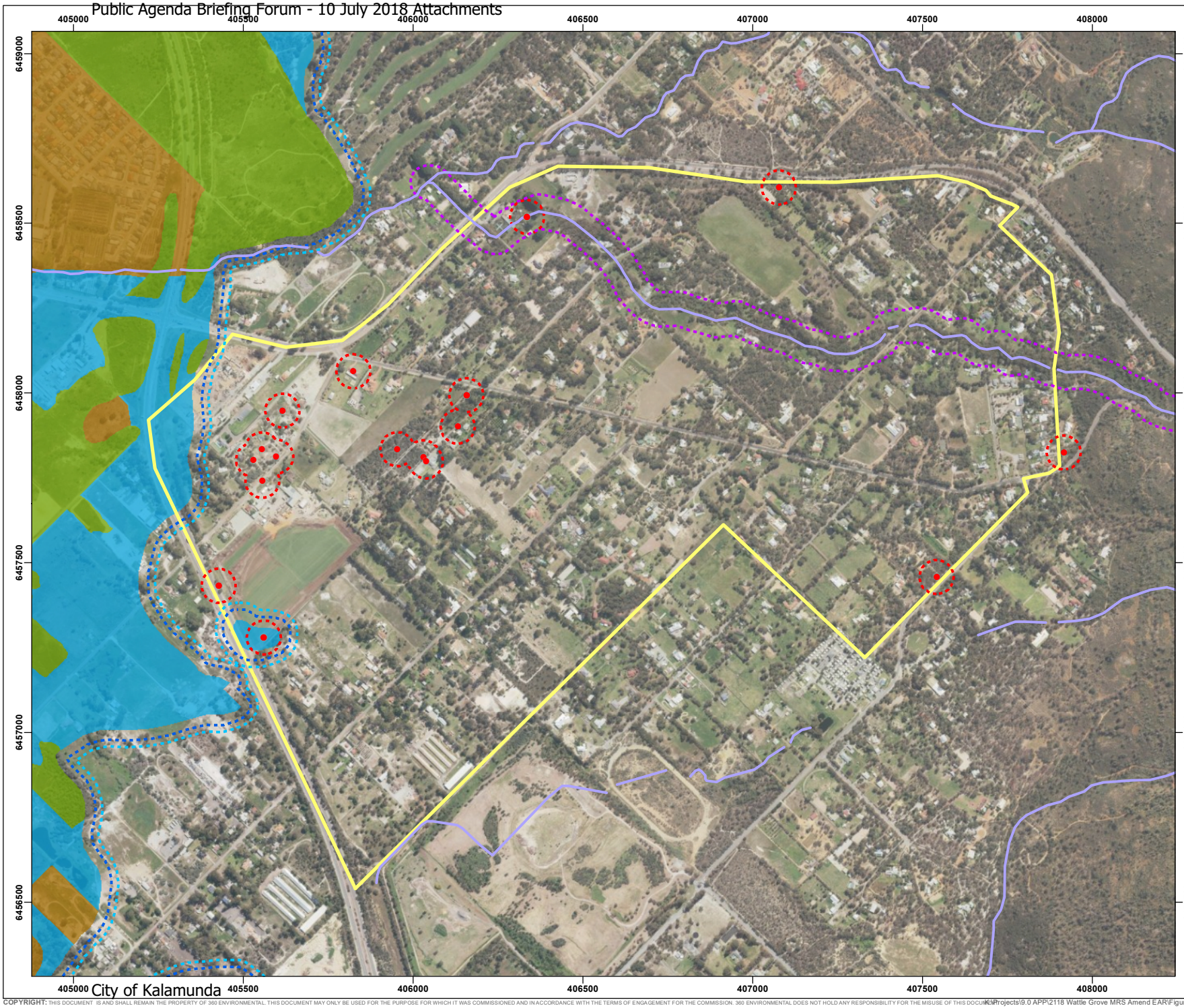
CREATED	CHECKED	APPROVED	REVISION
SL	CM	KC	1

Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 13
Land Use Opportunities and Constraints

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 FX Environmental Opportunities and Constraints.mxd



Legend

- Site Boundary
- Declared Rare Flora
- Declared Rare Flora 50m Buffer
- Watercourse - minor, perennial
- Potential Foreshore Area

Geomorphic Wetlands

- Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed

Wetland Buffers

- 30m Buffer
- 50m Buffer

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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LOCALITY MAP

PROJECT ID	DATE
2118	23/04/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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Burgess Design Group
Various Lots, Wattle Grove

Environmental Assessment Report

Figure 14

Environmental Opportunities and Constraints

K:\Projects\9.0 APP\2118 Wattle Grove MRS Amend EAR\Figures\2118 FX Environmental Opportunities and Constraints - Wetland Buffers.mxd

APPENDIX A

EPBC Protected Matters Report

Australian Government
Department of the Environment and Energy

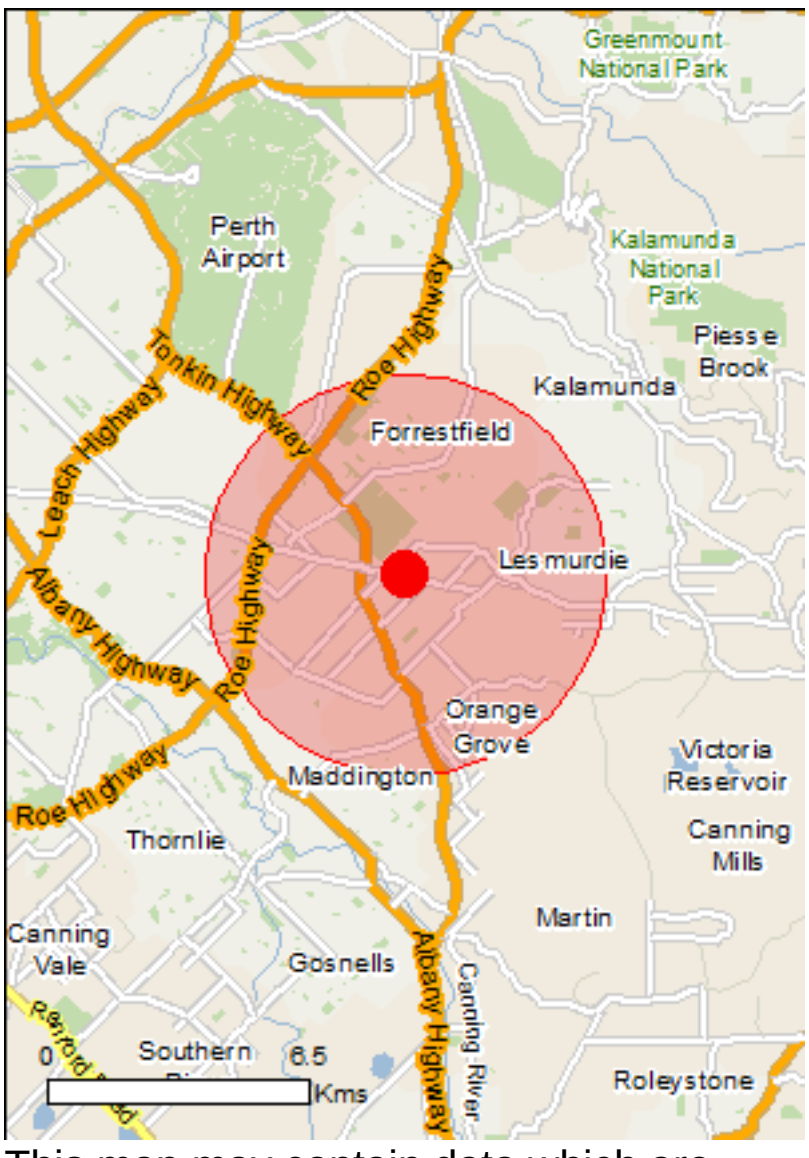
EPBC Act Protected Matters Report

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

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

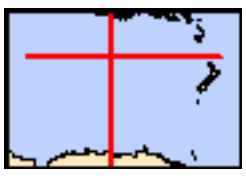
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 25/10/17 19:14:08



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

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	38
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	7
Regional Forest Agreements:	1
Invasive Species:	43
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Endangered	Community known to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Roosting known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Insects		
Leioproctus douglasiellus a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area
Mammals		

Name	Status	Type of Presence
Bettongia penicillata Brush-tailed Bettong, Woylie [213]	Endangered	Species or species habitat may occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat may occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Acacia anomala Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat known to occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
Anthocercis gracilis Slender Tailflower [11103]	Vulnerable	Species or species habitat likely to occur within area
Banksia mimica Summer Honeypot [82765]	Endangered	Species or species habitat likely to occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Calytrix breviseta subsp. breviseta Swamp Starflower [23879]	Endangered	Species or species habitat known to occur within area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
Conospermum undulatum Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat likely to occur within area
Darwinia apiculata Scarp Darwinia [8763]	Endangered	Species or species habitat likely to occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
Lasiopetalum pterocarpum Wing-fruited Lasiopetalum [64922]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
Ptilotus pyramidatus Pyramid Mulla-mulla [18216]	Critically Endangered	Species or species habitat known to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat known to occur within area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat likely to occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Kenwick Wetlands	WA
Korung	WA
Lesmurdie Falls	WA
Unnamed WA23076	WA
Unnamed WA24657	WA
Unnamed WA29815	WA
Unnamed WA37997	WA

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species [Resource Information]

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

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

Name	Status	Type of Presence
		within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and		Species or species

Name	Status	Type of Presence
Sterile Pussy Willow [68497]		habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Brixton Street Swamps	WA

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.00957 116.00676

Acknowledgements

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

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

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

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

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APPENDIX B

DBCA Naturemap Report

NatureMap Species Report

Created By Guest user on 26/10/2017

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 116° 00' 26" E,32° 00' 41" S
Buffer 5km
Group By Kingdom

Kingdom	Species	Records
Animalia	395	9190
Fungi	23	45
Plantae	1063	3808
Protozoa	4	5
TOTAL	**1485**	**13048**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Animalia					
1.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
2.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
3.	24262	*Acanthiza inornata (Western Thornbill)*			
4.	24265	*Acanthiza uropygialis (Chestnut-rumped Thornbill)*			
5.	25242	*Acanthophis antarcticus (Southern Death Adder)*		P3	
6.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
7.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
8.	25536	*Accipiter fasciatus (Brown Goshawk)*			
9.	24282	*Accipiter fasciatus subsp. fasciatus (Brown Goshawk)*			
10.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
11.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
12.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
13.		*Agraptocorixa parvipunctata*			
14.		*Ainudrilus nharna*			
15.		*Alboa worooa*			
16.		*Allodessus bistrigatus*			
17.		*Alona affinis*			
18.		*Alona cf. guttata*			
19.		*Alona rigidicaudis*			
20.		*Alona setigera*			
21.		*Alonella clathratula*			
22.		*Aname mainae*			
23.		*Aname tepperi*			
24.	24312	*Anas gracilis (Grey Teal)*			
25.	24313	*Anas platyrhynchos (Mallard)*			
26.	24315	*Anas rhynchotis (Australasian Shoveler)*			
27.	24316	*Anas superciliosa (Pacific Black Duck)*			
28.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
29.		*Anisops thienemanni*			
30.		*Anopheles annulipes s.l.*			
31.		*Anser anser*			
32.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
33.	24561	*Anthochaera carunculata (Red Wattlebird)*			
34.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
35.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
36.		*Apsectrotanypus nr maculosa*			
37.	24285	*Aquila audax (Wedge-tailed Eagle)*			
38.		*Arachnura higginsi*			
39.		*Araneus cyphoxis*			
40.		*Araneus eburnus*			
41.	41324	*Ardea modesta (great egret, white egret)*		IA	
42.	24340	*Ardea novaehollandiae (White-faced Heron)*			
43.	24341	*Ardea pacifica (White-necked Heron)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
44.		*Arrenurus (Micruracarus) sp. 1 (SAP)*			
45.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
46.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
47.		*Artoria linnaei*			
48.		*Artoriopsis joergi*			
49.		*Austracantha minax*			
50.		*Austrolestes analis*			
51.		*Austrolestes io*			
52.	24318	*Aythya australis (Hardhead)*			
53.		*Backobourkia heroine*			
54.		*Ballarra longipalpus*			
55.		*Barnardius zonarius*			
56.		*Bennelongia sp.*			
57.		*Berosus approximans*			
58.		*Berosus australiae*			
59.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
60.		*Bezzia sp.*			
61.		*Bezzia sp. 2 (SAP)*			
62.	24319	*Biziura lobata (Musk Duck)*			
63.		*Boeckella bispinosa*			
64.		*Brachionus quadridentatus*			
65.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
66.	25713	*Cacatua galerita (Sulphur-crested Cockatoo)*			
67.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
68.	25715	*Cacatua roseicapilla (Galah)*			
69.	25716	*Cacatua sanguinea (Little Corella)*			
70.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*	Y		
71.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
72.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
73.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
74.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
75.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)*		T	
76.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
77.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
78.		*Candonocypris novaezelandiae*			
79.		*Ceinidae sp.*			
80.		*Cephalodella gibba*			
81.		*Ceratopogonidae sp.*			
82.		*Cercophonius granulosus*			
83.		*Cercophonius sulcatus*			
84.		*Ceriodaphnia sp.*			
85.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
86.		*Chaoboridae sp.*			
87.	43380	*Chelodina colliei (South-western Snake-necked Turtle)*			
88.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
89.	33939	*Cherax cainii (Marron)*			
90.		*Cherax destructor*			
91.		*Cherax quinquecarinatus*			
92.		*Chironominae sp.*			
93.	24980	*Christinus marmoratus (Marbled Gecko)*			
94.		*Chroicocephalus novaehollandiae*			
95.		*Chydorus sp.*			
96.	24288	*Circus approximans (Swamp Harrier)*			
97.		*Coenagrionidae sp.*			
98.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
99.	24399	*Columba livia (Domestic Pigeon)*	Y		
100.	24361	*Coracina maxima (Ground Cuckoo-shrike)*			
101.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
102.	24363	*Coracina novaehollandiae subsp. subpallida (Black-faced Cuckoo-shrike)*			
103.		*Corixidae sp.*			
104.		*Cormocephalus aurantiipes*			
105.		*Cormocephalus rubriceps*			
106.		*Cormocephalus strigosus*			
107.	25592	*Corvus coronoides (Australian Raven)*			
108.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
109.		*Corynoneura sp. (V49) (SAP)*			
110.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
111.	25595	*Cracticus tibicen (Australian Magpie)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
112.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
113.	25596	*Cracticus torquatus (Grey Butcherbird)*			
114.		*Cricotopus 'brevicornis'*			
115.	25398	*Crinia georgiana (Quacking Frog)*			
116.	25399	*Crinia glauerti (Clicking Frog)*			
117.	25400	*Crinia insignifera (Squelching Froglet)*			
118.	25401	*Crinia pseudinsignifera (Bleating Froglet)*			
119.	30893	*Cryptoblepharus buchananii*			
120.		*Cryptochironomus griseidorsum*			
121.	24883	*Ctenophorus ornatus (Ornate Crevice-Dragon)*			
122.	25027	*Ctenotus australis*			
123.	25039	*Ctenotus fallens*			
124.		*Culex (Culex) annulirostris*			
125.		*Culicoides sp.*			
126.	24322	*Cygnus atratus (Black Swan)*			
127.		*Cypretta sp.*			
128.		*Cyprinotus cingalensis*			
129.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
130.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
131.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
132.		*Delena cancerides*			
133.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
134.	24999	*Delma grayii*			
135.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
136.		*Diaphanosoma sp.*			
137.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
138.		*Dingosa serrata*			
139.		*Dinocambala ingens*			
140.	24939	*Diplodactylus polyophthalmus*			
141.		*Diptera sp.*			
142.		*Dolichopodidae sp.*			
143.		*Dunhevedia crassa*			
144.		*Dytiscidae sp.*			
145.	25096	*Egernia kingii (King's Skink)*			
146.		*Egretta novaehollandiae*			
147.		*Elanus axillaris*			
148.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
149.		*Eolophus roseicapillus*			
150.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
151.		*Ephydridae sp.*			
152.		*Eriophora biapicata*			
153.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
154.		*Euchlanis sp.*			
155.		*Eupograpta kottae*			
156.		*Eylais sp.*			
157.	25621	*Falco berigora (Brown Falcon)*			
158.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
159.	24472	*Falco cenchroides subsp. cenchroides (Australian Kestrel, Nankeen Kestrel)*			
160.	25623	*Falco longipennis (Australian Hobby)*			
161.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
162.	24041	*Felis catus (Cat)*	Y		
163.	25727	*Fulica atra (Eurasian Coot)*			
164.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
165.	30916	*Funambulus pennanti (Indian Palm Squirrel)*	Y		
166.	34028	*Galaxias occidentalis (Western Minnow)*			
167.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
168.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
169.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
170.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
171.		*Gallus gallus*			
172.	25530	*Gerygone fusca (Western Gerygone)*			
173.	24271	*Gerygone fusca subsp. fusca (Western Gerygone)*			
174.		*Glacidorbidae sp.*			Y
175.	47962	*Glyciphila melanops (Tawny-crowned Honeyeater)*			
176.		*Glyptophysa sp*			
177.	24443	*Grallina cyanoleuca (Magpie-lark)*			
178.		*Gripopterygidae sp.*			
179.	24295	*Haliastur sphenurus (Whistling Kite)*			
180.		*Haliplus gibbus*			
181.		*Hebridae sp.*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
182.	25409	*Heleioporus barycragus (Hooting Frog)*			
183.	25410	*Heleioporus eyrei (Moaning Frog)*			
184.		*Hemianax papuensis*			
185.		*Hemicordulia tau*			
186.		*Hemicorduliidae sp.*			
187.	25115	*Hemiergis initialis subsp. initialis*			
188.	25119	*Hemiergis quadrilineata*			
189.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
190.	47965	*Hieraaetus morphnoides (Little Eagle)*			
191.	25734	*Himantopus himantopus (Black-winged Stilt)*			
192.	24491	*Hirundo neoxena (Welcome Swallow)*			
193.		*Holasteron perth*			
194.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
195.		*Hydrophilidae sp.*			
196.		*Idiommata blackwalli*			
197.		*Ilyocryptus sp.*			
198.		*Ilyodromus sp.*			
199.		*Isidorella sp.*			
200.	25478	*Isoodon obesulus (Southern Brown Bandicoot)*		P4	
201.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P4	
202.		*Isopeda leishmanni*			
203.		*Isopedella cana*			
204.		*Lacrimicypris "drummondi" n.sp. (SAP)*			
205.		*Latonopsis brehmi*			
206.		*Latrodectus hasseltii*			
207.		*Leberis aenigmatosa*			
208.	33981	*Leioproctus bilobatus (short-tongued bee)*		P2	
209.	33983	*Leioproctus douglasiellus (short-tongued bee)*		T	
210.		*Leptoceridae sp.*			
211.	25131	*Lerista distinguenda*			
212.	25133	*Lerista elegans*			
213.	25005	*Lialis burtonis*			
214.		*Libellulidae sp.*			
215.	25661	*Lichmera indistincta (Brown Honeyeater)*			
216.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
217.		*Limbodessus shuckhardi*			
218.		*Limnadia sp.*			
219.		*Limnochares australica*			
220.		*Limnophyes vestitus (V41)*			
221.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
222.	25388	*Litoria moorei (Motorbike Frog)*			
223.		*Longepi woodman*			
224.		*Lophoictinia isura*			
225.		*Lycidas chlorophthalmus*			
226.		*Lycosa leuckartii*			
227.		*Lynceus sp.*			
228.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
229.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
230.		*Macrothrix sp.*			
231.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
232.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
233.	24551	*Malurus pulcherrimus (Blue-breasted Fairy-wren)*			
234.	25654	*Malurus splendens (Splendid Fairy-wren)*			
235.	24552	*Malurus splendens subsp. splendens (Splendid Fairy-wren)*			
236.	24583	*Manorina flavigula (Yellow-throated Miner)*			
237.		*Maraura macracantha (formerly Alona macrocantha)*			
238.		*Masasteron maini*			
239.	25758	*Megalurus gramineus (Little Grassbird)*			
240.		*Megaporus sp.*			
241.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
242.	24587	*Melithreptus chloropsis (Western White-naped Honeyeater)*			
243.	25184	*Menetia greyii*			
244.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
245.		*Mesocyclops brooksi*			
246.		*Microcarbo melanoleucos*			
247.		*Microcyclops varicans*			
248.		*Microvelia sp.*			
249.		*Missulena granulosa*			
250.		*Missulena occatoria*			
251.		*Mitzoruga insularis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
252.		*Monohelea sp. 1 (SAP)*			
253.		*Monohelea sp. 2 (SAP)*			
254.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
255.	24223	*Mus musculus (House Mouse)*	Y		
256.		*Myandra bicincta*			
257.	25420	*Myobatrachus gouldii (Turtle Frog)*			
258.		*Nannoperca vittata*			
259.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
260.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
261.		*Nematoda sp.*			
262.	25686	*Neochmia temporalis (Red-browed Finch)*	Y		
263.	24738	*Neophema elegans (Elegant Parrot)*			
264.	24739	*Neophema petrophila (Rock Parrot)*			
265.		*Nicodamus mainae*			
266.	25747	*Ninox connivens (Barking Owl)*			
267.	25252	*Notechis scutatus (Tiger Snake)*			
268.		*Notiasemus glauerti*			
269.		*Notonectidae sp.*			
270.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
271.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
272.		*Occiperipatoides gilesii*			
273.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
274.		*Oligochaeta sp.*			
275.		*Ommatoiulus moreletii*			
276.		*Onychohydrus sp.*			
277.		*Oribatida sp.*			
278.		*Orthocladiinae sp.*			
279.		*Orthocladiinae sp. C = V44 Gymnometriocnemus (SAP)*			
280.		*Oxyopes gracilipes*			
281.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
282.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
283.	24624	*Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)*			
284.		*Palaemonidae sp.*			
285.		*Paramerina levidensis*			
286.		*Paramphisopus palustris*			
287.	25253	*Parasuta gouldii*			
288.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
289.	25682	*Pardalotus striatus (Striated Pardalote)*			
290.	24628	*Pardalotus striatus subsp. murchisoni (Striated Pardalote)*			
291.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
292.	48060	*Petrochelidon ariel (Fairy Martin)*			
293.	48061	*Petrochelidon nigricans (Tree Martin)*			
294.	48066	*Petroica boodang (Scarlet Robin)*			
295.	24659	*Petroica goodenovii (Red-capped Robin)*			
296.	25697	*Phalacrocorax carbo (Great Cormorant)*			
297.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
298.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
299.	25699	*Phalacrocorax varius (Pied Cormorant)*			
300.	24409	*Phaps chalcoptera (Common Bronzewing)*			
301.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		T	
302.		*Phreatoicidae sp.*			
303.		*Phryganoporus gausapatus subsp. occidentalis*			Y
304.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
305.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
306.		*Physidae sp.*			
307.		*Planicirclus alticarinatus*			
308.		*Planorbidae sp.*			
309.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
310.	24842	*Platalea regia (Royal Spoonbill)*			
311.	25720	*Platycercus icterotis (Western Rosella)*			
312.	24745	*Platycercus icterotis subsp. icterotis (Western Rosella)*			
313.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
314.	24751	*Platycercus zonarius subsp. zonarius (Port Lincoln Parrot)*			
315.	25007	*Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)*			
316.	25703	*Podargus strigoides (Tawny Frogmouth)*			
317.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
318.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
319.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
320.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
321.		*Poltys laciniosus*			
322.		*Polygonarea repanda*			Y
323.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
324.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
325.	24771	*Porzana tabuensis (Spotless Crake)*			
326.		*Procladius paludicola*			
327.		*Procladius sp. (normal claws)*			
328.	25261	*Pseudechis australis (Mulga Snake)*			
329.	25345	*Pseudemydura umbrina (Western Swamp Tortoise, Western Swamp Turtle)*		T	
330.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
331.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
332.	25710	*Pterodroma macroptera (Great-winged Petrel)*			
333.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			
334.		*Purpureicephalus spurius*			
335.	24245	*Rattus rattus (Black Rat)*	Y		
336.		*Raveniella cirrata*			
337.		*Raveniella peckorum*			
338.		*Rhantus suturalis*			
339.	48096	*Rhipidura albiscapa (Grey Fantail)*			
340.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
341.	24199	*Scotorepens balstoni (Inland Broad-nosed Bat)*			
342.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
343.		*Simocephalus elizabethae*			
344.		*Simuliidae sp.*			
345.	30948	*Smicrornis brevirostris (Weebill)*			
346.		*Spencerhydrus sp.*			Y
347.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
348.		*Steatoda grossa*			
349.		*Sternopriscus sp.*			
350.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
351.		*Storena formosa*			
352.	24426	*Strepera versicolor subsp. plumbea (Grey Currawong)*			
353.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
354.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
355.	24943	*Strophurus spinigerus subsp. inornatus*			
356.	24942	*Strophurus spinigerus subsp. spinigerus*			
357.		*Supunna funerea*			
358.		*Tabanidae sp.*			
359.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
360.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
361.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
362.		*Tanypodinae sp.*			
363.		*Tanytarsus fuscithorax*			
364.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
365.		*Tasmanicosa leuckartii*			
366.		*Testudinella patina*			
367.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
368.	25519	*Tiliqua rugosa*			
369.	25204	*Tiliqua rugosa subsp. aspera*			
370.	25207	*Tiliqua rugosa subsp. rugosa*			
371.		*Tipulidae sp.*			
372.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
373.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
374.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
375.		*Trichocerca similis*			
376.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
377.	24755	*Trichoglossus haematodus subsp. moluccanus (Rainbow Lorikeet)*	Y		
378.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
379.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
380.		*Triplectides australis*			
381.		*Turbellaria sp.*			
382.	48147	*Turnix varius (Painted Button-quail)*			
383.	24852	*Tyto alba subsp. delicatula (Barn Owl)*			
384.	24983	*Underwoodisaurus milii (Barking Gecko)*			
385.		*Urodacus novaehollandiae*			
386.		*Urodacus planimanus*			
387.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
388.	25225	*Varanus rosenbergi (Heath Monitor)*			
389.	25526	*Varanus tristis (Racehorse Monitor)*			

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390.		*Venator immansueta*			
391.		*Venatrix arenaris*			
392.		*Venatrix pullastra*			
393.	24206	*Vespadelus regulus (Southern Forest Bat)*			
394.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
395.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
Fungi					
396.	45014	*Amanita quenda*		P1	
397.	43542	*Amanita wadjukiorum*		P3	
398.	38757	*Amanita xanthocephala*			
399.		*Boletus sp.*			
400.	38774	*Cortinarius archeri*			
401.		*Cortinarius sublargus*			Y
402.		*Dermocybe clelandii*			
403.	38784	*Descomyces albus*			
404.	27748	*Flavoparmelia rutidota*			
405.		*Fomitopsis lilacinogilva*			
406.		*Gymnopilus purpuratus*			
407.		*Hygrocybe astatogala*			Y
408.	38800	*Labyrinthomyces varius*			
409.		*Lactarius clarkeae*			
410.	38804	*Lactarius eucalypti*			
411.		*Phytophthora cinnamomi*			
412.	38825	*Pluteus pauperculus*			
413.	38836	*Russula erumpens*			
414.		*Scleroderma cepa*			
415.		*Tubaria rufofulva*			
416.	45896	*Ustilago bromivora*			
417.	45902	*Ustilago nuda*			
418.	45906	*Ustilago tepperi*			
Plantae					
419.	19708	*Abutilon grandifolium*	Y		
420.	15429	*Acacia alata var. alata*			
421.	3219	*Acacia anomala (Grass Wattle)*		T	
422.	3220	*Acacia aphylla (Leafless Rock Wattle)*		T	
423.	15466	*Acacia applanata*			
424.	3233	*Acacia barbinervis*			
425.	3294	*Acacia dentifera*			
426.	11926	*Acacia drewiana subsp. drewiana*			
427.	3373	*Acacia horridula*		P3	
428.	3374	*Acacia huegelii*			
429.	3382	*Acacia incrassata*			
430.	3409	*Acacia lasiocarpa (Panjang)*			
431.	11611	*Acacia lasiocarpa var. lasiocarpa*			
432.	3454	*Acacia nervosa (Rib Wattle)*			
433.	3464	*Acacia obovata*			
434.	14131	*Acacia oncinophylla subsp. patulifolia*		P4	
435.	17860	*Acacia podalyriifolia*	Y		
436.	3502	*Acacia pulchella (Prickly Moses)*			
437.	15481	*Acacia pulchella var. glaberrima*			
438.	15483	*Acacia pulchella var. pulchella*			
439.	30033	*Acacia saligna subsp. lindleyi*			
440.	3541	*Acacia sessilis*			
441.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
442.	3574	*Acacia teretifolia*			
443.	3602	*Acacia willdenowiana (Grass Wattle)*			
444.	1205	*Acanthocarpus canaliculatus*			
445.	7811	*Acanthospermum hispidum (Starburr)*	Y		
446.	6205	*Actinotus leucocephalus (Flannel Flower)*			
447.	14970	*Adenanthos barbiger*			
448.	1775	*Adenanthos cygnorum (Common Woollybush)*			
449.	11837	*Adenanthos cygnorum subsp. cygnorum (Common Woollybush)*			
450.	18396	*Aeonium haworthii*	Y		
451.	1505	*Agave americana (Century Plant)*	Y		
452.	5316	*Agonis flexuosa (Peppermint, Wonil)*			
453.	179	*Agrostis gigantea (Redtop Bent)*	Y		
454.	23474	*Agrostocrinum hirsutum*			
455.	1261	*Agrostocrinum scabrum (Blue Grass Lily)*			
456.	23501	*Agrostocrinum scabrum subsp. scabrum*			

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457.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
458.	185	*Aira cupaniana (Silvery Hairgrass)*	Y		
459.	1056	*Alexgeorgea nitens*			
460.	1374	*Allium ampeloprasum*	Y		
461.	1728	*Allocasuarina fraseriana (Sheoak, Kondil)*			
462.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
463.	1734	*Allocasuarina microstachya*			
464.	2648	*Alternanthera denticulata (Lesser Joyweed)*			
465.	7820	*Ambrosia artemisiifolia (Annual Ragweed, Bitterweed, Hay-feverweed, Hog-weed)*	Y		
466.	7821	*Ambrosia psilostachya (Perennial Ragweed)*	Y		
467.	13380	*Amphibromus nervosus*			
468.	197	*Amphipogon debilis*			
469.	199	*Amphipogon strictus (Greybeard Grass)*			
470.	200	*Amphipogon turbinatus*			
471.	1058	*Anarthria gracilis*			
472.	1059	*Anarthria humilis*			
473.	1060	*Anarthria laevis*			
474.	6300	*Andersonia aristata (Rice Flower)*			
475.	6309	*Andersonia gracilis*		T	
476.	6312	*Andersonia involucrata*			
477.	6314	*Andersonia lehmanniana*			
478.	11471	*Andersonia lehmanniana subsp. lehmanniana*			
479.	7833	*Angianthus preissianus*			
480.	1406	*Anigozanthos bicolor (Little Kangaroo Paw)*			
481.	11470	*Anigozanthos bicolor subsp. bicolor*			
482.	1409	*Anigozanthos humilis (Catspaw)*			
483.	11434	*Anigozanthos humilis subsp. humilis*			
484.	1411	*Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)*			
485.	11261	*Anigozanthos manglesii subsp. manglesii*			
486.	1416	*Anigozanthos viridis (Green Kangaroo Paw, Kurulbardang)*			
487.	11566	*Anigozanthos viridis subsp. viridis*			
488.	6946	*Anthocercis gracilis (Slender Tailflower)*		T	
489.	12724	*Anthotium junciforme*			
490.	202	*Anthoxanthum odoratum (Sweet Vernal Grass)*	Y		
491.	3686	*Aotus cordifolia*			
492.	1116	*Aphelia brizula*			
493.	1117	*Aphelia cyperoides*			
494.	1118	*Aphelia drummondii*			
495.	43548	*Aphelia sp. Albany (B.G. Briggs 596)*			
496.	141	*Aponogeton hexatepalus (Stalked Water Ribbons)*		P4	
497.	32314	*Archidium rehmannii*			
498.	7838	*Arctotheca calendula (Cape Weed, African Marigold)*	Y		
499.	1264	*Arnocrinum preissii*			
500.	28288	*Artemisia arborescens (Silver Wormwood)*	Y		
501.	1364	*Asphodelus fistulosus (Onion Weed)*	Y		
502.	20350	*Astartea affinis (West-coast Astartea)*			
503.	20283	*Astartea scoparia (Common Astartea)*			
504.		*Asterella drummondii*			
505.	6323	*Astroloma ciliatum (Candle Cranberry)*			
506.	6327	*Astroloma foliosum (Candle Cranberry)*			
507.	6334	*Astroloma pallidum (Kick Bush)*			
508.	6337	*Astroloma stomarrhena (Red Swamp Cranberry)*			
509.	38480	*Austrostipa bronwenae*		T	
510.	17233	*Austrostipa campylachne*			
511.	17234	*Austrostipa compressa*			
512.	17241	*Austrostipa hemipogon*			
513.	17245	*Austrostipa mollis*			
514.	17254	*Austrostipa tenuifolia*			
515.	17257	*Austrostipa variabilis*			
516.	231	*Avellinia michelii*	Y		
517.	233	*Avena barbata (Bearded Oat)*	Y		
518.	20013	*Axonopus fissifolius*	Y		
519.	18279	*Babiana angustifolia*	Y		
520.	36441	*Babingtonia camphorosmae (Camphor Myrtle)*			
521.	45403	*Babingtonia pelloeae (Pelloe's Babingtonia)*			
522.	45402	*Babingtonia urbana (Coastal Plain Babingtonia)*		P3	
523.	1382	*Baeometra uniflora*	Y		
524.	32682	*Banksia armata var. armata*			
525.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
526.	32580	*Banksia dallanneyi var. dallanneyi*			

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527.	32577	*Banksia dallanneyi var. mellicula*			
528.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
529.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
530.	1823	*Banksia incana*			
531.	33399	*Banksia incana var. incana*			
532.	1834	*Banksia menziesii (Firewood Banksia)*			
533.	32211	*Banksia mimica (Summer Honeypot)*		T	
534.	32202	*Banksia nivea (Honeypot Dryandra, Pudjarn)*			
535.	32138	*Banksia pteridifolia subsp. vernalis*		P3	
536.	32080	*Banksia sessilis var. sessilis*			
537.	1852	*Banksia telmatiaea (Swamp Fox Banksia)*			
538.	32031	*Banksia vestita (Summer Dryandra)*			
539.	1855	*Banksia victoriae (Woolly Orange Banksia)*			
540.	32315	*Barbula calycina*			
541.	32321	*Bartramia breutelii*			
542.	32323	*Bartramia pseudostricta*			
543.	15037	*Bartsia trixago*	Y		
544.	740	*Baumea arthrophylla*			
545.	743	*Baumea juncea (Bare Twigrush)*			
546.	747	*Baumea rubiginosa*			
547.	5387	*Beaufortia macrostemon (Darling Range Beaufortia)*			
548.	5393	*Beaufortia squarrosa (Sand Beaufortia, Sand Bottlebrush, Puno)*			
549.	4413	*Boronia crenulata (Aniseed Boronia)*			
550.	16636	*Boronia crenulata subsp. viminea*			
551.	11503	*Boronia crenulata var. crenulata*			
552.	4414	*Boronia cymosa (Granite Boronia)*			
553.	4432	*Boronia ovata*			
554.	4438	*Boronia ramosa*			
555.	11381	*Boronia ramosa subsp. anethifolia*			
556.	11564	*Boronia ramosa subsp. ramosa*			
557.	4444	*Boronia tenuis (Blue Boronia)*		P4	
558.	1272	*Borya scirpoidea*			
559.	1273	*Borya sphaerocephala (Pincushions)*			
560.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
561.	3714	*Bossiaea ornata (Broad Leaved Brown Pea)*			
562.	7867	*Brachyscome bellidioides*			
563.	3000	*Brassica tournefortii (Mediterranean Turnip)*	Y		
564.	244	*Briza maxima (Blowfly Grass)*	Y		
565.	245	*Briza minor (Shivery Grass)*	Y		
566.	249	*Bromus diandrus (Great Brome)*	Y		
567.	250	*Bromus hordeaceus (Soft Brome)*	Y		
568.	1366	*Bulbine semibarbata (Leek Lily)*			
569.	1383	*Burchardia bairdiae*			
570.	12770	*Burchardia congesta*			
571.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
572.	3178	*Byblis gigantea (Rainbow Plant)*		P3	
573.	1276	*Caesia micrantha (Pale Grass Lily)*			
574.	1277	*Caesia occidentalis*			
575.	15330	*Caladenia arenicola*			
576.	44900	*Caladenia denticulata subsp. rubella*			
577.	1590	*Caladenia ferruginea (Rusty Spider Orchid)*			
578.	1592	*Caladenia flava (Cowslip Orchid)*			
579.	15348	*Caladenia flava subsp. flava*			
580.	13859	*Caladenia longicauda subsp. clivicola*			
581.	15365	*Caladenia longicauda subsp. longicauda*			
582.	17760	*Caladenia nobilis*			
583.	15503	*Caladenia paludosa*			
584.	2854	*Calandrinia granulifera (Pygmy Purslane)*			
585.	2856	*Calandrinia liniflora (Parakeelya)*			
586.	20096	*Calandrinia sp. Piawaning (A.C. Beauglehole 12257)*		P1	
587.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
588.	1214	*Calectasia grandiflora (Blue Tinsel Lily)*			
589.	19309	*Calectasia narragara*			
590.	4717	*Callitriche stagnalis (Common Starwort)*	Y		
591.	36520	*Callitris acuminata (Dwarf Cypress)*			
592.	36600	*Callitris pyramidalis (Swamp Cypress)*			
593.	5411	*Calothamnus hirsutus*			
594.	5426	*Calothamnus quadrifidus (One-sided Bottlebrush, Kwowdjard)*			
595.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			
596.	5428	*Calothamnus rupestris (Mouse Ears)*			

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597.	5431	*Calothamnus torulosus*			
598.	5437	*Calytrix acutifolia*			
599.	5439	*Calytrix angulata (Yellow Starflower)*			
600.	5441	*Calytrix aurea*			
601.	13653	*Calytrix breviseta subsp. breviseta*		T	
602.	5458	*Calytrix flavescens (Summer Starflower)*			
603.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
604.	5461	*Calytrix glutinosa*			
605.	5485	*Calytrix variabilis*			
606.	19713	*Campsis radicans*	Y		
607.	32461	*Campylopus bicolor var. bicolor*			
608.	32338	*Campylopus introflexus*	Y		
609.	11351	*Cassytha aurea var. hirta*			
610.	2951	*Cassytha flava (Dodder Laurel)*			
611.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
612.	11501	*Cassytha glabella forma casuarinae*			
613.	2956	*Cassytha pomiformis (Dodder Laurel)*			
614.	2957	*Cassytha racemosa (Dodder Laurel)*			
615.	11242	*Cassytha racemosa forma pilosa*			
616.	11799	*Cassytha racemosa forma racemosa*			
617.	760	*Caustis dioica*			
618.	6539	*Centaurium erythraea (Common Centaury)*	Y		
619.	7918	*Centipeda cunninghamii (Common Sneezewood, Gukwonderuk, Old Man Weed)*			
620.		*Centratherum punctatum*			
621.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
622.	1123	*Centrolepis caespitosa*		P4	
623.	1125	*Centrolepis drummondiana*			
624.	1129	*Centrolepis glabra (Smooth Centrolepis)*			
625.	1131	*Centrolepis inconspicua*			
626.	43642	*Centrolepis sp. Kalannie (B.J. Lepschi et al. BJL 3517)*			
627.	17685	*Chaetanthus aristatus*			
628.	1280	*Chamaescilla corymbosa (Blue Squill)*			
629.	11299	*Chamaescilla corymbosa var. corymbosa*			
630.	19338	*Chamaescilla gibsonii*		P3	
631.	8788	*Chamaescilla versicolor*			
632.	1513	*Chasmanthe floribunda (African Cornflag)*	Y		
633.	31	*Cheilanthes austrotenuifolia*			
634.	3169	*Cheiranthera preissiana*			
635.	17706	*Chordifex sinuosus*			
636.	763	*Chorizandra enodis (Black Bristlerush)*			
637.	764	*Chorizandra multiarticulata*			
638.	3753	*Chorizema dicksonii (Yellow-eyed Flame Pea)*			
639.	11900	*Chrysanthemoides monilifera subsp. monilifera*	Y		
640.	6543	*Cicendia filiformis (Slender Cicendia)*	Y		
641.	7370	*Citrullus lanatus (Pie Melon)*	Y		
642.	2929	*Clematis pubescens (Common Clematis)*			
643.	32999	*Colocasia esculenta var. esculenta*	Y		
644.	4550	*Comesperma calymega (Blue-spike Milkwort)*			
645.	4551	*Comesperma ciliatum*			
646.	14663	*Comesperma griffinii*		P2	
647.	4560	*Comesperma rhadinocarpum (Slender-fruited Comesperma)*		P2	
648.	4564	*Comesperma virgatum (Milkwort)*			
649.	40864	*Commersonia cygnorum*			
650.	15607	*Conospermum acerosum subsp. acerosum*			
651.	15041	*Conospermum canaliculatum*			
652.	16853	*Conospermum capitatum subsp. glabratum*			
653.	1875	*Conospermum huegelii (Slender Smokebush)*			
654.	1882	*Conospermum stoechadis (Common Smokebush)*			
655.	1885	*Conospermum triplinervium (Tree Smokebush)*			
656.	13999	*Conospermum undulatum*		T	
657.	6347	*Conostephium minus (Pink-tipped Pearl flower)*			
658.	6348	*Conostephium pendulum (Pearl Flower)*			
659.	6349	*Conostephium preissii*			
660.	11826	*Conostylis aculeata subsp. aculeata*			
661.	12109	*Conostylis aculeata subsp. preissii*			
662.	1420	*Conostylis androstemma (Trumpets)*			
663.	1423	*Conostylis aurea (Golden Conostylis)*			
664.	1429	*Conostylis caricina*			
665.	12035	*Conostylis caricina subsp. caricina*			
666.	1434	*Conostylis festucacea*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
667.	11695	*Conostylis festucacea subsp. festucacea*			
668.	1436	*Conostylis juncea*			
669.	1437	*Conostylis latens*			
670.	11388	*Conostylis pauciflora subsp. euryrhipis*		P4	
671.	1454	*Conostylis setigera (Bristly Cottonhead)*			
672.	11597	*Conostylis setigera subsp. setigera*			
673.	1455	*Conostylis setosa (White Cottonhead)*			
674.	5502	*Conothamnus trinervis*			
675.	20074	*Conyza sumatrensis*	Y		
676.	48259	*Cortaderia selloana subsp. selloana*	Y		
677.	17104	*Corymbia calophylla (Marri)*			
678.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
679.	13354	*Craspedia variabilis*			
680.	17701	*Crassula closiana*			
681.	3137	*Crassula colorata (Dense Stonecrop)*			
682.	11563	*Crassula colorata var. colorata*			
683.	3138	*Crassula decumbens (Rufous Stonecrop)*			
684.	3142	*Crassula natans*	Y		
685.	18397	*Crassula tetragona subsp. robusta*	Y		
686.	29054	*Crepis foetida subsp. foetida (Stinking Hawksbeard)*	Y		
687.	35838	*Cristonia biloba subsp. biloba*			
688.	13470	*Cryptandra arbutiflora var. arbutiflora*			
689.	4809	*Cryptandra pungens*			
690.	11021	*Cuscuta planiflora*	Y		
691.	15114	*Cyanicula gemmata*			
692.	15404	*Cyanicula sericea*			
693.	51	*Cyathea cooperi*	Y		
694.	768	*Cyathochaeta avenacea*			
695.	769	*Cyathochaeta clandestina*			
696.	17618	*Cyathochaeta equitans*			
697.	40661	*Cycnogeton lineare*			
698.	283	*Cynodon dactylon (Couch)*	Y		
699.	285	*Cynosurus echinatus (Rough Dogstail)*	Y		
700.	783	*Cyperus congestus (Dense Flat-sedge)*	Y		
701.	18198	*Cyperus papyrus*	Y		
702.	815	*Cyperus tenellus (Tiny Flatsedge)*	Y		
703.	816	*Cyperus tenuiflorus (Scaly Sedge)*	Y		
704.	17692	*Cytogonidium leptocarpoides*			
705.	7420	*Dampiera alata (Winged-stem Dampiera)*			
706.	7428	*Dampiera coronata (Wedge-leaved Dampiera)*			
707.	7454	*Dampiera linearis (Common Dampiera)*			
708.	7462	*Dampiera pedunculata*			
709.	5505	*Darwinia apiculata (Scarp Darwinia)*		T	
710.	5508	*Darwinia citriodora (Lemon-scented Darwinia)*			
711.	18193	*Darwinia thymoides subsp. thymoides*			
712.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
713.	1220	*Dasypogon obliquifolius*			
714.	6218	*Daucus glochidiatus (Australian Carrot)*			
715.	3793	*Daviesia angulata*			
716.	3799	*Daviesia cordata (Bookleaf)*			
717.	3805	*Daviesia decurrens (Prickly Bitter-pea)*			
718.	19747	*Daviesia decurrens subsp. decurrens*			
719.	18560	*Daviesia divaricata subsp. divaricata*			
720.	3815	*Daviesia horrida (Prickly Bitter-pea)*			
721.	3824	*Daviesia nudiflora*			
722.	3832	*Daviesia physodes*			
723.	3834	*Daviesia polyphylla*			
724.	3839	*Daviesia rhombifolia*			
725.	3845	*Daviesia triflora*			
726.	17336	*Dennstaedtia davallioides*	Y		Y
727.	17663	*Desmocladus asper*			
728.	17691	*Desmocladus fasciculatus*			
729.	11636	*Dianella revoluta var. divaricata*			
730.	1287	*Dichopogon capillipes*			
731.	32345	*Didymodon australasiae*			
732.	17838	*Dielsia stenostachya*			
733.	311	*Digitaria ciliaris (Summer Grass)*	Y		
734.	316	*Digitaria longiflora*			
735.	320	*Digitaria sanguinalis (Crab Grass)*	Y		
736.	1509	*Dioscorea hastifolia (Warrine, Wararn)*			

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737.	18589	*Diplopeltis huegelii subsp. lehmannii*			
738.	3867	*Dipogon lignosus (Dolichos Pea)*	Y		
739.	19649	*Disa bracteata*	Y		
740.	32347	*Ditrichum difficile*			
741.	7961	*Dittrichia graveolens (Stinkwort)*	Y		
742.	12943	*Diuris brumalis*			
743.	11049	*Diuris corymbosa*			
744.	1634	*Diuris laxiflora (Bee Orchid)*			
745.	1637	*Diuris purdiei (Purdie's Donkey Orchid)*		T	
746.	4757	*Dodonaea ceratocarpa*			
747.	15406	*Drakaea gracilis*			
748.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
749.	13211	*Drosera erythrorhiza subsp. collina*			
750.	3097	*Drosera gigantea (Giant Sundew)*			
751.	15453	*Drosera gigantea subsp. gigantea*			
752.	3098	*Drosera glanduligera (Pimpernel Sundew)*			
753.	13195	*Drosera helodes*			
754.	3101	*Drosera heterophylla (Swamp Rainbow)*			
755.	13197	*Drosera hyperostigma*			
756.	3106	*Drosera macrantha (Bridal Rainbow)*			
757.	14298	*Drosera macrantha subsp. macrantha*			
758.	3109	*Drosera menziesii (Pink Rainbow)*			
759.	11853	*Drosera menziesii subsp. menziesii*			
760.	13216	*Drosera menziesii subsp. penicillaris*			
761.	3110	*Drosera microphylla (Golden Rainbow)*			
762.	3115	*Drosera occidentalis (Western Sundew)*			
763.	13191	*Drosera occidentalis subsp. occidentalis*		P4	
764.	3118	*Drosera pallida (Pale Rainbow)*			
765.	3123	*Drosera platystigma (Black-eyed Sundew)*			
766.	3125	*Drosera pycnoblasta (Pearly Sundew)*			
767.	8911	*Drosera rosulata*			
768.	3131	*Drosera stolonifera (Leafy Sundew)*			
769.	3135	*Drosera zonaria (Painted Sundew)*			
770.	33500	*Dysphania ambrosioides (Mexican Tea)*	Y		
771.	7374	*Ecballium elaterium (Squirting Cucumber)*	Y		
772.	32351	*Eccremidium pulchellum*			
773.	328	*Echinochloa colona (Awnless Barnyard Grass)*	Y		
774.	11105	*Echinochloa crus-galli*	Y		
775.	329	*Echinochloa crus-pavonis (South American Barnyard Grass)*	Y		
776.	16093	*Echinochloa esculenta*	Y		
777.	8450	*Eclipta prostrata*	Y		
778.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
779.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
780.	5187	*Elatine gratioloides (Waterwort)*			
781.	822	*Eleocharis acuta (Common Spikerush)*			
782.	17605	*Eleocharis keigheryi*		T	
783.	352	*Eleusine coracan (Indian Millet)*	Y		
784.	353	*Eleusine indica (Crowsfoot Grass)*	Y		
785.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
786.	32353	*Entosthodon apophysatus*			
787.	32354	*Entosthodon productus*			
788.	374	*Eragrostis cilianensis (Stinkgrass)*	Y		
789.	376	*Eragrostis curvula (African Lovegrass)*	Y		
790.	379	*Eragrostis elongata (Clustered Lovegrass)*			
791.		*Eragrostis sp.*			
792.	5540	*Eremaea fimbriata*			
793.	5541	*Eremaea pauciflora*			
794.	14103	*Eremaea pauciflora var. calyptra*			
795.	14104	*Eremaea pauciflora var. pauciflora*			
796.	17150	*Eremophila glabra subsp. chlorella*		T	
797.	15414	*Eriochilus helonomos*			
798.	6219	*Eryngium pinnatifidum (Blue Devils)*			
799.	41801	*Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)*		P3	
800.	15446	*Eryngium pinnatifidum subsp. pinnatifidum*			
801.	41810	*Eryngium sp. Subdecumbens (G.J. Keighery 5390)*		P3	
802.	18299	*Erythrina x sykesii*	Y		
803.	5580	*Eucalyptus camaldulensis (River Gum, Yabalinyba)*			
804.	5708	*Eucalyptus marginata (Jarrah, Djara)*			
805.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			
806.	13548	*Eucalyptus marginata subsp. thalassica (Blue-leaved Jarrah)*			

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807.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
808.	5797	*Eucalyptus wandoo (Wandoo, Wondu)*			
809.	12906	*Eucalyptus wandoo subsp. wandoo*			
810.	3872	*Euchilopsis linearis (Swamp Pea)*			
811.	3880	*Eutaxia virgata*			
812.	32367	*Fissidens megalotis*			
813.	32368	*Fissidens taylorii*			
814.	32469	*Fissidens taylorii var. taylorii*			
815.		*Fossombronia altilamellosa*			
816.	2969	*Fumaria capreolata (Whiteflower Fumitory)*	Y		
817.	31532	*Fumaria muralis subsp. muralis*	Y		
818.		*Fumaria sp.*			
819.	32370	*Funaria hygrometrica*			
820.	900	*Gahnia aristata*			
821.	907	*Gahnia trifida (Coast Saw-sedge)*			
822.	7321	*Galium divaricatum*	Y		
823.	3887	*Gastrolobium acutum*			
824.	20475	*Gastrolobium capitatum*			
825.	20483	*Gastrolobium linearifolium*			
826.	3912	*Gastrolobium oxylobioides (Champion Bay Poison)*			
827.	3923	*Gastrolobium spathulatum (Poison Bush)*			
828.	16311	*Gazania linearis*	Y		
829.	32374	*Gemmabryum cheelii*			
830.	32375	*Gemmabryum chrysoneuron*			
831.	32379	*Gemmabryum inaequale*			
832.	32380	*Gemmabryum pachythecum*			
833.	32381	*Gemmabryum preissianum*			
834.	32383	*Gemmabryum sullivanii*			
835.	3936	*Genista linifolia (Flaxleaf Broom)*	Y		
836.	32384	*Gigaspermum repens*			
837.	18298	*Gladiolus carneus*	Y		
838.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
839.	6143	*Glischrocaryon aureum (Common Popflower)*			
840.	6587	*Gomphocarpus fruticosus (Narrowleaf Cottonbush)*	Y		
841.	11051	*Gomphocarpus physocarpus*	Y		
842.	10909	*Gompholobium confertum*			
843.	3950	*Gompholobium knightianum*			
844.	3951	*Gompholobium marginatum*			
845.	3954	*Gompholobium polymorphum*			
846.	3955	*Gompholobium preissii*			
847.	3956	*Gompholobium shuttleworthii*			
848.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
849.	6149	*Gonocarpus cordiger*			
850.	6159	*Gonocarpus nodulosus*			
851.	6160	*Gonocarpus paniculatus*			
852.	6161	*Gonocarpus pithyoides*			
853.	29362	*Goodenia coerulea*			
854.	12520	*Goodenia fasciculata*			
855.	7517	*Goodenia incana (Hoary Goodenia)*			
856.	12551	*Goodenia micrantha*			
857.	7538	*Goodenia pulchella*			
858.	19286	*Goodenia pulchella subsp. Coastal Plain A (M. Hislop 634)*			
859.	19284	*Goodenia pulchella subsp. Coastal Plain B (L.W. Sage 2336)*			
860.	14282	*Gratiola pubescens*			
861.	1964	*Grevillea bipinnatifida (Fuchsia Grevillea)*			
862.	19628	*Grevillea bipinnatifida subsp. bipinnatifida*			
863.	1997	*Grevillea endlicheriana (Spindly Grevillea)*			
864.	13450	*Grevillea manglesii subsp. manglesii*			
865.	2066	*Grevillea pilulifera (Woolly-flowered Grevillea)*			
866.	15839	*Grevillea preissii subsp. preissii*			
867.	2080	*Grevillea quercifolia (Oak-leaf Grevillea)*			
868.	2101	*Grevillea synapheae (Catkin Grevillea)*			
869.	2107	*Grevillea thelemanniana (Spider Net Grevillea)*			
870.	2122	*Grevillea wilsonii (Native Fuchsia)*			
871.	1465	*Haemodorum discolor*			
872.	1468	*Haemodorum laxum*			
873.	1469	*Haemodorum loratum*		P3	
874.	1472	*Haemodorum simplex*			
875.	1474	*Haemodorum sparsiflorum*			
876.	2128	*Hakea amplexicaulis (Prickly Hakea)*			

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877.	2136	*Hakea candolleana*			
878.	2137	*Hakea ceratophylla (Horned Leaf Hakea)*			
879.	2143	*Hakea conchifolia (Shell-leaved Hakea)*			
880.	2152	*Hakea cyclocarpa (Ramshorn)*			
881.	2158	*Hakea erinacea (Hedge-hog Hakea)*			
882.	2166	*Hakea incrassata (Marble Hakea)*			
883.	2175	*Hakea lissocarpha (Honey Bush)*			
884.	2185	*Hakea myrtoides (Myrtle Hakea)*			
885.	2197	*Hakea prostrata (Harsh Hakea)*			
886.	2203	*Hakea ruscifolia (Candle Hakea)*			
887.	31793	*Hakea sp. Eastern coastal plain (G.J. Keighery 8014)*			
888.	2206	*Hakea stenocarpa (Narrow-fruited Hakea)*			
889.	2212	*Hakea sulcata (Furrowed Hakea)*			
890.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
891.	2215	*Hakea undulata (Wavy-leaved Hakea)*			
892.	2216	*Hakea varia (Variable-leaved Hakea)*			
893.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
894.	3016	*Heliophila pusilla*	Y		
895.	6838	*Hemiandra linearis (Speckled Snakebush)*			
896.	6839	*Hemiandra pungens (Snakebush)*			
897.	6856	*Hemigenia incana (Silky Hemigenia)*			
898.	41020	*Hemiphora bartlingii (Woolly Dragon)*			
899.	1526	*Hesperantha falcata*	Y		
900.	5108	*Hibbertia acerosa (Needle Leaved Guinea Flower)*			
901.	5112	*Hibbertia aurea*			
902.	5114	*Hibbertia commutata*			
903.	19778	*Hibbertia glomerata subsp. darlingensis*			
904.	5134	*Hibbertia huegelii*			
905.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
906.	45534	*Hibbertia hypericoides subsp. hypericoides*			
907.	5146	*Hibbertia montana*		P4	
908.	5148	*Hibbertia mylnei*			
909.	5152	*Hibbertia ovata*			
910.	5155	*Hibbertia pilosa (Hairy Guinea Flower)*			
911.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
912.	5169	*Hibbertia serrata (Serrate Leaved Guinea Flower)*			
913.		*Hibbertia sp.*			
914.	5171	*Hibbertia spicata*			
915.	11481	*Hibbertia spicata subsp. spicata*			
916.	48381	*Hibbertia striata*			
917.	444	*Holcus lanatus (Yorkshire Fog)*	Y		
918.	6222	*Homalosciadium homalocarpum*			
919.	451	*Hordeum vulgare (Barley)*	Y		
920.	3964	*Hovea chorizemifolia (Holly-leaved Hovea)*			
921.	3966	*Hovea pungens (Devil's Pins, Puyenak)*			
922.	3968	*Hovea trisperma (Common Hovea)*			
923.	12859	*Hovea trisperma var. trisperma*			
924.	18296	*Humulus lupulus*	Y		
925.	12741	*Hyalosperma cotula*			
926.	5216	*Hybanthus calycinus (Wild Violet)*			
927.	6223	*Hydrocotyle alata*			
928.	6226	*Hydrocotyle callicarpa (Small Pennywort)*			
929.	6229	*Hydrocotyle diantha*			
930.	6233	*Hydrocotyle lemnoides (Aquatic Pennywort)*		P4	
931.	452	*Hyparrhenia hirta (Tambookie Grass)*	Y		
932.	5817	*Hypocalymma angustifolium (White Myrtle, Kudjid)*			
933.	35070	*Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)*			
934.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
935.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
936.	1070	*Hypolaena exsulca*			
937.	17841	*Hypolaena pubescens*			
938.	910	*Isolepis cernua (Nodding Club-rush)*			
939.	20199	*Isolepis cernua var. cernua*			
940.	20200	*Isolepis cernua var. setiformis*			
941.	912	*Isolepis cyperoides*			
942.	14540	*Isolepis hystrix*	Y		
943.	917	*Isolepis marginata (Coarse Club-rush)*			
944.	919	*Isolepis oldfieldiana*			
945.	2221	*Isopogon asper*			
946.	29775	*Isopogon drummondii*		P3	

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947.	2229	*Isopogon dubius (Pincushion Coneflower)*			
948.	2237	*Isopogon sphaerocephalus (Drumstick Isopogon)*			
949.	7396	*Isotoma hypocrateriformis (Woodbridge Poison)*			
950.	7398	*Isotoma pusilla (Small Isotome)*			
951.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
952.	16317	*Isotropis cuneifolia subsp. glabra*		P2	
953.	1533	*Ixia paniculata*	Y		
954.	1534	*Ixia polystachya (Variable Ixia)*	Y		
955.	3997	*Jacksonia alata*			
956.	3998	*Jacksonia angulata*			
957.	4010	*Jacksonia floribunda (Holly Pea)*			
958.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
959.	4018	*Jacksonia lehmannii*			
960.	4025	*Jacksonia restioides*			
961.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
962.	1298	*Johnsonia pubescens (Pipe Lily)*			
963.	19632	*Johnsonia pubescens subsp. pubescens*			
964.	1177	*Juncus articulatus (Jointed Rush)*	Y		
965.	1180	*Juncus capitatus (Capitate Rush)*	Y		
966.	1188	*Juncus pallidus (Pale Rush)*			
967.	4037	*Kennedia coccinea (Coral Vine)*			
968.	4044	*Kennedia prostrata (Scarlet Runner)*			
969.	4045	*Kennedia stirlingii (Bushy Kennedia)*			
970.	1221	*Kingia australis (Kingia, Pulonok)*			
971.	5832	*Kunzea ericifolia (Spearwood, Pondil)*			
972.	15498	*Kunzea glabrescens (Spearwood)*			
973.	5835	*Kunzea micrantha*			
974.	17461	*Kunzea micrantha subsp. micrantha*			
975.	3669	*Labichea punctata (Lance-leaved Cassia)*			
976.	20019	*Lachnagrostis filiformis*			
977.	19955	*Lachnagrostis plebeia*			
978.	29046	*Lactuca serriola forma serriola*	Y		
979.	2249	*Lambertia multiflora (Many-flowered Honeysuckle)*			
980.	14083	*Lambertia multiflora var. darlingensis*			
981.	28342	*Landoltia punctata (Thin Duckweed)*			
982.	5025	*Lasiopetalum bracteatum (Helena Velvet Bush)*		P4	
983.	45081	*Lasiopetalum glutinosum subsp. glutinosum*		P3	
984.	4047	*Lathyrus tingitanus (Tangier Pea)*	Y		
985.	4959	*Lawrencia squamata*			
986.	1307	*Laxmannia ramosa (Branching Lily)*			
987.	11911	*Laxmannia ramosa subsp. ramosa*			
988.	11464	*Laxmannia sessiliflora subsp. australis*			
989.	1309	*Laxmannia squarrosa*			
990.	7568	*Lechenaultia biloba (Blue Leschenaultia)*			
991.	1051	*Lemna disperma (Duckweed)*			
992.	925	*Lepidosperma angustatum*			
993.	42741	*Lepidosperma apricola*			
994.	936	*Lepidosperma leptostachyum*			
995.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
996.	940	*Lepidosperma pubisquameum*			
997.	942	*Lepidosperma rostratum*		T	
998.	944	*Lepidosperma scabrum*			
999.		*Lepidosperma sp.*			
1000.	29150	*Lepidosperma sp. Margaret River (B.J. Lepschi 1841)*			
1001.	16284	*Lepidosperma sp. P1 small head (M.D. Tindale 166A)*			
1002.	949	*Lepidosperma tuberculatum*			
1003.	118	*Lepilaena australis (Austral Water Mat)*			
1004.	1653	*Leporella fimbriata (Hare Orchid)*			
1005.	1077	*Leptocarpus canus (Hoary Twine-rush)*			
1006.	1078	*Leptocarpus coangustatus*			
1007.	46375	*Leptocarpus decipiens*			
1008.	1080	*Leptocarpus scariosus*			
1009.	2342	*Leptomeria cunninghamii*			
1010.	5850	*Leptospermum laevigatum (Coast Teatree)*	Y		
1011.	19241	*Lepyrodia curvescens*		P2	
1012.	1085	*Lepyrodia glauca*			
1013.	1088	*Lepyrodia macra (Large Scale Rush)*			
1014.	1090	*Lepyrodia muirii*			
1015.	6367	*Leucopogon capitellatus*			
1016.	6374	*Leucopogon conostephioides*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1017.	6397	*Leucopogon glaucifolius*			
1018.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
1019.	6434	*Leucopogon polymorphus*			
1020.	6436	*Leucopogon propinquus*			
1021.	6439	*Leucopogon pulchellus (Beard-heath)*			
1022.	14637	*Leucopogon sp. Coujinup (M.A. Burgman 1085)*			
1023.	6444	*Leucopogon sprengelioides*			
1024.	6445	*Leucopogon squarrosus*			
1025.	40803	*Leucopogon squarrosus subsp. squarrosus*			
1026.	6447	*Leucopogon strictus*			
1027.	7676	*Levenhookia pusilla (Midget Stylewort)*			
1028.	7677	*Levenhookia stipitata (Common Stylewort)*			
1029.	4363	*Linum trigynum (French Flax)*	Y		
1030.	36160	*Liparophyllum capitatum*			
1031.	7406	*Lobelia rhombifolia (Tufted Lobelia)*			
1032.	7407	*Lobelia rhytidosperma (Wrinkled-seeded Lobelia)*			
1033.	475	*Lolium multiflorum (Italian Ryegrass)*	Y		
1034.	11073	*Lolium x hybridum*	Y		
1035.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
1036.	1228	*Lomandra hermaphrodita*			
1037.	1229	*Lomandra integra*			
1038.	1232	*Lomandra micrantha (Small-flower Mat-rush)*			
1039.	14542	*Lomandra micrantha subsp. micrantha*			
1040.	1234	*Lomandra nigricans*			
1041.	1236	*Lomandra odora (Tiered Matrush)*			
1042.	1239	*Lomandra preissii*			
1043.	1240	*Lomandra purpurea (Purple Mat Rush)*			
1044.	1243	*Lomandra sericea (Silky Mat Rush)*			
1045.	1245	*Lomandra spartea*			
1046.	1246	*Lomandra suaveolens*			
1047.	7365	*Lonicera japonica (Japanese Honeysuckle)*	Y		
1048.	8564	*Lotus subbiflorus*	Y		
1049.	4063	*Lotus uliginosus (Greater Lotus)*	Y		
1050.	4067	*Lupinus luteus (Yellow Lupin)*	Y		
1051.	1097	*Lyginia barbata*			
1052.	18049	*Lyginia imberbis*			
1053.	36375	*Lysimachia arvensis (Pimpernel)*	Y		
1054.	36373	*Lysimachia minima*	Y		
1055.	6456	*Lysinema ciliatum (Curry Flower)*			
1056.	34736	*Lysinema pentapetalum*			
1057.	5281	*Lythrum hyssopifolia (Lesser Loosestrife)*	Y		
1058.	2839	*Macarthuria australis*			
1059.	17106	*Macarthuria keigheryi*		T	
1060.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
1061.	17636	*Marianthus coeruleopunctatus (Blue-spotted Marianthus)*			
1062.	4079	*Medicago polymorpha (Burr Medic)*	Y		
1063.	4080	*Medicago sativa (Alfalfa)*	Y		
1064.	33638	*Meionectes tenuifolia*		P3	
1065.	37580	*Melaleuca acutifolia*			
1066.	36296	*Melaleuca armillaris subsp. armillaris*	Y		
1067.	5881	*Melaleuca brevifolia*			
1068.	13273	*Melaleuca incana subsp. incana*			
1069.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
1070.	5932	*Melaleuca leucadendra*			
1071.	20297	*Melaleuca osullivanii*			
1072.	18394	*Melaleuca parviceps*			
1073.	5958	*Melaleuca radula (Graceful Honeymyrtle)*			
1074.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
1075.	5961	*Melaleuca scabra (Rough Honeymyrtle, Wurru Bush)*			
1076.	5983	*Melaleuca trichophylla*			
1077.	37683	*Melaleuca viminalis*		P2	
1078.	5987	*Melaleuca viminea (Mohan)*			
1079.	4516	*Melia azedarach (White Cedar)*			
1080.	14985	*Melinis repens*	Y		
1081.	953	*Mesomelaena graciliceps*			
1082.	955	*Mesomelaena pseudostygia*			
1083.	957	*Mesomelaena tetragona (Semaphore Sedge)*			
1084.	485	*Microlaena stipoides (Weeping Grass)*			
1085.	15419	*Microtis media subsp. media*			
1086.	8106	*Millotia tenuifolia (Soft Millotia)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1087.	14344	*Millotia tenuifolia var. tenuifolia (Soft Millotia)*			
1088.	4097	*Mirbelia ramulosa*			
1089.	4100	*Mirbelia spinosa*			
1090.	7410	*Monopsis debilis*	Y		
1091.	37440	*Monopsis debilis var. depressa*	Y		
1092.	4662	*Monotaxis grandiflora (Diamond of the Desert)*			
1093.	19585	*Monotaxis grandiflora var. grandiflora*			
1094.	19179	*Moraea flaccida (One-leaf Cape Tulip)*	Y		
1095.	19178	*Moraea lewisiae*	Y		
1096.	19438	*Moraea ochroleuca*	Y		
1097.	14187	*Myriocephalus occidentalis*			
1098.	6189	*Myriophyllum crispatum*			
1099.	6193	*Myriophyllum echinatum*		P3	
1100.	44496	*Narcissus tazetta subsp. italicus*	Y		
1101.	492	*Neurachne alopecuroidea (Foxtail Mulga Grass)*			
1102.	1381	*Nothoscordum gracile*	Y		
1103.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
1104.	6138	*Oenothera drummondii (Beach Evening Primrose)*	Y		
1105.	20052	*Oenothera jamesii*	Y		
1106.	16347	*Oenothera laciniata*	Y		
1107.	6140	*Oenothera mollissima*	Y		
1108.	14292	*Oenothera stricta subsp. stricta*	Y		
1109.	2365	*Olax benthamiana*			
1110.	2367	*Olax scalariformis*			
1111.	8127	*Olearia axillaris (Coastal Daisybush)*			
1112.	8143	*Olearia paucidentata (Autumn Scrub Daisy)*			
1113.	18254	*Opercularia apiciflora*			
1114.	18255	*Opercularia vaginata (Dog Weed)*			
1115.	5227	*Opuntia stricta (Common Prickly Pear)*	Y		
1116.	46207	*Opuntia tomentosa*	Y		
1117.	36200	*Ornduffia submersa*		P4	
1118.	4113	*Ornithopus compressus (Yellow Serradella)*	Y		
1119.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
1120.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
1121.	168	*Ottelia ovalifolia (Swamp Lily)*			
1122.	14531	*Ottelia ovalifolia subsp. ovalifolia*			
1123.	4348	*Oxalis caprina*	Y		
1124.	4349	*Oxalis corniculata (Yellow Wood Sorrel)*	Y		
1125.	4352	*Oxalis glabra*	Y		
1126.	4355	*Oxalis perennans*			
1127.	4356	*Oxalis pes-caprae (Soursob)*	Y		
1128.	4358	*Oxalis purpurea (Largeflower Wood Sorrel)*	Y		
1129.	20101	*Paragonis grandiflora*			
1130.	7089	*Parentucellia latifolia (Common Bartsia)*	Y		
1131.	7090	*Parentucellia viscosa (Sticky Bartsia)*	Y		
1132.	527	*Paspalum dilatatum*	Y		
1133.	528	*Paspalum distichum (Water Couch)*	Y		
1134.	5225	*Passiflora filamentosa*	Y		
1135.	1542	*Patersonia babianoides*			
1136.	1546	*Patersonia juncea (Rush Leaved Patersonia)*			
1137.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
1138.	1551	*Patersonia pygmaea (Pygmy Patersonia)*			
1139.	43765	*Pauridia glabella var. glabella*			
1140.	43761	*Pauridia occidentalis var. occidentalis*			
1141.	43762	*Pauridia occidentalis var. quadriloba*			
1142.	10828	*Pavonia hastata*	Y		
1143.	40424	*Pentameris airoides subsp. airoides*	Y		
1144.	40422	*Pentameris pallida*	Y		
1145.	6245	*Pentapeltis peltigera*			
1146.	16477	*Pericalymma ellipticum var. ellipticum*			
1147.	16478	*Pericalymma ellipticum var. floridum*			
1148.	13911	*Persicaria decipiens*			
1149.	2255	*Persoonia angustiflora*			
1150.	2262	*Persoonia elliptica (Spreading Snottygobble)*			
1151.	2273	*Persoonia saccata (Snottygobble)*			
1152.	2284	*Petrophile biloba (Granite Petrophile)*			
1153.	20391	*Petrophile juncifolia*			
1154.	2299	*Petrophile linearis (Pixie Mops)*			
1155.	2301	*Petrophile macrostachya*			
1156.	2308	*Petrophile seminuda*			

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1157.	2312	*Petrophile striata*			
1158.	19825	*Petrorhagia dubia*	Y		
1159.	547	*Phalaris angusta*	Y		
1160.	551	*Phalaris minor (Lesser Canary Grass)*	Y		
1161.	552	*Phalaris paradoxa (Paradoxa Grass)*	Y		
1162.	20460	*Pheladenia deformis*			
1163.	32409	*Philonotis australiensis*			
1164.	18529	*Philotheca spicata (Pepper and Salt)*			
1165.	1172	*Philydrella drummondii*			
1166.	1173	*Philydrella pygmaea (Butterfly Flowers)*			
1167.	14306	*Philydrella pygmaea subsp. pygmaea*			
1168.	1478	*Phlebocarya ciliata*			
1169.	1479	*Phlebocarya filifolia*			
1170.	16825	*Phyllangium divergens*			
1171.	4675	*Phyllanthus calycinus (False Boronia)*			
1172.	17794	*Phyllanthus tenellus*	Y		
1173.	4	*Phylloglossum drummondii (Pigmy Clubmoss)*			
1174.	6983	*Physalis peruviana (Cape Gooseberry)*	Y		
1175.	2408	*Pilostyles hamiltonii*			
1176.	78	*Pilularia novae-hollandiae (Austral Pillwort)*			
1177.	5231	*Pimelea angustifolia (Narrow-leaved Pimelea)*			
1178.	5238	*Pimelea ciliata (White Banjine)*			
1179.	11928	*Pimelea ciliata subsp. ciliata*			
1180.	11404	*Pimelea imbricata var. major*			
1181.	11402	*Pimelea imbricata var. piligera*			
1182.	5260	*Pimelea rara (Summer Pimelea)*		P4	
1183.	12041	*Pimelea suaveolens subsp. suaveolens*			
1184.	5268	*Pimelea sulphurea (Yellow Banjine)*			
1185.	8163	*Pithocarpa corymbulosa (Corymbose Pithocarpa)*		P3	
1186.	8165	*Pithocarpa pulchella (Beautiful Pithocarpa)*			
1187.	18352	*Pithocarpa pulchella var. melanostigma*			
1188.	7303	*Plantago lanceolata (Ribwort Plantain)*	Y		
1189.	6253	*Platysace filiformis*			
1190.	6255	*Platysace juncea*			
1191.	11132	*Platysace ramosissima*		P3	
1192.	32478	*Pleuridium nervosum var. nervosum*			
1193.	571	*Poa annua (Winter Grass)*	Y		
1194.	573	*Poa drummondiana (Knotted Poa)*			
1195.	8175	*Podolepis gracilis (Slender Podolepis)*			
1196.	8177	*Podolepis lessonii*			
1197.	8182	*Podotheca angustifolia (Sticky Longheads)*			
1198.	8183	*Podotheca chrysantha (Yellow Podotheca)*			
1199.	8188	*Pogonolepis stricta*			
1200.	8395	*Polygala myrtifolia (Myrtleleaf Milkwort)*	Y		
1201.	4578	*Polygala virgata*	Y		
1202.	2416	*Polygonum arenastrum (Sand Wireweed)*	Y		
1203.	2419	*Polygonum aviculare (Wireweed)*	Y		
1204.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
1205.	583	*Polypogon tenellus*			
1206.	4691	*Poranthera microphylla (Small Poranthera)*			
1207.	2884	*Portulaca oleracea (Purslane, Wakati)*			
1208.	1670	*Prasophyllum drummondii (Swamp Leek Orchid)*			
1209.	1672	*Prasophyllum fimbria (Fringed Leek Orchid)*			
1210.	1674	*Prasophyllum giganteum (Bronze Leek Orchid)*			
1211.	16688	*Prasophyllum gracile*			
1212.	1680	*Prasophyllum parvifolium (Autumn Leek Orchid)*			
1213.	10853	*Prasophyllum plumiforme*			
1214.	17211	*Prunus cerasifera*	Y		
1215.	4155	*Psoralea pinnata (African Scurfpea)*	Y		
1216.	13255	*Pterochaeta paniculata*			
1217.	1686	*Pterostylis barbata (Bird Orchid)*			
1218.	12217	*Pterostylis sanguinea*			
1219.	1698	*Pterostylis vittata (Banded Greenhood)*			
1220.	2716	*Ptilotus declinatus (Curved Mulla Mulla)*			
1221.	2720	*Ptilotus esquamatus*			
1222.	2742	*Ptilotus manglesii (Pom Poms, Mulamula)*			
1223.	2753	*Ptilotus pyramidatus*		T	Y
1224.	4172	*Pultenaea ericifolia*			
1225.	16367	*Pyrorchis nigricans (Red beaks, Elephants ears)*			
1226.	8195	*Quinetia urvillei*			

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1227.	13312	*Rhodanthe pyrethrum*			
1228.		*Riccia multifida*			
1229.	6020	*Rinzia crassifolia (Darling Range Rinzia)*			
1230.	17020	*Robinia pseudoacacia*	Y		
1231.	14485	*Romulea flava var. minor*	Y		
1232.	1556	*Romulea rosea (Guildford Grass)*	Y		
1233.	11151	*Rostraria pumila*	Y		
1234.	44608	*Rosulabryum billarderii*			
1235.	20506	*Rubus anglocandicans*	Y		
1236.	2432	*Rumex conglomeratus (Clustered Dock)*	Y		
1237.	40431	*Rytidosperma acerosum*			
1238.	40425	*Rytidosperma caespitosum*			
1239.	79	*Salvinia molesta (Salvinia)*	Y		
1240.	6483	*Samolus junceus*			
1241.	2356	*Santalum acuminatum (Quandong, Warnga)*			
1242.	7368	*Scabiosa atropurpurea (Purple Pincushion)*	Y		
1243.	7602	*Scaevola calliptera*			
1244.	7613	*Scaevola glandulifera (Viscid Hand-flower)*			
1245.	7619	*Scaevola lanceolata (Long-leaved Scaevola)*			
1246.	7635	*Scaevola pilosa (Hairy Fan-flower)*			
1247.	7636	*Scaevola platyphylla (Broad-leaved Fanflower)*			
1248.	13182	*Scaevola repens var. repens*			
1249.	32432	*Schizymenium bryoides*			
1250.	6263	*Schoenolaena juncea*			
1251.	971	*Schoenus andrewsii*			
1252.	974	*Schoenus benthamii*		P3	
1253.	975	*Schoenus bifidus*			
1254.	978	*Schoenus brevisetis*			
1255.	979	*Schoenus caespititius*			
1256.	980	*Schoenus capillifolius*		P3	
1257.	984	*Schoenus curvifolius*			
1258.	985	*Schoenus discifer*			
1259.	986	*Schoenus efoliatus*			
1260.	987	*Schoenus elegans*			
1261.	991	*Schoenus grammatophyllus*			
1262.	994	*Schoenus humilis*			
1263.	996	*Schoenus laevigatus*			
1264.	998	*Schoenus latitans*			
1265.	999	*Schoenus loliaceus*		P2	
1266.	1002	*Schoenus nanus (Tiny Bog Rush)*			
1267.	1003	*Schoenus natans (Floating Bog-rush)*		P4	
1268.	1006	*Schoenus odontocarpus*			
1269.	1007	*Schoenus pedicellatus*			
1270.	1008	*Schoenus pennisetis*		P3	
1271.	1009	*Schoenus pleiostemoneus*			
1272.	17614	*Schoenus plumosus*			
1273.	1011	*Schoenus rigens*			
1274.	1013	*Schoenus sculptus (Gimlet Bog-rush)*			
1275.	16280	*Schoenus sp. Beaufort (G.J. Keighery 6291)*		P1	
1276.	17731	*Schoenus sp. Waroona (G.J. Keighery 12235)*		P3	
1277.	1017	*Schoenus subbulbosus*			
1278.	1018	*Schoenus subfascicularis*			
1279.	1019	*Schoenus subflavus (Yellow Bog-rush)*			
1280.	1026	*Schoenus unispiculatus*			
1281.	17409	*Schoenus variicellae*			
1282.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
1283.	6	*Selaginella gracillima (Tiny Clubmoss)*			
1284.	32433	*Sematophyllum homomallum*			
1285.	8203	*Senecio diaschides*			
1286.	8212	*Senecio leucoglossus*		P4	
1287.	20663	*Senecio multicaulis subsp. multicaulis*			
1288.	609	*Setaria palmifolia (Palm Grass)*	Y		
1289.	19453	*Setaria parviflora*	Y		
1290.	2909	*Silene gallica (French Catchfly)*	Y		
1291.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
1292.	14583	*Siloxerus multiflorus*			
1293.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
1294.	617	*Sorghum halepense (Johnson Grass)*	Y		
1295.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
1296.	1558	*Sparaxis bulbifera*	Y		

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1297.	4205	*Sphaerolobium linophyllum*			
1298.	4206	*Sphaerolobium macranthum*			
1299.	4207	*Sphaerolobium medium*			
1300.	635	*Sporobolus virginicus (Marine Couch)*			
1301.	4716	*Stachystemon vermicularis*			
1302.	4733	*Stackhousia monogyna*			
1303.	9070	*Stackhousia pubescens (Downy Stackhousia)*			
1304.	13475	*Stenanthemum humile*			
1305.	19403	*Stenopetalum gracile*			
1306.	2316	*Stirlingia latifolia (Blueboy)*			
1307.	2317	*Stirlingia simplex*			
1308.	18564	*Stylidium aceratum*		P3	
1309.	7681	*Stylidium affine (Queen Triggerplant)*			
1310.	7684	*Stylidium amoenum (Lovely Triggerplant)*			
1311.	30278	*Stylidium androsaceum*			
1312.	25831	*Stylidium araeophyllum (Stilt Walker)*			
1313.	7692	*Stylidium breviscapum (Boomerang Triggerplant)*			
1314.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
1315.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
1316.	7696	*Stylidium calcaratum (Book Triggerplant)*			
1317.	7698	*Stylidium caricifolium (Milkmaids)*			
1318.	7702	*Stylidium ciliatum (Golden Triggerplant)*			
1319.	7712	*Stylidium despectum (Dwarf Triggerplant)*			
1320.	7713	*Stylidium dichotomum (Pins-and-needles)*			
1321.	7716	*Stylidium diuroides (Donkey Triggerplant)*			
1322.	7717	*Stylidium divaricatum (Daddy-long-legs)*			
1323.	7721	*Stylidium emarginatum (Biddy-four-legs)*			
1324.	19251	*Stylidium eriopodum*			
1325.	7734	*Stylidium guttatum (Dotted Triggerplant)*			
1326.	7736	*Stylidium hispidum (White Butterfly Triggerplant)*			
1327.	7742	*Stylidium inundatum (Hundreds and Thousands)*			
1328.	7745	*Stylidium junceum (Reed Triggerplant)*			
1329.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
1330.	7768	*Stylidium obtusatum (Pinafore Triggerplant)*			
1331.	7771	*Stylidium periscelianthum (Pantaloon Triggerplant)*		P3	
1332.	7772	*Stylidium perpusillum (Tiny Triggerplant)*			
1333.	7773	*Stylidium petiolare (Horn Triggerplant)*			
1334.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
1335.	7782	*Stylidium pulchellum (Thumbelina Triggerplant)*			
1336.	7783	*Stylidium pycnostachyum (Downy Triggerplant)*			
1337.	33106	*Stylidium recurvum*			
1338.	7785	*Stylidium repens (Matted Triggerplant)*			
1339.	7790	*Stylidium roseoalatum (Pink-wing Triggerplant)*			
1340.	25806	*Stylidium scariosum*			
1341.	7798	*Stylidium schoenoides (Cow Kicks)*			
1342.	7803	*Stylidium striatum (Fan-leaved Triggerplant)*		P4	
1343.	45594	*Stylidium tenue subsp. majusculum (Showy Fountain Triggerplant)*			
1344.	23511	*Stylidium thesioides (Delicate Triggerplant)*			
1345.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			
1346.	40947	*Stylidium xanthellum*			
1347.	1260	*Stypandra glauca (Blind Grass)*			
1348.	48297	*Styphelia filifolia*		P3	
1349.	6476	*Styphelia tenuiflora (Common Pinheath)*			
1350.	2321	*Synaphea acutiloba (Granite Synaphea)*			
1351.	2323	*Synaphea gracillima*			
1352.	2324	*Synaphea petiolaris (Synaphea)*			
1353.	16864	*Synaphea petiolaris subsp. petiolaris*			
1354.	2325	*Synaphea pinnata (Helena Synaphea)*			
1355.	18590	*Synaphea sp. Fairbridge Farm (D. Papenfus 696)*		T	
1356.	2329	*Synaphea spinulosa*			
1357.	15532	*Synaphea spinulosa subsp. spinulosa*			
1358.	32438	*Syntrichia pagorum*			
1359.	20135	*Taxandria linearifolia*			
1360.	4251	*Templetonia drummondii*			
1361.	4256	*Templetonia retusa (Cockies Tongues)*			
1362.	32441	*Tetrapterum cylindricum*			
1363.	1034	*Tetraria capillaris (Hair Sedge)*			
1364.	1036	*Tetraria octandra*			
1365.	667	*Tetrarrhena laevis (Forest Ricegrass)*			
1366.	4535	*Tetratheca hirsuta (Black Eyed Susan)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1367.	48342	*Tetratheca hirsuta subsp. hirsuta*			
1368.	4537	*Tetratheca nuda*			
1369.	4544	*Tetratheca setigera*			
1370.	1701	*Thelymitra antennifera (Vanilla Orchid)*			
1371.	10856	*Thelymitra benthamiana (Leopard Orchid)*			
1372.	1705	*Thelymitra crinita (Blue Lady Orchid)*			
1373.	1707	*Thelymitra flexuosa (Twisted Sun Orchid)*			
1374.	11053	*Thelymitra macrophylla*			
1375.	20729	*Thelymitra magnifica (Crystal Brook Star Orchid)*		P1	
1376.	1715	*Thelymitra spiralis (Curlylocks)*			
1377.	10862	*Thelymitra stellata (Star Orchid)*		T	
1378.	1718	*Thelymitra villosa (Custard Orchid)*			
1379.	20731	*Thelymitra vulgaris*			
1380.	673	*Themeda triandra*			
1381.	5080	*Thomasia foliosa*			
1382.	5084	*Thomasia grandiflora (Large Flowered Thomasia)*			
1383.	5087	*Thomasia macrocarpa (Large Fruited Thomasia)*			
1384.	1317	*Thysanotus anceps*		P3	
1385.	1318	*Thysanotus arbuscula*			
1386.	1319	*Thysanotus arenarius*			
1387.	1328	*Thysanotus dichotomus (Branching Fringe Lily)*			
1388.	1338	*Thysanotus manglesianus (Fringed Lily)*			
1389.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
1390.	1343	*Thysanotus patersonii*			
1391.	46055	*Thysanotus sp. Coastal plain (N.H. Brittan 66/63)*			
1392.	1351	*Thysanotus sparteus*			
1393.	1354	*Thysanotus tenellus*			
1394.	1357	*Thysanotus thyrsoideus*			
1395.	1358	*Thysanotus triandrus*			
1396.	8248	*Tolpis barbata (Yellow Hawkweed)*	Y		
1397.		*Tortula recurvata*			
1398.	6280	*Trachymene pilosa (Native Parsnip)*			
1399.	17684	*Tremulina tremula*			
1400.	11112	*Tribolium uniolae*	Y		
1401.	1481	*Tribonanthes australis*			
1402.	1482	*Tribonanthes brachypetala*			
1403.	1483	*Tribonanthes longipetala*			
1404.	1485	*Tribonanthes violacea*			
1405.	4383	*Tribulus terrestris (Caltrop)*	Y		
1406.	8251	*Trichocline spathulata (Native Gerbera)*			
1407.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
1408.	1362	*Tricoryne humilis*			
1409.	1363	*Tricoryne tenella*			
1410.	43207	*Tricostularia exsul*			
1411.	17145	*Trifolium angustifolium var. angustifolium*	Y		
1412.	4291	*Trifolium arvense (Hare's Foot Clover)*	Y		
1413.	17542	*Trifolium arvense var. arvense*	Y		
1414.	4292	*Trifolium campestre (Hop Clover)*	Y		
1415.	4295	*Trifolium dubium (Suckling Clover)*	Y		
1416.	4298	*Trifolium hirtum (Rose Clover)*	Y		
1417.	17788	*Trifolium pratense var. sativum*	Y		
1418.	15509	*Trifolium tomentosum var. tomentosum*	Y		
1419.	33676	*Triglochin calcitrapa*			
1420.	146	*Triglochin minutissima*			
1421.	147	*Triglochin mucronata*			
1422.	148	*Triglochin muelleri*			
1423.	18587	*Triglochin nana*			
1424.	150	*Triglochin stowardii*			
1425.	151	*Triglochin striata*			
1426.	4737	*Tripterococcus brunonis (Winged Stackhousia)*			
1427.	1139	*Trithuria bibracteata*			
1428.	1141	*Trithuria submersa*			
1429.	38401	*Tritonia gladiolaris (Lined Tritonia)*	Y		
1430.	13479	*Trymalium ledifolium var. rosmarinifolium*			
1431.	33418	*Trymalium odoratissimum subsp. odoratissimum*			
1432.	8255	*Ursinia anthemoides (Ursinia)*	Y		
1433.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
1434.	7138	*Utricularia inaequalis*			
1435.	7148	*Utricularia multifida*			
1436.	7153	*Utricularia tenella*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1437.	17868	*Vallisneria nana*			
1438.	7665	*Velleia trinervis*			
1439.	8257	*Vellereophyton dealbatum (White Cudweed)*	Y		
1440.	6070	*Verticordia acerosa*			
1441.	15431	*Verticordia acerosa var. acerosa*			
1442.	12388	*Verticordia acerosa var. preissii*			
1443.	6076	*Verticordia densiflora (Compacted Featherflower)*			
1444.	15432	*Verticordia densiflora var. densiflora*			
1445.	6088	*Verticordia huegelii (Variegated Featherflower)*			
1446.	15433	*Verticordia huegelii var. huegelii*			
1447.	15434	*Verticordia insignis subsp. insignis*			
1448.	14714	*Verticordia lindleyi subsp. lindleyi*		P4	
1449.	6107	*Verticordia pennigera*			
1450.	6110	*Verticordia plumosa (Plumed Featherflower)*			
1451.	12449	*Verticordia plumosa var. brachyphylla*			
1452.	15618	*Verticordia plumosa var. plumosa*			
1453.	4322	*Vicia sativa (Common Vetch)*	Y		
1454.	12070	*Vicia sativa subsp. sativa*	Y		
1455.	4325	*Viminaria juncea (Swishbush, Koweda)*			
1456.	6575	*Vinca major (Blue Periwinkle)*	Y		
1457.	17042	*Vitis vinifera*	Y		
1458.	722	*Vulpia bromoides (Squirrel Tail Fescue)*	Y		
1459.	11018	*Vulpia muralis*	Y		
1460.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
1461.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
1462.	7389	*Wahlenbergia preissii*			
1463.	13103	*Watsonia borbonica*	Y		
1464.	1566	*Watsonia marginata*	Y		
1465.	18108	*Watsonia meriana var. bulbillifera*	Y		
1466.	18118	*Watsonia meriana var. meriana*	Y		
1467.	1569	*Watsonia versfeldii*	Y		
1468.	32456	*Weissia rutilans*			
1469.	12072	*Wurmbea dioica subsp. alba*			
1470.	1401	*Wurmbea pygmaea*			
1471.	1249	*Xanthorrhoea acanthostachya*			
1472.	1251	*Xanthorrhoea brunonis*			
1473.	14544	*Xanthorrhoea brunonis subsp. brunonis*			
1474.	1252	*Xanthorrhoea drummondii*			
1475.	1253	*Xanthorrhoea gracilis (Graceful Grass Tree, Mimidi)*			
1476.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
1477.	6283	*Xanthosia atkinsoniana*			
1478.	6284	*Xanthosia candida*			
1479.	6289	*Xanthosia huegelii*			
1480.	44861	*Xerochrysum macranthum*			
1481.	2331	*Xylomelum occidentale (Woody Pear, Djandin)*			
Protozoa					
1482.	38969	*Arcyria minuta*			
1483.	38976	*Badhamia foliicola*			
1484.	39030	*Enerthenema papillatum*			
1485.	39097	*Trichia decipiens*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX C

WIN Groundwater Bores

WIN Bore ID	Owner	Current Purpose	Status	Drill Date	Drill Depth (m below ground level)
61600006	No Current Owner	-	Unknown	01-01-1900 - Unknown	9.14
61600018	No Current Owner	-	Unknown	01-01-1900 - Unknown	9.75
61600163	No Current Owner	-	Unknown	01-01-1900 - Unknown	3.35
61600178	No Current Owner	-	Unknown	01-01-1900 - Unknown	2.74
61600179	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	4.57
61600180	No Current Owner	-	Unknown	01-01-1900 - Unknown	5.18
61600181	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	4.88
61600182	No Current Owner	Livestock; Garden Irrigation	Unknown	30-06-1958 - Known year	8.23
61600183	No Current Owner	Garden Irrigation; Livestock	Unknown	01-01-1900 - Unknown	24.38
61600184	No Current Owner	-	Unknown	01-01-1900 - Unknown	2.74
61601079	No Current Owner	Irrigation	Unknown	19-06-1998 - Known day	63.00
61607277	No Current Owner	-	Unknown	01-01-1900 - Unknown	10.67
61607278	No Current Owner	-	Unknown	30-06-1950 - Known year	31.09
61607279	No Current Owner	Domestic/Household	Unknown	30-06-1955 - Known year	34.14
61607280	No Current Owner	-	Unknown	30-06-1962 - Known year	40.23
61607281	No Current Owner	-	Unknown	30-06-1962 - Known year	31.09
61607344	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	8.84
61607345	No Current Owner	-	Unknown	01-01-1900 - Unknown	11.58
61607347	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	8.53
61607355	No Current Owner	-	Unknown	01-01-1900 - Unknown	12.50
61607356	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	13.72
61607357	No Current Owner	-	Unknown	01-01-1900 - Unknown	6.10
61607358	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	11.58
61607359	No Current Owner	-	Unknown	30-06-1961 - Known year	27.13

WIN Bore ID	Owner	Current Purpose	Status	Drill Date	Drill Depth (m below ground level)
61607360	No Current Owner	-	Unknown	30-06-1961 - Known year	22.25
61607361	No Current Owner	Domestic/Household; Garden Irrigation	Unknown	01-01-1900 - Unknown	25.91
61607362	No Current Owner	Domestic/Household; Garden Irrigation	Unknown	01-01-1900 - Unknown	-
61607363	No Current Owner	Livestock; Garden Irrigation	Unknown	30-06-1962 - Known year	33.83
61607364	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	36.58
61607365	No Current Owner	Garden Irrigation	Unknown	30-06-1962 - Known year	34.75
61607366	No Current Owner	Orchard	Unknown	30-06-1958 - Known year	33.53
61607367	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	36.58
61607385	No Current Owner	-	Unknown	01-01-1900 - Unknown	3.05
61607386	No Current Owner	-	Unknown	30-06-1970 - Known year	30.48
61607387	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	7.92
61607388	No Current Owner	Garden Irrigation	Unknown	30-06-1962 - Known year	13.41
61607389	No Current Owner	Orchard	Unknown	30-06-1971 - Known year	22.86
61607390	No Current Owner	Garden Irrigation	Unknown	30-06-1950 - Known year	6.10
61607391	No Current Owner	Garden Irrigation; Livestock	Unknown	01-01-1900 - Unknown	-
61607392	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	-
61607393	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	15.24
61607394	No Current Owner	-	Unknown	30-06-1962 - Known year	28.04
61607477	No Current Owner	-	Unknown	15-12-1977 - Known day	30.48
61607522	No Current Owner	Irrigation	Unknown	15-02-1978 - Known day	21.03
61607523	No Current Owner	-	Unknown	30-01-1979 - Known day	25.00
61607559	No Current Owner	-	Unknown	04-05-1989 - Known day	26.00
61607568	No Current Owner	Garden Irrigation	Unknown	01-01-1900 - Unknown	6.00
61607569	No Current Owner	Garden Irrigation	Unknown	30-06-1990 - Known year	24.38

WIN Bore ID	Owner	Current Purpose	Status	Drill Date	Drill Depth (m below ground level)
61615517	No Current Owner	-	Unknown	08-11-1991 - Known day	-
61615518	No Current Owner	-	Unknown	08-11-1991 - Known day	-
61671956	No Current Owner	-	Unknown	Unknown	-

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APPENDIX 2:
KCTT, Infrastructure Servicing Report

INFRASTRUCTURE SERVICING REPORT

Wattle Grove Landholdings

Wattle Grove, Western Australia

April 2018

Rev B

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Approved by	Issued To	Revision type
Rev A	19.02.18	C Kleyweg	Jon Burgess / Mitchell Brooks	Draft for Review
Rev B	11.04.18	C Kleyweg	Jon Burgess / Mitchell Brooks	Final for coordination

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1. KCTT Infrastructure Servicing Report

1.1 Executive Summary

The Wattle Grove MRS Amendment area has a series of challenges from an infrastructure perspective, however each of these can be managed with each of the servicing authorities (City of Kalamunda, Water Corporation, Western Power, Telstra / NBN and ATCO Gas) through development of infrastructure strategies for future potential planning outcomes. The key items in this Executive Summary include: -

- Major road network upgrade requirements (i.e. interchange design requirements at the intersection of Welshpool Road and Tonkin Highway, with consideration that Welshpool Road will be grade separated above the Tonkin Highway).
- Geometrical design improvements are required to Welshpool Road which will cause the realigning of a section of this road into the current Crystal Brook Road alignment. We believe the logical outcome is for this section of road to then deviate to a major roundabout intersection at Kelvin Road to the east, forming a natural separation between industrial / commercial traffic to the south and residential traffic to the north.
- We believe that consideration should be given to either future rail connectivity in the long term at the corner of Tonkin Highway and Welshpool Road linking a future rail alignment between Forrestfield North and Thornlie. This could provide excellent opportunities for increased industrial / commercial business densities in the south western quadrant and for increased residential densities in the north-western quadrant of the MRS area.
- In the short to medium term bus linkages should be provided from this location to Forrestfield North Railway Station. These discussions can be commenced with the Planning Team at Transperth, with potential for minor amendments to existing services catering for the MRS Amendment area.
- The provision of a public transport node provides a logical centre for development and therefore provides logical connectivity for pedestrian and cyclist infrastructure.
- Drainage design requirements need to be looked at in detail with the future layout for residential and industrial outcomes as the site generally grades toward the west where development is intended to be denser. This provides opportunities for innovation and will need to be discussed in detail with City of Kalamunda Engineers.
- The interface between Crystal Brook (lying midway between Welshpool Road East and Crystal Brook Road in the Residential Zone of the MRS Amendment Area needs to be strongly considered in the urban design and planning processes. Existing 1 in 100-year overland drainage flows will need to be maintained into this creek system. Wherever drainage interfaces from the future development, treatment of 1 in 1 year events will need to be provided prior to any direct discharge into the creek.

Power & Communication

The existing adjacent network consists of a High Voltage overhead Transmission line that runs along Brentwood Road, as well as High Voltage overhead 3 phase distribution lines also running along Brentwood Road, Crystal Brook Road and Victoria Road. The likely supply scenario would consist of High Voltage cable from an appropriate point on the HV transmission line, up to a new High Voltage substation (High Voltage Switch and Transformer) within the development site. From here, Low Voltage distribution cables supplied underground and street light poles as normal would service the development of industrial to the south and residential development to the north of Crystal Brook

Road. Existing distribution lines that run along Brentwood Road, Crystal Brook Road, Gavour Road, Victoria Road and Valcan Road would need to be removed and replaced with underground infrastructure as part of the development as development moves incrementally through the MRS Amendment area.

At this stage there are no NBN rollouts currently planned for this area, however NBN Co has a charter to work with local governments and developers to develop their infrastructure in new areas. For a development of this size, with a large amount of future expected development surrounding it, there would be a high probability that NBN would develop infrastructure to service the development.

Detailed information on power and communication infrastructure to develop the site should be co-ordinated with an electrical engineer for the most relevant and up to date information.

Water

Water mains currently run in the road reserve of Crystal Brook Road, Victoria Road, Valcan Road, Gavour Road and Brentwood Road, generally sized at 100mm to 150mm diameter to service the current rural residential development of the area. The area forms part of the larger Foothills Gravity Water Supply Scheme and is supplied by several Pressure Releasing Valves (PRV's) off the south-north Foothills Trunk Main. Current planning has allowed for some industrial land use to the west of the site under investigation as part of the MKSEA developments, however, no provision has currently been allowed to this site. Substantial reticulation upgrades would be required as part of urban development of the subject site, which would be investigated by the Water Corporation as development continues in the area. KCTT have completed preliminary discussions with the Water Corporation and at this stage we believe the requirements for development centre on a local network of mains, as opposed to extensions of major trunk infrastructure, however this would depend on the density of development proposed. The Water Corporation have informed us that detailed planning will be required in the next 1 to 2 years to determine a design concept for the area.

Wastewater

The site forms part of a larger area that is planned to be established as a new sewer district in Water Corporation planning, called the Wattle Grove Sewer District. This district is bounded by Bickley Road to the south, Roe Highway to the west, Welshpool Road to the north and the Mundy Regional Park to the east. Long term conceptual planning has been conducted by the Water Corporation with a general layout of infrastructure provided.

The current planning is based on the discharge of wastewater from the newly formed Wattle Grove SD to be via a gravity feed to a 900mm diameter wastewater pipe running westward along Bickley Road. This collection sewer currently terminates at the intersection of Bickley Road and Dulwich Street, Beckenham, however this is a long-term ultimate design model. It is very important to understand that none of these works will be required to commence development within Wattle Grove as the Water Corporation usually allow the development of interim scenarios utilising available capacities in existing systems. The key point with the allowance of this use of existing system capacities is that the design of the overall network must not prejudice the future ultimate network. Therefore, all designs developed will need to consider both the ultimate planning and interim availabilities, with developers who construct interim solutions understanding that the cost for those works will be borne solely by the developer.

Long term service planning by the Water Corporation is predicated on the development of the MKSEA area to the west and south-west of the site under investigation, however development has commenced in the MKSEA area without the construction of the ultimate sewer network reinforcing the points made above.

We believe the following methodologies need to be considered and negotiated with the Water Corporation: -

1. Enter into a Performance Agreement / Tankering Agreement

Reference: Water Corporation Development Services Information Sheet No 58A

Where infrastructure assets are located a long distance from a potential development site, and where the planning for the development of the assets which will connect the site in the future are known and relatively risk-free for the Water Corporation, the Water Corporation can enter into agreements with developers for the tankering of early release stages to allow the developer to fund studies and the extension of infrastructure. Generally tankering will only be agreed in situations where the design and construction of the sections of sewer required for connection are being managed by the same developer (therefore the Water Corporation has the power to enforce elements of the Contract). If the design of downstream assets are not committed to, it will be more difficult to arrange a Performance Agreement.

2. Developer Constructed Headworks Asset Process

Reference: Water Corporation: Developer Constructed Headworks Process Document

Landowners have the opportunity to construct works on and behalf of the Water Corporation. The Water Corporation has a 5-year Capital Investment Programme (CIP), which is developed in consultation with the land development industry to determine the required timing for major infrastructure. The process needs to commence with submission of a letter with the following information: -

- Intended timing of development
- Staging options for development
- Ownership / control of the land
- Zoning / Structure Planning / Subdivision Approvals
- Demand projection (number of lots / projected flows etc)
- Known constraints to development
- Relevant other impacts

The Water Corporation will respond to this information with a Development Services Review. In this phase discussions will commence relating to potential staging, acceptance of tankering and other requirements.

Our understanding is that generally the Water Corporation will fund wastewater infrastructure works of diameter 450mm or greater for gravity networks. Given the planned network shows a series of 450mm to 900mm-diameter pipes between Brentwood Road (south of Tonkin Highway) and the corner of Bickley Road and Brixton Road there is strong potential for these works being negotiated and agreed under the Water Corporation's future Capital Works Program or being the subject of a detailed pre-fund arrangement.

3. Construction of a temporary Pumping Station

KCTT will discuss with the Water Corporation the potential for staging sections of the Wattle Grove district with a temporary or private pressure main and pumping station. This option will form part of the discussions referred to above.

Gas

Currently there are no ATCO Gas assets in the vicinity of the subject site. The nearest connection points are located to the west, on the western side of Tonkin Highway and to the north, on the northern side of Welshpool Road. ATCO Gas however, do install new infrastructure and extend or upgrade existing infrastructure when new development becomes apparent to them, and such that there may be current planning for the installation of new Atco Gas Assets in the vicinity of the site.

The Dampier-Bunbury gas pipeline runs along the southern end of the site parallel to the southern boundary, as shown on the planning by Burgess Design Group. This will require special attention during the planning, engineering and approvals phase of the project to ensure a smooth and timely project delivery. KCTT have previous experience with projects requiring Risk Assessment considerations regarding the pipeline and so have a strong understanding of what is required with regards to the planning and approval associated with works in the vicinity of the pipeline.

Topography and Drainage

As taken from Water Corporation planning, ground water starts at RL 12m in the western corner and rises gradually across the site to a height of RL 16m in the eastern corner of the site. This also follows the slope of the ground level with a low point in the western corner of approximately RL 22m, gradually rising to the highest point of the site toward the north eastern corner of RL 36m.

Currently the drainage network consists of roadside swales which would require major upgrade into a pit and pipe network potentially discharging into basins within future Pubic Open Space Areas, as well as co-ordination with the relevant local government authorities. As discussed earlier, the existing topography means drainage catchments are generally flowing toward the west, where the density of development is likely to be higher. This provides the opportunity for the development of innovative drainage solutions in the heart of Wattle Grove which can assist in local irrigation requirements. The development of linear treatment solutions in the eastern portion of the MRS area will also be very important due to steeper grades and to limit the impact of 1 in 100-year floods on the denser development areas to the west of the MRS area.

Finally, the existing Crystal Brook, located midway between Crystal Brook Road and Welshpool Road East is located centrally within the future residential precinct. The interface between development and the creek is very important. Existing overland flows will need to be maintained into the Crystal Brook with all flows through roads and residential areas to be treated up to and including the 1 in 1 year event prior to discharge into downstream environmental systems.

Roads

Amendments to the future road network will be very important given the future requirements for grade separation at the Tonkin Highway / Welshpool Road East interchange. Coupled with some tight existing horizontal geometry in Welshpool Road East immediately to the east of the proposed interchange, the existing near 3-way intersection between Welshpool Road East / Crystal Brook Road and Brentwood Road and tight road geometry and steep grades in Crystal Brook Road east of Kelvin Road, significant amendments to the existing road network will be required to

ensure proper access / egress is developed for industrial traffic to the south and future residential traffic to the north of Crystal Brook Road.

We therefore believe the logical configuration is to realign the Welshpool Road East alignment into Crystal Brook Road. This provides the following advantages: -

- It provides a clear delineation between residential zoning to the north and industrial zoning to the south
- It removes the sharp change in horizontal geometry in Welshpool Road East which commences just west of the current intersection of Welshpool Road East / Crystal Brook Road
- It removes the clash between the above intersection and the intersection of Crystal Brook Road / Brentwood Road
- Straightening this section of access to Tonkin Highway improves vertical design criteria and safety because current Main Roads WA planning shows Welshpool Road East interchange will be designed to bridge Welshpool Road East over Tonkin Highway. The removal of the sharp change in horizontal geometry therefore allows the bridge abutments and approaches to the bridge to be designed as a direct approach, therefore improving road safety considerably.

Consideration needs to be given to the RAV network and commodity route to the east, the connection of Welshpool Road East to Lesmurdie, and the large mature trees on Crystal Brook Road that would need to be retained and protected from road widening, with Kelvin Road at the northern end having significant trees and vegetation. This would need to be reviewed in a conceptual design phase which should follow this MRS Amendment.

The Welshpool Road East / Crystal Brook Road approach to the Tonkin Highway will need to be designed at a maximum approaching grade of 5%. This will require considerable amendment to existing road levels from a location near the intersection of Crystal Brook Road / Brentwood Road. This realignment of the road network also enables the deviation of the Crystal Brook Road alignment to form a perpendicular intersection with Kelvin Road to the east. This alignment is logical and provides the following strong benefits: -

- It provides a neat, enclosed triangular shaped industrial zone bounded by Tonkin Highway to the south, Welshpool Road East / Crystal Brook alignment to the north and Kelvin Road to the east.
- It focuses future industrial traffic directly toward Tonkin Highway to the west or Kelvin Road and Tonkin Highway to the east.
- It focuses higher volumes of traffic onto a new major spine road that can be designed to suit the future requirements better than the existing alignment in Welshpool Road East.
- It removes regional traffic vehicular loading onto sections of Welshpool Road East and Crystal Brook Road that have tight horizontal and vertical geometries. These sections of road should not provide greater regional / industrial functions.

1.2 Location

Structure Plan	Suburb	Locality (Shire, City etc.)
Wattle Grove District Structure Plan	Wattle Grove	City of Kalamunda

Brief Description of Site:

The Wattle Grove MRS Amendment Area is bounded by Tonkin Highway to the south and west, Welshpool Road East generally to the north and west and the City of Gosnells local government boundary and landholdings in Gavour Road generally to the east toward Kelvin Road.

The proposed amendment area is divided into two catchments: -

- Residential land-uses north of Crystal Brook Road; and
- Industrial land-uses south of Crystal Brook Road.

1.3 Proposed Development

The proposed development entails a Residential precinct of approximately 120 hectares and a potential Industrial area of 146 hectares. The general options considered in the MRS Amendment are to run two residential development scenarios at averages of R20, R30 and R40. The R30 option allows for some increase in development densities in the western third of the MRS Amendment area, with an R40 option allowing for stronger development with a potential railway station option to be considered in the long-term under agreement with the Western Australia state government.

Table 1 – Wattle Grove MRS Amendment Indicative Yields

Development Type	Total Area (m^2)	Equivalent Area	Yield Notes	Yield
Industrial	1,460,000	Assume 65% = 949,000	Assume average 20,000m^2 lots	Approx 47 Industrial Lots
Residential (R20 Avg)	1,200,000	Assume 65% = 780,000	R20 average option	1,560
Residential (R30 Avg)	As above	As above	R30 average option	2,340
Residential (R40 Avg)	As above	As above	R40 average option	3,120
Total Development	2,660,000	1,729,000		47 industrial lots, plus between 1,560 to 3,120 residential

While there are significant variations in the proposed yields, it is important at the MRS Amendment phase to test wider development potential, particularly for residential as the increased densities impact flows from various sites. For industrial / commercial the sizing of the lots is less relevant as the sizing of infrastructure is based on area of development, not yield. The development of 2 hectare industrial lots foresees the majority of each future landholding developed.

Recent research completed by Savills (Reference http://pdf.savills.asia/asia-pacific-research/australian-research/australia-industrial/savillsresearch-briefing-perth-industrial-q4-2017.pdf) shows that there has been improved recent demand for prime quality industrial land, particularly in the premier eastern suburbs developments in Forrestfield and Maddington. This information is provided for general review purposes only, and is not a formal recommendation on thee proposed quantum of industrial land shown in this MRS Amendment. We recommend that the City of Kalamunda engages a qualified consultant in this area to determine the potential for the quantum of industrial land shown in this MRS Amendment.

1.4 Existing Buildings

Does the feature existing buildings? If YES nominate.	YES, existing residential dwellings, populated sparsely throughout the proposed MRS Amendment Area.
Approximate age of buildings?	10-35 years, some potentially older. The likelihood of keeping existing residences and developing homesteads around them is lower south of Crystal Brook Road given the proposed potential for Industrial landholdings.
Is asbestos likely to be an issue? YES / NO	YES Desktop studies show that some existing buildings are at least 10-20 years old and thus asbestos could have been used in the construction of eaves fencing and other areas where asbestos was commonly used. Further investigation required to confirm.
Are septic tanks present? YES / NO	YES Wastewater plans for the precinct sourced from EsiNet show that there are minimal existing wastewater services in the MRS Amendment Area. Thus, the presence of septic tanks within the precinct should be considered on each private landholding.
Likely issues associated with remediation?	Key issues are likely to be asbestos in some buildings and structures to be demolished, and de-commissioning of septic tank / leach drain setups. These issues are local in nature and will be the responsibility of future land developers, therefore these issues do not pose a risk under any future Developer Contribution Plan except for lots with structures within future Public Open Space / Bush Forever.

2. Infrastructure Servicing

The area of study for this ISR is the Wattle Grove MRS Amendment as previously described in Section 1.2 and 1.3 of this report.

This section on Infrastructure Servicing includes the following discussion points: -

- Section 2.1 – Topography and Environment
- Section 2.2 – Geotechnical Conditions
- Section 2.3 – Building and Earthworks
- Section 2.4 – Roadworks
- Section 2.5 – Stormwater Drainage
- Section 2.6 – Wastewater (Sewerage)
- Section 2.7 – Water
- Section 2.8 – Power, Telecommunications and Gas Supply
- Section 2.9 – Earthworks
- Section 2.10 – Bridgeworks

2.1 Topography and Environment

As taken from Water Corporation planning, ground water starts at RL 12m in the western corner and rises gradually across the site to a height of RL 16m in the eastern corner of the Wattle Grove MRS Amendment Area. This also follows the slope of the ground level with a low point in the western corner of approximately RL 22m, gradually rising to the highest point of the site toward the north eastern corner of RL 36m.

The existing Crystal Brook, located midway between Crystal Brook Road and Welshpool Road East is located centrally within the future residential precinct. The interface between development and the creek is very important. Existing overland flows will need to be maintained into the Crystal Brook with all flows through roads and residential areas to be treated up to and including the 1 in 1-year event prior to discharge into downstream environmental systems.

We therefore believe that interface to groundwater should not pose excessive risk to the project, however there can be localised issues with perching of groundwater when combined with presence of cemented rock formations such as “coffee rock”.

2.2 Geotechnical Conditions

The Foothills Investigation area is located within the Swan Coastal Plain formation. The area features soils equally split between Bassendean Sands and Guildford clays in pockets around the site. Yoganup formations are present in the southern portion of the Investigation area. Colluvium is also present in the eastern and northern portions of the site, most likely due to being at the base of hills within the Mundy Regional Park. This information is observed from the Perth Groundwater Atlas.

In areas where significant new works are required, (such as new roads, stormwater drainage infrastructure etc.) detailed geotechnical reporting should be undertaken prior to the commencement of the design phase as the presence of hard rock, soft clays and other deleterious materials will impact the design intent. This information should be available in detail to inform the general design.

Mapping for the area shows that the western portion of the Investigation area has a low to moderate risk of encountering acid sulphate soils within 3 metres of the natural ground level. The remainder of the area has not been determined to pose a risk of encountering acid sulphate soils however where deeper works are required, for instance for sewer and stormwater infrastructure, more in-depth geotechnical reporting should be conducted to manage the risk of any exposure to acid sulphate soils, in accordance with standard industry practices.

2.3 Building and Earthworks

All development in the area should be staged where possible to follow the natural surface level of the land. Sewer and stormwater drainage should be designed to follow the natural contours of the land, to minimise earthworking required for the provision and installation of services. This is discussed in further detail in Sections 2.5 and 2.6. This should allow for land development in the area to follow the general natural surface levels and therefore limit the amount of import fill required. The use of imported fill in an area such as Wattle Grove is likely to be expensive and further, the use of import fill is a finite resource and should be considered in terms of its sustainability. In the current market we estimate the cost of imported fill to be in the region of $22.50 to $25.00 per m^3, (pending the size of each respective project to be developed). Earthworks in the Investigation area should therefore be confined to: -

- Replacement of local materials which are not suitable as sub-grades in the development of residential urban landholdings;
- Removal of material for the construction of stormwater drainage infrastructure including basins and the like;

- Importation of fill for areas of road construction which sit directly above hard rock, bed rock or similar and in particular in the proposed realignment of Welshpool Road East into Crystal Brook Road for the future bridge flyover for the Tonkin Highway interchange.
- Replacement of existing material in trenches for wastewater, water, power, gas and telco services (import select fill).

2.4 Roadworks

The Wattle Grove MRS Amendment area is currently special rural land within a general location bounded by Vulcan Road / Gavour Road to the east, Tonkin Highway to the south and Welshpool Road East to the north. The internal road layout has not been formalised at this stage, however will be developed in further iterations as part of more detailed investigation in the planning phases.

The proposed road cross sections and intersections are to be designed to meet the change in traffic conditions as a result of the development of the MRS Amendment Area. The design of the road network in particular should consider the external conditions on roads at the boundary of the Investigation Area. The key points to consider are: -

- The future Main Roads WA design requirements for the Tonkin Highway / Welshpool Road East Interchange;
- The existing horizontal geometry design of Welshpool Road near the intersection of Crystal Brook Road being inappropriate for increased vehicular volumes and for industrial traffic;
- The proximity of the intersection of Crystal Brook Road / Brentwood Road being highly inappropriate for any additional traffic loading, or industrial traffic of any size or type;
- The existing geometry of Crystal Brook Road east of Gavour Road and at the intersection of Kelvin Road being inappropriate for industrial traffic and heavier volumes of regional traffic.

The opportunity existing however to improve each of these issues simply as follows: -

- Realign the main spine access by aligning Welshpool Road East directly into Crystal Brook Road, thereby providing a straight access direct to Tonkin Highway in an east / west direction;
- Realign the existing Brentwood Road intersection to create a Left-In / Left-Out at Welshpool Road East / Crystal Brook Road;
- Realign the existing Welshpool Road East (east of Crystal Brook Road intersection) to a new intersection approximately 200 metres east of the intersection of Welshpool Road / Crystal Brook Road / Brentwood Road;
- Realign the new Welshpool Road East / Crystal Brook Road alignment to an improved location at Kelvin Road to the east so that industrial traffic has a simple, direct and circuitous path into and out of the MRS

Amendment Area. This route also provides a clear access / egress for all new traffic into the area for residential purposes north of the existing Crystal Brook Road and will reduce traffic loading for regional traffic from the Foothills on Welshpool Road East (west of Crystal Brook Road).

Consideration will need to be given to existing RAV Networks and protection of existing trees in Crystal Brook Road and the northern end of Kelvin Road. This should be reviewed in detail in a Conceptual Design phase.

2.5 Stormwater Drainage Considerations

The Investigation Area has a simple overland flow-path with the overland flow generally directed westerly within the Wattle Grove MRS Amendment Area. In the northern portion (residential) some flow will be directed toward the Crystal Brook. Specific locations of any detention structures which will be required will need to be determined. This can either be provided within a formalised road reserve, or it can be included in private landholdings with a specific area for easement purposes to the benefit of the City of Kalamunda. Given the goal density targets of R30, it is also important to note that connection to the City's main stormwater drainage lines may be required for lots with not enough space for on-site detention. These requirements are likely to play a key role in the stormwater drainage design process in the Investigation Area. As a general rule of thumb for R20 to R40 development (which needs to be confirmed through the DWMS / LWMS and UWMP phases): -

- 2% of the total land area will be needed for the 1 in 1-year event;
- 5% of the total land area will be needed for the 1 in 5-year event;
- 8% of the total land area will be needed for the 1 in 100-year event;

Based on these general principles, KCTT have determined that the following approximate areas will be required for stormwater drainage requirements: -

- Industrial Catchment = 146 hectares
    - 1 in 1-year = 2% or 29,200m^3 at approx. 0.3m depth
    - 1 in 5-year = 5% or 73,000m^3 at approx. 0.5m depth
    - 1 in 100-year = 8% or 117,000m^3 at approx. 0.65m to 0.8m depth
- Residential Catchment = 120 hectares
    - 1 in 1-year = 2% or 24,000m^3 at approx. 0.3m depth
    - 1 in 5-year = 5% or 60,000m^3 at approx. 0.5m depth
    - 1 in 100-year = 8% or 96,000m^3 at approx. 0.65m to 0.8m depth

The purpose of the above dot points is to show the approximate land requirements for drainage in a potential development area of this size and scope. The areas nominated above are not proposed to be concentrated in one location. Drainage should be treated locally and at-source as often as possible and our proposed development

approach would seek to maintain pre-development flows into the existing Crystal Brook, which will further reduce the areas quoted above. The areas quoted above however are useful for consideration at this early stage in the planning.

Some drainage may be able to be withheld within future proposed lots, however this will be determined by the ultimate lot sizing. The drainage design criteria should be carefully considered in the development of the Wattle Grove MRS Amendment Area because the lower-lying areas where drainage will likely accumulate coincide with the potential for higher density development landholdings near the intersection of Tonkin Highway / Welshpool Road East, particularly if there is success with the development of a future public transport node (either rail or high transit bus to the nearest railway station) in this location.

The capture of all storm events on-site for R30 and greater densities (lots less than 300m^2) promotes the concept of stormwater as a resource. Developers will have the choice of: -

- Using stormwater for flushing toilets/ irrigation etc.
- Planting roof top gardens
- Providing drainage detention on-site and allowing post-storm release into the City of Kalamunda Network.

Considerations for Drainage Re-Use

The key drainage re-use schemes considered in this report include: -

- At-Surface Treatment / Bio-Retention Drainage Swales
- At-source infiltration and cleaning systems

Below are KCTT schematics for the proposed potential WSUD systems: -

Bio-Retention Swales

Bio-retention swales are a key component of the drainage design strategy for Wattle Grove to maintain the bushland feel of the Wattle Grove area. All medians are proposed to treat surface water, with all roads adjacent to POS and near the Crystal Brook featuring bio-retention swales to treat and clean water prior to its entry to downstream environments. Consideration will need to be given to provision of rock riffle structures and other velocity-slowing measures where road grades exceed 3%, and particularly where any existing grades exceed 5%.

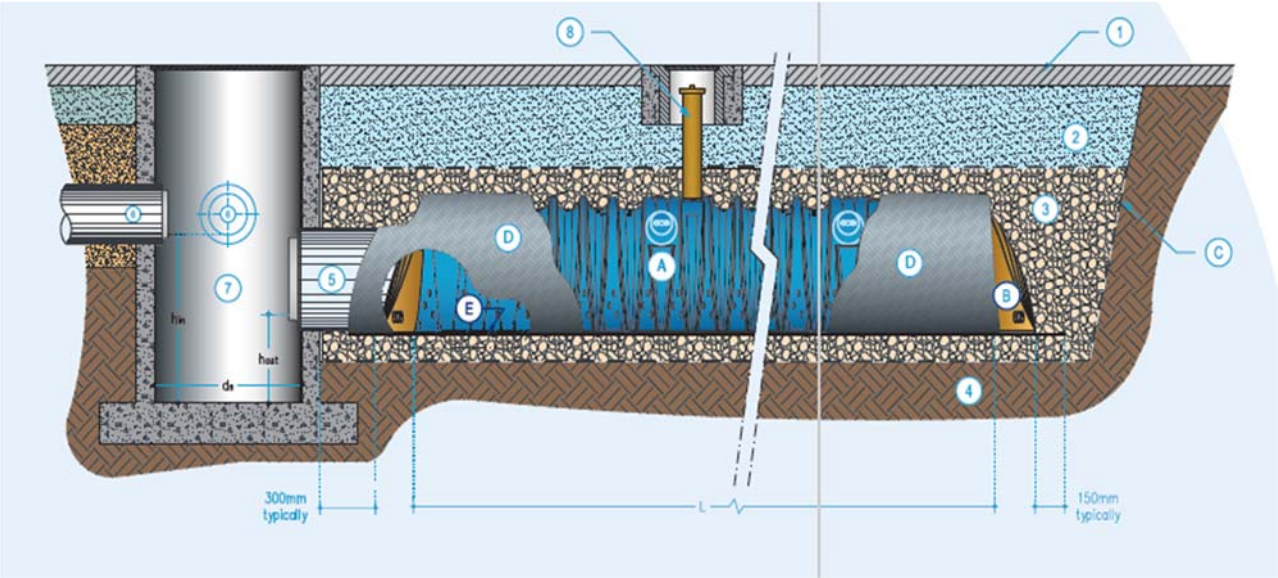
At-source Infiltration and Cleaning Systems

The capture of and reduction of stormwater pollutants, which remove the gross pollutants (GP) at source should be considered from the MRS Amendment phase as a requirement of good design. At-source cleaning systems provide the opportunity for improvements such as allowing the base of the Side Entry Pit, which is designed to infiltrate

water to be protected from sand rolling onto the new road surface picking up hydrocarbons and then entering the drain and causing localised pollution at the base of the side entry where the infiltration is intended.

Where greater volumes of flow are required to infiltration at-source events, underground modular stormwater management systems can be used to detain, infiltrate or harvest stormwater run-off, and also provide stormwater treatment by utilizing an internal gross pollutant and sediment trap. KCTT believe this is a great innovation which can be utilized throughout the Wattle Grove MRS Amendment Area.

The below is a figure sourced from the online ECOAID brochure, which outlines all the technical data and benefits of the system as an alternative to standard piping and pits used for stormwater drainage.



Source: https://www.geofabrics.co/sites/default/files/brochures/ecoAID_Brochure.pdf

2.6 Wastewater (Sewer)

The Water Corporation has provided long term planning for wastewater reticulation in this area. The basis of this report therefore, is not to discuss Water Corporation Planning, but to provide an indication of what we believe are the likely requirements of a wastewater system over the MRS Amendment Area. This report is therefore the commencement of an iterative process in developing a future strategy for the provision of wastewater assets.

The Water Corporation's Design and Construction Requirements for Gravity Sewers DN 150 to DN 600 Manual (Design Standard No DS 50) states: -

"Wastewater schemes shall be designed so that land will be sewered by a gravity scheme in preference to a pumping scheme." Ref: Section 4. Design Criteria, Section 4.1 Introduction paragraph 6, page 26 of 75.

The following points in Section 4.2 Sewer Design are of key importance to this assessment: -

Table 2 – Water Corporation Wastewater Design Parameters

Water Corporation Design Parameter	Investigative Area Requirements
a. The design flow in sewers shall include the wastewater flow from the design population contributing to the sewer and an allowance for stormwater and groundwater infiltration and approved industrial flows or special peak flows where appropriate.	Noted.
b. The Local Authority's current of proposed Residential Planning Code (R Code) which indicates the number of dwellings per net hectare in any area, together with the anticipated number of persons per dwelling shall form the basis for the calculation of contributing populations.	Proposed yields Residential north of Crystal Brook Road - R20 to R40 (to be confirmed) in a total land area of 120 hectares. Industrial landholdings south of Crystal Brook Road (potentially around 47 allotments with an average of 2 hectares each) in a total land area of 146 hectares.
c. A Residential Planning Code of R15 shall be used where the Local Authority Code is less than R15 or where no Code exists	Not applicable
d. *Wastewater design flows shall be calculated from the data shown in Tables 4.1, 4.2 and 4.3. The data shown in these tables represent minimum requirements. Where special factors or local information indicate the possibility of higher flows these shall be individually assessed.*	Demonstrated in Table 3 below.
e. The basis for calculating flows from town and city centres other than Perth shall be evaluated in each case.	Not applicable.
f. The Daily Flow from a residential area shall be the product of the population density, the daily flow per person and the net area.	Demonstrated in Table 3 below.
g. The Daily Flow from a non-residential area shall be the product of the flow per net hectare and the net area.	Demonstrated in Table 3 below.
h. The sewer Design Flow shall be 1.5 times the Daily Flow, unless special factors or local information indicate the possibility of higher flows which shall be individually assessed.	Demonstrated in Table 3 below.
i. In areas where there is an existing or proposed subdivision plan the net area shall be the total area of the	Not Applicable. Too early in the planning phase to provide a lot layout.

individual lots that can be connected to the wastewater system.	
j. When broadacre catchments are being evaluated the net area for the application of zoning densities shall be obtained by deducting the area of large recreation reserves and major roads from the gross area and reducing the remaining area by 25% to allow for public open space and minor roads.	KCTT have utilised an equivalent area for residential development representing approximately 65% of the total area for the purposes of this ISR.
k. Sewers serving a gravity area shall be designed to carry the Sewer Design Flow. When pumped flows are discharged into a gravity sewer, the gravity sewer shall be designed to accept the pumped flow rate plus the Sewer Design Flow from any gravity area contributing to the discharge point of the catchment. At these flows the depth of flow in the sewer shall not be more than: - • *Half full for DN 150 pipes.* • *Two thirds full for DN225 and larger pipes.*	To be confirmed by Water Corporation.
l. The minimum size of sewers in residential areas and serving small commercial areas and shopping centres shall be DN 150. Where the Gravity Sewer Design Flow is at least 3 L/second a DN225 sewer at 1:300 grade may be used. Small commercial areas and shopping centres are defined as areas / centres not exceeding 0.5 hectares/	Noted. Industrial landholdings are proposed south of Crystal Brook Road and Residential landholdings are proposed north of Crystal Brook Road.
m. The minimum size of sewers serving industrial, light industrial, large commercial areas and large shopping centres shall be DN225 with the following exceptions: - • *Single lots in industrial and commercial subdivisions can be served by a DN150 sewer.* • *A DN150 sewer can serve two industrial or commercial lots or an industrial and a commercial lot provided that the combined area of the two lots does not exceed 0.5 hectares.*	Noted. All sewers south of Crystal Brook Road to be a minimum of 225mm-diameter.
n. Pipe diameters with corresponding minimum and maximum grades, maximum distances between access chambers and the maximum allowable flows within ranges of grades are shown in Table 4.4. *The flow capacity of pipes is based on the Colebrook-White equation using a roughness coefficient (k) of 1.0mm.*	KCTT expect the majority of wastewater pipe infrastructure to be laid at minimum grades, however there may be some sections of steeper infrastructure which are installed to suit the longitudinal grades that naturally occur in the MRS Amendment Area.

Where the grade is required to be steeper than the minimum because of flow requirements it shall be marked on the drawing as the minimum grade allowable.	
o. The minimum grades shown in Table 4.4 may be varied as follows: - *The minimum grade of a DN150 sewer may be reduced to 1:250 provided that one of the following is achieved: - There is a reduction in the number of permanent pumping stations through which the flow discharges.* *The area is drained to a gravity sewer rather than to a pumping station.* *The number of entries to sewers DN300 and larger is reduced.*	Noted. This item is more applicable for detailed design requirements than the planning phases.
p. The minimum grade of a DN225 sewer may be reduced to 1:350 where a pumping station discharges at least 14L/second into the sewer.	Noted. As above.
q. When servicing industrial, light industrial, large commercial areas and large shopping centres the DN225 sewer shall be constructed at a minimum grade of 1:200 if the Sewer Design Flow is less than 3 L/second.	Noted.
r. The maximum and minimum grades of sewers are shown in Table 4.4	Noted.
s. The minimum size of a sewer receiving discharge from a pressure main shall be DN225 unless otherwise approved by the Water Corporation.	Noted.
t. Where the discharge rate of a pressure main exceeds two thirds of the capacity of a receiving gravity sewer the system design is to be discussed with the Corporation.	Noted
u. The diameter of a sewer downstream of any point should not be reduced.	Noted.
v. The centre lines of all sewers entering or leaving an Access Chamber should intersect at the centre point of the Access Chamber in plan unless the Access Chamber is a re-entrant Access Chamber.	Noted – detailed design procedure.

The MRS Amendment Area falls into the Wattle Grove SD073 catchment. KCTT have calculated the following design requirements for the proposed land uses in the MRS Amendment Area (this information is collated from Tables 4.2 and 4.3 of the design standard): -

Table 3 – Foothills Investigation Area Estimated Wastewater (Sewer) Flows

Development Type	Total Area (ha)	Equivalent Area (ha)	Number of Persons Per Dwelling	Population Density Persons / Net Ha	Flow (Dry Ground)	GSDF (Sewer Design Flow in Dry Ground) L/sec/Net ha	Total Design Flow	Primary Distribution Main
Northern Catchment (Residential R20 Option)	120 ha	78 ha	3.5	70	230**	0.280	21.84 L/sec	300mm-diameter
Northern Catchment (Residential R30 Option)	120 ha	78 ha	3.5	105	230**	0.419	32.7 L/sec	300mm-diameter
Northern Catchment (Residential R40 Option)	120 ha	78 Ha	3.5	120	230**	0.479	37.4 L/sec	300mm-diameter
Southern Catchment Industrial	146 ha	95 Ha	n.a.	n.a.	14,976 l/net ha/ day	0.260	24.7 L/sec	300mm-diameter
Total	**266 ha**	**173 ha**					**52.1 to 46.5 L/sec**	**375mm-diameter**

Note: ** L/person/day.

The Water Corporation have provided two planning diagrams for the wastewater, which show the existing planning through the southern section of the Foothills Investigation Area. A general description of these planning diagrams is provided below: -

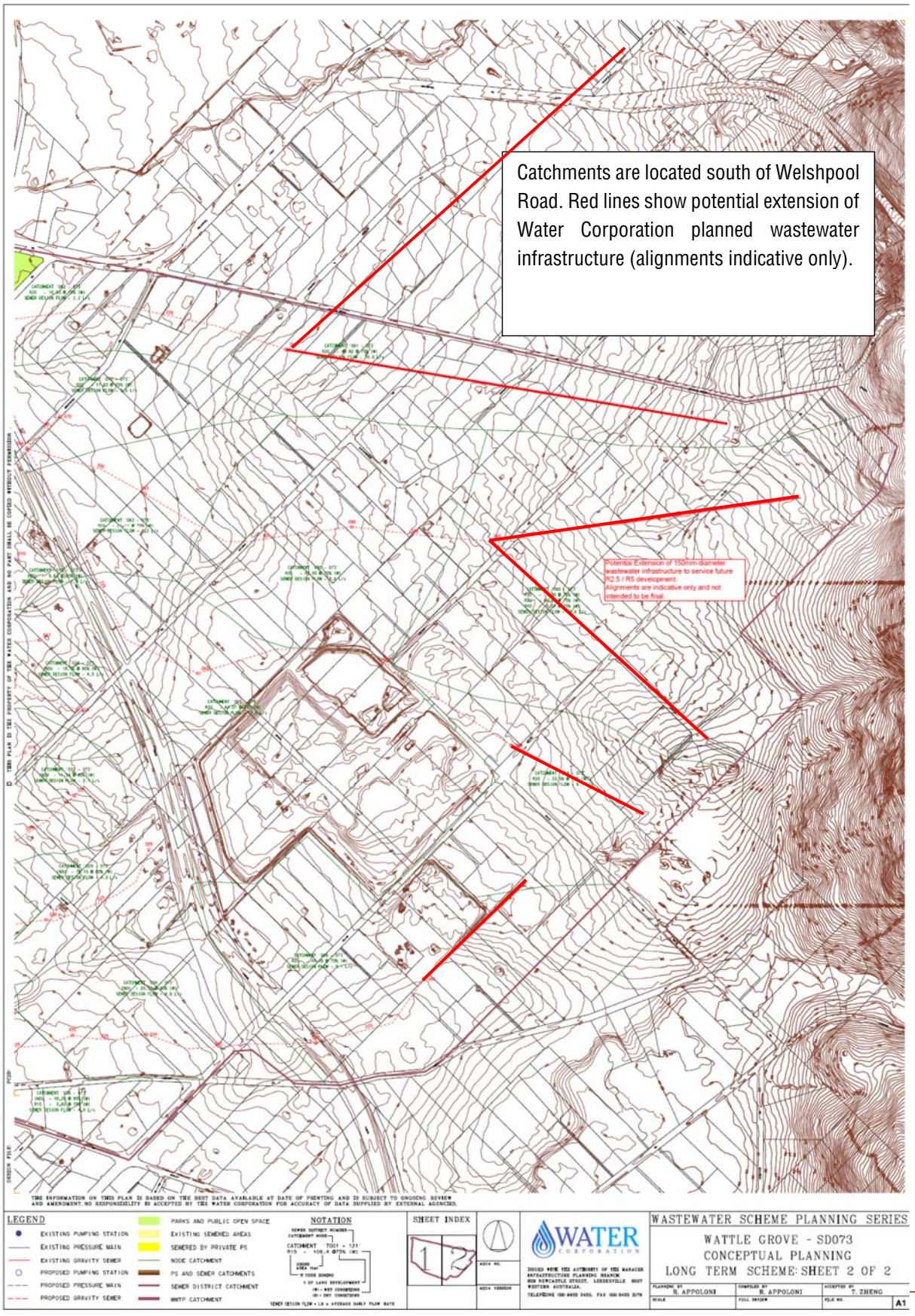
- Wattle Grove SD 1 shows a planned series of catchments generally south of Welshpool Road toward Bickley Road. These catchments are required for the development of land east of Tonkin Highway in the Foothills Investigation Area and drain via Brentwood Road in a 375mm-diameter and 450mm-diameter main toward 600mm-diameter mains in Bickley Road in the southwest. Wattle Grove SD1 is located to the

west of the Investigation Area, however the infrastructure is required for the expansion of lands in the south of the Investigation Area

- Wattle Grove SD 2 shows a planned series of catchments generally northeast of Tonkin Highway, south of Crystal Brook Road and west of Victoria Road. This is the southern section of the Investigation Area. These catchments have a rudimentary network of planned primary distribution mains, comprising of 225mm-diameter and 300mm-diameter mains draining toward Brentwood Road with a northern portion draining toward Boundary Road. There is no planning shown north of Welshpool Road.

The information provided above by KCTT in Table 1 therefore complies with the Water Corporation Planning, meaning an average R40 residential coding could be provided to all landholdings north of Crystal Brook Road if support to medium density is given by the Western Australian Planning Commission.

A Water Corporation map of the Wattle Grove planning is shown on the following page.


Catchments are located south of Welshpool Road. Red lines show potential extension of Water Corporation planned wastewater infrastructure (alignments indicative only).
Potential Extension of 150mm-diameter wastewater infrastructure to service future R2.5 / R5 development. Alignments are indicative only and not intended to be final.
LEGEND
EXISTING PUMPING STATION
EXISTING PRESSURE MAIN
EXISTING GRAVITY SEWER
PROPOSED PUMPING STATION
PROPOSED PRESSURE MAIN
PROPOSED GRAVITY SEWER
PARKS AND PUBLIC OPEN SPACE
EXISTING SEWERED AREAS
SEWERED BY PRIVATE PS
NODE CATCHMENT
PS AND SEWER CATCHMENTS
SEWER DISTRICT CATCHMENT
WWTP CATCHMENT
NOTATION
SHEET INDEX
WATER CORPORATION
WASTEWATER SCHEME PLANNING SERIES
WATTLE GROVE - SD073
CONCEPTUAL PLANNING
LONG TERM SCHEME: SHEET 2 OF 2
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2.7 Water

KCTT have held preliminary discussions with the Water Corporation relating to water design requirements for the MRS Amendment Area. The Water Corporation have confirmed there are significant water assets which run adjacent to the MRS Amendment Area inclusive of the Canning Trunk Main and the Canning Foothills Trunk Main. The Corporation has adopted a long-term water planning strategy for the area, however will only generally review the existing assets in the area and will not commence a formal detailed planning review until they are in receipt of detailed future development yields and road layouts for a Structure Planning phase.

The following table highlights the Water Corporation's design parameters as noted in the Water Reticulation Standard Design Standard DS63: -

Table 4 – Water Corporation Design Parameters and Foothills Investigation Area requirements

Water Corporation Design Parameter	Foothills Investigation Area Requirements
Design Criteria	
Minimum head at the reference ground level of every serviced lot shall be 17m in the Perth Metropolitan Area.	Water head pressure likely to be sufficient. The area is serviced by the Canning Foothills Distribution Main.
Maximum head shall be 100m.	Additional Pressure Reducing Valve's (PRV's) may be required.
Sizing of mains – water reticulation mains shall be sized so that the velocity of flow in pipes is kept below 2m/sec	To be confirmed by Water Corporation in planning.
The largest pipe size for water reticulation shall be DN250.	Noted – all proposed mains for servicing properties in the Foothills Investigation Area shall be between DN100 and DN250. Distribution mains of DN300 and greater will not be used for any direct connection to properties
Minimum size DN150 for industrial development and retail / commercial centres.	Noted.
Improvements to Existing Mains	
Improvements to the hydraulic capacity of existing mains may be necessary as a result of a proposed	To be confirmed as structure planning continues.

development. The nature and extent of the improvements will be determined by the Corporation.	
Sizing of Mains	
The impact of adjoining water supply schemes and high-level supply zone boundaries or operational control zones.	To be considered in planning phase.
The impact of staging the water supply to a development area in the event that all of the distribution mains defined in the Scheme design are not in place at the time of initial supply.	To be considered by the Water Corporation at submission of Subdivision Application
The eventuality of a single distribution main connection being closed.	We believe the network of water mains will be closed given the proposed road improvements.
The eventuality of any one section of the water reticulation being isolated.	Valves to be located in detailed design / construction phases which enable the isolation of sections of line.
All aspects of the overall long-term supply situation.	To be considered by the Water Corporation.
As many services as hydraulically possible be placed on each main to ensure it remains self-cleansing within the limits of minimum supply heads.	The MRS Amendment Area proposes sufficient numbers of services to ensure self-cleansing of the main and replenishment of water supplies.
Reticulation Layout	
The water reticulation shall as far as practicable, form a series of closed loops to minimise dead end mains. Every group of 50 or more properties shall be supplied by more than one pipe route.	Proposed concept planning should offer opportunities for closed loops with minimal use of cul-de-sacs.
Within a subdivision agreement area, mains shall be provided across the full frontage of all lots created except where the future extension of the main will not be required. Every lot shall be served by a reticulation main along one of the street frontages of the property, i.e. in gazetted road reserves.	Mains are already provided across the frontage of all existing “super lots”.
Mains and Services Location	
Mains shall align within the existing or proposed connection points from the distribution system and be located within road reserves on an alignment of 2.1 metres.	Mains shall be placed on standard 2.1 metre alignments.

The following table shows the yields with commentary relating to the minimum pipe sizing in each zone.

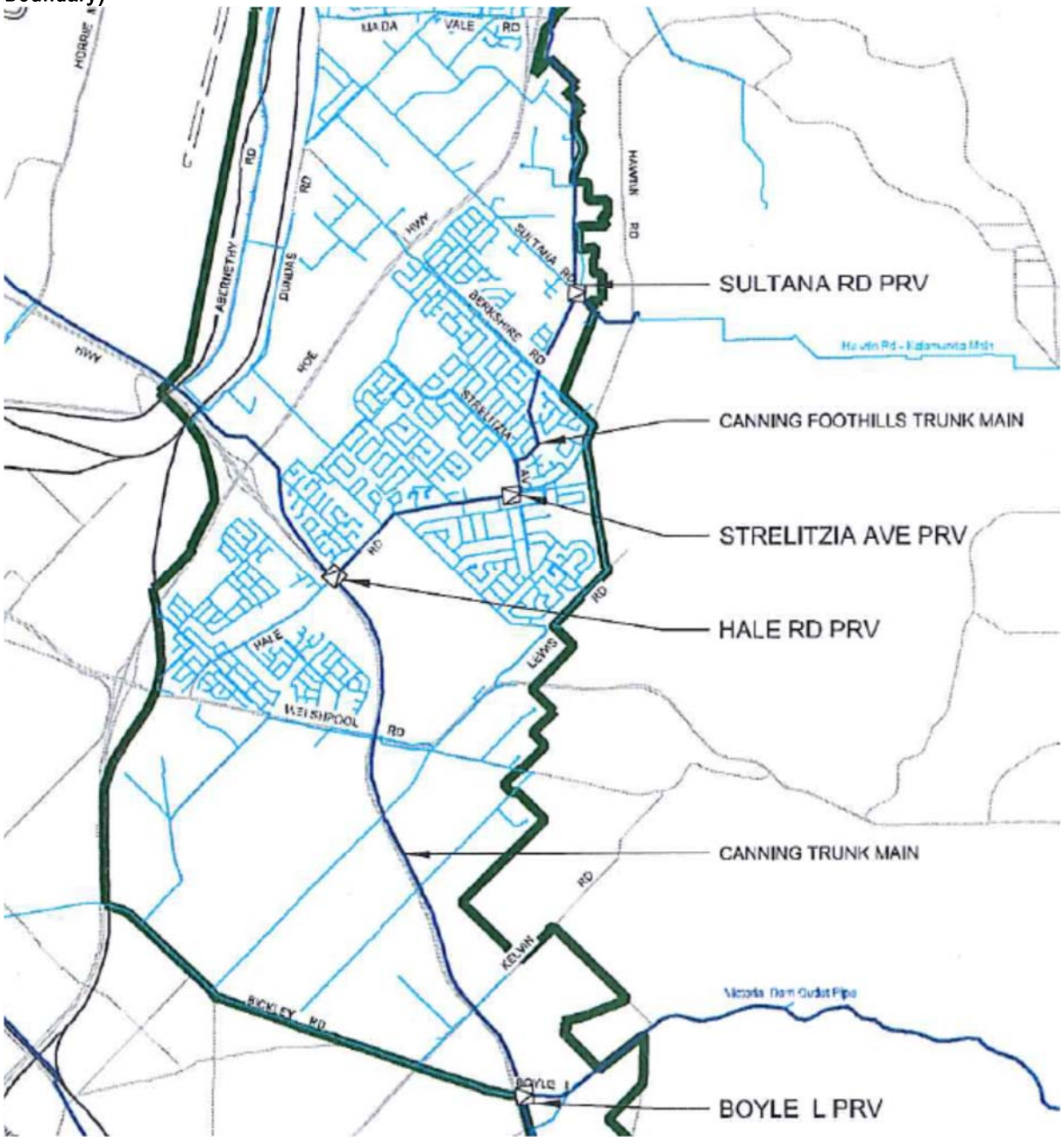
Table 5 – Development Zones and General Minimum Requirements for Water Infrastructure

Development Type	Total Area (Ha)	Equivalent Area	Minimum Pipe Sizing	Notes
Southern Catchment	266	173 Ha	100mm-diameter in residential zone. 150mm-diameter in industrial zone.	Primary Distributor Main at 250mm-diameter Secondary Distributor Main 200mm-diameter
Total	**266 ha**	**173 ha**		

The Water Corporation have major water infrastructure throughout the Foothills Investigation Area. The southern catchment includes the Canning Trunk Main, with the Canning Foothills Trunk Main branching off at Hale Road. In discussions with the Water Corporation, we believe a network of local infrastructure can be planned pending confirmation of road layouts.

Existing water mains are available in most existing road reservations in the catchment.

Figure 1 - Major Water Assets (source: SKM Investigation – modified to suit Foothills Investigation Area Boundary)



2.8 Power, Telecommunications and Gas Supply

The provision of power, telecommunications and gas supply will be a requirement for all future developers in the MRS Amendment Area.

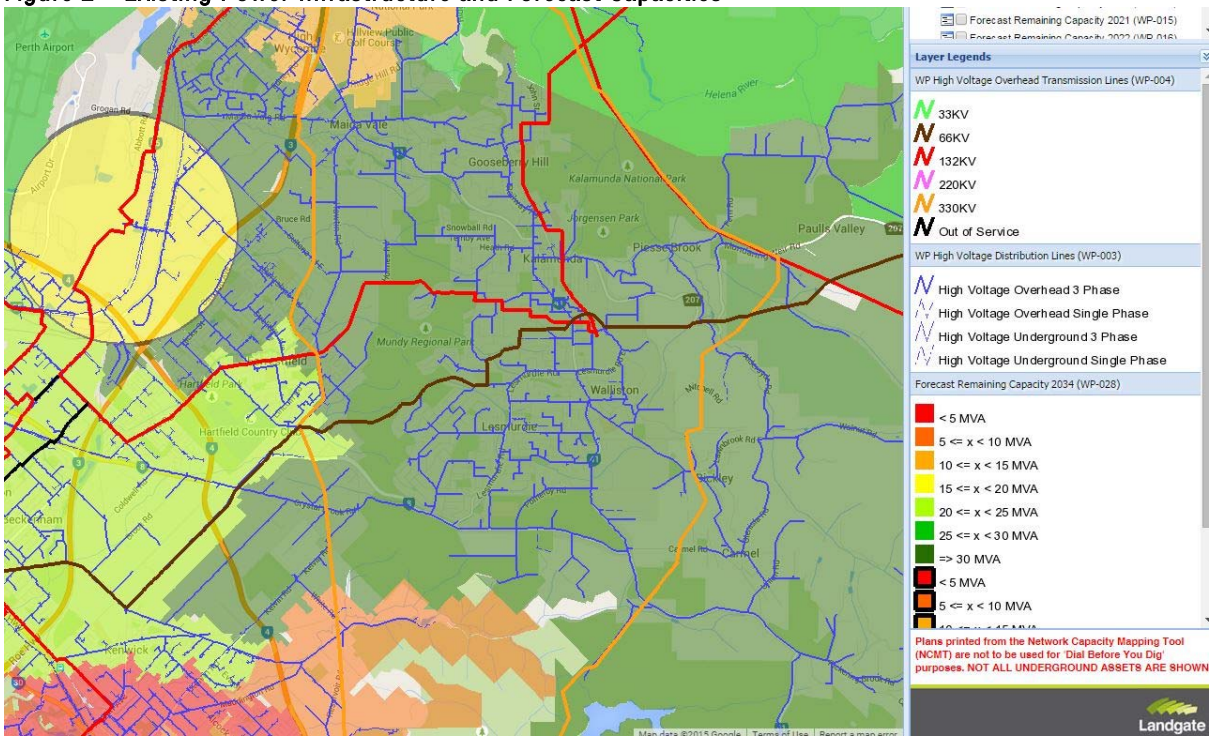
2.8.1 Power

Western Power requires that developers underground all existing overhead power assets which are located on the development side of any road reservation. This cost should be considered in any future development.

Western Power has an online management tool known as the Network Capacity Mapping Tool, or NCMT. Using this tool, we have reviewed the "forecast remaining capacity" and found that: -

- The catchment between Welshpool Road and Tonkin Highway generally has a forecast capacity of 20 to 25MVA in the year 2034.

Figure 2 – Existing Power Infrastructure and Forecast Capacities



High Voltage overhead 3 phase power infrastructure is currently available through most of the DSP Area as follows: -

- Hale Road to Mundy Regional Park (132kV)
- West of Hawtin Road (330kV) near the Canning Foothills Trunk Main water alignment
- 66kV assets on the south-eastern boundary of the Investigation Area.

2.8.2 Telecommunications

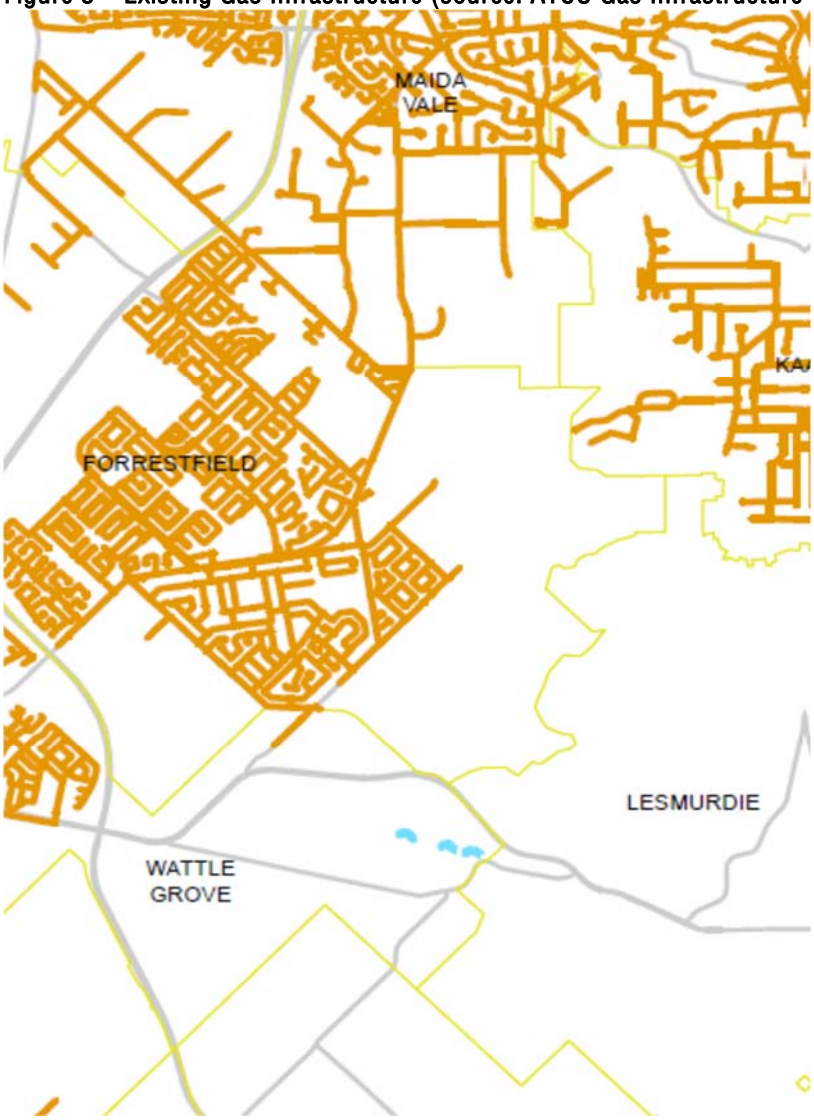
The MRS Amendment Area has existing telecommunications assets which are suitable for general telephony. There are no NBN rollouts currently planned in this area. NBN Co has a charter to work with local governments and developers, particularly for larger scale developments (+100 lots).

For the purposes of this Infrastructure Servicing Report, we believe the provision of suitable services can be negotiated.

2.8.3 Gas

The road network exhibits minimal existing infrastructure is available in Wattle Grove, however existing services are in reasonable proximity to the MRS Amendment Area.

Figure 3 – Existing Gas Infrastructure (source: ATCO Gas Infrastructure – Perth North Map)



2.9 Earthworks

For localised cut to fill (+ / - 1.0 metre) it is highly likely that the existing soils will be suitable for re-use. This is a key component of sustainability and is a key objective in all KCTT-designed projects. In 2016, KCTT completed research on the impact that overfilling land development sites has both economically and environmentally. Apart from the issues associated with difficulties in tree retention on filled developments, we found the following key metrics: -

Table 2– KCTT Key Metrics 1

Lot Size	Fill Depth	Fill Required Per Lot	Distance to Nearest Quarry	CO_2 Emissions Per Lot	Volatile Organic Compound
$80m^2$	1.0m	$230m^3$	40km	952kg	34,007kg
$100m^2$	1.0m	$250m^3$	40km	1035kg	36,964kg
$120m^2$	1.0m	$270m^3$	40km	1110kg	39,921kg
$160m^2$	1.0m	$310m^3$	40km	1283kg	45,835kg
$200m^2$	1.0m	$350m^3$	40km	1450kg	51,750kg

Table 3– KCTT Key Metrics 2

Lot Size	Total Hydrocarbons (THC Per Lot)	Carbon Monoxide Cost Per Lot	Nitrogen Oxides (not per lot)	Particulate Matter Under 2.5 Micron Per Lot
$80m^2$	34,711kg	267,246kg	49,012kg	952kg
$100m^2$	37,730kg	290,485kg	53,214kg	1035kg
$120m^2$	40,748kg	313,724kg	57,536kg	1110kg
$160m^2$	46,785kg	360,201kg	66,060kg	1283kg

$200m^2$	52,822kg	406,679kg	74583kg	1450kg

Importation of fill is therefore a significant contribution to pollution due to its labour-intensiveness in the field of transportation.

2.10 Bridges (Welshpool Road East / Tonkin Highway Interchange)

The Wattle Grove MRS Amendment Area is reliant on some significant improvements to road connectivity, with consideration needed for the impact of the proposed Welshpool Road East grade separation on the development potential in the western third of the MRS Amendment Area.

Any bridge of the Tonkin Highway over Welshpool Road East will have the following minimum requirements: -

- Min depth of bridge structure = 1.7 metres
- Min clearance to Welshpool Road East carriageways = 6.5 metres

The following picture shows the impact of the Benara Road bridge over the Tonkin Highway. The proposed Tonkin Highway Flyover at Welshpool Road East will have a similar visual and land-take impact to this bridge. This impact should be considered on the Wattle Grove MRS Amendment Area.

The cost of this bridge will not be the responsibility of the MRS Amendment Area, however costs to realign Welshpool Road East will need to be considered in the develop of a DCP.

APPENDIX 3:
KCTT,
Transport Impact Assessment

TRANSPORT IMPACT ASSESSMENT

Wattle Grove South

April 2018

Rev A

kctt

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
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Rev A	20.04.2018	M Kleyweg	M Kleyweg	20.04.2018	Amended according to planner's comments received on 20.04.2018.

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Revision	Date of issue	Quantity	Issued to
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Appendices

1. Executive Summary

KCTT have been commissioned by the City of Kalamunda to prepare a Transport Impact Assessment to inform a Feasibility Study for Wattle Grove South.

Wattle Grove South is located within the City of Kalamunda, approximately 15km from Perth City. The subject site is currently characterised by rural land approximately 320 hectares (ha) in size. It is encompassed by Tonkin Highway to the south, Welshpool East Road to the north and Kelvin Road and City of Kalamunda boundary to the east. The Study Area is proposed to be developed into a residential and service commercial/light industry area. Land generally south of Crystal Brook Road is proposed to be developed for commercial/light industrial uses, whilst land generally north of Crystal Brook Road will be developed for residential purposes.

The purpose of this report is to identify any potential traffic issues, constraints and opportunities for future development. A desktop trip generation, distribution and assignment exercise undertaken establishes the potential future traffic volumes.

KCTT have analysed vehicular crash information in the last 5 years within the Study Area. KCTT believe that the general safety will be improved through urbanisation of the area, by limiting vehicular speeds and improvements to the general road geometry. Additionally, the intersection of Tonkin Highway & Welshpool East Road is planned to be a grade separated interchange with a flyover on Tonkin Highway over Welshpool East Road. These measures should reduce the incidence of killed or seriously injured (KSI) crashes in the Study Area.

The area is currently serviced by bus routes 282, 283 and 279. The Public Transport Authority (PTA) confirmed there are currently no new routes planned unless there is a significant increase in residential development. Subject to increased residential density the existing routes may be improved over time. Introduction of additional routes would require a more detailed plan in the future stage of development.

KCTT assumes that subsequent to a concurrent Metropolitan Region Scheme and Local Planning Scheme Amendment process to rezone the land for urban development the City of Kalamunda will prepare a District Structure Plan (DSP). It is essential to develop an efficient and connected network of pedestrian paths in order to encourage pedestrian and cycling movement to and throughout the future DSP area. It is proposed that every major road within DSP area will have either a shared path or a separate pedestrian path. All pedestrian and shared paths should be designed to be accessible by all members of the community in accordance with the City of Kalamunda's Disability Access and Inclusion Plan 2012-2017 or any other subsequent document of this nature. The exact location of pram ramps and other elements is to be determined at a later stage of development.

The general options considered for the residential development scenarios of this site are averages of R20 (Option 1), R30 (Option 2) and R40 (Option 3). To cater for the proposed land uses KCTT assumes the development of a primary school and neighbourhood centre within the Wattle Grove South area. It's possible that Option 3 would require two primary schools and two neighbourhood centres. However, for purpose of this report and traffic modelling, KCTT have assumed one primary school and one neighbourhood centre in all three scenarios.

Although the cumulative traffic generation of the proposed development is expected to be in range from **38,216 VPD to 45,236 VPD**, it is expected that a total between **29,147 VPD to 36,167 VPD** will be generated into the network external to the Wattle Grove South area. This is the consequence of the fact that traffic attracted to the neighbourhood centre will be predominantly generated by the residents of the area and is already accounted for in the residential traffic. Further to this, KCTT have assumed that the primary school would be a government school with a limited local intake. That means that the traffic attracted by the primary school and neighbourhood centre is approximately

80% local traffic that has already been accounted for in residential traffic. And above all, various land uses will peak at different times with little or no overlap. It should be noted that these calculations represent the rough estimate of both yields and the traffic volumes. Once a precise layout plan of the future structure plan area is provided, a more accurate estimation of traffic generation can be provided.

There are plans for potential Wattle Grove rail realignment with new train lines to connect future Forrestfield North Railway Station and Wattle Grove South future station. The proposed alignment would follow the alignment of Tonkin Highway and continue along Brentwood Road to Roe Highway. If developed, this will be an important strategic connection, resulting in reduced car utilisation.

Traffic calming methods are desirable especially near primary schools and neighbourhood centres. Chicanes, speed humps, wombat crossings and/or other methods should be considered when designing streets to lower operating speeds and improve safety. Posted signs with reduced speed limits should be considered for roads near these facilities.

The internal road layout has not been formalised at this stage, however will be developed in further iterations as part of more detailed investigation in the planning phases.

The proposed road cross sections and intersections are to be designed in accordance with relevant regulatory documents such as Liveable Neighbourhoods and various State and Local Planning policies.

The Study Area and surrounding area, will be well planned to accommodate the major changes that will occur in the next decade. The key will be in monitoring the traffic and intersections performance and upgrading them as necessary and as timely as possible depending on the actual development yields. While some of the major upgrades on Metropolitan network are anticipated, suggestions for upgrade of the existing network are given as a guide only and should be considered with caution.

2. Transport Impact Assessment

Note: This document is copyright to KCTT (trading as KC Traffic and Transport Pty Ltd). The information provided in this TIA report has been developed by KCTT over a period of years and has been presented in accordance with the requirements of a number of our clients. The information in this report is therefore intended to be commercial in confidence and is not to be shared with external parties at any time, unless a Director of KCTT provides written authorisation that the document may be shared at a specific time to a specific party, or parties. The terms and conditions associated with the receipt of this material is that it is not shared or distributed without our express, and written consent.

If you have received this information in error, KCTT must be notified immediately. We request the immediate destruction of all formats of this document, inclusive of paper and electronic copies should you have received this document in error.

2.1. Location

Study Area	Wattle Grove South
Street Number	N/A
Road Name/s	N/A
Local Government Authority	City of Kalamunda

Description of Site

The Study Area is located within the City of Kalamunda, approximately 15km from the Perth CBD. It is a rural area of about 320ha. It is encompassed by Tonkin Highway to the south, Welshpool East Road to the north and Kelvin Road and City of Kalamunda boundary to the east.

2.2. Technical Literature Used

Type of Development	Residential and Service Commercial/Industrial
Are the R-Codes referenced?	YES
If YES, nominate which:	State Planning Policy 3.1 Residential Design Codes 2015 R-Codes (incorporating amendments gazetted on 23/10/15)
Are other State Planning Policies referenced?	NO
If YES, nominate which:	
Is the NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses) referenced?	YES Guide to Traffic Management – Part 3: Traffic Studies and Analysis, Austroads, 2008 Guide to Traffic Management – Part 11: Parking, Austroads, 2008 Guide to Traffic Management – Part 12: Traffic Impacts of Developments, Austroads, 2008
Which WAPC Transport Impact Assessment Guideline should be referenced?	Volume 2 – Planning Schemes, Structure Plans & Activity Centre Plans Volume 5 – Technical Guidance
Are there applicable LGA schemes for this type of development?	YES
Number of Scheme	No 3
Name of Scheme	City of Kalamunda Local Planning Scheme
Are Austroads documents referenced?	YES

Is the Perth Transport Plan for 3.5 million and beyond referenced?	YES
List of other documents:	• Perth Transport Plan for 3.5 Million People and Beyond • Directions 31 and Beyond • Disability Access and Inclusion Plan 2012-2017, City of Kalamunda

2.3. Land Uses

Are there any existing Land Uses within the Study Area?	YES
If YES, nominate:	Approximately 130 single dwelling lots
What zone is the Study Area included in according to the Metropolitan Region Scheme and LPS / TPS?	Special Rural

Proposed Land Uses

How many types of land uses are proposed?	4 land uses
Nominate land use type and yield	Please refer to the table below:

Development Type	Total Area (m^2)	Equivalent Area	Yield
Industrial	1,460,000	Assume 65% = 949,000	Approximately 47 Industrial Lots
Option 1 Residential – R20	1,200,000	Assume 65% = 780,000	1,560
Option 2 Residential – R30	As above	As above	2,340
Option 3 Residential – R40	As above	As above	3,120
School	Assume 40,000	N/A	450 students
Neighbourhood Centre	Assume 40,000	12,000 m^2 GFA (Equivalent of 30% of total area)	12,000m^2 GFA
Total Development	2,660,000	1,729,000	47 industrial lots + between 1,560 to 3,120 residential lots + primary school and neighbourhood centre

Is there any proposed staging of the Study Area?	Not known at this stage of development
Are the proposed land uses complimentary with the surrounding land-uses?	YES – the wider area is undergoing major changes from rural to urban, this DSP will compliment these changes.

2.4. Local Road Network Information

How many existing roads are there within the Study Area? 15 existing roads

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

Road 1

Road Name	**Crystal Brook Road**
Number of Lanes	One lane per direction
Road Reservation Width	20m
Road Pavement Width	7.2m
Classification	Urban Local Road / Access Road
Speed Limit	70kph (SLK 0.00 – 1.86) 60kph (SLK 1.86 – 3.18)
Bus Route	YES 283 - Perth - Kalamunda Bus Station via Lesmurdie Road
On-street parking	NO

Road 2

Road Name	**Brentwood Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 3

Road Name	**Johnson Place**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 4

Road Name	**Philemon Court**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	12m
Road Pavement Width	5m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 5

Road Name	**Victoria Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 6

Road Name	**Gavour Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	5m
Classification	Urban Local Road / Access Road
Speed Limit	50 km/h or State Limit
Bus Route	NO
On-street parking	NO

Road 7

Road Name	**Valcan Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	7m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 8

Road Name	**Judith Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50 kph or State Limit
Bus Route	NO
On-street parking	NO

Road 9

Road Name	**Jack Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	5.5m
Classification	Urban Local Road / Access Road
Speed Limit	50 kph or State Limit

Bus Route	NO
On-street parking	NO

Road 10

Road Name	**Crystal Place**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	16m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50 kph or State Limit
Bus Route	NO
On-street parking	NO

Road 11

Road Name	**Ridley Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	5.5m
Classification	Urban Local Road / Access Road
Speed Limit	50 kph or State Limit
Bus Route	NO
On-street parking	NO

Road 12

Road Name	**Easterbrook Place**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	16m
Road Pavement Width	5m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 13

Road Name	**Emanuel Court**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	16m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 14

Road Name	**Boundary Road (north of Tonkin Highway)**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	5.5m unsealed
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 15

Road Name	**Fontano Road**
Number of Lanes	two-way one lane (no centreline)
Road Reservation Width	20m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50 kph or State Limit
Bus Route	NO
On-street parking	NO

Name of Other Roads within 2km radius of site, or roads likely to take increased traffic due to the development:

Road 1

Road Name	**Welshpool Road East**
Number of Lanes	Two lanes per direction
Road Reservation Width	40m
Road Pavement Width	7.0m and 7.4 per direction, with 10.0m median
Classification	Significant Urban Local Road / Distributor A
Speed Limit	80kph
Bus Route	YES
	282 - Perth - Kalamunda Bus Station via Grove Road
On-street parking	NO

Road 2

Road Name	**Kelvin Road**
Number of Lanes	One line per direction
Road Reservation Width	20m
Road Pavement Width	7.2m
Classification	Significant Urban Local Road / Distributor B
Speed Limit	60kph
Bus Route	YES
If YES Nominate Bus Routes	279 - Maddington - Kalamunda Bus Station via Kelvin Road
On-street parking	NO

Road 3

Road Name	**Tonkin Highway**
Number of Lanes	two lanes per direction, with central median
Road Reservation Width	approximately 60 m
Road Pavement Width	9.5m pavement in each direction (2 x 3.5m lanes, plus shoulder)
Classification	Urban Highway / Primary Distributor
Speed Limit	80 kph / 100kph
Bus Route	NO
On-street parking	NO

2.5. Traffic Volumes

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Year	
			AM Peak Time - AM Peak VPH	PM Peak Time - PM Peak VPH	*If HV count is Not Available, are HV likely to be in higher volumes than generally expected?*	Date of Traffic Count	*If older than 3 years multiply with a growth rate*
Hale Road (Wattle Grove)	North of Welshpool Road East (SLK 0.81)	11,730	08:00 – 875	16:45 – 1,054	5.9%	Dec 2015	–
	East of Tonkin Highway (SLK 1.76)	15,960	08:15 – 994	16:30 – 1,418	6.9%	Aug 2017	–
Welshpool Road East	East of Tonkin Highway (SLK 0.24)	20,314	07:45 – 1,622	16:45 – 1,917	11.1%	Dec 2015	–
	East of Tonkin Highway**	16,546	08:00 – 1,501	17:00 – 1,699	n.a.	Sep 2017	–
	West of Tonkin Highway (SLK 9.90)	22,702	07:30 – 1,957	16:45 – 1,721	10.5%	Jun 2016	–
	West of Tonkin Highway**	17,998	08:00 – 1,386	17:00 – 1,477	n.a.	Sep 2017	–
Crystal Brook Road	250m East of Brentwood Road*	2,168	07:00 – 208	15:00 – 215	n.a.	Sep 2017	–
Tonkin Highway	North of Hale Road (SLK 17.27) North Bound	15,116	07:15 – 2,647	15:30 – 1,626	19.1%	Aug 2017	–
	North of Welshpool	40,695	07:15 – 3,410	15:30 – 3,566	52.3%	Aug 2017	–

	Road East (SLK 17.44)						
	North of Welshpool Road East**	40,237	08:00 – 3,336	17:00 – 3,380	n.a.	Sep 2017	–
	South of Welshpool Road East (SLK 19.45)	47,882	06:15 – 3,503	16:00 – 3,904	15.9%	Dec 2015	–
	South of Welshpool Road East**	42,791	08:00 – 3,256	17:00 – 3,738	n.a.	Sep 2017	–
	North of Kelvin Road**	39,620	08:00 – 3,014	17:00 – 3,594	n.a.	Sep 2017	–
	South of Kelvin Road (SLK 22.51)	43,124	07:00 – 3,141	1615 – 3,909	12.6%	May 2016	–
	South of Kelvin Road**	44,716	08:00 – 3,580	17:00 – 3,795	n.a.	Sep 2017	–
Kelvin Road	West of Bickley Road (SLK 2.38)	13,392	07:15 – 983	15:15 – 1,131	n.a.	Jun 2014	15,073
	West of Tonkin Highway (SLK 3.02)	17,823	07:30 – 1,433	1530 – 1,677	n.a.	Aug 2016	–
	East of Tonkin Highway (SLK 3.60)	5,963	07:30 – 535	16:00 – 539	n.a.	Jun 2014	6,711
	East of Tonkin Highway**	5,043	08:00 – 366	17:00 – 491	n.a.	Sep 2017	–
	West of Tonkin Highway**	14,611	08:00 – 1,066	17:00 – 1,258	n.a.	Sep 2017	–
	460m South West of Crystal Brook Road*	5,290	08:00 – 481	16:00 – 518	n.a.	Mar 2016	–

Note - These traffic data have been received from the City of Kalamunda*

*Note** - These traffic volumes have been derived from SCATS data obtained through Main Roads for the intersection of Tonkin Highway and Kelvin Road and intersection of Tonkin Highway and Crystal Brook Road. Although SCATS should not be used as a sole source of data it is a good tool to verify fluctuations in flow.*

2.6. Vehicular Crash Information

Is Crash Data Available on Main Roads WA website? YES

Analysis period 01/01/2013 – 31/12/2017

Road Name	Functional Classification	Road Hierarchy	Speed Limit	Crash Statistics			
				No of KSI Crashes (Fatal + Hospital)	No of Medical Attention Crashes	No of PDO Major Crashes	No of PDO Minor Crashes
Crystal Brook Road & Welshpool Road East – SLK 0.00	Urban Local Road / Significant Urban Local Road	Access Road / Distributor A	70kph/ 80kph	0	3	0	1
Crystal Brook Road & Welshpool Road East – SLK 3.18	Urban Local Road / Significant Urban Local Road	Access Road / Distributor A	60kph/ 80kph	1	2	2	0
Crystal Brook Road & Brentwood Road	Urban Local Road / Urban Local Road	Access Road / Access Road	70kph/ 50kph	0	0	1	0
Crystal Brook Road & Kelvin Road	Urban Local Road / Significant Urban Local Road	Access Road / Distributor B	60kph/ 60kph	0	1	4	2
Tonkin Highway & Welshpool Road East	Urban Highway	Primary Distributor	80kph/ 80kph	4	27	84	59
No of MVKT Travelled at Location	approximately 65,000*365*5years*0.4km = 47.45 MVKT						
KSI Crash Rate	4 per 47.45 = 8 KSI crashes / 100 MVKT						
Comparison with Crash Density and Crash Rate Statistics	8 KSI crashes / 100 MVKT crash rate is higher than network average of 4.5. *						
Other Crash Rate	174 per 47.45 = 367 other crashes / 100 MVKT						
Comparison with Crash Density and Crash Rate Statistics	367 crashes / 100 MVKT crash rate is significantly higher than network average 67.9. *						
*Note * - Tonkin Highway and Welshpool Road intersection will be a grade separated intersection by 2031, reducing the conflict points and therefore, improving the safety on the future interchange.*							
Crystal Brook Road SLK (0.00-2.10)	Urban Local Road	Access Road	60kph 70kph	0	0	3	1
No of MVKT Travelled at Location	approximately 2,200*365*5years*1.70km = 6.82 MVKT						
KSI Crash Rate	0 per 6.82 = 0.00 KSI crashes / MVKT						
Comparison with Crash Density and Crash Rate Statistics	0.00 crashes / MVKT crash rate is lower than network average of 0.04.						
All Crashes Rate	4 per 6.82 = 0.59 crashes / MVKT						
Comparison with Crash Density and Crash Rate Statistics	0.59 crashes / MVKT crash rate is lower than network average 0.91.						
Welshpool Road East SLK (0.00 – 0.54)	Significant Urban Local Road	Distributor A	80kph	0	1	1	3

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

CRASH DENSITY AND CRASH RATE ON METROPOLITAN LOCAL ROADS NETWORK ONLY

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

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

The following table shows the Crash Density and Crash Rates on Metropolitan State Roads as obtained from Main Roads WA on the 18th January 2017 by email request: -

METRO CRASH RATE AND CRASH DENSITY ON STATE ROADS FOR ALL CRASHES
2011 TO 2015

	CRASH RATE/100MVKT	CRASH DENSITY
ALL CRASHES	122.4	66.0
KSI CRASHES	4.5	2.4

METRO CRASH RATE AND CRASH DENSITY ON STATE ROADS EXCLUDING MAJOR INTERSECTIONS
2011 TO 2015

	CRASH RATE/100MVKT	CRASH DENSITY
ALL CRASHES	67.9	36.6
KSI CRASHES	3.1	1.7

In order to identify black spots being the locations noted for a high incidence of crashes involving death and injury, it is important to conduct the crash criteria analysis as shown in the table below. If the below crash criteria are met, there is a way to measure the cost-effectiveness of the proposed treatment. It is called BCR and it ensures that the black spot exhibits a significant number of crashes that are correctable by infrastructure treatment.

Table 3.1: Crash criteria for the State Black Spot Program

Crash Criteria	Highways and Main Roads		Local Roads	
	Metro	Rural	Metro	Rural
Intersection or Mid-block or Short road section (< 3 km)	10 crashes over 5 years	3 crashes over 5 years	5 crashes over 5 years	3 crashes over 5 years
Road length (≥ 3km)	Average of 3 Crashes per km over 5 years	Average of 1 crash per km over 5 years	Average of 2 Crashes per km over 5 years	Average of 1 crash per km over 5 years
Benefit-cost ratio (BCR)	1			

(Main Roads/ WALGA 2004)

Based on the comparative analysis, KCTT believe that the general safety can be improved through the urbanisation of the area, limiting of vehicular speeds and improvements to the general road and road geometry. These measures should reduce the incidence of KSI crashes in the future DSP Area.

2.7. Public Transport Accessibility

How many bus routes are within 400 metres of the subject site?			2 bus routes
How many rail routes are within 800 metres of the subject site?			no rail routes
Bus / Rail Route	Description	Peak Frequency	Off-Peak Frequency
279	Maddington - Kalamunda Bus Station via Kelvin Road	3 times a day	
282	Perth - Kalamunda Bus Station via Grove Road	20 minutes	2 hours
283	Perth - Kalamunda Bus Station via Lesmurdie Road	1 hour	2 hours
Are high frequency bus routes required to justify a reduction in parking?			NO

Walk Score Rating for Accessibility to Public Transport.

24- Minimal Transit. It is possible to get on a bus.

Is the development in a Greenfields area? Partially

Additional information on planned improvements:

PTA confirmed there are currently no new routes planned unless there is a great likelihood of significant changes in residential density. Subject to increased residential density the existing routes may be improved over time. Introduction of additional routes would require a more detailed development proposal.

Forrestfield Station – approximately 5.5km from the proposed development

Public Transport Authority website accessed on 16.10.2017. – 10:26

http://www.pta.wa.gov.au/forrestfieldairportlink/rail-map :

" Forrestfield Station will deliver a significant public transport boost to Perth's growing eastern and south-eastern suburbs by improving the bus feeder network, providing parking for up to 2500 cars, and servicing future residential and business developments.

The location of the railway station, east of Perth Airport, is adjacent to Dundas Road south of Maida Vale Road."

2.8. Pedestrian Infrastructure

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

Classification	Road Name
"Other Shared Path (Shared by Pedestrians & Cyclists)"	Crystal Brook Road, Welshpool Road East (west of Lewis Road), Lewis Road, Hartfield Road.
Does the site have existing pedestrian facilities	YES – as classified above
Does the site propose to improve pedestrian facilities?	YES

If YES, describe the measures proposed.

It is essential to develop an efficient and connected network of pedestrian paths in order to encourage pedestrian movement.

Please refer to Section 2.20. Proposed Internal Road Network for cross-sections of existing and proposed roads. Every major road within future structure plan area will have either shared path or a separate pedestrian path.
All pedestrian and shared paths should be designed to be accessible by all members of the community in accordance with the City of Kalamunda's Disability Access and Inclusion Plan 2012-2017 or any other subsequent document of this nature. The exact location of pram ramps and other accessible design elements are to be determined at a later stage in the project.

What is the Walk Score Rating?

1 - Car-Dependent. Almost all errands require a car.

2.9. Cyclist Infrastructure

Are there any PBN Routes within an 800m radius of the subject site?	YES
Classification	**Road Name**
"Bicycle Lanes or Sealed Shoulder Either Side"	Tonkin Highway, Crystal Brook Road (east of Kelvin Road)
"PBN – Continuous Signed Routes"	**SE3 –** Kelvin Road**,** Crystal Brook Road (east of Kelvin Road)
"Good Road Riding Environment"	Brentwood Road, White Road
"Other Shared Path (Shared by Pedestrians & Cyclists)"	Crystal Brook Road, Welshpool Road East (west of Lewis Road), Lewis Road, Hartfield Road.
Are there any PBN Routes within a 400m radius of the subject site?	YES
If YES, describe:	
Classification	**Road Name**
"Bicycle Lanes or Sealed Shoulder Either Side"	Tonkin Highway, Crystal Brook Road (east of Kelvin Road)
"PBN – Continuous Signed Routes"	**SE3 –** Kelvin Road**,** Crystal Brook Road (east of Kelvin Road)
"Good Road Riding Environment"	Brentwood Road, White Road
"Other Shared Path (Shared by Pedestrians & Cyclists)"	Crystal Brook Road, Welshpool Road East (west of Lewis Road), Lewis Road, Hartfield Road.
Does the site have existing cyclist facilities?	YES - as classified above
Does the site propose to improve cyclist facilities?	YES

If YES, describe the measures proposed.

Please refer to Section 2.20. Proposed Internal Road Network for cross-sections of existing and proposed roads. Every major road within future structure plan area should have either shared path or a dedicated cycle lane.

2.10. Calculation of Development Generated / Attracted Trips

What are the likely hours of operation?	For residential land uses, the hours of operation are not applicable. Retail: 09:00h to 17:00h Commercial: 09:00h to 21:00h
What are the likely peak hours of operation?	AM 08:00 to 09:00 PM 17:00 to 18:00
Do the development generated peaks coincide with existing road network peaks?	YES
Guideline Document Used	**WAPC Transport Assessment Guidelines for Developments**
Rates from above document:	**Industrial –** 1 VPH/100 m^2 GFA in the AM and PM peak. A 80% IN / 20% OUT split has been adopted for the AM peak and a 20% IN / 80% OUT split for the PM peak hour; **Residential** – 0.8 vehicle trips per dwelling for the AM and PM peak hours. A 25% IN / 75% OUT split has been adopted for the AM peak and a 67% IN / 33% OUT split for the PM peak hour; **Schools** - The rates are based on data from the PARTS surveys that indicate that around 65% - 70% of children are driven to primary school, with an average occupancy of around 1.4 - 1.5 children per car. This equates to 0.5 trips per child to school and

	0.5 trips per child from school in each of the AM and PM peak hours. For secondary schools the PARTS data indicate that the proportion driven to school is generally a little lower but, to simplify the process of determining the level of assessment required and for the broad assessment of structure plans, it is suggested that the above primary school rates be used for all schools. **Retail / Shopping Centres** - (with significant food retail component) - 10 vehicular trips per 100m2 of GFA for PM Peak and 2.5 trips per 100m² for the AM peak hour. A 50% IN / 50% OUT split has been adopted for the PM peak and an 80% IN / 20% OUT split for the AM peak hour;
Guideline Document Used	**NSW RTA Guide to Traffic Generating Developments**
Rates from above document:	The NSW RTA Guide to Traffic Generating Developments suggest residential developments of this type in Sydney tend to generate between 4 and 5 vehicular trips per dwelling. In Perth, the Department of Planning and Infrastructure conducted a series of studies in the late 1990's / early 2000's which showed that higher density dwellings tended to average closer to 6.7 vehicle movements per day. Given that the proposed study area area is rural KCTT propose a more conservative approach by using an average VPD of 6.5 vehicular trips per day per residence for R40 and an average VPD of 9 vehicular trips per day per residence for R30. **Retail** - (10,000 m^2-20,000 m^2) - 78 vehicular trips per 100m^2 of GFA **Factories** – 5 VPD per 100 m^2 GFA, 1 VPH in the PM peak per 100 m^2 GFA.
Guideline Document Used	**ITE Trip Generation Report (9th Edition)**
Rates from above document:	**Elementary School** • *Students: 1.29 vehicular trips per day per student*
Base data for trip calculation (daily trips)	• **General Industry** - 5 VPD per 100 m^2 GFA • **R20** - 9 VPD per dwelling • **R40** - 6.5 VPD per dwelling • **School** - 1.29 VPD per student • **Neighbourhood Centre** - 121 VPD per 100m^2 of GFA
Base data for trip calculation (AM peak trips)	• **General Industry** - 1 VPH per 100 m^2 GFA • **R20, R40** - 0.8 VPH per dwelling • **School** - 0.5 VPH per child • **Neighbourhood Centre** - 2.5 VPH per 100m^2 of GFA - AM
Base data for trip calculation (PM peak trips)	• **General Industry** - 1 VPH per 100 m^2 GFA • **R20, R40** - 0.8 VPH per dwelling • **School** - 0.5 VPH per child • **Neighbourhood Centre** - 10 VPH per 100m^2 of GFA - PM

Development Type	Rate Above	Yield (Area, Number of Dwellings etc.)	Total VPD	Total VPH
General Industry	5 VPD per 100 m^2 GFA 1 VPH per 100 m^2 GFA	30% of Total Lots Equivalent area = 30% ($949,000m^2$) =$284,700m^2$	14,235	2,847
Option 1 Residential – R20	9 VPD per dwelling 0.8 VPH per dwelling	1,560	14,040	1,248
Option 2 Residential – R30	9 VPD per dwelling 0.8 VPH per dwelling	2,340	21,060	1,872
Option 3 Residential – R40	6.5 VPD per dwelling 0.8 VPH per dwelling	3,120	20,280	2,496
School	1.29 VPD per student 0.5 VPH per child	assumed 450 students	(581) 170*	(225) 45*
Neighbourhood Centre	78 VPD per $100m^2$ of GFA 2.5 VPH per $100m^2$ of GFA - AM 10 VPH per $100m^2$ of GFA - PM	12,000 m^2 GFA (Equivalent of 30% of total area)	(9,360) 1,872*	(300) 60* – AM (1,200) 240* – PM
Total Development		**Option 1**	**(38,216)** **30,317***	**4,200* AM** **4,380* PM**
		Option 2	**(45,236)** **37,337***	**4,824* AM** **5,004* PM**
		Option 3	**(44,456)** **36,557***	**5,448* AM** **5,628* PM**

Does the site have existing trip generation / attraction?	YES – approximately 130 single dwelling lots
No of Daily Trips	9 VPD per dwelling * 130 dwellings = 1,170 VPD
No of AM Peak Hour Trips	0.8 VPH per dwelling * 130 dwellings = 104 VPH
No of PM Peak Hour Trips	0.8 VPH per dwelling * 130 dwellings = 104 VPH
What is the total impact of the new proposed development?	High impact The total expected **additional** traffic generated by the proposed development will be: **Option 1: 29,147 VPD; AM 4,096 VPH; PM 4,276 VPH.** **Option 2: 36,167 VPD; AM 4,720 VPH; PM 4,900VPH.** **Option 3: 35,387 VPD; AM 5,344 VPH; PM 5,524 VPH.**

Justification

*Note** - Traffic attracted to the neighbourhood centre will be predominantly generated by the residents of the area and is already accounted for in the residential traffic. We have assumed that the primary school would be a government school with a limited local intake. That means that the traffic attracted by the primary school and neighbourhood centre is approximately 80% local traffic that has already been accounted for in the residential traffic generation.

Further to this, various land uses will peak at different times with little or no overlap.

Although the cumulative traffic generation of the proposed development is expected to be in range from **38,216 VPD to 45,236 VPD**, it is expected that a total between **29,147 VPD to 36,167 VPD** will be generated into the network external to the Study Area.

It should be noted that the calculations above represent a rough estimate of both yields and the traffic volumes. Once a precise layout plan of the future structure plan area is provided, a more accurate estimation of traffic generation can be provided.

2.11. Trip Purposes

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

Land Use	Residential	Neighbourhood Centre	Primary School
Employment	40%	20%	20%
Shopping	25%	60%	n/a
Education	17.5%	n/a	80%
Social / Recreational	17.5%	20%	n/a

2.12. Expected Origin / Destination

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

Residential — Employment (profile.id)

The economic profile in the City of Kalamunda shows that according to the latest census that 64.8%of the city's resident's travel outside the area for work while the remaining 23.7% both live and work within the area (Work location unknown for 11.5%)

- Kalamunda - 23.7 %
- Canning - 9.7%
- Swan - 9.2%
- Belmont - 8.2%
- Perth - 5.0%
- POW No Fixed Address - 4.2%
- Perth - Remainder - 4.0%
- POW State/Territory undefined - 3.9%
- Victoria Park - 3.7%
- Gosnells - 3.5%
- Other – 13.4%

http://profile.id.com.au/kalamunda/residents?WebID=170

We therefore believe that the following roads will be used for access / egress to the future Structure Plan area:

- Welshpool Road East
- Crystal Brook Road
- Tonkin Highway

Excluding work from home, working in Neighbourhood Centre and Primary School there are no other sources of employment in this Study Area.

Journey to work data:

- Car as Driver – 67.6%
- Did not go to work – 11.2%
- Car as Passenger – 4.9%
- Worked at Home – 4.2%
- Bus – 3.4%
- Train – 2.0%
- Walked only – 1.5%
- Other – 5.2%

KCTT strongly believe that passenger cars will be the primary type of transportation vehicle.

	Shopping	• Wattle Grove Shopping Centre – approximately 1.5km to the west • Lesmurdie Village - approximately 2.0km to the north-east • Hawaiian's Forrestfield – approximately 2.5km to the north-west
	Education	• Skooleez Outside School Hours Care - approximately 1.2km to the north • Pachamama Early Education and Childcare – approximately 1.3km to the east • Forrestfield Primary School - approximately 1.5km to the north • Mazenod College - approximately 1.5km to the north-east • Orange Grove Primary School - approximately 1.5km to the south-east • Wattle Grove Primary School – approximately 2.0km to the west • Fun and Learn Child Care Centre – approximately 2.0km to the south-east • East Kenwick Primary School - approximately 2.5km to the south-west • Lesmurdie Senior High School – approximately 2.5km to the east
	Social / Recreational	• Lesmurdie Falls National Park - immediately to the north-east • Hartfield Park Recreation Centre – approximately 300m to the west • Korung National Park – approximately 500m to the east • Ray Owen Sports Centre – approximately 1.9km to the north-east • Bickley Outdoor Recreation Camp - approximately 2.5km to the south-east
Neighbourhood Centre	Employment	• The Neighbourhood Centre is not expected to be a large attractor for employment purposes.
	Shopping / Social	• The Neighbourhood Centre is treated as retail premises for the purposes of this report.
Primary School	Employment	• The Primary School is not expected to be a large attractor for employment purposes.
	Education	• The Primary School is expected to be a strong attractor for Education purposes.

2.13. Traffic Flow Distribution onto External Road Networks

How many routes are available for access / egress to the site?	Five (5)		
Route 1			
Provide details for Route No 1	**To / from north via Roe Highway – Tonkin Highway – Welshpool Road**		
Percentage of Vehicular Movements via Route No 1	**Option 1** 30%	**Option 2** 30%	**Option 3** 30%
Route 2			
Provide details for Route No 2	**To/ from west via Welshpool Road**		
Percentage of Vehicular Movements via Route No 2	**Option 1** 30%	**Option 2** 29%	**Option 3** 29%
Route 3			
Provide details for Route No 3	**To/ from south via Roe Highway - Welshpool Road**		
Percentage of Vehicular Movements via Route No 3	**Option 1** 13%	**Option 2** 15%	**Option 3** 15%
Route 4			
Provide details for Route No 4	**To/ from south via Tonkin Highway**		
Percentage of Vehicular Movements via Route No 4	**Option 1** 13%	**Option 2** 12%	**Option 3** 12%

Route 5			
Provide details for Route No 5	**To/ from east via Welshpool Road East**		
Percentage of Vehicular Movements via Route No 5	**Option 1**	**Option 2**	**Option 3**
	10%	11%	11%
Route 6			
Provide details for Route No 5	**To/ from north via Lewis Road**		
Percentage of Vehicular Movements via Route No 5	**Option 1**	**Option 2**	**Option 3**
	4%	3%	3%

2.14. Road Safety

Are sight distances adequate at proposed intersections?	N/A

Justification

All distances between intersections should be according to Liveable Neighbourhoods. To be reviewed in more detailed stages of planning.

Are there any proposed interventions to streets surrounding schools, neighbourhood centres, child and aged person day care facilities etc.?	YES
If YES, nominate which:	Some traffic calming methods are desirable especially near the primary school and neighbourhood centre. Chicanes, speed humps, wombat crossings and/or other methods should be considered when designing streets to lower operating speeds and improve safety. Posted signs with reduced speed limits should be considered for roads near these facilities.

2.15. Proposed Internal Road Network

Guideline Document used as reference	Liveable Neighbourhoods
How many proposed roads are there within the Study Area?	The internal road layout has not been formalised at this stage, however will be developed in further iterations as part of more detailed investigation in the planning phases.

2.16. Proposed Intersection Controls

How many proposed intersections have been analysed?	The proposed road cross sections and intersections are to be designed to meet the change in traffic conditions as a result of the development of the Study Area.

2.17. Proposed Internal Transport Networks

Are there any changes / additions to the existing road network?	YES – Several new roads will be constructed to service the future structure plan development area. The precise number, locations and alignments will be determined at a later planning stage. Furthermore, plans for new railway route alignment along Tonkin Highway with a potential station within the study area were considered.

Were there any discussions / agreements with MRWA regarding intersections with, or direct access onto roads under their jurisdiction?	Not at this stage. However, the intersection of Tonkin Highway & Welshpool Road East is currently a signalised intersection. There are plans for a flyover on Tonkin Highway over Welshpool Road.
Are there any pedestrian / cycle networks and crossing facilities proposed for the roads within the Study Area?	The future Structure Plan should propose construction of pedestrian paths network to cater for pedestrian needs in the area. Most streets in the area will have pedestrian paths on one or both sides of the road. Roads with higher hierarchy level will have shared paths on one side of the road reservation.
Were there any discussions / agreements with the local authority over local road networks and pedestrian and cycle facilities?	Not at the date of this report, however discussions are expected.
Were there any discussions / agreements with PTA / Transperth on new bus services or extensions / alterations to existing bus services to serve the Study Area?	YES PTA confirmed there are currently no new routes planned unless there is likely to be significant changes in residential development. Subject to increased residential density the existing routes may be improved over time. Introduction of additional routes would require a more detailed stage of development.

2.18. Changes to External Transport Networks

Are there any proposed changes of the road network?	• Tonkin Highway will be extended to tie in with the Perth Darwin National Highway in the north and Forrest Highway at Pinjarra in the south. It will be constructed to freeway standard between the Perth Darwin National Highway and Mundijong Road, with freeway-to-freeway interchanges at Reid and Roe Highways. • Planned upgrades include six-lane freeways on Roe and Tonkin Highways interspersed with four-lane highways and traffic signalised intersections. • Existing rail lines will be extended to cater for growing suburbs, with the Armadale line extending to Byford and Thornlie line to Cockburn Central. • Forrestfield Airport Link will be extended to join the Thornlie line. • Potential Wattle Grove rail realignment with new train lines to connect future Forrestfield North Railway Station and Wattle Grove South future station. The proposed alignment would follow the alignment of Tonkin Highway and continue along Brentwood Road to Roe Highway. • Potential Welshpool Road East realignment straight into Crystal Brook Road • Industrial Road Connection through to a major roundabout with Kelvin Road to the east

Are there any proposed changes of the intersection controls?	• Intersection of Tonkin Highway & Welshpool Road East is currently a signalised at grade intersection. There are plans that indicate that Welshpool Road will be grade separated with a flyover above the Tonkin Highway. • It is expected that the intersection of Tonkin Highway and Kelvin Road will also be grade separated in the future. • Industrial Road Connection through to a major round a bout at Kelvin Road to the east • It is expected that the potential realigned Welshpool Road will form a round a bout with Crystal Brook Road.
Are there any proposed changes of the pedestrian / cycle networks and crossing facilities?	Since the area is about to go through significant changes, it is expected that many changes will occur. However, introduction of additional pedestrian / cycle networks and crossing facilities would require a more detailed stage of development.
Are there any proposed changes of the public transport services?	The area is currently serviced by bus routes 282, 283 and 279. PTA confirmed there are currently no new routes planned unless there is likely to be significant changes in residential development. Subject to increased residential density the existing routes may be improved over time. Introduction of additional routes would require a more detailed stage of development.

These changes could be those committed or proposed by others, MRWA or local authority, or by the proponent as part of the future district structure plan.

2.19. Integration with Surrounding Area

Are there any existing major residential generators of traffic within a minimum of 800 metres from the boundaries of the Study Area?	YES
If YES, nominate:	• Wattle Grove Urban Cell to the west • Lesmurdie to the east • Kenwick and Maddington to the south
Are there any existing major non-residential attractors of traffic within a minimum of 800 metres from the boundaries of the Study Area?	YES
If YES, nominate:	• Existing Davison Industrial Area south of Bickley Road • Future Forrestfield North Station
What are the main desire lines between the proposed land uses and these external attractors / generators?	KCTT believe that proposed major changes to the surrounding area and network will be able to match these desire lines.
Will the existing transport networks, plus any proposed changes, adequately match these desire lines, particularly for pedestrians, cyclist and public transport users?	The Study Area, and surrounding areas, are well planned for the major changes that will occur in the next decade. The key will be in monitoring the traffic and intersections performance and upgrading them as necessary and as timely as possible.
Identify any deficiencies or areas for improvement in the surrounding transport networks and/or areas where improvements could be made.	N/A

2.20. Traffic Modelling

Nominate the source(s) for obtaining the traffic data	Main Roads website; Traffic Data from City of Kalamunda Main Roads WA ROM Model – 2031
Annual traffic growth rate used for analysis	N/A No traffic growth rate was used for analysis since the ROM data for 2031 has been provided by the City of Kalamunda.
Determine the year(s) for assessment and the time period(s) for the traffic flow analysis.	2031 Traffic attracted to the neighbourhood centre will be predominantly generated by the residents of the area and is already accounted for in the residential traffic. We have assumed that the primary school would be a government school with a limited local intake. That means that the traffic attracted by the primary school and neighbourhood centre is approximately 80% local traffic that has already been accounted for in residential traffic. Further to this, various land uses will peak at different times with little or no overlap. Although the cumulative traffic generation of the proposed development is expected to be in range from **38,216 VPD to 45,236 VPD**, it is expected that a total between **29,147 VPD to 36,167 VPD** will be generated onto the network external to the Study Area.
Determine additional traffic generated from study area to the surrounding network.	**Option 1: 29,147 VPD; AM 4,096 VPH; PM 4,276 VPH.** **Option 2: 36,167 VPD; AM 4,720 VPH; PM 4,900 VPH.** **Option 3: 35,387 VPD; AM 5,344 VPH; PM 5,524 VPH.**

Determine the total traffic flows on the external road network by adding the development generated traffic to the estimated traffic volumes on these roads in year(s) of assessment.

Road Name	Location of Traffic Counts	Existing Traffic Volumes	Year	Traffic Modelling Passing Traffic*	Passing Traffic + Study Area Generated Traffic		
					Option 1	Option 2	Option 3
Welshpool Road East	East of Tonkin Highway	20,314	2015	30,000	44,000	47,500	46,900
	West of Tonkin Highway	22,702	2016	28,500	35,100	36,400	36,100
Crystal Brook Road	250m East of Brentwood Road	2,168	2017	1,000	10,900	14,600	14,100
Tonkin Highway	North of Welshpool Road East	40,695	2017	92,500	99,200	101,100	100,800
	South of Welshpool Road East	47,882	2015	95,500	96,200	96,500	96,500
	South of Kelvin Road	44,716	2017	89,500**	92,400	93,100	92,900
Kelvin Road	West of Tonkin Highway	17,823	2016	24,000**	26,700	27,900	27,800

	East of Tonkin Highway	5,043	2017	9,300	14,100	15,800	15,500
	460m South West of Crystal Brook Road	5,290	2016	10,000	10,400	10,800	10,800
**Note: The passing traffic was modelled to reflect, as closely as possible, the volumes shown in MRWA ROM24 data received from the City of Kalamunda.* ***Note: The extract of ROM data received from the City of Kalamunda does not include these sections of roads.*							

How many zones were created for the model?

19 Zones were created in Paramics software for purpose of trip distribution.

Nominate external zones

6 zones external to the Wattle Grove South area:

- **Zone 1.** To / from the north via Tonkin Highway (north of Welshpool Road East)
- **Zone 2.** To / from the west via Welshpool Road East (west of Tonkin Highway)
- **Zone 3.** To / from the west via Kelvin Road (west of Tonkin Highway)
- **Zone 4.** To / from the south via Tonkin Highway (south of Kelvin Road)
- **Zone 5.** To / from the east via Welshpool Road East (east of Crystal Brook Road)
- **Zone 6.** To / from the north via Lewis Road (north of Welshpool Road)

Nominate internal zones and traffic generation

13 internal zones:		**Traffic generation from the zone (VPD)**		
		Option 1	**Option 2**	**Option 3**
Zone 7.	Residential Zone	2,340	3,510	3,380
Zone 8.	Residential Zone	2,340	3,510	3,380
Zone 9.	Residential Zone	2,340	3,510	3,380
Zone 10.	Residential Zone	2,340	3,510	3,380
Zone 11.	Residential Zone	2,340	3,510	3,380
Zone 12.	Residential Zone	2,340	3,510	3,380
		All Options		
Zone 13.	Neighbourhood Centre	20% (4,680) = 936*		
Zone 14.	Primary School	20% (291) = 58*		
Zone 15.	Industrial Zone	2,847		
Zone 16.	Industrial Zone	2,847		
Zone 17.	Industrial Zone	2,847		
Zone 18.	Industrial Zone	2,847		
Zone 19.	Industrial Zone	2,847		

*Note: 80% of Neighbourhood Centre and Primary School trip generation is deemed to be internal to the Wattle Grove South area.

For more details on trip generation, refer to section 2.15 Calculation of Development Generated Traffic.

Traffic Flow Distribution onto External Road Networks

ZONE	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Wattle Grove Industrial Zones	Internal Trips
Wattle Grove Residential Zones – Option 1	12%	11%	8%	5%	5.5%	0%	5%	53.5%
Wattle Grove Residential Zones – Option 2	16%	15%	12%	7%	7%	0%	5%	38%
Wattle Grove Residential Zones – Option 3	15%	15%	12%	6.5%	7%	0%	5%	39.5%

**Note – Internal trips percentage was calculated starting from assumption that for all three options 80% on neighbourhood centre and primary school traffic will be internal.*

External to External Traffic Distribution

Traffic from external to external zones was modelled to reflect, as close as possible, the obtained data from the latest Main Roads WA ROM Model for 2031. The difference between results may occur due to network level of detail.

Paramics Output

XX – Passing Traffic
XX – Wattle Grove South Traffic

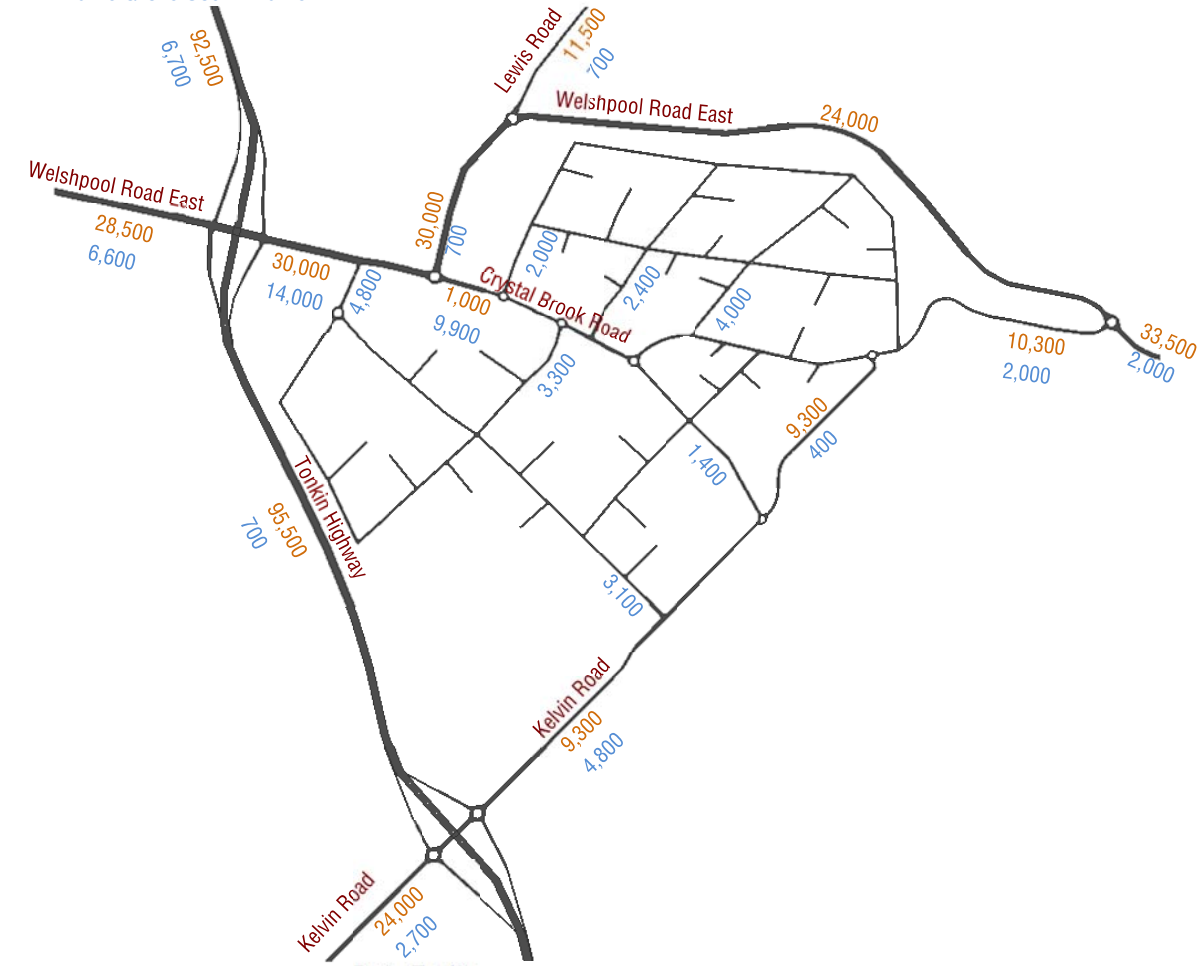


Figure 1 Links Traffic Volumes – Daily Traffic – Option 1 R20 – 2031

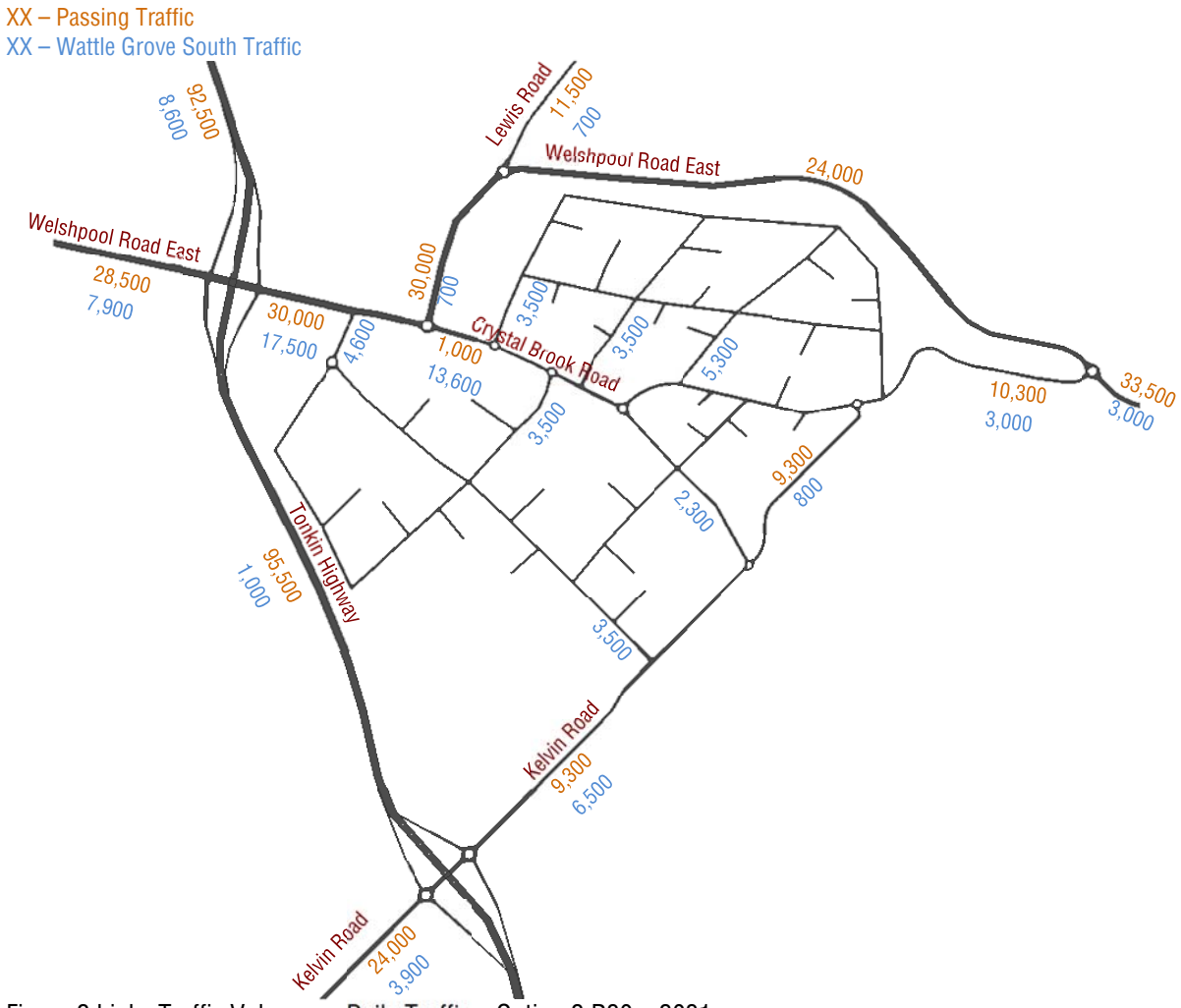


Figure 2 Links Traffic Volumes – Daily Traffic – Option 2 R30 – 2031

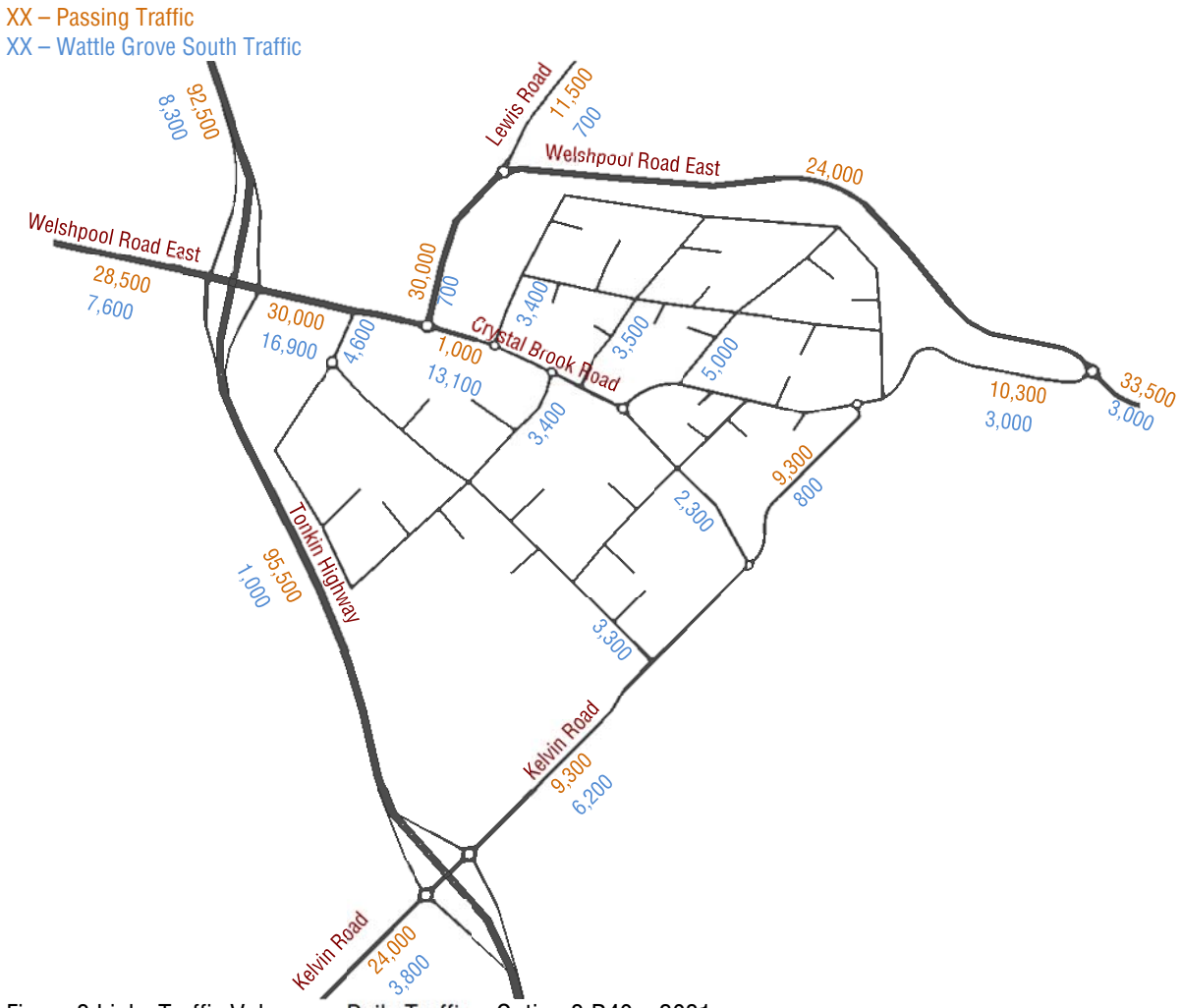


Figure 3 Links Traffic Volumes – Daily Traffic – Option 3 R40 – 2031

2.21. Anticipated Upgrades of the Existing Network

What amendments to the road network were incorporated in the traffic modelling?	• Given the expected grade separation of Tonkin Highway / Welshpool Road East Intersection by 2031, it is assumed that Welshpool Road East will be realigned to form a 90-degree intersection with Crystal Brook Road. This will allow for appropriate distances between the intersection and the proposed interchange. It is expected that the future intersection of Crystal Brook Road and Welshpool Road East will require upgrade to a roundabout. • Section of Crystal Brook Road (east of Victoria Road) is expected to be realigned and a future Industrial Road Connection will extend to form a 90-degree intersection (roundabout) with Kelvin Road. • Grade separation is expected for the Kelvin Road and Tonkin Highway Intersection by 2031 and it was incorporated in the traffic modelling.
What are the anticipated road upgrades due to the future DSP area generated traffic?	Should the traffic volumes reach the values shown on the above figures (Section 2.25.) the following upgrades will be required: • Crystal Brook Road is expected to carry between 10,000 – 15,000 VPD depending on the R-Code option. According to Liveable Neighbourhoods Crystal Brook Road should be upgraded to an Integrator B (one lane each direction, median, bicycle lanes, on-street parking) • Kelvin Road (north of Tonkin Highway) is expected to carry between 10,000 – 16,000 VPD depending on the R-Code option. According to Liveable Neighbourhoods Kelvin Road should be upgraded to an Integrator B (one lane each direction, median, bicycle lanes).

*Note: The anticipated changes to the road network are likely to occur only when and if the volumes reach the stated values. However, since this is an early stage of planning, the proposed road realignments, road and intersection upgrades should be considered with caution, since they are subject to the later stage planning process inclusive of the proponent, City of Kalamunda and / or Main Roads WA. Only grade separation of Tonkin Highway intersections with Welshpool Road East and Kelvin Road are the only certain change in the road network, as they are incorporated in the MRWA ROM24 model.

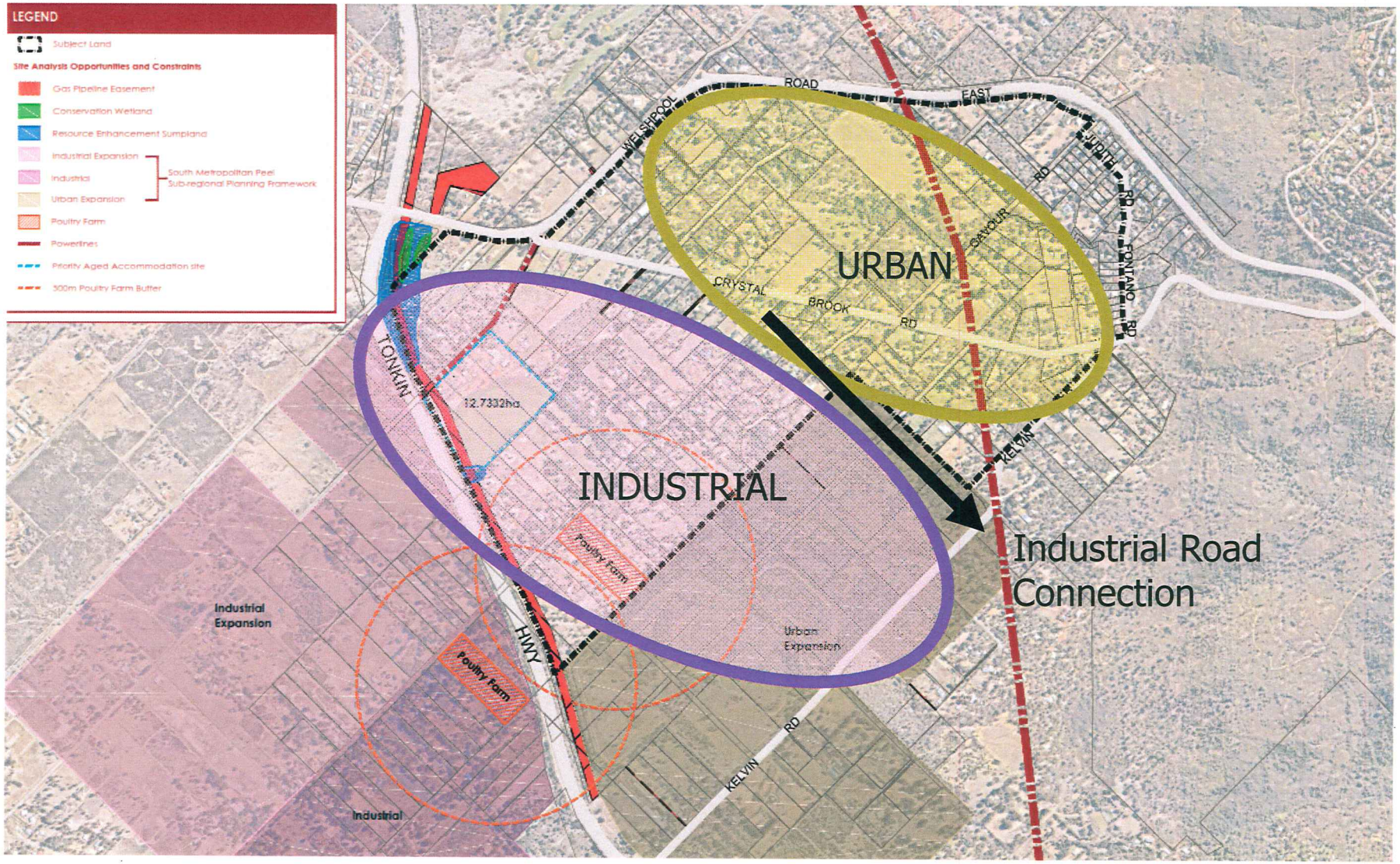
2.22. Site Specific Issues and Proposed Remedial Measures

How many site-specific issues need to be discussed?	One (1)
Site Specific Issue No 1	**Traffic Impact of the Proposed Development**
Remedial Measure / Response	Although the cumulative traffic generation of the proposed development is in range from 38,216 VPD to 45,236 VPD, it is expected that a total between 29,147 VPD to 36,167 VPD will be generated into the network external to the Study Area. The surrounding network is expected to be upgraded to meet the requirements of passing traffic growth (grade separation of intersections of Tonkin Highway with Welshpool Road East and with Kelvin Road; additional lanes on Tonkin Highway etc.); additional upgrades to cater for the impact of the development are expected to be determined at later stages of the planning process. KCTT believe that the future surrounding network will successfully cater for the developments generated traffic.

Appendix 1

The layout of the proposed development

Industrial and Urban



Appendix 2

Transport Planning and Traffic Plans

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street — STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION
STRUCTURE PLAN AREA
FORRESTFIELD — SUBURB
CITY OF KALAMUNDA — LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY

Certified System Quality ISO 9001 SAI GLOBAL

LEGEND

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH

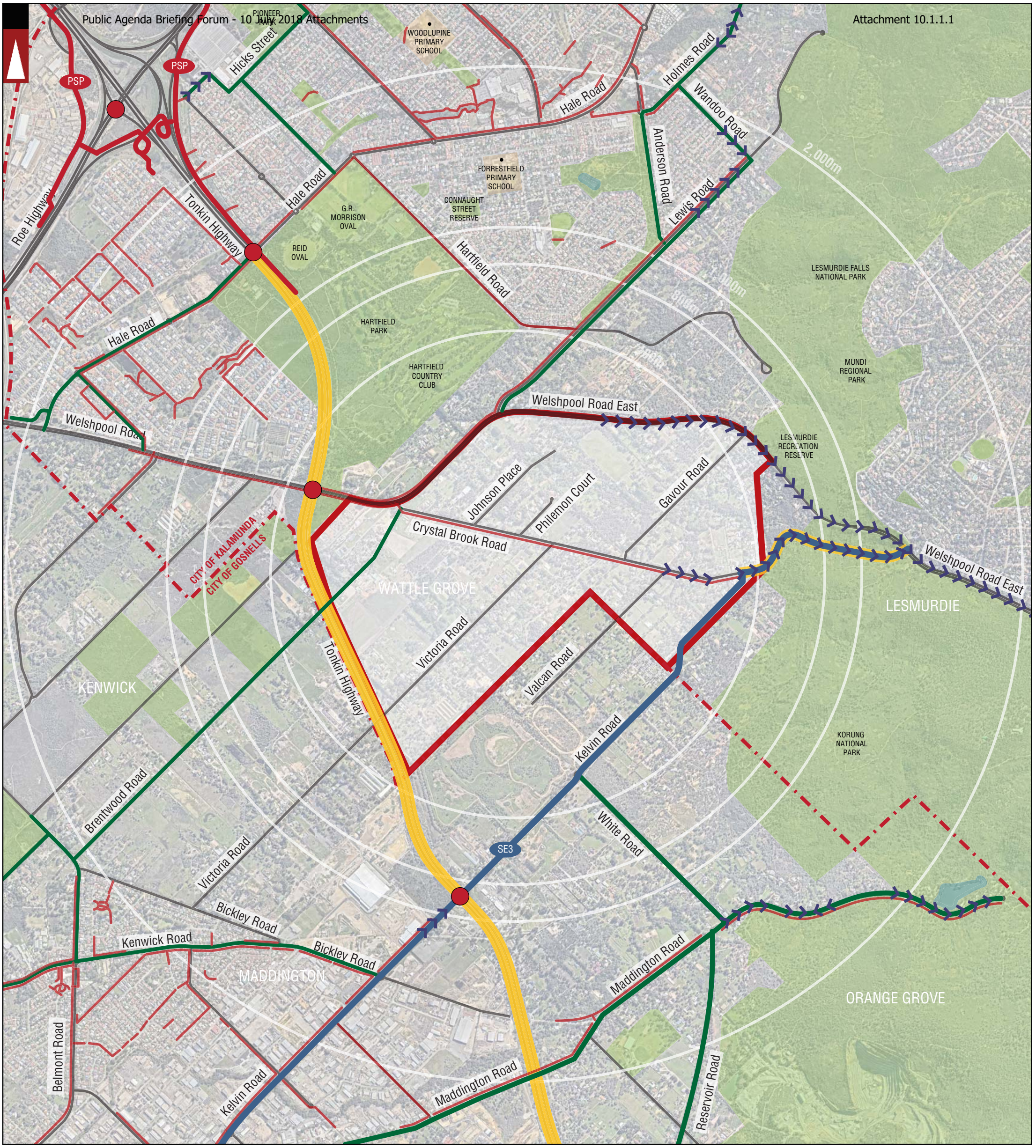
TITLE: LOCALITY PLAN - 2,000M RADIUS

DRAWING NUMBER: KC00381.000_ S01

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
PH: 08 9441 2700
WEB: www.kctt.com.au

kctt



PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION
STRUCTURE PLAN AREA
FORRESTFIELD SUBURB
CITY OF KALAMUNDA LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY
PSP PRINCIPAL SHARED PATH (PSP)
OTHER SHARED PATH (SHARED BY PEDESTRIAN & CYCLIST)
GOOD ROAD RIDING ENVIRONMENT
NW12 PERTH BICYCLE NETWORK (PBN) - CONTINUOUS SIGNED ROUTES
BICYCLE LANES OR SEALED SHOULDER EITHER SIDE
GRADIENT ARROW
TRAFFIC LIGHT

Certified System
Quality ISO 9001
SAI GLOBAL

LEGEND

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH

TITLE: BICYCLE NETWORK PLAN - 2,000M RADIUS

DRAWING NUMBER: KC00381.000_ S02

DRAWN BY: J.S.

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PH: 08 9441 2700
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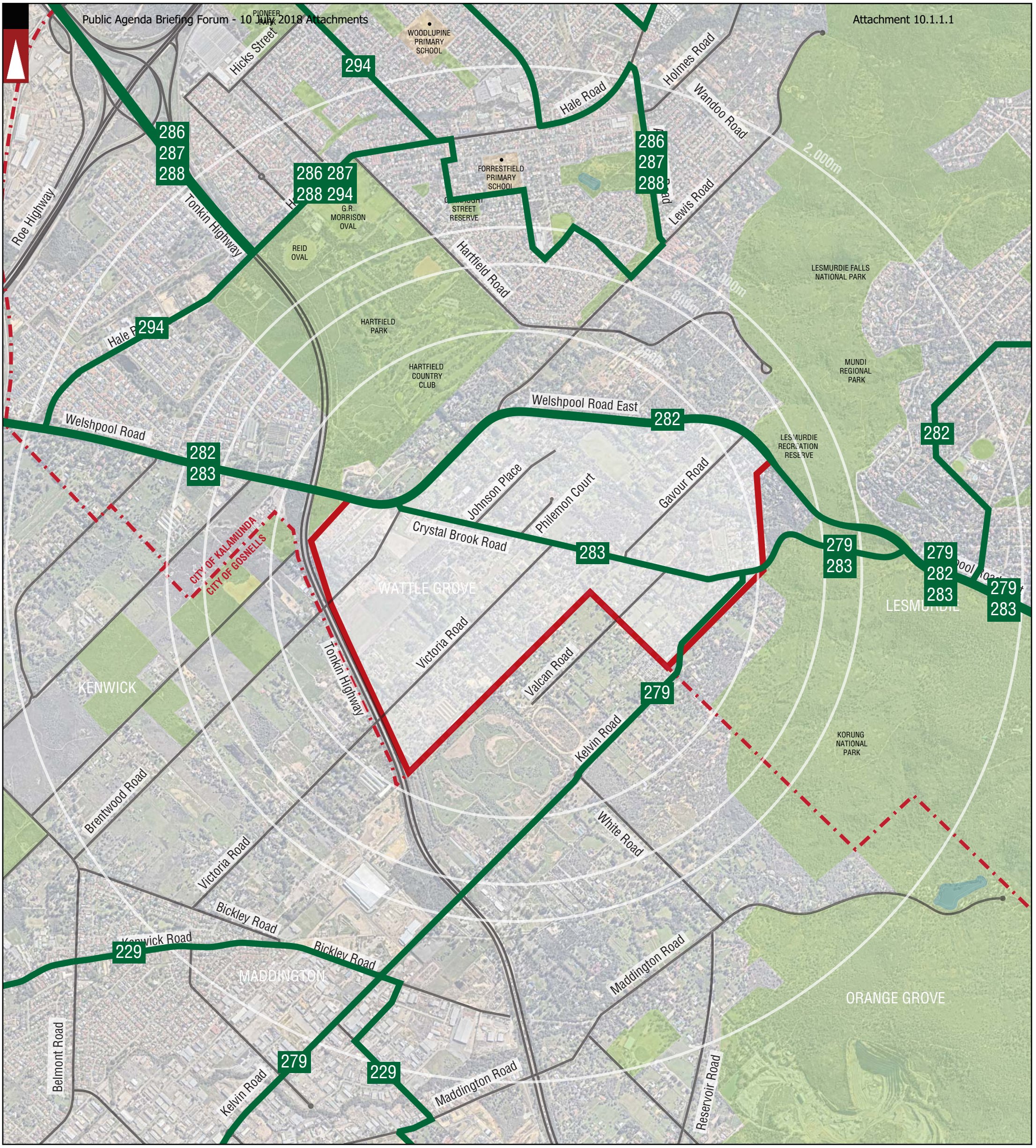

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION
STRUCTURE PLAN AREA
FORRESTFIELD SUBURB
CITY OF KALAMUNDA LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY
BUS TERMINUS
BUS ROUTES
103 BUS ROUTE NUMBER

NOTE : FOR MORE INFORMATION REGARDING TO DESCRIPTION OF THE BUS ROUTE AND THEIR INDICATIVE PEAK AND OFF-PEAK FREQUENCIES REFER TO THE REPORT

LEGEND

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH

TITLE: PUBLIC TRANSPORT PLAN - 2,000M RADIUS

DRAWING NUMBER: KC00381.000_ S03

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
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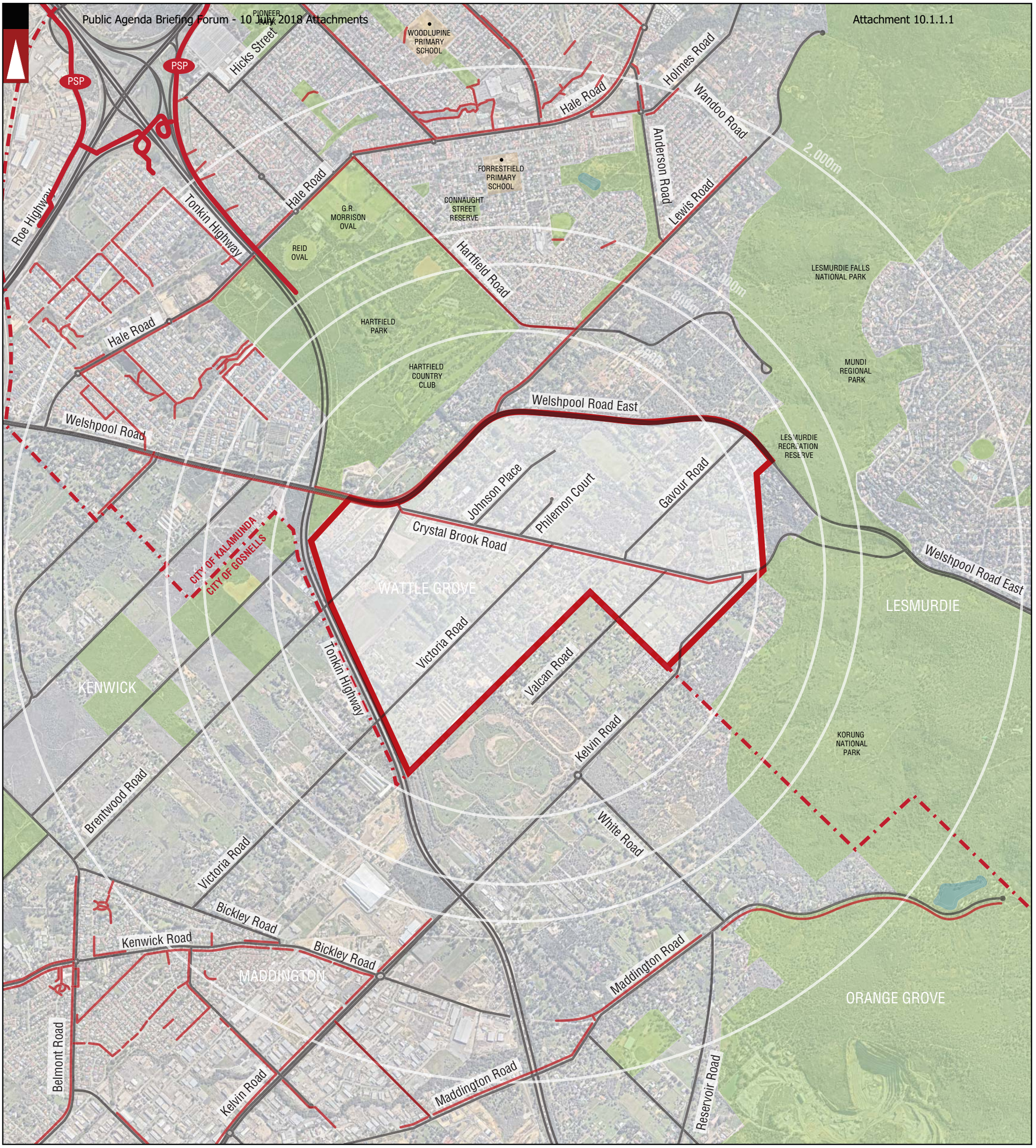
PH: 08 9441 2700
WEB: www.kctt.com.au



PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION
STRUCTURE PLAN AREA
FORRESTFIELD SUBURB
CITY OF KALAMUNDA LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY
PSP PRINCIPAL SHARED PATH (PSP)
OTHER SHARED PATH (SHARED BY PEDESTRIAN & CYCLIST)

LEGEND

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH

TITLE: PEDESTRIAN PATHS PLAN - 2,000M RADIUS

DRAWING NUMBER: KC00381.000_ S04

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
PH: 08 9441 2700
WEB: www.kctt.com.au

15,116 AM 07:15 – 2,647 PM 15:30 – 1,626 2017
NORTH OF HALE ROAD (SLK 17.27)NB

15,960 AM 08:00 – 875 PM 16:45 – 1,054 2017
EAST OF TONKIN HIGHWAY (SLK 1.76)

11,730 AM 08:00 – 875 PM 16:45 – 1,054 2016
NORTH OF WELSHPOOL ROAD EAST (SLK 0.81)

22,702 AM 07:30 – 1,957 PM 16:45 – 1,721 2016
WEST OF TONKIN HIGHWAY (SLK 9.90)

VPD 17,998
AM 08:00 – 1,386
PM 17:00 – 1,477

40,695 AM 07:15 – 3,410 PM 15:30 – 3,566 2017
NORTH OF WELSHPOOL ROAD EAST (SLK 17.44)

VPD 40,237
AM 08:00 – 3,336
PM 17:00 – 3,380

20,314 AM 07:45 – 1,622 PM 16:45 – 1,917 2015
EAST OF TONKIN HIGHWAY (SLK 0.24)

VPD 16,546
AM 08:00 – 1,501
PM 17:00 – 1,699

2,168 AM 07:00 – 208 PM 15:00 – 215 2017
250M EAST OF BRENTWOOD ROAD

47,882 AM 06:15 – 3,503 PM 16:00 – 3,904 2015
SOUTH OF WELSHPOOL ROAD EAST (SLK 19.45)

VPD 42,791
AM 08:00 – 3,256
PM 17:00 – 3,738

5,290 AM 08:00 – 481 PM 16:00 – 518 2016
460M SOUTH WEST OF CRYSTAL BROOK ROAD

VPD 39,620
AM 08:00 – 3,014
PM 17:00 – 3,594

5,963 AM 07:30 – 535 PM 16:00 – 539 2014
NORTH OF TONKIN HIGHWAY (SLK 3.60)

VPD 39,620
AM 08:00 – 3,014
PM 17:00 – 3,594

VPD 44,716
AM 08:00 – 3,580
PM 17:00 – 3,795

43,124 AM 07:00 – 3,141 PM 16:15 – 3,909 2016
SOUTH OF KELVIN ROAD (SLK 22.51)

17,823 AM 07:30 – 1,433 PM 15:30 – 1,677 2016
WEST OF TONKIN HIGHWAY (SLK 3.02)

VPD 44,716
AM 08:00 – 3,580
PM 17:00 – 3,795

13,392 AM 07:15 – 983 PM 15:15 – 1,131 2014
WEST OF BICKLEY ROAD (SLK 2.38)

LEGEND

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION
STRUCTURE PLAN AREA
FORRESTFIELD SUBURB
CITY OF KALAMUNDA LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY

TRAFFIC DATA
5,512 NUMBER OF VEHICLES PER DAY
AM 1145 – 381 PM 1630 – 480 NUMBER OF VEHICLES PER AM PEAK HOUR / NUMBER OF VEHICLES PER PM PEAK HOUR
2014 YEAR
EAST OF HARLOW RD LOCATION

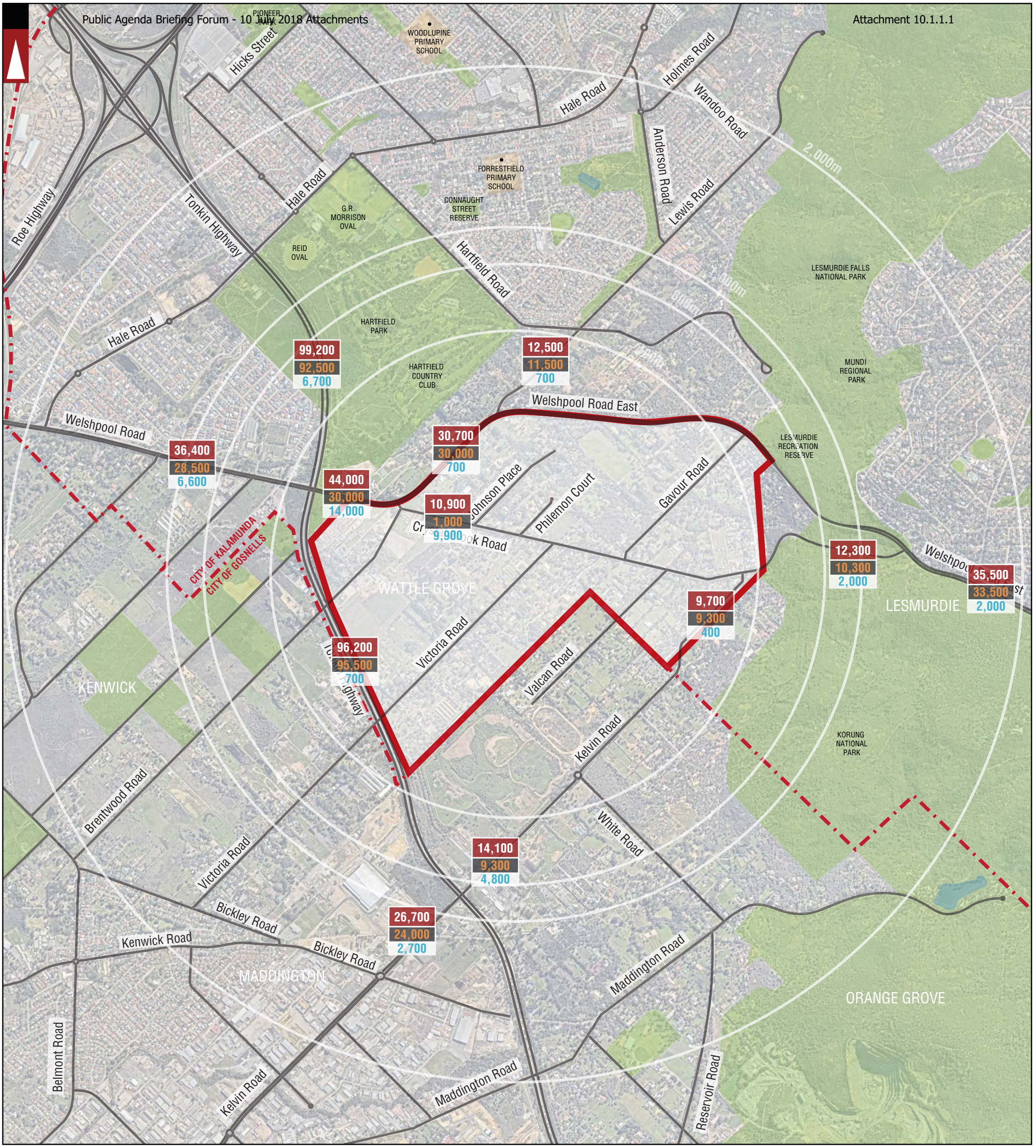
TRAFFIC VOLUMES DERIVED FROM SCATS
VPD 17,998 NUMBER OF VEHICLES PER DAY
AM 08:00 – 1,386 NUMBER OF VEHICLES PER AM PEAK HOUR
PM 17:00 – 1,477 NUMBER OF VEHICLES PER PM PEAK HOUR
ALL DATED - SEPT 2017

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH
TITLE: EXISTING TRAFFIC COUNTS - 2,000M RADIUS
DRAWING NUMBER: KC00381.000_ S05
DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
PH: 08 9441 2700
WEB: www.kctt.com.au
kctt



PARKS AND RECREATION

WATERWAYS

PUBLIC PURPOSE

ROAD

Hay Street — STREET NAME

RAILWAY

ROAD BRIDGE

DISTANCE FROM LOCATION

STRUCTURE PLAN AREA

FORRESTFIELD — SUBURB

CITY OF KALAMUNDA — LOCAL GOVERNMENT NAME

LOCAL AUTHORITY BOUNDARY

3,219 — TOTAL FORECASTED TRAFFIC VOLUMES ON EXISTING ROADS

3,219 — TOTAL FORECASTED PASSING TRAFFIC ON EXISTING ROADS

3,219 — TOTAL GENERATED TRAFFIC FROM WATTLE GROVE SOUTH

NOTE - TRAFFIC FROM EXTERNAL TO EXTERNAL ZONES WAS MODELLED TO REFLECT, AS CLOSE AS POSSIBLE, THE OBTAINED DATA FROM THE LATEST MAIN ROADS WA ROM MODEL FOR 2031. THE DIFFERENCE BETWEEN RESULTS MAY OCCUR DUE TO NETWORK LEVEL OF DETAIL.

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH

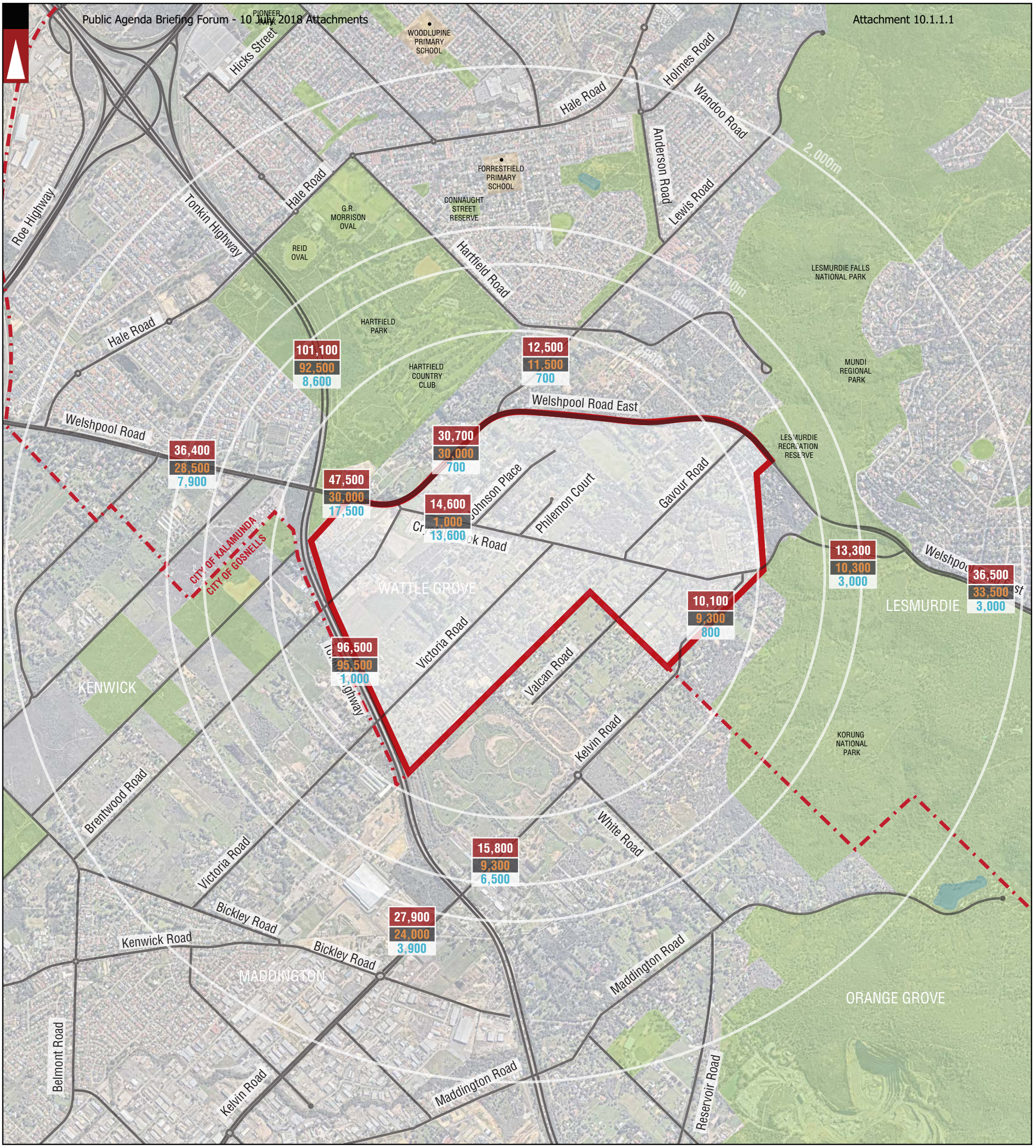
TITLE: - 2031 (PARAMICS OUTPUT) FUTURE TRAFFIC COUNTS - DAILY TRAFFIC - OPTION 1(R20)

DRAWING NUMBER: KC00381.000_ S06

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
PH: 08 9441 2700
WEB: www.kctt.com.au

kctt



PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE

ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION

STRUCTURE PLAN AREA
FORRESTFIELD SUBURB
CITY OF KALAMUNDA LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY

3,219 TOTAL FORECASTED TRAFFIC VOLUMES ON EXISTING ROADS
3,219 TOTAL FORECASTED PASSING TRAFFIC ON EXISTING ROADS
3,219 TOTAL GENERATED TRAFFIC FROM WATTLE GROVE SOUTH

NOTE - TRAFFIC FROM EXTERNAL TO EXTERNAL ZONES WAS MODELLED TO REFLECT, AS CLOSE AS POSSIBLE, THE OBTAINED DATA FROM THE LATEST MAIN ROADS WA ROM MODEL FOR 2031. THE DIFFERENCE BETWEEN RESULTS MAY OCCUR DUE TO NETWORK LEVEL OF DETAIL.

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LEGEND

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH

TITLE: - 2031 (PARAMICS OUTPUT)
FUTURE TRAFFIC COUNTS - DAILY TRAFFIC - OPTION 2(R30)

DRAWING NUMBER: KC00381.000_ S07

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
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PH: 08 9441 2700
WEB: www.kctt.com.au

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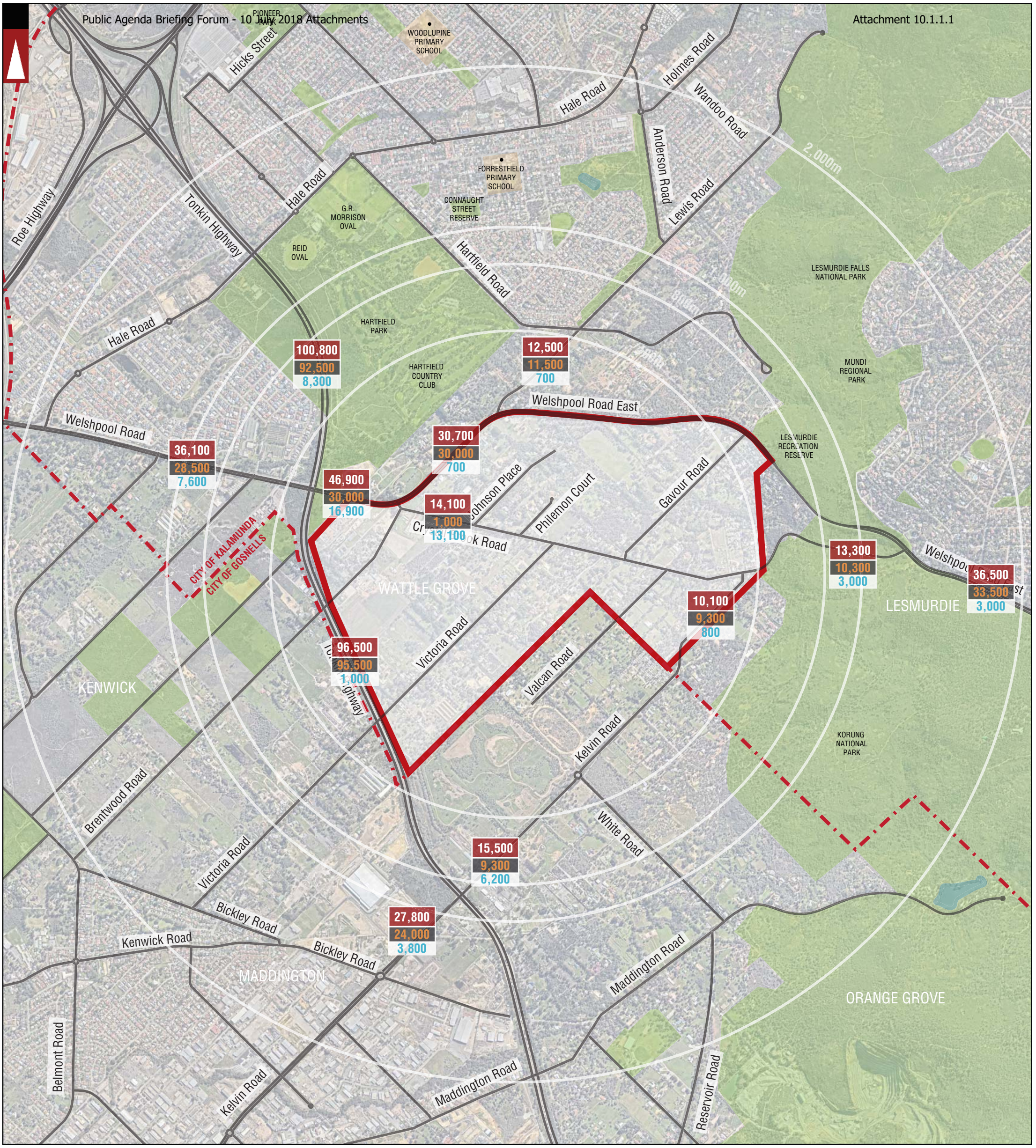


PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE

ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
DISTANCE FROM LOCATION

STRUCTURE PLAN AREA
FORRESTFIELD SUBURB
CITY OF KALAMUNDA LOCAL GOVERNMENT NAME
LOCAL AUTHORITY BOUNDARY

3,219 TOTAL FORECASTED TRAFFIC VOLUMES ON EXISTING ROADS
3,219 TOTAL FORECASTED PASSING TRAFFIC ON EXISTING ROADS
3,219 TOTAL GENERATED TRAFFIC FROM WATTLE GROVE SOUTH

NOTE - TRAFFIC FROM EXTERNAL TO EXTERNAL ZONES WAS MODELLED TO REFLECT, AS CLOSE AS POSSIBLE, THE OBTAINED DATA FROM THE LATEST MAIN ROADS WA ROM MODEL FOR 2031. THE DIFFERENCE BETWEEN RESULTS MAY OCCUR DUE TO NETWORK LEVEL OF DETAIL.

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
A	11-04-2018	ISSUED FOR REVIEW

PROJECT: WATTLE GROVE SOUTH

TITLE: - 2031 (PARAMICS OUTPUT)
FUTURE TRAFFIC COUNTS - DAILY TRAFFIC - OPTION 3(R40)

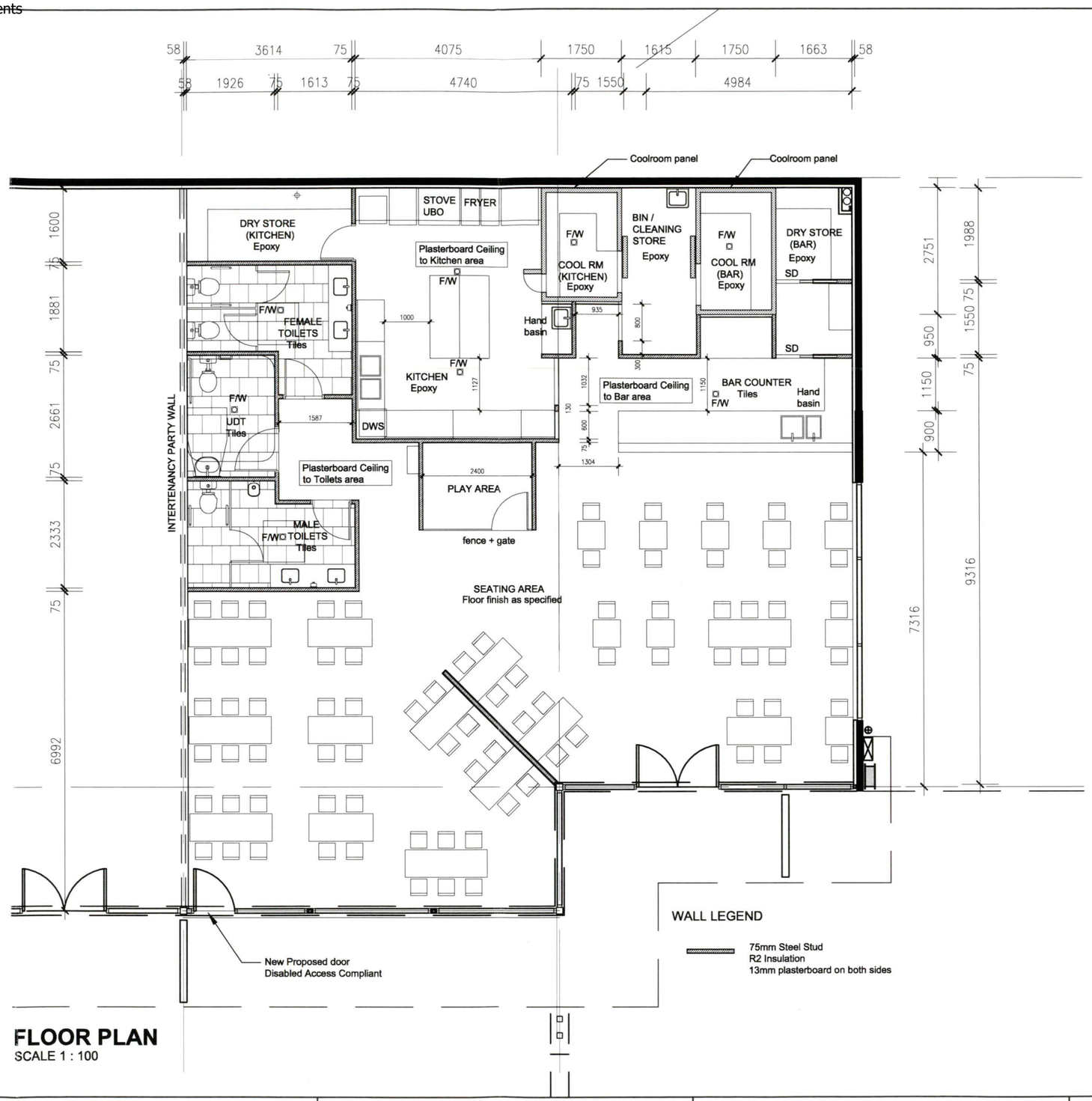
DRAWING NUMBER: KC00381.000_ S08

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
PH: 08 9441 2700
WEB: www.kctt.com.au

kctt

NOTES
CONCEPT DESIGN DRAWING ONLY.NOT FOR CONSTRUCTION USE. DO NOT SCALE FROM DRAWING.



FLOOR PLAN
SCALE 1 : 100

DRAFT ONLY
CONCEPT DESIGN

issue	by	date	issue name
1	NLTL	21.11.17	CONCEPT DESIGN ISSUE

City of Kalamunda

NEW FORM CONSTRUCTION
architects & builders
206 railway parade
west leederville, wa 6007
93819710
robert@newformconstruction.com.au

DRAWING TITLE
GROUND FL. PLAN

ALL DIMENSIONS TO BE VERIFIED ON SITE PRIOR TO COMMENCEMENT OF ON-SITE WORK & / OR OFF-SITE FABRICATION. ONLY FIGURED DIMENSIONS TO BE USED. DO NOT SCALE THIS DRAWING.

CLIENT
MR LUKE NORRIS

PROJECT
HALE VILLAGE
MIXED USE DEVELOPMENT
TENANCY 01

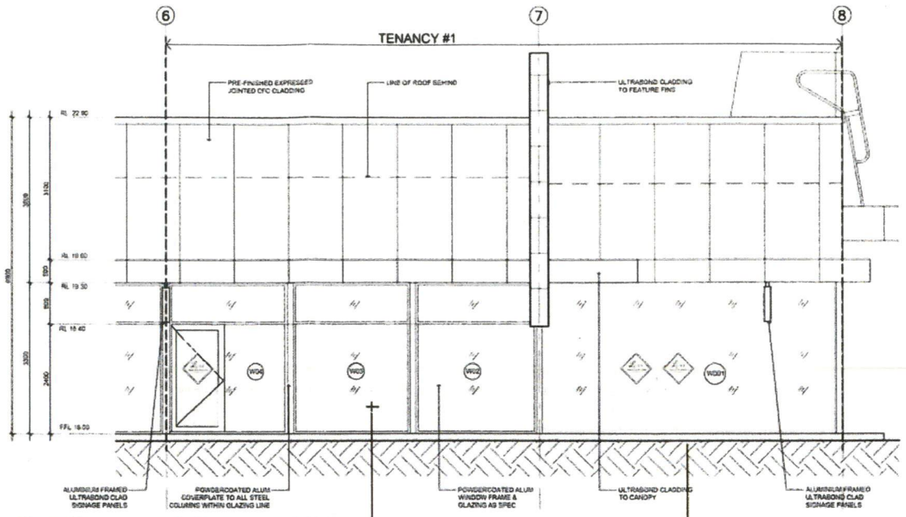
NOTE: SCALE/S APPLY FOR ORIGINAL DRAWING SIZE: A3

SCALES
1:100

DRAWN
SIGN..... ...../...../.....

DESIGNED
SIGN..... ...../...../.....

JOB NUMBER	DRAWING NUMBER	ISSUE No.
	A101	1



TENANCY #1 - ELEVATION 1 (FRONT)
SCALE 1:50

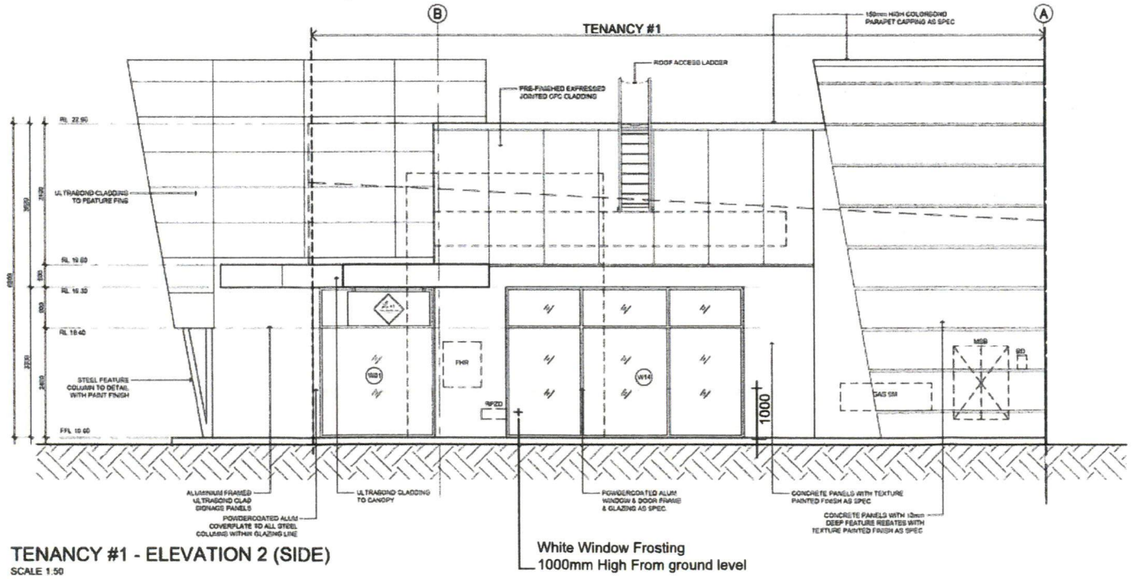
White Window Frosting
1000mm High From ground level

Signage logo.
with 1000mm High
White window frosting
On Front door.

NOTES

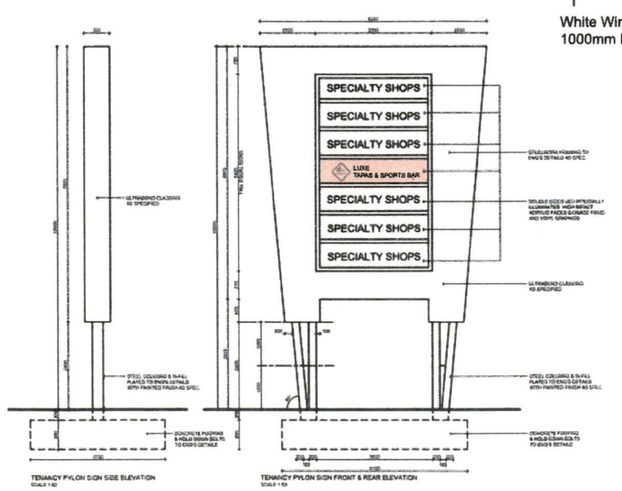
Signage logo.
with Rose Gold Background
On Signage box

White Window Frosting
1000mm High From ground level



TENANCY #1 - ELEVATION 2 (SIDE)
SCALE 1:50

White Window Frosting
1000mm High From ground level



Typical Signage logo design

DRAFT ONLY
CONCEPT DESIGN

1	NLTL	21.11.17	CONCEPT DESIGN ISSUE
issue	by	date	issue name

NEW FORM CONSTRUCTION
architects & builders
206 railway parade
west leederville, wa 6007
93819710
robert@newformconstruction.com.au

DRAWING TITLE
SIGNAGE PLAN

CLIENT
MR LUKE NORRIS

PROJECT
HALE VILLAGE
MIXED USE DEVELOPMENT
TENANCY 01

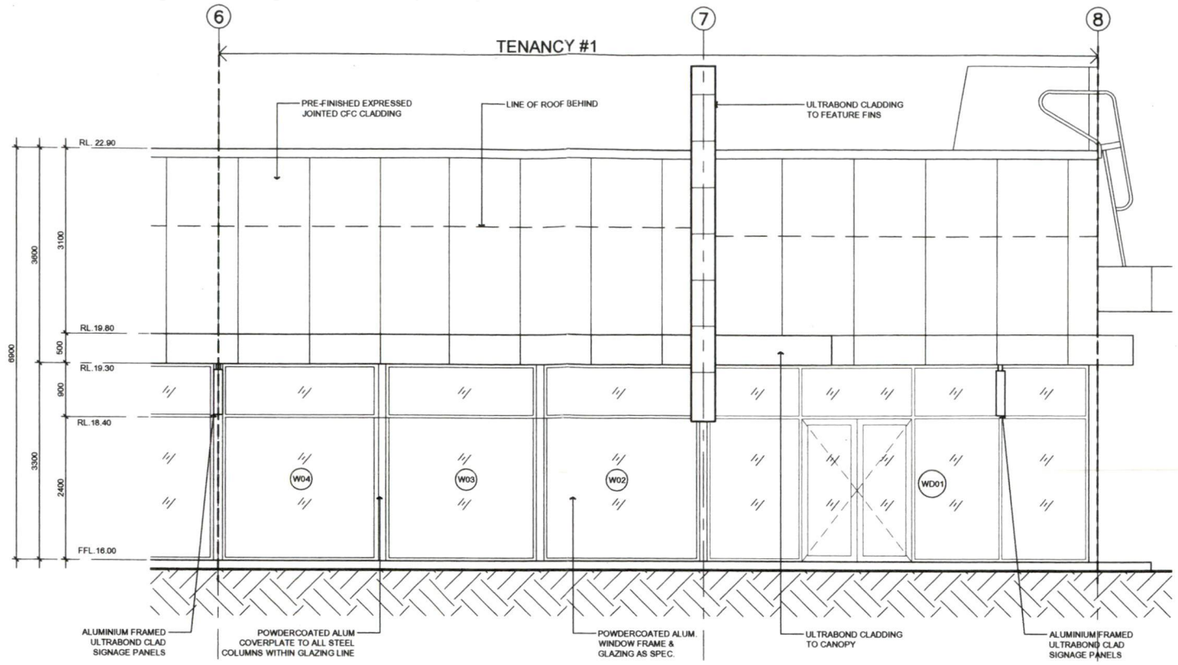
NOTE: SCALE/S APPLY FOR ORIGINAL DRAWING SIZE: A3

SCALES
NTS

DRAWN
SIGN. ..... / /

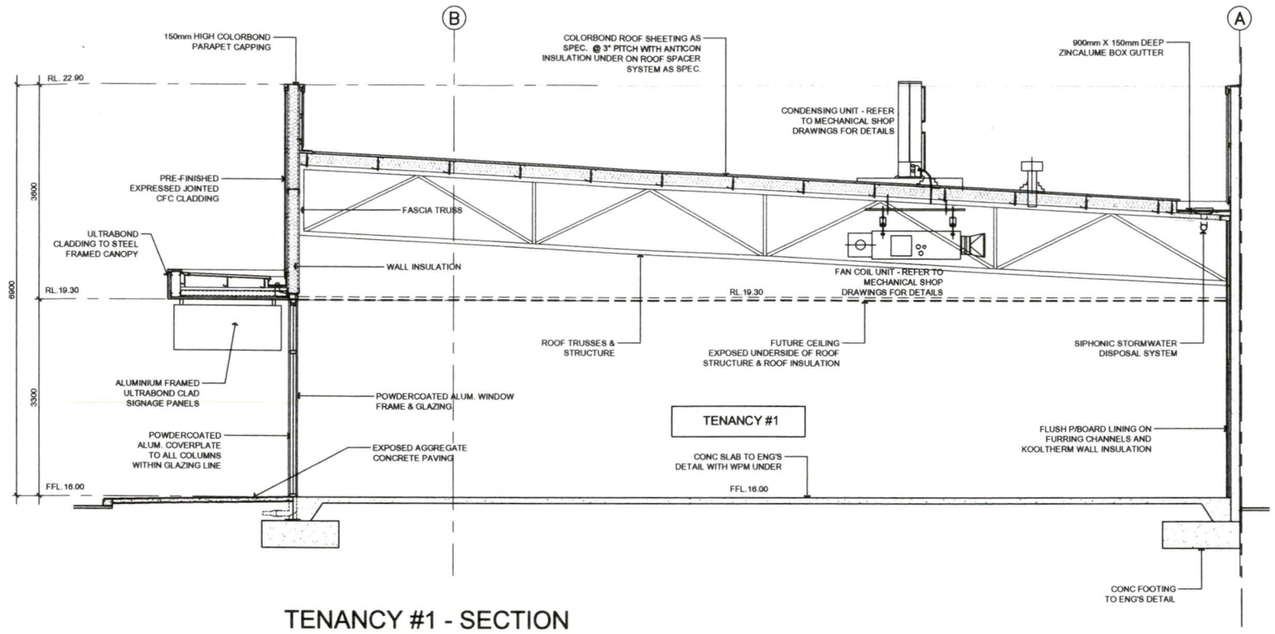
DESIGNED
SIGN. ..... / /

JOB NUMBER	DRAWING NUMBER	ISSUE No.
	A102	1



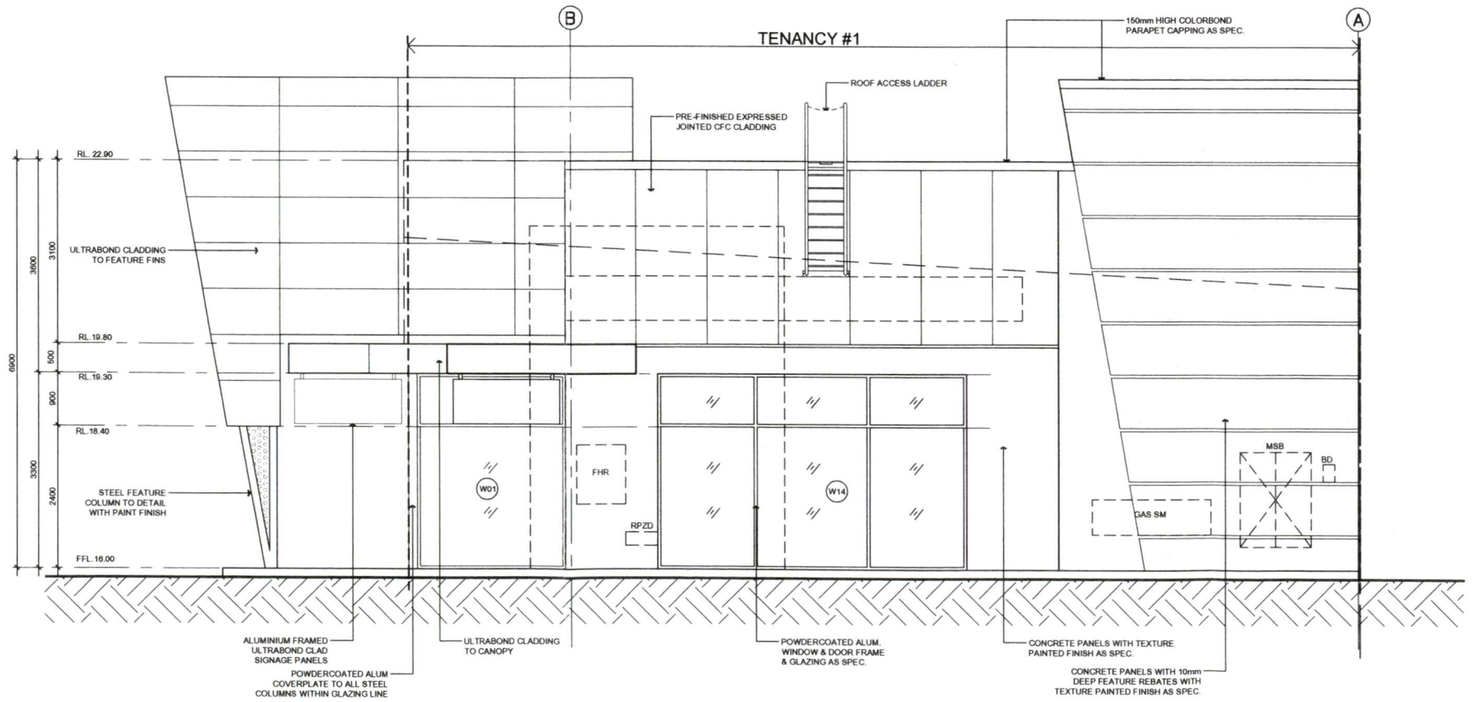
TENANCY #1 - ELEVATION 1 (FRONT)

SCALE 1:50



TENANCY #1 - SECTION

SCALE 1:50



TENANCY #1 - ELEVATION 2 (SIDE)

SCALE 1:50

LEGEND:

- 150mm CONCRETE PANELS TO ENG'S DETAILS WITH 30mm KOOLTHERM K12 INSULATION AS SPECIFIED FIXED TO WALL WITH 28mm FURRING CHANNELS AND 13mm PLASTERBOARD TO ROOF LEVEL
- FUTURE TENANCY PARTITION WALL
- W01 / D01 WINDOW / DOOR NUMBER
- COL STEEL COLUMN
- COL. DP STEEL COLUMN & DOWNPIPE
- BOL STAINLESS STEEL BOLLARD
- PJ PANEL JOINT
- CJ CONTROL JOINT
- CNJ CONSTRUCTION JOINT
- SJ SAWN JOINT
- GW INDUSTRIAL / GREASE WASTE POINT
- SW SEWER WASTE POINT
- VP VENT PIPE
- W WATER SERVICE
- G GAS SERVICE
- 40DIA GAS COCK ON WALL AT 150mm BELOW FINISHED CEILING LINE
- 20DIA COLD WATER BV WITH REMOTE READ SUBMETER ON WALL AT 150mm BELOW FINISHED CEILING LINE
- G GAS PIPEWORK IN CEILING SPACE
- WATER PIPEWORK IN CEILING SPACE
- DENOTES CONTINUATION OF SERVICES PIPES INTO ADJACENT TENANCY
- FHR FIRE HOSE REEL
- RPZD REDUCED PRESSURE ZONE DEVICE
- DB TENANCY DISTRIBUTION BOARD
- FD FLOOR DISTRIBUTOR
- MSB MAIN SWITCH BOARD
- BD BUILDING DISTRIBUTOR
- SFP 2400 CEILING TYPE / CEILING HEIGHT ABOVE FINISHED FLOOR LEVEL
- UB ULTRABOND CLADDING AS SPECIFIED
- LED EXTERIOR LIGHT TO ELEC. ENG'S DETAILS
- EMERGENCY LIGHT TO ELEC. ENG'S DETAILS
- EXIT SIGN TO ELEC. ENG'S DETAILS
- SURFACE MOUNTED LIGHT TO ELEC. ENG'S DETAILS

NORTHERN RETAIL

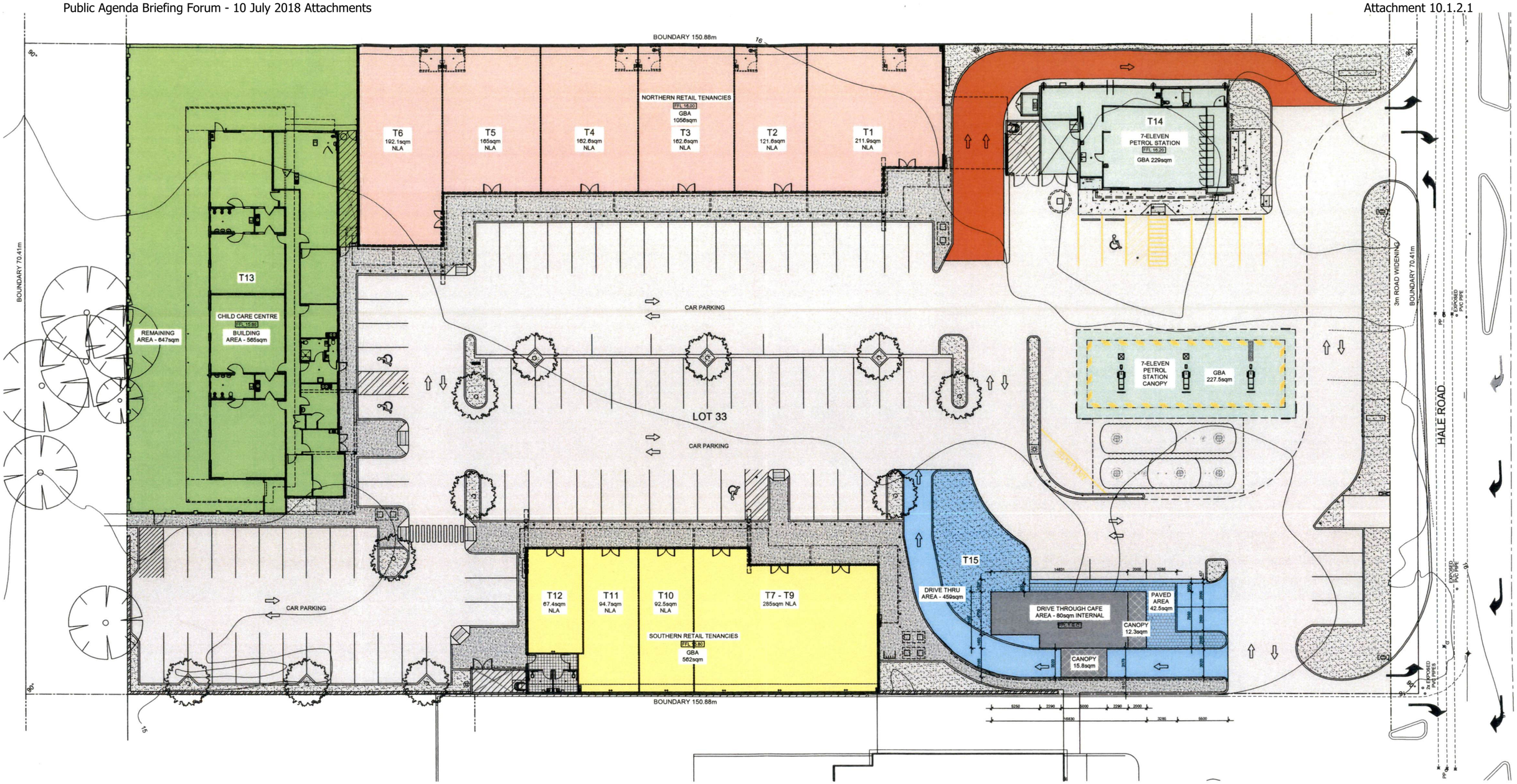
- AREA TO BE CONFIRMED BY LICENSED SURVEYOR.
- AREA CALCULATED FROM INSIDE WALL FACE OF EXTERIOR WALLS TO CENTRE LINE OF INTERTENANCY WALL.
- CHECK AND CONFIRM ALL DIMENSIONS AND LOCATIONS OF EXISTING SERVICES ON SITE.
- REFER ALSO TO TENANCY FITOUT GUIDE.

A	ISSUED FOR INFORMATION	AK	AK	10.11.2017
revision/ issue	description	drawn	checked	date

project: HALE VILLAGE – MIXED USE DEVELOPMENT
location: LOT 33 HALE ROAD, WATTLE GROVE

drawn: AK
checked: AK
description: TENANCY #1 DRAWINGS
scale: 1:50 @ A1
date: 10.11.2017
project no: 54.16
dwg no: T1-2
rev: A

Hodge Collard Preston ARCHITECTS
Third Floor, 38 Richardson Street, West Perth, WA 6005
PO Box 743, West Perth, WA 6872
Ph: (08) 9322 5144
Fax: (08) 9322 5740
Email: admin@hcparch.com



PROPOSED LEASE AREA PLAN

SCALE 1:200

N

LEGEND:

- LICENCED AREA - T1
- 7 ELEVEN LEASE AREA
- DRIVE THROUGH CAFE LEASE AREA
- SOUTHERN RETAIL TENANCY LEASE AREA
- NORTHERN RETAIL TENANCY LEASE AREA
- CHILDCARE CENTRE LEASE AREA
- COMMON AREA

rev	description	drawn	checked	date
H	TENANCIES T1 AND T2 FLOOR AREA REVISED	AK	AK	10.11.2017
G	TENANCY NUMBERS REVISED	AK	AK	05.10.2017
F	DIMENSIONS FOR DRIVE THROUGH CAFE ADDED	AK	AK	15.09.2017
E	DRIVE THROUGH CAFE ADDED IN LIEU OF MUZZ BUZZ PAD	AK	AK	15.09.2017
D	TENANCY T12 REVISED TO T11 AND TENANCY T11 REVISED TO T12	AK	AK	26.06.2017
C	MUZZ BUZZ LEASED AREA REVISED	AK	AK	22.12.2016
B	NORTHERN & SOUTHERN RETAIL TENANCY NLA ADDED	AK	AK	06.12.2016
A	MUZZ BUZZ BUILDING AREA & REMAINING AREA ADDED	AK	AK	01.12.1016

project: HALE VILLAGE – MIXED USE DEVELOPMENT
location: LOT 33 HALE ROAD, WATTLE GROVE
drawn: AK
checked: AK
description: LEASE AREA PLAN
scale: 1:200 @ A1
date: 11.11.2016
project no: 54.16
dwg no: L01
rev: H

Hodge Collard Preston ARCHITECTS
Third Floor, 38 Richardson Street, West Perth, WA 6005
PO Box 743, West Perth, WA 6872
Ph: (08) 9322 5144
Fax: (08) 9322 5740
Email: admin@hcparch.com

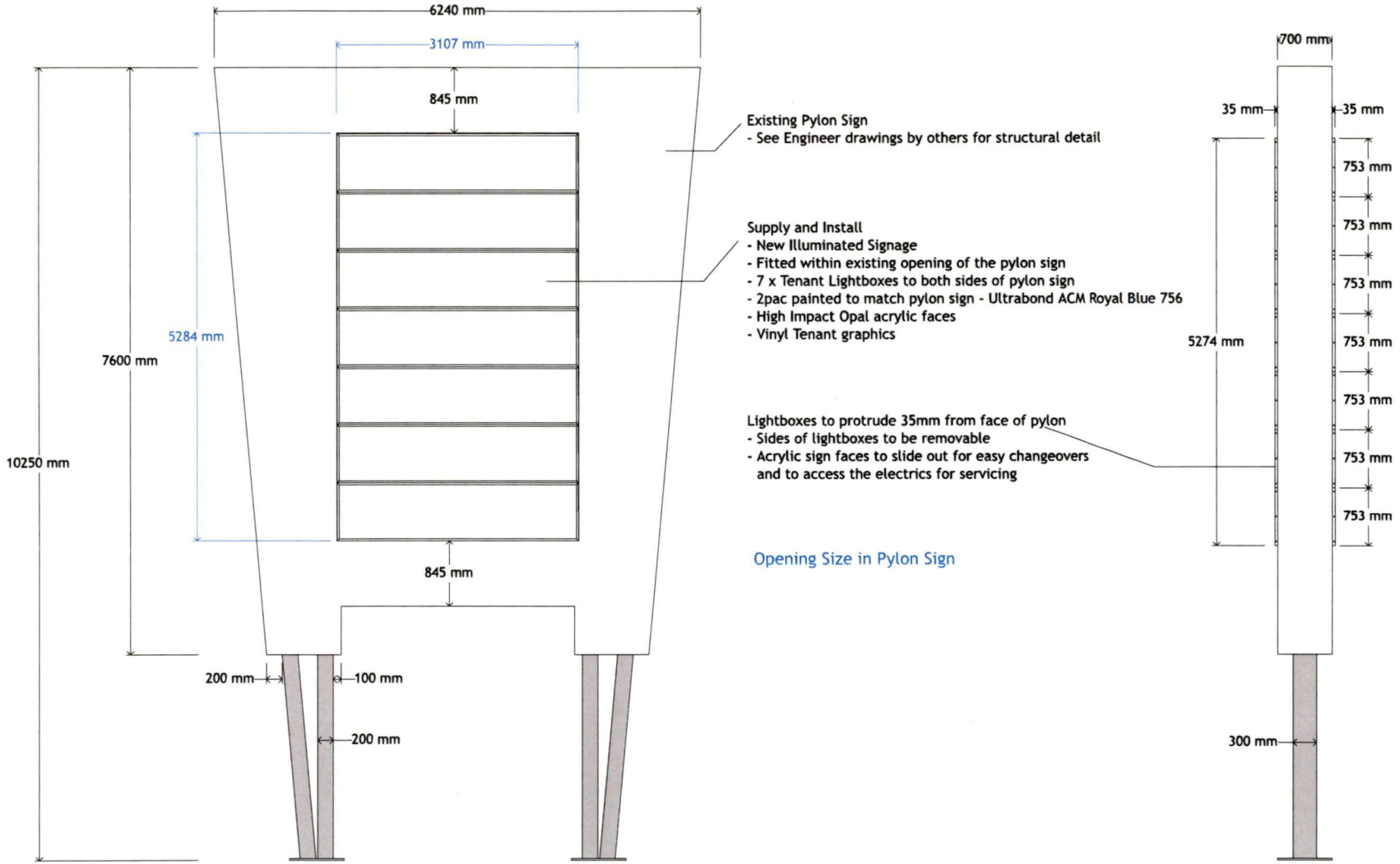
- ALL AREAS TO BE CONFIRMED BY LICENSED SURVEYOR.

!!! NOTE - THIS DRAWING SHOULD BE PRINTED IN COLOUR


ACTON
FOR LEASE


ACTON
FOR LEASE
JONATHAN KILBORN
0404 796 137

Hale Village Pylon Sign
- Tenant Lightboxes

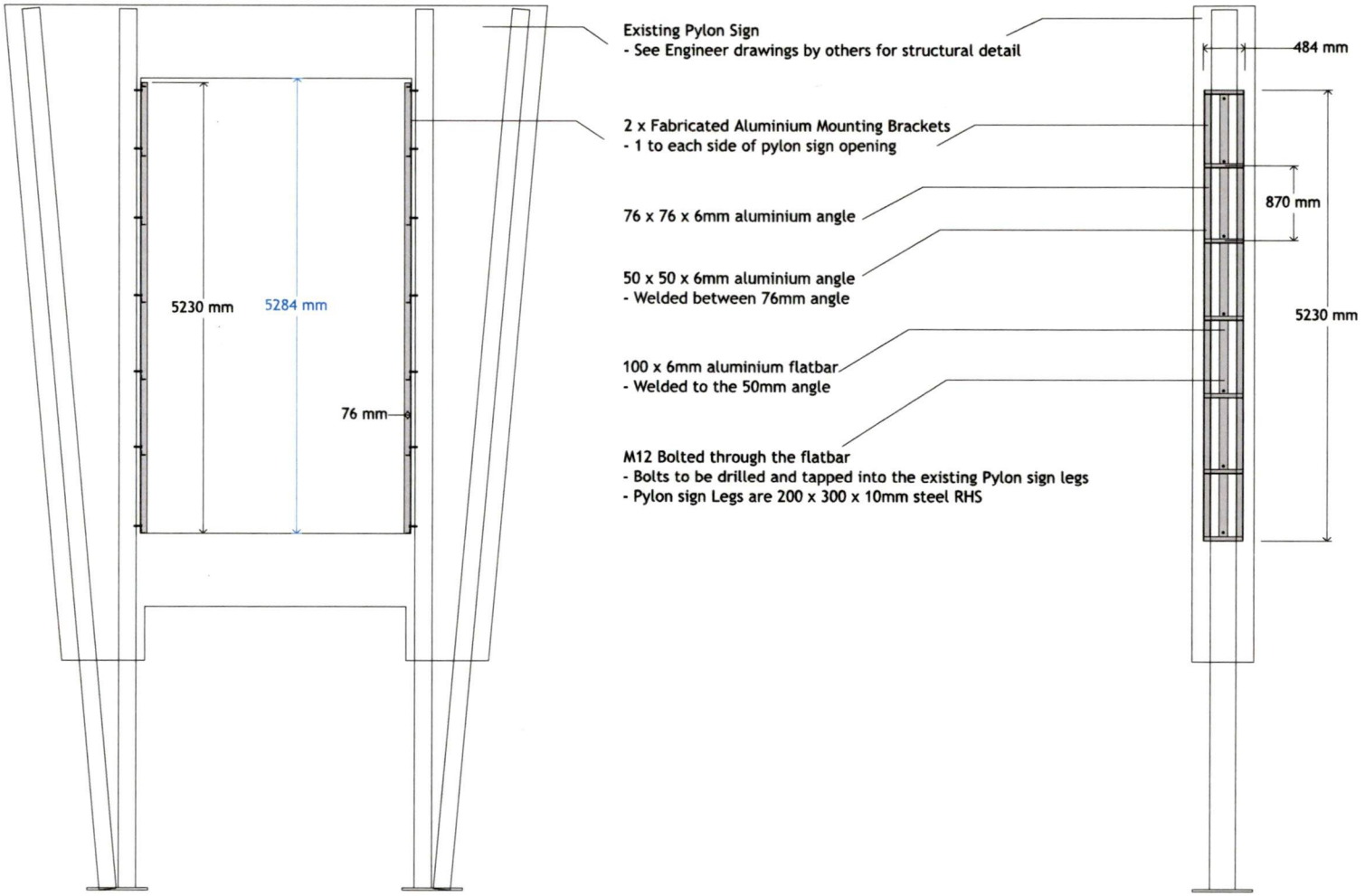


Date	Rev	By	Revision/Issue Description	Date	Rev	By	Revision/Issue Description	Job Name:
23/08/2017	1	LM						Path:
05/09/2017	2	LM						Notes:

Kingman VISUAL
SIGNAGE + DESIGN + CONSTRUCT

Issued: 05/09/17 | Page 02 | D2

Hale Village Pylon Sign
- Mounting Brackets for Tenant Lightboxes
- Construction Drawing 1 of 5



Date	Rev	By	Revision/Issue Description	Date	Rev	By	Revision/Issue Description
23/08/2017	1	LM					
05/09/2017	2	LM					

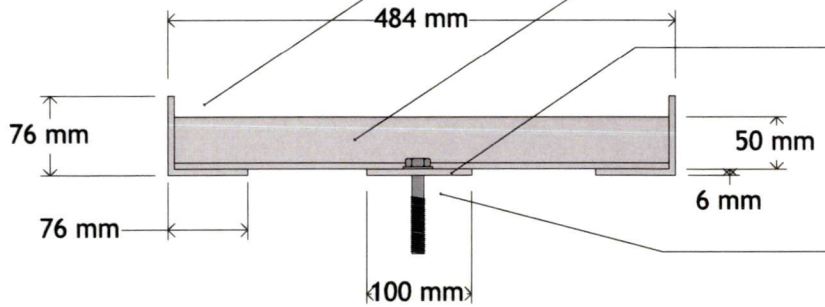
Job Name:
Path:
Notes:

Kingman VISUAL
SIGNAGE + DESIGN + CONSTRUCT

Issued: 05/09/17 | Page 03 | D2

Hale Village Pylon Sign
- Mounting Brackets Detail
- Construction Drawing 2 of 5

2 x Fabricated Aluminium Mounting Brackets
- 1 to each side of pylon sign opening
- Top View



76 x 76 x 6mm aluminium angle

50 x 50 x 6mm aluminium angle
- Welded between 76mm angle

100 x 6mm aluminium flatbar
- Welded to the 50mm angle

M12 Bolted through the flatbar
- Bolts to be drilled and tapped into the existing Pylon sign legs
- Pylon sign Legs are 200 x 300 x 10mm steel RHS

Date	Rev	By	Revision/Issue Description	Date	Rev	By	Revision/Issue Description
23/08/2017	1	LM					
05/09/2017	2	LM					

Job Name:

Path:

Notes:

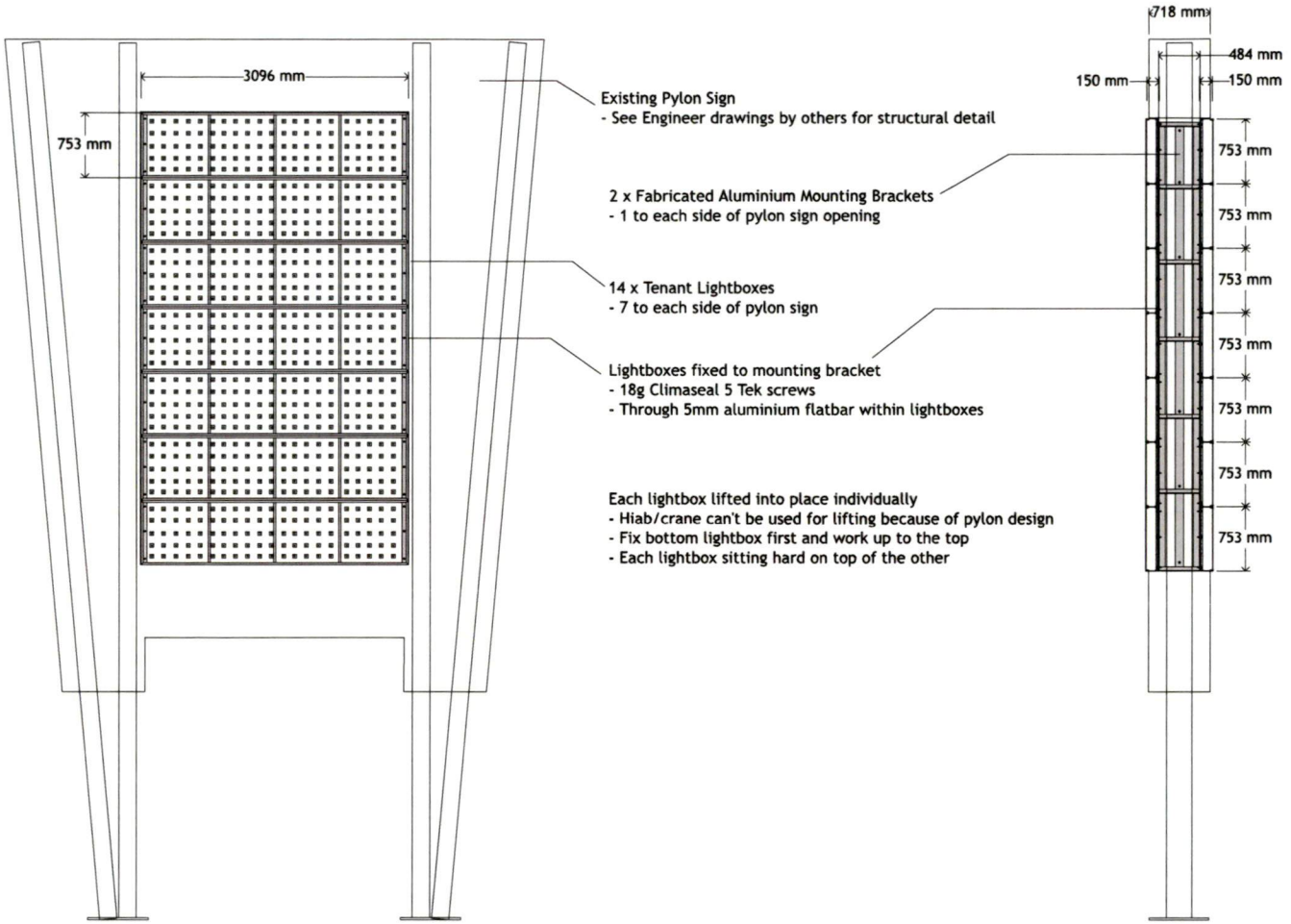
Kingman VISUAL
SIGNAGE + DESIGN + CONSTRUCT

Issued: 05/09/17

Page 04

D2

Hale Village Pylon Sign
- Tenant Lightbox Fixing Method
- Construction Drawing 3 of 5



Date	Rev	By	Revision/Issue Description	Date	Rev	By	Revision/Issue Description	Job Name:
23/08/2017	1	LM						Path:
05/09/2017	2	LM						Notes:

Kingman VISUAL
SIGNAGE + DESIGN + CONSTRUCT

Issued: 05/09/17 | Page 05 | D2

Hale Village Pylon Sign
- Tenant Lightbox Construction Method
- Construction Drawing 4 of 5

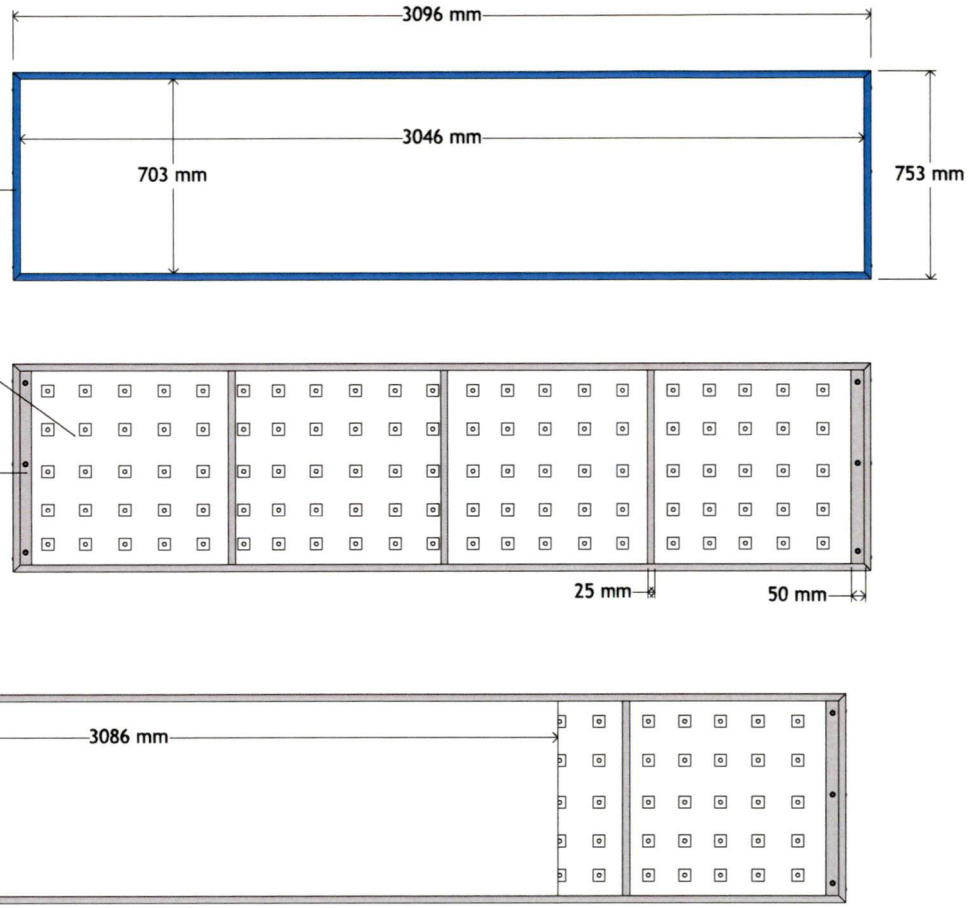
14 x Tenant Lightboxes
- Fabricated from 150mm deep aluminium lightbox extrusion
- 2pac painted - Ultrabond Royal Blue 756 to match pylon cladding

3mm Satin White ACM rear cladding/light tray
- LED Illumination

50 x 5mm aluminium flatbar welded within the lightboxes
- For fixing lightboxes to mounting brackets

4.5mm High Impact Opal acrylic signfaces
- Removable keeper to end of lightbox
- Signfaces to slide out

Approx weight per box is
39kg



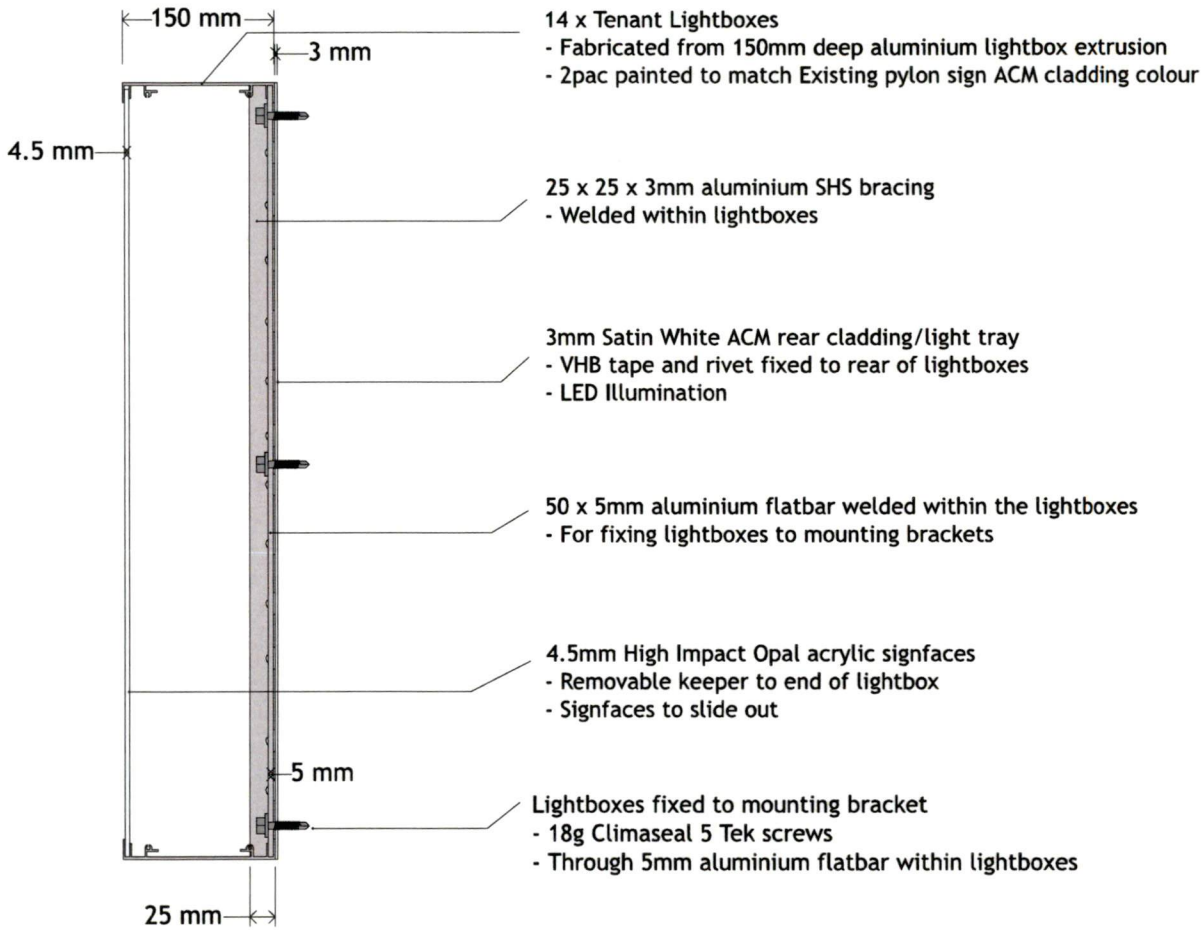
Date	Rev	By	Revision/Issue Description	Date	Rev	By	Revision/Issue Description
23/08/2017	1	LM					
05/09/2017	2	LM					

Job Name:
Path:
Notes:

Kingman VISUAL
SIGNAGE + DESIGN + CONSTRUCT

Issued: 05/09/17 | Page 06 | D2

Hale Village Pylon Sign
- Tenant Lightbox Construction Method Detail
- Construction Drawing 5 of 5



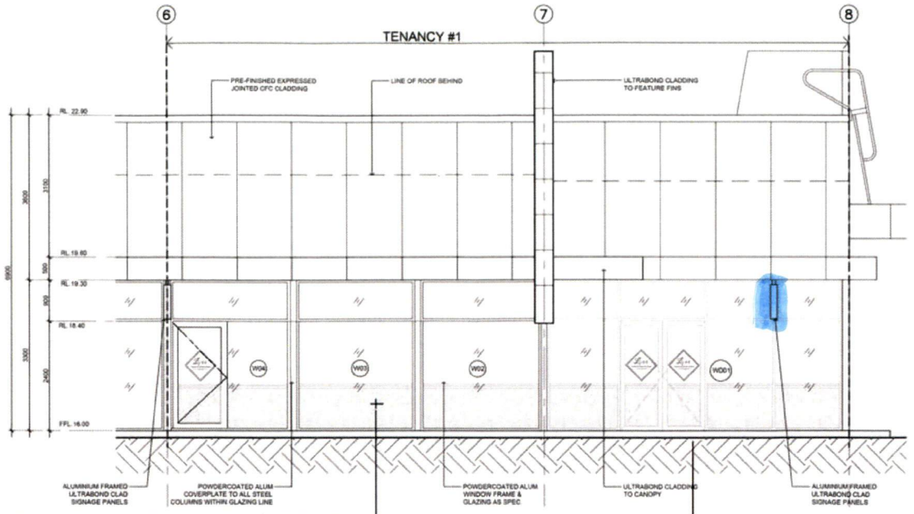
Date	Rev	By	Revision/Issue Description	Date	Rev	By	Revision/Issue Description
23/08/2017	1	LM					
05/09/2017	2	LM					

Job Name:
Path:
Notes:

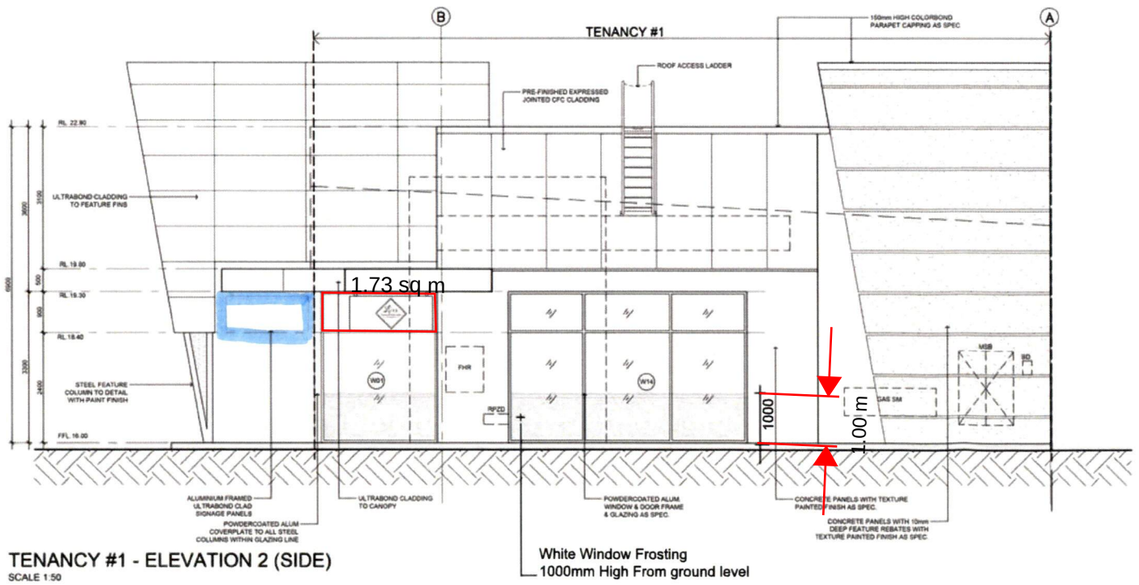
Kingman VISUAL
SIGNAGE + DESIGN + CONSTRUCT

Issued: 05/09/17 | Page 07 | D2

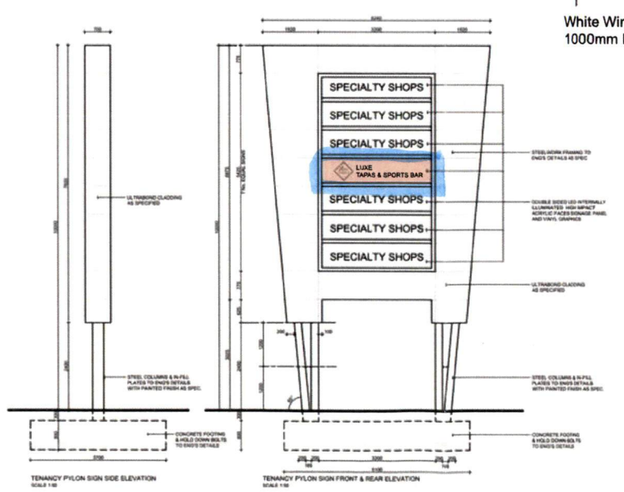
NOTES
CONCEPT DESIGN DRAWING ONLY NOT FOR CONSTRUCTION USE. DO NOT SCALE FROM DRAWING



TENANCY #1 - ELEVATION 1 (FRONT)
SCALE 1:50



TENANCY #1 - ELEVATION 2 (SIDE)
SCALE 1:50



Typical Signage logo design

DRAFT ONLY
CONCEPT DESIGN

issue	by	date	issue name
1	NLTL	21.11.17	CONCEPT DESIGN ISSUE

NEW FORM CONSTRUCTION
architects & builders
206 railway parade
west leederville, wa 6007
93819710
robert@newformconstruction.com.au

DRAWING TITLE
SIGNAGE PLAN

ALL DIMENSIONS TO BE VERIFIED ON SITE PRIOR TO COMMENCEMENT OF ON-SITE WORK & / OR OFF-SITE FABRICATION. ONLY FIGURED DIMENSIONS TO BE USED. DO NOT SCALE THIS DRAWING.

CLIENT
MR LUKE NORRIS

PROJECT
HALE VILLAGE
MIXED USE DEVELOPMENT
TENANCY 01

NOTE: SCALE/S APPLY FOR ORIGINAL DRAWING SIZE: A3

SCALES
NTS

DRAWN
SIGN..... ...../...../.....

DESIGNED
SIGN..... ...../...../.....

JOB NUMBER	DRAWING NUMBER	ISSUE No.
	A102	1

Submitter Assess No.	Nature of Submission	Applicant/Owner Response	Response/Recommended Modifications
1	**Objection** We received a letter regarding the proposed changes to the shop to small bar. We are not against the bar going in but are concerned for the noise, and the opening hours. We feel like 12am finishes are too late and don't feel like this will be family friendly. Also the live band we feel would cause too much noise and are against that. We have 2 small children which go to bed at 7pm and will be going to school next year and feel like if the bar is open at those times it might affect their sleep. Our bedrooms in our house are closest to the road and we hear a lot of noise already from 7/eleven and the road and feel like if something else with a lot of noise goes in it will affect our sleep. Is they something we can put in place for noise levels? I look forward to hear back from you.	• In response to the noise objection here, we note that the live music would only be specific to a Sunday to create a relaxed atmosphere, this would limit the times of the performer from midday to 6pm. Any other music would be background music as played in any other restaurant. • The times we have applied for are may be reduced should the restaurant be not busy later in the evening.	**Noted** The applicant would be required to comply with undertake a detailed noise assessment in relation to the *Environmental Protection (Noise) Regulations 1997* to the satisfaction of the City of Kalamunda prior to commencing the development.
2	**No Objection** No comment.		**Noted**
3	**Objection** We are @ work @ 4am and in bed early 8pm we don't want any noise or disturbances. Please NO!	• In response to the noise objection here, we note that the live music would only be specific to a Sunday to create a relaxed atmosphere, this would limit the times of the performer from midday to 6pm. Any other music would be light background music.	**Noted** The applicant would be required to comply with undertake a detailed noise assessment in relation to the *Environmental Protection (Noise) Regulations 1997* to the satisfaction of the City of Kalamunda prior to commencing the development.
4	**Objection** Small bar located in close proximity to a child care center is my main objection. Licenced premises located at Quills Eatery feel the area also does not require a second one.	• The atmosphere we are creating is family friendly, we have applied for a Small Bar Liquor License for 2 reasons; 1) so that people can enjoy a beverage whilst standing (a Restaurant Liquor License requires patrons to be seated whilst consuming alcohol) and 2) so that patrons do not have to order a meal in order to have	**Noted** In this case market demand for the land use is not a planning consideration. The compatibility with the existing childcare centre has been noted and considered.

		an beverage (a Restaurant Liquor License only allows consumption of alcohol as a secondary to a meal). • The child care centre will not be affected by our venue as we are a restaurant not a bar. Our venue is family friendly and has an American sports bar atmosphere (variety of sports on TV's throughout the venue, No TAB). • I have been advised by many residents that they are looking forward to our venue coming into the area as they have not got a family friendly restaurant option.	
5, 10 & 12	**Objection** Wattle Grove is a small and quiet peaceful residential area. Most of the family have very young kids and this type of BAR may cause small affects which will not be noticed now but in the long term it will not good for them and as well as for the nearby community. On the other hand all the activity around it and this area must cause some unwanted situation. As a affected landowner I strongly object this proposal. Thanks.	• See above	**Noted** The primary use of the site is a restaurant with a small bar component. It is also notable the drive through 7/Eleven on site is also open 24 hours.
6.	**No Objection** This would be great for our community.	**-**	**Noted**
7.	**No Objection** A fantastic opportunity to be around like minded people within our community, social interaction and local involvement are the key to having a proud and happy suburb and this opportunity will be welcomed wholeheartedly by us.	**-**	**Noted**
8.	**No Objection** Welcome the proposed application - reference number DA18/0138.	**-**	**Noted**
9 & 13	**Objection** I strongly object to the newly proposed development proposal	• In response to the noise objection here, we note that the live music would only be specific to a Sunday to create a relaxed atmosphere, this would limit the times	**Noted** The applicant would be required to comply with undertake a detailed

	My property is only less than 60m away from the proposed Bar At present due to the close proximity of Hale road, which runs parallel to my home has a huge traffic volume and at night and during day time it impacts to have a noise free time. My 3 and 5 years old kids struggle to sleep in the current noisy environment as there is no noise wall. By inclusion of a bar with live music facility for 120 people so close to our property will worsen our standards of living in this residential area. Nowadays we struggle to get a suitable parking spot at the shopping complex and it will further worsen if approval is provided for 120 people bar. Because I think lot of people who will not be able to park in 332 hale road complex will park in the Aldi shopping complex. As my home is parallel to Hale road, definitely I don't want to see broken bottle close to my property and vandalized car on my parking lot. At present, at night time, we have observed a huge gathering of young people close to 7 Eleven and we are afraid to go on 7 eleven to fill up fuel in our car. A proposed bar for 120 people will worsen the environment of the vicinity of my property . So I firmly object this proposal.	of the performer from midday to 6pm. Any other music would be background music as played in any other restaurant. • We do not sell liquor for off the premises consumption, there will be no broken bottles and litter from our venue. • We in no way condone any sort of bad behaviour and will have policies and procedures in place to reduce the possibility of anything arising. • As per the parking claim, as our venue is open for Lunch and Dinner, these times would not highly impact parking for the shopping complex.	noise assessment in relation to the Environmental Protection (Noise) Regulations 1997 to the satisfaction of the City of Kalamunda prior to commencing the development. The applicant has advised live music will be limited to Sunday midday to 6pm, which is considered reasonable. Parking is a relevant planning consideration. Anti-social behaviour is a consideration and will relate largely to management of the premises. It is acknowledged all beverages are to be consumed onsite. Current anti-social behaviour is acknowledged. It is also submitted that the later opening hours of the proposed bar may reduce antisocial behaviour due to the increased presence of patrons.
10, 5 & 12	**Objection** I love our Wattle Grove because of its safe and peaceful environment. As far as my concern it will not remain same if a small bar is build in this totally residential area.	• The atmosphere we are creating is family friendly, we have applied for a Small Bar Liquor License for 2 reasons; 1) so that people can enjoy a beverage whilst standing (a Restaurant Liquor License requires patrons to be seated whilst consuming alcohol) and 2) so that patrons do not have to order a meal in order to have	**Noted** The property is zoned commercial under the adopted U9 ODP and is a use that can be considered in this zone.

	My request is that Please think again to approve such a place and its after effects around all the growing family environment.	an beverage (a Restaurant Liquor License only allows consumption of alcohol as a secondary to a meal). • Our aim is to add to the Wattle Grove community in a positive way by creating more jobs for locals, using local suppliers and by creating a venue the whole family can go out to and enjoy.	
11.	**Objection** I strongly oppose the proposed project Ref DA/0138 & HL-01/332 Attached is my object to the proposal. *(Cannot open submission).*	• There is no objection for me to address here.	
12, 5 & 10	*(Cannot open submission).*	**-**	
13 & 9	**Objection** I firmly object to the proposed change of use from shop to the small bar. My property is less than 60-70m away from the proposed Bar As a small family with my wife and two little kids (3 and 5 years old) I am already in distress with the sound created by heavy traffic volume travels along the Hale road which is parallel to my home. We struggle to sleep without the presence of noise wall at this point. By inclusion of a bar with live music facility for 120 people so close to our property will worsen our standards of living in this residential area. Moreover, nowadays, we struggle to get a parking spot on the Wattle Grove shopping complex. Approval of a bar with 120 people will worsen the case. As my home is parallel to Hale road , definitely I don't want to see broken bottle close to my property and vandalized car on my parking lot. At present, at night time, we have observed a huge gathering of young people close to 7 Eleven and we are afraid to go on 7 eleven to fill up fuel in our car. A proposed bar for 120 people will worsen the environment of the vicinity of my property . So I strongly object this proposal.	• In response to the noise objection here, we note that the live music would only be specific to a Sunday to create a relaxed atmosphere, this would limit the times of the performer from midday to 6pm. Any other music would be background music as played in any other restaurant. • We do not sell liquor for off the premises consumption, there will be no broken bottles and litter from our venue. • We in no way condone any sort of bad behaviour and will have policies and procedures in place to reduce the possibility of anything arising. • As per the parking claim, as our venue is open for Lunch and Dinner, these times would not highly impact parking for the shopping complex.	**Noted** See point 9.
14.	**Objection**	• The atmosphere we are creating is family friendly, we have applied for a Small Bar Liquor License for 2	**Noted**

	The proposed small bar is adjacent to a child care centre - the placement of a bar in this location is not appropriate and has potential to expose small children to antisocial behaviour	reasons; 1) so that people can enjoy a beverage whilst standing (a Restaurant Liquor License requires patrons to be seated whilst consuming alcohol) and 2) so that patrons do not have to order a meal in order to have an beverage (a Restaurant Liquor License only allows consumption of alcohol as a secondary to a meal). • The child care centre will not be affected by our venue as we are a restaurant not a bar. Our venue is family friendly and has an American sports bar atmosphere (variety of sports on TV's throughout the venue, No TAB). • I have been advised by many residents that they are looking forward to our venue coming into the area as they have not got a family friendly restaurant option.	It is acknowledged the opening hours of the proposed development will coincide with the opening hours of the childcare centre, though peak periods are anticipated to be Friday to Sunday evenings.
15.	**Objection** We are concerned regarding the live music and also the midnight closure on weekends and the effects it will have both noise wise and possible anti social behaviour. Our house sits on the side street, Thorogood Ave and with the new cross bridge we get a lot of walking traffic. We don't particularly want the bars inebriated customers trying to find their way home around midnight walking past our house.....who would?! And the thought of live music on weekends.....well!! everyone has parties but not every single Friday, Saturday and Sunday :(Noise wise and possible antisocial behaviour this bar could cause the area to devalue.....as Wattle Grove residents we are rather concerned it will impact both the value of our house being so near and also having to contiually put up with music and noise. Regarding the 95% of people surveyed (130 people) as "wanting" this bar - this equates to approx 2.5% of the Wattle Grove population which is a very low number that was actually surveyed. I would be interested to know if any of these surveyed were in the residential streets close to where the venue would like to set up.	• In response to the noise objection here, we note that the live music would only be specific to a Sunday to create a relaxed atmosphere, this would limit the times of the performer from midday to 6pm. Any other music would be light background music. • We in no way condone any sort of bad behaviour and will have policies and procedures in place to reduce the possibility of anything arising. • As per the note made about the survey we completed, the link to this survey was posted in the Wattle Grove Facebook Chat page so that only local residents could have their say. We only ran this survey over a period of 24hrs and out of the 130 people that completed the survey the result was 125 people supported the idea of us creating this restaurant.	**Noted** The applicant would be required to comply with undertake a detailed noise assessment in relation to the Environmental Protection (Noise) Regulations 1997 to the satisfaction of the City of Kalamunda prior to commencing the development. Anti-social behaviour is a consideration and will relate largely to management of the premises. It is acknowledged all beverages are to be consumed onsite. Property value is, in this case, not a relevant planning consideration however the potential for anti-social behaviour is and has been considered.

PIA Form 2A - Additional Information

Luxe Tapas and Sports Bar

2.1 What facilities and services will be provided by the proposed premises?

At Luxe Tapas and Sports Bar we will be providing a service of food and drinks to our patrons. Our menu consists of a combination of tapas foods and pub style foods. Our menu will be available to all patrons throughout all operating hours. On our drink menu we have a variety of drink choices available to patrons who intend on dining with us, these choices will be from; tap beers, bottled beers, ciders, a choice of cocktails, spirits and a selection of non-alcoholic drinks (tea, coffee, juices, and soft drinks).

We have a small zone that can be partitioned off for patrons should they want to hold a function with us. We will provide catering from our kitchen for any functions that are held within the premises.

We intend on showing all major sporting events along with non-major sporting events throughout the venue. Occasionally we will have performances from live artists, this would occur on weekends and would abide by the noise guidelines. We believe that having a live musician will aid in creating a relaxed atmosphere. Live musicians can also be an option available for guests if they are holding a function with us.

We have the following facilities available to patrons who visit our premises; 2 toilets and 2 basins for females, 1 toilet, 1 urinal and 2 basins for males, and 1 toilet and basin in the disabled toilet along with a wall mounted change table for any patrons with small children.

One of our goals for the venue is to make it a family friendly environment, to cater for those with young children we intend on having a small play zone which will be closed with a fence and gate, we will also have soft fall flooring to prevent children from hurting themselves.

2.2 What is the proposed manner of trade?

After completing a survey over 24 hours of 130 people who live within a 2km radius of the premises, we found that during our trading hours we will be catering for people aged between 25 and 45, with some of these people having young families. We aim to provide a unique dining experience for our guests that leave them wanting to return. We will have fully trained and qualified staff who hold current RSA certification and managers who hold a current Unrestricted Approved Manager's certificate, we will also ensure all employed staff members abide by all house policies and procedures that are in place.

2.3 What is the target client base?

After researching the population within Wattle Grove we found that in 2016 there was a recorded number of 5,968 people living in the area. Since then more housing estates have been constructed and established therefore more people now live within the area. We completed a survey over 24 hours of 130 people who live within a 2km radius of the premises' location and found that our target client base would be people between the ages of 25 – 45, with some of these having young families.

With gaining the knowledge of this information we aim to create a unique dining experience combined with a sports bar atmosphere that caters for all persons and is also family friendly.

2.4 Will the premises be distinguished by any particular theme or décor?

Our design layout will consist of the following; we aim to create an open plan layout whilst still being able to host small functions. We will be doing this by having a partition wall placed in the venue with an open centre, this wall will be covered with timber look material, we will then be mounting televisions along the top of this wall on either side (3 either side, 6 in total) these televisions will show different sports throughout all hours of the day.

The bar will have timber look material along the front (this will tie in nicely with the partition wall that I mentioned earlier), and the bar top will be finished in gloss black. We will be using warm coloured pendant lighting as features throughout the venue.

The overall theme will be tied together with timber tables and matte black chairs. As our design theme incorporates a sports bar there will also be different sporting memorabilia displayed around the venue for patrons to admire.

3.1 Why is the grant of a license in the public interest and how will it benefit the community?

We believe the grant of this small bar license is in the public's interest because there aren't any other venues within the area that offer services like ours. The survey that we completed had responses from 130 people who live within a 2km radius of the premises in Wattle Grove. We found that 125 people (96%) said they do want a sports bar/ tapas restaurant in the area, as noted by a survey participant, "it is something different, there isn't anything else in the area like it that is also family friendly". We believe our premises will benefit the community in a positive way as it will give people somewhere to go out locally, and will also open up a variety of jobs for those who live in the area.

As there are only a couple of sit down only restaurants within the area, we believe our premises will be greatly accepted as we also have the option for a function zone/ private dining area, along with being a family friendly environment.

We want to help fellow small businesses within the Shire of Kalamunda community. We aim on doing this by using locally sourced fruits, vegetables, wines and ciders.

We also note that upon discussing with the City of Kalamunda, they supported the idea of our tapas restaurant/ sports bar being established in Wattle Grove as it is positive addition to the area.

4.3 What are the proposed strategies the applicant will implement to minimise harm or ill health?

In order for us to minimise harm or ill health at our venue we will be implementing the following;

- Set cut off times for the bar's service of alcohol,
- All alcohol is to be consumed on the premises only,
- Crowd controllers will be hired for major sporting events and functions,
- CCTV security surveillance will be installed throughout the premises,
- Our menu will be readily available for all patrons whilst the premises is open for business,
- All staff will be required to have current RSA certification and must follow the harm minimisation policy, code of conduct, and house management plans, along with Occupational Health and Safety Policies,
- There be an approved manager on the premises at all times during all operating hours.

5.1 What is the nature and character of the local community?

According to the statistics from Census 2016, Wattle Grove has a population of 5,968, with a median age of 32 years. Of these 5,968 people 50.5% are female and 49.5% are male. There are roughly 1,610 families within the area with an average of 1.9 children per family. The employment status for those living in Wattle Grove was noted to be 61.3% fulltime, 27.4% part time and 7.1% were unemployed. The median weekly income for those living in Wattle Grove was noted at $876 for individuals, and $2,180 for families. For those that were employed, it was recorded that 77.7% of people travelled by car and 6.9% of people used public transport.

Since this Census report was conducted back in 2016 more housing estates have been established. Unfortunately these are the most current statistics available for us to use.

(Attached is a hard copy of the 2016 Census report for your perusal).

5.4 What consultation with local government regarding the proposed premises has been taken into account in establishing a business plan?

We have met with the Planning Department and Health Department at the City of Kalamunda and discussed their acceptance of our proposed tapas restaurant and sports bar, we also discussed the need for a change of use application. The building was initially approved and zoned for multiple restaurants and small business premises', as our tenancy was initially approved for a drive through liquor store we have been required to submit a Change of Use to accommodate our Small Bar Liquor License. We have submitted sections 39 & 40 for written approval by the City of Kalamunda on the 8th November 2017. We are currently in the process of completing our Change of Use application with the City of Kalamunda.

5.7 What are the public transport facilities (including taxi services) that would be available to patrons, or any other transport facilities proposed to be provided by the applicant for patrons?

After doing research we found that the following public transport facilities will be available to our patrons;

- Uber and Taxis are readily available 24 hours a day, 7 days a week.
- 2 bus stops are located at either end of the shopping complex where the premises is located.

5.11 What is the potential impact of the proposed premises on vandalism, litter and criminal acts? (Especially violent crimes including domestic violence). This may include improvements in the passive and active security of the area.

As the premises is located within the area of a shopping complex there is already street lights in place and lighting around the outside of all the buildings. We intend on having CCTV surveillance installed not only inside the premises but monitoring the front of our premises. We do not condone any form of violence or criminal activity and will have crowd controllers and procedures in place to deal with such situations should they arise. We will also have a rubbish bin located at the front of our premises to aid in the reduction of littering of passer-byers and patrons.

2016 Census QuickStats

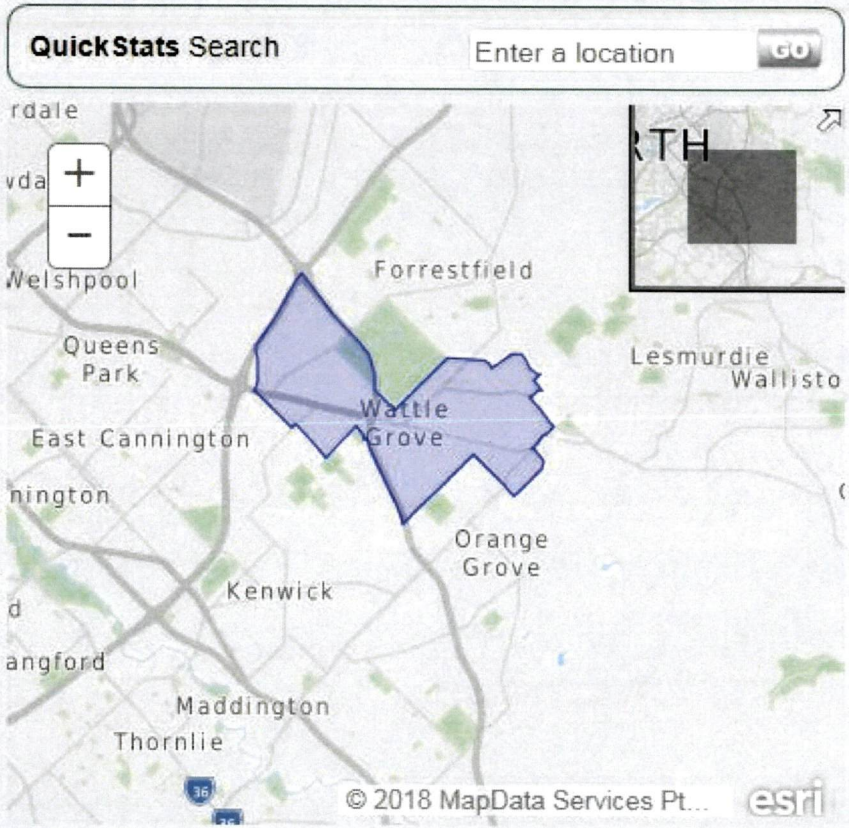
Australia | Western Australia | State Suburbs

Wattle Grove (WA)

Code SSC51533 (SSC)

Search for a Community Profile

People	**5,968**
Male	49.5%
Female	50.5%
Median age	32
Families	**1,610**
Average children per family	
for families with children	1.9
for all families	1.1
All private dwellings	**1,962**
Average people per household	3.2
Median weekly household income	$2,145
Median monthly mortgage repayments	$2,167
Median weekly rent	$450
Average motor vehicles per dwelling	2.3



Australian Bureau of Statistics

2016 Census QuickStats

Australia | Western Australia | State Suburbs

Wattle Grove (WA)

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Median monthly mortgage repayments	$2,167
Median weekly rent	$450
Average motor vehicles per dwelling	2.3

People — demographics & education

People tables are based on a person's place of usual residence on Census night

People *Persons count based on place of usual residence on Census night*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Male	2,955	49.5	1,238,419	50.0	11,546,638	49.3
Female	3,020	50.5	1,235,994	50.0	11,855,248	50.7
Aboriginal and/or Torres Strait Islander people	76	1.3	75,978	3.1	649,171	2.8

In the 2016 Census, there were 5,968 people in Wattle Grove (WA) (State Suburbs). Of these 49.5% were male and 50.5% were female. Aboriginal and/or Torres Strait Islander people made up 1.3% of the population.

Age	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Median age	32	--	36	--	38	--
0-4 years	602	10.1	161,727	6.5	1,464,779	6.3
5-9 years	582	9.8	164,153	6.6	1,502,646	6.4
10-14 years	398	6.7	150,806	6.1	1,397,183	6.0
15-19 years	358	6.0	149,997	6.1	1,421,595	6.1
20-24 years	332	5.6	160,332	6.5	1,566,793	6.7
25-29 years	449	7.5	184,908	7.5	1,664,602	7.1
30-34 years	660	11.1	194,267	7.9	1,703,847	7.3
35-39 years	616	10.3	173,041	7.0	1,561,679	6.7
40-44 years	508	8.5	171,996	7.0	1,583,257	6.8
45-49 years	395	6.6	172,520	7.0	1,581,455	6.8
50-54 years	318	5.3	162,438	6.6	1,523,551	6.5
55-59 years	240	4.0	149,899	6.1	1,454,332	6.2
60-64 years	178	3.0	132,145	5.3	1,299,397	5.6
65-69 years	160	2.7	116,755	4.7	1,188,999	5.1
70-74 years	78	1.3	82,911	3.4	887,716	3.8
75-79 years	45	0.8	61,509	2.5	652,657	2.8
80-84 years	26	0.4	42,590	1.7	460,549	2.0
85 years and over	18	0.3	42,420	1.7	486,842	2.1

The median age of people in Wattle Grove (WA) (State Suburbs) was 32 years. Children aged 0 - 14 years made up 26.5% of the population and people aged 65 years and over made up 5.5% of the population.

Registered marital status *People aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Married	2,530	57.6	975,062	48.8	9,148,218	48.1
Separated	107	2.4	63,205	3.2	608,059	3.2

Divorced	256	5.8	167,361	8.4	1,626,890	8.5
Widowed	95	2.2	88,619	4.4	985,204	5.2
Never married	1,407	32.0	703,482	35.2	6,668,910	35.0

Of people in Wattle Grove (WA) (State Suburbs) aged 15 years and over, 57.6% were married and 8.2% were either divorced or separated.

Social marital status *People aged 15 years and over*	**Wattle Grove (WA)**	**%**	**Western Australia**	**%**	**Australia**	**%**
Registered marriage	2,283	56.2	835,938	48.4	8,001,141	47.7
De facto marriage	453	11.2	201,709	11.7	1,751,731	10.4
Not married	1,326	32.6	688,868	39.9	7,024,973	41.9

In Wattle Grove (WA) (State Suburbs), of people aged 15 years and over, 56.2% of people were in a registered marriage and 11.2% were in a de facto marriage.

Education	**Wattle Grove (WA)**	**%**	**Western Australia**	**%**	**Australia**	**%**
Preschool	98	5.1	30,247	3.9	347,621	4.8
Primary - Government	573	29.6	144,988	18.9	1,314,787	18.2
Primary - Catholic	70	3.6	36,865	4.8	380,604	5.3
Primary - other non Government	99	5.1	28,046	3.7	231,490	3.2
Secondary - Government	240	12.4	88,176	11.5	827,505	11.5
Secondary - Catholic	79	4.1	34,065	4.4	338,384	4.7
Secondary - other non Government	81	4.2	34,773	4.5	280,618	3.9
Technical or further education institution	116	6.0	46,835	6.1	424,869	5.9
University or tertiary institution	272	14.1	106,811	13.9	1,160,626	16.1
Other	52	2.7	18,547	2.4	198,383	2.8
Not stated	253	13.1	197,644	25.8	1,707,023	23.7

In Wattle Grove (WA) (State Suburbs), 32.2% of people were attending an educational institution. Of these, 38.1% were in primary school, 20.6% in secondary school and 20.1% in a tertiary or technical institution.

Level of highest educational attainment *People aged 15 years and over*	**Wattle Grove (WA)**	**%**	**Western Australia**	**%**	**Australia**	**%**
Bachelor Degree level and above	1,090	24.8	410,272	20.5	4,181,406	22.0
Advanced Diploma and Diploma level	473	10.8	177,631	8.9	1,687,893	8.9
Certificate level IV	145	3.3	62,656	3.1	551,767	2.9
Certificate level III	622	14.2	279,448	14.0	2,442,203	12.8
Year 12	757	17.2	318,674	16.0	2,994,097	15.7
Year 11	234	5.3	107,858	5.4	941,531	4.9
Year 10	435	9.9	235,001	11.8	2,054,331	10.8
Certificate level II	0	0.0	940	0.0	13,454	0.1
Certificate level I	0	0.0	209	0.0	2,176	0.0
Year 9 or below	210	4.8	117,996	5.9	1,529,897	8.0
No educational attainment	41	0.9	10,572	0.5	145,844	0.8
Not stated	256	5.8	220,701	11.0	1,974,794	10.4

Of people aged 15 and over in Wattle Grove (WA) (State Suburbs), 17.2% reported having completed Year 12 as their highest level of educational attainment, 17.3% had completed a Certificate III or IV and 10.8% had completed an Advanced Diploma or Diploma.

2011 benchmarks are not available for this data item.

People — cultural & language diversity

Ancestry, top responses	**Wattle Grove (WA)**	**%**	**Western Australia**	**%**	**Australia**	**%**
English	1,736	22.0	931,150	27.9	7,852,224	25.0
Australian	1,563	19.8	760,032	22.8	7,298,243	23.3
Indian	666	8.4	68,796	2.1	619,164	2.0
Chinese	444	5.6	103,677	3.1	1,213,903	3.9
Scottish	374	4.7	214,154	6.4	2,023,470	6.4

The most common ancestries in Wattle Grove (WA) (State Suburbs) were English 22.0%, Australian 19.8%, Indian 8.4%, Chinese 5.6% and Scottish 4.7%.

Respondents had the option of reporting up to two ancestries on their Census form, and this is captured by the Ancestry Multi Response (ANCP) variable used in this table. Therefore, the total responses count will not equal the persons count for this area. Calculated percentages represent a proportion of all people in Wattle Grove (WA) (State Suburbs) (including those who did not state an ancestry).

Country of birth	**Wattle Grove (WA)**	**%**	**Western Australia**	**%**	**Australia**	**%**
Australia	3,311	55.4	1,492,842	60.3	15,614,835	66.7
Other top responses						
India	452	7.6	49,385	2.0	455,389	1.9
England	225	3.8	194,163	7.8	907,570	3.9
Philippines	198	3.3	30,835	1.2	232,386	1.0
New Zealand	192	3.2	79,221	3.2	518,466	2.2
Malaysia	149	2.5	29,126	1.2	138,364	0.6

In Wattle Grove (WA) (State Suburbs), 55.4% of people were born in Australia. The most common countries of birth were India 7.6%, England 3.8%, Philippines 3.3%, New Zealand 3.2% and Malaysia 2.5%.

Country of birth of father and/or mother, stated responses	**Wattle Grove (WA)**	**%**	**Western Australia**	**%**	**Australia**	**%**
Both parents born overseas	3,210	53.8	1,001,150	40.5	8,051,196	34.4
Father only born overseas	419	7.0	184,890	7.5	1,488,092	6.4
Mother only born overseas	314	5.3	144,217	5.8	1,094,591	4.7
Both parents born in Australia	1,798	30.1	947,977	38.3	11,070,538	47.3

In Wattle Grove (WA) (State Suburbs), 30.1% of people had both parents born in Australia and 53.8% of people had both parents born overseas.

Country of birth of father, stated responses	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Australia	2,116	35.7	1,097,468	44.4	12,231,150	52.3
India	652	11.0	70,114	2.8	616,939	2.6
England	408	6.9	276,956	11.2	1,403,096	6.0
Philippines	234	3.9	33,259	1.3	270,177	1.2
New Zealand	219	3.7	97,382	3.9	617,331	2.6

In Wattle Grove (WA) (State Suburbs), the most common countries of birth for male parents were Australia 35.7%, India 11.0%, England 6.9%, Philippines 3.9% and New Zealand 3.7%.

Country of birth of mother, stated responses	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Australia	2,235	37.6	1,140,417	46.1	12,643,365	54.0
India	653	11.0	68,962	2.8	605,777	2.6
England	376	6.3	265,520	10.7	1,302,147	5.6
Philippines	250	4.2	38,495	1.6	325,049	1.4
New Zealand	216	3.6	94,116	3.8	608,329	2.6

In Wattle Grove (WA) (State Suburbs), the most common countries of birth for female parents were Australia 37.6%, India 11.0%, England 6.3%, Philippines 4.2% and New Zealand 3.6%.

Religious affiliation, top responses	Wattle Grove (WA)	%	Western Australia	%	Australia	%
No Religion, so described	1,560	26.1	804,268	32.5	6,933,708	29.6
Catholic	1,390	23.2	530,361	21.4	5,291,834	22.6
Anglican	551	9.2	354,790	14.3	3,101,185	13.3
Islam	502	8.4	50,649	2.0	604,240	2.6
Hinduism	426	7.1	38,739	1.6	440,300	1.9

The most common responses for religion in Wattle Grove (WA) (State Suburbs) were No Religion, so described 26.1%, Catholic 23.2%, Anglican 9.2%, Islam 8.4% and Hinduism 7.1%. In Wattle Grove (WA) (State Suburbs), Christianity was the largest religious group reported overall (51.4%) (this figure excludes not stated responses).

Language, top responses (other than English)	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Mandarin	266	4.4	47,840	1.9	596,711	2.5
Malayalam	206	3.4	7,544	0.3	53,206	0.2
Bengali	145	2.4	3,263	0.1	54,566	0.2
Tamil	106	1.8	6,888	0.3	73,161	0.3
Filipino	101	1.7	10,317	0.4	71,220	0.3
English only spoken at home	3,648	60.9	1,861,041	75.2	17,020,417	72.7
Households where a non English language is spoken	671	36.5	181,998	19.4	1,971,011	22.2

In Wattle Grove (WA) (State Suburbs), 60.9% of people only spoke English at home. Other languages spoken at home included Mandarin 4.4%, Malayalam 3.4%, Bengali 2.4%, Tamil 1.8% and Filipino 1.7%.

People — employment

Employment *People who reported being in the labour force, aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Worked full-time	2,012	61.3	715,287	57.0	6,623,065	57.7
Worked part-time	898	27.4	376,590	30.0	3,491,503	30.4
Away from work	140	4.3	65,859	5.2	569,276	5.0
Unemployed	232	7.1	97,966	7.8	787,452	6.9

There were 3,282 people who reported being in the labour force in the week before Census night in Wattle Grove (WA) (State Suburbs). Of these 61.3% were employed full time, 27.4% were employed part-time and 7.1% were unemployed.

The ABS Labour Force Survey provides the official estimates of Australia's unemployment rate. More information about Census and labour force status is provided in Understanding the Census and Census Data.

Employment - hours worked *Employed people aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
1-15 hours per week	339	11.1	138,263	11.9	1,218,823	11.4
16-24 hours per week	266	8.7	114,814	9.9	1,079,236	10.1
25-34 hours per week	292	9.6	123,517	10.7	1,193,445	11.2
35-39 hours per week	614	20.1	198,785	17.2	2,031,263	19.0
40 hours or more per week	1,399	45.8	516,501	44.6	4,591,801	43.0

Of employed people in Wattle Grove (WA) (State Suburbs), 11.1% worked 1 to 15 hours, 8.7% worked 16 to 24 hours and 45.8% worked 40 hours or more.

Occupation *Employed people aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Professionals	608	19.9	237,230	20.5	2,370,966	22.2
Technicians and Trades Workers	567	18.5	187,396	16.2	1,447,414	13.5
Clerical and Administrative Workers	493	16.1	150,408	13.0	1,449,681	13.6
Managers	306	10.0	139,350	12.0	1,390,047	13.0
Community and Personal Service Workers	298	9.7	122,889	10.6	1,157,003	10.8
Machinery Operators and Drivers	273	8.9	86,392	7.5	670,106	6.3
Sales Workers	244	8.0	102,337	8.8	1,000,955	9.4
Labourers	236	7.7	112,599	9.7	1,011,520	9.5

The most common occupations in Wattle Grove (WA) (State Suburbs) included Professionals 19.9%, Technicians and Trades Workers 18.5%, Clerical and Administrative Workers 16.1%, Managers 10.0%, and Community and Personal Service Workers 9.7%.

Industry of employment, top responses *Employed people aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Hospitals (except Psychiatric Hospitals)	142	4.8	41,706	3.6	411,808	3.9
Iron Ore Mining	89	3.0	28,510	2.5	33,163	0.3
Road Freight Transport	75	2.5	15,673	1.4	129,528	1.2
Aged Care Residential Services	73	2.5	21,177	1.8	211,621	2.0
Cafes and Restaurants	67	2.3	26,557	2.3	253,385	2.4

Of the employed people in Wattle Grove (WA) (State Suburbs), 4.8% worked in Hospitals (except Psychiatric Hospitals). Other major industries of employment included Iron Ore Mining 3.0%, Road Freight Transport 2.5%, Aged Care Residential Services 2.5% and Cafes and Restaurants 2.3%.

Median weekly incomes *People aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Personal	876	--	724	--	662	--
Family	2,180	--	1,910	--	1,734	--
Household	2,145	--	1,595	--	1,438	--

The median weekly personal income for people aged 15 years and over in Wattle Grove (WA) (State Suburbs) was $876.

Travel to work, top responses *Employed people aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Car, as driver	2,148	70.5	733,030	63.3	6,574,571	61.5
Car, as passenger	141	4.6	56,173	4.9	489,922	4.6
Worked at home	106	3.5	49,354	4.3	503,582	4.7
Bus	94	3.1	44,742	3.9	323,201	3.0
Other	34	1.1	15,822	1.4	73,512	0.7
People who travelled to work by public transport	212	6.9	106,764	9.2	1,225,668	11.5
People who travelled to work by car as driver or passenger	2,370	77.7	815,077	70.4	7,305,271	68.4

In Wattle Grove (WA) (State Suburbs), on the day of the Census, the most common methods of travel to work for employed people were: Car, as driver 70.5%, Car, as passenger 4.6% and Worked at home 3.5%. Other common responses were Bus 3.1% and Other 1.1%. On the day, 6.9% of employed people used public transport (train, bus, ferry, tram/light rail) as at least one of their methods of travel to work and 77.7% used car (either as driver or as passenger).

Unpaid work *People aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Did unpaid domestic work (last week)	3,270	74.5	1,387,280	69.4	13,143,914	69.0
Cared for child/children (last two weeks)	1,744	39.8	568,406	28.5	5,259,400	27.6
Provided unpaid assistance to a person with a disability (last two weeks)	448	10.2	196,328	9.8	2,145,203	11.3
Did voluntary work through an organisation or group (last 12 months)	820	18.7	379,578	19.0	3,620,726	19.0

In Wattle Grove (WA) (State Suburbs), of people aged 15 years and over, 74.5% did unpaid domestic work in the week before the Census. During the two weeks before the Census, 39.8% provided care for children and 10.2% assisted family members or others due to a disability, long term illness or problems related to old age. In the year before the Census, 18.7% of people did voluntary work through an organisation or a group.

Unpaid domestic work, number of hours *People aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Less than 5 hours per week	1,026	23.4	447,726	22.4	4,298,593	22.6
5 to 14 hours per week	1,238	28.2	521,733	26.1	4,944,578	26.0
15 to 29 hours per week	516	11.7	228,248	11.4	2,189,776	11.5
30 hours or more per week	491	11.2	189,571	9.5	1,710,970	9.0

Of people who did unpaid domestic work in the week before the Census in Wattle Grove (WA) (State Suburbs), 28.2% worked 5 to 14 hours, 11.7% worked 15 to 29 hours and 11.2% worked 30 hours or more.

Families — family composition

Family composition	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Couple family without children	440	27.2	247,841	38.5	2,291,987	37.8
Couple family with children	981	60.7	292,133	45.3	2,716,224	44.7
One parent family	175	10.8	93,344	14.5	959,543	15.8
Other family	20	1.2	10,869	1.7	102,559	1.7

Of the families in Wattle Grove (WA) (State Suburbs), 60.7% were couple families with children, 27.2% were couple families without children and 10.8% were one parent families.

Single (or lone) parents *Proportion of the total single (or lone) parent population*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Male	--	18.7	--	18.3	--	18.2
Female	--	81.3	--	81.7	--	81.8

In Wattle Grove (WA) (State Suburbs), 18.7% of single parents were male and 81.3% were female.

Families — employment status of couple families

Employment status of parents in couple families *Labour force, parents or partners aged 15 years and over*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Both employed, worked full-time	362	25.5	106,951	19.8	1,084,006	21.6
Both employed, worked part-time	44	3.1	22,177	4.1	203,596	4.1
One employed full-time, one part-time	381	26.8	119,913	22.2	1,086,460	21.7
One employed full-time, other not working	262	18.4	88,558	16.4	749,886	15.0
One employed part-time, other not working	50	3.5	31,917	5.9	302,037	6.0

Both not working	122	8.6	93,686	17.4	1,006,697	20.1
Other (includes away from work)	83	5.8	29,973	5.6	264,145	5.3
Labour force status not stated (by one or both parents in a couple family)	117	8.2	46,793	8.7	311,381	6.2

In Wattle Grove (WA) (State Suburbs), of couple families with children, 25.5% had both partners employed full-time, 3.1% had both employed part-time and 26.8% had one employed full-time and the other part-time.

The ABS Labour Force Survey provides the official estimates of Australia's unemployment rate. More information about Census and labour force status is provided in Understanding the Census and Census Data.

Dwellings — dwelling structure

Dwelling tables exclude visitor only and other non-classifiable households

Dwelling count	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Occupied private dwellings	1,793	94.2	866,767	86.7	8,286,073	88.8
Unoccupied private dwellings	111	5.8	132,874	13.3	1,039,874	11.2

In Wattle Grove (WA) (State Suburbs), 94.2% of private dwellings were occupied and 5.8% were unoccupied.

Dwelling structure *Occupied private dwellings*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Separate house	1,769	98.7	685,824	79.1	6,041,788	72.9
Semi-detached, row or terrace house, townhouse etc	12	0.7	122,562	14.1	1,055,016	12.7
Flat or apartment	0	0.0	49,086	5.7	1,087,434	13.1
Other dwelling	3	0.2	6,314	0.7	64,425	0.8

Of occupied private dwellings in Wattle Grove (WA) (State Suburbs), 98.7% were separate houses, 0.7% were semi-detached, row or terrace houses, townhouses etc, 0.0% were flat or apartments and 0.2% were other dwellings.

Number of bedrooms *Occupied private dwellings*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
None (includes bedsitters)	0	0.0	2,452	0.3	39,769	0.5
1 bedroom	7	0.4	30,043	3.5	411,252	5.0
2 bedrooms	22	1.2	107,035	12.3	1,562,759	18.9
3 bedrooms	328	18.3	327,662	37.8	3,403,190	41.1
4 or more bedrooms	1,414	78.9	381,319	44.0	2,670,758	32.2
Number of bedrooms not stated	21	1.2	18,272	2.1	198,351	2.4
Average number of bedrooms per dwelling	3.9	--	3.3	--	3.1	--
Average number of people per household	3.2	--	2.6	--	2.6	--

In Wattle Grove (WA) (State Suburbs), of occupied private dwellings 0.4% had 1 bedroom, 1.2% had 2 bedrooms and 18.3% had 3 bedrooms. The average number of bedrooms per occupied private dwelling was 3.9. The average household size was 3.2 people.

Tenure *Occupied private dwellings*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Owned outright	314	17.5	247,050	28.5	2,565,695	31.0
Owned with a mortgage	1,178	65.6	344,014	39.7	2,855,222	34.5
Rented	271	15.1	245,705	28.3	2,561,302	30.9
Other tenure type	4	0.2	9,181	1.1	78,994	1.0
Tenure type not stated	29	1.6	20,823	2.4	224,869	2.7

Of occupied private dwellings in Wattle Grove (WA) (State Suburbs), 17.5% were owned outright, 65.6% were owned with a mortgage and 15.1% were rented.

Dwellings — household composition

Household composition	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Family households	1,548	86.7	629,882	72.7	5,907,625	71.3
Single (or lone) person households	197	11.0	204,202	23.6	2,023,542	24.4
Group households	41	2.3	32,692	3.8	354,917	4.3

In Wattle Grove (WA) (State Suburbs), of all households, 86.7% were family households, 11.0% were single person households and 2.3% were group households.

Household income	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Less than $650 gross weekly income	--	7.4	--	18.3	--	20.0
More than $3000 gross weekly income	--	24.2	--	19.2	--	16.4

In Wattle Grove (WA) (State Suburbs), 7.4% of households had a weekly household income of less than $650 and 24.2% of households had a weekly income of more than $3000.

Dwellings — mortgage & rent

Proportions are calculated using all tenure types for occupied private dwellings. This excludes visitor only and other non-classifiable households.

Rent weekly payments	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Median rent	450	--	347	--	335	--
Households where rent payments are less than 30% of household income	--	95.7	--	90.3	--	88.5
Households with rent payments greater than or equal to 30% of household income	--	4.3	--	9.7	--	11.5

The number of households where rent payments were 30% or more of an imputed income measure are expressed in this table as a proportion of the total number of households in an area (including those households which were not renting, and excluding the small proportion of visitor-only and other non-classifiable households). The nature of the income imputation means that the reported proportion may significantly overstate the true proportion.

Mortgage monthly repayments	Wattle Grove (WA)	%	Western Australia	%	Australia	%

Median mortgage repayments	2,167	--	1,993	--	1,755	--
Households where mortgage repayments are less than 30% of household income	--	83.2	--	91.4	--	92.8
Households with mortgage repayments greater than or equal to 30% of household income	--	16.8	--	8.6	--	7.2

The number of households where mortgage repayments were 30% or more of an imputed income measure are expressed in this table as a proportion of the total number of households in an area (including those households which were renting, and excluding the small proportion of visitor only and other non-classifiable households). The nature of the income imputation means that the reported proportion may significantly overstate the true proportion.

Dwellings — number of motor vehicles

Number of registered motor vehicles	Wattle Grove (WA)	%	Western Australia	%	Australia	%
None	16	0.9	42,620	4.9	623,829	7.5
1 motor vehicle	349	19.5	274,198	31.6	2,881,485	34.8
2 motor vehicles	863	48.2	337,355	38.9	2,999,184	36.2
3 or more vehicles	530	29.6	186,678	21.5	1,496,382	18.1
Number of motor vehicles not stated	31	1.7	25,934	3.0	285,197	3.4

In Wattle Grove (WA) (State Suburbs), 19.5% of occupied private dwellings had one registered motor vehicle garaged or parked at their address, 48.2% had two registered motor vehicles and 29.6% had three or more registered motor vehicles.

Dwellings — internet connection

Dwelling internet connection	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Internet not accessed from dwelling	79	4.4	108,489	12.5	1,172,415	14.1
Internet accessed from dwelling	1,690	94.1	737,659	85.1	6,892,165	83.2
Not stated	27	1.5	20,625	2.4	221,494	2.7

In Wattle Grove (WA) (State Suburbs), 94.1% of households had at least one person access the internet from the dwelling. This could have been through a desktop/laptop computer, mobile or smart phone, tablet, music or video player, gaming console, smart TV or any other device.

People characteristics - Aboriginal and/or Torres Strait Islander peoples

People characteristics *Count based on place of usual residence on Census night.*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Male	31	37.8	38,027	50.0	322,171	49.6
Female	51	62.2	37,959	50.0	326,996	50.4
Median age	21	--	23	--	23	--

In Wattle Grove (WA) (State Suburbs), 37.8% of Aboriginal and/or Torres Strait Islander people were male and 62.2% were female. The median age was 21 years.

Dwelling characteristics - Aboriginal and/or Torres Strait Islander households

Dwelling tables exclude visitor only and other non-classifiable households

Dwelling characteristics *Occupied private dwellings where at least one person was Aboriginal and/or Torres Strait Islander*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Average number of people per household	3.7	--	3.3	--	3.2	--
Average number of persons per bedroom	0.9	--	1	--	1	--
Median weekly household income	1,812	--	1,210	--	1,203	--

There has been change in methodology used to calculate the average number of persons per bedroom. To compare the time series for average number of persons per bedroom please refer to Understanding the Census and Census Data

In Wattle Grove (WA) (State Suburbs), for dwellings occupied by Aboriginal and/or Torres Strait Islander people, the average household size was 3.7 persons, with 0.9 persons per bedroom. The median household income was $1,812.

Mortgage and rent *Occupied private dwellings where at least one person was Aboriginal and/or Torres Strait Islander*	Wattle Grove (WA)	%	Western Australia	%	Australia	%
Median weekly rent	465	--	216	--	250	--
Median monthly mortgage repayments	2,383	--	1,830	--	1,660	--

In Wattle Grove (WA) (State Suburbs), for dwellings occupied by Aboriginal and/or Torres Strait Islander people, the median weekly rent was $465 and the median monthly mortgage repayment was $2,383.

LATEST ISSUE Released at 11:30 AM (AEST) 23/10/2017

Small random adjustments have been made to all cell values to protect the confidentiality of data. These adjustments may cause the sum of rows or columns to differ by small amounts from the table totals. For further information, go to the User Guide for QuickStats.

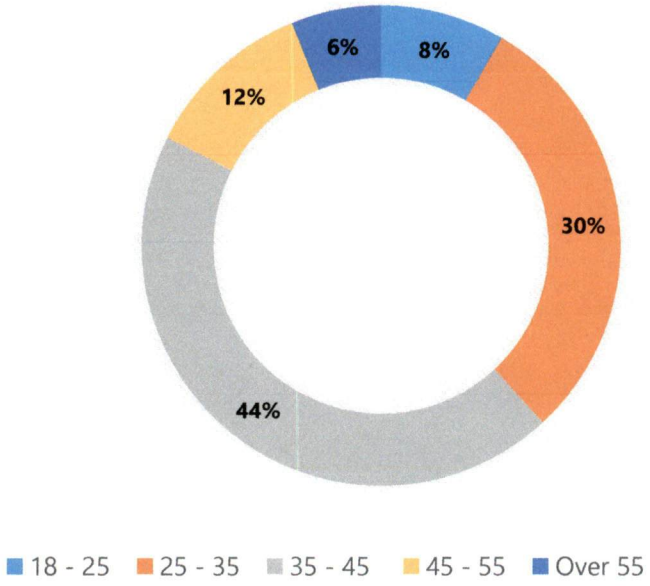
Data reported for Australia and Other Territories now includes Norfolk Island, following an amendment to the *Acts Interpretation Act, 1901*. Because Norfolk Island has not previously been included in the Census, any 2011 benchmarks will not include Norfolk Island.

The information contained in this QuickStat has been produced by the Australian Bureau of Statistics | It contains data from the 2016 Census of Population & Housing held on 9 August 2016 | Release date of this QuickStat was 23 October 2017 | Some values may have been adjusted to avoid release of confidential data | These adjustments may have a significant impact on the calculated percentages in QuickStats | For more information refer to Introduced Random Error in the 2016 Census Dictionary. For further enquiries contact the ABS National Information and Referral Service on 1300 135 070 | www.abs.gov.au/census

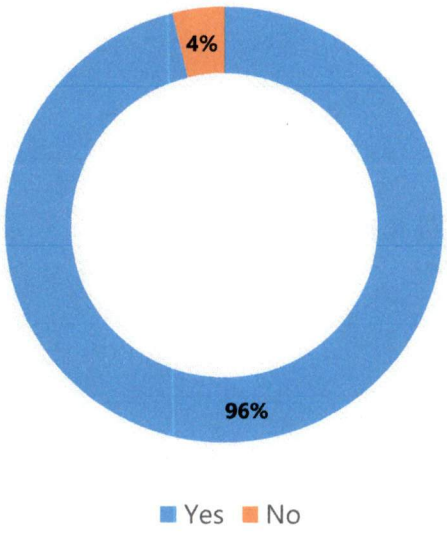
This page last updated 12 January 2017

Luxe Tapas and Sports Bar – Surveyed 130 people in the Wattle Grove area
01/11/2017

What age group do you fit into?

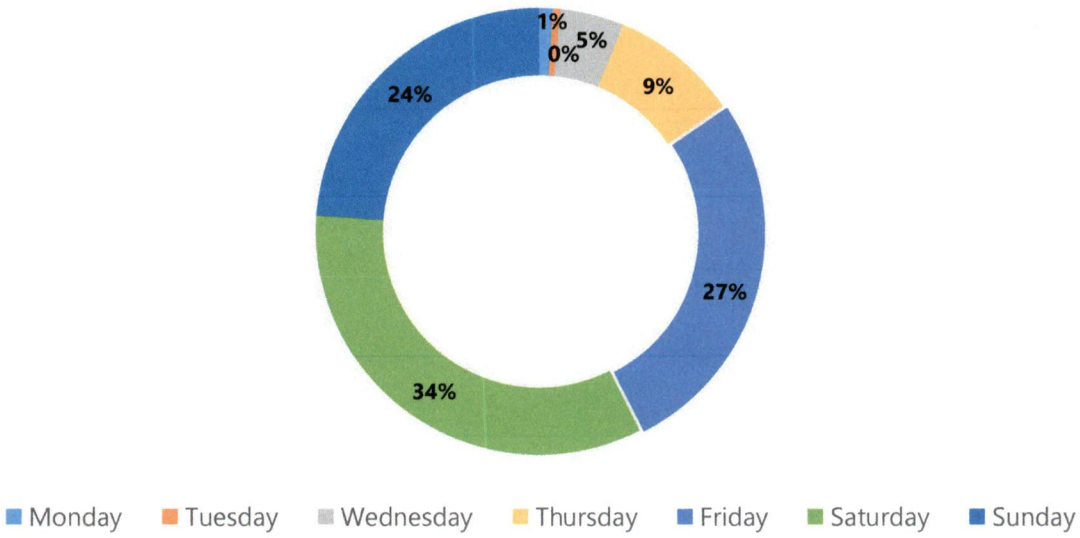


Would you like to have a Sports Bar/ Tapas Resturant in the area?

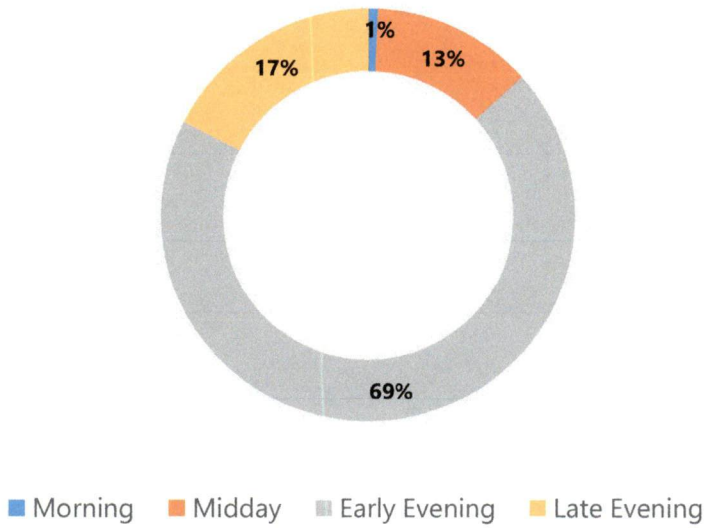


Luxe Tapas and Sports Bar – Surveyed 130 people in the Wattle Grove area
01/11/2017

What days would you be more likely to go to a Sports Bar/ Tapas Restaurant?

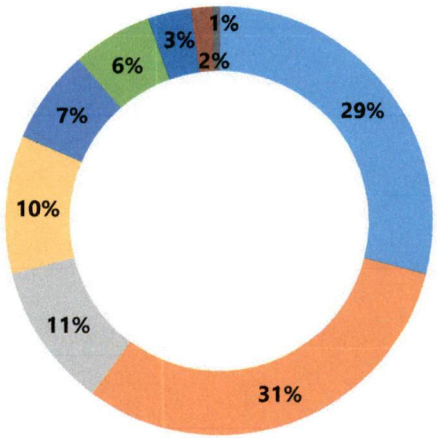


What time of day would you be more inclined to go to a Sports Bar/ Tapas Restaurant?



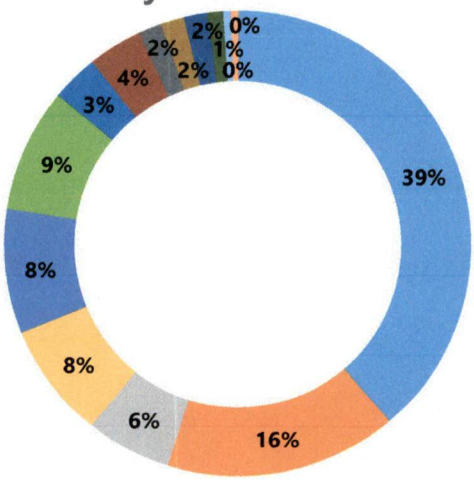
Luxe Tapas and Sports Bar – Surveyed 130 people in the Wattle Grove area
01/11/2017

What do you think is important in a Sports Bar/ Tapas Restaurant?

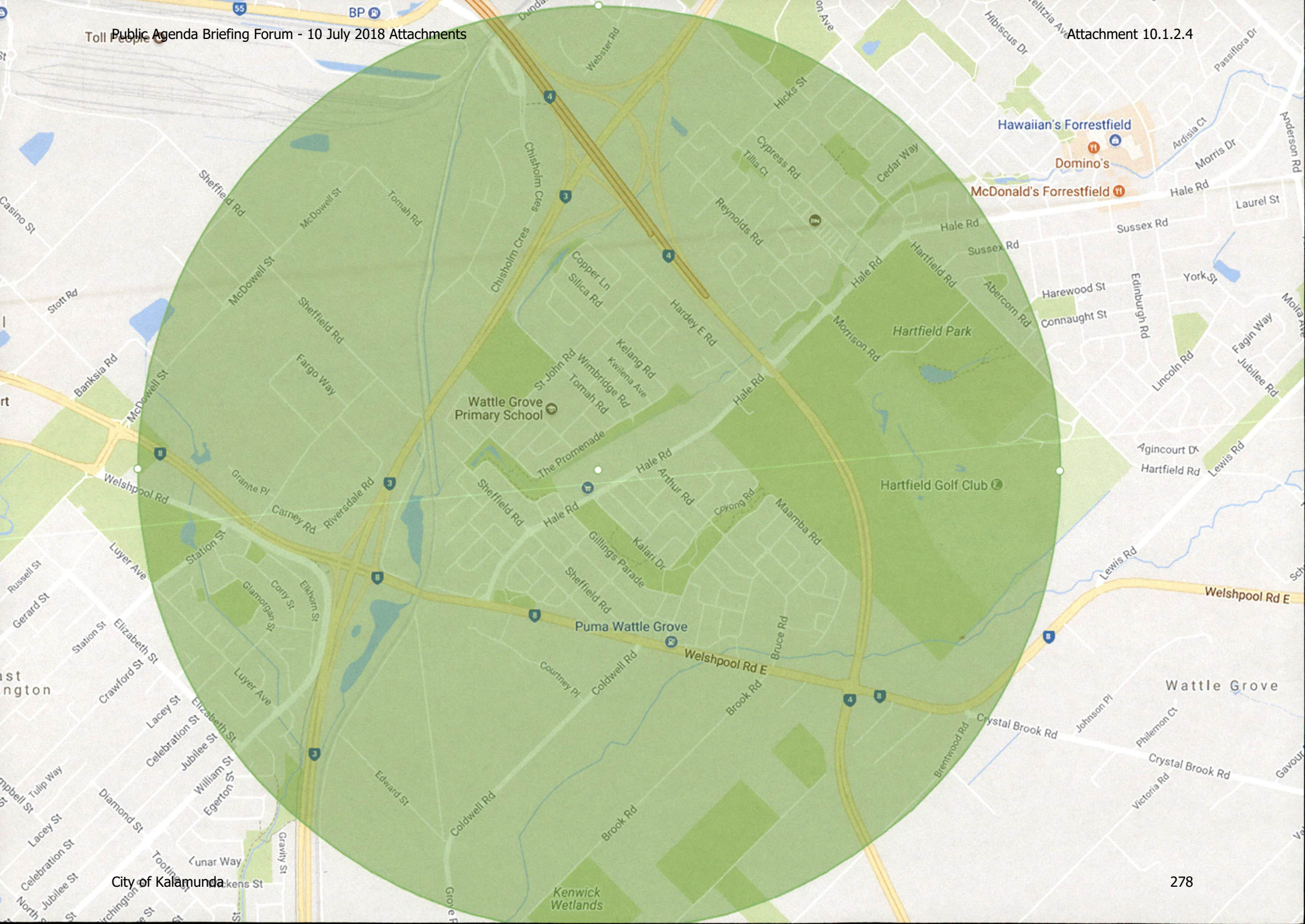


- Atmosphere
- Variety of Food
- Variety of Drinks
- Sports on TV
- Live Entertainment
- Family Friendly
- Affordable
- Prompt Service
- Quality of Food

What sports would you like to see on the TV's?



- AFL
- Motorsport
- NBL
- Boxing
- Soccer
- NRL
- Cricket
- NBA
- Gridiron
- UFC
- Main Event Shows
- NHL (Ice Hockey)
- TAB (Betting)
- Hockey


Toll Peopie
BP
Webster Rd
Hicks St
Hawaiian's Forrestfield
Domino's
McDonald's Forrestfield
Hibiscus Dr
Passiflora Dr
Ardisia Ct
Morris Dr
Anderson Rd
Hale Rd
Laurel St
Sussex Rd
York St
Harewood St
Connaught St
Edinburgh Rd
Abercorn Rd
Hartfield Rd
Fagin Way
Jubilee Rd
Lincoln Rd
Lewis Rd
Agincourt Dr
Hartfield Park
Hartfield Golf Club
Morrison Rd
Cypress Rd
Tillia Ct
Cedar Way
Reynolds Rd
Chisholm Cres
Sheffield Rd
McDowell St
Tomah Rd
Copper Ln
Silica Rd
Hardey E Rd
Kelang Rd
Kwilena Ave
Wimbridge Rd
St John Rd
Wattle Grove Primary School
The Promenade
Arthur Rd
Ceyong Rd
Maamba Rd
Gillings Parade
Kalari Dr
Fargo Way
Banksia Rd
Stott Rd
Casino St
Granite Pl
Carney Rd
Riversdale Rd
Welshpool Rd
Station St
Luyer Ave
Russell St
Gerard St
Glamorgan St
Corry St
Elkhorn St
Elizabeth St
Crawford St
Lacey St
Celebration St
Jubilee St
William St
Egerton St
Diamond St
Tulip Way
Campbell St
Tootal Rd
Lunar Way
Gravity St
Edward St
Coldwell Rd
Courtney Pl
Brook Rd
Bruce Rd
Welshpool Rd E
Puma Wattle Grove
Wattle Grove
Crystal Brook Rd
Johnson Pl
Philemon Ct
Victoria Rd
Brentwood Rd
Kenwick Wetlands

Drainage
Asset Management Plan

city of kalamunda

Document Control					
Document ID: Asset Management Plan – Drainage 2018					
Rev No	**Date**	**Revision Details**	**Author**	**Reviewer**	**Approver**
1.0	*07/04/2018*	*Draft 0*	*LK*	*CF*	
1.1	*14/04/2018*	*Draft 1*	*LK*	*DB (DAS) & DB (MAPM)*	
1.2	*11/06/2018*	*Submitted for endorsement*	*LK*	*DB (DAS) & DB (MAPM)*	

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1. EXECUTIVE SUMMARY

1.1 Current Services and Costs

The City of Kalamunda (the City) has an extensive network of drainage assets for the safe collection, conveyance and discharge of stormwater. These drainage assets are reported in the following three categories:

- Drain - an underground pipe, culvert or lined open channel carrying stormwater,
- Pit - an inlet, outlet or a manhole where two or more pipes meet (junction pits), and
- Basin - a constructed or improved land area used to detain and / or retain stormwater.

The quantity, cost, value, condition and age details of these drainage assets are summarised in Table 1:

Table 1: Drainage asset summary

Drainage Asset Category	Quantity	Total Replacement Cost $,000 (as at 30/06/17)	Written Down Value $,000 (as at 30/06/17)	Expected Condition (1 – Excellent, 5 – Very Poor)	Average Age (years)
Drains	220 km	69,615	13,238	1.9	22
Pits	15,708 pits	13,999	3,026	2.5	31
Basins	195,817 m^2 (86 basins)	3,975	993	1.7	20
All Categories		**87,589**	**17,257**	**2.0**	**24**

Note: Only 56% of the total Drains asset data has been collected to date. The above Total Replacement Cost for Drains includes a management value for the 44% of Drain assets not yet collected.

Funds currently allocated for new, renewal and maintenance of all drainage assets in the 2018 – 2028 Long Term Financial Plan (LTFP) are summarised in Table 2:

Table 2: Current funding for drainage assets 2018 – 2028

New ($,000)	Renewals ($,000)	Maintenance ($,000)
4,699	**6,280**	**24,163**

In the City's 2016 Community Satisfaction Survey, 87% of respondents stated that they are satisfied with the service provided by the City's stormwater drainage assets.

The City also conducted a Community Assets Levels of Service survey in 2018 to understand the expectations of residents. Generally, three quarters of respondents agreed that the City's drainage assets are working to an acceptable level.

The City, in the past, has identified specific drainage issues in several areas through engineering flood studies and customer requests for works. These issues are being managed through increased maintenance activities, asset upgrades and the installation of new assets.

1.2 Future Challenges

The key challenges in the future for the City in providing and maintaining drainage assets in order to maintain current levels of service include:

- Providing adequate and sustainable assets for incremental development and subdivision works, mainly in the foothills suburbs.
- Maintaining, replacing and upgrading of older drainage assets, mainly in hills suburbs.
- Provide adequate resilience and capacity for weather patterns and events arising from climate change.

1.3 Recommendations

The financial predictive modelling for the renewal of drainage assets using current asset data and maintaining current average condition indicates that an additional average renewal funding of $265,200 per annum will be needed over the next 10 years.

Based on the confidence level of current data, it is considered premature to request additional renewal funding at this stage and that funding for drainage assets renewals be maintained at current levels.

The following key tasks are recommended to improve the City's Drainage Asset Management:

- Development of a City wide Stormwater Management Plan (SMP) to identify actions for better management of stormwater and to estimate current and future drainage infrastructure needs.
- Completion of the Drains asset register by collecting and mapping of all individual underground pipes and open channels and to conduct visual assessment to determine the asset condition rating.
- Develop a Stormwater Maintenance Management Plan (SMMP) incorporating asset criticality and risk.

2. INTRODUCTION

2.1 Background

The City has an Asset Management Policy that requires the creation of Asset Management Plans for each asset class. This Asset Management Plan (AMP) for the drainage asset class is the first major review from the original plan written in 2013.

The City is responsible for managing, operating and maintaining the infrastructure asset classes for roads, pathways, drainage, parks, plant and equipment and buildings.

Asset Management Plans are developed for each asset class for the following purposes:

- Sustainable management of assets for the community,
- Provide input into the Long Term Financial Plan,
- Document existing practices and identify opportunities for improvement,
- Meet legislative and reporting requirements,
- Support business cases and funding applications, and
- Support community and organisational needs.

This document is to be read in conjunction with the following City documents:

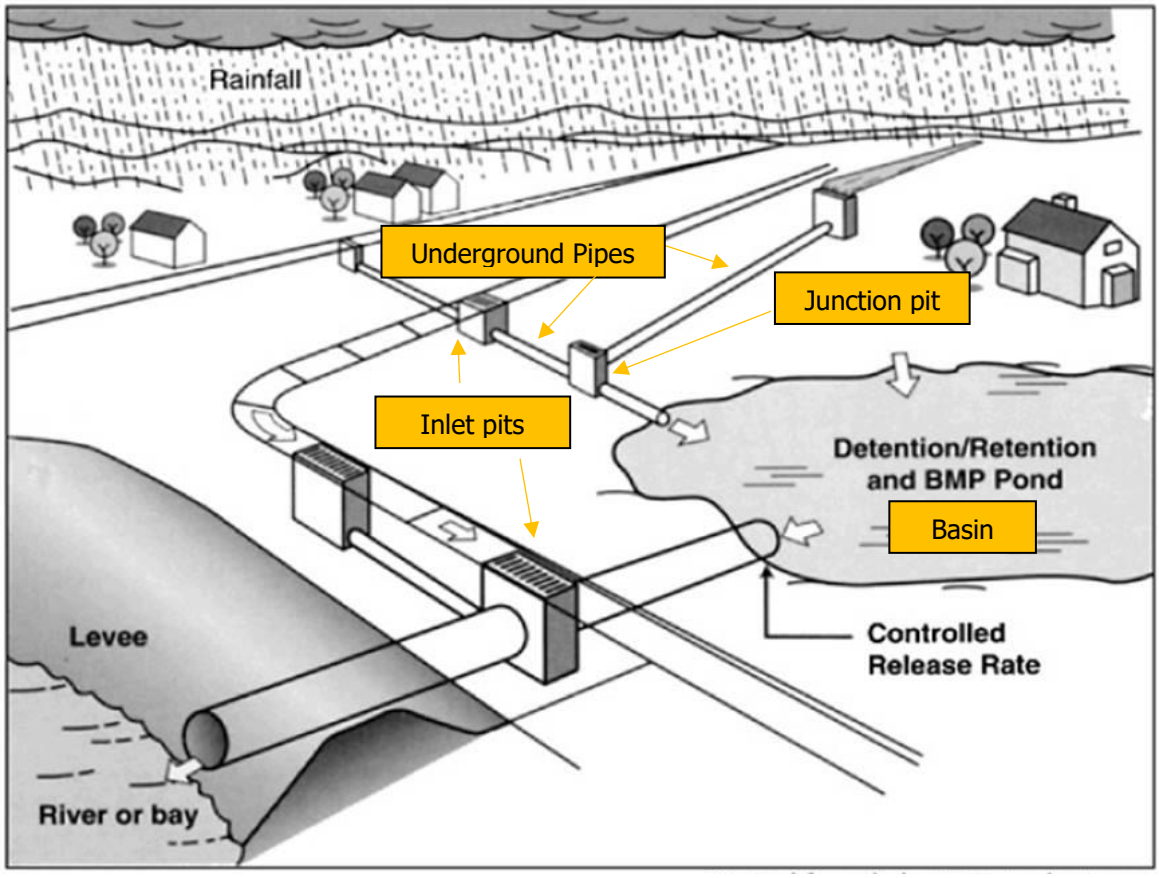
- Asset Management Council Policy (Policy C-ASS01)
- Asset Management Strategy 2017 - 2021
- Strategic Community Plan 2017 - 2027 – "Kalamunda Advancing"
- Long Term Financial Plan to 2023 – "Kalamunda Accountable"
- Corporate Business Plan 2017 -2021 - "Kalamunda Achieving"
- Community Engagement Strategy 2017 – "Kalamunda Engages"
- 2016 Community Scorecard
- 2018 Asset Levels of Service Survey Community Engagement Results
- Stormwater Design Guidelines for Subdivisional and Property Development
- IPWEA, 2016. Local Government Guidelines for Subdivisional Development (Edition 2.3) – This document has been adopted by the City as its guideline for subdivisional developments.

A summary of the City's current Asset Management practices are detailed in Appendix F.

2.2 Typical Urban Stormwater Drainage System

A typical urban stormwater system is shown in Figure 1:

Figure 1: Typical urban stormwater system



Source: Adapted from Monash University

2.3 Scope

This Drainage AMP addresses assets constructed for the purpose of safe collection, conveyance and discharge of stormwater. The following drainage assets which are not a responsibility of the City are excluded from this AMP:

- Pits and pipes located within private properties
- Pits and pipes located within road reserves of private roads and Main Roads WA roads
- Open channels and drains that belong to the Water Corporation
- Headwalls and pipes for crossover access to private properties in rural areas.

The management and monitoring activities of natural waterways within the City are also excluded from this AMP. The City's responsibilities for some drainage easements within private properties for underground pipes and natural waterways may need clarification but do not impact on this AMP.

All constructed drainage assets are assigned into three groups and their related inventory and financial data is recorded within the City's corporate asset management system Assetic myData (Figure 2 and Table 3). Further details of each asset category can be found in Appendix A.

Figure 2: Categories within drainage assets

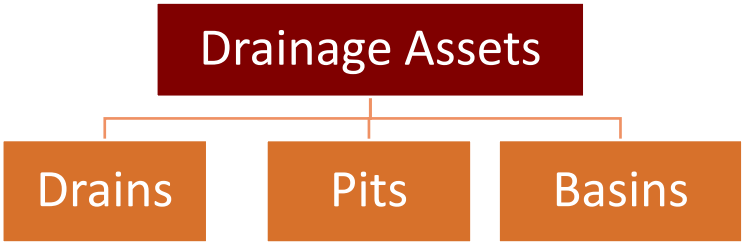


Table 3: Drainage asset category details

Asset Category (standard category name in Assetic myData)	Asset Details	Total Measure (as recorded at 31/03/2018)	Data collection status
Drains (Stormwater Drains)	Underground pipes, culverts and constructed open channels carrying stormwater.	220 km	56% collected to date
Pits (Stormwater Pits)	Pit asset portfolio is consist of stormwater inlets (e.g. side entry pits), locations where two or more pipes meet (junction pits) and stormwater outlets (e.g. head wall).	15,708 pits	Completed
Basins (Lagoons)	Basin assets are defined as constructed or improved (formed) land area used to detain and / or retain stormwater. It should be noted that any water or vegetation present within a basin is not a part of the basin infrastructure asset. Also the value of a basin does not include the value of the land.	195,817 m^2 (86 Basins)	Completed

2.4 Alignment to Strategic Planning

The Drainage AMP is aligned with the following objectives and strategies of the City's Kalamunda Advancing: Strategic Community Plan 2017 -2027 (Shire of Kalamunda (a), 2017) as adopted by the Council on 26th June 2017.

- Objective 1.2 - To provide safe and healthy environments for community to enjoy
  - Strategy 1.2.1 – Facilitate a safe community environment
- Objective 3.2 – To connect community to quality amenities
  - Strategy 3.2.1 – Optimal management of assets

2.5 Legislative Requirements

The City has to meet the requirements of various Federal and State legislation and regulations when constructing and maintaining infrastructure assets. The main legislation and regulations are detailed in Table 4:

Table 4: Legislation and regulations related to drainage asset management

Legislation	Requirement
Local Government Act, 1995 (WA)	The Act provides the principal legislative framework around which the roles, purpose, responsibilities and power of local government as set out. Under the Act, regulations set out a minimum requirement for all WA local governments to develop and maintain a Strategic Community Plan and Corporate Business Plan. This compels the local governments to establish long term service and asset strategies through robust asset management practices.
Local Government (Drainage Management) Amendment Act 2007	Establishes the Drainage Management Authority which facilitates and coordinates drainage management planning in councils.
Rights in Water and Irrigation Act 1914)	Provides the statutory basis for planning and allocation of water in WA. The objectives of the legislation include providing for the management, sustainable use and development of water resources to meet the needs of current and future users, and for the protection of their ecosystems and the environment in which water resources are situated.
Environment Protection Act 1986 (WA)	The Environmental Protection Act 1986 provides for the formation of the Environmental Protection Authority (EPA). It also provides for the prevention, control and abatement of pollution and environmental harm and for the conservation, preservation, protection, enhancement and management of the environment.
Planning and Development Act 2005	Provides an efficient system of land use planning and development in WA, which promotes sustainable use.
Occupational Safety & Health Act 1984 and Regulations 1996	The Occupational Health and Safety Act is concerned with protecting the safety, health and welfare of people engaged in work or employment.
Conservation and Land Management Act 1984	Regulations and requirements that the City must comply with in relating to the use of land and vegetation.
Health Act 1911	Discharging causing pollution to waterways.
Wildlife Conservation Act 1950	Provides for the conservation and protection of native flora and fauna.

Other Standards and Regulations	Other relevant legal requirements include, but are not limited to: • Local water management plans • Contaminated Sites Act 2003 and Regulations 2006 • Agricultural & Related Resources Protection Act 1976 • All other relevant State and Federal Acts & Regulations • All Local Laws and relevant policies of the organization

2.6 Asset Management Plan Framework

Key elements of this Drainage AMP are:

- Current Status of Assets – describes current condition and age profile of drainage assets.
- Levels of service – specifies the levels of service to be provided by drainage assets.
- Future demand – how this will impact on future service delivery.
- Life cycle management – summary on how the City manages its existing and future drainage assets to provide the required services.
- Financial summary – what funds are required to provide the required services.
- Asset management improvement plan – key recommendations to improve City's drainage asset management processes.

2.7 Data Confidence

A qualitative assessment of the City's overall confidence of the data used in this Drainage AMP is shown in Table 5.

Table 5: Data confidence levels of Drainage AMP

Data Set	Confidence Level (1- Certain - (5- Doubtful)	Comments
Asset age	3	Age of some assets has been assumed to be similar to the surrounding road pavement age
Asset condition	4	Condition is estimated based on asset age. Refer to Appendix B Condition Rating Methodology.
Asset inventory completeness (inclusion of all assets)	4	Inventory for Pits and Basins are completed. Underground pipe network 56% completed.
Asset inventory accuracy (dimensions, material, invert levels, depths etc.)	3	No separate assessment or verification carried out so far. Contains many estimated values
Replacement costs	3	As per the fair value valuation using industry standards
Useful lives	3	As per the fair value valuation using industry standards

3. CURRENT STATUS OF DRAINAGE ASSETS

3.1 Age Profile

The average estimated age of each drainage asset category based on City's asset register as at 31 May 2018 are summarised in Table 6:

Table 6: Average age of drainage asset categories

Asset Category	Average Age (years)
Drains	22
Pits	31
Basins	20
All Asset Categories	**24**

The age of individual drainage assets have been assumed to be of similar age to the surrounding road pavement age. As drainage assets are considered to be long life assets typically 80 years plus, any inaccuracy in the age data will have minimal impact on this Drainage AMP.

The age distribution of each drainage asset category by suburb is shown graphically in Figures 3, 4 and 5.

Figure 3: Age profile of drains

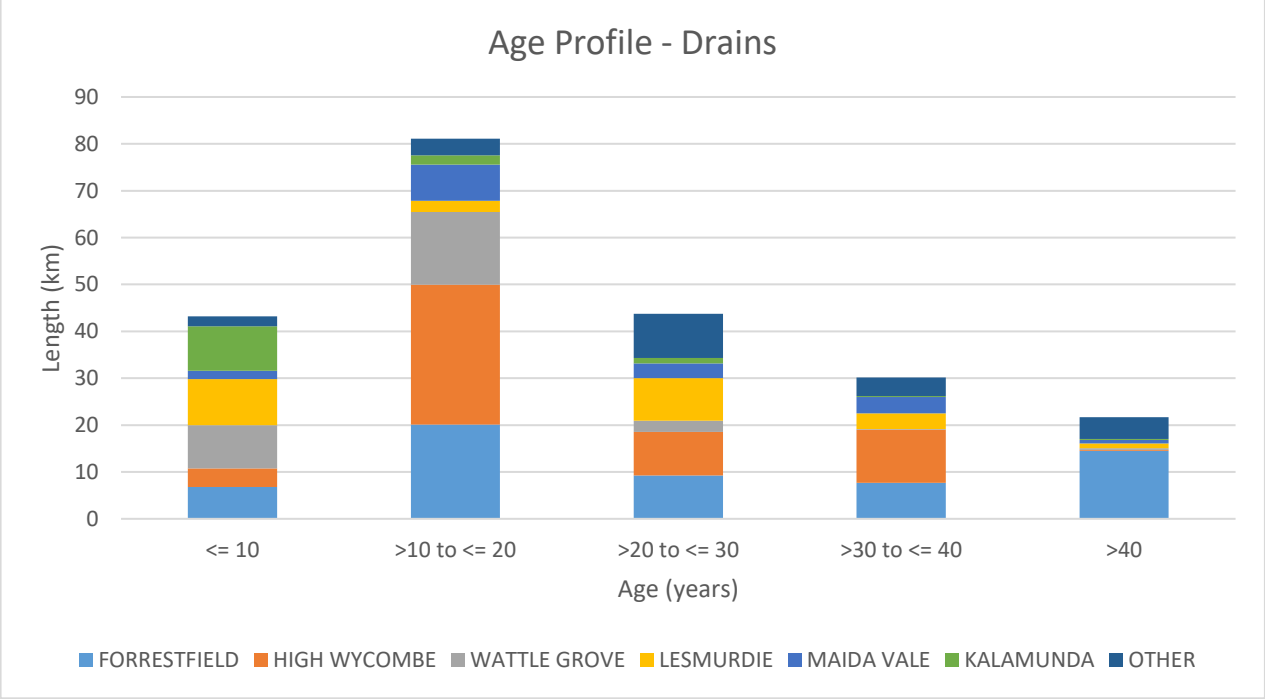


Figure 4: Age profile of pits

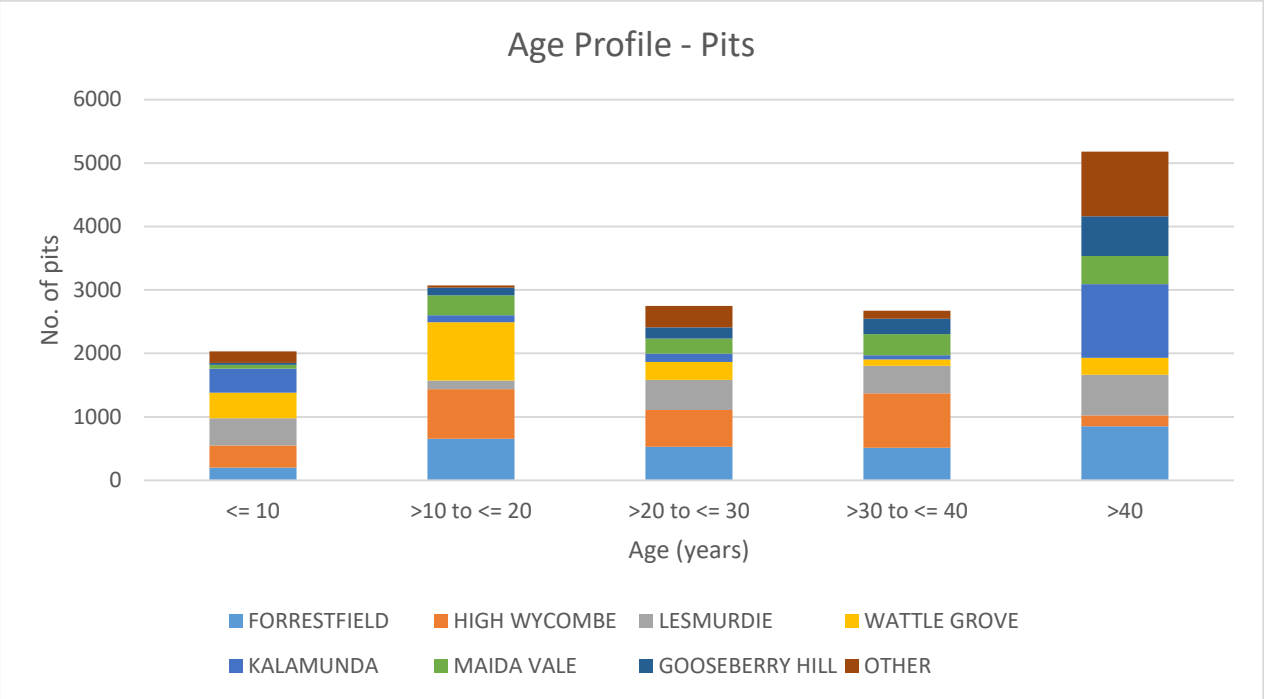
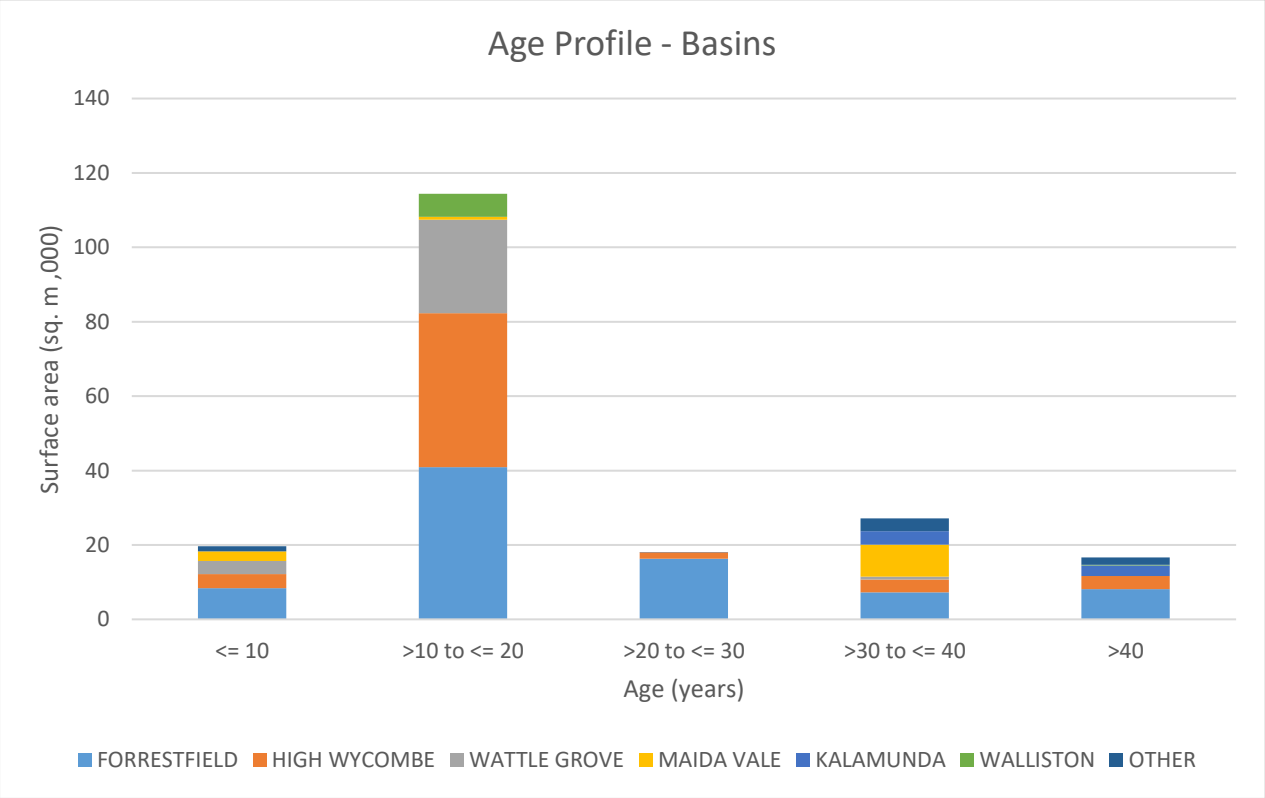


Figure 5: Age profile of Basins



The need for the additional basin capacity will be required within certain catchments due to an increase in impervious areas (e.g. roofs, paving, and roads) as a result of higher density residential and industrial development. This is evident in Figure 5 as the majority of the Basins have been constructed in the last 20 years within the densely populated suburbs of Forrestfield, High Wycombe and Wattle Grove.

3.2 Condition Profile

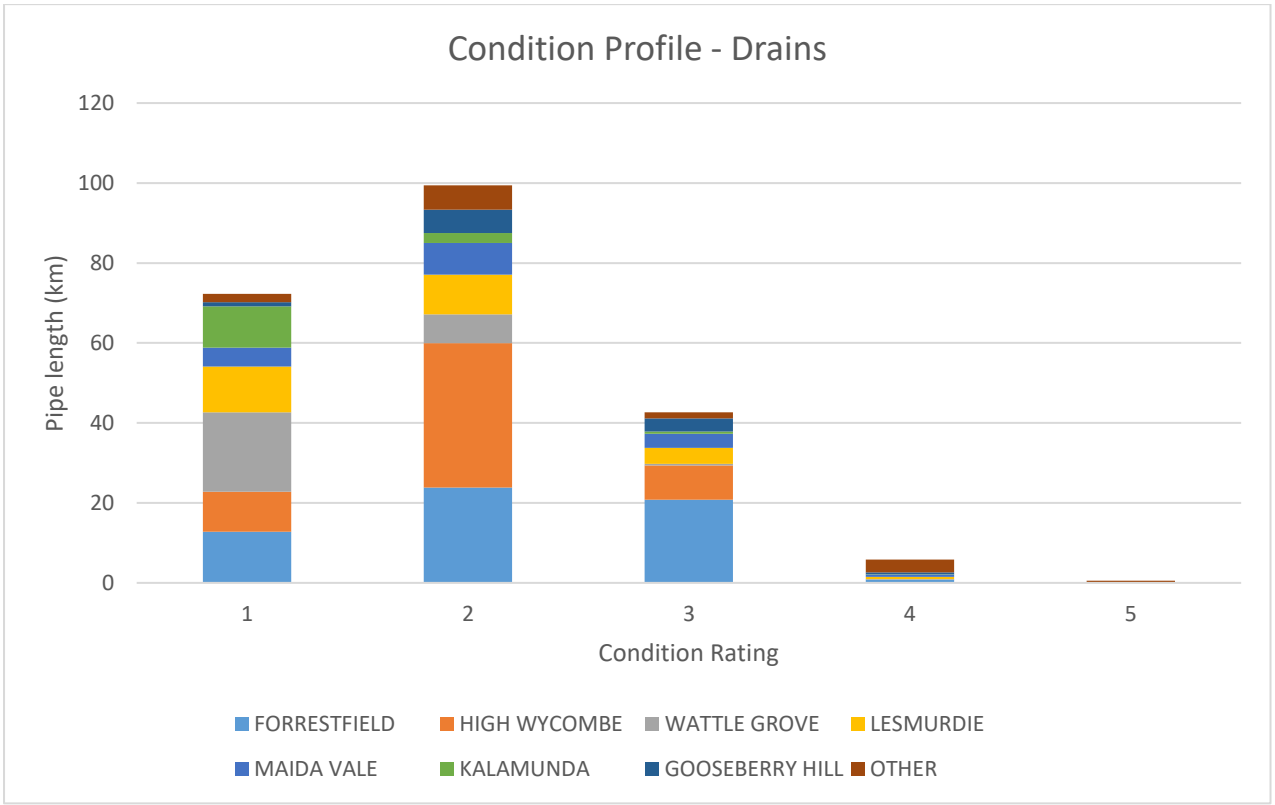
The condition of drainage assets has been estimated based on the age of the assets. The methodology of condition relative to age is detailed in Appendix B.

Table 7: Average estimated condition of drainage asset categories

Asset Category	Average Condition (1 – Excellent, 5 – Very Poor)
Drains	1.9
Pits	2.5
Basins	1.7
All Asset Categories	**2.0**

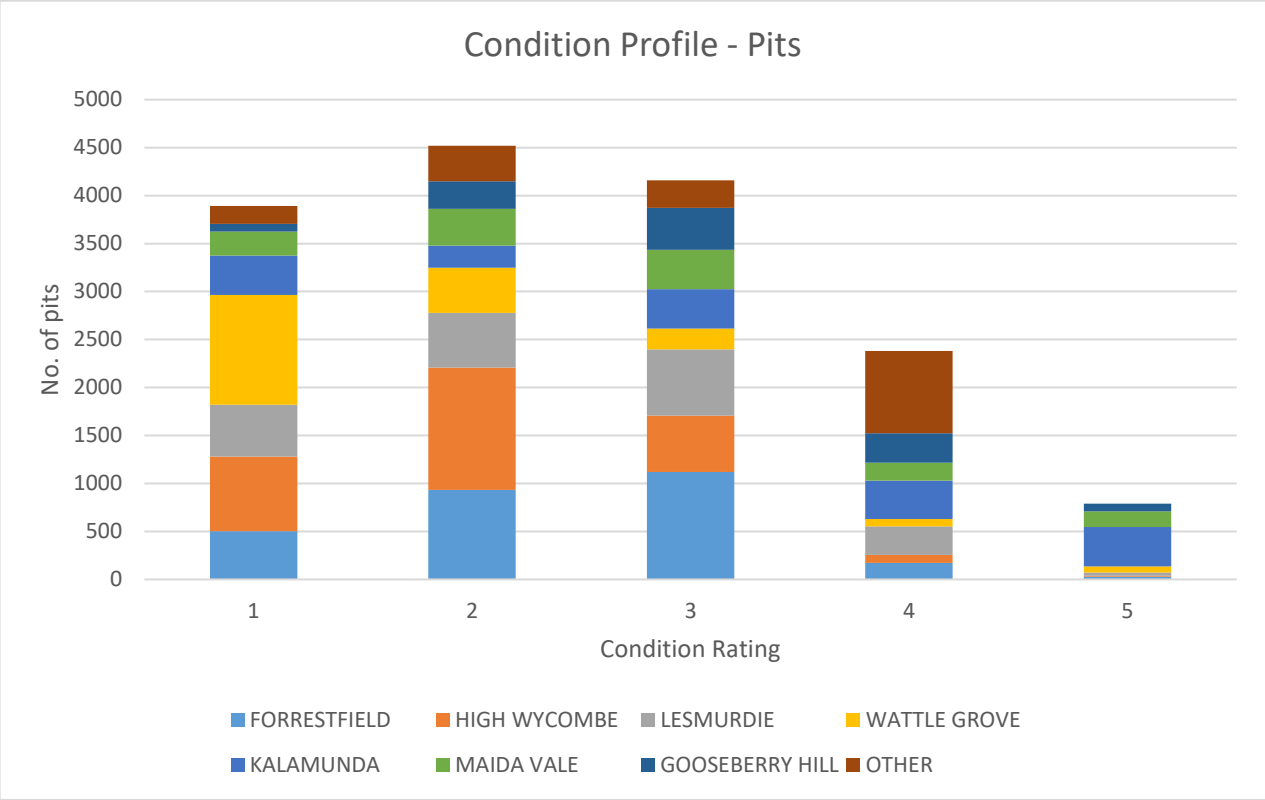
The derived condition profile of each asset category in the City by suburb are shown in Figures 6, 7 and 8.

Figure 6: Expected Condition profile of drains



Most Drain assets currently in the register are recorded as being constructed more recently and given their long useful life, their condition profile is mostly consistent with Condition 1 and 2 assets. Asset in Condition 2 are expected to have approximately 61% - 80% of its useful life remaining.

Figure 7: Expected condition profile of pits

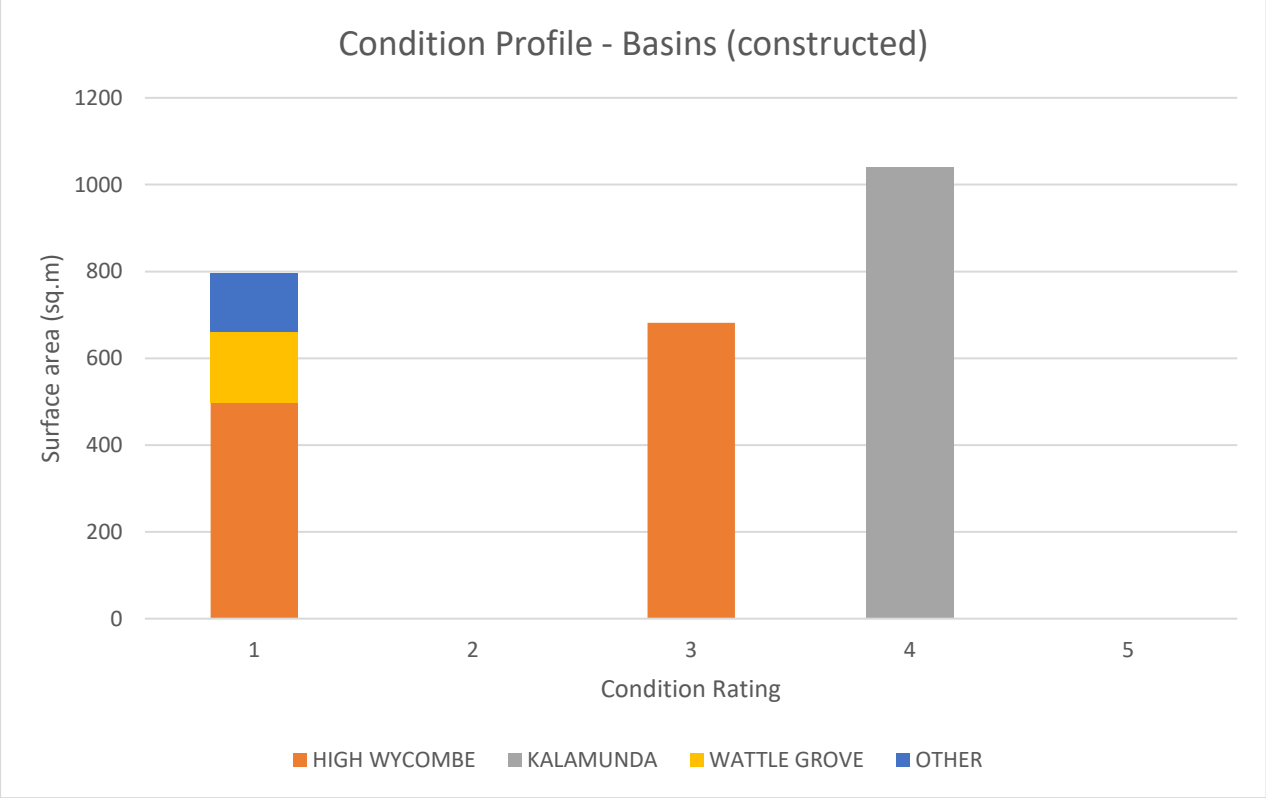


The condition profile of pits represents a reliable distribution of assets, where 15% and 5% of assets are expected to be in Condition 4 and 5 respectively. As the oldest urban area of the City, the suburb of Kalamunda is expected to have assets with the poorest condition.

One of the key recommendation of this AMP is to conduct condition assessment of a representative drainage asset sample. It is further recommended that to prioritize the condition assessment of assets with expected Condition Rating of 4 and 5 to verify the accuracy of this condition profile.

Large number of pit assets with expected conditions of 1 and 2 is a result of most assets being constructed in recent years with increased subdivision developments.

Figure 8: Expected condition profile of constructed Basins



98% of the Basins are constructed by improving the natural ground or by using clay (Refer to Basin Material graph in Appendix A). They are considered to have an indefinite useful life provided that routine maintenance work (e.g. vegetation control, debris removal) is carried out in a timely manner. Therefore, as per the condition matrix (Appendix B), a single condition rating cannot be determined for those Basins. Only 10 individual Basins shown in Figure 8 above are constructed using engineering materials (either polyethylene resin, limestone blocks or concrete). The basin in Condition 4 is the concrete lined basin within Stirk Park and is listed in the LTFP for upgrading in 2018/19.

3.3 Conclusions and Recommendations

The key recommendation pertaining to this section of the AMP is to collect data and map all drains to complete the Drains asset register. Also it is recommended to conduct condition assessment of a representative sample of assets. Both these recommendations involves extensive works with a likely project duration of two years and a significant cost. The key tasks of this project are:

1. Review historical drainage records (e.g. subdivision plans), and convert into digital data formats and export in into Asset Management and Geographical Information System (GIS) systems.

2. Collection of pipe inventory data (e.g. material, diameter, invert levels etc.) Opening of pit lids involves significant manual handling effort and is time consuming due to the weight of each lid and working adjacent to or in traffic. There are currently 15,708 pits throughout the City's drainage network. The most safe and efficient method of delivery will need to be determine considering available in-house resources and / or funding for outsourcing.
3. Select a representative and statistically valid sample of drains and pits for condition assessment considering different attributes such as age, location, material, criticality (Section 6.1) etc. This task can be conducted together with task 2 above.

4. LEVELS OF SERVICE

The level of service is the outcome received by users of a particular service which provides the basis for all life cycle management activities. The International Infrastructure Management Manual (IPWEA, 2015) defines the level of service as "the parameters or combination of parameters that reflect social, political, economic and environmental outcomes that the organization delivers".

Community Levels of Service relate to how the community perceives the service in terms of safety, quality, quantity, reliability, responsiveness, cost / efficiency, accessibility and legislative compliance.

Supporting the Community Levels of Service are operational or technical measures of performance (Technical Levels of Service), which are developed to ensure that the minimum community levels of service are met. These technical measures relate to service criteria such as quality, availability and safety.

To deliver acceptable service standards for the drainage assets, the City needs to have a commitment to annual funding. These funds provide for the regular maintenance, upgrade and timely replacement or renewal of assets. The community is directly impacted if the assets are not maintained and renewed at the accepted service levels.

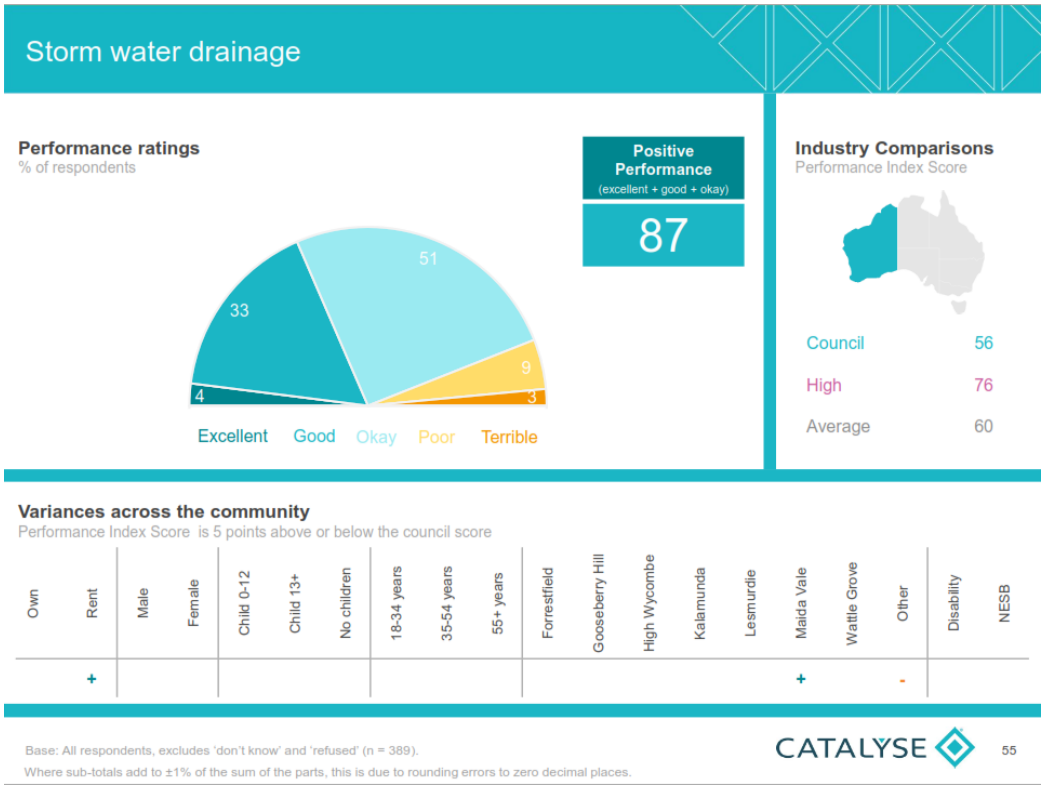
The following two sections detail the City's endeavours to gain an understanding of community's expectations of levels of service for drainage assets.

4.1 Community Scorecard 2016

In 2016, the City commissioned Catalyse Pvt Ltd. to conduct a community survey to evaluate community priorities and measure City's performance against key indicators in the Strategic Community Plan. The outcomes of this survey can be considered as an indicator for community satisfaction of current levels of service.

Figure 9 shows the summary of outcomes related to stormwater drainage (Catalyse Pty Ltd, May 2016). 87% of the respondents indicate a positive performance (excellent, good or okay) by the City in this category. However, the Performance Index Score is below that average for other Western Australian Councils, and the survey participants in non-built up areas have indicated a lower performance rating.

Figure 9: 2016 Community survey outcome summary for stormwater drainage



4.2 Asset Levels of Service Consultation Results

In 2018, the City conducted a community asset level of service consultation through hard copy, online questionnaire and community workshops. Details of the survey methodology and results can be found in the Appendix C.

Table 8 details the percentages of respondents agreeing and disagreeing to various statements related to the City's drainage assets.

Table 8: Drainage levels of service responses

Statement	% Agreed	% Disagreed	% Unsure/ no answer
Drainage pits, kerb and channels (on the side of the road) are working to an acceptable level	64	26	10
Stormwater drainage flows where it should (through drain pipes, and along waterways and creeks).	60	26	14
The amount of water running onto and through properties from storms is acceptable	58	18	24
The quality of the water in the drainage system is acceptable, for protecting the natural environment	46	8	46
Mosquitos are a problem where I live	44	50	6

Respondents were asked to allocate the City's budgets for maintenance, renewals, and upgrade of all major infrastructure asset classes (roads, footpaths, drainage, parks and buildings). In this question, drainage scored the lowest priority. Respondents suggested spending on average only 14.9% of the total budget for these asset classes on drainage.

It is also worth noting that despite the apparent concerns with drainage, no supporting comments or specific problem sites were provided on drainage.

More than a quarter of survey respondents disagreed that the City's drainage assets are working to an acceptable level and that stormwater flows where it should and about one fifth believed that the amount of water running onto and through properties from storms is unacceptable. The survey also provides insight that the community may be unaware of the water quality matters (ie: almost half of respondents were either unsure or did not provide an answer). Also, 44% of survey respondents indicated that mosquitoes are a problem for them.

4.3 Conclusions and Recommendations

Some of the Asset Level of Service consultation responses indicated the possible need for increased maintenance and asset upgrade works. To quantify these requirements and to propose suitable actions, this Drainage AMP recommends developing a Stormwater Management Plan (SMP) for the City. Details of a typical SMP can be found in Appendix E. The outcome of the SMP can be then used to develop technical levels of service for the next revision of the Drainage AMP.

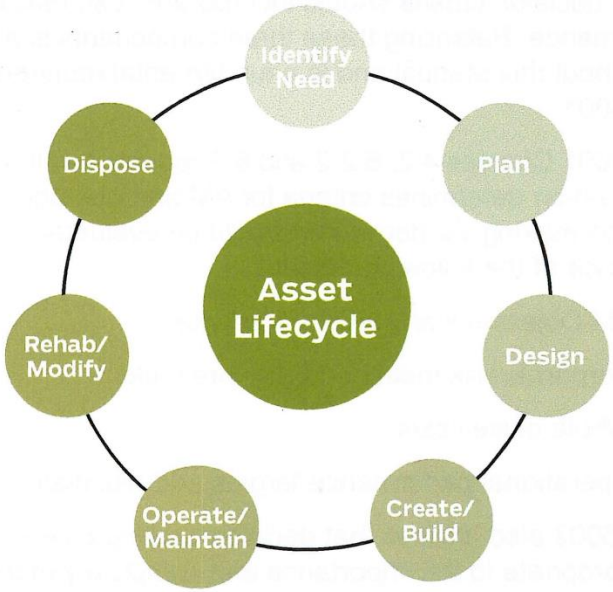
The initial consultation process is inconclusive in terms of understanding community's willingness to pay for increased level of service. Therefore, it is recommended to conduct a more detailed consultation for the next revision of this AMP. The consultation will include a detailed analysis to establish the relationship between various drainage service levels and associated costs. The consultation will also form part of the SMP, being developed through 2018 to 2020.

5. LIFE CYCLE MANAGEMENT

Drainage assets are either gifted by the developers in new subdivisions or built by the City to address specific Stormwater drainage system deficiencies. These assets are operated and maintained by the City throughout their useful life and their performance and condition are monitored to ensure that they deliver a satisfactory service to the community at an appropriate cost.

The ability to meet the defined levels of service is determined, in part, by how these assets are managed through their useful life. When assets do not perform as required, they are renewed, upgraded or disposed of. The recurrent maintenance works, the capital works of renewals and upgrades, and the one-off creations and disposal work form part of the activities required to provide a satisfactory level of service.

Figure 10: Asset Life Cycle (Source: IPWEA, 2015)



A summary of various activities undertaken during the life of drainage assets are detailed in the Table 9 below.

Table 9: Drainage asset life cycle activities

Creation/ Acquisition	Significant new drainage assets are generally gifted by private parties through subdivision developments. The standard that guides the creation of drainage assets in the City is the Local Government Guidelines for Subdivisional Development (IPWEA, 2016). The City's new Stormwater Design Guidelines for Subdivisional and Property Developments (City of Kalamunda, 2018) for residential, commercial, and industrial developments will manage the asset creation process for infill land developments. Drainage asset creation for larger greenfield developments is managed on a case-by-case basis. Most of these developments are required to produce detailed local stormwater management strategies / plans as per the stipulated guidelines by the City for each project. The City will then review and either approve or request changes as required.

	Some of the current and future large developments are; • Forrestfield North surrounding the proposed Forrestfield train station • 'The Hales' development in Forrestfield • New residential and commercial subdivisions in Wattle Grove • Forrestfield/High Wycombe Industrial area This AMP recommends development of a Stormwater Management Plan (SMP) (Appendix E) for the City. One of the objectives of the proposed SMP will be to identify the need to create new drainage assets in the overall context of optimum management of stormwater within the City.
Operational/ Maintenance	Current operational and maintenance activities include; - Clean open drains - Pit and drain gully eduction and jetting - Emergency cleaning and repairs All open drains are inspected at intervals less than two years while critical areas are inspected at shorter intervals. Any works identified during the inspections are then programed and executed. A programmed gully eduction program is also carried out on a bi-annual basis.
Renewal	Renewal consists of two main types of work; - Re-lining - Replacement Presently renewal works are determined on a case by case basis to rectify identified drainage deficiencies.
Upgrade/ Expansion	Drainage upgrades / expansions are mainly based on the outcomes of specific flood studies carried out for the purpose of mitigating identified drainage issues. A recent such study conducted for Kalamunda town centre resulted in an extensive pipe upgrade project in 2017/18.
Disposal	Disposal requirements are assessed on an individual case-by-case basis.

5.1 Operational and Maintenance Planning

An often overlooked, but a critical aspect of asset management is operational and maintenance planning. Most organizations will have comprehensive operational and maintenance procedures in place but their link to overall asset management and service levels may not be explicitly described or identified.

While the City currently has various maintenance programs and emergency response mechanisms for the drainage asset network, it is recommended to develop and document a formal maintenance / operational plan. This plan is required to address key service delivery risks (Section 6) and be able to help meet community expectations (Section 4).

Operational and maintenance planning involves taking a structured approach in developing asset operational plans and procedures and generally consists of following activities (IPWEA, 2015);

- Establishing operational objectives and intervention criteria
- Developing maintenance plans and procedures

- Developing operational process plans
- Planning for emergencies, crises and incidents
- Operational structure and support requirements
- Operational improvements

The City's work order and complaints recording system does not provide adequate information on maintenance work types, costs and identification of asset on which the maintenance is carried out. This is one of the key barriers for maintenance planning and for asset life-cycle costing, with this information needed to identify optimum renewal intervention levels for the renewal of assets.

Table 10 and Figure 10 show the analysis of customer requests received by the City during the 2009 – 2016 period related to drainage issues. Suburbs have been ranked based on the number of requests received per pit assets. Also, most requests are likely to be based on the inlet point of stormwater which is usually a pit. It indicates that more customer requests can be anticipated in the four of the older suburbs of the City, namely Lesmurdie, Walliston, Kalamunda and Maida Vale.

Table 10: Customer requests per suburb

Suburb	Number of requests	Number of pits	Requests/ 1000 pits
Lesmurdie	140	2116	66
Walliston	25	384	65
Kalamunda	114	1845	62
Maida Vale	68	1392	49
Forrestfield	118	2754	43
Gooseberry Hill	49	1191	41
High Wycombe	109	2737	40
Wattle Grove	76	1971	39
Other	52	1318	39
All	**751**	**15,708**	**48**

As generally expected, the number of requests per year closely follows the annual rainfall patterns for the analysis period (Figure 11). Within the year, the critical period for maintenance is two months before and one month after the peak rainfall in July (Figure 12). This will be included in the SMMP being developed through 2018 to 2020.

Rainfall data source: Bureau of Meteorology station 009021 Perth Airport accessed through Climate Data Online tool at http://www.bom.gov.au/climate/data/index.shtml accessed on 30/04/2017. Dates of customer requests are not available for the suburb of Forrestfield and therefore omitted from Figures 11 and 12.

Figure 11: Maintenance requests 2009 to 2016 by year

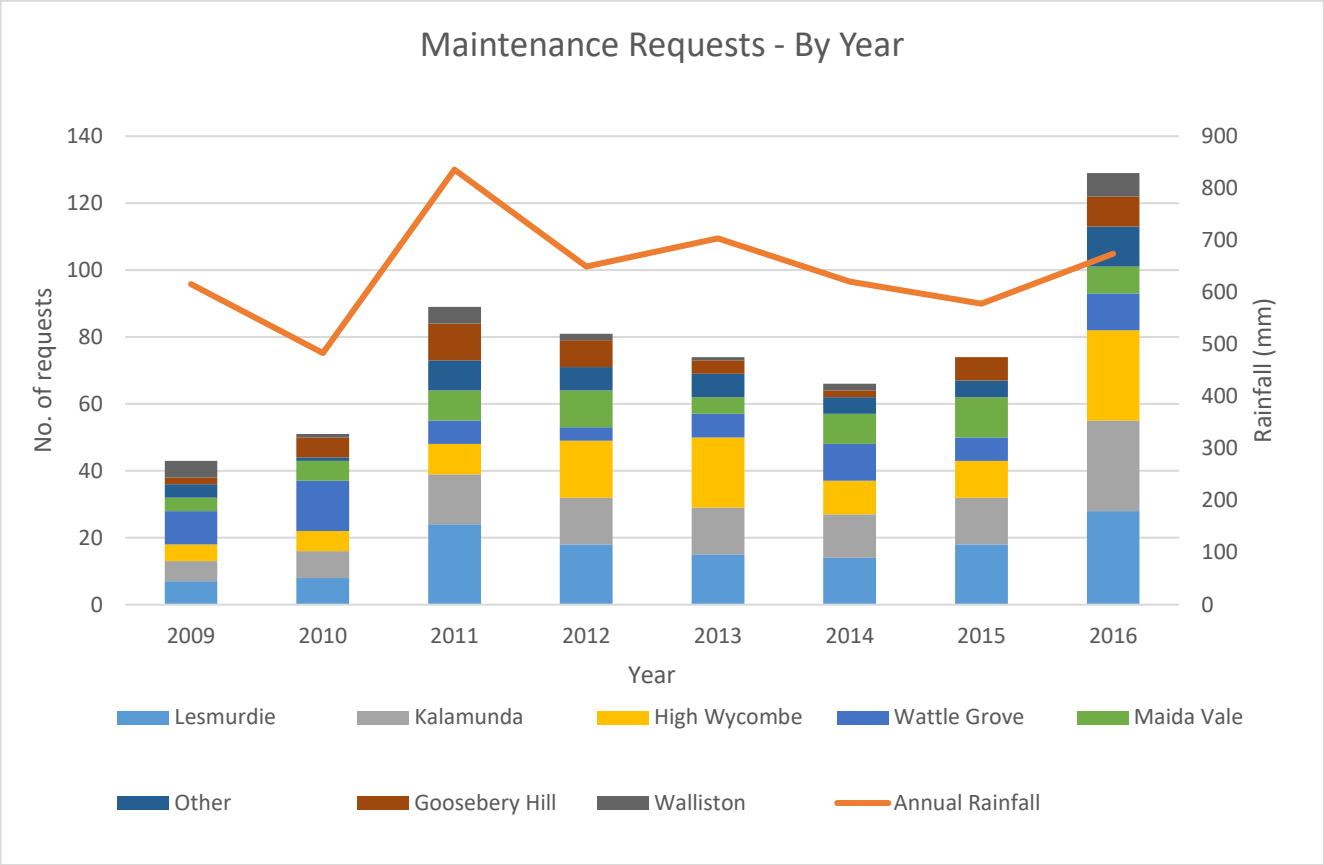
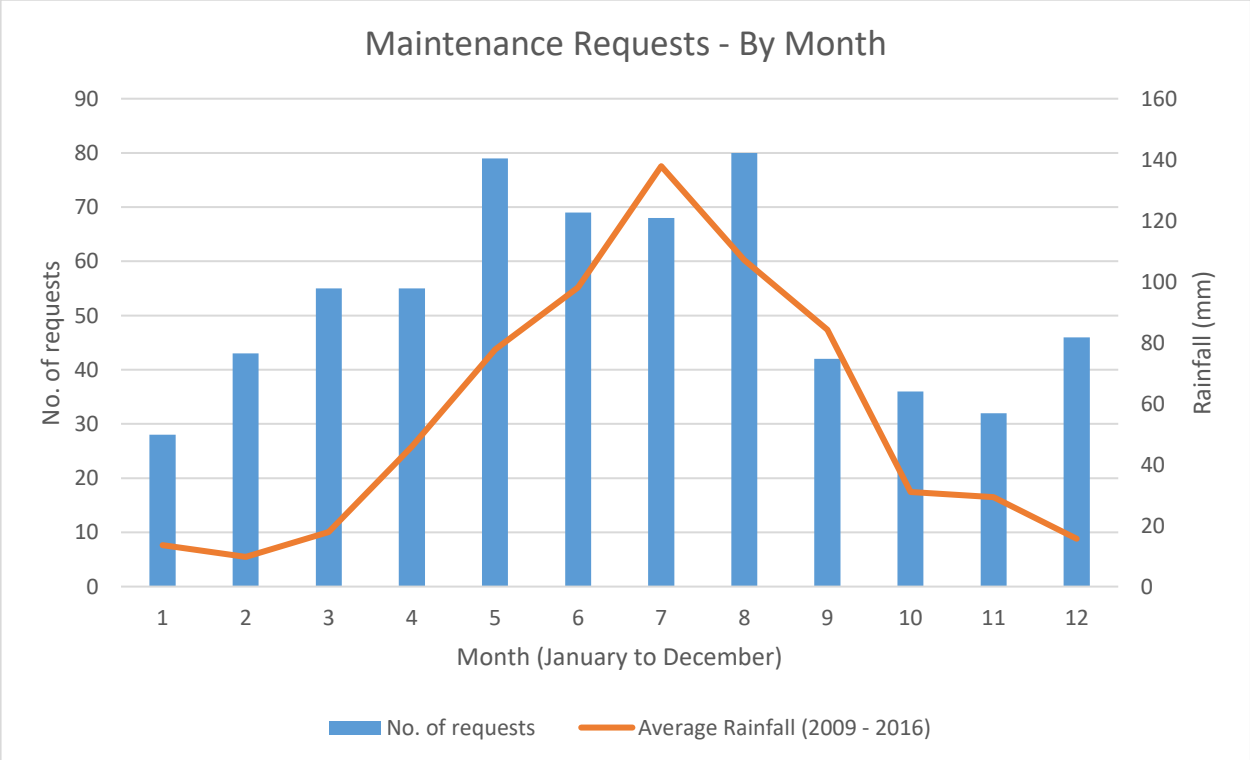


Figure 12: Maintenance requests 2009 to 2016 by month



6. RISK MANAGEMENT

An assessment of typical strategic risks associated with service delivery of drainage assets has been undertaken in accordance with City's risk matrix. This assessment has identified a number of inherent high risks to the City.

The identified high risks are summarised in Table 11 below.

Table 11: Drainage assets risk assessment

Risk	Likelihood (Almost certain, Rare)	Consequence (What can happen?)	Risk Level (Inherent)	Recommended Risk Treatment	Risk Level (Residual)
Isolated flooding of roads and private properties due to blocked drains, pits and gross pollutant traps and silted basins	Likely	Moderate (financial and reputation)	High	Establish appropriate maintenance inspection regime as part of the Maintenance Management Plan (MMP)	Medium
Broad flooding of roads and private properties due to inadequate capacity of the drainage network of larger catchments	Possible	Significant (financial and reputation)	High	Complete the drain asset registry and conduct drainage capacity studies as part of SMP. Allocate funding for the works identified	Medium
Drainage Asset failures leading to impediments in safe collection, conveyance and disposal of stormwater	Unlikely	Significant (financial and reputation)	Medium	Conduct visual asset condition rating on a representative sample of drainage network and prioritise the renewals	Low
Health and safety risks –water contamination	Unlikely	Significant (environmental, financial and reputation	Medium	Establish appropriate maintenance inspection regime as part of the MMP	Low
Health and safety risks – mosquitos	Possible	Moderate (health and safety)	Medium	Develop larvicide spray and baiting programs as part of the MMP	Low
Soil erosion due to overflow	Possible	Significant (environmental, financial and reputation	High	Establish appropriate maintenance inspection regime as part of the MMP	Low

Assessment of job safety risks for the personnel involved in asset service delivery (for example maintenance) are not included in this Asset Management Plan. Such job specific assessments are done routinely according to City's Occupational Health and Safety policies and procedures.

6.1 Asset Criticality

Identification of critical assets is essential for risk minimization and budget optimization. The proposed method for assigning criticality to individual drainage assets is based on location and size of the drain. All asset life cycle management activities can be prioritised based on the criticality of assets.

Once the City's Drain asset data is completed, the criticality will be assigned to individual assets to determine critical network for the entire City.

The following factors lead to a higher level of criticality:

- Pipes greater than 600mm
- Major culverts (width greater than 1200mm)
- Pipes and pits located within densely built up areas and along/under distributor roads
- Basins within built up areas
- Pipes and pits located on high gradients
- Drainage assets in impermeable soils where water will infiltrate very slowly and is more likely to flow overland.
- Gross Pollutant Traps and other water sensitive urban design (WSUD) elements that require regular inspection and maintenance work

6.2 Conclusions and Recommendations

There is no information on historical major events related stormwater or any major failures of drainage assets. However, it is recommended that the City be proactive in formulating detailed risk assessment as part of developing a Stormwater Management Plan.

7. FUTURE DEMAND

Changes that drive demand for drainage assets may include growth in population in built up areas, and in the long term the effects of climate change. These drivers will have an impact on services provided by the drainage assets and the asset life cycle activities detailed in Section 5. The demand is managed through a combination of maintaining and upgrading existing assets, providing new assets and non-asset solutions.

Table 12 details the key drivers of future demand for drainage assets of the City. However, quantitative assessment of these drivers to identify specific asset needs has not yet been carried out. There is also no demand management plan covering the whole of the City. Demand from new residential, commercial, and industrial developments is managed according to the City's Stormwater Design Guidelines for Subdivisional and Property Development (City of Kalamunda, 2018)

Therefore, this Drainage AMP recommends the preparation of a comprehensive Stormwater Management Plan for the entire City to estimate future asset requirements and to identify actions for better management of stormwater (Appendix E).

Table 12: Drainage assets demand factors

Demand Factor	Comments
Demographic changes and higher service level expectations	The population prediction conducted in September 2017 indicated an increase in population for ages 70+. The prediction notes "The largest increase in persons between 2016 and 2026 is forecast to be in ages 75 to 79, which is expected to increase by 1,096 and account for 4.2% of the total persons." (See Appendix D for more details). This will require increased safety for walking on road verges (e.g. new footpaths, removal of open drains). To cater for this need, existing open drains are required to be upgraded to piped drains.
Developments, re-zoning and new land subdivisions	The following new developments are expected to add a significant number of drainage assets. • Forrestfield North area surrounding the proposed Forrestfield train station • 'The Hales' estate and surrounding developments in Forrestfield • New residential and commercial subdivisions in Wattle Grove The City will need a robust mechanisms in place to ensure gifted drainage assets through the subdivision process are affordable in the longer term (i.e. rates revenue from new subdivision are sufficient to cover whole of life cost of assets such as maintenance and renewal)
Climate change	Effects of climate change can lead to disruptions in asset management processes. Evidence suggests that the climate is changing with two key outcomes being observed: • Average temperatures, rainfall and other climate related indicators are changing from year-to year; and • Extreme events are occurring more frequently than in past decades (The World Bank, April 2017) As the long term trend for WA, a continued decline in average annual rainfall is expected and median stream flow is estimated to decline 25% by 2030 (The Climate Commission , 2013) However, drainage assets still need to be able to provide the required level of service during frequent extreme rainfall events. This requires providing adequate resilience within the existing drainage network.

8. FINANCIAL SUMMARY

This section contains the financial requirements resulting from all the information presented in the previous sections of this Drainage AMP. The financial projections will be improved as further information becomes available on the desired levels of service and future asset performance.

8.1 Fair Value

The City, through an external consultant, undertook a comprehensive Fair Value valuation of its drainage assets for the 2014/15 financial year. The current fair values, as reported for the year ended on 30th June 2017 are shown in Table 13.

These values include an estimation of the portion of Drain assets that have not yet been collected. This method of estimation has been accepted by the City's external auditors.

Table 13: Drainage asset valuation results as at 30/06/2017

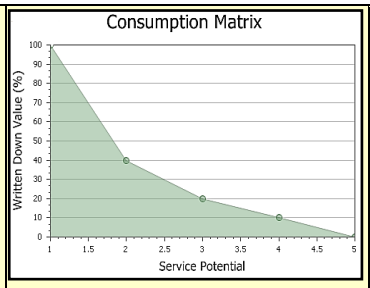
Asset Category	Total Replacement Value ($,000)	Written Down Value ($,000)	Annual Depreciation ($,000)
Drains	69,615	13,238	867
Pits	13,999	3,026	170
Basins	3,975	993	41
Total	**87,589**	**17,257**	**1,078**

8.2 Key Performance Indicators

The following key indicators are calculated for drainage assets as per the Local Government Operational Guidelines. (DLGC (a), June 2013).

Table 14: Key performance indicators

Indicator	**Purpose** (DLGC (a), 2013)	Current Value	Comments	Calculations
Asset Consumption Ratio	This ratio measures the extent to which depreciable assets have been consumed by comparing their written down value (fair value) to their replacement cost. Standard is met if the ratio can be measured and is 0.50 or greater.	0.20	Value is as at 30/06/2017. This ratio is low due to reducing balance consumption curve used (shown below) in the last comprehensive valuation in 2015. This curve is depreciating assets at higher rate when the condition (service potential) of assets is high.	Replacement cost = $87,589,000 Fair value = $17,257,000 (Table 13) Asset Consumption Ratio = Fair value/ Replacement cost =$17,257,000/$87,589,000 **=0.20**

				
Asset Sustainability Ratio	This ratio indicates whether a Local Government is replacing or renewing existing non-financial assets at the same rate that its overall asset stock is wearing out. Standard is met if the ratio can be measured and is 0.90 or greater.	0.58	Ratio is calculated for the 2018 – 2028 period using the current LTFP renewal budgets for asset renewals and annual depreciation of 2015 fair value valuation.	Annual Depreciation = $1,078,000 (Table 13) Current LTFP funding for next 10 years = $6,280,000 (Table 15) Asset Sustainability Ratio (for next 10 year period) = Current LTFP funding for next 10 years/ Annual Depreciation * 10 =$6,280,000 /($1,078,000 * 10) **=0.58**
Asset Renewal Funding Ratio	This ratio is a measure of the ability of a Local Government to fund its projected asset renewal / replacements in the future and can continue to provide existing levels of services in future. Standard is met if the ratio is between 0.75 and 0.95.	0.70	Ratio is calculated for the 2018 – 2028 period using the current LTFP renewal budgets and the funding required to maintain current average drainage network condition. Renewal cost excludes any asset upgrades. Details of funding projections can be found in the Section 8.4.	Current LTFP funding for next 10 years = =$6,280,000 (Table 15) Funding required to maintain current service levels = $8,932,000 (Table 16) Asset Renewal Funding Ratio = Current LTFP funding/ Funding required to maintain current service levels =$6,280,000/$8,932,000 **=0.70**

8.3 Current Funding Levels

The City's current LTFP funding allocations are detailed in the following Table 15 and Figure 12. The City's current LTFP lists fixed annual funding after 2018/19 and 2019/20 for asset renewals and new asset creation respectively.

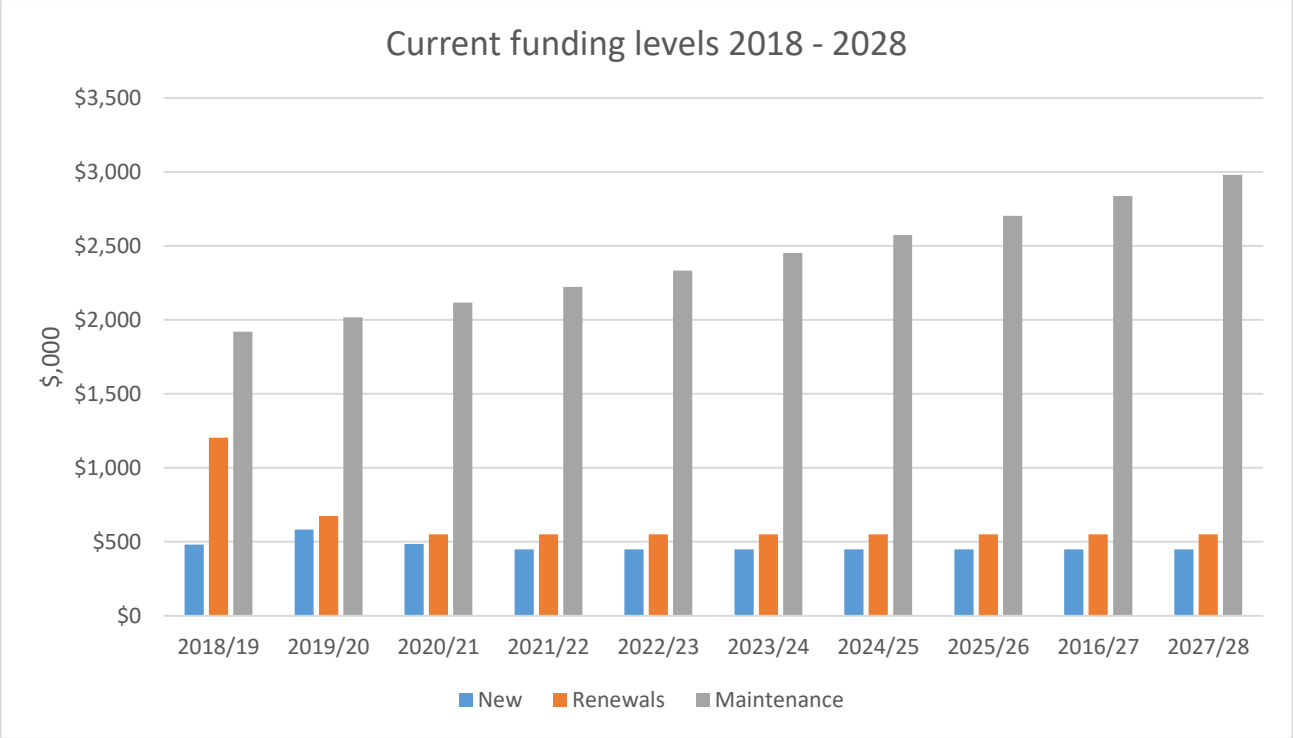
Table 15: Current Long Term Financial Plan allocations for drainage assets

Year	New/Upgrade (LTFP capital budget) ($,000)	Renewals (LTFP capital budget) ($,000)	Maintenance (LTFP operating budget) ($,000)
2018/19	481	1205	1,921
2019/20	583	675	2,017
2020/21	485	550	2,118
2021/22	450	550	2,224
2022/23	450	550	2,335
2023/24	450	550	2,452
2024/25	450	550	2,575
2025/26	450	550	2,703
2016/27	450	550	2,838
2027/28	450	550	2,980
Total	**4,699**	**6,280**	**24,163**

Notes:

- Values exclude income from grants and contributions.
- Minor assets are renewed using maintenance funds if the cost is under the City's $3,000 capitalisation threshold.
- The following high value projects account for the higher than typical projected annual expenditure over the 10 years in the above table and will be reviewed as part of the 2018/2019 budget deliberations.
  - New/upgrade capital expenditure
    - Stanhope Road, extension of existing network to creek- 2018/19 -$220,000
    - Hummerston Road, extension of piped drainage system and install additional manholes - 2019/20 -$250,000 and 2020/21 - $200,000
  - Renewal capital expenditure
    - Kostera Oval stormwater drainage renewal Stage 2 - 2019/20 - $125,000
    - Booligal Street drainage renewal/upgrade – 2018/19 - $100,000 and 2019/20 – $125,000
    - Stirk Park channel and pond improvements - 2018/19 -$760,000

Figure 13: Current drainage asset funding levels



8.4 Funding Gap Analysis

The funding 'gap' is a measure of shortfall (or excess) in current funding compared to funding required to provide desired levels of service. Clear direction was not provided through the 2018 Levels of Service Community Engagement Program on desirable levels of service by the community. Therefore, funding levels required are determined on the basis of technical levels of service for asset renewal.

Predictive financial modelling was carried out on the basis that drainage assets are generally being renewed when their physical condition has become unacceptable (i.e. Condition 5 – Very Poor measured against Condition Rating scale of 1-5). Currently the drainage assets have not been visually inspected to assess the condition. Therefore, the Condition Rating of individual assets has been assumed based on its age using the methodology detailed in Appendix A.

Further, predictions are inclusive of an allowance for the missing portion of Pipe network within pipes asset register and the overall condition rating of the pit network has been used as an indicator for all drainage assets in the modelling.

Three scenarios have been modelled as follows:

Scenario 1 (S1)
This scenario is modelled on the basis of renewing assets with Condition Rating of 5 (very poor) and that the budget available is unlimited. The budget is spread evenly for the 10-year period.

Scenario 2 (S2)
In this scenario, assets are being renewed on the basis of maintaining current average overall condition of the drainage network.

Scenario 3 (S3)
In this scenario, maintaining the current average annual funding levels has been used.

Table 16 summarises the outputs of these three scenarios.

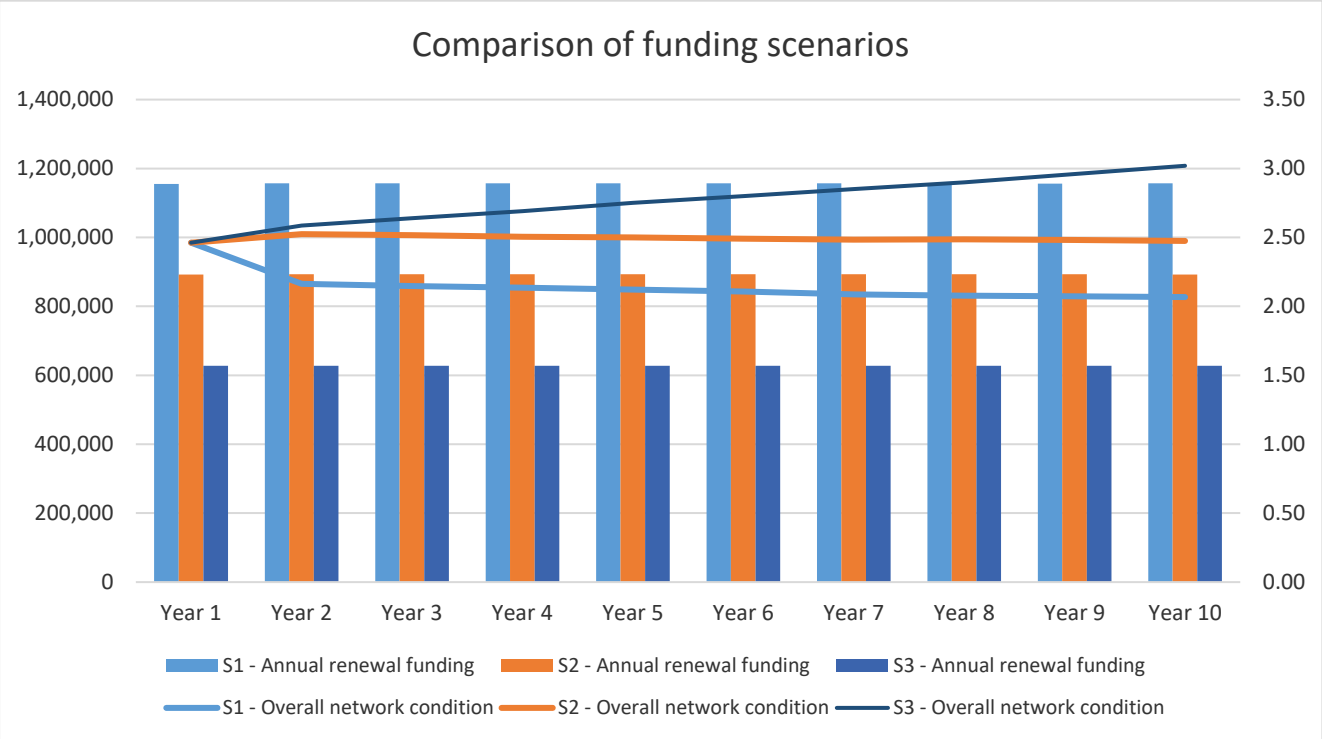
Table 16: Drainage assets predictive modelling scenarios for renewal

Scenario No.	Scenario Name	Description	10 year predicted cost $,000	Current funding allocation $,000	10 year predicted funding gap $,000	Overall average network condition at the end of 10th year
S1	S1: Unlimited budget	All assets are renewed when their Condition Rating reaches or have reached 5	11,567	6,280	5,287	2.10
S2	S2: Maintain current average condition	Optimized budget to maintain the current average condition over next 10 years	8,932	6,280	2,652	2.46
S3	S3: Current funding	Current average annual funding levels used to predict network condition at the end of 10 years.	N/A	6,280	0	3.07

- Scenario 1 indicates a funding gap of 5.287 million over next 10 years, if unlimited funds were available.
- Scenario 2 indicates a funding gap of $2.652 million over next 10 years to maintain the current average network condition.
- Scenario 3 indicates at current funding level, the drainage assets are expected to deteriorate below average condition of 3.00.

Detailed annual funding for each of the three scenario is shown in Figure 14.

Figure 14: Comparison of renewal funding scenarios



8.5 Conclusions

- The financial predictive modelling for the renewal of drainage assets using current asset data and maintaining current average condition recommends providing an additional average renewal funding of $265,200 per annum over next 10 years (Table 16, Scenario 2).
- Modelling is based on the assumed condition for all drainage assets.
- Confidence level of the predictive modelling can be improved by completing the pipe asset register and conducting visual condition rating of a representative asset sample.
- Based on the confidence level of current data, it is considered premature to request additional renewal funding at this stage and it is recommended that funding for drainage assets renewals be maintained at current levels.

8.6 Recommendations

- Maintain the funding for drainage asset renewals at current levels.
- Implement the Asset Management Improvement Plan Tasks as detailed in Section 9, Table 17.

9. IMPROVEMENTS, MONITORING AND REVIEW

9.1 Performance Monitoring

The City's Asset Management Steering Committee (AMSC) will monitor the performance of the City's Asset Management activities through the progress of Asset Management Improvement Plan Tasks and the relevant Actions of the City's Corporate Business Plan 2017 -2021 (CBP) (Shire of Kalamunda (e), 2017).

9.2 Improvement Plan

The asset management improvement plan for drainage assets is shown inTable 17 below.

Table 17: Asset management improvement plan for drainage assets

Task No.	Task	Responsible Department	Timeline
1	Complete drain asset register by collecting and mapping all City drains and conduct visual condition rating for representative sample (with priority given to assets with expected condition of 4 or 5) of all drainage assets	Asset Management	2018/19 and 2019/20
2	Develop a Stormwater Management Plan (SMP) with the prime objective to determine; • Water quantity and quality targets • asset and non-asset solutions meet the targets • Critical assets • Intervention levels for asset upgrades • Quantify future demand and link to future asset needs (Further details about SMPs can be found in Appendix E)	Asset Management	2018/19 and 2019/20
3	Develop a Stormwater Maintenance Management Plan based on asset criticality, risk and maintenance service levels	Asset Maintenance	2018/19 and 2019/20
4	Develop an asbestos register for drainage assets containing asbestos	Asset Management	2019/20
5	Review Drainage Asset Management Plan and implement all associated actions	Asset Management	2020/21

9.3 Review Procedures

The next review of this Drainage AMP is scheduled for 2020/2021.

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GLOSSARY

Source: IPWEA

ACCRUAL ACCOUNTING
Recognition of assets, liabilities, equity, income and expenses as they are incurred (and once they satisfy the definitions and recognition criteria inclusion on Financial Statements).

ACTIVITY MANAGEMENT
The coordinated management of activities of an organisation to deliver on its objectives. For asset-intensive activities, ACTIVITY MANAGEMENT is considered in this Manual to be synonymous with ASSET MANAGEMENT.

ADVANCED ASSET MANAGEMENT
Asset management which employs predictive modelling, risk management and optimised decision-making techniques to establish asset lifecycle treatment options and related long term cash flow predictions.

ANNUAL PLAN
A document produced annually by an organisation to inform stakeholders of its objectives, intended activities, performance, income and expenditure required for a period of one financial year. It may also indicate anticipated future short-term income and expenditure.

APPROPRIATE ASSET MANAGEMENT PRACTICE
The level of AM practice development (minimum-advanced) which is considered optimal for the specific organisation.

ASSET
An item that has potential value to an organisation such as plant, machinery, buildings, etc.

ASSET HIERARCHY
A framework for segmenting an asset base into appropriate classifications. The asset hierarchy can be based on asset function; asset type or a combination of the two.

ASSET MANAGEMENT (AM)
The systematic and coordinated activities and practices of an organisation to optimally and sustainably deliver on its objectives through the cost-effective lifecycle management of assets.

ASSET MANAGEMENT COORDINATOR
The person appointed by an organisation to ensure the corporate AM goals, objectives and legal obligations are met. The AM coordinator may also be required to lead the AM team.

ASSET MANAGEMENT FRAMEWORK
The overarching AM hierarchy including the AM Policy, Objectives, Strategy and the AM Plan.

ASSET MANAGEMENT INFORMATION SYSTEM (AMIS)
A combination of processes, data, software, and hardware applied to provide the essential outputs for effective AM.

ASSET MANAGEMENT OBJECTIVES
Specific outcomes required from the implementation of the AM Framework.

ASSET MANAGEMENT PLAN (AM Plan)
Long-term plans (usually 10-20 years or more for infrastructure assets) that outline the asset activities and programmes for each service area and resources applied to provide a defined level of service in the most cost effective way.

ASSET MANAGEMENT POLICY
A document that broadly outlines the principles and mandated requirements for undertaking AM across the organisation in a systematic and coordinated way, consistent with the organisation's strategic plan. It provides the framework for the AM Strategy and AM Plan.

ASSET MANAGEMENT PRACTICES
The AM processes and techniques that an organisation undertakes, as outlined in this Manual, such as demand forecasting, developing and monitoring levels of service, risk management.

ASSET MANAGEMENT STRATEGY
The high level long-term approach to AM including AM action plans and objectives for managing the assets.

ASSET MANAGEMENT TEAM
The team appointed by an organisation to review and monitor the corporate AM improvement programme and ensure the development of integrated AM information systems, processes and plans consistent with organisational goals and objectives.

ASSET REGISTER
A record of asset information, typically held in a spreadsheet, database or software system, including asset attribute data such as quantity, type and construction cost.

BENEFIT-COST ANALYSIS (BCA)
A decision technique that quantifies the benefits and costs in monetary terms over the life of the decision (often the life of the asset involved), discounting these to current monetary terms (where non-monetary terms are used, this is called 'multi-criteria' analysis).

BENEFIT-COST RATIO (BCR)
The sum of the present values of all benefits (including residual value, if any) over a specified period, or the lifecycle, of the asset or facility, divided by the sum of the present value of all costs.

BUSINESS CONTINUITY PLAN
Plans developed to ensure critical services can continue to function even during unexpected events. The plans typically detail critical services and functions, ways these can potentially fail, mitigation measures and processes or work-arounds to recover services if they do fail.

BUSINESS PLAN
A plan produced by an organisation (or business units within it) which translates the objectives contained in an Annual Plan into detailed work plans for a particular, or range of, business activities or programmes.

CAPITAL EXPENDITURE (CAPEX)
Expenditure used to create new assets or to increase the capacity of existing assets beyond their original design capacity or service potential. CAPEX increases the value of asset stock.

CASH FLOW
Inflows and outflows of cash and cash equivalents.

COMPONENTS
Specific parts of an asset having independent physical or functional identity and having specific attributes such as different life expectancy, maintenance regimes, risk or criticality.

CONDITION
The physical state of the asset.

CONDITION GRADE (RATING)
A measure of the physical integrity of an asset or component.

CONDITION-BASED PREVENTIVE MAINTENANCE
Preventive maintenance initiated as a result of an asset reaching a specified condition.

CONDITION ASSESSMENT (CONDITION MONITORING)
The inspection, assessment, measurement and interpretation of the resultant data, to indicate the condition of a specific component so as to determine the need for some preventive or remedial action.

CORE ASSET MANAGEMENT (also called 'BASIC AM')
Asset management which relies primarily on the use of an asset register, maintenance management systems, top-down condition assessment, simple risk assessment and defined levels of service, in order to establish a long-term cash flow projection.

CORRECTIVE MAINTENANCE
The remedial actions performed as a result of failure, to restore an asset or component to a specified condition.

CURRENT ASSETS
Those assets which are expected to be realised in cash or sold or consumed within one year of an organisation's balance date.

CURRENT REPLACEMENT COST
See REPLACEMENT COST.

CRITICAL ASSETS
Those assets that are likely to result in a more significant financial, environment and social cost in terms of impact on organisational objectives.

CROSS-ASSET OPTIMISATION
The application of Optimised Decision Making techniques to compare and prioritise proposals across different assets or activities.

CUSTOMER
Any person who uses the asset or service, is affected by it or has in interest in it either now or in the future. This definition does not necessarily require that payment is made for use of the asset.

CUSTOMER GROUP
A set of customers that has been grouped for the purposes of levels of service review. Customers are generally grouped into those that have similar needs or wants in relation to the assets and services.

DECOMMISSION
Actions required to take an asset out of service.

DEFERRED MAINTENANCE
The shortfall in maintenance work required to maintain the service potential of an asset.

DEMAND MANAGEMENT
Actions taken to influence demand for services and assets, often undertaken as part of sustainability initiatives and/ or to avoid or defer required asset investment. Demand management may be 'SUPPLY-SIDE' demand Management (for example minimising wastage through pipe leak detection or customer DEMAND-SIDE management, to reduce demand for over-utilised assets or vice versa (for example through pricing, regulation, education and incentives).

DEPRECIATED REPLACEMENT COST (DRC)
The Replacement Cost (RC) of an asset less accumulated depreciation calculated on the basis of such cost to reflect the already consumed or expired future economic benefits of the asset.

DEPRECIATION (amortisation)
The systematic allocation of the depreciable amount of an asset over its useful life.

DETERIORATION RATE
The rate at which an asset approaches failure (end of life).

DISCOUNTED CASH FLOW
A methodology whereby the future cash flows over the analysis period are discounted to present values and then summed to yield the present value (PV) of the time stream of costs or benefits.

DISCOUNTING
A technique for converting cash flows that occur over time to equivalent amounts at a common point in time.

DISCOUNT RATE
A rate used to relate present and future money values, e.g. to convert the value of all future dollars to the value of dollars at a common point in time, usually the present.

DISPOSAL
Actions necessary to decommission and dispose of assets that are no longer required.

ECONOMIC LIFE
The period from the acquisition of the asset to the time when the asset, while physically able to provide a service, ceases to be the lowest cost alternative to satisfy a particular level of service. The economic life is at the maximum when equal to the physical life, however obsolescence will often ensure that the economic life is less than the physical life.

EMERGENCY RESPONSE PLANS
(Also called Contingency Plans, Crisis Management Plans or Incident Response Plans)

Detail the processes that an organisation will use to respond and recover from an incident. These plans typically include some type of escalation process to define when structures, communication and reporting lines may change as an incident escalates.

ENABLERS (Asset Management)
The organisational resources, structures, plans, systems and tools that enable the implementation of the AM framework.

EQUITY
The residual interest in the assets of the entity after deduction of its liabilities.

FACILITY
A complex comprising many assets (e.g. a hospital, water treatment plant, recreation complex, etc.) which represents a single management unit for financial, operational, maintenance or other purposes.

FAILURE MODES, EFFECTS AND CRITICALITY ANALYSIS (FMECA)
FMECA and RCM are similar systematic, logical risk-based maintenance approaches aimed at maximising reliability of plant and equipment assets.

FAIR VALUE
The amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction.

FINANCIAL STATEMENTS
Balance sheets, profit and loss accounts, statements of changes in financial position, notes and other statements which collectively are intended to give a true and fair view of the state of affairs and profit or loss for an entity for a defined period.

FOCUS GROUP
A method of consulting with representative customers/ stakeholders. A focus group typically comprises 6 to 8 people, invited to participate in a discussion about a specified topic, product or service.

GAP ANALYSIS
A method of assessing the gap between an organisation's current AM practices and the future desirable AM practices. Also called AM 'needs analyses or 'status assessment'.

GENERALLY ACCEPTED ACCOUNTING PRACTICES (GAAP)
Approved financial reporting standards so far as those standards apply to a particular entity; or, where there are no approved standards, accounting policies that are appropriate to the entity and have authoritative support within the accounting profession.

INFRASTRUCTURE ASSETS
Stationary systems forming a network and serving whole communities, where the system as a whole is intended to be maintained indefinitely at a particular level of service potential by the continuing replacement and refurbishment of its components. The network may include normally recognised ordinary assets as components.

INTERNAL RATE OF RETURN (IRR)
The discount (or interest) rate which will equate the present value of the net cash inflows from a project with its initial cash outlay. The internal rate of return is the true yield and is expressed as the average rate of return per annum or other chosen period.

INTERVENTION LEVELS
Identify the point where the performance against the level of service warrants intervention.

KEY PERFORMANCE INDICATOR (KPI)
A performance measure that is considered important to the organisation (see performance measure).

LEVEL OF SERVICE
Levels of service statements describe the outputs or objectives an organisation or activity intends to deliver to customers.

LIFE
A measure of the anticipated life of an asset or component; such as time, number of cycles, distance intervals, etc.

LIFECYCLE
The time interval that commences with the identification of the need for an asset and terminates with the decommissioning of the asset or any liabilities thereafter.

LIFECYCLE ASSET MANAGEMENT
Encompasses all AM strategies and practices associated with an asset or group of assets that results in the lowest lifecycle cost.

LIFECYCLE COST
The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.

MAINTENANCE
All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal. Maintenance does not increase the service potential of the asset or keep it in its original condition, it slows down deterioration and delays when rehabilitation or replacement is necessary.

MAINTENANCE PLAN
Details the specific planned and unplanned maintenance actions for an asset or facility.

MAINTENANCE OBJECTIVES
Objectives for what maintenance has to achieve to ensure the assets are in the right condition to meet the needs of the organisation. Maintenance performance measures and targets are the means of assessing whether the maintenance objectives are being met.

MAINTENANCE STRATEGY
Identifies the tactics and tools that will be used to deliver the maintenance plan, as well as defining the maintenance roles and responsibilities.

MARKET VALUE
The estimated amount at which an asset would be exchanged on the date of valuation, between a willing buyer and a willing seller, in an arm's length transaction and when the parties have each acted knowledgeably, prudently and without compulsion. Market value is based on highest and best use of the asset and not necessarily the existing uses.

MODERN EQUIVALENT ASSETS
Assets that replicate what is in existence with the most cost-effective asset providing an equivalent level of service.

MULTI-CRITERIA ANALYSIS (MCA)
A decision technique where a selection of criteria are selected to represent the benefits provided from the proposal. Each attribute is scored and weighted for the different options and the results can be used to identify the preferred solution/s.

NET PRESENT VALUE (NPV)
The value of an asset to the organisation, derived from the continued use and subsequent disposal in present monetary values. It is the net amount of discounted total cash inflows arising from the continued use and subsequent disposal of the asset after deducting the value of the discounted total cash outflows.

OPERATION
The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials.

OPTIMISED DECISION-MAKING (ODM)
Two definitions are: 1. ODM is a formal process to identify and prioritise all potential solutions with consideration of financial viability, social and environmental responsibility and cultural outcomes. 2. An optimisation process for considering and prioritising all options to rectify existing or potential performance failure of assets. The process encompasses NPV analysis and risk assessment.

OPTIMISED DEPRECIATED REPLACEMENT COST (ODRC) IFRSs require the DRC to be optimised, therefore ODRC is synonymous with DRC.

PERFORMANCE GRADE
A measure of the ability of the asset to achieve levels of service.

PERFORMANCE MEASURE
A qualitative or quantitative measure used to measure actual performance against a standard or other target. Performance measures are used to indicate how the organisation is doing in relation to delivering levels of service.

PERFORMANCE MONITORING
Continuous or periodic quantitative and qualitative assessments of the actual performance compared with specific objectives, targets or standards.

PLANNED MAINTENANCE
Planned maintenance activities fall into three categories:

a) Periodic - necessary to ensure the reliability or to sustain the design life of an asset.

b) Predictive - condition monitoring activities used to predict failure.

.

c) Preventive - maintenance that can be initiated without routine or continuous checking (e.g. using information contained in maintenance manuals or manufacturers' recommendations) and is not condition-based.

PREDICTIVE MODELS
Typically use condition and performance deterioration curves to project the lifecycle costs of each asset for different maintenance or renewal strategies and identify the optimal treatment strategy.

PROCESS
A structured, measured set of activities designed to produce a specific output.

RECOVERABLE AMOUNT
Is the greater of the amount recoverable from an asset's further use and ultimate disposal, and its current net realisable value.

REHABILITATION (REFURBISH)
Works to rebuild or replace parts or components of an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification. Generally involves repairing the asset to deliver its original level of service (i.e. heavy patching of roads, sliplining of sewer mains, etc.) without resorting to significant upgrading or renewal, using available techniques and standards.

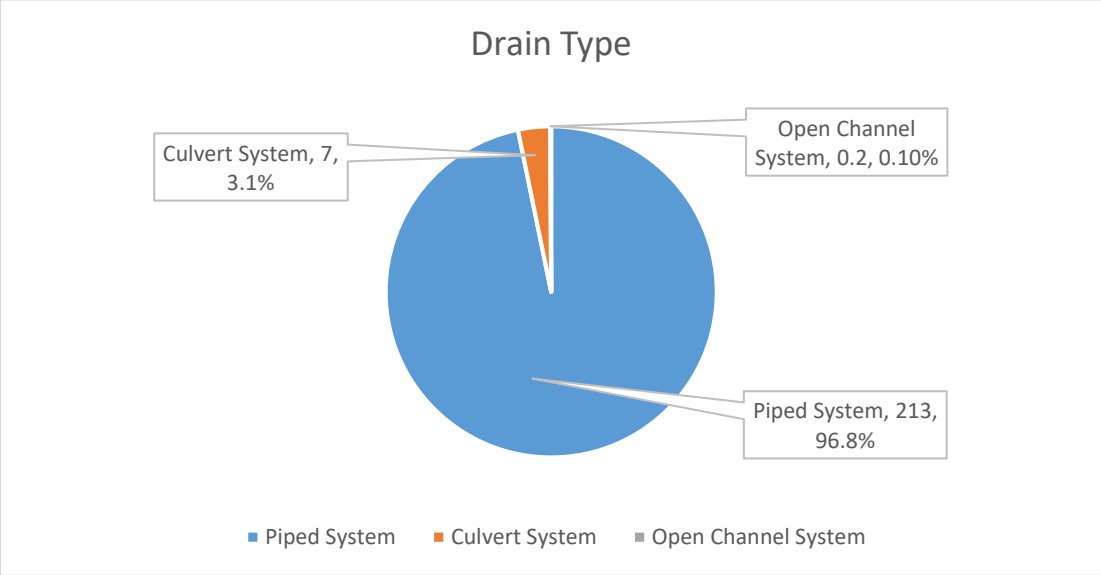
RELIABILITY CENTRED MAINTENANCE (RCM)
A process for optimising maintenance based on the reliability characteristics of the asset.

RENEWAL
Works to replace existing assets or facilities with assets or facilities of equivalent capacity or performance capability

APPENDIX A: ASSET INFORMATION SUMMARY

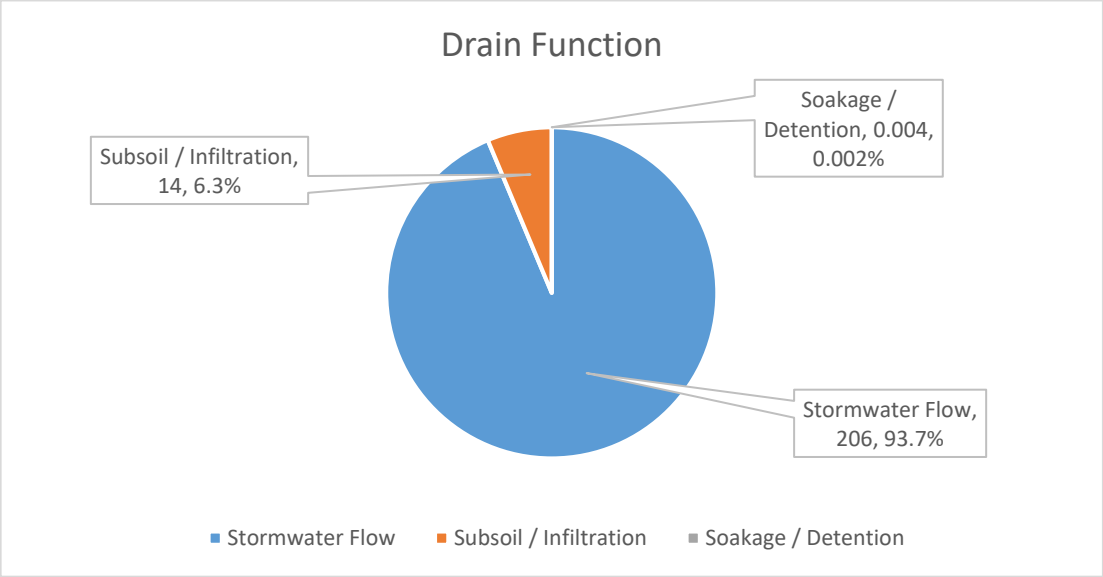
Drains

The following graphs show the various aspects of the City's Drain assets recorded within the City's asset register. The graphs show the classification group, total pipe length of the group in kilometres and % of the group out of the total network. The total length of Drain assets in City's asset register is 219.906km.

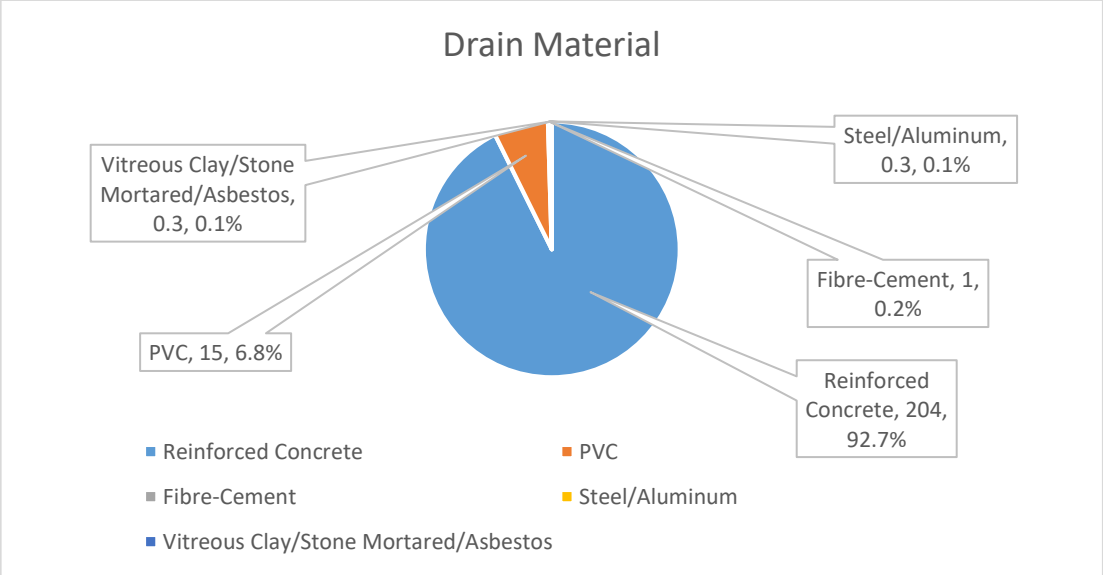


Drains are divided into the following 3 types:

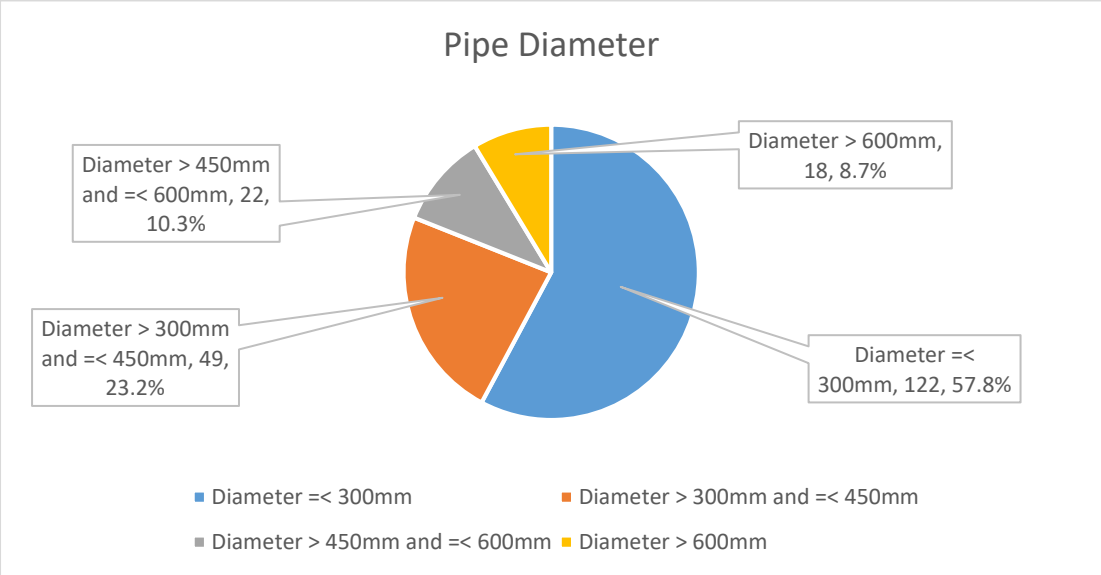
- Piped system is an underground pipe with entry pits, junction pits and a outfall head wall.
- Culvert System is an underground pipe with headwalls at both ends, and
- Open Channel System is a lined open drain.

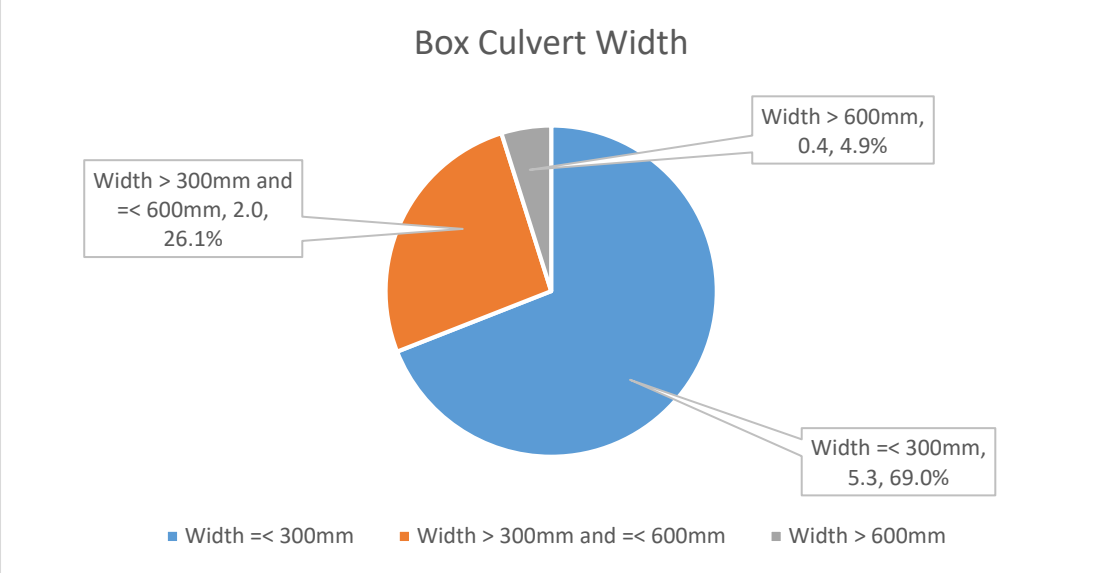


The Drain function indicates if the system allows detention or infiltration of stormwater. Drains with the function "Stormwater Flow" do not allow detention or infiltration.



The main drain material is reinforced concrete. The City currently has 79m of asbestos drain pipes. This Drainage AMP recommends to create a detailed register of drainage assets that contain asbestos.



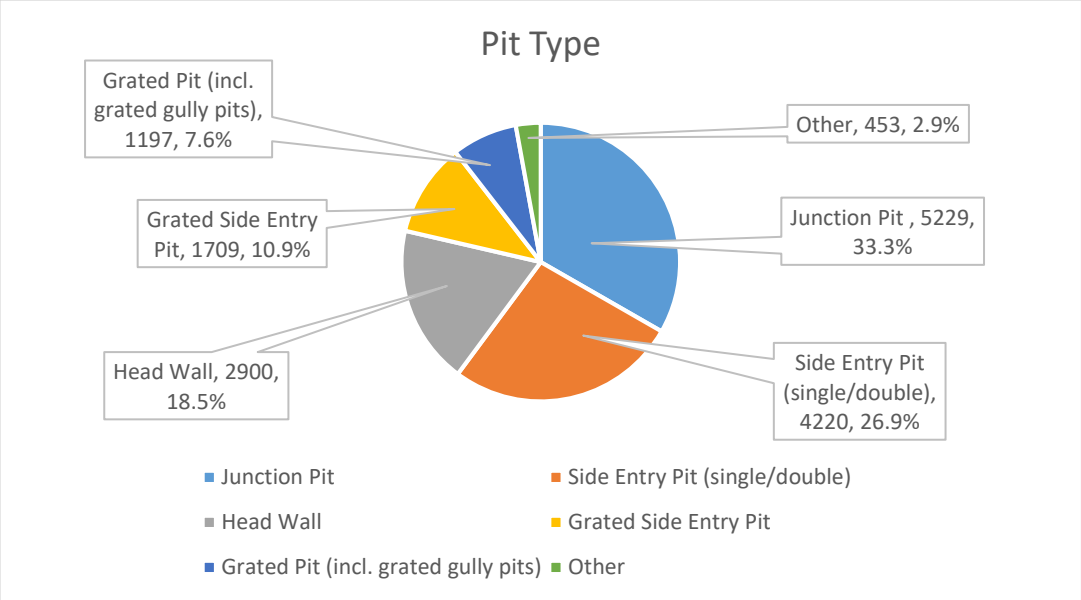


More than half of the pipes and more than one third of box culverts have a diameter / width of 300mm or less.

Pits

The following graphs show the various aspects of the City's Pit assets recorded within City's asset register. The graphs show the classification group, total number of pits in the group and the % of the group out of the total number of pits in the network.

The number of pits in City's asset register is 15,708.



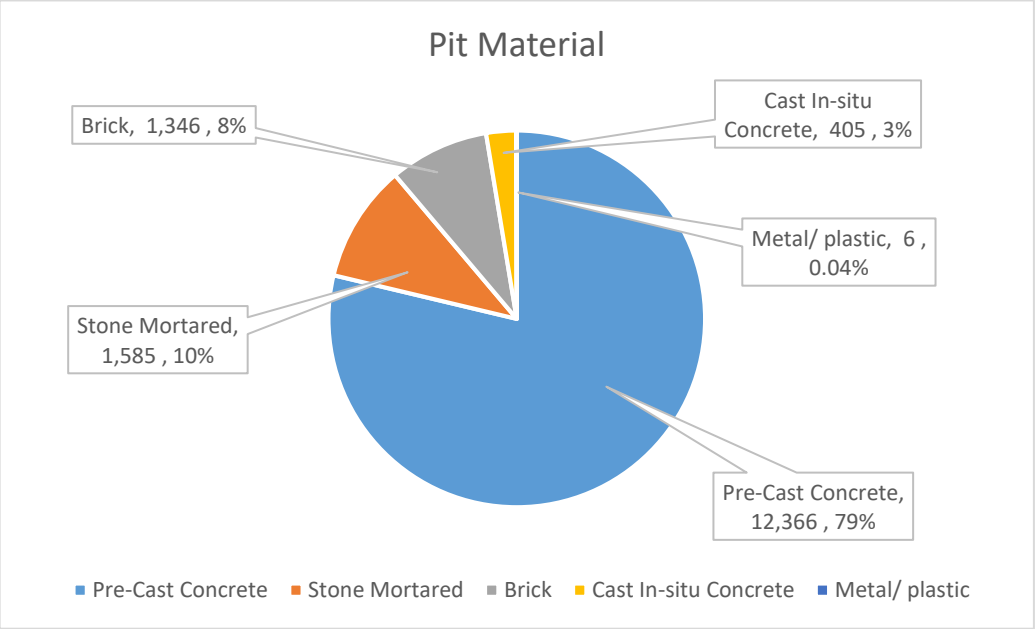
Junction Pits

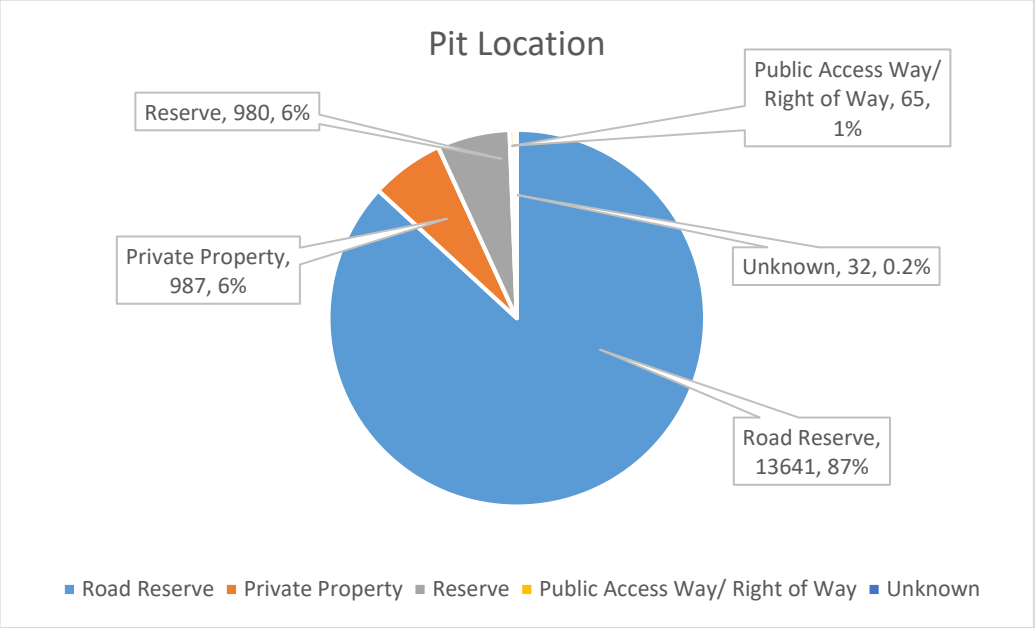
Side Entry Pits (left to right - single, double and grated)

Head Walls

Grated Pits (left to right - single, double and grated gully)

Source: City of Kalamunda Stormwater Drainage Manual



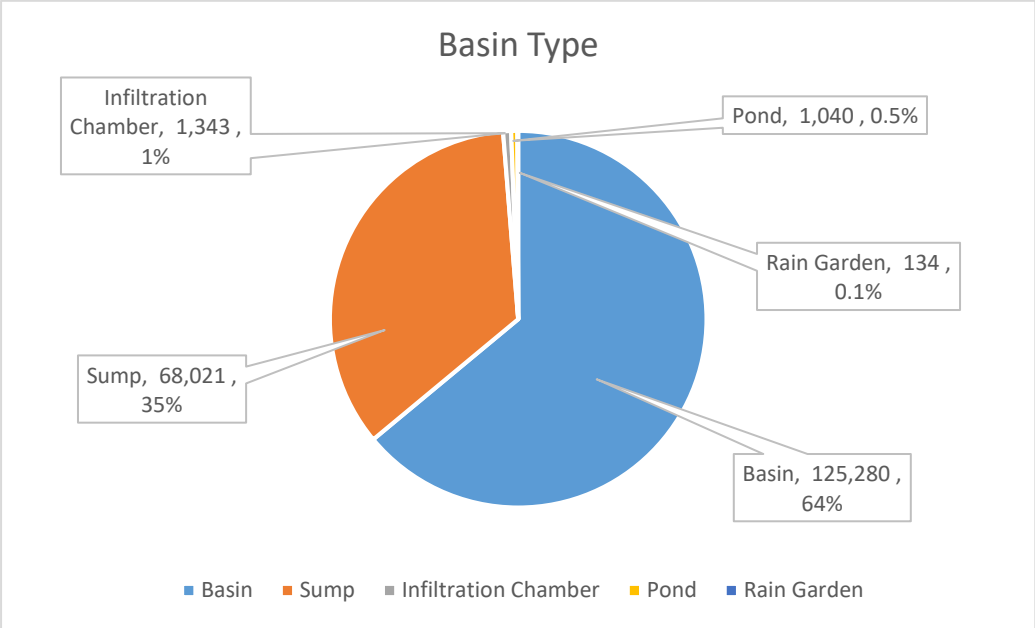


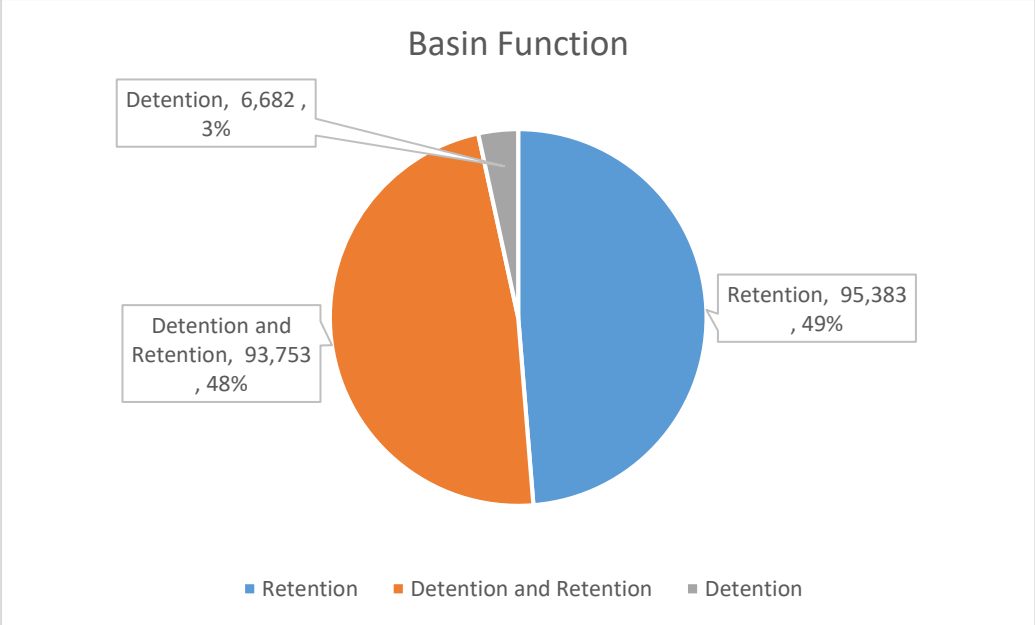
The majority of pit assets are located within the road reserve. The pit assets located within private property are not a responsibility of the City and have not been included in the financial modelling scenarios.

Basins

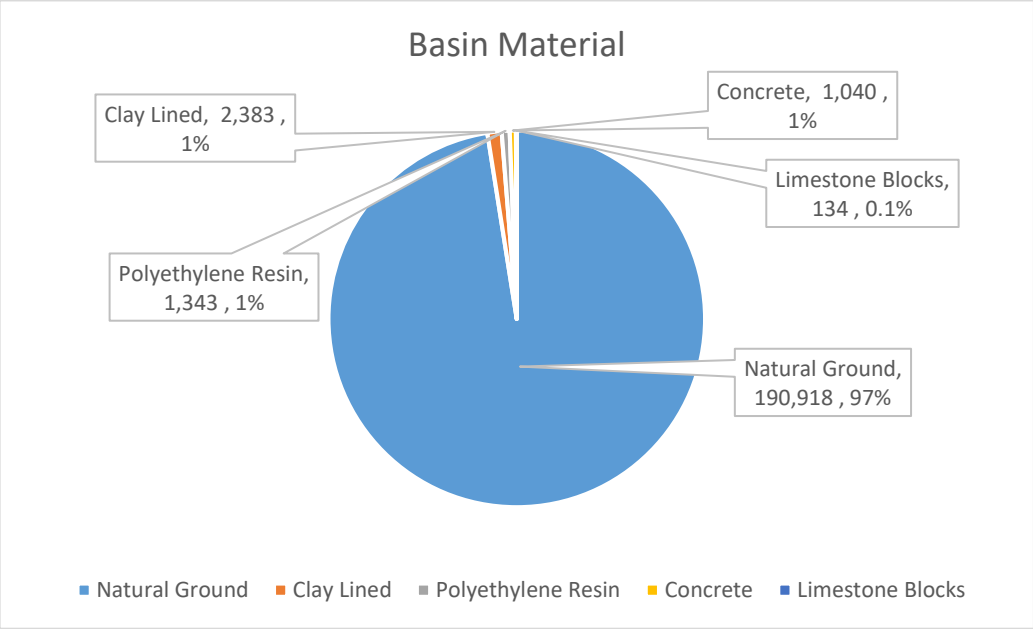
The following graphs show the various aspects of the City's Basin assets recorded within City's asset register. The graphs show the classification group, total area of Basins in each group and % of each group against the total area of Basins in the City.

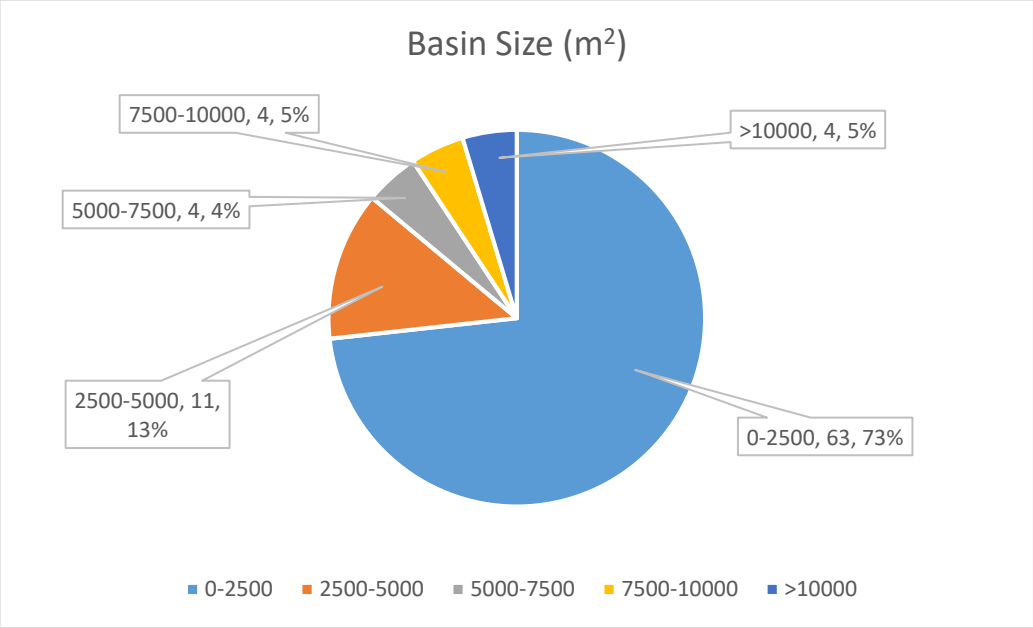
The City currently has 86 basins with a total area of 195,817 m2.





Retention basins collect and retain stormwater within a site and then discharge by infiltration into the groundwater or by evaporation, whereas, detention basins collect, temporarily store and then discharge at a controlled rate into a downstream drainage system or natural watercourse.


Basin Material
Clay Lined, 2,383 , 1%
Concrete, 1,040 , 1%
Limestone Blocks, 134 , 0.1%
Polyethylene Resin, 1,343 , 1%
Natural Ground, 190,918 , 97%
Natural Ground
Clay Lined
Polyethylene Resin
Concrete
Limestone Blocks


Basin Size (m2)
7500-10000, 4, 5%
>10000, 4, 5%
5000-7500, 4, 4%
2500-5000, 11, 13%
0-2500, 63, 73%
0-2500
2500-5000
5000-7500
7500-10000
>10000

APPENDIX B: CONDITION RATING METHODOLOGY

The condition of the assets have been estimated based on the % of total useful life remaining as per the following table:

Rating Score	Expected Condition	% of Total Useful Life Remaining	Description of Expected Condition	Expected Deterioration Signs	Expected Serviceability Problems	Expected Maintenance Costs
1	Very Good	>80	Asset is in near new condition. Only routine maintenance is required.	No visible signs.	None. No risk associated with the condition.	Low, if any.
2	Good	61 - 80	Asset has deteriorated slightly but only regular maintenance is required to maintain the rating.	Slight deterioration is evident that can readily be repaired to "As New" condition. Obviously no longer new.	None. Very low risk associated with the condition.	Low, if any.
3	Fair (Average)	41 - 60	Asset is in satisfactory condition but showing signs of wear and tear. Moderate levels of periodic (programmed) maintenance are required to maintain the asset in this condition.	Deterioration is evident. Deterioration may either be localised, or to a minor degree spread over a wider part of the component. No structural or functional concerns, provided that maintenance or repairs are undertaken.	Impaired slightly. General user would not be aware of problems. Low risks may be associated with the condition.	Low to medium.
4	Poor	21 - 40	Asset is in below average condition with significant signs of wear and tear. High levels of periodic maintenance may require to maintain the rating of this asset. Partial or full replacement maybe required to improve the rating of this asset.	Deterioration is obvious. There may be structural or functional concerns and maintenance or repairs are necessary.	Medium loss. General user is aware the asset is performing poorly, and may have to adjust use of the asset accordingly. Low to medium risks may be associated with the condition.	Medium to high. Plan for renewal.
5	Very Poor	=< 20	Asset is in very poor condition and needing full replacement.	Severe deterioration. Actual or potential failure to structural or functional components.	Significant effect on service, and can be unusable. General user avoids the asset or complains. Needs high priority renewal (rehabilitation or renovation or replacement or restoration). Medium to Extreme risks may be associated with the condition.	Very high, usually more effective to renew the asset.

Condition Rating Example as follows:

If and underground pipe is constructed in year 1978 and the expected total useful life of the pipe is 80 years:

- Remaining total useful life in years = (80) – (age of pipe) = (80) – (2018-1978) = 40 years
- Remaining total useful life as a percentage of total useful life = 40/80% = 50%
- From above table 50% lies within the range (41% – 60%) of Condition 3; therefore, the expected condition rating of the pipe is 3.

APPENDIX C: ASSET LEVELS OF SERVICE CONSULTATION AND ENGAGEMENT RESULTS

Introduction

The Asset Levels of Service consultation was undertaken in accordance with a Communications and Engagement Plan, endorsed by the Council in December 2017.

The objectives of the consultation were:

1. Raise awareness of the Asset Management Strategy and consultation process among 70% of all stakeholders,
2. Create an understanding of the major asset categories and level of service criteria among 60% of stakeholders,
3. Influence the perception and attitude in 50% of stakeholders that the City has obtained equitable levels of feedback from residents across the districts in the City, and
4. Achieve uptake of the engagement process.

The media and methods used to undertake the consultation included:

- Presentation of a marketing video on YouTube and through social media,
- Social media releases, paid and unpaid,
- Path stickers in public areas, and
- Notices on community notice boards.

The primary feedback method for the consultation was through a questionnaire, available in hard copy and online at the Engage.Kalamunda web site. When hard copies were received they were loaded in to the Engage.Kalamunda web site by staff.

Respondent Statistics

The City of Kalamunda consultation on Asset Levels of Service was open from 8 February 2018 to 23 March 2018. Over that time 50 surveys were completed, with the following key statistics:

- 54% of the responses were from females and 44% from males,
- 82% overall were residents,
- Residents from the hills suburbs made up 60% of respondents, and
- The age distribution was reasonable.

Workshops and Site Visits

Community workshops were conducted on 12 February 2018 at The City's Function Room, and 27 February 2018 at the Woodlupine Community Centre. There were no attendees on 12 February. The second workshop received ten attendees, and proceeded well with valuable comments received.

The public was also asked for feedback at the Forrestfield Shopping Centre.

All feedback was entered into the engagement website.

The workshop at the Woodlupine Community Centre is shown below:

Responses on Drainage

Drainage Questions

The questions asked about drainage were:

- 22. Drainage pits, kerb and channels (on the side of the road) are working to an acceptable level.
- 23. Stormwater drainage flows where it should (through drain pipes, and along waterways and creeks).
- 24. The amount of water running onto and through properties from storms is acceptable.
- 25. The quality of the water in the drainage system is acceptable, for protecting the natural environment.
- 26. Mosquitos are a problem where I live.

The survey was conducted during summer, so the answers may not reflect opinions during the winter. The nature of drainage is that issues are usually localised, so where one or two properties may be affected by a heavy rainfall event, the wider neighbourhood may not be aware of the problems. There is also a perception issue that when water ponds in the road this is a drainage problem, where the design may be working as expected.

Feedback is summarised as follows:

Question 22: 26% of respondents disagreed, and 64% agreed that drainage was working effectively.

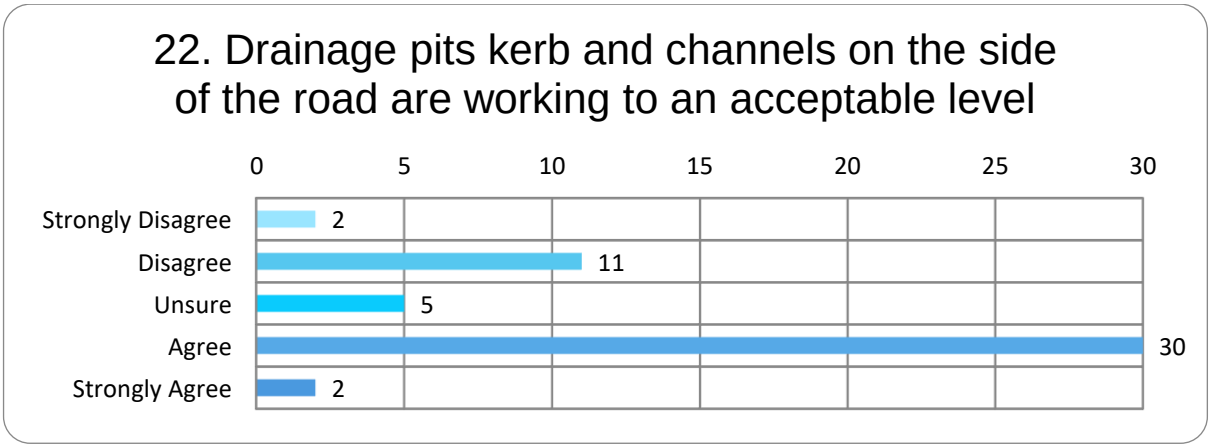
Question 23: 26% of respondents disagreed that stormwater drainage flows where it should. 60% agreed.

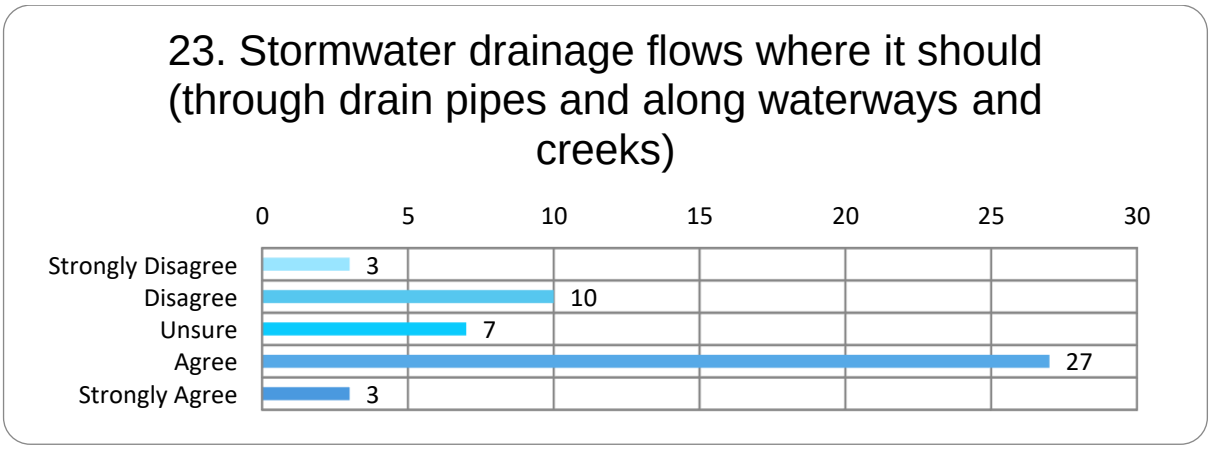
Question 24: 18% of respondents disagreed that the amount of water was acceptable, while 58% agreed.

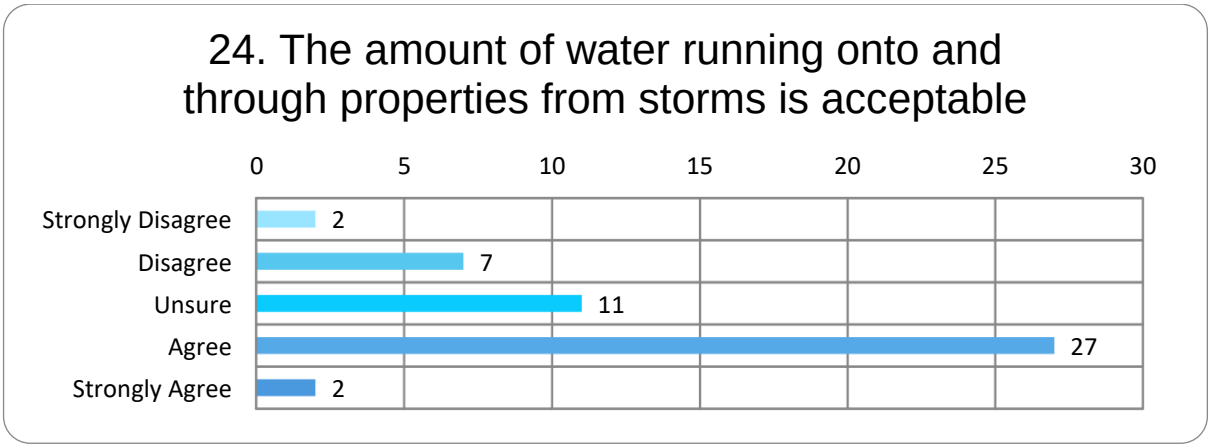
Question 25: 46% of respondents were unsure whether the quality of water in the drainage system was acceptable. This indicates a lack of awareness of the quality of stormwater in the City. 8% disagreed.

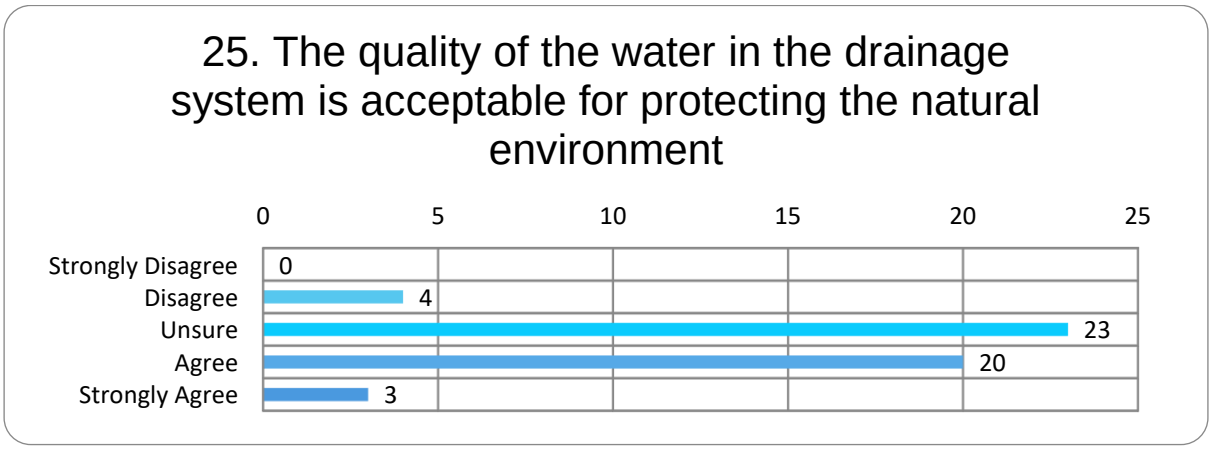
Question 26: Mosquitoes appear to either be a problem or not, with 44% agreeing that they are a problem, and 50% disagreeing.

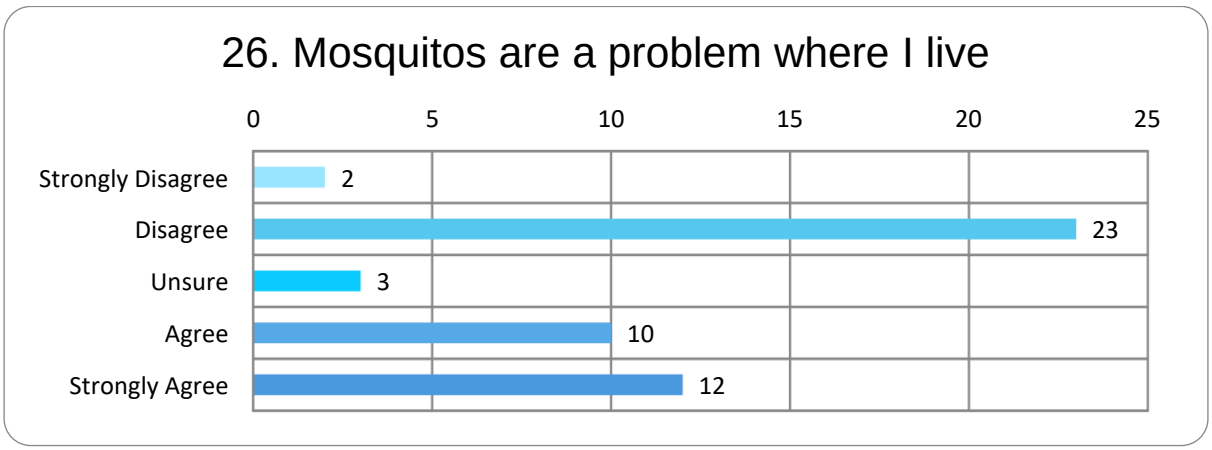
It is worth noting that despite the apparent concerns with drainage, no comments or specific problem sites were given regarding drainage.











Responses on Budget Spend

The question asked was "If you had to allocate all the City's maintenance, renewals, and upgrade budget for these assets, how much budget would you allocate? Enter a percentage against each asset class including Parks and Buildings, so that the total for the five asset classes equals 100%. Please note this includes all major asset classes."

46 of the 50 respondents answered this question. In the following list, the first value is the average, with the following two values in brackets representing the range of responses:

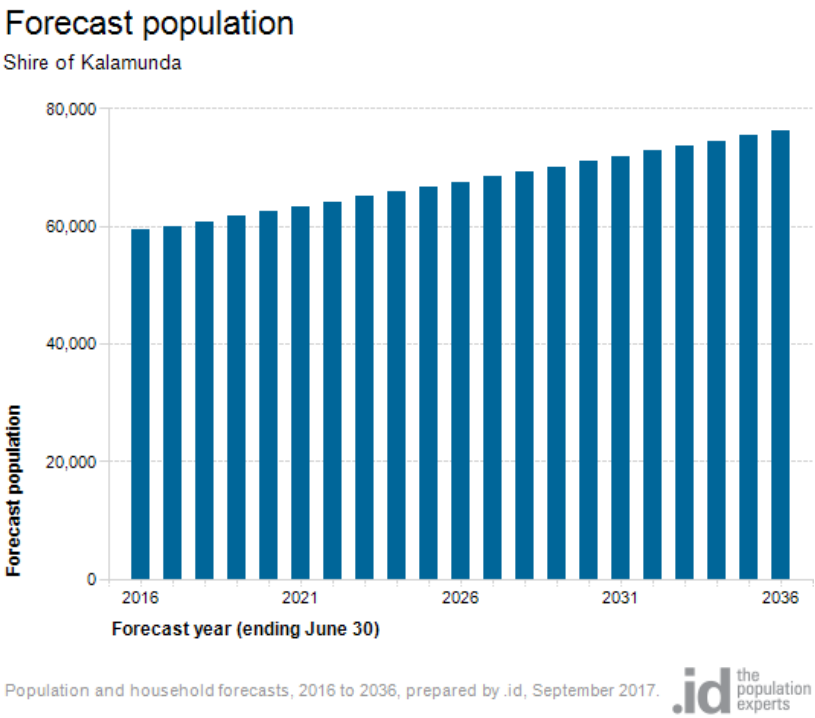
- Roads 28.9% (20% to 40%)
- Footpaths 20.4% (10% to 30%)
- Drainage 14.9% (0% to 20%)
- Parks and Reserves 20.9% (10% to 30%)
- Buildings 16.0% (0% to 25%)

This means that (for example) the average percentage of budget that the community would like to allocate to roads is 28.9%. The responses from individuals ranged from allocating 20% up to allocating 40%. In the workshop, the attendees were shown a slide of the total value of assets in the different asset classes, however no maintenance or renewal expenditure was discussed. No financial information was provided to other respondents, and most respondents are probably not aware of the actual amount that is spent. Consequently the results should be interpreted as indications of preference rather than actual targets.

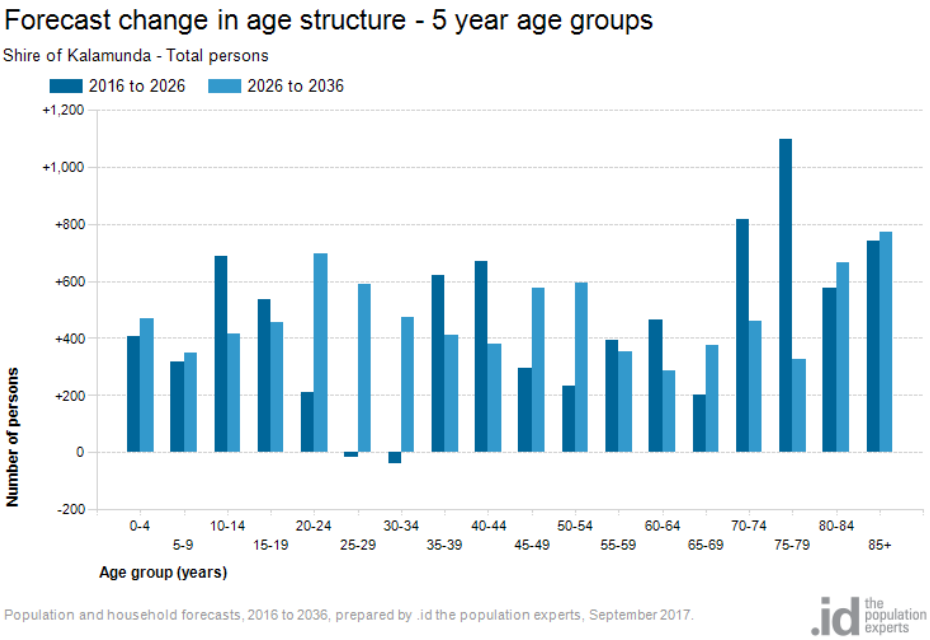
APPENDIX D: POPULATION FORECASTS

The City's demographic information and analysis is provided by .id (http://profile.id.com.au/kalamunda) are based on results from the 2016, 2011, 2006, 2001, 1996 and 1991 Australian Bureau of Statistics Censuses of Population and Housing.

Population forecast to 2036



Age structure forecast



APPENDIX E: STORMWATER MANAGEMENT PLAN

The Stormwater Management Manual for Western Australia (SMMWA) (Department of Water and Swan River Trust, 2007) details how a Stormwater Management Plan (SMP) can be used to manage urban stormwater quantity and quality to protect ecological, social/cultural and economic values.

A Stormwater Management Plan is used to aid with decision making to ensure that;

a. Remedial measures (asset and non-asset) in existing developed areas are undertaken in a cost-effective, integrated and coordinated manner, and
b. Decisions in relation to new development (including redevelopment) are made with the implications for stormwater impacts taken into account.

This will inform the City's Drainage AMP on new, upgrading of drainage assets and maintenance plans.

The SMMWA recommends that stormwater management plans provide objectives for how stormwater should be managed in an area. It also provides a process to manage stormwater in a considered and coordinated manner that targets priority issues. Therefore, a SMP will help to prioritise the City's LTFP for new, upgrading, renewal and maintenance works for drainage assets.

The SMMWA also mentions that a SMP is particularly useful for improving stormwater management in established urban areas, where the land use planning process for individual redevelopment sites is often at an insufficient scale for stormwater management improvement.

The City has many areas that are being developed in stages and the development of a SMP will help to identify the impact of subsequent developments within current catchments.

APPENDIX F: THE CITY OF KALAMUNDA ASSET MANAGEMENT PRACTICES

The City has a dedicated Asset Management (AM) team within its' Asset Services directorate. The AM team is led by the Coordinator Asset Management and reports directly to Manager Asset Planning and Management. The AM team provides many AM services related to the City's infrastructure and community assets such as:

- Maintains the 10-year long tem financial plan for new, upgrades and renewal of assets
- Manages asset registries and inventory information
- Conducts periodic condition inspections and develops budget estimates for capital works
- Maintains asset geographical information
- Conducts asset financial tasks such as asset valuations and capitalisation of works
- Conducts predictive modelling to forecast future renewal demands
- Develops AM Plans

The City's Asset Management Steering Group consisting of the Executive Management team monitors the performance of the City's Asset Management activities and the implementation of actions within the AM Strategy and AM Plans.

The City's current AM Policy and AM Strategy were adopted in September 2016 and July 2017 respectively. The key objective of City's AM Strategy is to achieve a Core Level of maturity (as per International Infrastructure Management Manual) of Asset Management by the end of 2021.

Since 2010, the City has used the Assetic suite of software as its main Corporate AM system to maintain all asset inventory and financial information (within Assetic myData) and to conduct predictive modelling (within Assetic Predictor).

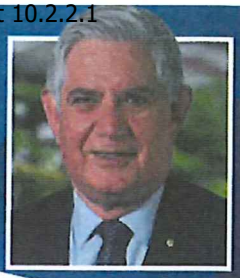
The City's Assetic myData system currently holds the data for all Infrastructure Assets, Land and Buildings.

In 2014, the Australian Road Research Board (ARRB) conducted an independent assessment of 14 of the most commonly available AM systems in Australia. The Assetic systems were rated to have the availability of all technical and non-technical assessment criteria (Figure A).

The City's asset geographical information is managed using open source software QGIS and data is accessible to the entire organization through the corporate Geographical Information System (GIS) Intrapmaps. The City also uses Intramaps Roam software and a suite of hardware for its' mobile data collection.

The City uses predictive modelling to estimate long term financial needs by forecasting the asset renewal demand. This process involves modelling of several service level and funding scenarios applicable to different asset classes to identify optimum funding levels.

Figure A, Source: ARRB, 2014, *Asset Management System Review*



KEN **WYATT MP**
Your Federal Member for **Hasluck**

5 February 2018

Ms Rhonda Hardy
Chief Executive Officer
City of Kalamunda
P O Box 42
KALAMUNDA WA 6926

Email to: rhonda.hardy@kalamunda.wa.gov.au

Dear Rhonda

Further to our meeting on Monday 18 December 2017 with yourself, Dennis Blair and Rob Korenhof - City of Kalamunda, Stephen Price - Member for Forrestfield and Alison Reid from Hawaiian's Forrestfield. We discussed the progress of the design concept for upgrade works at the intersection of Hale Road and Woolworths Drive, Forrestfield.

At this meeting we were advised the design concept was at 15%; community consultation was to be scheduled and a booth was to be set up in the Hawaiian's Shopping Centre in January 2018. I also suggested Main Roads WA should consider reducing the speed limit to 40kph from Strelitzia Avenue to Woolworths Drive and that a seagull lane with traffic calming be introduced to streamline traffic into Hale Road.

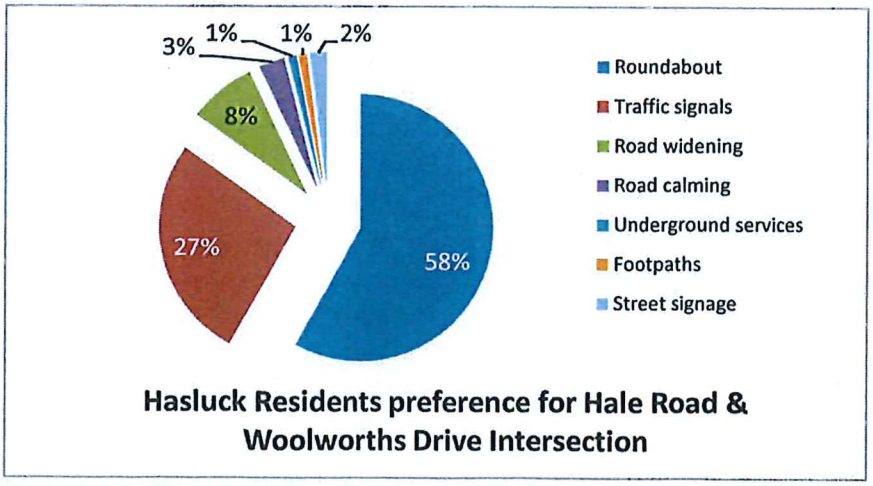
As you know, I am keen to see this project underway as soon as possible and I am very interested to know what stage the design concept is at currently; what option will be selected and if the timeline for the detailed design concept is on schedule to be finalised by June 2018.

As previously advised, I engaged with the local community to seek their views on the best design for the intersection. I have now analysed the results and wish to share with you that overwhelmingly, the first preference (58%) was to upgrade the intersection into a roundabout. I trust this result will be taken into consideration.

I look forward to receiving an update on this project.

Yours sincerely

HON KEN WYATT MP
MEMBER FOR HASLUCK



Hasluck Residents preference for Hale Road & Woolworths Drive Intersection

HALE ROAD / WOOLWORTHS DRIVE INTERSECTION AND COMMERCIAL ACCESS REVIEW

Porter
Consulting Engineers

Summary Report

Hale Road / Woolworths Drive Intersection and Hale Road Commercial Access Review

Porter

Report Prepared For:

CITY OF KALAMUNDA

Report Prepared By:

PORTER CONSULTING ENGINEERS
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CANNING BRIDGE WA 6153
Phone: (08) 9315 9955
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Job No:	17-10-115
Date:	6 June 2018
Our Ref:	R06.18
Rev:	D
Checked:	

CONTENTS

1.0 INTRODUCTION

The City of Kalamunda has commissioned Porter Consulting Engineers to investigate potential improvement options along Hale Road between Woolworths Drive and Strelitzia Avenue, Forrestfield.

The two key objectives are to:

- improve traffic safety at the Hale Road and Woolworths Drive intersection; and
- rationalise the existing Commercial access/egress crossovers that front Hale Road thereby improving the safety and efficiency of traffic flow along Hale Road.

Hale Road is classified a District Distributor A Road under the Main Roads WA's *Functional Road Hierarchy*. This classification of road "carrys traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining properties."

The intersection of Hale Road and Woolworths Drive is an uncontrolled T-junction with Hale Road as the major road having priority over Woolworths Drive. There are eight crossovers along this 310m length of Hale Road.

The study area is as shown in **Figure 1.**

Figure 1: Hale Road, Woolworths Drive to Strelitzia Avenue

2.0 TRAFFIC MODELLING

Three different treatments for the intersection of Hale Road and Woolworths Drive were identified at the outset of the project. These treatments in addition to the existing layout were modelled using SIDRA to determine the respective operating conditions. To summarise these include:

- Existing Layout – Channelisation
- Modified Channelisation
- Roundabout
- Traffic Signals

With the proximity of Woolworths Drive to other intersections to the east along Hale Road of Hanover Street and Strelitzia Avenue those intersections are included in this assessment with respect to their impacts on design options and the analysis of traffic movements.

2.1 Existing Traffic Volumes

A video survey of traffic movements was undertaken on Monday, 30 October 2017 between the hours of 3.00pm and 5.30pm covering the intersections of Woolworths Drive/Hale Road and Hanover Street/Hale Road. From the survey data the pm peak hour was determined to be 4.30pm-5.30pm.

In addition to the turning movement counts at each of these intersections, a count of the number of weaving movements between the two intersections was undertaken. Approximately 60% or 29 vehicles turning left from Hanover Street then turned right into Woolworths Drive. Whilst 51% or 36 vehicles turning left out of Woolworths Drive then turned right into Hanover Street. The maximum observed queue length of 2 vehicles was observed for the right turn into Hanover Street while the maximum observed queue length of 4 vehicles was observed for the right turn into Woolworths Drive.

Appendix A includes a copy of the peak hour intersections turning movement count.

Traffic volumes for Strelzia Avenue and Hale Road was sourced from the Main Roads WA SCATS database for the week 16 - 22 October 2017.

2.2 SIDRA Analysis

SIDRA modelling analysis for the pm peak hour was performed for each of the intersection improvement options proposed for Hale Road/Woolworths Drive. The existing layout and the intersection improvements were modelled as a network that includes the adjacent intersections to the east along Hale Road being Hanover Street (approximately 40m east of Woolworths Drive) and the existing traffic signals at Strelitzia Avenue (approximately 240m east of Woolworths Drive).

The analysis was performed for the pm peak hour for two timeframes being:
- 2017 – existing volumes
- 2027 – existing volumes + 10%

A summary of the results for the various intersection treatments are outlined in **Tables 1** and **2.**

The SIDRA summary output results of the analysis are contained in **Appendix B.**

Existing Layout – 2017

At present the T-intersection of Hale Road and Woolworths Drive has a channelisation treatment on Hale Road that provides a short right turn pocket on Hale Road for the right turn into Woolworths Drive. No right turn lane is provided on Hale Road to accommodate the right turns into the Hanover Street T-intersection. The T-intersection of Hale Road and Strelitzia Avenue is signalised.

The intersection of Hale Road and Woolworths Drive currently operates with a maximum degree of saturation (DOS) of 0.644. The highest average delay is associated with the right turn out of Woolworths Drive onto Hale Road at 31 seconds with a Level of Service (LOS) of D. The highest 95% queue length is along Woolworths Drive being 28m or 4 vehicles. The 95% queue along Hale Road waiting to turn right into Woolworths Drive is 4-5m or 1 vehicle. (The observed maximum queue length was 4 vehicles although this was not typical). In this instance the predicted increase in the future scenario will be added to the observed max queue).

The intersection of Hale Road and Hanover Street currently operates with a highest DOS of 0.362. The highest average delay is associated with the right turn from Hanover Street into Hale Road at 14 seconds with a LOS B. The highest 95% queue length is along Hale Road turning right being 10m or 1-2 vehicles.

The signalised intersection of Hale Road and Strelitzia Avenue currently operates with a highest DOS of 0.664 and a cycle time of 40 seconds. The highest average delay is associated with the right turn out of Strelitzia Avenue onto Hale Road at 24 seconds with a LOS C. The highest 95% queue length is along Hale Road being 35m or 5 vehicles. The queue along Hale Road (west) towards Hanover Street is 31m or 4-5 vehicles.

Channelisation Option – 2017

An option to provide a short right turn lane along Hale Road for vehicles turning right into Hanover Street has been modelled. The results suggest that the highest average delay may increase slightly by 5 seconds to 19.9 seconds whilst the queue length may decrease 1m to 8.2m. The short right turn lane will allow for some storage of the longest queue observed at 2 vehicles, although this was not typical.

Roundabout Options – 2017

A single-lane roundabout in accordance with the Public Transport Authority standard geometry at the intersection of Hale Road and Woolworths Drive would operate with a highest DOS of 0.607 (compared to the exiting DOS of 0.644). The highest average delay is still associated with the right turn out of Woolworths Drive onto Hale Road however the delay decreases from the existing layout by 20 seconds to 10.4 seconds (30.5 existing) with a LOS B. The highest 95% queue length is along Hale Road (west) being 44m or 6-7 vehicles. The queue along Hale Road waiting to turn right into Woolworths Drive is 26m or 3-4 vehicles. Minor operational improvements associated with introducing a roundabout are suggested by banning the right turn movement into Hanover Street.

Traffic Signal Option – 2017

The intersection of Hale Road/Woolworths Drive under traffic signal control would operate at a highest DOS of 0.861 (compared to the exiting DOS of 0.644) with a cycle time of 50 seconds. The highest average delay is associated with turning movements from Woolworths Drive with a delay of 35.6 seconds with a LOS D. The highest 95% queue length is along Hale Road (west) being 66m or 9-10 vehicles. The queue along Hale Road (east) is 54m or 7-8 vehicles. This would block the intersection of Hanover Street but be well clear of Strelitzia Avenue.

The cycle time of the existing signals at the intersection of Hale Road and Strelitzia Avenue is altered under this option from 40 seconds to 50 seconds to co-ordinate with the new signals at Woolworths Drive. The signalised intersection of Hale Road and Strelitzia Avenue will operate with a highest DOS of 0.968 (compared to the exiting DOS of 0.664). The highest average delay is associated with the right turn out of Strelitzia Avenue onto Hale Road of 52 seconds (compared to the existing average delay of 24 seconds) with a LOS D. The highest 95% queue length is along Strelitzia Avenue being 57m or 8 vehicles. The queue along Hale Road (west) towards Hanover Street is 42m or 6 vehicles.

Existing Layout– 2027

In 2027 the intersection of Hale Road/Woolworths Drive can be predicted to operate with a highest DOS of 0.859 (compared to the exiting DOS of 0.644). The highest average delay is associated with the right turn out of Woolworths Drive onto Hale Road of 54 seconds (compared to the existing 31 seconds) with a LOS F. The highest 95% queue length is along Woolworths Drive being 56m (compared to the existing 28m). The queue along Hale Road waiting to turn right into Woolworths Drive remains at approximately 1 vehicle unaltered from the 2017 analysis. The observed longest queue length was 4 vehicles although this was not typical and only occurred on a few occasions. It is estimated that this observed queue length would typically remain unaltered and would be less for the majority of the peak.

The intersection of Hale Road and Hanover Street will operate with a highest DOS of 0.404 (compared to the existing 0.362). The highest average delay is associated with the right turn from Hanover Street into Hale Road of 16 seconds with a LOS C. The highest 95% queue length is along Hale Road turning right being 13m or 2 vehicles.

The signalised intersection of Hale Road and Strelitzia Avenue is likely to operate with a highest degree of saturation of 0.730 and a cycle time of 40 seconds. The highest average delay is associated with the right turn out of Strelitzia Avenue onto Hale Road of 25 seconds (compared to the existing 24 seconds) with a LOS C. The highest 95% queue length is along Hale Road west being 40m (compared to the existing 35m).

Roundabout Options – 2027

A single-lane roundabout at the intersection of Hale Road/Woolworths Drive would operate with a highest DOS of 0.678 (compared to 0.859 if the existing layout with 2027 traffic volumes). The highest average delay is still associated with the turning movements out of Woolworths Drive onto Hale Road however the delay decreases from the existing layout 2027 by 7 seconds to 47.1 seconds (54.1 existing layout with 2027 traffic volumes) with a LOS D. The highest 95% queue length is along Hale Road (west) being 55m or 7-8 vehicles. The queue along Hale Road waiting to turn right into Woolworths Drive is 31m or 4-5 vehicles. Minor operational improvements are

suggested with the banning of the right turn movement into Hanover Street.

Traffic Signal Option -2027

The intersection of Hale Road/Woolworths Drive under traffic signal control would operate with a highest DOS of 0.947 (compared to 0.859 if the existing layout with 2027 traffic volumes). The cycle time is 50 seconds. The highest average delay is associated with the turning movements from Woolworths Drive with a delay of 47.1 seconds with a LOS D. The highest 95% queue length is along Hale Road (west) being 72m or 10 vehicles. The queue along Hale Road (east) is 63m or 9 vehicles. This would block the intersection of Hanover Street but be well clear of Strelitzia Avenue.

The cycle time of the existing signals at the intersection of Hale Road and Strelitzia Avenue is altered under this option from 40 seconds to 50 seconds to co-ordinate with the new signals at Woolworths Drive. The signalised intersection of Hale Road and Strelitzia Avenue will operate with a highest degree of saturation of 0.913 (compared to 0.730 for the existing layout with 2027 traffic volumes). The highest average delay is associated with the right turn out of Strelitzia Avenue onto Hale Road of 41 seconds (25 seconds existing layout with 2027 traffic volumes) with a LOS D. The highest 95% queue length is along Strelitzia Avenue being 54m or 7-8 vehicles. The queue along Hale Road (west) towards Hanover Street is 49.5m.

Table 1: SIDRA Analysis Comparison for 2017 Options

	Max DOS	Max. Ave. Delay	Max LoS	Movement with Max Delay	Highest 95% Queue Length	Queue Length toward adjacent intersection
Existing Layout						
Woolworths Dr	0.644	30.5	D	Right from Woolworths Dr	28.1m Woolworths	4.3m Hale Rd (east)
Hanover St	0.362	14.4	B	Right from Hanover St	9.9m Hale Rd (west)	9.9m Hale Rd (west)
Strelitzia Ave Cycle Time = 40secs	0.664	24.3	C	Right from Strelitzia Ave	35.4m Hale Rd (west)	35.4m Hale Rd (west)
Channelisation with right turn pocket for Hanover St and Woolworths Dr						
Hanover St	0.304	19.9	B	Right from Hanover St	8.2m Hale Rd (west)	8.2 Hale Rd (west)
Roundabout at Woolworths Dr / Hale Rd – Option A						
Woolworths Dr	0.607	10.4	B	Right from Woolworths Dr	43.8m Hale Rd (west)	25.7m Hale Rd (east)
Hanover St	As per the existing layout					
Strelitzia Ave Cycle Time = 40secs	As per the existing layout					
Roundabout at Woolworths Dr / Hale Rd – No Right Turn (NRT) into Hanover St – Option B						
Woolworths Dr	As per roundabout option					
Hanover St	0.324	7.8	A	Left from Hanover St	2.2m Hanover St	0m - NRT Hale Rd (west)
Strelitzia Ave Cycle Time = 40secs	As per the existing layout					
Traffic Signals at Woolworths Dr / Hale Rd						
Woolworths Dr Cycle Time = 50secs	0.861	35.6	D	Left/right from Woolworths Dr	65.8m Hale Rd (west)	53.6m Hale Rd (east)
Hanover St	0.269	5.7	A	Left from Hanover St	1.3m Hanover St	0m - NRT Hale Rd (west)
Strelitzia Ave Cycle Time = 50secs	0.968	52.0	D	Right from Strelitzia Ave	56.7m Strelitzia Ave	42.0m Hale Rd (west)

Table 2: SIDRA Analysis Comparison for 2027 Options

	Max DOS	Max. Ave. Delay	Max LoS	Movement with Max Delay	Highest 95% Queue Length	Queue Length towards adjacent intersection
2027						
Existing Layout						
Woolworths Dr	0.859	54.1	F	Right from Woolworths Dr	55.5m Woolworths	5.4m Hale Rd (east)
Hanover St	0.404	16.8	C	Right from Hanover St	13.2m Hale Rd (west)	13.2m Hale Rd (west)
Strelitzia Ave Cycle Time = 40secs	0.730	25.4	C	Right from Strelitzia Ave	40.4m Hale Rd (west)	40.4m Hale Rd (west)
Channelisation with right turn pocket for Hanover St and Woolworths Dr						
Hanover St	0.335	23.9	C	Right from Hanover St	10.9m Hale Rd (west)	10.9m Hale Rd (west)
Roundabout at Woolworths Dr / Hale Rd – Option A						
Woolworths Dr	0.678	10.9	B	Right from Woolworths Dr	54.6m Hale Rd (west)	31.2m Hale Rd (east)
Hanover St	As per the existing layout					
Strelitzia Ave Cycle Time = 40secs	As per the existing layout					
Roundabout at Woolworths Dr / Hale Rd – No Right Turn (NRT) into Hanover St – Option B						
Woolworths Dr	As per roundabout option					
Hanover St	0.357	8.2	A	Left from Hanover St	2.6m Hanover St	0m - No right turn Hale Rd (west)
Strelitzia Ave Cycle Time = 40secs	As per the existing layout					
Traffic Signals at Woolworths Dr / Hale Rd						
Woolworths Dr Cycle Time = 50secs	0.947	47.1	D	Left/right from Woolworths Dr	72.4m Hale Rd (west)	62.6m Hale Rd (east)
Hanover St	0.295	6.0	A	Left from Hanover St	1.5m Hanover St	0m - No right turn Hale Rd (west)
Strelitzia Ave Cycle Time = 50secs	0.913	40.6	D	Right from Strelitzia Ave	53.5m Strelitzia Ave	49.5m Hale Rd (west)

2.3 Modelling Summary and Conclusion

The existing channelisation layout operates satisfactorily from an operational perspective both with current traffic volumes and in 2027 with a 10% increase in traffic. The intersection of Woolworths Drive and Hale Road in 2027 is approaching capacity with a degree of saturation of 0.859 whilst Hanover Street and Strelitzia Avenue have additional spare capacity with degrees of saturation of 0.404 and 0.730 respectively. Under this option the queue lengths along Hale Road are minimised with the queues occurring on the side roads. Observed queues during the survey suggest that the longest queue length on Hale Road turning right into Woolworths Drive is 4 vehicles. The analysis suggests negligible increase in queue lengths (1m) along Hale Road between 2017 and 2027 hence the longest observed queue length is not expected to alter significantly.

From an operational perspective the roundabout option has a lower highest degree of saturation in 2017 and 2027 compared to the existing layout. (0.678 compared to 0.859 for 2027). Queue lengths along Hale Road are estimated to be 55m (west) and 31m (east). The queue to the east extends to Hanover Street but typically does not block this intersection so Hanover Street remains fully operational.

The coordinated traffic signals along Hale Road at Woolworths Drive and Strelitzia Avenue operate satisfactorily under the existing traffic volumes and with a 10% increase. Under the 2027 estimated volumes the maximum degree of saturation is 0.947 and 0.913 respectively. The highest delays are experienced on the minor legs of the intersections being Woolworths Drive and Strelitzia Avenue with typically a LOS D under both the 2017 and 2027 volumes. The queue lengths estimated are manageable on the road network.

All options operate satisfactorily based on 2017 volumes and 10% growth. The channelisation and traffic signal option start to near their maximum capacity under the 2027 scenario whilst comparatively the roundabout option has additional spare capacity.

3.0 CONCEPT PLANS

Whilst three intersection improvements were identified and subsequently modelled using SIDRA i.e. channelisation, traffic signals and a roundabout with slight variations of these treatments have produced a total of five options as follows:

- Channelisation – Option A - one approach lane on Woolworths Drive
- Channelisation – Option B - two approach lanes on Woolworths Drive
- Traffic Signals
- Roundabout –Option A - Hanover Street All Movements
- Roundabout – Option B – Hanover Street Left Turns Only

There are concept layout drawings of these options included in **Appendix C**.

3.1 Channelisation – Option A - one approach lane on Woolworths Drive

This channelisation option requires the least construction work and has the lowest complexity of the five options. Potential service relocations are minimised by maintaining existing kerblines where possible. In order to maintain existing kerblines as much as possible only one approach lane on Woolworths Drive is provided. A seagull treatment has been incorporated at the Hanover Street intersection which allows for a more formalised storage of vehicles on Hale Road and provides vehicles with a marked lane to queue out of the eastbound through lane.

The proximity of Crossover 2 servicing lots 76, 72 and 70 Hale Road to Hanover Street creates traffic flow and safety issues. It is proposed that this crossover be relocated with the proposed channelisation works.

The existing "Shopping Centre" pylon sign installed within the central median has a significant presence to drivers along the Woolworths Drive approach. Consideration should be given to relocation of this sign away from the island which will assist in creating a more "open" environment with improvement to visibility for vehicles exiting Woolworths Drive.

This channelisation layout maintains the major flow along Hale Road thereby reducing disruption to the priority movements. Woolworths Drive being the minor road, it is subject to delays whilst drivers seek gaps in the Hale Road traffic stream.

3.2 Channelisation –Option B - two approach lanes on Woolworths Drive

This option was developed after discussion with the City of Kalamunda in order to improve the intersection capacity and reduce queue lengths compared to that of option A.

The construction works and complexity of this channelisation Option B increase compared to Option A due to the additional widening works required on Woolworths Drive. The layout separates the left and right turning vehicles over a short length hence reduces the queue length and delays on this approach compared to Option A.

Whilst the operational conditions can be improved through the introduction of a second approach

lane there are potential safety issues. There is the potential for right turning vehicles to obstruct sight lines between left turning vehicles and eastbound traffic. In this situation with the reduced sight lines left turning drivers can misread gap length, become impatient and take risks when entering the eastbound traffic stream.

The proximity of Crossover 2 still creates traffic flow and safety issues.

The road widening for this option is proposed on the western side of Woolworths Drive in order to avoid service relocation on the northeast corner of the intersection. This option will require land acquisition to accommodate the road widening on Woolworths Drive.

3.3 Traffic Signals

The traffic signal option requires some road construction work in addition to the traffic signals installation. As per the channelisation option, potential service relocations are minimised by maintaining existing kerblines where possible.

Hanover Street is proposed to be closed to right turn movements due to its proximity to Woolworths Drive. The proximity of Crossover 2 servicing lots 76, 72 and 70 Hale Road to Hanover Street is no longer an issue however the width and geometry of the crossover creates additional safety issues that should be addressed. This is discussed further within the report.

The existing "Shopping Centre" pylon sign installed within the central median will be required to be removed and relocated in order to install traffic signals and maintain visibility to the signal aspects.

Traffic signals will add some interruption to the major traffic flow along Hale Road which will result in queuing. There is likely to be a change in existing crash patterns at the intersection i.e. increase in rear-end collisions compared to right angle crashes.

3.4 Roundabout Option A – Hanover Street Left Turns Only

Option A for the roundabout restricts Hanover Street movements to left turns only. Prohibiting right turn movements into Hanover Street improves traffic flow by reducing the potential for queuing on Hale Road behind a vehicle stopped to turn right.

As per the channelisation and traffic signal options, Crossover 2 creates safety issues that need to be addressed in conjunction with the intersection treatment improvement.

The roundabout impacts numerous services and in particular the services located within the northeast corner of the intersection and the overhead low voltage and high voltage power lines. The roundabout is the most complex geometry to construct and will require the purchase of abutting private land as the existing road reserve is inadequate.

3.5 Roundabout Option B – All Movements at Hanover Street

Option B for the roundabout is primarily the same as Option A except it allows all vehicle movements into and out of Hanover Street. Option A is the preferred option as maintaining access to Hanover Street is an added risk.

4.0 CRASH HISTORY

A study of the recent crash history for the section of Hale Road from Woolworths Drive to Strelitzia Avenue has been conducted for the five year period to the end of December 2016 from the Main Roads Western Australia Integrated Road Information System (IRIS) crash database. There was a total of 44 crashes within the extracted data which is summarised as follows:

- 5 crashes at the intersection of Woolworths Drive and Hale Road: 4 right angled crashes and 1 object hit. 1 crash required medical attention and the remaining 4 involved property damage.
- 3 midblock crashes between Woolworths Drive and Hanover Street: 2 rear end crashes and 1 right angle crash. All involved property damage only.
- 7 crashes occurred at the intersection of Hanover Street and Hale Road: 4 right angled crashes; 1 right turn through; 1 side swipe; 1 reversing/or rolling in traffic. 1 crash involved hospitalisation with the remaining 6 involving property damage.
- 18 midblock crashes between Hanover Street and Strelitzia Avenue: 9 right angle crashes; 5 side swipe same direction crashes; 2 rear end crashes; 1 right turn through and 1 rear end. 1 crash involved hospitalisation, 1 required medical attention and the remaining 16 were property damage only.
- 11 crashes occurred at the intersection of Strelitzia Avenue and Hale Road: 8 right turn through crashes; 2 rear end crashes and 1 side swipe same direction.

5.0 RATIONALISATION OF CROSSOVERS

There are eight crossovers located along the 310m section of Hale Road adjacent to the commercial properties extending from the west of Woolworths Drive to Strelitzia Avenue. Including the Woolworths Drive access makes nine connections to Hale Road. Hale Road by its definition as a "*District Distributor A road*" is intended to facilitate the flow of traffic and typically provide only limited access. However, the historic nature and progressive commercial developments that front Hale Road are such that individual properties are typically serviced via their own crossover.

Moving forward from the historical development of properties which resulted in a crossover for each individual property, there is now the opportunity to rationalise the number of crossovers on Hale Road through the creation of a de-facto service road by joining their carparks. Benefits to adjoining businesses, Hale Road traffic flow and the local community could all be realized. Those benefits include:

- Less disruption to through traffic along the section of Hale Road;
- Increased flow of traffic/trade between commercial properties fronting Hale Road via the pseudo "service road";
- Commercial properties patronage effectively have access to all crossovers along Hale Road;
- Decrease in potential vehicle conflict points along Hale Road; and
- Less vehicle /pedestrian conflict points as less crossovers.

5.1 Crossover 1 – 82 Hale Road

This is the only crossover located along Hale Road, west of Woolworths Drive. The crossover primarily services no. 82 Hale Road. Access is also possible from a crossover on Woolworths Drive primarily to service no. 88 Hale Road. The Hale Road crossover should be maintained as there are no other crossovers within close proximity and it assists with reducing demand at the Hale Road and Woolworths Drive intersection.

Photo 1: Crossover 1 along Hale Road

5.2 Crossover 2 – 76, 72, 70 Hale Road

There are a number of safety and design issues associated with the crossover located directly adjacent to Hanover Street that services no. 76, 72 and 70 Hale Road referred to as Crossover 2. The crossover is approximately 6 wide with minimal radii. There is a power pole located on the western side on the kerbline that restricts the entrance radius into the driveway. There is evidence of this in that the kerbline immediately adjacent to the pole is damaged. Vehicles were observed to almost come to a stop to negotiate the driveway especially when a vehicle was stopped on the crossover waiting to exit onto Hale Road.

The proximity of this crossover to Hanover Street is also undesirable and influences the flow of traffic along Hale Road.

Crossover 3 is located some 40m to the east of Crossover 2. Due to the existing safety issues it is proposed that Crossover 2 be closed.

Photo 2: Crossover 2 along Hale Road showing power pole proximity

5.3 Crossover 3 – 70, 72 Hale Road

Crossover 3 is located immediately opposite the McDonalds drive thru exit. Crossover 3 has a width of approximately 8m and the ingress and egress movements are clearly defined with pavement marking. The McDonalds drive through waiting bays are located immediately to the east of Crossover 3. This presents some safety issues. The McDonalds drive thru waiting bays are currently located next to Crossover 2. McDonalds staff walking a customer's order to a waiting vehicle is required to stand at the driver's window effectively within the Crossover 2 exit pathway and subsequently exposed to moving vehicles.

Photo 3: Crossover 3 along Hale Road with the Waiting Bays

An opportunity exists to improve this existing safety issue created by the current design. The closure of Crossover 3 and Crossover 2 and the creation of a new crossover in between has merit. The closure of Crossover 3 allows for the creation of 2 waiting bays opposite the store. The existing pedestrian zebra crossing pavement marking can then be used by staff to safely access vehicles within the waiting bays.

5.4 Crossover 4 – 64, 64B Hale Road

Crossover 4 services no.64 and 64B Hale Road also known as Hale Road Tavern and the Forrestfield TAB. At present Crossover 4 is located approximately 20m from Crossover 3. No existing safety issues have been identified with this crossover. It is located at the start of the left hand turn lane for the signalised intersection of Hale Road and Strelitzia Avenue.

The closure of Crossover 3 would increase the distance to this crossover to approximately 50m.

Crossover 4 is located some 20m to the west of Crossover 5. One of these crossovers should be closed due to their close proximity to each other. The concept plans show the closure of Crossover 4.

5.5 Crossover 5 – 60 Hale Road

Crossover 5 services no. 60 Hale Road which includes Red Rooster and Subway. At present crossover 5 is located approximately 20m from Crossover 4. No existing safety issues have been identified with this crossover. It is located within the left hand turn lane for the signalised intersection of Hale Road and Strelitzia Avenue.

Crossover 5 is located some 20m to the east of Crossover 4. One of these crossovers should be closed due to their close proximity to each other.

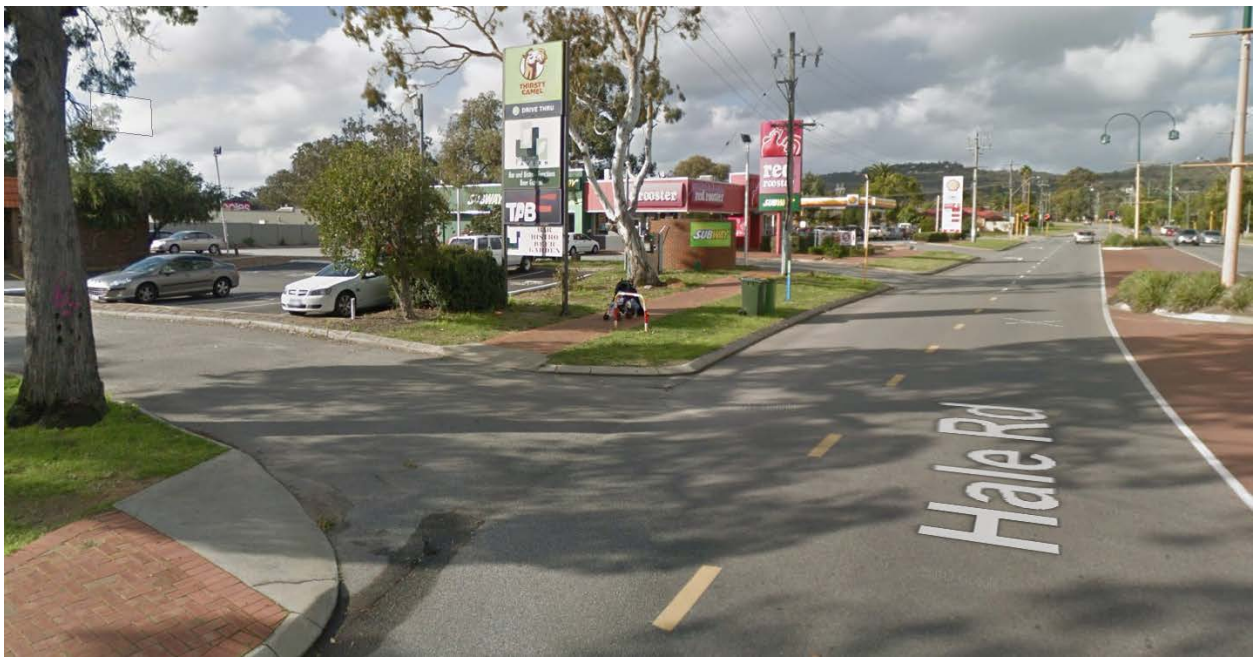


Photo 4: Crossover 4 along Hale Road with Crossover 5 and 6 in the background

Photo 5: Crossover 5 along Hale Road

5.6 Crossover 6 – Red Rooster Drive through exit, Crossover 7 – 2 Strelitzia Avenue

The drive through exit is immediately adjacent to the crossover that services the Coles Express Service Station. This is not ideal and creates potential safety issues as vehicles exiting from the Red Rooster Drive Through may be interpreted by approaching drivers to be on the wrong side of crossover 7.

The concept proposes to realign the drive through exit into the Coles Express Service Station thereby eliminating the potential for driver confusion.

Photo 6: Crossover 6 and 7 along Hale Road

5.7 Crossover 8 – 2 Strelitzia Avenue

Crossover 8 is the eastern most crossover along Hale Road servicing the Coles Express Service Station. The crossover is within the "traffic signal zone" and as such may lead to vehicles cutting through the site to avoid stopping on a red signal.

It is unknown if this crossover is required by the refueling tankers in order to exit the site. If not required it is suggested that this crossover should be closed. Vehicles that exit the site using this crossover enter the left hand turn lane of the signals requiring them to turn left into Strelitzia Avenue. This being the case vehicles are likely to exit the site directly onto Strelitzia Avenue and not do it via the traffic signals. Due to the proximity of the traffic signals, vehicles using exiting the crossover are not permitted to cross the barrier line to travel eastbound along Hale Road.

Photo 8: Crossover 8 along Hale Road

5.8 Priorities and Staging for Crossover Rationalisation

As previously outlined it is recommended that Crossover 2 be closed in conjunction with the intersection improvements works. Further rationalisation of the driveway along Hale Road can be implemented in stages based on their priorities or in line with when relevant approvals from land owners for associated easements are secured. **Table 3** provides an outline of the driveway works priority and possible stages.

Table 3: Priorities and Staging for Rationalisation of Driveway Works

Item	Recommendation	Priority	Staging
Crossover 1	Remain Open	-	-
Crossover 2	Close & Relocate	High	Intersection Works
Crossover 3	Close	High	2
Reconfigure Tavern and TAB carpark		Medium	2
Crossover 4	4 or 5 to close	Low	4
Crossover 5	4 or 5 to close	Low	4
Crossover 6	Close	Medium	3
Crossover 7	Remain	Medium	3
Crossover 8	Close	Low	5

6.0 SERVICE RELOCATIONS

Service Authorities have been contacted and provided with the concept design plans and their advice requested for the design of potential service relocations and order of magnitude of costs. Due to the conceptual nature of the design, the contacted Service Authorities have provided limited (where any) advice and no indicative costs.

Therefore, based on Porter's previous experience with the relocation of services for other detailed design projects the following provisional amounts are suggested. These sums are based on a desktop review and would be subject to detailed design and Authority quotations on services changes. Service Authorities, in particular Western Power will need to confirm if the relocation of services as proposed by the concept designs are feasible. **Table 4** summarises the indicative only service relocation order of costs.

Table 4: Indicative Service Relocation Costs

Service Relocation	Channelisation Options A and B	Traffic Signals	Roundabout Options A and B
Gas Valve Hale Rd	-	-	$5,000
Gas Internal Connection Woolworths Dr	$5,000	$5,000	$5,000
Communication Pits and Lowering	$10,000	$10,000	$30,000
Water Main Banding/Protection 1065S	$10,000	$10,000	$20,000
Water Main Value/Fire Service	$5,000	$5,000	$5,000
Western Power Switchboards/Pillars	-	-	$15,000
Western Power LV Frame	-	-	$40,000
Western Power LV and HV Power Poles	-	-	$130,000
Contingency (25%)	$7,500	$7,500	$62,500
Total	**$37,500**	**$37,500**	**$312,500**

The creation of a bus embayment has also been proposed within the westbound carriageway, west of Strelitzia Avenue. It is noted that there is a 1065 dia. steel water main on the southern side of Hale Road. The location of this service would need to be further investigated to establish the impact of the proposed widening to accommodate a bus embayment and whether this treatment would be cost prohibitive. In that instance, an alternative lesser effective option may be the use of line marking to better define the road geometry and the bus stop.

7.0 CONSTRUCTION ESTIMATES

Preliminary order of cost estimates for each of the intersection treatments have been developed. For the purpose of the cost estimate both roundabout options are assumed to be the same indicative order of cost. A cost for the modifications proposed to rationalise the driveways along Hale Road as well as a possible bus embayment treatment have also been estimated.

These cost estimates are order of magnitude only and will ultimately depend on a detailed design. Known construction rates where available have been used in conjunction with rates documented in *"Rawlinsons, Australian Construction Handbook, 2017"*.

Table 5 provides a summary of the order of costs including a breakdown of the various elements costed. Note that these construction costs do not include service relocations and land acquisition costs. Those are reviewed separately.

Table 5: Order of Magnitude Construction Cost Estimates

Construction Costs	Channelisation Option A	Channelisation Option B	Traffic Signals	Roundabout Options A and B
Hale Road / Woolworths Drive	**$322,200**	**$400,200**	**$486,700**	**$582,300**
Preliminaries	$19,500	$19,500	$21,500	$29,500
Clearing and Disposal	$32,900	$37,900	$31,800	$47,200
Roads and Paths	$115,600	$165,600	$124,200	$241,700
Drainage	$25,000	$25,000	$25,000	$45,000
Traffic Signals	-	-	$105,000	-
Landscaping	-	-	-	$9,000
Street Lighting	$28,000	$28,000	$28,000	$28,000
Construction Contingency Sum (25%)	$56,000	$69,000	$84,000	$101,000
Detailed Design Fee (15%)	$33,150	$41,400	$50,400	$60,100
Contract Administration (5%)	$11,050	$13,800	$17,000	$21,000
Bus Embayment near Strelitzia Ave	**$77,000**			
Rationalisation of Driveways	**$150,000**			

8.0 LAND ACQUISITION

There are various land acquisition requirements in order to provide sufficient road reserve for each of the options. Indicative Land acquisition plans have been prepared based on the concept designs. The road reserve on Hale Road has been based on maintaining a minimum verge width of not less than 3m and a minimum of 1.8m verge width is assumed to be suitable for Woolworths Drive.

The land requirements for each of the options are as listed below.

Channelisation Option A = 9.31m^2
Channelisation Option B =107.1m^2
Traffic Signals =13.2m^2 (Refer below comment)
Roundabout Option A =274.55m^2
Roundabout Option B =274.55m^2

Additional land may also need to be acquired on Woolworths Drive under the traffic signal option to potentially meet any Main Roads WA traffic signals maintenance area requirement.

A copy of the Land Acquisition Plans are contained in **Appendix D**.

An internet search for commercial land for sale in this area did not result in sufficient information to form an estimate of average per square metre land pricing. It is therefore suggested that the City consider engaging a Land Valuer to provide appropriate advice should land purchase costings be desired.

9.0 SUMMARY OF COSTS

Table 6 provides a summary of the total costs for comparison purposes. Please note that as land acquisition costs have not been able to be included an indication i.e. low, medium and high with respect to each option is provided.

Table 6: Summary of Costs for Options

Cost Items	Channelisation Option A	Channelisation Option B	Traffic Signals	Roundabout Options A and B
Service Relocation	$37,500	$37,500	$37,500	$312,500
Construction	$322,200	$400,200	$486,700	$582,300
Land Acquisition	low	medium	low	High
Total	**$359,700**	**$437,700**	**$524,200**	**$894,800**

All estimates exclude land acquisition.

10.0 MULTI CRITERIA ASSESSMENT

Each option has been assessed with respect to various criteria. Evaluation criteria were formulated so that a balanced evaluation of the options could be achieved. Each evaluation criteria was assessed for each option as either low, medium or high. Evaluation criteria were broken down into three categories being: Operational Issues, Engineering Costs and Safety and Social Issues. These categories were subsequently weighted in order to assign a greater importance to various criteria. In summary, the operational issues has a weighting of 30%, engineering costs 55% and safety/social issues 15%. **Table 7** outlines the various evaluation criteria, rating, weighting and the overall ranking of each option.

The final ranking determines the preferred option balancing all of the evaluation criteria. Based on this overall assessment the channelisation options are the two most preferred treatments. This assessment not only takes into account the operational issues but engineering costs. For instance from an operational perspective Channelisation Option B is preferred. This is also the reason why this option was developed i.e. to improve Option A. However when engineering costs are taken into consideration as is the case with the multi criteria assessment then Channelisation Option A is preferred over Channelisation Option B.

Considering all criteria the roundabout options rate the least. Whilst operationally a roundabout scores high it comes at a high cost of construction and complexity and, is unable to be constructed in the short term due to the time it will take to negotiate and purchase land. The traffic signals and roundabout options also have very high impacts on the abutting residential properties.

Table 7: Multi Criteria Assessment of Intersection Treatments

	Channelisation Option A	Channelisation Option B	Traffic Signals	Roundabout Option A and B	Weightings
Operational Issues					**30%**
Sidra LOS	Low	Medium	Medium	High	15%
Queuing	Medium	Medium	High	Medium	15%
Engineering Costs					**55%**
Construction Costs	Low	Medium	High	High	25%
Maintenance Costs	Low	Low	High	Medium	5%
Service Relocation	Low	Low	Low	High	10%
Complexity	Low	Low	Medium	High	5%
Land Acquisition Costs	Low	Medium	Low	High	10%
Safety and Social Issues					**15%**
Sight Lines	Low	Low	Medium	Medium	5%
Pedestrian Facilities/Safety	Medium	Medium	High	Low	5%
Noise	Low	Low	High	High	2.5%
Landscaping	Medium	Medium	Low	Medium	2.5%
Overall Ranking	**1**	**2**	**3**	**4 Option B 5 Option A**	

11.0 STAKEHOLDER CONSULTATION

Stakeholder Consultation for the project involved the completion of a questionnaire. The questionnaire was developed to ascertain what issues were seen as most important by the Stakeholders along Hale Road between Woolworths Drive and Strelitzia Avenue and, the subsequent traffic improvement at Hale Road/Woolworths Drive they considered would best address those concerns.

The non-residential landowners and businesses adjacent to this section of Hale Road were consulted. A total of 20 businesses were identified with 9 questionnaires completed. The questionnaire was also posted to the non-residential landowners. Face to face interview surveys using the questionnaire were conducted with the staff at these businesses or a copy left for completion where it was not able to be completed on the day. The interview surveys were undertaken on Thursday 22nd February, 2018. Feedback was also sought regarding potential access modifications along Hale Road which was not specifically covered in the questionnaire.

The nine businesses that completed the questionnaire included:

- 60 Hale Road – Red Rooster – Staff
- 64 Hale Road – Hale Tavern – Business Manager
- 64 Hale Road – TAB – Business Manager
- 72 Hale Road – Chinese Restaurant – Business Manager
- 4/76 Hale Road – Friendlies Chemist - Staff
- 3/76 Hale Road – Mead Physio Group - Staff
- 78 Hale Road – KFC – Staff
- 1/ 82 Hale Road – Forrestfield Radiology – Staff
- 2/82 Hale Road – Jetts – Staff

Face to face interview surveys using the questionnaire were conducted with the residents on Friday 23rd February, 2018. Where residents were not available, a copy of the questionnaire was left in their letterbox for completion and return. A total of 15 residents were identified with 2 questionnaires completed.

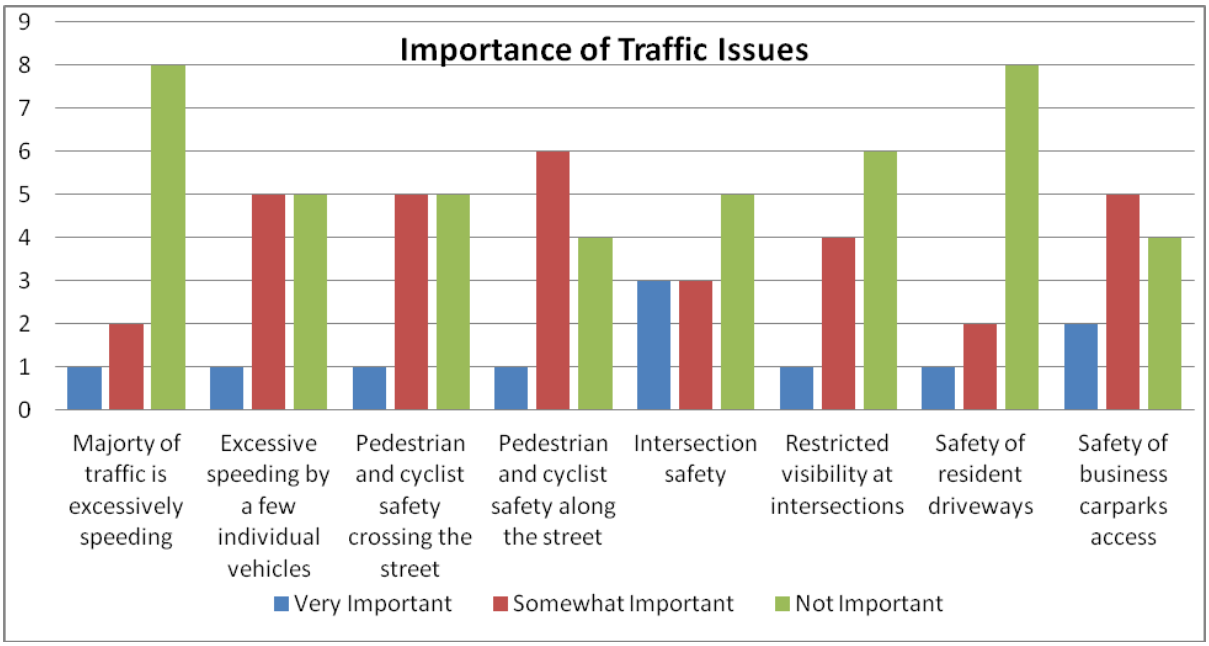
Stakeholders were asked to rate various traffic issues and list the locations where these were a concern along Hale Road (refer **Graph 1**). Of particular interest were the following comments:

- 5 out of the 11 stakeholders mentioned that intersection safety was a concern at Woolworths Drive.
- 3 out of 11 stakeholders mentioned that safety of the crossover immediately adjacent to Hanover Street was a concern. In particular, the width being too narrow for two vehicles to use simultaneously i.e. in/out and the proximity of the power pole.

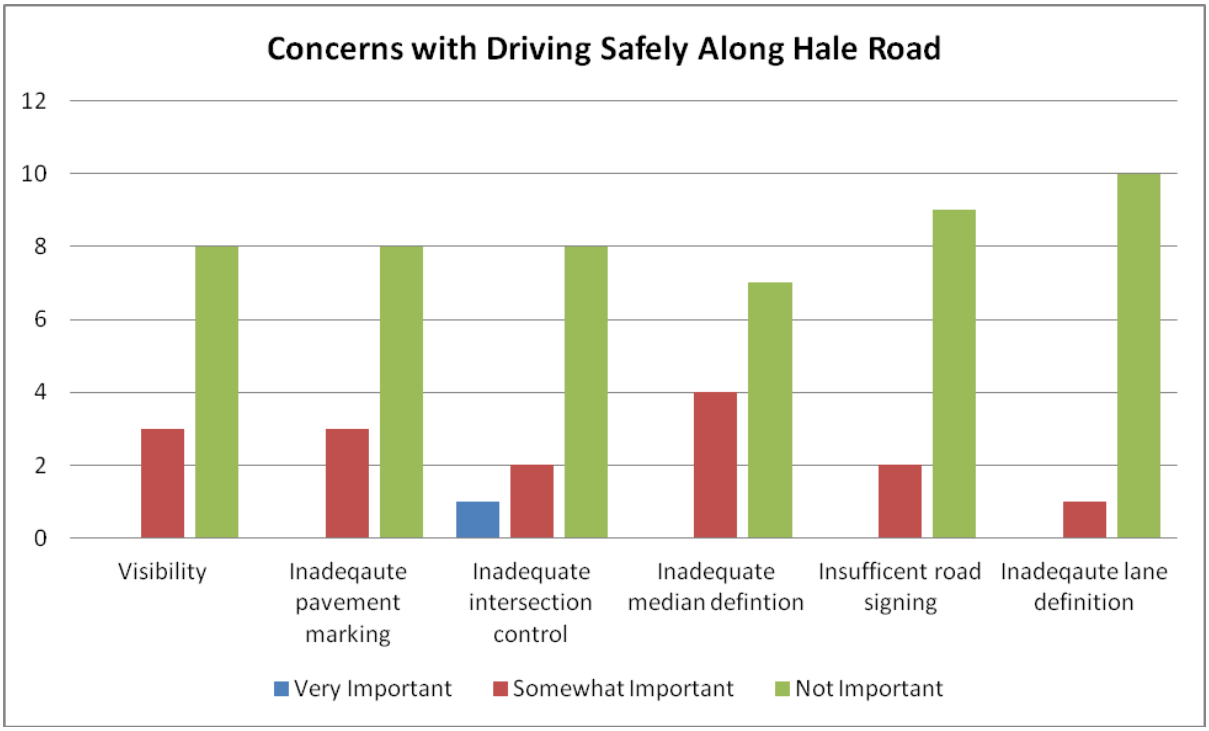
Stakeholders were asked what level of concern they had in regard to driving safely along Hale Road with respect to various issues such as visibility, pavement markings, intersection control, lane and median definition and road signing (refer **Graph 2**) In the majority of cases where there was a concern it related to the intersection of Woolworths Drive at Hale Road.

With respect to vulnerable road users such as physically handicapped, school children and the elderly, it was raised that there are a number of children that cross Hale Road near Hanover Street

due to the proximity of the Forrestfield Primary School. Also, elderly were stated as crossing Woolworths Drive as patrons to various businesses either side of Woolworths Drive.

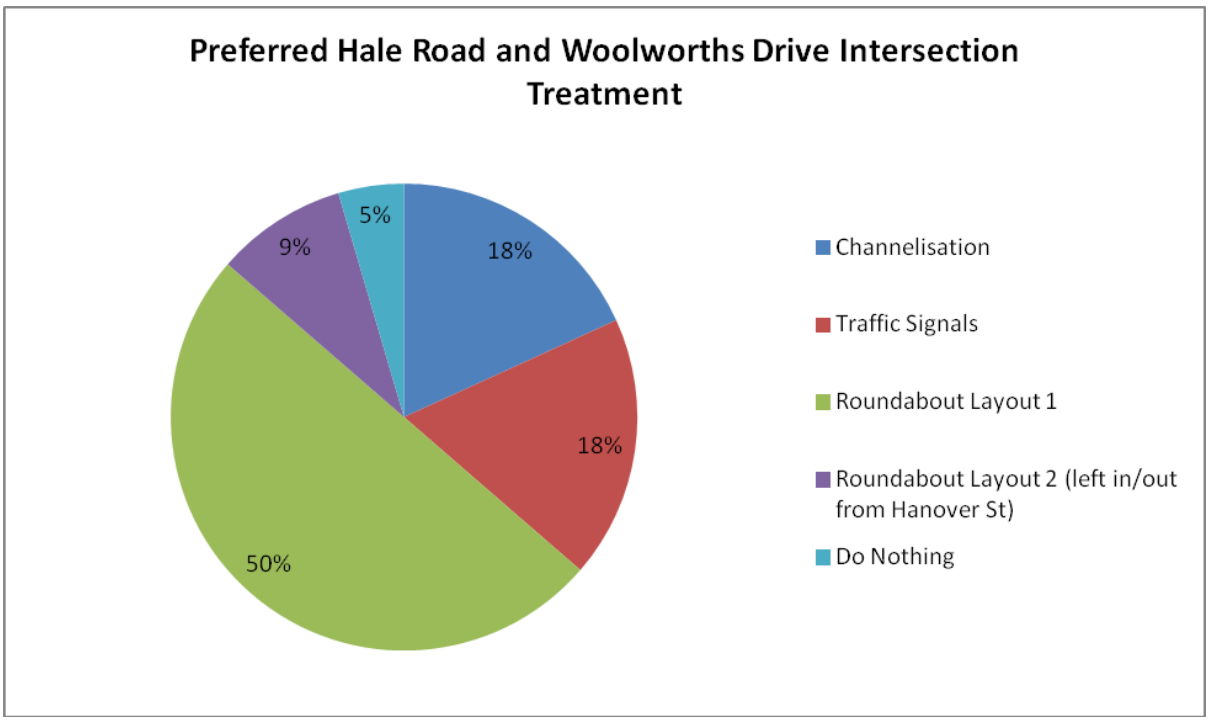


Graph 1: Importance of Traffic Issues



Graph 2: Concerns with Driving Safely Along Hale Road

Four options were presented as a proposed treatment at the intersection of Hale Road and Woolworths Drive. These being: Channelisation, Traffic Signals, Roundabout Layout 1 and Roundabout Layout 2 (left in/out only at Hanover Street). Stakeholders were also given the opportunity to propose an alternative treatment in which one respondent proposed a "do nothing" option.



Graph 3: Preferred Hale Road and Woolworths Drive Intersection Treatment

After the face to face interview surveys with businesses, a discussion with respect to the rationalisation of driveways along Hale Road occurred. Some potential access modifications were presented with feedback as follows:

- General support in the relocation of the crossover immediately adjacent to the Hanover Street intersection largely due to the existing issues with the width of the crossover, the proximity of the power pole and congestion created near the Hanover Street intersection.
- Concern was raised with respect to the closure of the driveway that currently aligns with the Hale Road tavern drive through outlet.
- The City has received a formal response on behalf of McDonalds Australia with respect to the access modifications. Concern was raised about the easement arrangements that have taken place privately between 70 and 72 Hale Road and the associated costs.

ADDENDUM 1

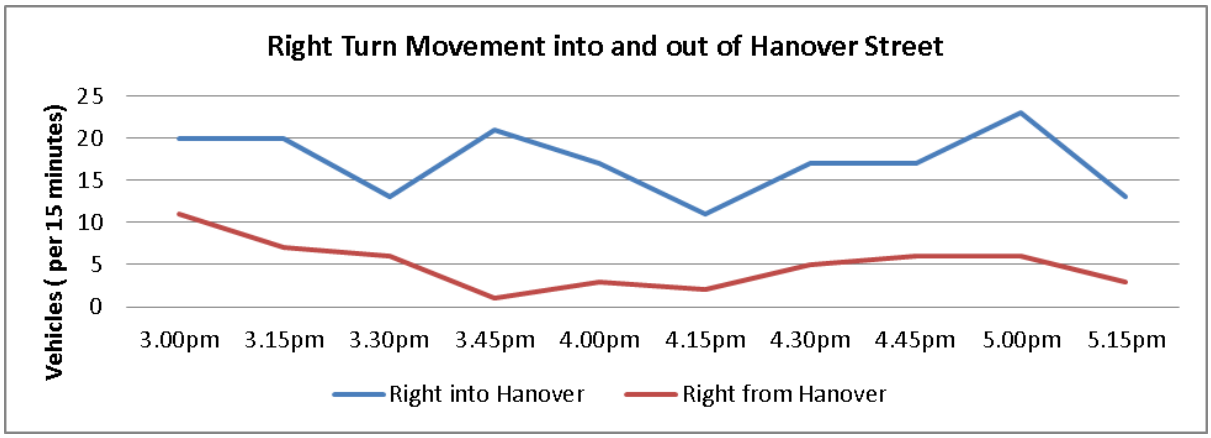
Hanover Street Discussion

Under the channelisation options the right turn traffic movements in and out of Hanover Street can be accommodated through the provision of a short right turn lane to minimise disruption to the Hale Road through traffic.

Under the traffic signal option right turn movements are prohibited due to operational and safety issues associated with the traffic signals.

From an operational perspective the removal of right turn traffic movements at Hanover Street is also preferred be included when associated with the installation of the roundabout proposals i.e. Option B. The removal of the right turn movements within close proximity to the roundabout improves safety and traffic flow along the eastbound departure leg of the roundabout.

Intersection turn counts recorded a total of 20 vehicles per hour turning right from Hanover Street into Hale Road and 70 vehicles per hour turning right into Hanover Street from Hale Road during the overall road network peak period of 4.30pm-5.30pm. Graph 4 below shows the number of vehicles per 15 minutes undertaking a right turn movement between the survey period of 3.00pm to 5.30pm.



Graph 4: Right Turn Movements into and out of Hanover Street

Figure 2 shows likely routes for eastbound vehicles should the right turn movements be prohibited at Hanover Street. Vehicles turning right onto Hale Road wanting to travel eastbound along Hale Road may easily use Mallow Way to turn right onto Hale Road with a minimum of alteration to their travel distance. Eastbound vehicles wanting to turn right from Hale Road into Hanover Street are likely to incur increased travel distances. Those vehicles may turn right into either Fife Street or Mallow Way. Due to the closure of Sussex Road east of Stratheam Road an increased travel route would be required. The re-opening of Sussex Road would result in similar travel distances of routes with or without right turn movements permitted at Hanover Street.

Under the roundabout option B, vehicles desiring to head eastbound from Hanover Street via Hale Road can instead turn left onto Hale Road and then perform a u-turn at the roundabout in order to travel east along Hale Road. This is an easily performed minor deviation.

Hanover Street currently carries in the order of 1,761 vehicles per day (Aug 2016). The volume of traffic on the possible alternative connections to Hale Road i.e. Fife Street carries 447 vehicles per day (Aug 2016), Coburg Street carries 1,240 vehicles per day (Aug 2017) and Mallow Way carries 3,217 vehicles per day (January 2017). These roads are all classified as Local Access roads with the exception of Mallow Way which is classified as Local Distributor road. Access roads typically carry up to a desirable maximum of 3,000 vehicles per day whilst Local Distributors carry up to a desirable maximum of 6,000 vehicles per day.

As Figure 2 demonstrates, the redistribution of the formerly right turning traffic at Hanover Street is likely to be to Fife Street for the right turn from Hale Road and to Mallow Way for the right turn onto Hale Road. The traffic count volumes recorded over the 2.5 hour period is estimated to represent approximately 27% of the daily traffic assumed to be 1,761 vehicles per day. Therefore the 172 vehicles counted over the 2.5hr period turning right from Hale Road into Hanover Road is estimated to equate to 643 vehicles per day. As such the volume of traffic on Fife Street is likely to increase from 447 to 1,090 vehicles per day. This is still below the desirable maximum of 3,000 vehicles per day for a local access road.

Similarly, the 50 vehicles counted over the 2.5hr period turning right from Hanover Street into Hale Road is estimated to equate to 187 vehicles per day. As such the volume of traffic on Mallow Way is likely to increase from 3,217 to 3,404 vehicles per day. This is still below the desirable maximum of 6,000 vehicles per day for a local distributor road.

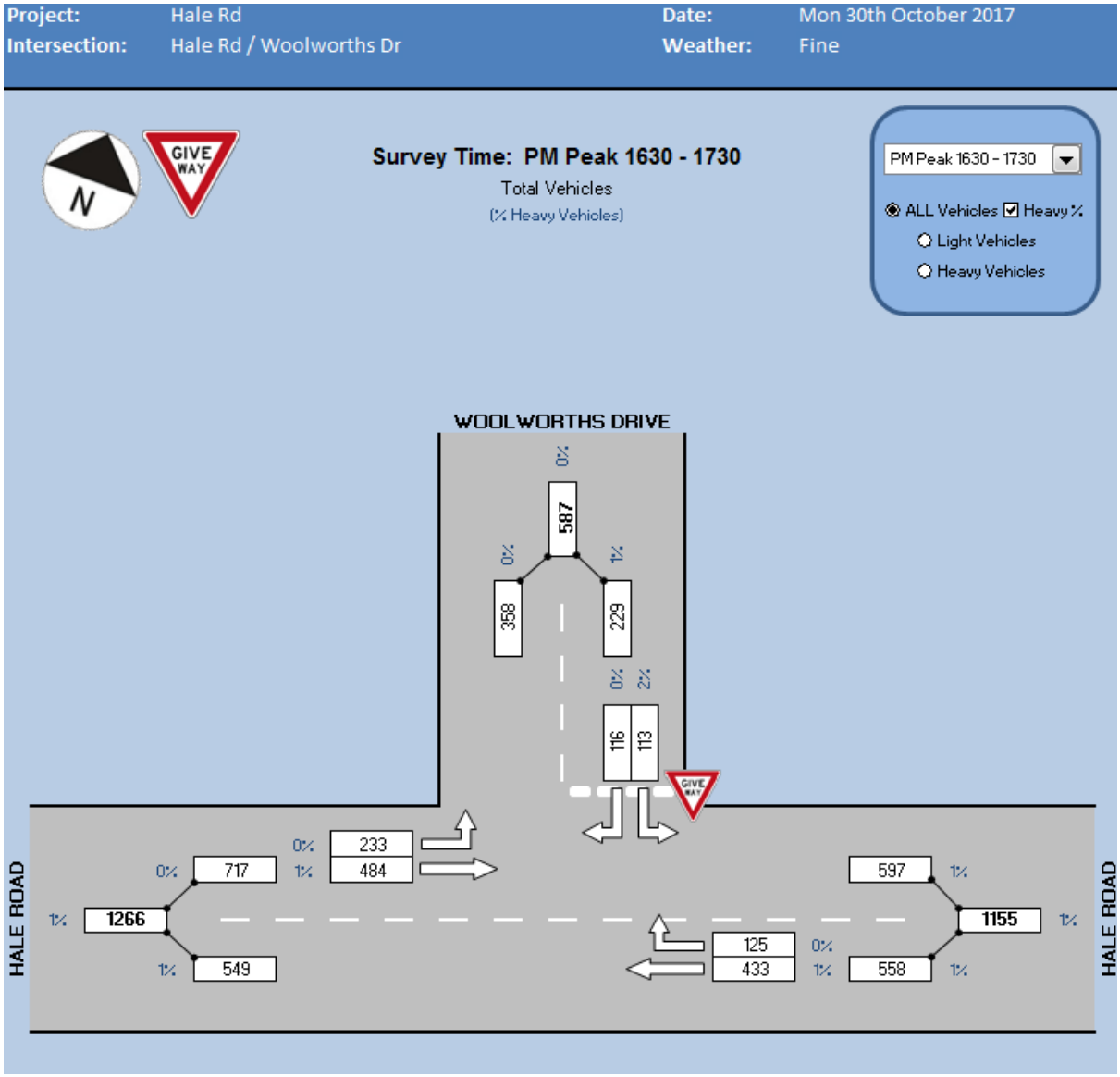
Numerous residential properties will be impacted by this proposed road modification as suggested in **Figure 2**. The further the residential properties are located from Hanover Street the lesser the impact. The closure of Sussex Road east of Strathem Road contributes to this impact. Of particular interest is the impact to traffic movements to/from the Forrestfield Primary School. It is understood from Department of Education information that Hale Road from Tonkin Highway to Hawtin Road forms a boundary of the local catchment area of Forrestfield Primary School with residents on the southern side included. There are two optional catchment areas one located to the northwest on the opposite side of Hale Road and the other to the northeast of the School along Hale Road. These areas have the potential to generate vehicular school trips along Hale Road. On this basis the demand for right turning vehicles into and out of Hanover Street associated with Forrestfield Primary School to/from the place of residence should be minimal as these catchment areas are optional i.e. residents residing in these areas can chose from a number of schools. The demand may increase if a multi-purpose trip to/from school occurs e.g. leave home to drop children at school then on the work via Hale Road and vice versa in the afternoon.

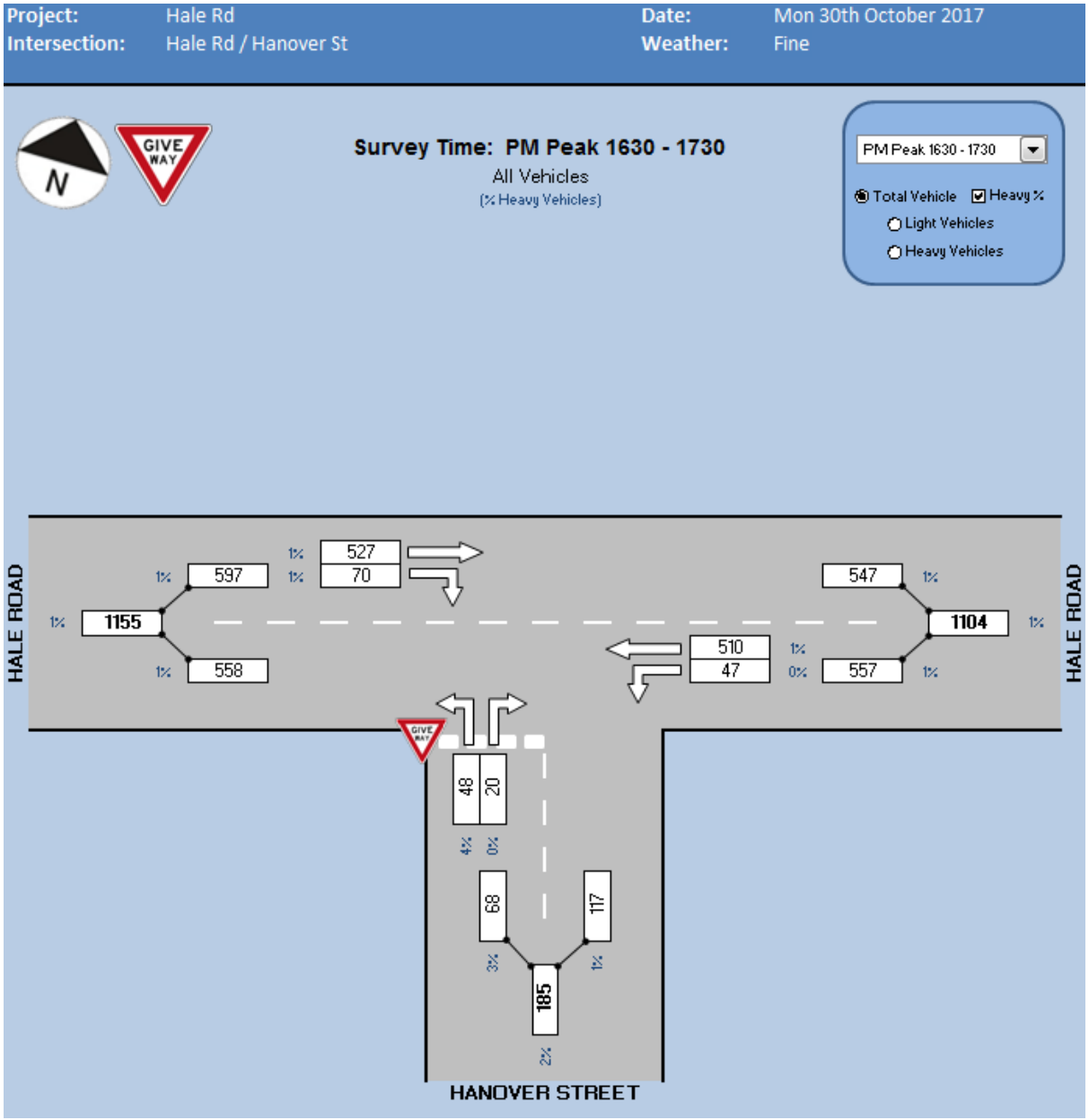
The history of the purpose of the closure of Sussex Road is unknown. Depending on whether the past purpose for the closure remains relevant, consideration by the City of Kalamunda should be given to the re-opening of Sussex Road in conjunction with any restrictions to left turn movements only at Hanover Street.

Based on the traffic volumes predicted using the existing traffic count data, the redistribution of traffic onto the surrounding road network can be readily accommodated in context with the road hierarchy of the respective roads.

Figure 2: Alternative Routes with Hanover Street as left turns only including existing traffic volumes.

APPENDIX A – INTERSECTION TURN COUNTS


Project: Hale Rd
Intersection: Hale Rd / Woolworths Dr
Date: Mon 30th October 2017
Weather: Fine
N
GIVE WAY
Survey Time: PM Peak 1630 - 1730
Total Vehicles
(% Heavy Vehicles)
PM Peak 1630 - 1730
ALL Vehicles
Heavy %
Light Vehicles
Heavy Vehicles
WOOLWORTHS DRIVE
587
358
229
116
113
233
484
717
1266
549
125
433
597
1155
558
HALE ROAD
HALE ROAD


Project: Hale Rd
Intersection: Hale Rd / Hanover St
Date: Mon 30th October 2017
Weather: Fine
N
GIVE WAY
Survey Time: PM Peak 1630 - 1730
All Vehicles
(% Heavy Vehicles)
PM Peak 1630 - 1730
Total Vehicle
Heavy %
Light Vehicles
Heavy Vehicles
HALE ROAD
HALE ROAD
1% 597
1% 527
1% 70
1% 1155
1% 558
547 1%
1104 1%
510 1%
47 0%
557 1%
48
20
4% 0%
68
117
3% 1%
185
2%
HANOVER STREET

APPENDIX B – SIDRA OUTPUTS

APPENDIX C – CONCEPT PLANS

4191-20-12-12/B	Channelisation Option A
4191-20-14-14/B	Channelisation Option B
4191-20-11-11/B	Traffic Signals
4191-20-13-13/B	Roundabout Option A
4191-20-10-10/B	Roundabout Option B
4191-20-15-15/A	Rationalisation of Crossovers

4191-20-12-12/B

WOOLWORTHS DRIVE

PIZZA

JETTS

DRYCLEANERS

X-RAY

LARGE TREES

WATER VALVE/
FIRE SERVICE

LV/HV POWER POLE
RELOCATION/UNDERGROUNDING

GAS VALVE

TELSTRA PITS

FORRESTFIELD
FAMILY
HEALTH
CARE
CENTRE

WATER VALVE

GAS VALVE

POWER CABINETS AND DOME

LV/HV POWER POLE
RELOCATION/UNDERGROUNDING

POWER/COMMS

CHINESE
RESTAURANT

MCDONALDS

REMOVE CROSSOVER

INSTALL NEW CROSSOVER

HALE ROAD

DRAINAGE PIT TO BE MODIFIED

LV/HV POWER POLE

LEFT IN, LEFT OUT ONLY
AT HANOVER STREET

DRAINAGE PITS TO BE MODIFIED

EXISTING WATER MAIN (1065S)
MAY BE IMPACTED

EXISTING WATER MAIN (1065S)
MAY BE IMPACTED

HANOVER STREET

REFER TO INTERSECTION OPTIONS ON DRAWINGS 4191-20-15

PRELIMINARY CONCEPT
FOR DISCUSSION ONLY

LEGEND

- EXISTING OPTIC FIBRE COMMS
- EXISTING TELSTRA
- EXISTING GAS
- EXISTING HIGH VOLTAGE OVERHEAD POWER
- EXISTING UNDERGROUND POWER
- EXISTING LOW VOLTAGE OVERHEAD POWER
- EXISTING WATER MAIN
- EXISTING EXISTING WATER MAIN (1065S)

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TOSAD Pty Ltd ACN 070 097 948 as trustee for the Consulting Engineering Unit Trust trading as Porter Consulting Engineers ABN 78 656 394 385

APPROVAL	NAME	SIGN	DATE
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DRAWN BY: XXXX			
CHECKED BY: XXXX			
APPROVED BY DIRECTOR:			

City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

CHANNELISATION OPTION A

ONE APPROACH LANE ON WOOLWORTHS DRIVE

No.	REVISION	BY	DATE	AUTH
A	ISSUED FOR PUBLIC CONSULTATION	MJV	29/11/17	
B	SERVICES AND NOTES ADDED TO THIS DRAWING.	MJV	11/4/18	

SCALE: 1:500 (50 0 5 10 15 20 25 SCALE IN METRES)
DATUM: AHD
GRID: PCG94
SURVEYED: /2017 ENGINEERING SURVEYOR
DESIGNED: E.WILLIAMS 15/11/2017 INFRASTRUCTURE DESIGN OFFICER
DRAWN: M.VINEY 15/11/2017 INFRASTRUCTURE DESIGN OFFICER
CHECKED: /2017 COORDINATOR PROJECT DESIGN
AUTHORISED: /2017 MANAGER ASSET DELIVERY
APPROVED: /2017 DIRECTOR ASSET SERVICES
Discipline: CI
Structure Code: 420
JOB No. 4191-20

DRAWING-No. 4191-20-12-12/B
-SHEET
/REVISION
ORIGINAL DRG. SIZE A1

PLOTTED: PC35 ; 4/10/2018 15:10:00 ; XXXX ; P:\4191-20\12\DWG\4191-20-12-12.DWG PRN:----

4191-20-14-14/A

REFER TO INTERSECTION OPTIONS ON DRAWINGS 4191-20-15

PRELIMINARY CONCEPT
FOR DISCUSSION ONLY

LEGEND

- Ox — EXISTING OPTIC FIBRE COMMS
- Tx — EXISTING TELSTRA
- Gx — EXISTING GAS
- HVx — EXISTING HIGH VOLTAGE OVERHEAD POWER
- Px — EXISTING UNDERGROUND POWER
- OHx — EXISTING LOW VOLTAGE OVERHEAD POWER
- Wx — EXISTING WATER MAIN
- Wx — EXISTING EXISTING WATER MAIN (1065S)

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DRAWN BY: XXXX			
CHECKED BY: XXXX			
APPROVED BY DIRECTOR:			

City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

CHANNELISATION OPTION B

TWO LANE APPROACH ON WOOLWORTHS DRIVE

No.	REVISION	BY	DATE	AUTH
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AUTHORISED: MANAGER ASSET DELIVERY /2017
APPROVED: DIRECTOR ASSET SERVICES /2017
Discipline: CI
Structure Code: 420
JOB No. 4191-20
DRAWING-No. 4191-20-14-14/A
-SHEET
/REVISION
ORIGINAL DRG. SIZE A1

PLOTTED: PC35 ; 4/10/2018 2023pm ; C:\USERS\MVINEY\DESKTOP\4191-20-14-14A.DWG PRN: ----

4191-20-11-11/B

REFER TO INTERSECTION OPTIONS ON DRAWINGS 4191-20-15

N

WOOLWORTHS DRIVE

PIZZA

JETTS

DRYCLEANERS

X-RAY

LARGE TREES

TELSTRA PITS

FORRESTFIELD FAMILY HEALTH CARE CENTRE

WATER VALVE

GAS VALVE

POWER CABINETS AND DOME

LV/HV POWER POLE RELOCATION/UNDERGROUNDING

POWER/COMMS

CHINESE RESTAURANT

MCDONALDS

INSTALL NEW CROSSOVER

REMOVE CROSSOVER

HALE ROAD

WATER VALVE/ FIRE SERVICE

LV/HV POWER POLE RELOCATION/UNDERGROUNDING

GAS VALVE

DRAINAGE PIT TO BE MODIFIED

LV/HV POWER POLE

LEFT IN, LEFT OUT ONLY AT HANOVER STREET

DRAINAGE PITS TO BE MODIFIED

EXISTING WATER MAIN (1065S) MAY BE IMPACTED

PROPOSED TRAFFIC SIGNALS

EXISTING WATER MAIN (1065S) MAY BE IMPACTED

HANOVER STREET (OVER STREET)

PRELIMINARY CONCEPT FOR DISCUSSION ONLY

LEGEND

- EXISTING OPTIC FIBRE COMMS
- EXISTING TELSTRA
- EXISTING GAS
- EXISTING HIGH VOLTAGE OVERHEAD POWER
- EXISTING UNDERGROUND POWER
- EXISTING LOW VOLTAGE OVERHEAD POWER
- EXISTING WATER MAIN
- EXISTING EXISTING WATER MAIN (1065S)

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APPROVED BY DIRECTOR:			

City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

TRAFFIC SIGNALS

No.	REVISION	BY	DATE	AUTH
A	ISSUED FOR PUBLIC CONSULTATION	MJV	29/11/17	
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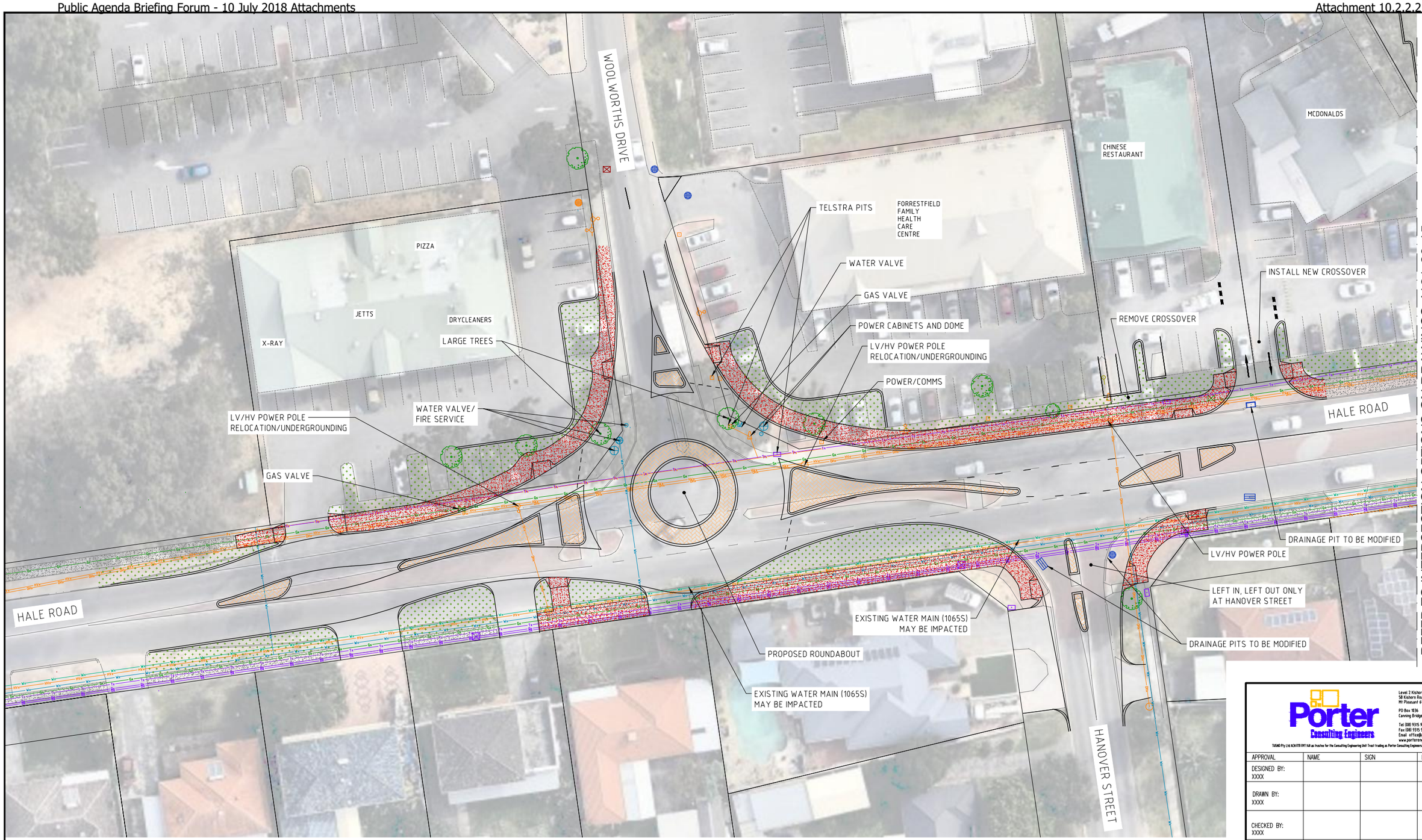
APPROVED: ...../2017 DIRECTOR ASSET SERVICES
Discipline: CI
Structure Code: 420
JOB No. 4191-20

DRAWING-No. 4191-20-11-11/B
-SHEET /REVISION
ORIGINAL DRG. SIZE A1

PLOTTED: PC35 ; 4/10/2018 1:59:36 PM ; \\kalfs1\Projects\4191-20\Drawings\4191-20-11-11B.DWG PRN=----

City of Kalamunda



PRELIMINARY CONCEPT FOR DISCUSSION ONLY

LEGEND

- EXISTING OPTIC FIBRE COMMS
- EXISTING TELSTRA
- EXISTING GAS
- EXISTING HIGH VOLTAGE OVERHEAD POWER
- EXISTING UNDERGROUND POWER
- EXISTING LOW VOLTAGE OVERHEAD POWER
- EXISTING WATER MAIN
- EXISTING EXISTING WATER MAIN (1065S)

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APPROVAL	NAME	SIGN	DATE
DESIGNED BY: XXXX			
DRAWN BY: XXXX			
CHECKED BY: XXXX			
APPROVED BY DIRECTOR:			

City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

ROUNDABOUT OPTION A

HANOVER STREET ALL MOVEMENTS

No.	REVISION	BY	DATE	AUTH
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APPROVED: ...../2017 DIRECTOR ASSET SERVICES
Discipline: CI
Structure Code: 420
JOB No. 4191-20

DRAWING-No. 4191-20-13-13/B
-SHEET
/REVISION
ORIGINAL DRG. SIZE A1

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4191-20-10-10/B

N

WOOLWORTHS DRIVE

PIZZA

JETTS

DRYCLEANERS

X-RAY

LARGE TREES

WATER VALVE/
FIRE SERVICE

LV/HV POWER POLE
RELOCATION/UNDERGROUNDING

GAS VALVE

HALE ROAD

TELSTRA PITS

FORRESTFIELD
FAMILY
HEALTH
CARE
CENTRE

WATER VALVE

GAS VALVE

POWER CABINETS AND DOME

LV/HV POWER POLE
RELOCATION/UNDERGROUNDING

POWER/COMMS

CHINESE
RESTAURANT

MCDONALDS

REMOVE CROSSOVER

INSTALL NEW CROSSOVER

HALE ROAD

DRAINAGE PIT TO BE MODIFIED

LV/HV POWER POLE

LEFT IN, LEFT OUT ONLY
AT HANOVER STREET

DRAINAGE PITS TO BE MODIFIED

EXISTING WATER MAIN (1065S)
MAY BE IMPACTED

PROPOSED ROUNDABOUT

EXISTING WATER MAIN (1065S)
MAY BE IMPACTED

HANOVER STREET

REFER TO INTERSECTION OPTIONS ON DRAWINGS 4191-20-15

PRELIMINARY CONCEPT
FOR DISCUSSION ONLY

LEGEND

- EXISTING OPTIC FIBRE COMMS
- EXISTING TELSTRA
- EXISTING GAS
- EXISTING HIGH VOLTAGE OVERHEAD POWER
- EXISTING UNDERGROUND POWER
- EXISTING LOW VOLTAGE OVERHEAD POWER
- EXISTING WATER MAIN
- EXISTING EXISTING WATER MAIN (1065S)

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DESIGNED BY: XXXX			
DRAWN BY: XXXX			
CHECKED BY: XXXX			
APPROVED BY DIRECTOR:			

City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

ROUNDABOUT OPTION B

HANOVER STREET LEFT TURNS ONLY

No.	REVISION	BY	DATE	AUTH
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APPROVED: ...../2017 DIRECTOR ASSET SERVICES
Discipline: CI
Structure Code: 420
JOB No.: 4191-20

DRAWING-No.: 4191-20-10-10/B
-SHEET /REVISION
ORIGINAL DRG. SIZE: A1

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4191-20-15-15/A

REFER TO INTERSECTION OPTIONS ON DRAWINGS 4191-20-10 TO 4191-20-14

ROAD TAVERN

RECONFIGURE CAR PARK

TAB

SUBWAY

INSTALL RED ROOSTER WAITING BAYS

REALIGN EXIT

RED ROOSTER

COLES EXPRESS

STRELITZIA AVENUE

EXISTING SERVICES TO BE AVOIDED

FROM

RELOCATE MCDONALDS WAITING BAYS

10

HALE ROAD

6.0m

3.0m

2.0m

HALE ROAD

REMOVE CROSSOVER

EXISTING WATER MAIN (1065S) MAY BE IMPACTED

CONSTRUCT 3m WIDE BUS EMBAYMENT

REALIGN PAVEMENT MARKING

REMOVE CROSSOVER

REMOVE CROSSOVER

ST MARTINS CHURCH

WCWA CANNING FOOTHILLS TRUNK MAIN

PRELIMINARY CONCEPT FOR DISCUSSION ONLY

Porter Consulting Engineers

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CHECKED BY: XXXX			
APPROVED BY DIRECTOR:			

City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

RATIONALISATION OF CROSSOVERS

No.	REVISION	BY	DATE	AUTH
A	ISSUED FOR PUBLIC CONSULTATION	MJV	11-4-18	

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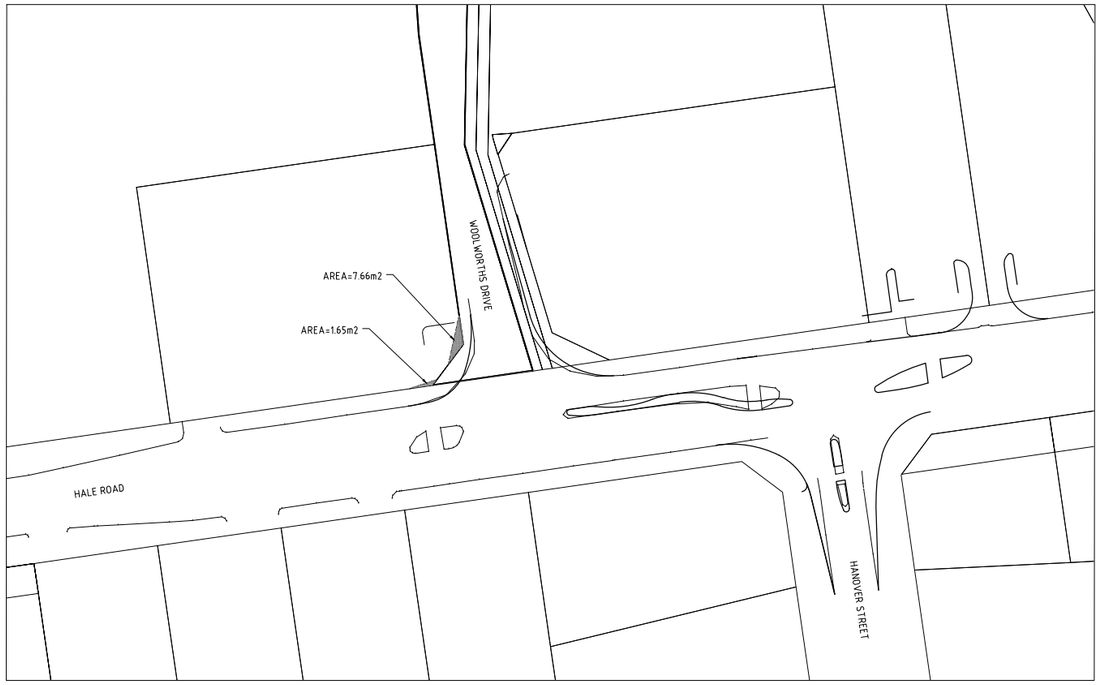
Discipline: CI
Structure Code: 420
JOB No. 4191-20

DRAWING-No. 4191-20-15-15/A
-SHEET
/REVISION
ORIGINAL DRG. SIZE A1

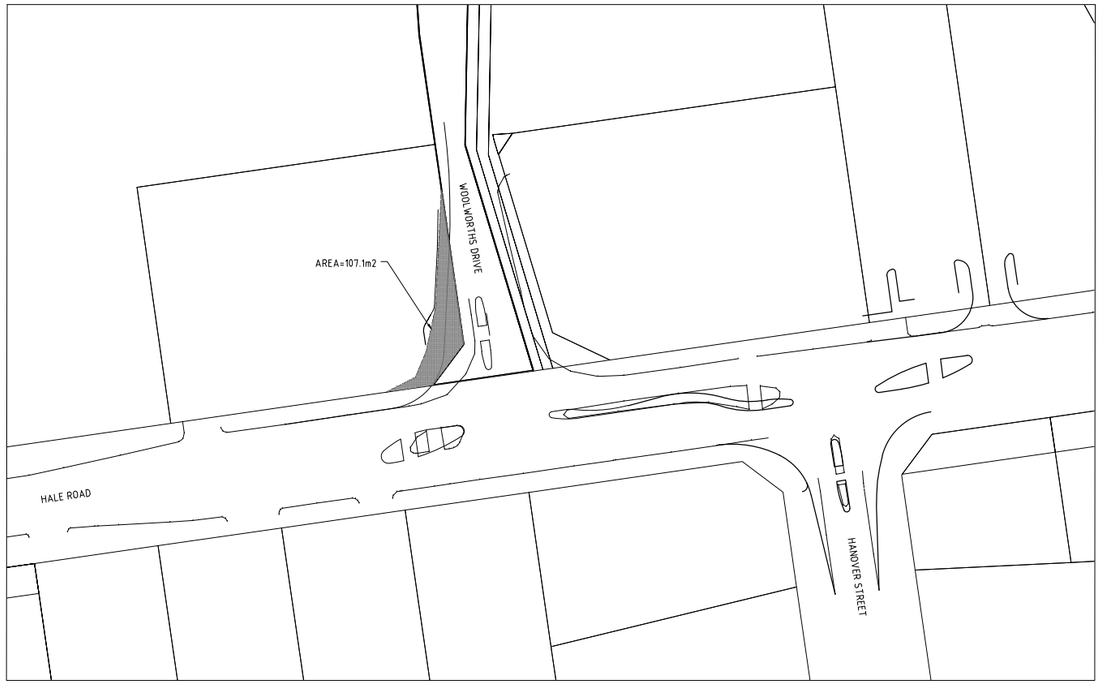
APPENDIX D – LAND ACQUISITION PLANS

4191-20-16-16/A	Land Acquisition Plan Sheet 1
4191-20-17-17/A	Land Acquisition Plan Sheet 2

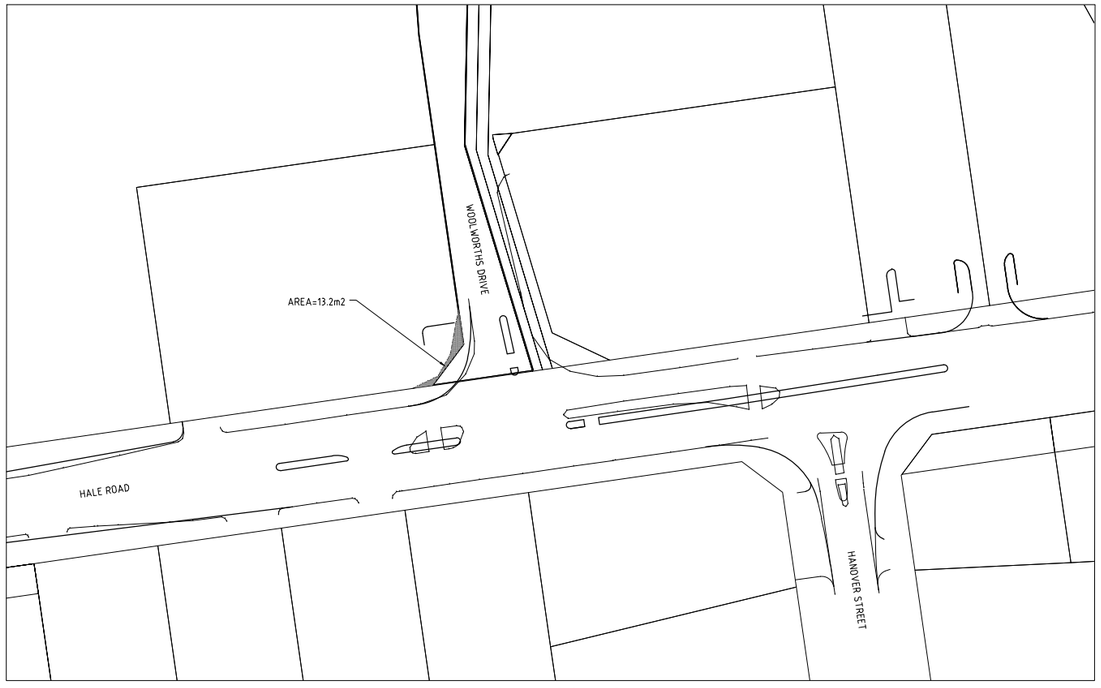
4191-20-16-16/A



CHANNELISATION OPTION A - ONE APPROACH LANE ON WOOLWORTHS DRIVE
1:500



CHANNELISATION OPTION B - TWO APPROACH LANES ON WOOLWORTHS DRIVE
1:500



TRAFFIC SIGNALS
1:500

PRELIMINARY CONCEPT
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APPROVED BY DIRECTOR:			

City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

LAND ACQUISITION PLAN

SHEET 1

No.	REVISION	BY	DATE	AUTH
A	ISSUED FOR PUBLIC CONSULTATION	MJV	29/11/17	

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APPROVED: ..../2017 DIRECTOR ASSET SERVICES
Discipline: CI
Structure Code: 420
JOB No.: 4191-20
DRAWING-No.-SHEET/REVISION: 4191-20-16-16/A
ORIGINAL DRG. SIZE: A1

PLOTTED: Fri, 15 Dec 2017 7:06:01 AM by Matthew Williams
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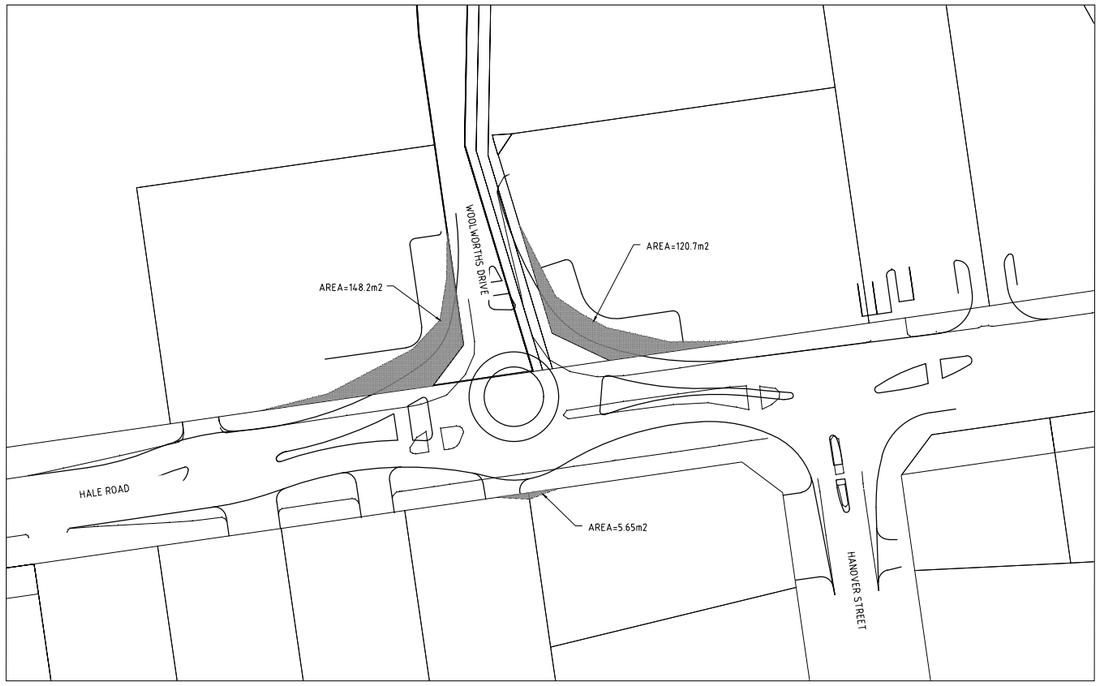
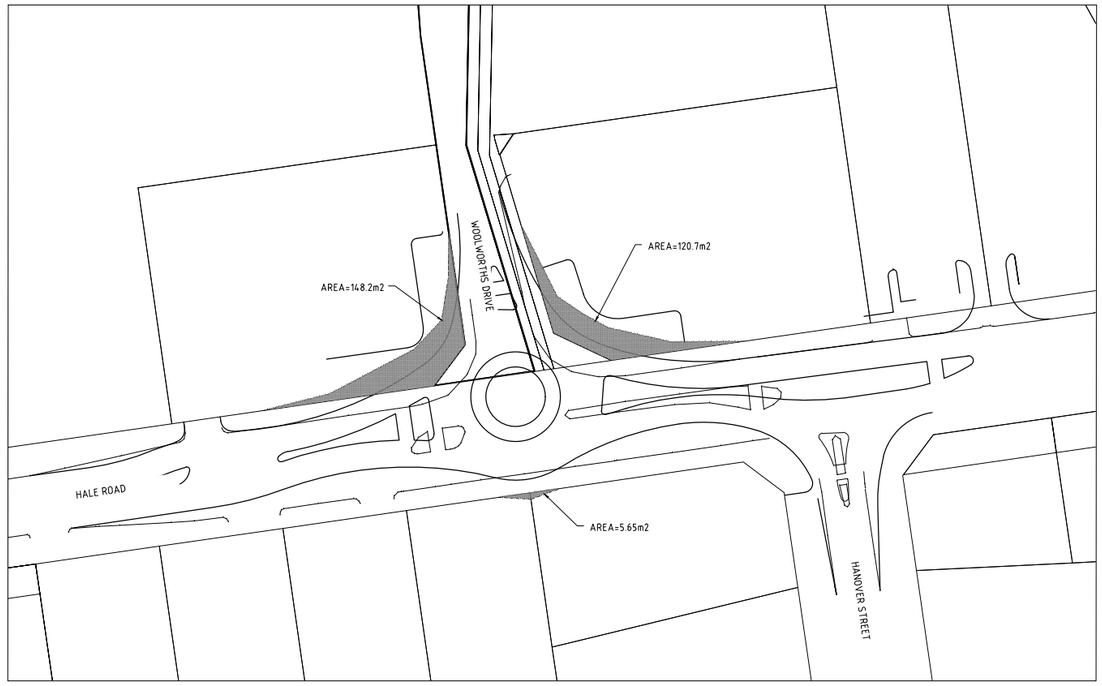
4191-20-17-17/A



ROUNDABOUT OPTION A - HANOVER STREET ALL MOVEMENTS
1:500



ROUNDABOUT OPTION A - HANOVER STREET LEFT TURNS ONLY
1:500

PRELIMINARY CONCEPT
FOR DISCUSSION ONLY

No.	REVISION	BY	DATE	AUTH
A	ISSUED FOR PUBLIC CONSULTATION	MJV	29/11/17	

No.	REVISION	BY	DATE	AUTH

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City of Kalamunda

ASSET SERVICES

HALE ROAD, FORRESTFIELD

ROAD UPGRADE
STRELITZIA AVENUE TO WOOLWORTHS DRIVE
FORRESTFIELD

LAND ACQUISITION PLAN
SHEET 2

DRAWING-No. 4191-20-17-17/A -SHEET /REVISION
ORIGINAL DRG. SIZE A1

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Consulting Engineers

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Hale Road/Woolworths Drive Intersection Improvements

Have your say!

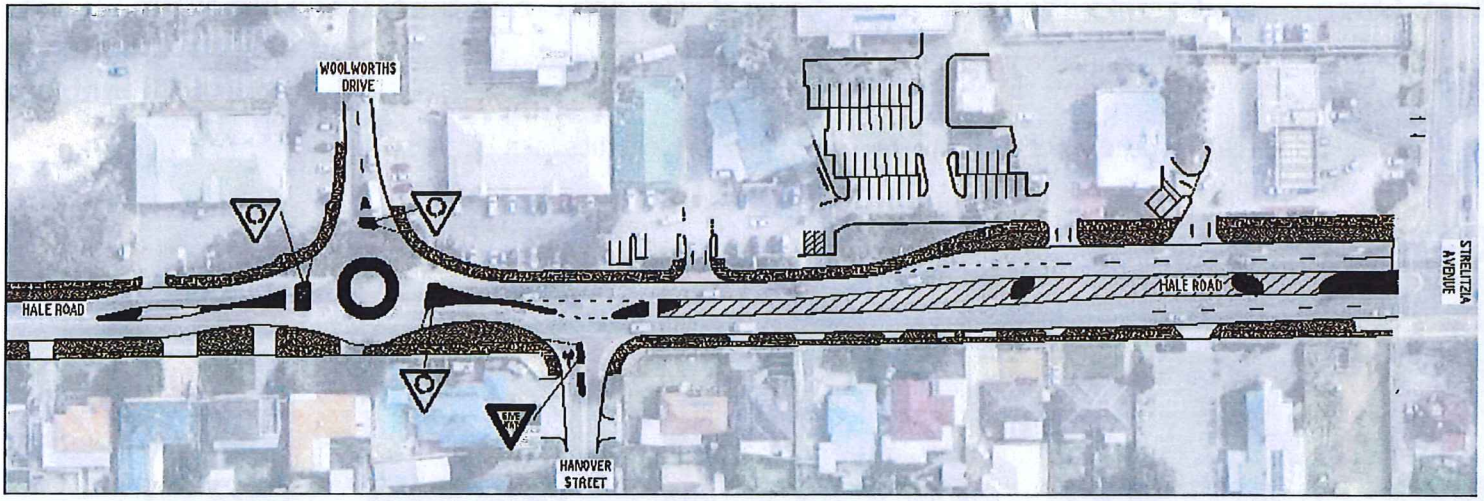
The City of Kalamunda is looking at ways to improve safety and congestion at the Hale Road/ Woolworths Drive intersection in Forrestfield.

Traffic engineers have developed a number of potential road improvement options for the community's consideration. The City would like to know which one of the four solutions you would like to see implemented.

We kindly request you complete all parts of the survey, which should take about 5-10 minutes. If you have any questions about the survey, or would like any further information, please contact us at 9257 9999 or enquiries@kalamunda.wa.gov.au or visit our FAQ at engage.kalamunda.wa.gov.au.

Which option would you like to see implemented? (Tick one option)

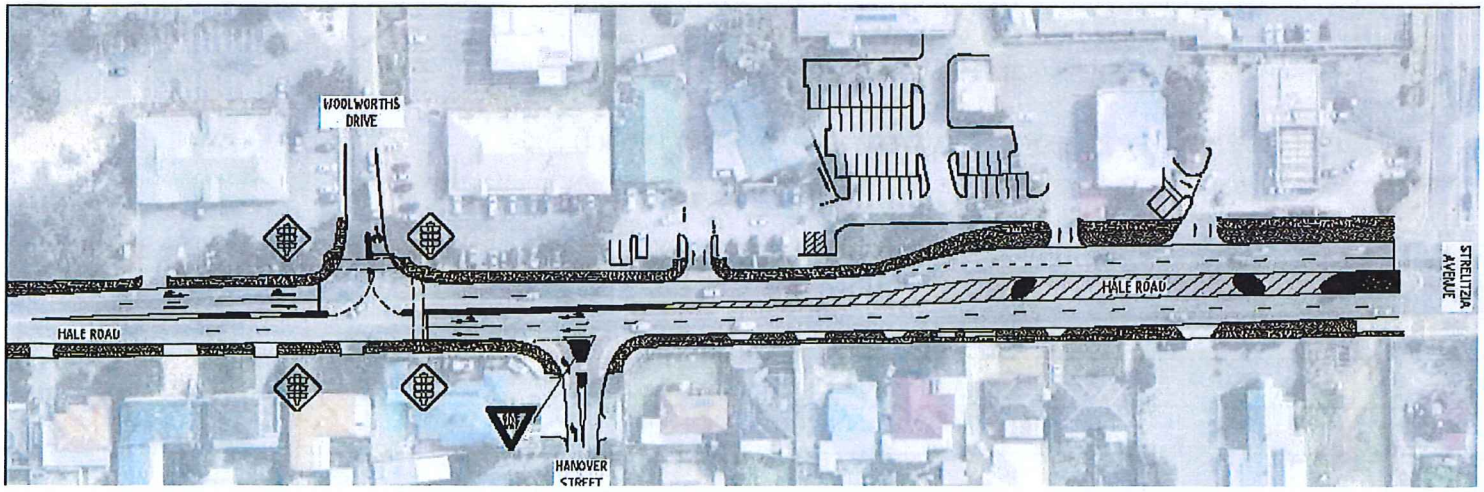
OPTION 1 ☐



Cost: High **Complexity: High** **Estimated construction time: 12 months**

- Installation of a roundabout at the Hale Road/Woolworths Drive intersection, with full access to Hanover Street maintained;
- Modifications to kerbing, line-marking and median islands on Hale Road between Woolworths Drive and Strelitzia Avenue; and
- Modifications to the entry and egress points from the Commercial properties fronting Hale Road

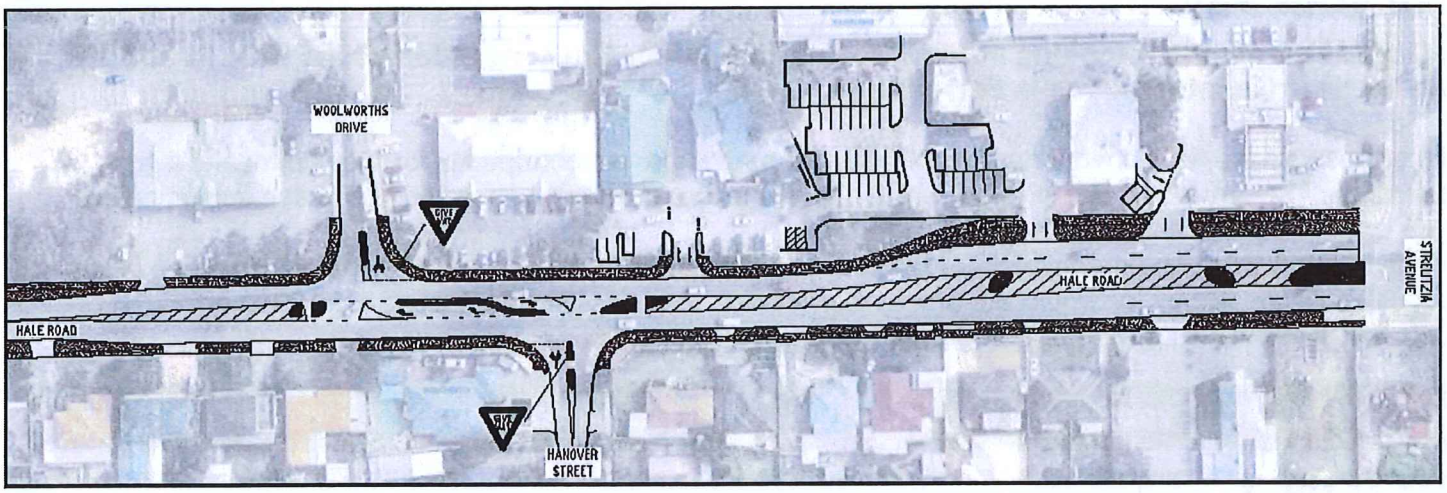
OPTION 2 ☐



Cost: Medium **Complexity: Medium/High** **Estimated construction time: 9 months**

- Installation of traffic signals at the Hale Road/Woolworths Drive intersection
- Modifications to kerbing, line-marking and median islands on Hale Road between Woolworths Drive and Strelitzia Avenue;
- Modification of the Hale Road/Hanover Street intersection to left-in/left-out; and
- Modifications to the entry and egress points from the Commercial properties fronting Hale Road

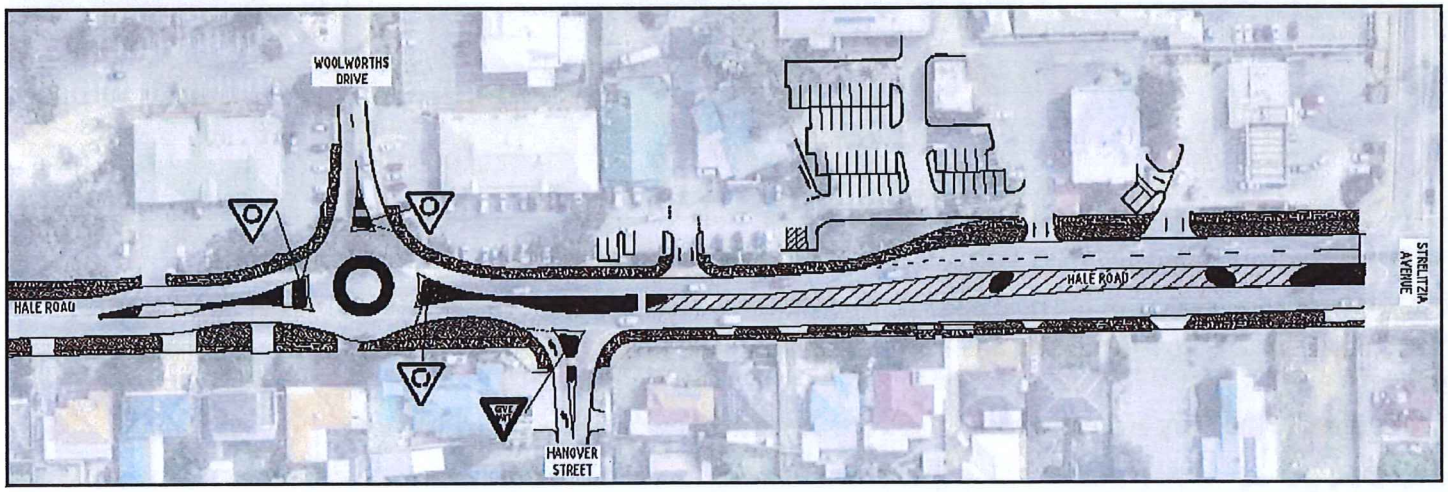
OPTION 3 ☐



Cost: Low **Complexity: Low** **Estimated construction time: Up to 6 months**

- Modifications to kerbing, line-marking and median islands on Hale Road between Woolworths Drive and Strelitzia Avenue; and
- Modifications to the entry and egress points from the Commercial properties from Hale Road.

OPTION 4 ☐



Cost: High **Complexity: High** **Estimated construction time: 12 months**

- Installation of a roundabout at the Hale Road/Woolworths Drive intersection;
- Modifications to kerbing, line-marking and median islands on Hale Road between Woolworths Drive and Strelitzia Avenue;
- Modification of the Hale Road/Hanover Street intersection to left-in/left-out; and
- Modifications to the entry and egress points from the Commercial properties fronting Hale Road.

Any further comments?

About You

Gender

☐ Male ☐ Female

In which suburb do you live?

☐ Wattle Grove
☐ Maida Vale
☐ Walliston
☐ Bickley
☐ High Wycombe
☐ Gooseberry Hill
☐ Piesse Brook
☐ Pickering Brook

☐ Hacketts Gully
☐ Canning Mills
☐ Paulls Valley
☐ Other_____
☐ Forrestfield
☐ Kalamunda
☐ Lesmurdie

What is your age bracket?

(Please tick all that apply)

☐ 15 years and under
☐ 26-35
☐ 46-55
☐ 66-75
☐ 16-25
☐ 36-45
☐ 56-65
☐ 76 +

Contact Details

Name: _____

Email: _____

Phone number: _____

Address: _____

_____

Please keep me informed on the progress of this project:

☐ Yes

☐ No

If you wish to include any additional information/pages, please include as an attachment with your survey response.

Thank you for completing this survey. We are interested in what you have to say!

Return via post to the City of Kalamunda, PO Box 42, Kalamunda, WA, 6926, or to City Administration, 2 Railway Road, Kalamunda.

Comments close 5:00pm 28 February 2018

This survey can also be completed online @ engage.kalamun

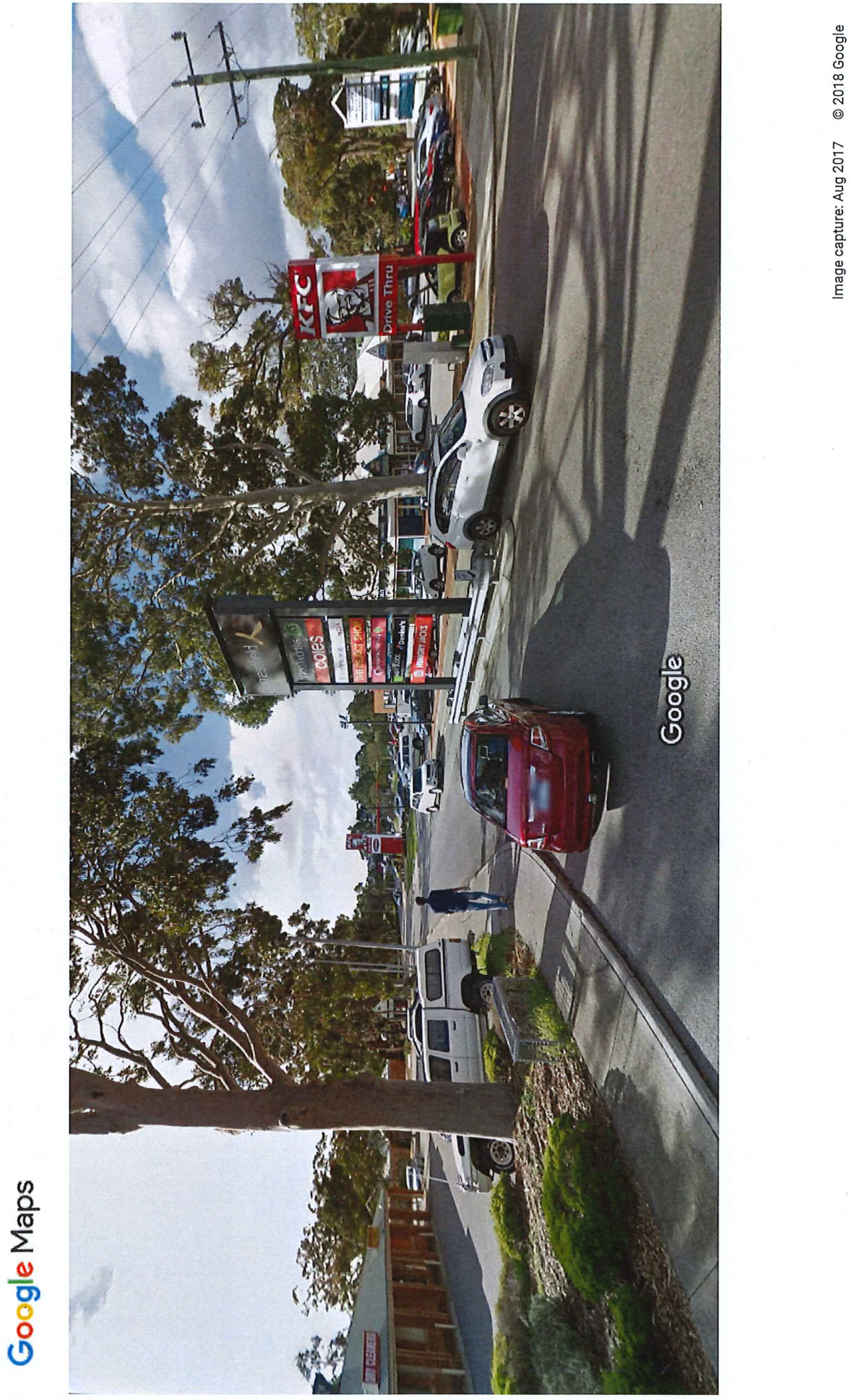
For further information please contact

E: enquiries@kalamunda.wa.gov.au

Phone: 9257 9999

www.kalamunda.wa.gov.au

city of kalamunda


Google Maps
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coles
Google
Image capture: Aug 2017 © 2018 Google

Western Australian Planning Commission

Your Ref :
Enquiries : Mario Carbone (Ph 6551 9617)

Chief Executive Officer
City of Kalamunda
P O Box 42
KALAMUNDA WA 6926

Approval Subject To Condition(s)
Freehold (Green Title) Subdivision

Application No : 155243

Planning and Development Act 2005

Applicant	:	Rowe Group 3/369 Newcastle Street NORTHBRIDGE WA 6003
Owner	:	Satterley Forrestfield Pty Ltd 18 Bowman Street SOUTH PERTH WA 6151
Application Receipt	:	25 May 2017

Lot Number	:	14, 15, 515 & 9002
Diagram / Plan	:	Diagram 31498, Plan 4684, Deposited Plan 408883
Location	:	-
C/T Volume/Folio	:	1256/743, 1298/593, 2004/412, 2922/710
Street Address	:	Lots 14, 15, 515 & 9002 Lovett Drive, Forrestfield
Local Government	:	City of Kalamunda

The Western Australian Planning Commission has considered the application referred to and is prepared to endorse a deposited plan in accordance with the plan date-stamped **25 May 2017** once the condition(s) set out have been fulfilled.

This decision is valid for **four years** from the date of this advice, which includes the lodgement of the deposited plan within this period.

The deposited plan for this approval and all required written advice confirming that the requirement(s) outlined in the condition(s) have been fulfilled must be submitted by **26 September 2021** or this approval no longer will remain valid.

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
Tel: (08) 6551 8002; Fax: (08) 6551 9001; Infoline: 1800 626 477
e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 68 565 723 484

Western Australian Planning Commission

Reconsideration - 28 days

Under section 151(1) of the *Planning and Development Act 2005*, the applicant/owner may, within 28 days from the date of this decision, make a written request to the WAPC to reconsider any condition(s) imposed in its decision. One of the matters to which the WAPC will have regard in reconsideration of its decision is whether there is compelling evidence by way of additional information or justification from the applicant/owner to warrant a reconsideration of the decision. A request for reconsideration is to be submitted to the WAPC on a Form 3A with appropriate fees. An application for reconsideration may be submitted to the WAPC prior to submission of an application for review. Form 3A and a schedule of fees are available on the WAPC website: http://www.planning.wa.gov.au

Right to apply for a review - 28 days

Should the applicant/owner be aggrieved by this decision, there is a right to apply for a review under Part 14 section 251 of the *Planning and Development Act 2005*. The application for review must be submitted in accordance with part 2 of the *State Administrative Tribunal Rules 2004* and should be lodged within 28 days of the date of this decision to: the State Administrative Tribunal, Level 6, State Administrative Tribunal Building, 565 Hay Street, PERTH, WA 6000. It is recommended that you contact the tribunal for further details: telephone 9219 3111 or go to its website: http://www.sat.justice.wa.gov.au

Deposited plan

The deposited plan is to be submitted to the Western Australian Land Information Authority (Landgate) for certification. Once certified, Landgate will forward it to the WAPC. In addition, the applicant/owner is responsible for submission of a Form 1C with appropriate fees to the WAPC requesting endorsement of the deposited plan. A copy of the deposited plan with confirmation of submission to Landgate is to be submitted with all required written advice confirming compliance with any condition(s) from the nominated agency/authority or local government. Form 1C and a schedule of fees are available on the WAPC website: http://www.planning.wa.gov.au

Condition(s)

The WAPC is prepared to endorse a deposited plan in accordance with the plan submitted once the condition(s) set out have been fulfilled.

The condition(s) of this approval are to be fulfilled to the satisfaction of the WAPC.

The condition(s) must be fulfilled before submission of a copy of the deposited plan for endorsement.

The agency/authority or local government noted in brackets at the end of the condition(s) identify the body responsible for providing written advice confirming that the WAPC's requirement(s) outlined in the condition(s) have been fulfilled. The written advice of the agency/authority or local government is to be obtained by the applicant/owner. When the written advice of each identified agency/authority or local government has been obtained, it should be submitted to the WAPC with a Form 1C and appropriate fees and a copy of the deposited plan.

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ABN 68 565 723 484

Western Australian Planning Commission

If there is no agency/authority or local government noted in brackets at the end of the condition(s), a written request for confirmation that the requirement(s) outlined in the condition(s) have been fulfilled should be submitted to the WAPC, prior to lodgement of the deposited plan for endorsement.

Prior to the commencement of any subdivision works or the implementation of any condition(s) in any other way, the applicant/owner is to liaise with the nominated agency/authority or local government on the requirement(s) it considers necessary to fulfil the condition(s).

The applicant/owner is to make reasonable enquiry to the nominated agency/authority or local government to obtain confirmation that the requirement(s) of the condition(s) have been fulfilled. This may include the provision of supplementary information. In the event that the nominated agency/authority or local government will not provide its written confirmation following reasonable enquiry, the applicant/owner then may approach the WAPC for confirmation that the condition(s) have been fulfilled.

In approaching the WAPC, the applicant/owner is to provide all necessary information, including proof of reasonable enquiry to the nominated agency/authority or local government.

The condition(s) of this approval, with accompanying advice, are:

CONDITION(S):

Modifications

1. The Plan of Subdivision is to be modified by:

   a) Removing the northern two laneways and changing the configuration of various lots within the subdivision in accordance with the attached plan date stamped 12 July 2017; and

   b) an area of at least 2141m^2 being removed from proposed Lot 275 and identified as a reserve for recreation to ensure a minimum of 10 per cent public open space is provided within the Hales Local Structure Plan area.

   (Western Australian Planning Commission)

Road and Movement Network

2. Engineering drawings and specifications are to be submitted, approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications, to ensure that those lots not fronting an existing road are provided with frontage to a constructed road(s) connected by a constructed road(s) to the local road system and such road(s) are constructed and drained at the landowner/applicant's cost.

   As an alternative, and subject to the agreement of the Local Government the Western Australian Planning Commission (WAPC) is prepared to accept the

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
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e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 68 565 723 484

Western Australian Planning Commission

landowner/applicant paying to the local government the cost of such road works as estimated by the local government and the local government providing formal assurance to the WAPC confirming that the works will be completed within a reasonable period as agreed by the WAPC. (Local Government)

3. Engineering drawings and specifications are to be submitted and approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications to ensure that:

   a) street lighting is installed on all new subdivisional roads to the standards of the relevant licensed service provider;

   b) roads that have been designed to connect with existing or proposed roads abutting the subject land are coordinated so the road reserve location and width connect seamlessly;

   c) temporary turning areas are provided to those subdivisional roads that are subject to future extension, and

   d) embayment parking is provided within the road reserves abutting public open space and laneways lots;

   to the satisfaction of the Western Australian Planning Commission. (Local Government)

4. Engineering drawings and specifications are to be submitted, approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications, for the provision of shared paths through and connecting to the application area to the satisfaction of the Western Australian Planning Commission. The approved shared paths are to be constructed by the landowner/applicant. (Local Government)

5. All local streets within the subdivision being truncated in accordance with the Western Australian Planning Commission's *Liveable Neighbourhoods* policy. (Local Government)

Subdivision Works/Drainage

6. Engineering drawings and specifications are to be submitted, approved, and works undertaken in accordance with the approved engineering drawings, specifications and approved plan of subdivision, for grading and/or stabilisation of the site to ensure that:

   a) lots can accommodate their intended use; and

   b) finished ground levels at the boundaries of the lot(s) the subject of this approval match or otherwise coordinate with the existing and/or proposed finished ground levels of the land abutting.

   (Local Government)

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e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 68 565 723 484

Western Australian Planning Commission

7. 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)

8. Engineering drawings and specifications are to be submitted and approved, and works undertaken in accordance with the approved engineering drawings and specifications and approved plan of subdivision, for the filling and/or draining of the land, including ensuring that stormwater is contained on-site, or appropriately treated and connected to the local drainage system. Engineering drawings and specifications are to be in accordance with an approved Urban Water Management Plan (UWMP) for the site, or where no UWMP exists, to the satisfaction of the Western Australian Planning Commission. (Local Government)

9. Suitable arrangements being made with the Water Corporation for the drainage of the land either directly or indirectly into a drain under the control of that body. (Water Corporation)

10. Prior to the commencement of subdivisional works, the landowner/applicant is to provide a pre-works geotechnical report certifying that the land is physically capable of development or advising how the land is to be remediated and compacted to ensure it is capable of development; and

    In the event that remediation works are required, the landowner/applicant is to provide a post geotechnical report certifying that all subdivisional works have been carried out in accordance with the pre-works geotechnical report. (Local Government)

Services

11. Arrangements being made to the satisfaction of the Western Australian Planning Commission and to the specification of Western Power for the provision of an underground electricity supply to the lot(s) shown on the approved plan of subdivision. (Western Power)

12. The transfer of land as a Crown reserve free of cost to Western Power for the provision of electricity supply infrastructure. (Western Power)

13. Arrangements being made with the Water Corporation so that provision of a suitable water supply service will be available to the lots shown on the approved plan of subdivision. (Water Corporation)

14. Arrangements being made with the Water Corporation so that provision of a sewerage service will be available to the lots shown on the approved plan of subdivision. (Water Corporation)

15. The provision of easements for existing or planned future water, sewerage and/or drainage infrastructure as may be required by the Water Corporation being granted free of cost to that body. (Water Corporation)

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Western Australian Planning Commission

Reserves

16. The proposed reserve(s) shown on the approved plan of subdivision being shown on the diagram or plan of survey (deposited plan) as reserve(s) for recreation and/or public utilities and/or drainage and vested in the Crown under Section 152 of the *Planning and Development Act 2005*, such land to be ceded free of cost and without any payment of compensation by the Crown. (Local Government)

17. Arrangements being made for the proposed public open space to be developed by the landowner/applicant to a minimum standard and maintained for two summers through the implementation of an approved landscape plan providing for the development and maintenance of the proposed public open space in accordance with the requirements of Liveable Neighbourhoods and to the specifications of the local government. (Local Government)

18. Uniform fencing being constructed along the boundaries of all of the proposed lots abutting public open space. (Local Government)

Miscellaneous

19. Measures being taken to ensure the identification and protection of any vegetation on the site worthy of retention that is not impacted by subdivisional works, prior to commencement of subdivisional works. (Local Government)

20. A management plan detailing how risk of erosion and sedimentation impacts into nearby water bodies will be minimised during subdivision is to be:

    a) prepared by the landowner/applicant and approved prior to the commencement of subdivisional works; and

    b) implemented during subdivisional works.

    (Local Government)

21. A revegetation plan being prepared, approved and implemented for the revegetation of the Crumpet Creek reserve with appropriate native species to the specifications of the Local Government. (Local Government)

22. Information is to be provided to demonstrate that the measures contained in the Bushfire Management Plan (July 2017) that address the provision of suitable asset protection zones to proposed lots have been implemented during subdivisional works. (Local Government)

23. A Notification, pursuant to Section 165 of the *Planning and Development Act 2005* is to be placed on the certificate(s) of title of the proposed lot(s) with a Bushfire Attack Level (BAL) rating of 12.5 or above, advising of the existence of a hazard or other factor. Notice of this notification is to be included on the diagram or plan of survey (deposited plan).

    The notification is to state as follows:

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
Tel: (08) 6551 8002; Fax: (08) 6551 9001; Infoline: 1800 626 477
e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 68 565 723 484

Western Australian Planning Commission

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

(Western Australian Planning Commission)

24. Local Development Plans (LDP) being prepared and approved for all lots shown on the plan dated stamped 12 July 2017 (attached) that address the matters, including R-Code variations, within the approved Hales Local Structure Plan to the satisfaction of the Western Australian Planning Commission. In addition, the LDP for Lots 78 to 97 and 184 to 196 are to address the following matters:

    a) Building design and dwelling orientation;

    b) Vehicular and pedestrian access;

    c) Surveillance of streets and public open space; and

    d) Fencing.

    (Local Government)

25. The landowner/applicant shall make arrangements to ensure that prospective purchasers of lots subject of a Local Development Plan are advised in writing that Local Development Plan provisions apply. (Local Government)

ADVICE:

1. In regard to Condition 1(b), an updated public open space (POS) schedule is to be provided at the subdivision clearance stage to determine the exact amount of POS to ensure 10 per cent POS is provided in accordance with Liveable Neighbourhoods. This may result in a change to the POS amount referred to in Condition 1(b). Condition 1(b) is to be cleared when proposed Lot 275 is being created.

2. In regard to Condition 2 and the section of road reserve of 13.2m width located north of public open space E: as the road has an acute angle, the design will need to incorporate traffic islands or similar treatment to prevent vehicles cutting the corner when travelling from the north to the west.

3. In regard to Condition 2 and 3, the landowner/applicant is advised that the road reserves, including the constructed carriageways, laneways, truncations, footpaths/dual use paths and car embayments, are to be generally consistent with the approved plan of subdivision.

4. In regard to Conditions 2 and 3, the applicant is advised to liaise with the Local Government on the provision of adequate street trees.

5. Condition 7 has been imposed in accordance with *Better Urban Water Management Guidelines (WAPC 2008).* Further guidance on the contents of urban water

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Western Australian Planning Commission

management plans is provided in *'Urban Water Management Plans: Guidelines for preparing and complying with subdivision conditions' (Department of Water 2008).*

6. In regard to Condition 11, Western Power provides only one underground point of electricity supply per freehold lot.

7. In regard to Conditions 9, 13 and 14, the landowner/applicant shall make arrangements with the Water Corporation for the provision of the necessary services. On receipt of a request from the landowner/applicant, a Land Development Agreement under Section 83 of the *Water Services Act 2012* will be prepared by the Water Corporation to document the specific requirements for the proposed subdivision.

8. With regard to Condition 17, the development is to include full earthworks, basic reticulation, grassing of key areas, and pathways that form part of the overall pedestrian and/or cycle network. A landscaping plan shall be prepared and approved by the local government prior to the commencement of works.

9. The landowner/applicant is advised that the Department of Water and Environmental Regulation has prepared dust control guidelines for development sites, which, outline the procedures for the preparation of dust management plans. The dust management plans are generally approved, and their implementation overseen, by Local Government. Further information on the guidelines can be obtained from the Department of Water and Environmental Regulation's website: www.der.wa.gov.au under air quality publications.

10. The landowner/applicant and the local government are advised to refer to the Institute of Public Works Engineering Australia Local Government Guidelines for Subdivisional Development (current edition). The guidelines set out the minimum best practice requirements recommended for subdivision construction and granting clearance of engineering conditions imposed.

11. Approval should be sought from Western Power for using the power easement for drainage purposes.

12. Conditions 20 and 21 are to be satisfied at the time when lots adjoining the Crumpet Creek Reserve are being created.

13. The applicant is advised that the existing Pearce Avenue road reserve does not form part of proposed Lots 73 and 102. A separate road closure process should be undertaken to enable the excess road reserve to be incorporated into the proposed lots.

KM Blenkinsop

Kerrine Blenkinsop
Secretary
Western Australian Planning Commission
26 September 2017

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
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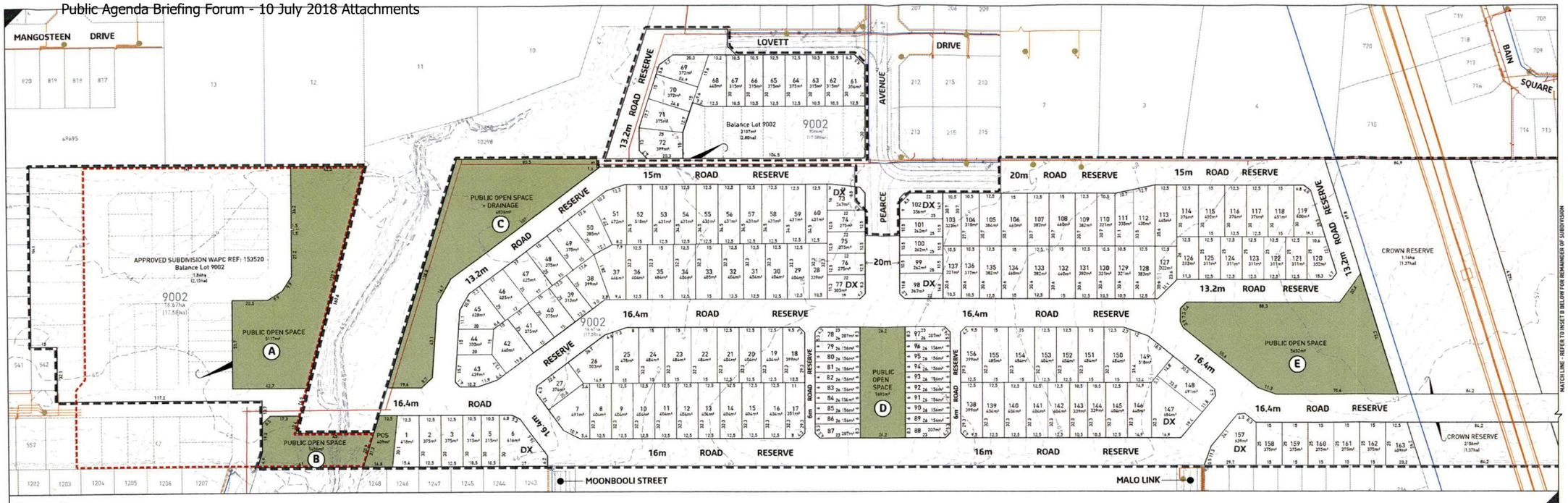
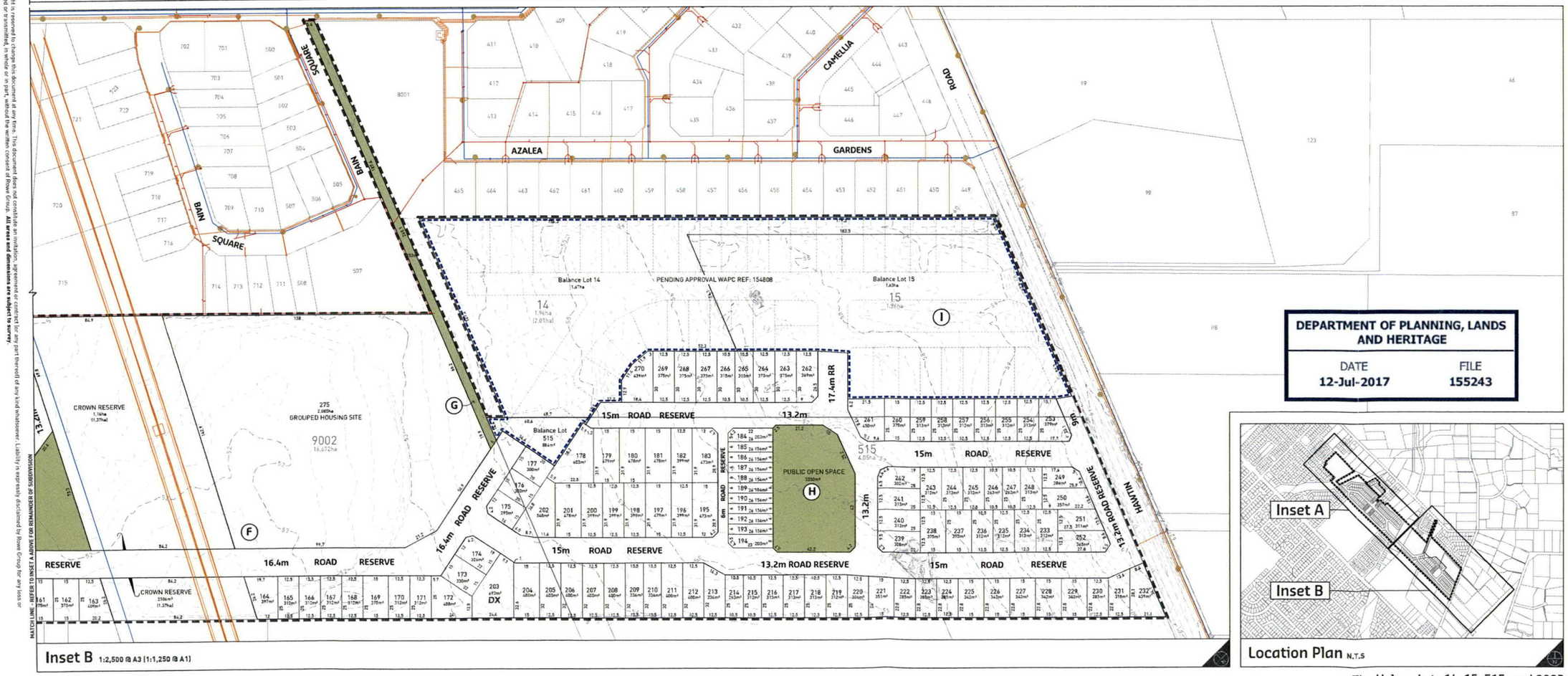
e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 68 565 723 484





LEGEND

- Application Area
- Contours
- Existing Lot Numbers
- Proposed Lot Numbers
- Existing Boundaries
- Proposed Boundaries
- Water
- Sewer
- Power
- Powerpole
- Public Open Space
- Public Open Space Reference
- Existing Features (approx)
- DX Potential Duplex Lot
- Subdivision Application 154808
- Subdivision Approval 153520

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
12-Jul-2017	155243

Location Plan N.T.S

0 50 Metres

REVISIONS

Rev	Date	Drawn
A	2017.06.27	F. Chesterman
B	2017.07.03	W. Clements

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

Date Drawn:	2017.06.27
Job Ref:	8485
Scale:	1:2,500 @ A3 / 1:1,250 @ A1
Client:	Satterley Property Group
Designer:	F. Chesterman
Drawn:	F. Chesterman
Projection:	PCG94
Plan ID:	8485-SUB-19-B

Cadastre supplied by MNG

The Hales - Lots 14, 15, 515, and 9002
Hawtin Road, Forrestfield

Modified Plan of Subdivision

N:\TOWN PLANNING\Projects\8485 Hawtin Road, Forrestfield\Drawings\8485_SUB19B_20170630 FORRESTFIELD (MODIFIED SUBDIVISION PLAN).DWG
Forbes Chesterman 30/06/2017 4:40:47 PM

Job Ref: 8485
17 November 2017

City of Kalamunda
PO Box 42
KALAMUNDA WA, 6926

Attention: Ms Melissa Retsifo – Coordinator Land & Property Services

Dear Melissa,

Proposed partial Road Closure Setosa Drive and Excision of portion of Crown Reserve 37650, Forrestfield.

Rowe Group acts on behalf of Satterley Property Group (SPG) in regard to their landholding comprising Lot 9003 Gala Way, The Hales, Forrestfield.

Further to our previous correspondence with Jordan Koroveshi, previously employed at the City we write to request the City of Kalamunda initiate:

1. Excision of portion of Reserve 37650 to be dedicated as road reserve to facilitate the future subdivision of lots as part of The Hales development.

2. Closure of portions of Setosa Drive to be amalgamated with lot 9003 and incorporated into proposed lots subject to subdivision approval WAPC Ref: 155243.

Please see the attached survey drawing prepared by MNG surveyors in support of our request which identifies the land subject to this proposal and which will form the basis for the preparation of a Deposited Plan.

It is our understanding that the City is required to consider the request prior to then complying with section 58 of the Land Administration Act and regulation 9 of the Land Administration Regulations 1998, dealing with public advertising, resolution with agencies and formally resolving to endorse the proposal and advising the Department of Planning Heritage and Lands in writing. Following this process a valuation and agreed purchase price would be determined and finalisation of the request through the lodgement of a Road Closure Order and Amalgamation Order for registration at Landgate.

ROWEGROUP

Perth Office
L3, 369 Newcastle Street
Northbridge 6003
Western Australia

p: +618 9221 1991
f: +618 9221 1919
info@rowegroup.com.au
rowegroup.com.au

ROWEGROUP

In support of our request we provide the following:

- Plan of Proposed Crown Subdivision and Road Closure, Crown Reserve 37650 and Setosa Drive, Forrestfield (Attachment 1);
- Approved Modified Plan of Subdivision, The Hales estate (Attachment 2);
- Approved Local Structure Plan (Attachment 3);

Please could you confirm the City is amenable to the above request and initiate the process.

Should you require any further information or clarification in relation to this matter, please do not hesitate to contact the undersigned on 9221 1991.

Thank you for considering this matter.

Yours faithfully,

Forbes Chesterman
Rowe Group

ROWEGROUP

Attachment One

Plan of Proposed Crown Subdivision and Road Closure

FUTURE POS
9003
DP 411158
CT: 2932 / 78
(160.6)
A37650
10298
P 13574
FUTURE POS
(166.02)
A37650
10298
P 13574
A37650
8001
DP 69083
Portion of Reserve 37650
to be excised & dedicated as road
744 m²
9003
DP 411158
CT: 2932 / 78
FUTURE SUBDIVISION
SUBJECT TO
WAPC APPROVAL 155243
FUTURE SUBDIVISION
SUBJECT TO
WAPC APPROVAL 155243
9003
DP 411158
CT: 2932 / 78
Proposed Road Closure
63 m²
Proposed Road Closure
13 m²
MANDON STREET
GALA WAY
AUBURN LANE
DARA LANE
CANOPY CIRCUIT
SULTANA ROAD EAST
BARDOOK GARDENS
MOONBOOLI STREET
PEARSE AVENUE
LOVETT DRIVE
SETOSA DRIVE
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212
213
215
146.23
149.05
8.49
8.5
10.96
4.25
8.48
45
5

Rev.		Drawn	Date	Checked
C	Updated with latest precal, abuttals and add road closures	CAY	14/11/2017	
B	Updated Future Subdivision layout	CAY	03/05/2016	
A	Initial Issue	CAY	08/04/2016	

City of Kalamunda
Location Plan

SCALE 1:1250 @ A3
0 13 26 39 52 65 78
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

Surveyor:-
Survey Date:-
Precal/Cad:- 22/8/2017

bsi. ISO 9001 Quality Management FS 565311
AS/NZS 4801:2001 Occupational Health and Safety Management OSH 591267

N

THIS SURVEY IS A CLASS 2 & 3 SURVEY
(Hard Stand areas are to Class 2 all other areas are Class 3)
Class 1: Horizontal Accuracy ± 5mm, Vertical Accuracy ± 5mm
Class 2: Horizontal Accuracy ± 20mm, Vertical Accuracy ± 20mm
Class 3: Horizontal Accuracy ± 30mm, Vertical Accuracy ± 50mm

CADASTRAL INFORMATION
* The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy.
* Existing easements, encumbrances or other interests are not depicted and a title search is recommended to obtain this information.
* Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

MNG.
MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Broome, Bunbury, Kununurra, Newman, Onslow, Port Hedland
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

PROPOSED CROWN SUBDIVISION & ROAD CLOSURES
CROWN RESERVE 37650 & SETOSA DRIVE
FORRESTFIELD

CLIENT: Satterley.com.au

Project Mngr	Charles Younge	Datum	PCG94 / AHD

99234 - AP - 011 - C
Job Number | Type | Plan Number | Revision

ROWEGROUP

Attachment Two

Approved Modified Plan of Subdivision

LEGEND
- Application Area
- Contours
- 7 Existing Lot Numbers
- 7 Proposed Lot Numbers
- Existing Boundaries
- Proposed Boundaries
- Water
- Sewer
- Power
- Powerpole
- Public Open Space
- (A) Public Open Space Reference
- Existing Features (approx)
- DX Potential Duplex Lot
- Subdivision Application 154808
- Subdivision Approval 153520

MATCH LINE - REFER TO INSET B BELOW FOR REMAINDER OF SUBDIVISION

MATCH LINE - REFER TO INSET A ABOVE FOR REMAINDER OF SUBDIVISION

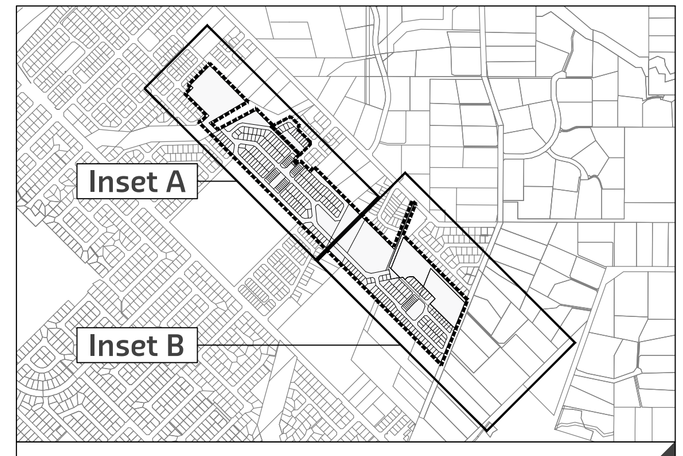
Inset A 1:2,500 @ A3 (1:1,250 @ A1)

Inset B 1:2,500 @ A3 (1:1,250 @ A1)

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
12-Jul-2017	155243

Location Plan N.T.S



0 | 50 | Metres

REVISIONS

Rev	Date	Drawn
A	2017.06.27	F. Chesterman
B	2017.07.03	W. Clements

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

Date Drawn:	2017.06.27
Job Ref:	8485
Scale:	1:2,500 @ A3 / 1:1,250 @ A1
Client:	Satterley Property Group
Designer:	F. Chesterman
Drawn:	F. Chesterman
Projection:	PCG94
Plan ID:	8485-SUB-19-B

Cadastre supplied by MNG

Modified Plan of Subdivision

The Hales - Lots 14, 15, 515, and 9002
Hawtin Road, Forrestfield

N:\TOWN PLANNING\8000-8999\8485\DRAFTING\A-CAD\8485_SUB19B_20170630 FORRESTFIELD (MODIFIED SUBDIVISON PLAN).DWG
Forbes Chesterman 11 July 2017

ROWEGROUP

Attachment Three

Approved Local Structure Plan

Planning Design Delivery

LEGEND

RESIDENTIAL
- Residential - R30
- Residential - R60

PARKS, RECREATION AND CONSERVATION
- Local Open Space

TRANSPORT
- Access Street - Local Road

OTHER
- Structure Plan Boundary
- Existing Boundaries
- Powerline Easement
- Shared Use Path

0 187.5 Metres

REVISIONS

Rev	Date	Drawn
A	2016.05.10	M. Sullivan
B	2016.05.13	W. Clements
C	2016.09.08	M. Sullivan
D	2017.06.08	W. Clements

ROWEGROUP
PLANNING DESIGN DELIVERY

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

Date Drawn:	2016.05.10
Job Ref:	8485
Scale:	1:7500 @ A4
Client:	Satterley Property Group
Designer:	F. Chesterman
Drawn:	M. Sullivan
Projection:	PCG94
Plan ID:	8485-FIG-41-D

Local Structure Plan

City of Kalamunda

Various Lots
Forrestfield

N:\TOWN PLANNING\8000-8999\8485\DRAFTING\A-CAD\8485_FIG41D_20170608 FORRESTFIELD (LSP).DWG
William Clements June 2017

Attachment One - Proposed Location of Skate Park – Stirk Park

A BALANCED VIEW
LEISURE CONSULTANCY SERVICES

city of kalamunda

Maida Vale Reserve Master Plan – Final Draft

City of Kalamunda

June 2018

ABV LEISURE CONSULTANTS

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ACKNOWLEDGEMENTS

A Balanced View (ABV) Leisure Consultants have developed the Master Plan Report for the Maida Vale Reserve in the City of Kalamunda.

ABV would like to acknowledge City of Kalamunda staff, and the sport and recreation community in Kalamunda who provided valuable input into this project.

DISCLAIMER

ABV Leisure Consultants, its employees, directors and associated entities shall not be liable for any loss, damage, claim, costs, demands and expenses whatsoever and howsoever arriving in connection with the use of this master plan.

While all due care and consideration has been undertaken in the preparation of this report, ABV advise that all recommendations, actions and information provided in this document is based on our experience as professional leisure consultants and upon research as referenced in this document.

Information contained in this document is based on available information at the time of writing. All figures and diagrams are indicative only and should be referred to as such. This is a strategic document, which deals with technical matters in a summary way only.

CONTENTS

1 EXECUTIVE SUMMARY

A Balanced View Leisure Consultancy (ABV) was commissioned by the City of Kalamunda to prepare a master plan for the Maida Vale Reserve.

The principal aim of the master plan is to provide a strategy to guide future development of the reserve in a sustainable manner to maximise opportunities for active and passive recreation for the community.

This study is comprised of the following key components:

- Review of background information including relevant City plans, reports and studies, facility usage data and demographics.
- An audit review of the facilities within the Maida Vale Reserve.
- Identification of trends and factors that may influence facility development recommendations.
- Extensive consultation with City officers, sports and recreation groups and key stakeholders, the general community, other relevant agencies and organisations, and City Councillors.
- Analysis of needs through synthesis of all information gathered through the study.
- Preparation of high-level concept plans to illustrate all proposed developments for the Maida Vale Reserve.
- Construction cost estimates of developments as recommended.

The consultation process was integral in connecting with the community to hear directly from them about current facilities, issues and where provision could be improved.

The approach to the consultation process was underpinned by the utilisation of a number of methods. A combination of community and club specific surveys, stakeholder liaison and community drop-in sessions were used to explore the community's views on infrastructure at the Maida Vale Reserve.

The following were key themes identified through the consultation process:

CAR PARKING & TRAFFIC	PAVILION / CHANGE ROOMS	SPORTS CLUBS
• Car Parking needs improvement • Car park lighting • Ingress and Egress improvements • Linkages from car parks to sports spaces	• Change Rooms not compliant with current standards • Not enough change rooms to accommodate current competition • Improve spectator viewing to main baseball diamond • Administration areas requested	• Baseball: Improved facilities – diamonds, car parking, change areas, security. • Soccer: change rooms upgrade required, lighting • Archery: Upgrades to amenities buildings • Tennis: Court Maintenance • Cricket: Wicket improvements • Storage: Existing storage inadequate: size and location.

LIGHTING (POWER)	PATHWAYS/LINKAGES	OTHER
• Limited Oval Lighting. Limits use to predominantly day light hours. • 3 power sources to site. Current supply not likely to accommodate any increased load.	• Improve walkways and cycle tracks and linkages	• Some areas of poor drainage on oval • Underutilised facilities (e.g. netball courts and tennis courts) • Highly valued by community • Skate park location • Playground – location and quality

The consultation highlighted that the Maida Vale Reserve is highly valued by the existing users and community for its natural spaces and diversity in use.

Existing sporting groups identified that a number of facilities are in need of upgrading to meet contemporary standards and the current and future needs of the clubs.

The City of Kalamunda had an Estimated Resident Population of 59,349 as of the 30th June 2016. The population in the City of Kalamunda grew at a rate of 7 – 8% per 5-year period from 2001 to 2016 and is projected to increase by an additional 16,838 by the year 2036.

Maida Vale Reserve is in a growth area of the City. The increase in population surrounding the Reserve will continue to put increasing demand on existing infrastructure.

The main changes are in the 25 – 34 year age group where the percentage of population decreases from approximately 6.4% of the population to 5.7%, and the increase in population of people over the age of 70 years. Whilst the decrease in percentage of population is projected to occur in 25-34 year age group, there is still growth in these age cohorts, resulting in the demand for sports and recreation opportunities to grow.

Persons aged 70+ are expected to grow by over 88% over the 20 year period. Mobility and accessibility are significant issues for this demographic that need to be considered in recreation planning. Passive recreation pursuits need to be considered in future development.

Key Elements for successful Master Plans that have been considered throughout the development of this plan are:

1. **Financially sustainable** – recommended development opportunities provide a mix of facilities that are maintainable in accordance with Asset Management Plan.
2. **Colocation, shared use, multipurpose design**s – where possible, ensure development is designed to enable greatest use by a variety of users.
3. **Maximised utilisation** – where possible, developments should allow for the greatest utilisation possible.
4. **Contemporary Standards**– developments should meet current designs and trends to enable longevity of use.
5. **Accessibility** – Community facilities should be designed to comply with the principles of universal design by facilitating access to, and use of the facility and its spaces by all individuals and groups.
6. **Sustainability** - development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

A number of opportunities were highlighted throughout the background research, consultation and analysis. These are outlined in the table below. The recommendations derived from this review meet the requirements as outlined in the guiding principles.

Opportunity	Recommendation
Improved oval lighting Limited on sporting reserves. Electrical supply interruptions No car park lighting Minimal Security Lighting	Upgrade power supply to the site to accommodate the recommendations in this report and provide one incoming power source. Improve lighting to sports fields to accommodate additional training and reduce load impact of existing areas with lighting: • Conduct a lighting audit and lighting plan for the precinct. This should include an analysis of power requirements to accommodate future works. • Existing lighting within reserve to be confirmed to meet training lux requirements. • Upgrade existing lighting and provide additional training level lighting to Eastern fields (for soccer) and to second baseball diamond area (if relocated). • Upgrade existing lighting to netball court area and provide additional level lighting to accommodate evening use and competition for tennis. • Provision of lighting to cricket net/relocated baseball batting cages, and pitching practice nets (as per current cages lighting). • Provision of lighting to main car park area. Potential to light paths/fitness trail with solar lighting (to be discussed further in this analysis).
Car Parking	<u>Car Park off Acacia Road:</u> Based on recommendations for additional playing surface to be considered, and proposed relocation of tennis Club, reconfiguration of the existing entrance off Acacia Road and additional car parking be provide to the South of the existing car park area. <u>Car Park off Ridgehill Road:</u> Flow in and out of car park to be reviewed along with consideration to improved accessibility. Provide change in traffic flow by provision of one way access into overflow car park and one way egress lane. The existing trees of significance should be retained and protected. <u>General:</u> Establish direct pedestrian crossing points in the car parks to enable safe crossing between ovals. Include traffic calming measures within the car parks.

Opportunity	Recommendation
Norm Sadler Pavilion/change rooms and storage provision	Retain existing pavilion. Minor upgrades to internal area (provide allowance for new carpets and paint). Modify / Refurbish existing change rooms to meet current standards and contemporary design. Resume existing pavilion public toilets into the refurbished change rooms to provide increased wet areas (showers and toilets). Maintain servery access to the baseball side and the soccer side. Provision of additional spectator covered area for baseball spectators. Provision of new pavilion toilets. Provision of additional 3 change rooms + first aid and umpires change room. Recommended to have proximity to main soccer field. Provision of additional storage for baseball club inclusive of drive in access (Baseball club uses trailer to hold equipment). Provision of additional storage for user groups of the reserve. Consideration to converting an existing store of the pavilion to an administration office for use by resident clubs. Upgrade of existing septic system or connection to sewer system. Discussions with City staff identify connection to sewer system better longer term option. Provision of additional user group storage Relocate the soccer goal storage compound to this location.
New Public Toilets	Demolish existing public toilet building and provide new public toilets within the expanded change room development. This is a more centralised location for the reserve and will provide contemporary, accessible public toilet facilities for all users of the reserve. The public toilets should have external access.
Netball Courts – Provide for alternative use to activate location	The space has the potential for increased utilisation. In response to analysis further in this document regarding the tennis club facility, there is an opportunity to convert this space to accommodate the tennis club in a more prominent position than it currently is, and retain some existing courts for netball/multipurpose courts for community and school use. Recommendation: Convert existing netball courts to 8 x tennis hard courts and 4 x multipurpose courts (netball/basketball/Futsal Soccer) for community use. This will require an extension of the hard surface by approximately 2.5m to the immediate north of existing to accommodate recommended run off spaces required for the specified sports, resurfacing of courts with an acrylic surface and relocating some floor plates for the tennis courts. Upgrade of the existing lighting to meet current standards. Upgrade of the community area, change rooms and office area of the existing pavilion.

Opportunity	Recommendation
Tennis Courts : Currently underutilised	Reduce the number of courts. Relocate the tennis club from its current location to the existing netball courts. Upgrade existing netball courts to accommodate 8 x hard tennis courts with lighting. With modifications to the pavilion currently at the netball court site, the tennis club can be located within this facility. Modifications should include an addition of meeting/program space and modifications to toilets, change rooms and kitchen to meet current standards. Triggers that may instigate a potential relocation include: • Requirement for court surface upgrades to the tennis courts. • Requirement for additional grass/synthetic playing surface • Requirement for additional car parking (potentially due to informal car park off Ridgehill Road unable to accommodate any parking due to damage to trees).
Archery Complex Improvements	It is recommended that the City support the club in improving their facilities by the provision of lease extension to provide surety of tenure to the club. The City support the club in upgrading the clubroom facility. The club identified clubroom issues should be reviewed by the City by way of an analysis of the redevelopment options to determine most cost effective method. I.e. refurbishment of existing non-compliant building with asbestos may cost more than a newly constructed or prefabricated clubroom. That the City provides a more formal (graded) access and parking area with signage to clearly identify vehicular accessible areas.
Baseball	Support inclusion of netting to reduce impact of fly balls. Netting to be placed above existing back nets. Convert existing underutilised cricket nets to allow baseball batting cages and install lighting to the area. This can be achieved by also retaining access as cricket nets. Install pitching practice mound (as per picture below).  Relocation of diamond 2 closer to the pavilion. Improve spectator viewing to the permanent diamonds in the redevelopment of the pavilion. This would create greater spectator viewing to both permanent diamonds and provide a more cohesive oval layout. The current dugouts on diamond 1 have a solid backing. Best practice is to provide alternative backing that allows spectator viewing through the dugout area. Provision of some cyclone mesh to parts of the dugout backing will also allow improved spectator viewing. The proposed lighting upgrade to the reserve to include improved lighting for general practice to the existing and relocated diamond area.

Opportunity	Recommendation
Soccer	Improved lighting to the reserve as identified earlier in this assessments. Pavilion upgrade to include additional change areas, ideally in a more suitable location to the soccer fields. The upgrade to include additional storage for user groups and the inclusion of a specific soccer goal storage compound.
Additional Playing Surface	Allocate space for future playing field that is suitable to hold an additional senior sized soccer pitch as a minimum. Analysis should be undertaken to confirm water availability and storage for additional grass space. The additional playing surface may be provided as a synthetic surface, additional grassed area or a combination of both.
Pathways: *Fitness Trail* *Linkages*	Inclusion of fitness trail through precinct that provides a dual use linkage. Provision of 2.5m wide path will enable multiple uses and be wide enough for vehicular access for service vehicles if required. Can be provided as a more natural pathway, as per image:  Improved lighting on the ovals will allow these paths to be utilised in the evenings that sports training/games are operating. A further consideration to providing lighting to the path to allow evening use could include the provision of solar lights. The inclusion of distance markers further enhance use as a fitness trail. Include seating for rest spots, lighting to path network. Provision of outdoor fitness equipment.
Cricket	Demolish existing cricket pitch on South Western Oval and provide a second cricket pitch (Synthetic surface) to North end of North Eastern oval. This will allow a senior cricket and junior sized cricket oval to provide for future use (and soccer fields can be located either side of the pitches). Convert the existing cricket nets to multiuse cricket / baseball batting cages and upgrade with power / lighting. The City has current plans to decommission the cricket practice nets located near the Primary School.
Provision of Water Fountains	Install water fountains in the reserve at strategic locations that most users can access.

Opportunity	Recommendation
Skate Park and Youth Facilities	Relocate and upgrade skate park to a more prominent location in the precinct. Upgrade to include contemporary features and designed with input from the local skating community. Provide a 3 on 3 basketball court within proximity of the skate park.
Dog Access: **Designated as no access for dogs. People are using as dog exercise area**	Retain as dog prohibited area.
Playgrounds	In line with other recommendations within this report and the importance of the Maida Vale Reserve as a regional level park within the Public Open Space Strategy, it is recommended that the playground be relocated within the reserve and upgraded to a district level playground. In line with the City's desire to promote sustainable outcomes and with an environmental focus, a nature playground development is recommended.
Signage Improvements	Improve signage to and within the reserve, consistent with the City's style guide.
Primary School	Support the development and contribute some funding for the re-surfacing and conversion to multiuse of the courts at the Primary School if the existing netball courts are repurposed for alternative uses.
Environmental Areas	Continue to protect the current environmental areas as outlined in the Maida Vale Reserve Action Plan 2012-2019. Significant value trees within the car park areas are to be retained and protected. Furthermore, other recommendations within this summary have been made in consideration of enhancing current bushland areas and reducing any further negative impact of environmentally sensitive areas: • Provision of a more formal path network • Provision of a low level fence along the eastern edge of the ovals to provide a buffer between the ovals and environmental bushland of significance. • Improving and defining access to the archery leased area. • Improved signage. • Relocation of the existing skate park from an environmentally sensitive area. • Additional tree planting in future car parking areas to provide shade and increase tree canopy.

The recommendations have been prioritised for implementation on a short, medium, and long term with estimated capital costs. This is based on community need identified through the consultation process and analysis of data indicating high pressure points of existing facilities, audit of current facilities including accessibility and compliance issues and availability of funding.

SHORT TERM RECOMMENDATIONS

Item on Master Plan	Short Term	Cost Estimate	Contin-gencies	Professional Fees
5, 6 & 23	Pedestrian crossings across car park x 3 & Chain Link fence 0.9m high	$57,930	$11,993	$6,913
7	Formalise parking (off Ridgehill Road)	$30,000	$6,300	$3,630
9, 10, 11	Archery Area Improvements (Entry, Car Park , Club House)	$160,000	$33,600	$19,360
12	Upgrade to Norm Sadler Pavilion	$1,778,750	$273,278	$214,503
15	Upgrade lighting to oval/s	$650,000	$136,500	$78,650
17 & 18	Install baseball practice pitching mounds & Install backing nets to baseball (for fly balls)	$109,940	$23,087	$13,303
19	Convert cricket nets into baseball batting cages	$90,000	$18,900	$10,890
	Remove existing concrete cricket pitch	$10,000	$4,200	$2,420
24	Upgrade power to site	$750,000	$157,500	$90,750
25	Connect site to sewer system	$530,000	$111,300	$64,130
	Demolition - existing toilet block	$6,000	$1,260	$726
	Water fountains	$22,500	$4,725	$2,723
	TOTAL	**$4,195,120**	**$782,643**	**$507,998**
	Preliminaries	$419,512		
	TOTAL SHORT TERM COSTS	**$5,905,273**		

MEDIUM TERM RECOMMENDATIONS

Item on Master Plan	Medium Term	Cost Estimate	Contin-gencies	Professional Fees
1	Relocate Baseball diamond	$100,000	$21,000	$12,100
2	Potential to convert existing netball courts to Tennis & Multipurpose	$363,050	$76,241	$61,892
15	Upgrade lighting to Tennis/Multipurpose courts	$120,000	$25,200	$14,520
3	Fitness Trail (Lighting Optional - $600,000)	$1,111,500	$233,415	$134,492
8	New playground - Nature Play	$500,000	$105,000	$60,500
20	New synthetic cricket pitch and relocation of existing	$60,000	$12,600	$7,260
	Demolition - existing playground	$10,000	$2,100	$1,210
	Signage to precinct - to entrance and environmental areas	$25,000	$5,250	$3,025
	TOTAL	**$2,289,550**	**$480,806**	**$294,999**
	Preliminaries	$228,955		
	TOTAL MEDIUM TERM COSTS	**$3,294,310**		

LONG TERM RECOMMENDATIONS

Item on Master Plan	Long Term	Cost Estimate	Contin-gencies	Professional Fees
4	New skate park & youth space	$715,000	$150,150	$86,515
13	Future expansion of playing surface (potential synthetic)	$1,820,800	$318,150	$183,315
14	Future access to car park off Acacia Street	$222,390	$46,702	$26,909
16	Future car park expansion	$1,276,520	$268,070	$154,459
27	Modifications to existing pavilion at netball to accommodate tennis and community use	$500,000	$105,000	$60,500
	Demolish existing tennis courts and tennis pavilion	$66,600	$13,986	$8,060
	TOTAL	**$4,601,310**	**$902,058**	**$519,758**
	Preliminaries	$460,131		
	TOTAL LONG TERM COSTS	**$6,483,257**		

POTENTIAL FUNDING SOURCES:

There are a number of funding opportunities that may be available to the City to reduce the capital outlay cost burden. These include:

Funding Source	Type of Projects they will fund
Grants	**CSRFF** • Cricket pitches • Safety fences • Court resurface or upgrade • Upgrade to clubrooms/pavilions • Sports floodlighting • Court construction **Lotterywest** • Skate parks • Playgrounds **Other** There are potentially other grants that may be applied for as the master plan is progressed
Cash In Lieu	• Playgrounds • Toilets • Pathways • Seating • Carparks • Fencing • Signs
Rates and Advocacy	• All above infrastructure

2 INTRODUCTION

A Balanced View Leisure Consultancy Services (ABV) was commissioned by the City of Kalamunda to prepare a master plan for the Maida Vale Reserve.

The principal aim of the master plan is to provide a strategy to guide future development of the reserve in a sustainable manner to maximise opportunities for active and passive recreation for the community.

3 BACKGROUND

The City of Kalamunda is located in Perth's south eastern suburbs, approximately 24 kilometres from the Perth CBD. It is bound by the City of Swan to the north, the Shire of Mundaring to the east, the Cities of Armadale and Gosnell's to the south, and the Cities of Canning and Belmont to the west.

The Maida Vale Reserve is a Regional Reserve located on Ridgehill Road, Maida Vale and is approximately 30.58ha or 75.56 acres in size. The Reserve includes playing fields (8.6 hectares), the Norm Sadler Pavilion (0.1 hectares), Skate Park, Maida Vale Netball Complex (former Hills Netball Association) (0.9 hectares), Tennis Complex (1.4 hectares), and Bush Forever sites. The main user groups of the reserve being Kalamunda United Football Club, Kalamunda Rangers Inc, Maida Vale Tennis Club, Kalamunda Governor Stirling Archers and the West Australian Christian Football Association.

Maida Vale Reserve Site

4 GUIDING PRINCIPLES

Key Elements for successful Master Plans that have been considered throughout the development of this plan are:

7. **Financially sustainable** – recommended development opportunities provide a mix of facilities that are maintainable in accordance with Asset Management Plan.
8. **Colocation, shared use, multipurpose design**s – where possible, ensure development is designed to enable greatest use by a variety of users.
9. **Maximised utilisation** – where possible, developments should allow for the greatest utilisation possible.
10. **Contemporary Standards**– developments should meet current designs and trends to enable longevity of use.
11. **Accessibility** – Community facilities should be designed to comply with the principles of universal design by facilitating access to, and use of the facility and its spaces by all individuals and groups.
12. **Sustainability** - development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

5 PROJECT METHODOLOGY

This study is comprised of the following key components:

- Review of background information including relevant City plans, reports and studies, facility usage data and demographics.
- An audit review of the facilities within the Maida Vale Reserve.
- Identification of trends and factors that may influence facility development recommendations.
- Extensive consultation with City officers, sports and recreation groups and key stakeholders, the general community, other relevant agencies and organisations, and City Councillors.
- Analysis of needs through synthesis of all information gathered through the study.
- Preparation of high-level concept plans to illustrate all proposed developments for the Maida Vale Reserve.
- Construction cost estimates of developments as recommended.

6 STRATEGIC AND PLANNING DOCUMENT REVIEW

6.1 CITY OF KALAMUNDA DOCUMENTS

The following documents were reviewed. A detailed summary is included as Appendix 1.

- Kalamunda Advancing 2017 - 2027 Strategic Community Plan
- Maida Vale Reserve Action Plan 2012 - 2019
- Community Facilities Plan 2011 – 2031
- Public Open Space Strategy April 2018

In addition, a number of documents provided by the City were reviewed in order to undertake the analysis of future requirements, such as;

- Lease arrangements
- Floor Plans of existing facilities
- Facility Bookings
- Pioneer Park Reserve Master Plan
- Ray Owen Reserve Master Plan
- Hartfield Park Sport and Recreation Facilities Master Plan
- Darling Range Master Plan

6.2 OTHER RELEVANT DOCUMENTS

Strategic Directions 6 (SD6)

This publication by the Department of Local Government, Sport and Cultural Industries (Previously the Department of Sport and Recreation) Strategic Directions 6 (SD6) planning document that covers the five-year period (2016 – 2020) to guide the sport and recreation industry. It identifies the following key societal trends that are driving change in the industry:

The outcomes are:

- Increased participation
- Improved Performance
- Enhanced Social Capital and Organisational Capability
- Enhanced Wellbeing

The following summarises the identified industry challenges in this period:

1. **Governance**

   Western Australia's sport and recreation organisations must proactively engage national and state/territory counterparts in developing governance models that are collaborative and strategically aligned partnerships. These models must balance local context and interest as well as national priorities.

2. **Integrity and Values**

   Sport and recreation interests must proactively develop responses to safeguard the integrity and wholesome values which make sport and recreation a fundamental part of Australian culture. The integrity that has encouraged participants, partners, sponsors and governments to invest time, effort and resources needs active protection.

3. **Public Open Space and Urban Form**

   Urban parklands and green spaces for sport and active recreation are integral components of urban infrastructure and make a significant contribution to community health and wellbeing. In order to deliver public open space which meets the needs of communities into the future we must be efficient with resources, focus on the function of sites, provide equitable access to facilities and secure strategically important regional scale spaces.

4. **Adventure and Outdoor Recreation**

   Western Australia is a destination point for numerous adventure and outdoor recreation pursuits. Stakeholders from the public, private and community sectors must engage collaboratively to deliver high-quality activities, services and facilities to satisfy and sustain the growing demand, while protecting the environments where these activities take place.

5. **Commercialisation**

   A small number of high profile sports with significant participation bases and integrated competition structures now have robust commercially-oriented business models, while community-based sport and recreation organisations are increasingly reliant on public investment for their survival. Public investment in sport and recreation organisations should factor in the capacity of these organisations to source commercial revenue.

6. **Diversity of Leadership and Management**

   Initiatives are needed to expedite diversity in Western Australia's sport and recreation landscape at all levels of leadership and management. Sport and recreation organisations must be proactive to increase the contribution that currently underrepresented groups within the community, particularly women, are able to make to the industry.

7. **Financial (Un)Certainty**

   The sport and recreation industry must optimise the value derived from public and private funding in tight fiscal circumstances. Sport and recreation stakeholders must be strong advocates for the many benefits that are enabled by continued investment.

8. **Leveraging Facilities Investment**

   Stakeholders must leverage the investment made in sport and recreation facilities and infrastructure over the past decade. Securing high profile events and increasing visitor and local participation will add vibrancy to our communities and convert these places and spaces into business drivers, delivering extensive economic benefits to Western Australia.

9. **Life Course and Life Stage Participation**

   The achievement of improved participation rates in sport and recreation, and more broadly active lifestyles, will require innovative responses to the life course and life stage circumstances of Western Australians. A combination of expanding pioneering initiatives and adapting successful concepts from other jurisdictions can stimulate healthier and socially beneficial outcomes for our community.

10. **Monitoring, evidence and Research**

    Research and evidence-based decision-making are increasingly important for sport and recreation. Availability and utilisation of reputable information will be vital for future policy development and strategic planning.

11. **Participation, Culture and Affordability**

    Sport and recreation provides opportunities to embrace those otherwise often excluded in the community. Opportunities should be affordable and provide equitable access to encourage participation of people from diverse social, cultural and economic backgrounds.

12. Technology

Western Australia's sport and recreation landscape must embrace opportunities to progress the industry through new and emerging technologies. Astute sourcing of technological innovations that enhance core values, support participation and performance outcomes and promote organisational sustainability will be crucial.

13. Vital Volunteers

The engagement of volunteers in sport and recreation is vital for the industry to thrive and deliver personal and social benefits. Sport and recreation organisations must devise responsive and accommodating approaches to recruit, support and retain the vital volunteer base, which facilitates the delivery of sport and recreation activities.

Public Parkland Planning and Design Guide (WA)

This document was developed by the Department of Sport and Recreation and the Department of Water and outlines design principles for the development of parklands and open space. The focus of the document is the requirement for consideration of well-planned parklands that during the planning and design stages, consider all elements to achieve sustainability in the long term. Planning needs to be integrated to ensure quality outcomes are achieved;

- Consideration of end user requirements
- Allocation of parkland is suitable for desired outcomes
- Development of multi-use parklands
- Playing fields are well planned to consider peak usage and watering requirements, ongoing maintenance, use of appropriate equipment (Irrigation systems) and ongoing water supply considerations.
- Enhancement of existing site features
- Use of local resources and materials
- Department of Water should be consulted during the planning phase of parklands.

Classification framework for Public Open Space (WA), Department of Sport and Recreation

Developed in 2012, the primary purpose of this framework is to define terminology that can be universally used to describe POS and is designed to achieve that consistency and reduce confusion. The framework contains two (2) central categories – function and catchment hierarchy.

Functions - (primary use and expected activities) identifies three primary types of open spaces

Recreation spaces	Recreation spaces enhance physical and mental health through activity that provides relaxation, amusement or stimulation. Recreation spaces can be accessed by all to play, socialise, exercise, celebrate or participate in other activities that provide personal satisfaction or intrinsic reward. Recreation spaces include gardens and open parklands, community gardens, corridor links, amenity spaces, community use facilities, civic commons or squares.
Sport spaces	Sport spaces provide a venue for formal structured sporting activities such as team competitions, physical skill development and training. Sport spaces are designed to accommodate playing surface, buffer zones and infrastructure requirements of specific or general sporting activity. Players and spectators attend with the express purpose of engaging in organised sporting activity, training or competition or watching the game. Most sport spaces can also be accessed by community members for informal sport and recreation.
Nature spaces	Nature spaces provide opportunity for low-impact recreational activities, such as walking, cycling, picnicking, playing, watching or exploring natural features. Nature spaces may include bushland, coastal areas, wetlands and riparian habitats, and geological and natural features. Sites are managed to enable recreational access while protecting local ecological and biodiversity values.

Catchment hierarchy - (typical size and how far a user might travel to visit the site) includes four categories:

Local Open Space	Local open space (LOS) is usually small parklands that service the recreation needs of the immediate residential population. LOS is primarily used for recreation and may include small areas of nature space. Typical Size: 0.4ha to 1ha Access: within 400m or 5 minute walk
Neighbourhood Open Space	Neighbourhood open space (NOS) serves as the recreational and social focus of a community. Residents are attracted by the variety of features and facilities and opportunities to socialise. NOS can assist to engender sense of place and protect specific conservation values through retention of nature spaces. Typical Size: 1ha to 5ha Access: within 800 m or 10 minutes walk
District Open Space	District open space (DOS) is principally designed to provide for organised formal sport. DOS will very likely include substantial recreation space and some nature space. DOS design and function should consider biodiversity principles and environmental management goals. DOS serves several neighbourhoods with players and visitors travelling from surrounding districts. Typical size: 5ha to 15+ ha

	Access: Within 2km to 5 minute drive DOS may: • Consist of sufficient space to accommodate a variety of concurrent uses, including organised sports, children's play, picnicking, exercising the dog, social gatherings and individual activities. • Include a combination of bushland, open parkland for casual play and space for organised sport. • Accommodate multiple user groups, clubs and associations.
Regional Open Space	Regional open space (ROS) may accommodate important recreation and organised sport spaces as well as significant conservation and/or environmental features. ROS may provide substantial facilities for organised sport, play, social interaction, relaxation and enjoyment of nature. ROS can assist to protect biodiversity conservation and environmental values through retention of bushland, wetlands and other natural features. Typical size: varies. When sporting space is identified as a necessary regional function, allocations for playing fields and sports facilities should be 20+ha in area. Access: ROS serves one or more geographical or social regions and is likely to attract visitors from outside any one local government area. Users not living within close proximity will use either private vehicles or public transport systems.

7 DEMOGRAPHIC REVIEW

In planning for sporting and recreation infrastructure, it is important to understand the demographics of the area to provide insights into better understanding the likely key areas of demand and potential future need.

The City of Kalamunda had an Estimated Resident Population of 59,349 as of the 30th June 2016.[1] The Estimated Resident Population is an estimate of the population including the count of every person on Census night, and factors in an estimate of those missed in the Census and those who were overseas on Census night. It is usually higher than either Census count, and is updated annually after the Census.

Table 1 below provides a snapshot of the City population, and percentages are compared with WA overall.

Table 1: City of Kalamunda Demographic Overview

Category	City of Kalamunda	WA	Difference of Kalamunda LGA from WA
Population (2016 Census)	57,449	2,474,410	
Males	49.5%	50%	-0.5%
Females	50.5%	50%	+0.5%
Aboriginal and/or Torres Strait Islander Population	1.8%	3.1%	-1.3%
Born in Australia	64.9%	60.3%	+4.6%
Overseas Born	35.1%	39.7%	-4.6%
Median Age	39	36	+3 years
Median Income per person ($ weekly)	$732	$724	-1.1%
Median Income per household ($ weekly)	$1,661	$1,595	+4%
Couple family with children	45.9%	45.3%	+0.6%
Couple family without children	38.8%	38.5%	+0.3%
Number of dwellings	21,734		
Occupied private dwellings	92.6%	89.4%	
Index of Relative Socio-Economic Advantage and Disadvantage in Australia* [1]	85th percentile		

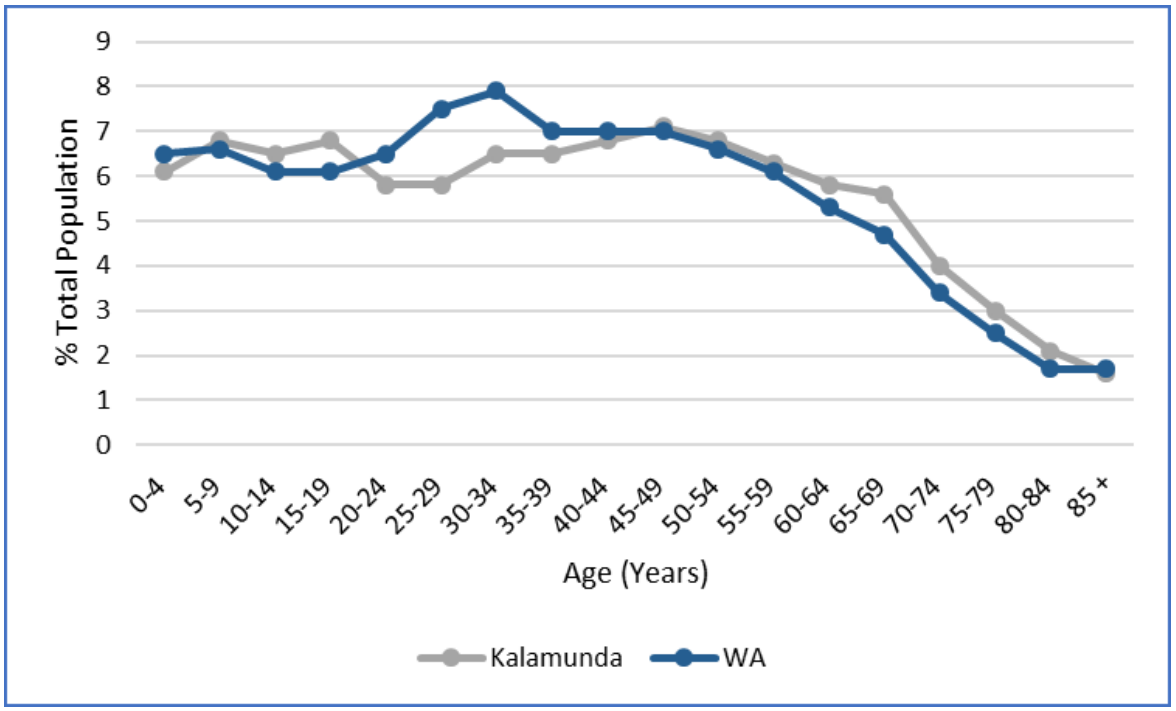
Compared to other Australian LGA's, the City of Kalamunda ranks in the 85th Percentile (1 being the most disadvantaged, 100 being the most advantaged).
Source: Australian Bureau of Statistics, Census of Population and Housing, 2016.
1. Socio-Economic Indexes for Areas (SEIFA), ABS, 2016

[1] Profile.id.com.au/Kalamunda/population-estimate

7.1 AGE STRUCTURE

The table below highlights age structure for the City of Kalamunda for the 2016 Census.

Table 2: City of Kalamunda Age Distribution Profile



Source: Australian Bureau of Statistics, Census of Population and Housing, 2016

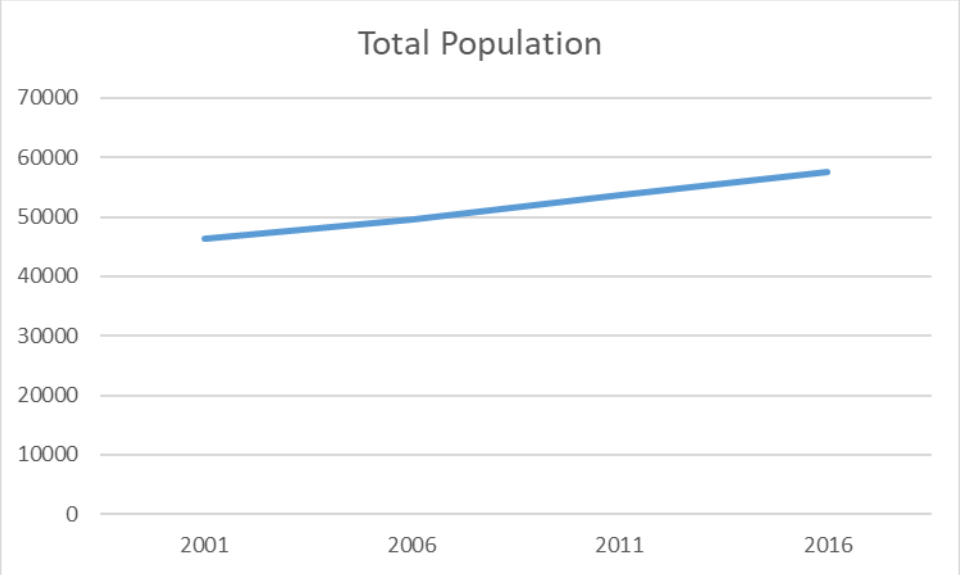
7.2 POPULATION GROWTH

Table 3 and Figure 1 provide an overview of the change in population from the 2001 Census information through to the 2016 Census.

Table 3. Population Growth

Census Year	2001	2006	% Change	2011	% Change	2016	% Change
0-4 year	2,746	2,950	7.43	3,430	16.27	3,523	2.71
5-14 years	7,263	7,033	-3.17	7,155	1.73	7,653	6.96
15-24 years	6,968	7,008	0.57	7,383	5.35	7,221	-2.19
25-54 years	21,906	20,221	-7.69	21,202	4.85	22,733	7.22
55-64 years	4,764	6,315	32.56	6,933	9.79	6,914	-0.27
65 years and over	4,903	5,939	21.13	7,454	25.51	9,413	26.28
City of Kalamunda	**46,244**	**49,534**	**7.11**	**53,568**	**8.14**	**57,449**	**7.24**

Figure 1: Actual Population Growth 2001 – 2016



7.3 PROJECTED FUTURE POPULATION GROWTH

The population forecast in Table 4 have been obtained by the City of Kalamunda forecast.id portal.

Table 4: Projected Population Change 2016-2036, City of Kalamunda

Age (Years)	2016	%	2026	%	2036	%	Number Change 2016-2036
0 to 4	3,764	6.3	4,169	6.2	4,638	6.1	874
5 to 9	4,034	6.8	4,350	6.4	4,697	6.2	663
10 to 14	3,831	6.5	4,520	6.7	4,935	6.5	1,104
15 to 19	4,007	6.8	4,541	6.7	4,998	6.6	991
20 to 24	3,610	6.1	3,819	5.7	4,514	5.9	904
25 to 29	3,699	6.2	3,682	5.5	4,273	5.6	574
30 to 34	3,983	6.7	3,943	5.8	4,416	5.8	433
35 to 39	3,864	6.5	4,482	6.6	4,893	6.4	1,029
40 to 44	4,028	6.8	4,696	7.0	5,075	6.7	1,047
45 to 49	4,152	7.0	4,448	6.6	5,022	6.6	870
50 to 54	3,977	6.7	4,212	6.2	4,806	6.3	829
55 to 59	3,651	6.2	4,045	6.0	4,399	5.8	748
60 to 64	3,338	5.6	3,802	5.6	4,087	5.4	749
65 to 69	3,264	5.5	3,464	5.1	3,840	5.0	576
70 to 74	2,325	3.9	3,139	4.6	3,599	4.7	1,274
75 to 79	1,720	2.9	2,816	4.2	3,144	4.1	1,424
80 to 84	1,195	2.0	1,769	2.6	2,432	3.2	1,237
85 and over	898	1.5	1,638	2.4	2,410	3.2	1,512
Total	**59,340**	**100**	**67,535**	**100**	**76,179**	**100**	**16,838**

Shading: Key Club Sport Playing Demographics
Source: http://forecast.id.com.au/kalamunda/population-age-structure.

The total population of the City of Kalamunda is forecast to grow by over 28% over the next 20 years, adding over 16,800 new population to the area. The key findings are:

- The data in the table above reveals that future population growth is fairly evenly distributed and the percentage of each age group remains reasonably consistent.
- The main changes are in the 25 – 34 year age group where the percentage of population decreases from approximately 6.4% of the population to 5.7%, and the increase in population of people over the age of 70 years.
- Persons aged 70+ are expected to grow by over 88% over the 20 year period. Mobility and accessibility are significant issues for this demographic that need to be considered in recreation planning. Passive recreation pursuits need to be considered in future development.
- Whilst the decrease in percentage of population is projected to occur in 25-34 year age group, there is still growth in these age cohorts, resulting in the demand for sports and recreation opportunities to grow.

7.4 FAMILY AND HOUSEHOLD MAKE-UP

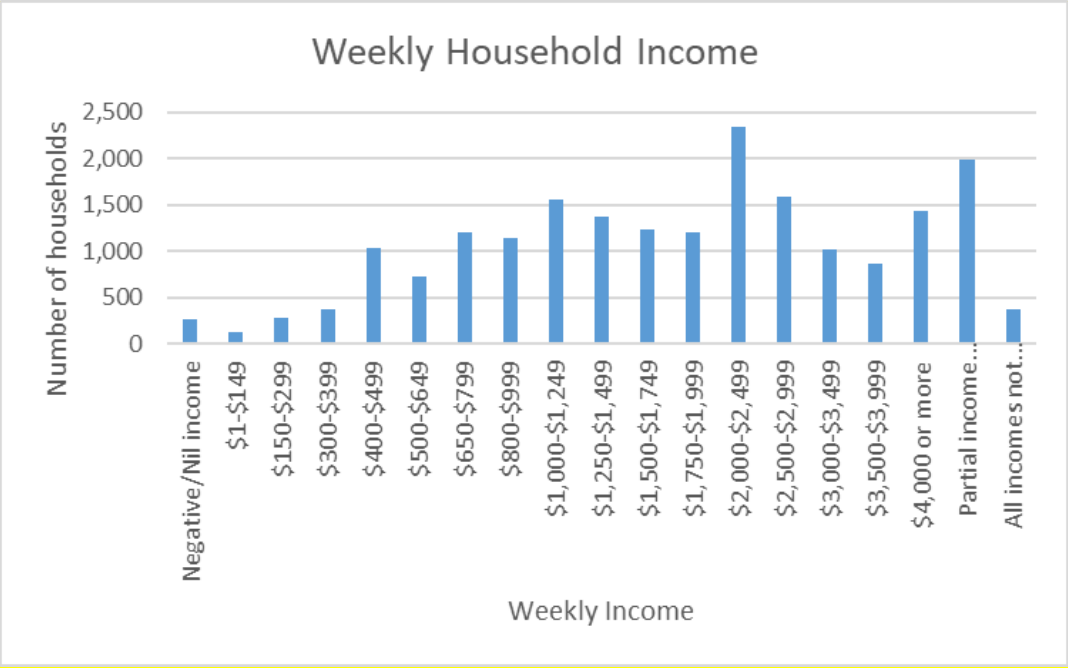
According the Australian Bureau of Statistics 2016 Census;

- There are 15,898 families in the City of Kalamunda. For families with children, the average number of children per family is 1.9.

7.5 HOUSEHOLD INCOME

The table below shows the weekly household income:

Table 5: Weekly Household income in the City



- 25.6% of households earn up to $1,000 per week, with 26.7% between $1,000 and $2,000 per week, 19.5% between $2,000 and $3,000 per week, 17.2% between $3,000 and $4,000 per week and 7.15% above $4,000 per week. 11.7% of the respondents in the City did not state their household income or provided partial income only when responding to the census.

7.6 CULTURAL PROFILE

Analysis of the country of birth of the population in 2016 highlights that 64.9% of the population in the City of Kalamunda was born in Australia, with 9.1% born in England and 3.8% born in New Zealand. The next 3 highest countries of birth are India (1.8%), Philippines (1.3%) and South Africa (1.1%).

7.7 DWELLINGS

There are 22,758 private dwellings in the City, of which 92.4% are occupied. Of the occupied houses, the 80.4% are owned, either outright or with a mortgage, 16.3% rented, with 3.2% either not identified or 'other tenure' type.

7.8 INTERNET ACCESS

87.7% of residents access the internet from their dwelling. 10.3% do not access the internet from home, with 2% not stated. The number of residents that access the internet from their dwelling is slightly higher than the Western Australian average of 85.1%.

7.9 CORE ACTIVITY NEED FOR ASSISTANCE

Core Need for Assistance is defined as a person's need for help or assistance in one or more of the three core activity areas of self-care, mobility and communication, because of disability, long-term health condition (lasting six months or more) or old age.[2]

- Of the 57,449 population, there are 2068 persons that require assistance, being 3.6% of the City's population. Of the 2068, 47.5% are male and 52.5% are female.
- 63.8% of those requiring assistance with core activities are over the age of 55 years, with 16.8% under 19 years of age and 19.4% between the age of 20 years and 54 years of age.
- It is important to note that 3,505 persons did not state whether need assistance is required for core activity in the census.
- 4,993 persons indicated they provide unpaid assistance to a person with disability.

7.10 KEY CHARACTERISTICS AND IMPLICATIONS

The key demographic characteristics for the City of Kalamunda are:

- The population in the City of Kalamunda grew at a rate of 7 – 8% per 5-year period from 2001 to 2016. The population is forecast to continue to grow and is projected to increase by an additional 16,838 by the year 2036.
- Maida Vale Reserve is in a growth area of the City. The increase in population surrounding the Reserve will continue to put increasing demand on existing infrastructure.
- The main changes are in the 25 – 34 year age group where the percentage of population decreases from approximately 6.4% of the population to 5.7%, and the increase in population of people over the age of 70 years.
- Persons aged 70+ are expected to grow by over 88% over the 20 year period. Mobility and accessibility are significant issues for this demographic that need to be considered in recreation planning. Passive recreation pursuits need to be considered in future developments.

[2] Australian Bureau of Statistics Census 2016

- Whilst the decrease in percentage of population is projected to occur in 25-34 year age group, there is still growth in these age cohorts, resulting in the demand for sports and recreation opportunities to grow.
- Of the private dwellings in the City of Kalamunda, it is estimated that over 92% are occupied. This is higher the Western Australian average.
- The City of Kalamunda has a higher than average median age of 39 years (in comparison to the WA average of 36 years). It is also projected that the percentage of the population above 70 years old is likely to increase to 2036. Whilst this increase is not large, it does demonstrate an ageing population and that consideration to passive recreation opportunities should be considered.

The following information was obtained from the City of Kalamunda Public Open Space Strategy, further illustrating projected population growth in surrounding areas of the Maida Vale Reserve.

- The Foothills will account for the majority of the City's population growth.
- Forrestfield and Maida Vale will account for the highest population growth.
- Forrestfield North, Maida Vale South and Wattle Grove South areas will grow from a small population into large district localities with POS provided in accordance with Liveable Neighbourhoods (i.e. 10% of the development area) and in response to existing site specific environmental constraints.
- The Foothills will experience the largest development of new dwellings
- Growth in the Foothills will be a combination of greenfield growth and urban infill.
- Young families and the elderly will account for significant amount of the population increase.
- The Foothills will have the greatest population rise from established families and the elderly.

8 RELEVANT INDUSTRY TRENDS

There are a number of important national, state and local sport and recreation trends that should be considered when planning for the future development of the Maida Vale Reserve**.** A summary of relevant trends are outlined below:

Public open space (POS) is generally described as land set aside for the purpose of public enjoyment and protection of unique, environmental, social and cultural values for existing and future generations.[2]

POS can increase aesthetic appeal, amenity and value of a neighbourhood, suburb or regional area. Aside from providing places to play, be active or relax, public open spaces afford many benefits. Environmental benefits can be gained through protecting local biodiversity and visual landscapes, retaining ecological systems and linkages, and management of urban water. Social benefits can be gained through community interaction and activation of places for formal and informal sport and recreation. Cultural benefits can be gained through recognition and interpretation of Indigenous and historic values. Economic benefits can be gained through provision of services supporting visitation for sport, recreation and tourism.[3]

8.1 INTEGRATED PLANNING

In recent times, planning of Community Infrastructure, including public open space is undertaken on a more holistic scale across a district or sub-region, rather than isolated facility development.

- Identifying and prioritising service needs.
- Reviewing existing services in relation to these needs.
- Identifying which services should be retained or discontinued.
- Identifying and developing new services aligned with the current and future priorities of Council and the community.

A broad range of community needs, population, demographic profiles and existing provision is assessed in the planning of infrastructure. Services provided and likely to be required are taken into consideration.

Generally, local governments are adopting this approach and introducing an integrated planning model along discrete service lines (i.e. youth provision, aged and seniors care, sports facility provision, child and community health).

The purpose of the model is to ensure the need for community services is fully analysed in order that they can identify how to best meet the community requirements. This enables local governments / not for profit services to take a more strategic and pragmatic approach to the delivery of services and facilities. Inherent in a more strategic and pragmatic approach is an organisation that is more responsive and adaptive to community needs, takes a more holistic approach but able to distil this to a local level, is able to balance service needs with financial pressures and is able to forecast future needs.

This integrated approach provides in general for a better network of facilities that meet the community aspirations, and allows for a different range of service options within facilities. This strategic approach reduces duplication of facilities and services, ultimately providing a more sustainable outcome for the community.

[3] Classification framework for Public Open Space, Department of Sport and Recreation, 2012

8.2 ACTIVE AND PASSIVE SPORT AND RECREATION PARTICIPATION TRENDS

General Participation

- There is an increasing trend of participation in non-traditional recreation by youth e.g. active recreation, 'electronic' recreation etc.
- Growing awareness of the need to engage people who do not traditionally participate in sport and recreation e.g. people with disabilities, teenage girls, culturally diverse groups. Greater need to offer opportunities to capture imagination and interest.
- Growing trend towards more casual options requiring small groups of people and minimal coordination e.g. walking, cycling, trails and mountain biking etc.
- Transportation can be a significant impediment to participation, emphasising importance of footpaths and cycle paths leading to facilities.
- Growing recognition that participation in physical activity can have positive impact on educational outcomes, school attendance, juvenile crime, antisocial behaviour, population health etc.

The latest Australian sports and physical recreation participation trends are now being captured in the Ausplay survey that is conducted by the Australian Sports Commission (ASC). This replaces data that was previously captured by the Australian Bureau of Statistics and the Exercise, Recreation and Sports Survey conducted by the ASC.

The first Ausplay survey was conducted from October 2015 to September 2016 and included interview with over 20,000 adults, including more than 3,800 parents/guardians of children aged up to 14 years. Key findings from the Ausplay 2016 Report are as follows:

8.2.1 TOP ACTIVITIES

Tables 6 and 7, below from the Ausplay survey show the top 20 activities for adults (organised and non-organised), and the top 20 organised activities for children outside of school hours.

Source: Ausplay 2016, Australian Sports Commission.

Table 6: Ausplay Survey Top 20 Activities Adult

Adults Top 20 activities	Population estimate	Per cent of population
Walking (recreational)	8,397,408	42.6%
Fitness/gym	6,317,614	32.1%
Athletics, track and field*	3,115,027	15.8%
Swimming	2,852,924	14.5%
Cycling	2,302,614	11.7%
Football	1,141,027	5.8%
Bush walking	1,058,061	5.4%
Golf	1,022,127	5.2%
Tennis	946,790	4.8%
Yoga	866,679	4.4%
Basketball	667,006	3.4%
Cricket	643,919	3.3%
Netball	630,638	3.2%
Surfing	528,058	2.7%
Australian football	496,829	2.5%
Pilates	489,731	2.5%
Fishing (recreational)	412,049	2.1%
Touch football	402,756	2.0%
Canoeing/kayaking	312,664	1.6%
Dancing (recreational)	269,798	1.4%

Table 7: Ausplay Survey Top 20 Activities Children

Children organised out of school hours Top 20 activities	Population estimate	Per cent of population
Swimming	1,378,967	30.0%
Football	674,094	14.7%
Australian football	366,462	8.0%
Gymnastics	341,200	7.4%
Netball	332,018	7.2%
Dancing (recreational)	329,003	7.2%
Basketball	300,622	6.5%
Tennis	280,239	6.1%
Cricket	256,930	5.6%
Athletics, track and field	203,873	4.4%
Rugby league	126,754	2.8%
Karate	121,877	2.6%
Dance Sport	106,901	2.3%
Hockey	76,922	1.7%
Touch football	76,039	1.7%
Lifesaving surf	65,986	1.4%
Fitness/gym	59,282	1.3%
Rugby union	57,429	1.2%
Taekwondo	49,261	1.1%
Martial arts	47,279	1.0%

These statistics find that recreational walking is the primary form of physical activity undertaken by Adults (43%), with jogging (included within Athletics Track and Field 16%), and Cycling (12%) also included in the top 5 activities. It underscores the level of importance that pathways and trails have in sport and recreation facility provision that is inclusive of the whole community.

8.2.2 ORGANISED SPORTS PARTICIPATION

The Ausplay survey reveals, as have previous national surveys, that organised sports participation is highly popular amongst children and peaks amongst children in the upper primary school years, and then gradually declining amongst high school aged children.

Organised sports participation amongst Adults (15+ years) is at its peak amongst persons aged 15-17 and then progressively declines as age increases.

Figure 2: Adult participation by age

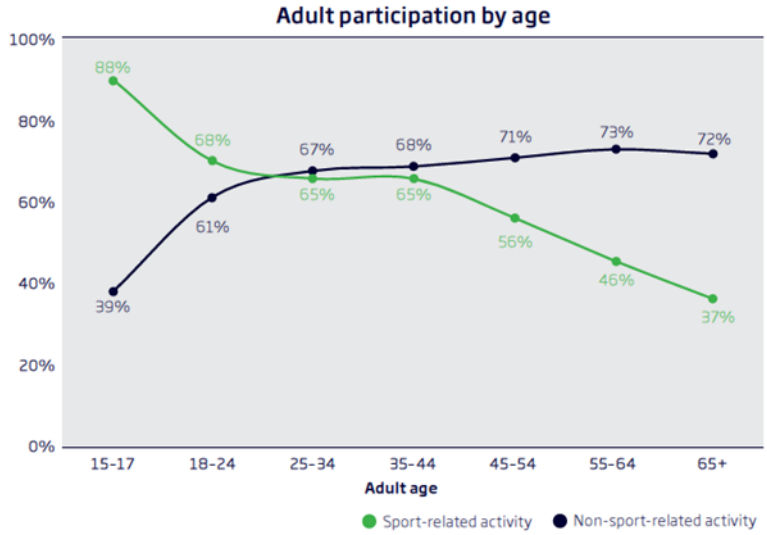
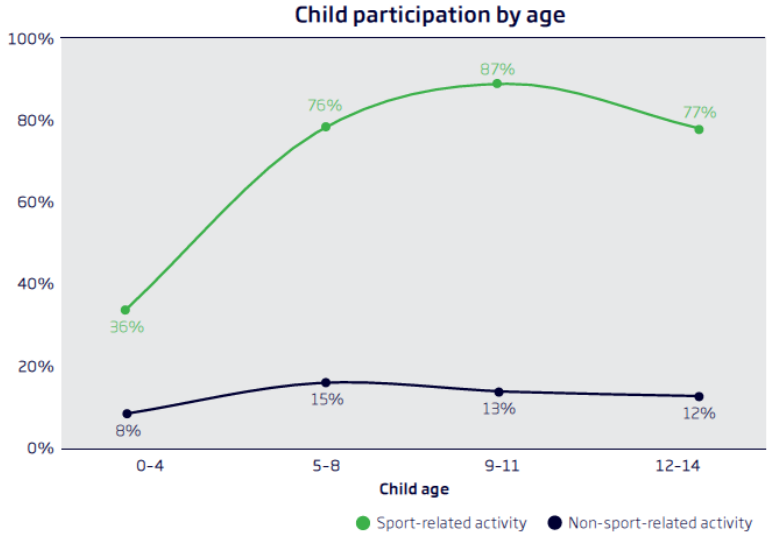


Figure 3: Child participation by age



Source: Ausplay 2016, Australian Sports Commission.

8.2.3 BARRIERS TO PARTICIPATION

For adults, lack of time is the primary reason for not participating in physical recreation up to age of 50, after which poor health/injury becomes the major reason for not participating.

For children, lack of time is cited as the major reason for not participating in physical recreation followed by lack of money and lack of enjoyment (excluding too young/too old to participate).

8.3 LOCAL SPORTS PARTICIPATION GROWTH

Within the key sports playing age groupings (5 - 34 years of age), the City of Kalamunda is anticipating minimal change in percentage of the population.

Analysis of the City's population growth in the key sports playing demographics by ABV indicates that the City of Kalamunda is likely to experience increased local demand for both junior and senior sports participation.

8.3.1 FEMALE SPORTS PARTICIPATION

An emerging trend in two major field sporting codes in Australia is the rapid growth in female participation cricket and football, which traditionally have been male dominated. Female Cricket and Australian Rules football have recorded remarkable growth in recent years including:

- The Australian Cricket Association reported a 20% increase in female participation from 2014 to 2015, with females now making up 1 in 4 cricket participants.
- The Australian Football League reported a 19% increase in female participation from 2014-2015, and that they now make up 22% of all football players nationally.

Interestingly, female soccer participation has not recorded significant growth in participation in recent years, however it is a goal of the Football Federation of Australia as stated in the Women's Football Strategic Plan 2014-2016. Currently 20% of soccer players in Australia are female.

This increased female participation in traditionally male dominated mainstream sports including football, cricket and soccer, will have a significant impact on growth in demand for active reserve space and the need for more female friendly facilities such as female change rooms at multi-field sports complexes.

8.3.2 GAME FORMAT CHANGES

Many sports are introducing new forms of the game to attract younger and new participants. Amongst others, cricket, rugby and soccer are now providing modified, fast versions of the game. The impact is that sports such as rugby, Australian Rules football and soccer have introduced their modified game during summer seasons, effectively increasing their season and requirements for infrastructure.

8.4 FACILITY SHARING

Strong emphasis is now placed on the best practice principles of joint use facilities and co-location at all levels of government. The push towards greater implementation of joint use and co-location is encouraged through the prioritisation of funding towards projects that espouse these best practice principles. The Department of Local Government, Sport and Cultural Industries (DLGSC) administer the primary source of State Government funding for community sport and recreation facilities, the Community Sport and Recreation Facilities Fund (CSRFF), and the information on its website clearly states that:

> "Priority will be given to projects that lead to facility sharing and rationalisation. Multi-purpose facilities reduce infrastructure required to meet similar needs and increase sustainability." Source: http://www.dsr.wa.gov.au/facilitiesfunding

This provides significant financial incentive for community groups to pursue shared facility opportunities in order to gain significant levels of funding.

DLGSC also advocates joint use facility provision in the *Facility Planning Guide, Sport and Recreation Facilities, March 2007.* This document provides the following rationale for joint use facilities:

- Less duplication and maximum use of community facilities and services
- Creation of a community hub—a focal point for community activity
- Shared capital costs, services, resources and expertise
- Improved relationships between organisations
- Reduced operating costs
- Increased community ownership of facilities
- Access to a broader range of services and expertise
- Reduced vandalism

This document notes that all parties need to carefully consider their specific needs for access and usage and be assured that compatibility exists before planning progresses to the design phase. Comprehensive management agreements need to be developed to ensure all parties are aware of their responsibilities, however, if a sharing arrangement is to be successful there must be flexibility, trust, open communication and co-operation.

Sharing of facilities allows optimisation of usage of sports fields, clubrooms and amenities. A common example of facility sharing is usage of a set of clubrooms and sporting fields by a winter user and a summer user. At the end of a season, one club vacates the facility to enable the other seasonal user group access for their season. This ensures the facility is used year round.

There are also opportunities for junior clubs to share with seniors. Juniors and seniors of the same sport generally play on different days or morning and afternoons/evenings. Junior clubs generally have a lesser requirement for social facilities, and therefore can be well suited to being a secondary tenant of a clubroom facility.

It should be noted however, that one size does not fit all in regards to facility sharing. In some instances there may be opportunities for increased facility sharing and in some instances there may be less. One of the major factors that affect the ability for sharing of facilities is the size of the clubs concerned. For example, a junior sporting club may have very large membership and require scheduling of games on both days of the weekend plus training times on most weeknights thus limiting availability of the facilities for other same season users.

Additionally, some sports are moving beyond a traditional six month season with both strong winter and summer competitions, with soccer being one example; therefore sharing of facilities with another major user group can be difficult if the facilities do not have the capacity/flexibility to accommodate multiple user groups simultaneously.

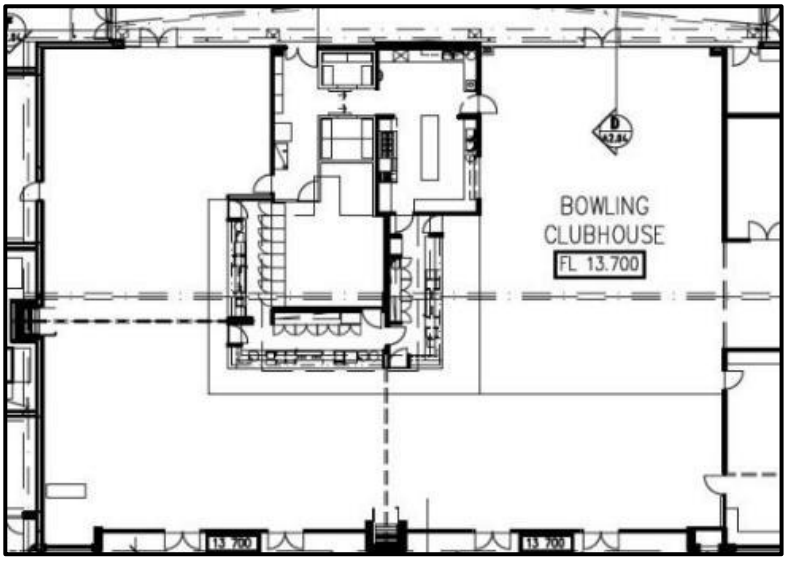
Opportunities for facility sharing need to be individually assessed and include consultation with the key stakeholders. In each case there will be a range of issues that need to be carefully considered before making a decision on opportunities for facility sharing and the timing for proceeding with the infrastructure developments.

Multi–User Pavilions

ABV has collated the plans of many shared use pavilions during the course of numerous sport and recreation facility needs assessments and feasibility studies. There are a number of traits from contemporary facility designs that are considered appropriate and should be considered in the design of an upgraded or new shared use pavilion(s) at Maida Vale Reserve.

Large Dividable Social/Function Room, Kitchen and Bar – A large function area that can be divided; the plans below indicate three separate spaces with retractable walls is a key component of this successful shared use facility. It allows multiple groups to use the facility simultaneously, and provides the flexibility for different sized room spaces to be configured depending on the needs of the function. A horse shoe shape central kitchen/bar area is a feature of a number of contemporary designs including the recently constructed Mandurah Bowling and Recreation Club as shown below:

Figure 4: Large dividable social/function space with central kitchen/bar



It is important that each of the divisible areas can be accessed by patrons independently without disturbing users of the other function rooms, including external access and access to the kitchen, bar and toilets.

Multiple sets of Change rooms – Multiple sporting fields/courts require multiple sets of change rooms to adequately provide for the needs of the sports participants. It is advantageous to provide at least one set of change rooms specified to senior community Australian Rules football standards as these dimensions are equivalent or greater than the community standards of all other sports as they have the highest number of players in a team. The number of change rooms for each multi-field sporting reserve needs to be individually assessed on a case by case basis – depending on the users make up of senior to junior teams, what sports / clubs are playing on the same day and the type of fixturing the sports utilise.

Multiple Kiosks – the ability to run a kiosk is important to many sporting clubs as it forms a significant part of their revenue which they are able to staff with their own volunteers. This is important for smaller groups who may not have the economy of scale to participate in a sports association model that requires paid staff to serve food and drink. Depending on the management arrangement for the shared pavilion and the need to service separate areas at the same time, it may be necessary to provide two or three small kiosks that can serve food and drinks, whilst food preparation occurs in the shared kitchen.

Shared Administration Facilities – Meeting rooms can readily be shared by multiple user groups, less common are the use of shared office spaces, although these are appearing in recent plans (see below for an example). A shared office space can have multiple work stations as well as lockable cabinet space so that club administrators have access to an office as required, without needing unnecessary duplication of building space.

Figure 5: Example of Shared Office Space

Ample Storage – A large amount of storage is needed for a shared pavilion, with the total requirement depending on each club's needs. 20-30m2 of storage space is generally considered suitable for the equipment storage requirements of most clubs. Small storage spaces should also be included for community groups that may be regular hirers of the facility.

Spectator Shelter and Viewing – Shared pavilions at multi-field reserves can have large patronage numbers on competition days. Ideally the pavilion would be elevated and have large verandas for spectator shelter facing towards the key sporting fields. If the pavilion is elevated, it provides the opportunity for tiered seating under the shelter as shown below:

Figure 6: Image of spectator shelter and viewing example

Playgrounds – Facilities for young children are a beneficial addition to pavilions for participants/spectators who have young children and also for community hirers of the facility such as playgroups, providing day time activation of facilities. It helps the facility to be more family friendly and maintain involvement of participants as they become young parents.

8.4.1 MULTI-USE SPORTS PRECINCT KEY SUCCESS FACTORS

The layout design of a multi-use sporting precinct is critical for successful shared usage by multiple user groups. The following key design elements have been developed from a best practice perspective accumulated from projects undertaken by A Balanced View (ABV) Leisure Consultancy Services and feedback from LGA's and sporting clubs:

Proximity of Pavilions to Sporting Fields – Users of a shared pavilion facility must have good viewing and access to their sporting field from the pavilions. Access to the fields should not be obstructed by parking or driveways to ensure safety of children.

Large Open Grassed Playing Areas - Grassed sporting fields should be positioned together without dividing barriers such as trees or fencing where possible. This allows for maximum flexibility of use and is beneficial for holding school carnivals, festivals and other large events.

Driveway Location – Where possible, access driveways should not dissect a sporting complex, particularly where children are likely to cross – i.e. between the pavilion and a sporting field. If a pavilion is situated a considerable distance from entry access points of a reserve, the driveway should be routed along the boundary.

Compatibility of Users – Compatible users should be grouped together in shared facilities. For example, cricket and football clubs are compatible groups due to their opposing seasonal usage.

Passive & Informal Recreation Features - A range of passive and informal recreation features should be provided in conjunction with the active facilities to ensure there is something for everyone in the one location. This will also encourage the general community to make use of the sporting fields when not in use by clubs as the large grassed areas are excellent passive recreation facilities in themselves. Passive informal elements may include trails, outdoor exercise equipment, playground equipment, 3 on 3 basketball feature, tennis hitting walls, amphitheatre style meeting places, picnic facilities, water features and fountains for people and their pets, shaded rest stops and seating etc.

Parking and Access - Ample parking and road access is important as well as via public transport and being linked to a dual use path network. Whilst catering for adequate parking for dedicated peak utilisation is neither practical or in many cases possible, too few parking spaces can cause significant safety issues and hamper the ability of sporting organisations to conduct their activities effectively and efficiently.

Spectator Viewing – Spectators should be well catered for with ample shelter and areas to stand/sit whilst viewing sporting events. Community sports have strong family involvement and therefore it is important that parents, children, siblings, grandparents etc. are able to view the sporting activities in a degree of comfort.

Hosting Events – Large multi-use sporting reserves should have design features that will allow them to cater for large events such as regional tournaments, top grade grand finals and community festivals. In addition to the design features previously mentioned, this may also include ensuring supporting amenities such as change rooms, toilets and social facilities are of a sufficient standard.

Floodlighting – Adequate floodlighting to Australian Standards for training at a minimum is required to ensure the sporting fields can be used to their full capacity, particularly for winter sports when sunset occurs soon after the work day has ended. Competition lighting is also increasingly becoming a need due to the growth in midweek competition which allows greater utilisation of facilities.

Water Efficiency - Sustainable irrigation and landscaping practices such as native plantings and computerised reticulation are important to give protection against the effects of climate change.

8.4.2 SPORTS FIELD CAPACITY

Overuse of sporting grounds is a major issue in the Perth metropolitan area, arising from a growing population with a lack of corresponding growth in active open space. Grounds that have excessive usage are damaged, become unsafe to play on and are costly to repair. The amount of usage that a particular sporting field can handle is dependent on many variables including the type of users, quality of the soil, climatic conditions, water quality and the type of turf to name a few.

Research by ABV amongst various LGAs across Australia has found that approximately 20-25 hours of usage per week is generally supported as being the optimum capacity of a well-drained and reticulated active sporting field in a moderate climate.

ABV notes that LGA's across the Perth metropolitan area are implementing usage restrictions based around these figures to ensure the sustainability of their sporting reserves.

Synthetic surfaces are also coming under increasing consideration by WA sports field providers including LGA's and education institutions, as they are able to handle more than double the capacity of natural turf fields. This is explored further in the following section.

8.4.3 SYNTHETIC SURFACES

Synthetic turf sports surfaces have been implemented for several decades now and are being used extensively for lawn bowls, tennis, hockey and cricket (wickets) within Western Australia. The benefits of synthetic turf include increased usage capacity, decreased water and maintenance requirements and improved uniformity of ball bounce/roll characteristics.

A more recent phenomenon is the increasing development of synthetic soccer surfaces (often with multi-use purposes) of LGA's and schools. In the 1990's 'Third Generation' synthetic turf was developed that includes long pile turf with granulated rubber infill. The playing characteristics of synthetics for soccer and other such large ball sports are similar to that of natural turf and reportedly do not affect the style of play. They have low abrasion qualities and allow players to slide on the turf as they would on natural grass. Fourth generation surfaces are now relying on less infill, are more multi-purpose and retain less heat which is a problem during Australia's hot summers.

In Australia, the uptake of synthetic surfaces has been influenced by the severe water shortages along the east coast over the past decade. In the Eastern States, many synthetic soccer fields have been developed and synthetic ovals for AFL/Cricket are also beginning to appear now that synthetics are meeting AFL/Cricket criteria. Another significant factor in synthetic surface uptake is that major cities in Australia have growing populations but limited land availability for additional active reserve space.

The Perth metropolitan area has been fortunate to have a very large and easily accessible ground water resource that is used to irrigate almost all public open space. Synthetic turf fields can cost over four times the capital establishment costs of an equivalent area of natural turf, thus the development of synthetics for soccer and other large ball sports has been limited in WA to date given the previous levels of low cost water supply. However, Perth's climate is drying and warming, with 2015 being one of the hottest on record and was combined with a dry winter and spring resulting in very little replenishment of water supplies. There is

growing discussion in the Parks and Recreation industry that ground water allocations for public open space (POS) are likely to be reduced in the near future due to the sustained reductions in groundwater recharge, thus requiring LGAs and education institutions to reduce water consumption and find other (and most likely more costly) water supplies. This will impact on the ability for providers to maintain their existing levels of active reserve provision and greatly restrict their ability to develop new turf for growing populations.

Perth metropolitan areas are also running out of available space for new active reserve developments to cater for increasing demand as population infill occurs. Synthetic surfaces are more efficient uses of land than natural turf in this regard.

The City of Swan has developed four multi-purpose synthetic fields for a new district open space in Ellenbrook, completed in mid-2016. It is the largest synthetic development of its kind in the southern hemisphere. It has been developed in response to limited water supply and the need to maximise use of limited active reserve space availability.

Figure 7: Ellenbrook District Open Space Multi-Use Synthetic Fields

Hybrid synthetic / natural grass surfaces are also increasingly being implemented where circumstances require. The synthetic turf is almost unnoticeable and whilst not providing savings on water use compared to full synthetic pitches, they offer the same significant increase in usage capacity and do not have the same requirement for fencing for protection of the surface, thus being more suited to areas of public open space.

Synthetic surfaces are increasingly being developed in multi-purpose varieties that meet the international standards for multiple sports, however, there are still limitations to the range of sports that can be played on a single surface, particularly sports that are played on short fast rolling turf such as hockey and tennis and those that are played on longer turf such as soccer and football. A synthetic sports surface development should be considered in a detailed feasibility study to ensure the most effective location, surface type/dimensions and management options are identified to meet the community's requirements.

8.5 CHANGING COMMUNITY EXPECTATIONS

Communities are becoming more aware and engaged in regard the development and use of community spaces, and therefore expectations are higher. Communities and sports groups are aware that changing trends in participation and space requirements requires multipurpose buildings and spaces that are adaptive to the changing environments.

There is an increasing expectation that local communities will develop sustainable solutions to community issues to reduce ongoing funding support.

Older persons seek lower impact activities at more convenient and flexible times of the day and expect that facilities are suitable for their use.

There is a greater reliance on locally accessed and lower cost opportunities by those without the resources to travel or pay for more expensive pursuits.

8.6 LEGISLATION

Increasing statutory obligations (e.g. Disability Discrimination Act), risk management and occupational health and safety require local governments to undertake more rigorous monitoring of compliance and risk.

8.7 ACCESSIBILITY

Community facilities should comply with the principles of universal design by facilitating access to and use of the facility and its spaces by all individuals and groups (regardless of age, ability, cultural background or level of social or economic advantage/disadvantage). This relates to providing a high level of physical access, connection and way-finding as well as ensuring services, programs and activities are broadly advertised, and are affordable.

8.8 SUSTAINABILITY

There is an increasing trend to focus on all aspects of sustainability. This includes the desire and requirement for community facilities to be affordable (from a construction and ongoing operational cost base).

Materials and Ecologically Sustainable Development initiatives, technology built in to the design. Flexibility in design also improves long term sustainability as buildings and other infrastructure are more adaptable.

Initiatives include passive solar design, use of photovoltaic cells, water capture and reuse, use of low embodied materials and purchase of ‘green’ energy. Incorporating these and other ESD initiatives in new buildings and other infrastructure helps reduce their carbon footprint.

Obtaining contributions from user groups to cover costs of providing the facility where they have the ability to generate an income source from use of the facility.

8.9 NATURE PLAY

In recent times, there is strong trend to connect all children, their families and communities to nature. Guidelines are being developed to reintroduce nature play into play areas and the design of community parklands.

The opportunity to be in the outdoor environment is important for the development of children’s motor and cognitive skills, interpersonal attitudes and emotions. The differences in outdoor environments such as

neighbourhoods, parks, playgrounds, school grounds and natural environments can comprise rich sources of stimulation and affordances for children. [4]

As such, proactively providing opportunities to play in nature and natural environments is becoming critical and is recommended to include nature play areas in the Public Parkland Planning and Design Guide (WA) for newly developed parklands.

8.10 SKATE FACILITIES

The number of children participating in bike riding, skateboarding and scootering has grown markedly in recent years. The design of skate facilities has also changed in recent years:

- The involvement of youth in the design of skate parks has become an important aspect in obtaining buy-in from local youth.
- The development of different facility types including skateable landscapes and combination facilities, often forming a youth precinct.
- Facilities designed to have varied spaces that cater for differing levels and abilities.
- The development of skate facilities in high profile locations centrally located with ease of access to other facilities such as shopping precincts.
- Development of facilities using an integrated landscape approach

[4] The Trends and Influential Factors or Children's Use of Outdoor Environments: A Review, Nor Fadzila Aziz and Ismail Said, 2010

9 CONSULTATION

Consultation and engagement with the community was crucial to the development of this master plan. The following opportunities were provided to the community to participate in the master planning process:

Initial Information Gathering	Follow Up	Community Visioning Workshop
• Project Page developed on 'Engage Kalamunda' • On-line Community Survey (City of Kalamunda "Engage Kalamunda" page). • Sporting Group Survey. • 2 x Community Drop-In Sessions	• Individual face to face or telephone meeting with identified key users and stakeholders to ascertain requirements, concerns, ideas. • Meetings with additional groups as requested by the City of Kalamunda • Meetings with relevant State Agencies and State Sporting Bodies.	• A visioning workshop was held for members of the community to provide input into development opportunities for the reserve.

The following key themes were identified through the consultation process. A detailed summary of the consultation results can be seen as Appendix 2.

CAR PARKING & TRAFFIC	PAVILION / CHANGE ROOMS	SPORTS CLUBS
• Car Parking needs improvement • Car park lighting • Ingress and Egress improvements • Linkages from car parks to sports spaces	• Change Rooms not compliant with current standards • Not enough change rooms to accommodate current competition • Improve spectator viewing to main baseball diamond • Administration areas requested	• Baseball: Improved facilities – diamonds, car parking, change areas, security. • Soccer: change rooms upgrade required, lighting • Archery: Upgrades to amenities buildings • Tennis: Court Maintenance • Cricket: Wicket improvements • Storage: Existing storage inadequate: size and location.
LIGHTING (POWER)	**PATHWAYS/LINKAGES**	**OTHER**
• Limited Oval Lighting. Limits use to predominantly day light hours. • 3 power sources to site. Current supply not likely to accommodate any increased load.	• Improve walkways and cycle tracks and linkages	• Some areas of poor drainage on oval • Underutilised facilities (e.g. netball courts and tennis courts) • Highly valued by community • Skate park location • Playground – location and quality

10 CURRENT SITE SITUATION ANALYSIS

The information in this section provides an overview of the existing condition of the reserve, including current features, facilities and uses. This information was gained through site visits, consultation with the user groups and community, and information obtained in documents and policies of the City of Kalamunda.

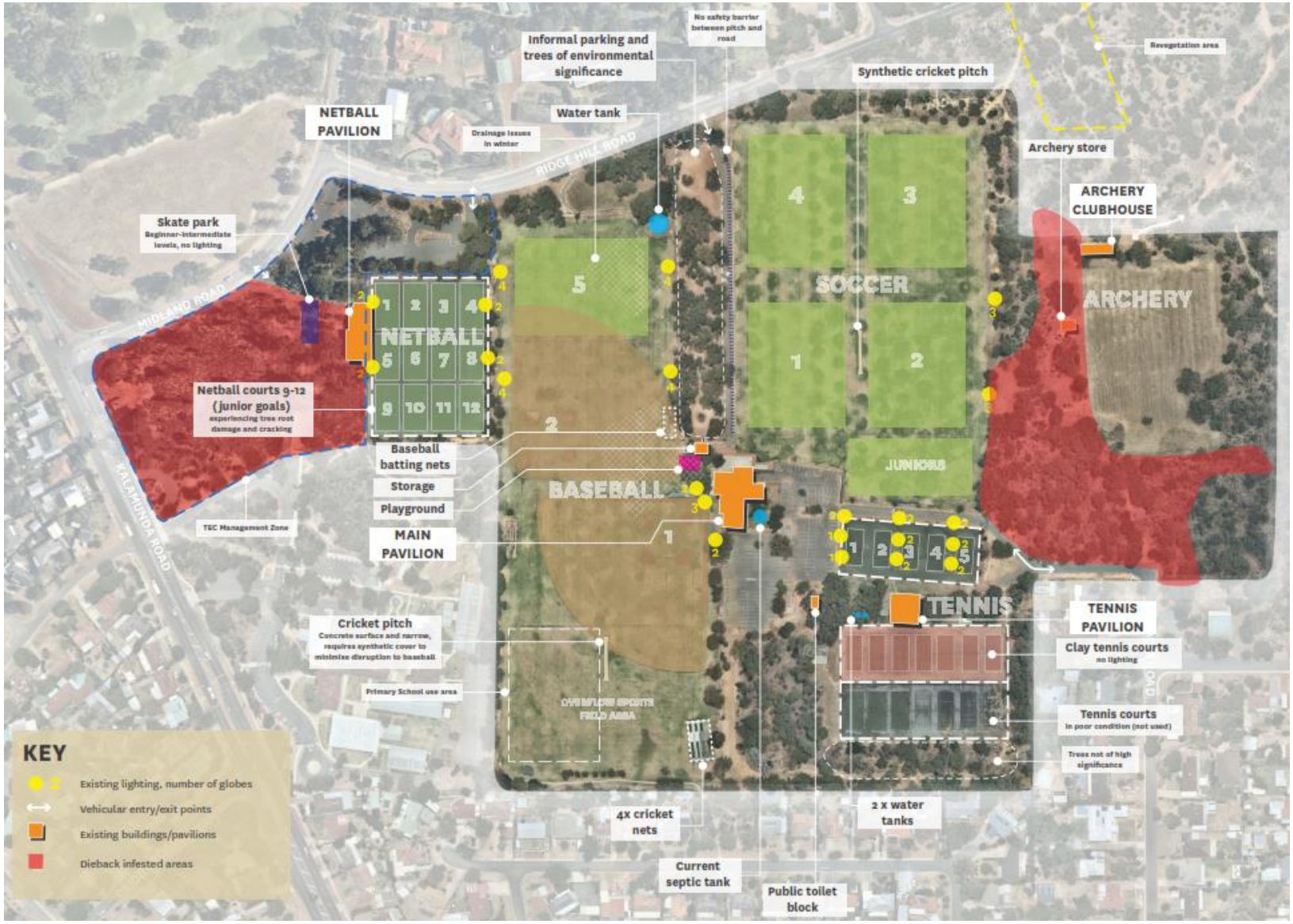
Maida Vale Reserve				
	Identification Method			Summary Comments & Assessment
	Site Visits	Policy/Background Review / Research	Consultation	
Roadway Network	Dissects the reserve playing fields at Ridgehill Road car park, no traffic controls or calming measures in place.		Acacia Road residents - cars speed through streets and park along street during major events.	Acacia Street entrance through narrow local streets - issues for local residents at peak times. Archery Roadway informal Mature and significant trees potentially damaged with cars travelling across roots in informal areas
Power to site	It was observed on site that sports lighting was impacted by the power supply. Lights intermittent		Clubs/users reiterated issues with supply, citing electrical interruptions to lighting and pavilion electricity.	Information provided by the City of Kalamunda identified there are 3 supplies for the precinct, both at or nearing capacity.
Signage - entry statements - information signage	Limited signage off main access points. Limited signage once within precinct			Signage is not clear delineating access to and within the reserve. Signage outlining areas of significance may improve awareness.
Pathways	No path linkages between areas of the reserve. Informal pathways created by users through bush areas (near skate park and from footpaths to precinct)	Fitness tracks popular and generally well used. Can be dual use.	Noted that children run across current informal car park area (off Ridgehill Rd) - dangerous. Identified in surveys and drop in session Consult with City of Kalamunda suggested opportunity to separate and protect environmentally sensitive areas via path network	The degree of accessibility and inclusiveness should reflect the park's hierarchy. The higher the catchment hierarchy of the open space, the more elements should be made accessible. Integration of paths would contribute significantly to the use and value of the reserve.

Maida Vale Reserve				
	Identification Method			Summary Comments & Assessment
	Site Visits	Policy/Background Review / Research	Consultation	
Lighting	Site Visit during night training time confirmed limited lit areas suitable for training. Some lights not working.	Lighting identified as an issue in background documentation.	Consultation with Rangers & Kalamunda United confirmed that the areas of playing field with sports lighting limits the ability to train, resulting in small pockets of the playing area more heavily used.	Maida Vale reserve is highly utilised sporting reserve with a number of clubs and organisations using the facilities for training and competition. There is currently minimal lighting available and covers less than 50% of the active open space. The condition of existing lighting was noted through the consultation as poor, in regards to; consistency of supply to lights, lux level, and coverage, thereby limiting the areas of the active open space available for training
Norm Sadler Pavilion	Internal of pavilion and kitchen in good condition and look well maintained. Site visit identified shortfall in storage, public toilets, number of & non-compliance of toilet and change facilities	Previous planning and response to club surveys	Consultation with Rangers, Kalamunda United and Christian Football Club	Whilst the internals of the pavilion are in good condition, the current change room facilities are outdated, limited in numbers and do not fully support current operations
Car-Parking	Formal car park layout inefficient Informal car park being used Formal car park at netball area under utilised		Identified through consultation that informal car park under trees (off Ridgehill Road) dangerous and inefficient	Existing car parking bays not adequate to cope with load at peak times. Additional formal car parking may be required to meet current needs. Improvements to flow of existing formalised car park and improvements to overflow area to accommodate more efficient parking required.
Tennis Club Options	19 courts in total. Existing courts in relatively poor condition. Location of courts is not highly visible within the reserve.		Consultation with Tennis Club advises that 12 courts are in use.	Membership has reduced (52 current). Of 19 courts, 7 are not in use, 5 hardcourts mould affected and clay also nearing refurbishment time.
Skate park	Location: minimal passive surveillance in current location.			Fencing / trail – dieback issue Standard of facility. In keeping with the city standards of skate park provision? Relocation

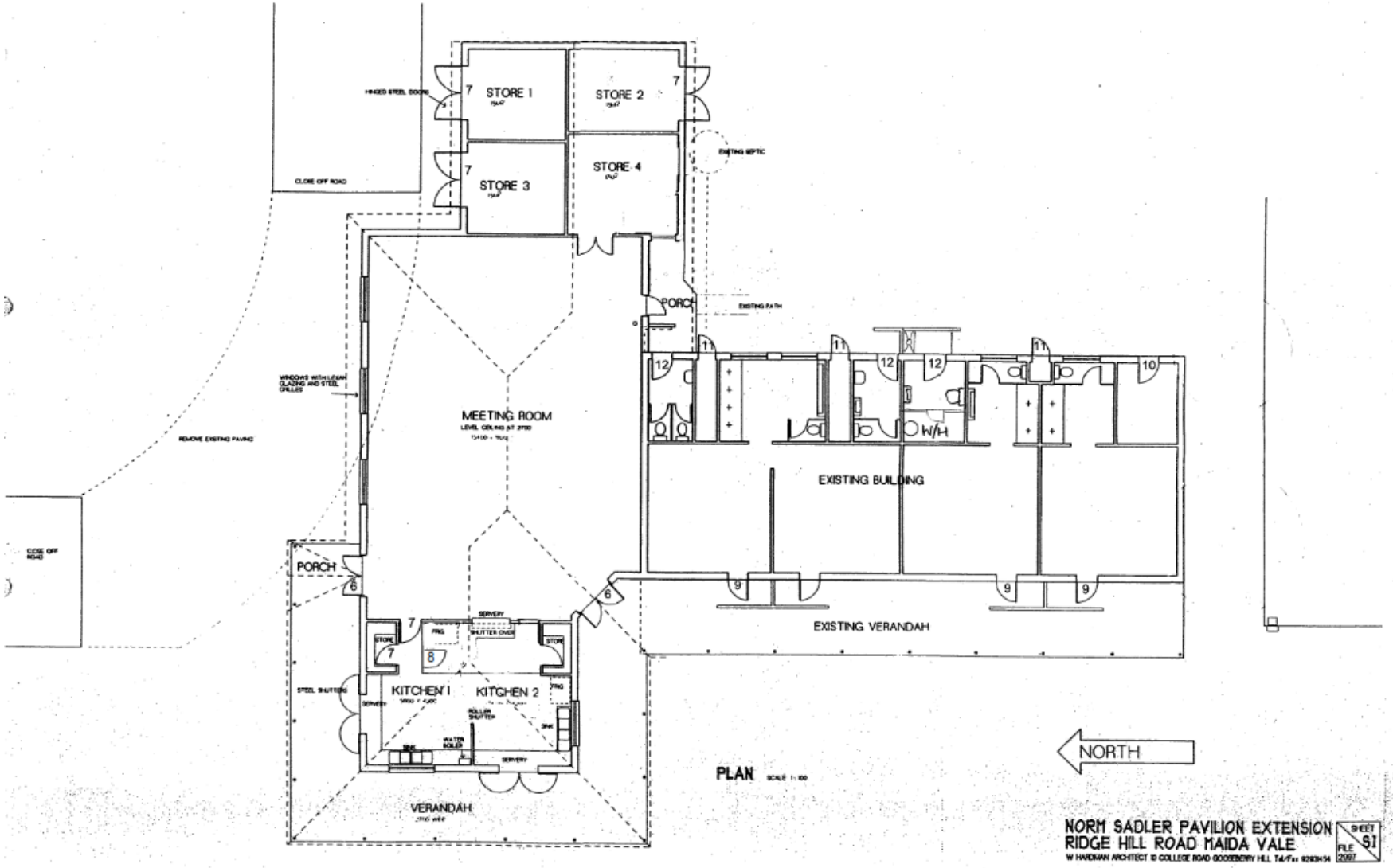
Maida Vale Reserve				
	Identification Method			Summary Comments & Assessment
	Site Visits	Policy/Background Review / Research	Consultation	
Areas of poor drainage	This was not specifically observed on site visits, however identified by user groups.		Consultation with user groups and City of Kalamunda staff.	City of Kalamunda staff confirmed areas of poor drainage on north western playing space.
Cricket Nets	2 sets of cricket nets in reserve. Disused cricket nets along western edge of reserve in very poor condition. Nets in South East corner of western oval in good condition.			In good condition. Underutilised
Cricket Pitch on south east oval in very poor condition	Observation: 1 Cricket pitch not in use and does not meet current cricket requirements. It is too narrow for cricket to be played. The outfield of baseball diamond 1 traverses the cricket pitch.		Baseball/ soccer preference to remove as interferes in their playing fields (outfields and infrequently in play)	The condition of the concrete pitch is very poor
Netball Courts	Underutilised. Some courts in poor condition and require upgrade to surface condition.	Review of bookings for 2016/2017 year showed bookings were limited for the courts and in most cases, one or two courts were booked at a time. Pavilion has regular bookings	Consultation with KDBA, KDNA: difficulty in running satellite program at MV courts low interest (additional volunteers required). Netball WA not currently planning programs at facility.	Highly underutilised court space. Likely to require court maintenance /resurface to at least 4 courts in coming years.
Diamond Sports	Two permanent diamonds with background netting on the reserve. Spectator viewing is particularly poor for diamond 2 and there is limited covered spectator viewing for baseball. Other diamonds are set up on temporary basis for tee-ball, baseball and softball.		Request for lighting of existing diamond 1. Request for increased and improved spectator viewing aspect and access to pavilion.	2 permanent diamonds set up provides good facilities for baseball club. Spectator viewing is poor for both permanent diamonds.

Maida Vale Reserve				
	Identification Method			Summary Comments & Assessment
	Site Visits	Policy/Background Review / Research	Consultation	
Archery	Limited access for people with mobility issues. Clubroom non-compliant and in poor condition.	Lease area reduced due to environmental issues in nearby bushland area	Reduction in leased area has impacted membership and ability to train for all disciplines of archery. Club room facility is in poor condition and leaks.	Letter written to City requesting extension of lease terms (timeline). Some issues with club room and access that club can predominantly fund.
Playground	The playground is small for a regional level reserve.		Identified by community - playground facilities too small and equipment could be upgraded, although indicated widely used.	Playground facilities not commensurate with regional level status of the reserve
Use of reserve by dog walkers	Dog walkers were observed on the oval.		Community Survey User Group / Stakeholder Meetings Drop in session	City of Kalamunda has designated Maida Vale Reserve as a 'Dog Prohibited' area. Feedback through the consultation for this project indicates the reserve is regularly being used as a dog exercise area.

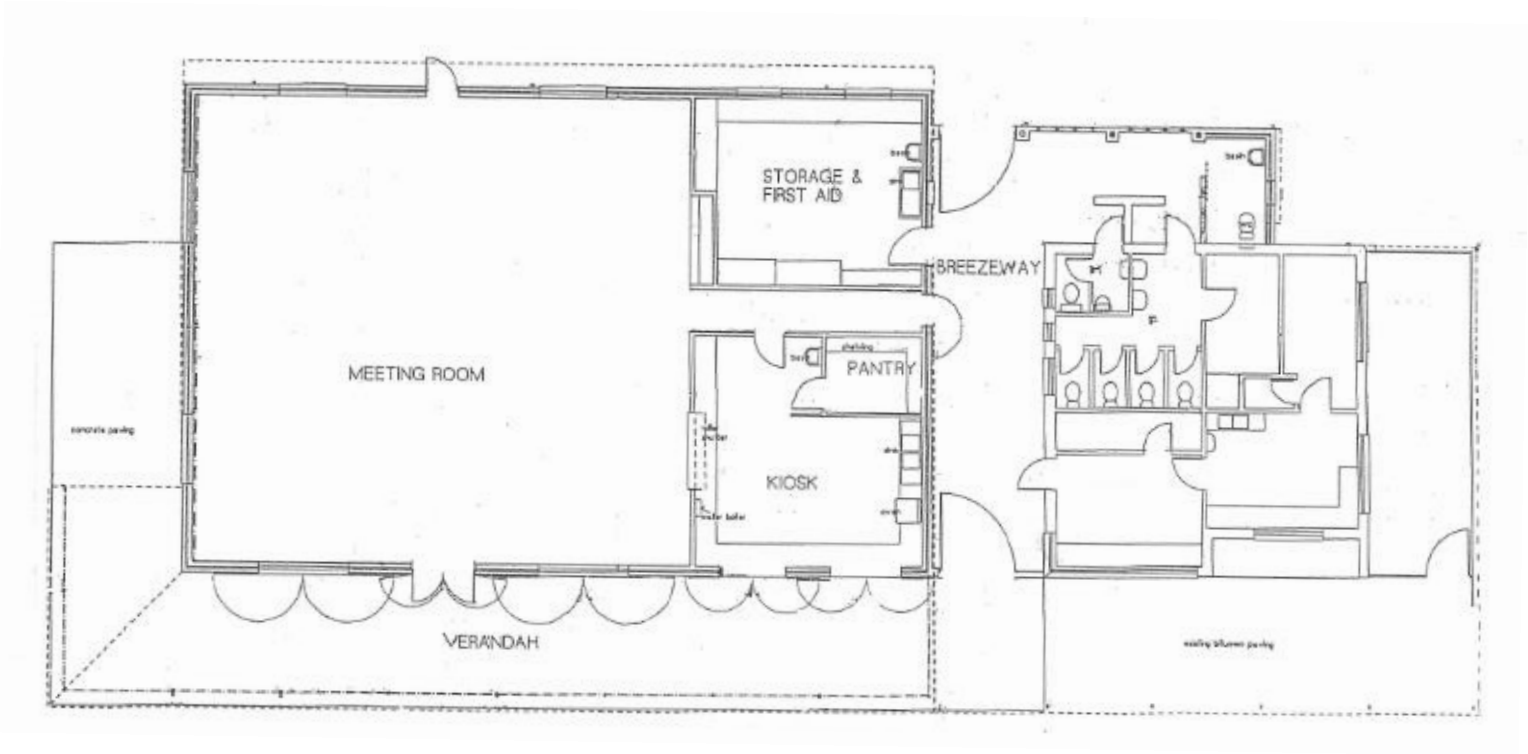
10.1 CURRENT SITE PLAN



10.2 NORM SADLER PAVILION CURRENT LAYOUT

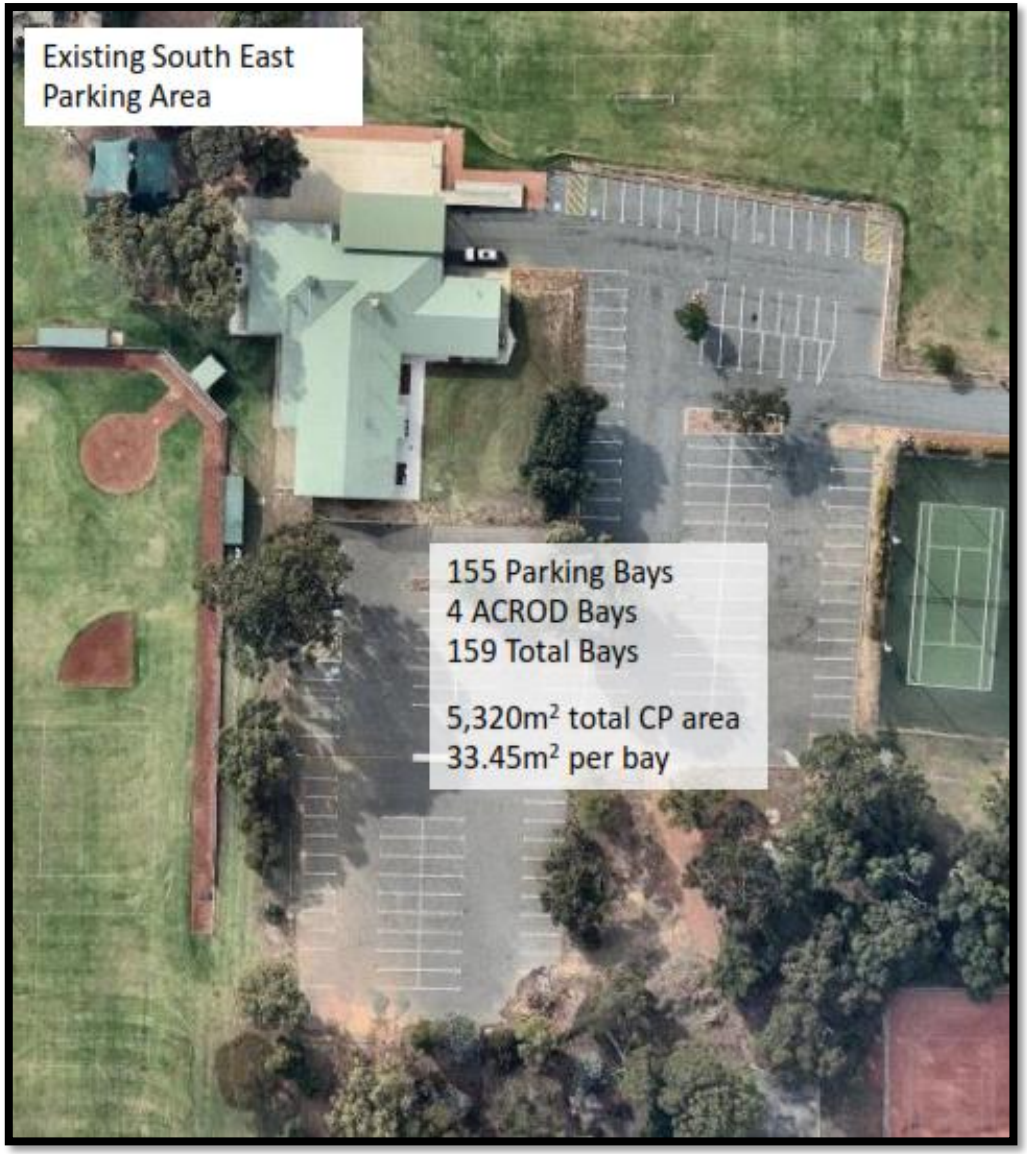


10.3 NETBALL COMPLEX PAVILION CURRENT LAYOUT



10.4 EXISTING CAR PARK BAYS

The Maida Vale Reserve currently has two (2) formal car park areas. One being on the North West of the site and predominantly services the netball court and netball pavilion. The car park has been developed around trees considered of environmental importance that were existing in the location and as such provides a unique layout with an access point from Midland Road and Ridgehill Road. There are 124 bays in this car park, consisting of 2 ACROD bays and 122 standard car parking bays. The second is accessible from Acacia Road and is the largest formal car park within the reserve. There are 159 bays in this car park, consisting of 4 ACROD bays an 155 standard car parking bays.


Existing South East Parking Area
155 Parking Bays
4 ACROD Bays
159 Total Bays
5,320m² total CP area
33.45m² per bay

The following table summarises the formal car park bays in the Maida Vale Reserve.

Parking Area	Parking Area (m2)	Av. Area per Bay	Standard Bays	ACROD Bays	Total Bays
North West of the site near the netball courts	5,240	42.25	122	2	124
South East of the site (off Acacia Road)	5,320	33.45	155	4	159
TOTAL	**10,560**	**37.85**	**277**	**6**	**283**

The average area per square metre is the total car park area divided by the number of actual bays. This includes areas of entry, service access areas, room between car bays to navigate in and out and landscaped areas. More recently, the Public Transport Authority of WA have been working on efficency rates of between 25 – 27m^2 in design of park and ride car parks, however in general does not include much landscaping.

Informal Car Parking Areas

An additional area accessible from Ridgehill Road is not formalised, although is regularly used for car parking (See image left). The City has advised that this area includes trees of environmental significance that should be retained in that location and be protected.

There is also an area utilised by the Archery Club for parking that is not formalised in terms of surface. The Archery Club has confirmed that members and casual users of the archery club commonly use this area.

There are no formal car parks within close proximity of the Archery Club. Users would also be required to walk through bush areas that contain dieback if an existing formal car park is used.

11 DEMAND ANALYSIS

A demand analysis was undertaken to develop options that could be considered within the master plan. The process followed to complete the analysis included:

- Identification of existing assets and provision through document review, mapping and consultation.
- A general inspection of facilities and site visits, advice from Council staff and consultation responses.
- An assessment of current and future need by balancing anticipated demand based on population and participation trends.
- Determining opportunities for more effective use of existing asset provision.
- Information provided by the community and user groups.
- Highlighting the potential opportunities direction.

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Improved oval lighting *Limited on sporting reserves.* *Electrical supply interruptions* *No car park lighting* *Minimal Security Lighting*	Maida Vale reserve is a highly utilised sporting reserve with a number of clubs and organisations using the facilities for training and competition. There is currently minimal lighting available that covers less than 50% of the active open space. The condition of existing lighting was noted through the consultation as poor, in regards to; consistency of supply to lights, lux level, and coverage, thereby limiting the areas of the active open space available for training, particularly during winter months. There is currently no lighting to the car park area/s. It is identified that the current electrical supply to the reserve is via 3 separate supplies, which does not meet current standards. Supply to the transformers are at or nearing capacity. Analysis of usage indicates that carrying capacity of areas of the active open space is at capacity levels. Introduction of additional lighting will enable increased utilisation of additional areas of the playing fields and alleviate usage of high wear and tear areas.	*Upgrade power supply to the site to accommodate the recommendations in this report and provide one incoming power source.* *Improve lighting to sports fields to accommodate additional training and reduce load impact of existing areas with lighting:* • Conduct a lighting audit and lighting plan for the precinct. This should include an analysis of power requirements to accommodate future works. • Existing lighting within reserve to be confirmed to meet training lux requirements. • Upgrade existing lighting and provide additional training level lighting to Eastern fields (for soccer) and to second baseball diamond area (if relocated). • Upgrade existing lighting to netball court area and provide additional level lighting to accommodate evening use and competition for tennis. • Provision of lighting to cricket net/relocated baseball batting cages, and pitching practice nets (as per current cages lighting). • Provision of lighting to main car park area. *Potential to light paths/fitness trail with solar lighting (to be discussed further in this analysis).*	*Across Plan* *15,24*
Car Parking	Formal car park layout accessible from Acacia Road is inefficient. Reserve users are using the informal tree lined car park (accessed from Ridgehill Road) regularly. The current parking is inefficient and the consultation process identified small accidents are regularly reported. Formal car park at netball area underutilised. Existing car parking bays not adequate to cope with load at peak times. Additional formal car parking may be required to meet current needs. Improvements to flow of existing formalised car park and improvements to overflow area to accommodate more efficient parking required. Consultation identified children safety is at risk with children running from the ovals on the western side to the eastern side (and vice versa) through the informal parking area.	*<u>Car Park off Acacia Road:</u>* *Based on recommendations for additional playing surface to be considered, and proposed relocation of tennis Club, reconfiguration of the existing entrance off Acacia Road and additional car parking be provide to the South of the existing car park area.* *<u>Car Park off Ridgehill Road:</u>* *Flow in and out of car park to be reviewed along with consideration to improved accessibility. Provide change in traffic flow by provision of one way access into overflow car park and one way egress lane. The existing trees of significance should be retained and protected.* *<u>General:</u>* *Establish direct pedestrian crossing points in the car parks to enable safe crossing between ovals.* *Include traffic calming measures within the car parks.*	*5,6,7,16, 10,14*

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Norm Sadler Pavilion/change rooms and storage provision	The Norm Sadler pavilion and associated change rooms are shared between 2 major sporting clubs at the reserve – Kalamunda Rangers (baseball) and Kalamunda United Football Club. Both clubs operate 6 months a year to operate their sports via a lease arrangement with the City. In addition, the Western Australian Christian Football Association (WACFA), play games at the reserve and share facilities with Kalamunda United. All clubs have identified that the current change rooms are inadequate. A site analysis identified: • The pavilion / clubroom area is generally in good condition overall. • The existing change rooms are not compliant with current standards. • The number of change rooms is inadequate for the sports that play at the reserve. (Competition through Winter has use of 5 senior soccer fields for games with less than 2 appropriately supporting change rooms) • The size and layout of the existing change rooms are not adequate. • Two of the existing change rooms do not have adequate wet facilities (showers/toilets). One set of toilets and showers is shared between home and away teams. • Accessibility is poor. • The existing change rooms do not provide well for increasing female participation. • Location of change rooms is not ideal for soccer. • There is no first aid or dedicated umpires change room that meets contemporary standards for design. • There are inadequate storage areas available to secure club equipment. A disused kiosk building, sea containers and batting cages are satisfying demand currently. • There is a lack of spectator viewing on baseball side, and limited covered viewing area for baseball spectators. An existing septic system services the change rooms. Confirmation from the City of Kalamunda highlighted that the existing septic system would require either: • An upgrade to meet the requirements of additional infrastructure, or • Connection of the site to the sewer system.	*Retain existing pavilion.* *Minor upgrades to internal area (provide allowance for new carpets and paint).* *Modify / Refurbish existing change rooms to meet current standards and contemporary design. Resume existing pavilion public toilets into the refurbished change rooms to provide increased wet areas (showers and toilets).* *Maintain servery access to the baseball side and the soccer side.* *Provision of additional spectator covered area for baseball spectators.* *Provision of new pavilion toilets.* *Provision of additional 3 change rooms + first aid and umpires change room. Recommended to have proximity to main soccer field.* *Provision of additional storage for baseball club inclusive of drive in access (Baseball club uses trailer to hold equipment). Provision of additional storage for user groups of the reserve.* *Consideration to converting an existing store of the pavilion to an administration office for use by resident clubs.* *Upgrade of existing septic system or connection to sewer system. Discussions with City staff identify connection to sewer system better longer term option.* *Provision of additional user group storage* *Relocate the soccer goal storage compound to this location.*	*12, 24*

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
New Public Toilets	There is a set of toilets within the existing pavilion / change building, however these are not always open. A standalone public toilet block is located in the southern end of the reserve. It is isolated, dated and has no security lighting. This has been expressed as an issue for reserve users, particularly for children to access during training and games.	*Demolish existing public toilet building and provide new public toilets within the expanded change room development. This is a more centralised location for the reserve and will provide contemporary, accessible public toilet facilities for all users of the reserve.* *The public toilets should have external access.*	*12*
Netball Courts – Provide for alternative use to activate location	The 12 netball courts previously occupied by the Foothills Netball Association are underutilised and require maintenance. They are utilised by some local netball teams for training during the winter months and some Primary Schools for carnivals. There are lighting towers that provide lighting to 8 of the 12 courts. 4 of the courts are in poor condition and require maintenance to bring to a playable standard. Throughout the consultation, a number of options were suggested for alternative uses; including a synthetic surface to accommodate a soccer pitch and baseball training. It was confirmed through discussions with Netball WA and the potential user groups that there are no current plans to operate further netball / basketball competitions in that location. Area facilities; Approximate dimensions • 75m x 100m Hardcourts – line marked for netball – northern 8 courts in reasonable condition, southern 4 courts are in poor condition with cracks and poor levels for water runoff. Pavilion including the following features; meeting room, kitchen / kiosk, first aid/store, toilets and change areas. The area is prominent on the site and visible from Midland Road and Ridgehill Road.	*The space has the potential for increased utilisation.* *In response to analysis further in this document regarding the tennis club facility, there is an opportunity to convert this space to accommodate the tennis club in a more prominent position than it currently is, and retain some existing courts for netball/multipurpose courts for community and school use.* *Recommendation:* *Convert existing netball courts to 8 x tennis hard courts and 4 x multipurpose courts (netball/basketball/Futsal Soccer) for community use. This will require an extension of the hard surface by approximately 2.5m to the immediate north of existing to accommodate recommended run off spaces required for the specified sports, resurfacing of courts with an acrylic surface and relocating some floor plates for the tennis courts.* *Upgrade of the existing lighting to meet current standards.* *Upgrade of the community area, change rooms and office area of the existing pavilion.*	*2,20,26*

<table>
<tr><th>Opportunity</th><th>Analysis</th><th>Recommendation</th><th>Item on Master Plan Concept</th></tr>
<tr>
<td>Tennis Courts :

Currently underutilised</td>
<td>
There are currently 19 courts at the Tennis Club. 12 are in use however are in average condition requiring some maintenance.

The club also utilise a clubroom facility.

Current membership: 4 junior and 48 senior. There are no pennant teams. Projected growth is minimal.

Tennis West advises that in general Western Australia have a higher member to court ratio than the standards generally used by Tennis Australia, however has a much lower member to court ratio for lit courts. The table below identifies the standards applied, the WA ratios and the Maida Vale Tennis Club ratios:
<table>
<tr><th></th><th>Total Courts</th><th>Total Lit Courts</th><th>Players</th><th>Member to court ratio</th><th>Member to lit court ratio</th></tr>
<tr><td>Standard (Australia Wide)</td><td></td><td></td><td></td><td>1:30</td><td>1:20</td></tr>
<tr><td>West Australia</td><td>1,006</td><td>450</td><td>13,414</td><td>1:13</td><td>1:30</td></tr>
<tr><td>MVTC</td><td>12 (in use)</td><td>5</td><td>52</td><td>1:4.3</td><td>1:10.5</td></tr>
</table>
There is an oversupply of courts at this location for the number of members currently in the club.

There are 5 courts to the north of the clubhouse that have lighting. There are 7 clay courts to the south of the clubhouse with another 7 unused courts further south.

The location of the courts is not prominent and only visible once within the precinct.
</td>
<td>
Reduce the number of courts.

Relocate the tennis club from its current location to the existing netball courts. Upgrade existing netball courts to accommodate 8 x hard tennis courts with lighting.

With modifications to the pavilion currently at the netball court site, the tennis club can be located within this facility. Modifications should include an addition of meeting/program space and modifications to toilets, change rooms and kitchen to meet current standards.

Triggers that may instigate a potential relocation include:

Requirement for court surface upgrades to the tennis courts.
Requirement for additional grass/synthetic playing surface
Requirement for additional car parking (potentially due to informal car park off Ridgehill Road unable to accommodate any parking due to damage to trees).

</td>
<td>2, 26</td>
</tr>
</table>

<table>
<tr><th>Opportunity</th><th>Analysis</th><th>Recommendation</th><th>Item on Master Plan Concept</th></tr>
<tr><td></td><td>The City has advised that there are other tennis clubs in proximity. The following table highlights the member to court ratio at other tennis clubs located within the City. The Maida Vale Tennis Club has the lowest member to court ratio of the clubs:
<table>
<tr><th>Club</th><th># Courts</th><th>Members</th><th>Ratio</th></tr>
<tr><td>Forrestfield Tennis Club</td><td>6</td><td>62</td><td>1:10</td></tr>
<tr><td>Kalamunda Tennis Club</td><td>10</td><td>63</td><td>1:6.5</td></tr>
<tr><td>Lesmurdie Tennis Club</td><td>8</td><td>170</td><td>1:21</td></tr>
<tr><td>Rangeview Tennis Club</td><td>4</td><td>80</td><td>1:20</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>Archery Complex Improvements</td><td>The Archery Club (Kalamunda Governor Stirling Archers) lease an area within the bushland on the eastern side of the reserve. The area is secluded from the remainder of the reserve, which suits the activities taking place (use of bow and arrow). Changes to the club's leased area in recent years has limited the leased area to allow target archery only.

The archery club has a small clubroom and small storage shed within their leased area. The clubroom is not to current standards and has a leaking roof.

Access to the archery range is via an informal roadway off Ridgehill Road. Parking is within the Bushland area and is informal. The consultation process identified that the informal access and parking is of concern as it results in people driving in areas of the bush that are designated conservation areas and incidences (small accidents) occur in the parking area.

The club has requested an extension to the lease terms and approval to upgrade the clubroom facilities. The club is in a financial position that minimal assistance is required for the clubroom upgrades.

The club has indicated refurbishment of the existing clubroom be undertaken. The club room is currently not compliant with standards. A potential refurbishment may trigger the requirement to bring the building to current code. It is recommended the club in consultation with the City undertake an assessment of whether it is more cost effective to refurbish the existing facility or replace with a new facility.</td><td>It is recommended that the City support the club in improving their facilities by the provision of lease extension to provide surety of tenure to the club.

The City support the club in upgrading the clubroom facility.

The club identified clubroom issues should be reviewed by the City by way of an analysis of the redevelopment options to determine most cost effective method. I.e. refurbishment of existing non-compliant building with asbestos may cost more than a newly constructed or prefabricated clubroom.

That the City provides a more formal (graded) access and parking area with signage to clearly identify vehicular accessible areas.</td><td>9,10,11</td></tr>
</table>

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Baseball	The Kalamunda Rangers Inc. (Diamond Sports Club) offers baseball, softball, tee ball for the community, and have approximately 400 members. The club leases the Norm Sadler Pavilion over Summer season and has 2 permanent diamonds with back nets within the reserve. Any additional diamonds for all diamond sports are temporarily set up when required. The club identified through the consultation process that the ability to have the permanent diamond set up is much appreciated. The current change rooms are not in good condition and are of a poor layout. There is limited undercover spectator viewing for the permanent diamonds. The existing batting cages are in a prominent location but are also used for storage out of necessity. The location of the #1 diamond (east of the pavilion) results in fly balls entering the carpark area closest to the pavilion and has damaged cars in the past. The club is operating well with an active committee. An opportunity exists to optimise the playing fields by providing a pitching practice mound, thus improving safety as well as a casual user facility that can be used at any time.	*Support inclusion of netting to reduce impact of fly balls. Netting to be placed above existing back nets.* *Convert existing underutilised cricket nets to allow baseball batting cages and install lighting to the area. This can be achieved by also retaining access as cricket nets.* *Install pitching practice mound (as per picture below).*  *Relocation of diamond 2 closer to the pavilion.* *Improve spectator viewing to the permanent diamonds in the redevelopment of the pavilion. This would create greater spectator viewing to both permanent diamonds and provide a more cohesive oval layout. The current dugouts on diamond 1 have a solid backing. Best practice is to provide alternative backing that allows spectator viewing through the dugout area. Provision of some cyclone mesh to parts of the dugout backing will also allow improved spectator viewing.* *The proposed lighting upgrade to the reserve to include improved lighting for general practice to the existing and relocated diamond area.*	*1,17,18,19,15,13*

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Soccer	The Kalamunda United Football Club leases the Norm Sadler Pavilion over Winter season and utilise most grassed areas within the reserve for training and games. The club currently has approximately 300 members. Training in Winter, there are limited areas with lighting and these areas are overused. Current location of the change rooms is poor in proximity to the soccer playing fields. The number of change rooms is inadequate to service the playing fields and does not cater for the development of female participation in the sport. There is currently no change area for referees within the reserve or first aid area. Lack of storage is an issue. The Western Australian Christian Football Association (WACFA) has over 1500 members and utilise the reserve for games. Further games and training are held at various other ovals in the vicinity.	*Improved lighting to the reserve as identified earlier in this assessments.* *Pavilion upgrade to include additional change areas, ideally in a more suitable location to the soccer fields. The upgrade to include additional storage for user groups and the inclusion of a specific soccer goal storage compound.*	*12,13,15*

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Additional Playing Surface	The existing playing surfaces are highly utilised in both Summer and Winter for training and match play. Some areas of the grassed surfaces are more heavily used than others predominantly due to lighting available and proximity to the amenities building. The 2 predominant clubs based at the reserve (utilising oval space) have had steady membership numbers in recent years. Both have highlighted they are restricted to training in season only with clashes during pre-season. Growth in membership would result in increased use. The potential relocation of the tennis club to a more prominent location in the reserve provides an opportunity to allocate space for additional playing surface. Increased capacity at this reserve can be created with extra field to cater for growth needs into the future. To provide greatest opportunity, the area identified would be suitable for an additional senior sized soccer field with a junior sized field alongside. The City of Kalamunda staff have indicated that water shortages may prevent additional grassed area on the site. Following further analysis on water availability, the additional playing surface may be provided as a synthetic surface, additional grassed area or a combination of both. Both the Kalamunda United and the Kalamunda Rangers have indicated increased playing surface will increase training and playing opportunities. There is potential to provide synthetic playing area for future growth. This may also increase potential uses, such as a 5 a side Futsal to be played on a synthetic surface that could provide an income generating opportunity.	*Allocate space for future playing field that is suitable to hold an additional senior sized soccer pitch as a minimum.* *Analysis should be undertaken to confirm water availability and storage for additional grass space. The additional playing surface may be provided as a synthetic surface, additional grassed area or a combination of both.*	*13*

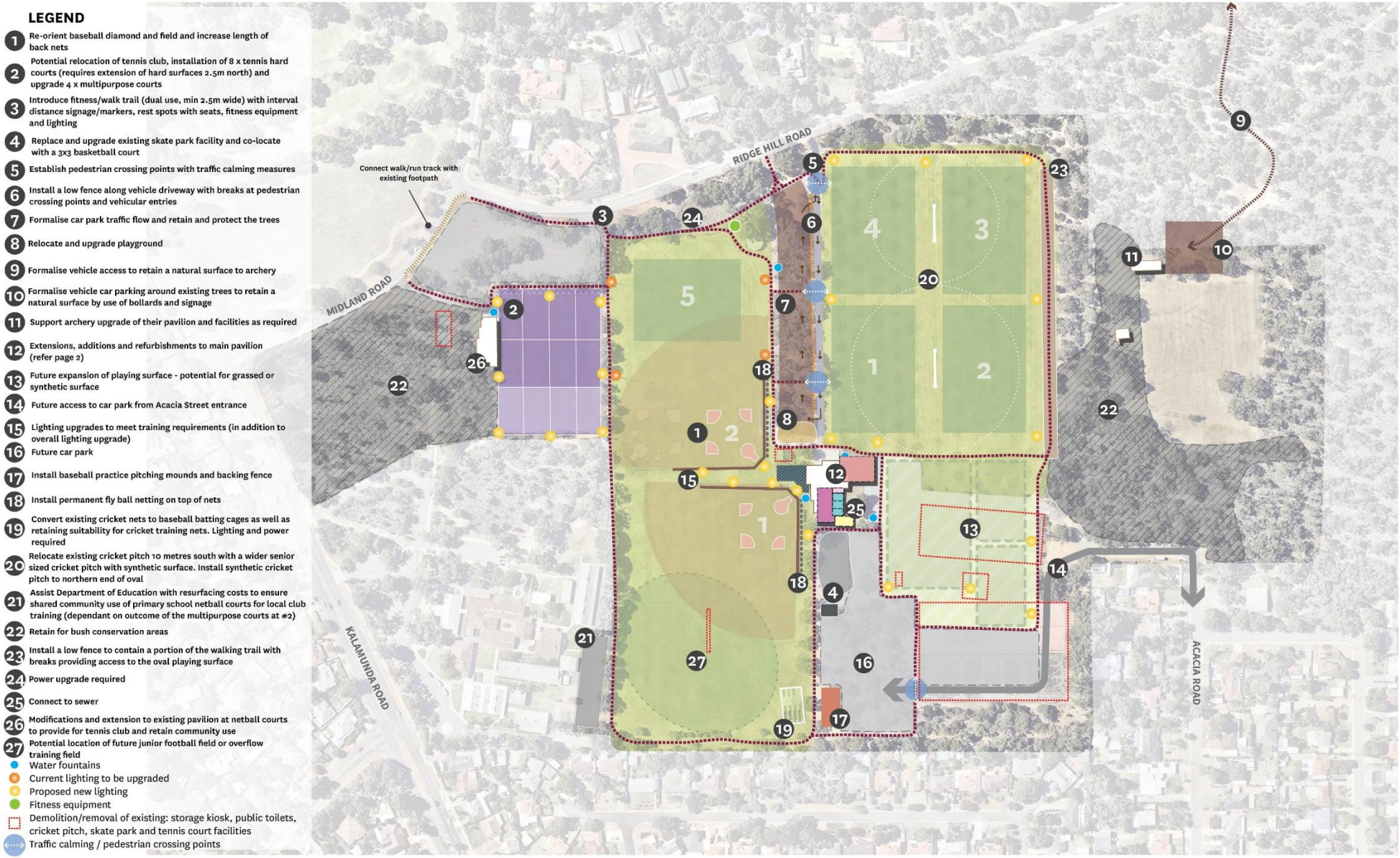
Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Pathways: *Fitness Trail* *Linkages*	There is currently no pathways / linkages through the precinct. The reserve is highly utilised for sport and the clubs operate a number of junior sport programs, resulting at times in high number of children utilising the area. The consultation highlighted: • That the reserve is utilised by the general community for walking and running. • That children regularly cross car-parking areas to access sporting fields and the Maida Vale Primary School. • Through the analysis of the site, it is noted that a number of informal paths through bushland areas are present from areas such as the skate park and netball facility to the ovals. • There are areas of bushland that are environmentally sensitive in the reserve that show signs that people are walking through to access parts of the reserve. Fitness trails are popular and generally well used. Can be developed to be dual use and be made suitable for recreational cycling. A well designed path network for the precinct can provide the following: • Provide linkages from existing footpath networks on neighbouring roads to the precinct. • Provide much needed linkages within the precinct. • Provide designated walking / running / cycling paths with distance markers to enable tracking of distance. • Provide a separation from high traffic areas of the reserve from environmentally sensitive areas. • Provide rest sports throughout trail network. • Provide outdoor fitness equipment along trail.	*Inclusion of fitness trail through precinct that provides a dual use linkage. Provision of 2.5m wide path will enable multiple uses and be wide enough for vehicular access for service vehicles if required.* *Can be provided as a more natural pathway, as per image:*  *Improved lighting on the ovals will allow these paths to be utilised in the evenings that sports training/games are operating. A further consideration to providing lighting to the path to allow evening use could include the provision of solar lights.* *The inclusion of distance markers further enhance use as a fitness trail.* *Include seating for rest spots, lighting to path network.* *Provision of outdoor fitness equipment.*	*3,5,6*

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Cricket	The cricket infrastructure in the Maida Vale reserve includes: • A synthetic cricket pitch in the eastern oval (requires some general maintenance). • A bare concrete pitch on the south western oval. This pitch is not to senior cricket standard for width and is in very poor condition. It also penetrates the outfield of the #1 permanent baseball field. • 4 cricket practice nets (in good condition). • Cricket practice nets near Primary School are in very poor condition and not used. There is currently no cricket club permanently based at the reserve. The eastern oval is used as an overflow field for club competition on occasions but it would be prudent to retain the flexibility for future use.	*Demolish existing cricket pitch on South Western Oval and provide a second cricket pitch (Synthetic surface) to North end of North Eastern oval. This will allow a senior cricket and junior sized cricket oval to provide for future use (and soccer fields can be located either side of the pitches).* *Convert the existing cricket nets to multiuse cricket / baseball batting cages and upgrade with power / lighting.* *The City has current plans to decommission the cricket practice nets located near the Primary School.*	*19,20*
Provision of Water Fountains	There are currently no water fountains within the reserve. External of the kiosk provided in the pavilion, there is only one external water tap that can be used as a water tap and to refill water bottles. It is a highly utilised reserve.	*Install water fountains in the reserve at strategic locations that most users can access.*	
Skate Park and Youth Facilities	Existing Skate park location is in a poor location with limited passive surveillance. Infrastructure is ageing and design is dated. Requires increased maintenance. Trends in the provision of skate facilities include; • The involvement of local youth in the design of skate parks has become an important aspect in obtaining buy-in. • The development of different facility types including "skateable" landscapes and combination facilities, often forming a youth precinct. • Facilities designed to have varied spaces that cater for differing levels and abilities. • Creation of path networks, benches, chairs and activities for all community segments, not just Skate park users. • Located in a prominent location to create vibrancy and offer connectivity / integration with other spaces i.e. CBD, parks, playgrounds next to road networks. The addition of a 3 on 3 basketball court will also provide further opportunities for youth to utilise the area.	*Relocate and upgrade skate park to a more prominent location in the precinct. Upgrade to include contemporary features and designed with input from the local skating community.* *Provide a 3 on 3 basketball court within proximity of the skate park.*	*4*

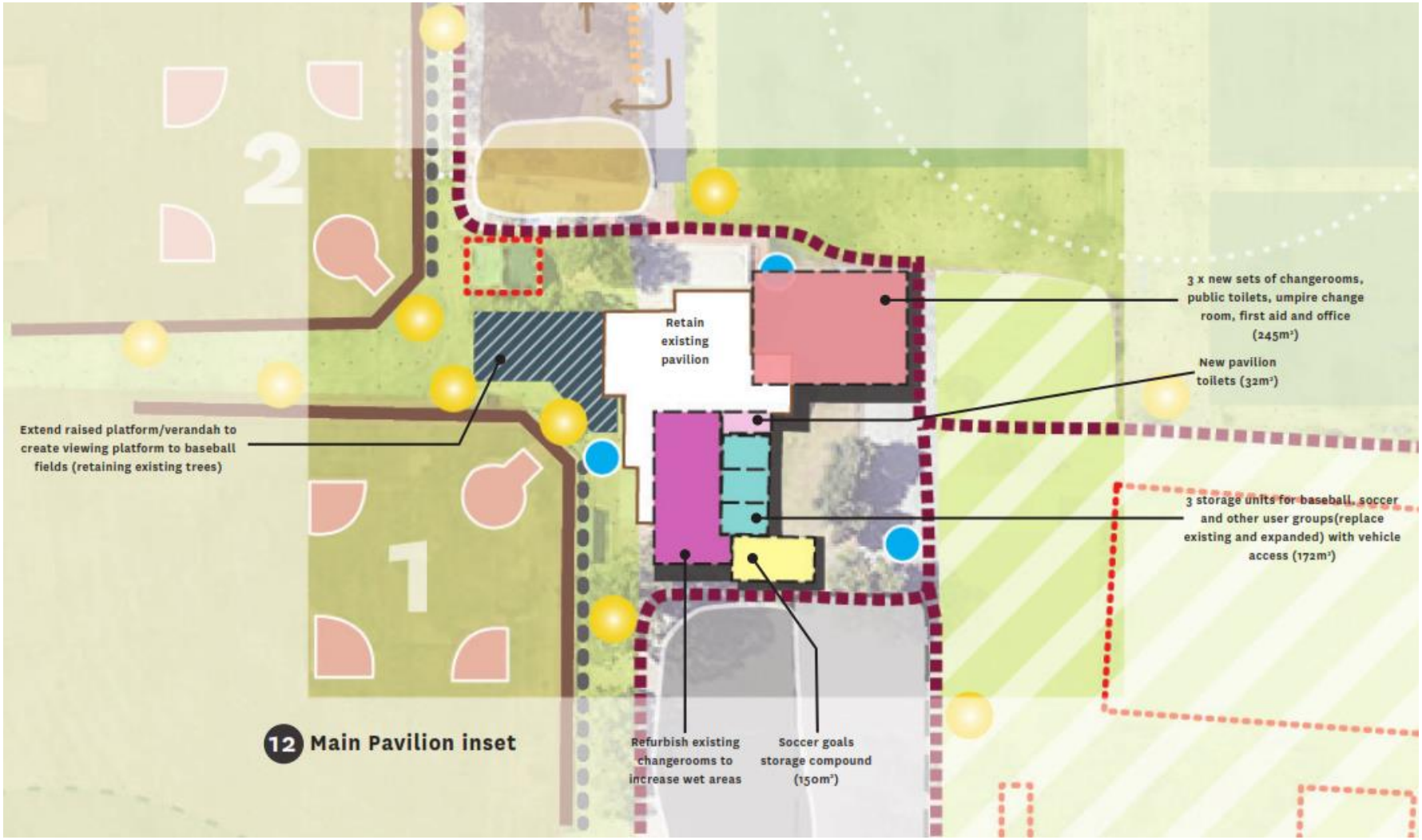
Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Dog Access: **Designated as no access for dogs. People are using as dog exercise area**	City of Kalamunda has designated Maida Vale Reserve as a 'Dog Prohibited' area. Feedback through the consultation for this project indicates the reserve is regularly being used as a dog exercise area. Suggested through the consultation phase was the option to provide a designated fenced dog exercise / socialisation area on underutilised section of the reserve. The City of Kalamunda has nominated dog permitted exercise areas (on lead and off lead), and dog prohibited areas. The Maida Vale Reserve is a designated dog prohibited area, as it is a nominated Class 1 reserve within the Public Open Space Strategy.	*Retain as dog prohibited area.*	*NA*
Playgrounds	There is one neighbourhood level playground within the reserve.	*In line with other recommendations within this report and the importance of the Maida Vale Reserve as a regional level park within the Public Open Space Strategy, it is recommended that the playground be relocated within the reserve and upgraded to a district level playground. In line with the City's desire to promote sustainable outcomes and with an environmental focus, a nature playground development is recommended.*	*8*
Signage Improvements	An analysis of the site noted that signage to, and within the reserve does not provide any identity to the reserve. Improved signage on main access roads, at the main entrances, and to identify environmentally significant areas could improve flow and use of the reserve.	*Improve signage to and within the reserve, consistent with the City's style guide.*	
Primary School	The Maida Vale Primary School uses the southern end of the western oval during school hours via a joint use agreement with the City. The school Principal has indicated that if supported by the City, the existing 2 outdoor courts (1 x netball and 1 x basketball) can be upgraded and be made available for community use. The school has indicated that they would provide a large financial contribution to this development and requests some financial support from the City to the project.	*Support the development and contribute some funding for the re-surfacing and conversion to multiuse of the courts at the Primary School if the existing netball courts are repurposed for alternative uses.*	*21*

Opportunity	Analysis	Recommendation	Item on Master Plan Concept
Environmental Areas	The master plan area includes bushland throughout. The bushland setting was identified through the consultation as highly valued by the community and an important element as to what they most love about the reserve. There are areas that are infested with dieback and other areas of high environmental significance due to smokebush being evident.	*Continue to protect the current environmental areas as outlined in the Maida Vale Reserve Action Plan 2012-2019.* *Significant value trees within the car park areas are to be retained and protected.* *Furthermore, other recommendations within this summary have been made in consideration of enhancing current bushland areas and reducing any further negative impact of environmentally sensitive areas:* • *Provision of a more formal path network* • *Provision of a low level fence along the eastern edge of the ovals to provide a buffer between the ovals and environmental bushland of significance.* • *Improving and defining access to the archery leased area.* • *Improved signage.* • *Relocation of the existing skate park from an environmentally sensitive area.* • *Additional tree planting in future car parking areas to provide shade and increase tree canopy.*	3,9,22,23

12 MASTER PLAN

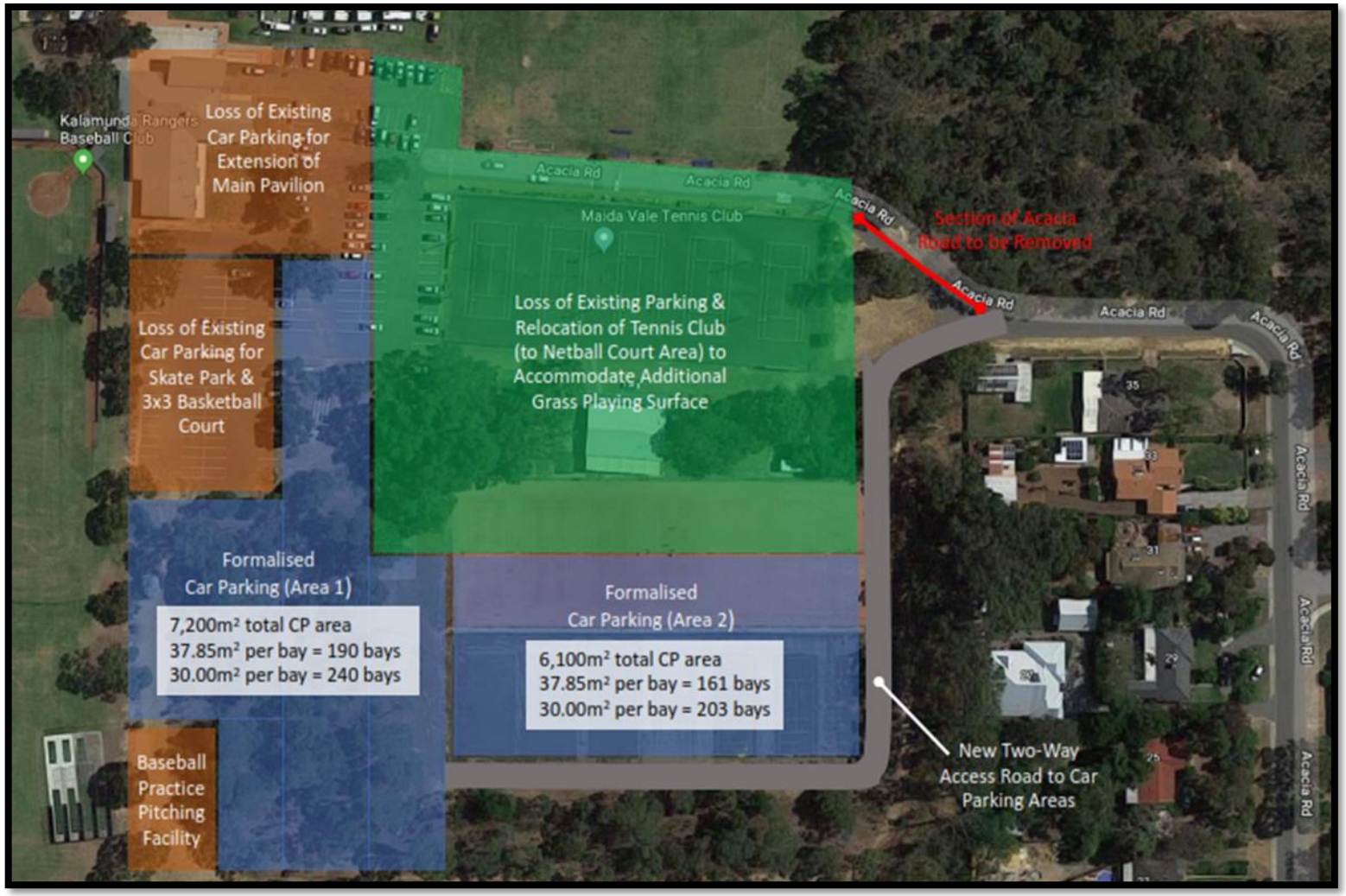


12.1 INDICATIVE PAVILION UPGRADE LAYOUT



12.2 FUTURE CAR PARK OFF ACACIA ROAD

The area identified in the master plan for future car parking can provide an approximate increase in formal car park bays from the existing 283 to 475 using current efficiency of 37.85m² per bay, and up to 567 using a more efficient use of space of 30.00m² per bay as seen in the image and tables in this section.



Future Car Parking – based on existing average area per bay (37.85m^2):

Parking Area	Current Bays	Parking Area (m2)	Av. Area per Bay	Total Bays
North West of the site near the netball courts	124	5,240	42.25	124
Car Parking Area 1 (off Acacia Road)	159	7,200	37.85	190
Car Parking Area 2 (off Acacia Road)	0	6,100	37.85	161
TOTAL	**283**	**18,540**		**475**

Future Car Parking – based on more efficient use of space average area per bay (30.00m^2):

Parking Area	Current Bays	Parking Area (m2)	Av. Area per Bay	Total Bays
North West of the site near the netball courts	124	5,240	42.25	124
Car Parking Area 1 (off Acacia Road)	159	7,200	30.00	240
Car Parking Area 2 (off Acacia Road)	0	6,100	30.00	203
TOTAL	**283**	**18,540**		**567**

13 RECOMMENDED IMPLEMENTATION

The identified priorities have been determined by ABV based on the results of the analysis undertaken throughout the development of this master plan. This is based on community need identified through the consultation process and analysis of data indicating high pressure points of existing facilities, audit of current facilities including accessibility and compliance issues. There are also a number of identified actions that have precursors that are directly linked. For example, a power upgrade to the site must be undertaken prior to any lighting upgrade. These linkages have also been considered in the development of the implementation plan.

It is noted that the priorities should be revisited by the City on a regular basis as needs may change with changing demographic and usage.

13.1 SHORT TERM RECOMMENDATIONS

Item on Master Plan	Short Term	Cost Estimate	Contin-gencies	Professional Fees
5, 6 & 23	Pedestrian crossings across car park x 3 & Chain Link fence 0.9m high	$57,930	$11,993	$6,913
7	Formalise parking (off Ridgehill Road)	$30,000	$6,300	$3,630
9, 10, 11	Archery Area Improvements (Entry, Car Park , Club House)	$160,000	$33,600	$19,360
12	Upgrade to Norm Sadler Pavilion	$1,778,750	$273,278	$214,503
15	Upgrade lighting to oval/s	$650,000	$136,500	$78,650
17 & 18	Install baseball practice pitching mounds & Install backing nets to baseball (for fly balls)	$109,940	$23,087	$13,303
19	Convert cricket nets into baseball batting cages	$90,000	$18,900	$10,890
	Remove existing concrete cricket pitch	$10,000	$4,200	$2,420
24	Upgrade power to site	$750,000	$157,500	$90,750
25	Connect site to sewer system	$530,000	$111,300	$64,130
	Demolition - existing toilet block	$6,000	$1,260	$726
	Water fountains	$22,500	$4,725	$2,723
	TOTAL	**$4,195,120**	**$782,643**	**$507,998**
	Preliminaries	$419,512		
	TOTAL SHORT TERM COSTS	**$5,905,273**		

13.2 MEDIUM TERM RECOMMENDATIONS

Item on Master Plan	Medium Term	Cost Estimate	Contin-gencies	Professional Fees
1	Relocate Baseball diamond	$100,000	$21,000	$12,100
2	Potential to convert existing netball courts to Tennis & Multipurpose	$363,050	$76,241	$61,892
15	Upgrade lighting to Tennis/Multipurpose courts	$120,000	$25,200	$14,520
3	Fitness Trail (Lighting Optional - $600,000)	$1,111,500	$233,415	$134,492
8	New playground - Nature Play	$500,000	$105,000	$60,500
20	New synthetic cricket pitch and relocation of existing	$60,000	$12,600	$7,260
	Demolition - existing playground	$10,000	$2,100	$1,210
	Signage to precinct - to entrance and environmental areas	$25,000	$5,250	$3,025
	TOTAL	**$2,289,550**	**$480,806**	**$294,999**
	Preliminaries	$228,955		
	TOTAL MEDIUM TERM COSTS	**$3,294,310**		

13.3 LONG TERM RECOMMENDATIONS

Item on Master Plan	Long Term	Cost Estimate	Contin-gencies	Professional Fees
4	New skate park & youth space	$715,000	$150,150	$86,515
13	Future expansion of playing surface (potential synthetic)	$1,820,800	$318,150	$183,315
14	Future access to car park off Acacia Street	$222,390	$46,702	$26,909
16	Future car park expansion	$1,276,520	$268,070	$154,459
27	Modifications to existing pavilion at netball to accommodate tennis and community use	$500,000	$105,000	$60,500
	Demolish existing tennis courts and tennis pavilion	$66,600	$13,986	$8,060
	TOTAL	**$4,601,310**	**$902,058**	**$519,758**
	Preliminaries	$460,131		
	TOTAL LONG TERM COSTS	**$6,483,257**		

13.4 COST ASSUMPTIONS

Donald Cant Watts Corke (Quantity Surveyors) has costed the recommendations. The costings developed are based on a cost per square metre and are considered on the conservative side. ABV has extrapolated them into a recommended implementation schedule.

- The costs have been developed on present day figures on a square metre rate.
- A design contingency of 10% and a construction contingency of 10% has been included on all items.
- A 10% design services fee has been included on all items.
- The cost plan has been developed based on the information and size allocations identified in this plan, therefore all quantities, and rates are provision and therefore subject to change.

In addition to above, all costs:

- Excludes GST
- Excludes abnormal ground conditions / contamination etc.
- Excludes major services diversions
- Excludes major utility upgrades / contributions & headworks
- Excludes fit out of Furniture and Equipment
- Excludes client costs, legal costs, site costs, agent's fees, finance etc.
- Excludes land purchase costs
- Excludes Client Representative / Project Management Fee / Professional Fees
- Excludes escalation - costs are current day
- Excludes % for Public Art
- Excludes specific Ecologically Sustainable Development initiatives
- Costs assume Competitive Tender process with local builders using basic palette of materials.

14 POTENTIAL FUNDING SOURCES

Funding Source	Type or projects they will fund
Grants	**CSRFF** • Cricket pitches • Safety fences • Court resurface or upgrade • Upgrade to clubrooms/pavilions • Sports floodlighting • Court construction **Lotterywest** • Skate parks • Playgrounds **Other** There are potentially other grants that may be applied for as the master plan is progressed
Cash in Lieu	• Playgrounds • Toilets • Pathways • Seating • Carparks • Fencing • Signs
Rates and Advocacy	• All above infrastructure

COMMUNITY SPORTING AND RECREATION FACILITIES FUND (CSRFF)

Administered through the DLGSCI, the CSRFF provides funding through a competitive application process for small and large sporting infrastructure projects, however will provide a maximum of one-third of the total estimated cost (excluding GST) of the applicant's project. Priority will be given to projects that lead to facility sharing and rationalisation. Multi-purpose facilities reduce infrastructure required to meet similar needs and increase sustainability.

Small Grants: $2,500–$66,666 will be allocated to projects involving a basic level of planning. The total project cost for grant must not exceed $200,000. Grants given in this category must be claimed in the financial year following the date of approval. For projects with a grant request below $2,500 it is expected that the applicant should be able to fully fund these.

Annual Grants: $66,667 – $166,666 will be allocated to projects with a planning and construction process that will be complete within 12 months. The total project cost for annual grants is between $200,001 – $500,000. Grants given in this category must be claimed in the financial year following the date of approval.

Examples of annual projects:

- upgrades to clubrooms/pavilions
- upgrade to swimming pool
- large floodlighting project
- court or bowling green construction
- reticulation system for a grassed playing field.

CSRFF forward planning grants

$166,667–$2,000,000 will be allocated to the large scale projects where the total project cost exceeds $500,000 and may require an implementation period of between one and three years. Grants given in this category may be allocated in one or a combination of the years in the triennium.
Examples of forward planning projects:

- multipurpose leisure/recreation centre
- swimming pool – new or major upgrade including heating to allow increased use
- construction of large synthetic fields
- playing field construction
- clubroom – new or major upgrade
- large ablution block/change rooms.

LOTTERYWEST

Lotterywest provide funding for the following types of projects:

- Creation of skate parks
- Development of playgrounds
- Earthworks, play equipment and shade facilities
- Temporary infrastructure that may make public spaces more welcoming for people

Lotterywest grants do not support the ongoing operation and maintenance of community spaces.

15 APPENDIX 1 – REVIEW OF CITY OF KALAMUNDA DOCUMENTS

DOCUMENT REVIEWED	RELEVANT KEY ASPECTS	IMPLICATIONS FOR MASTER PLAN
Kalamunda Advancing 2017 - 2027 Strategic Community Plan	Kalamunda Advancing 2027 purpose is to document the community's main priorities, expectations and aspirations for the City over a 10 year period and to plan strategies for achieving them. The plan notes that the City has three distinct communities of interest; eastern hills, escarpment and foothills. The Maida Vale Reserve is within the foothills area. Community Vision: *"Connected Communities, Valuing Nature and Creating our Future Together."* Simple Guiding Principle will be: *"To ensure everything we do will make Kalamunda socially, environmentally and economically sustainable".* Kalamunda Advancing 2027 is broken into four key themes. The following shows the themes and relevant objectives and strategies that may impact the development of the Maida Vale Reserve Master Plan: • **Kalamunda Cares and Interacts;** Objective 1.2: to provide safe and healthy environments for community to enjoy. Strategies 1.2.2 Advocate and promote healthy lifestyle choices by encouraging the community to become more physically active. Strategies 1.2.3 Provide high quality and accessible recreational and social spaces and facilities. Success Measurement: Increasing level of satisfaction with parks and recreational facilities Objective 1.3 To support the active participation of local communities. Strategies 1.3.1 Support local communities to connect, grow and shape the future of Kalamunda Success Measurement: Increase number of people volunteering. Increasing community participation and satisfaction with City held events and community groups. • **Kalamunda Clean and Green** Objective 2.1: to Protect and enhance the environmental values of the City. Strategies 2.1.1 Enhance our bushland, natural areas, waterways and reserves. Strategies 2.1.2 Support the conservation and enhancement of our biodiversity. Success Measurement: Increasing level of satisfaction with parks and recreational facilities Objective 2.2: to achieve environmental sustainability through effective natural resource management. Strategies 2.2.1 Facilitate the appropriate use of water and energy supplies for the City.	The Vision outlined in the plan, set by the Community and Council will need to be considered within the master plan development. Environment and sustainability are important to the City of Kalamunda communities. The Maida Vale Reserve is within the foothills community. The unique characteristics of this community need to considered in the master plan development.

DOCUMENT REVIEWED	RELEVANT KEY ASPECTS	IMPLICATIONS FOR MASTER PLAN
	• **Kalamunda Develops** Objective 3.2: to connect community to quality amenities. Strategies 3.2.1 Optimal management of all assets. • **Kalamunda Leads** Objective 4.2: to proactively engage and partner for the benefit of community. Strategies 4.2.1 Actively engage with the community in innovative ways.	
City of Kalamunda Community Facilities Plan 2011 – 2031 **(Final Report – May 2011)**	The plan was commissioned to identify community facility needs within the City to accommodate the growing population to the year 2031. The report identified that in general, the City provides an extensive portfolio of community facilities, although many are dated and the maintenance and upkeep has been relatively low. Recommendations in the report: Develop a Master Plan for the development of Maida Vale Reserve to a District level sports ground, capable of catering for the future population of Maida Vale and High Wycombe. Develop a District level recreation centre to cater for the population expected in High Wycombe and Maida Vale. (It is noted that in the more recently developed Public Open Space Strategy, the Maida Vale Reserve is classified as a Regional Level Open Space.)	In relation to the Maida Vale Reserve, the report recommended the reserve be classified as a District Level Sports Ground.
City of Kalamunda Public Open Space Strategy April 2018	The Public Open Space Strategy (the POS Strategy) was developed to ensure the future protection, provision and management of POS sites to meet the ongoing needs of the community. The Strategy will ensure that POS is delivered to optimise community benefit by providing direction to guide the future provision, enhancement and management of POS. The Strategy aims to ensure that POS is utilised to its maximum potential to deliver maximum benefit to the community. The City of Kalamunda will have a network of fit for purpose parkland that protects our natural resources and meets community need. The Strategy provides alternative categories than those outlined within the Community Facilities Plan. The Maida Vale Reserve is classified as a Regional Open Space in the POS Strategy, in the form of Bush Forever for the purpose of conservation and Maida Vale Recreation Reserve for the purpose of organised sport and nature space purposes. It is noted that Maida Vale Reserve, being a Regional Open Space was not included in the allocation of public open space. It was identified that further sports field allocation would be required in Maida Vale by the year 2036. The plan identified that a potential location is Maida Vale South, however land is not confirmed. There is a real possibility that further sports playing field space will be required at Maida Vale Reserve.	A number of strategies, objectives and actions were developed within the POS Strategy that are relevant to the Maida Vale Reserve: <u>Objectives</u> As part of any sports space facility master planning of new or existing sites, the implementation of synthetic turf should be considered. Phased installation of low level solar powered lighting to be undertaken on park areas of a neighbourhood level and above where footpath access is provided to improve site security. Disability access paths to be provided to all parks of a neighbourhood level and above. To improve pedestrian access traversing through existing POS To improve pedestrian and cycling access to and from POS.

DOCUMENT REVIEWED	RELEVANT KEY ASPECTS	IMPLICATIONS FOR MASTER PLAN
City of Kalamunda Maida Vale Reserve Action Plan 2012-2019	The document provides a structured management approach to address environmental issues of the Maida Vale Reserve. The goal of the plan is to improve the ecological function of the Reserve with overall habitat improvement in the naturally vegetated area and to provide natural and social values. Objectives to achieve the goals are: • To monitor the ecological functions and vegetation condition of the Reserve • To increase populations and distributions of threatened and priority flora on the Reserve • To identify and assess threatening processes affecting the Reserve • To implement management actions required to maintain and improve the ecological function and vegetation condition of the Reserve. • To develop awareness of the environmental values of the Reserve and encourage community interest and action in the Reserve. Maida Vale Reserve is a recognised Bush Forever Site (Site 316). The Reserve is home to Wavy leaved Smokebush, a plant species that has been declared rare by the Department of Biodiversity Conservation and Attractions (Previously Department of Parks and Wildlife). The Reserve is home to the Threatened Ecological Community notated as TEC 20a. There is known areas of Dieback infestation in the reserve.	The Action Plan highlights that The provision for increased or upgraded recreation activities should be located in previously cleared areas or degraded area in close proximity to sporting fields. Reduction of and minimisation of the impact on the environmental areas needs to be considered.

16 APPENDIX 2 – CONSULTATION

CONSULTATION SUMMARY

Maida Vale Reserve Master Plan

Stakeholders (User Groups)

MAIDA VALE RESERVE MASTER PLAN PROJECT

Kalamunda United Football Club

Kalamunda Rangers Teeball/Baseball Club

Kalamunda Governor Stirling Archers Club

Maida Vale Tennis Club

Friends of Maida Vale Reserve

WA Christian Football Association

Maida Vale Primary School

Kalamunda Cricket Club

Kalamunda and Districts Basketball Association

Kalamunda Districts Netball Association

Brazilian Ju-Jitsu Legion (Since the consultation was undertaken, the Brazilian Ju-Jitsu are no longer hiring the facility, however another user group has hired the space on a regular basis.)

The information provided in the table below is based on the consultation with individual clubs and user groups. Suggested upgrades to existing or new infrastructure included below are club identified priorities.

GROUP	OUTCOME

Maida Vale Tennis Club	• Currently play on clay courts and front hard courts: 12 total. The additional 7 courts to the South of the facility are in very poor condition (very poor court surface, fence has fallen down in sections)
	  ○ The clay courts are playable – Approximately 10 yrs old. General life span is approximately 10 years. Noted as "classic clay" and comes out of QLD. Expensive sand laid on 2 layers of red carpet (approx. $1,000 per cubic metre)
	  ○ The original clay they laid failed in 2 years
	  ○ Prior to that, the courts were grass. Water shortages resulted in change
	  ○ Front courts have mould patches. Areas of pooling water due to insufficient camber
	• Lights – not all working on the courts. Issues with lighting on Court 5
	• Hire the front bank of courts a bit at night (suggested it be 1 night a week - $15 an hour)
	• Security lights – no car park lights. Very dark at night.
	• Tennis Pavilion – is suitable for need, hired out a bit to a gun club regularly and members birthdays etc.
	• On site storage container holds the mowing machinery and related equipment
	
	Council does some basic repairs to buildings such as recent gutter repairs.
	
	Discussion Points:
	• Front row courts– provide a profile to the club. Would be concerned that the club would lose profile if front courts were claimed for alternative use and the back courts were used.

Kalamunda Rangers Baseball	Change rooms • Teams have 20 max in a room (large bags each) • Plans were done 6 years ago on a redevelopment of social / change areas • More change rooms so there is a minimum 2 x men's, 2 x women's and umpires. Storage • Require more storage. Currently use batting cages and a sea container. Would be good outcome to have that and batting cages free from storage • Require vehicle access storage so they can back up and connect trailer with the home run fence already loaded on • Proximity to main field would also be helpful

GROUP	OUTCOME
	Playing fields • Main field has undulation that should be rectified at next major ground renovation works (in-field the priority) • Advised that club has put own reticulation into infields ($3-4k) which they paid for and use potable water they have to pay for • 10m+ past infield – bases area grass is very dry and looks like in need of water in summer season • Ideally an area available for full-year access for the creation of a winter softball/baseball competition • Back nets/fencing extension • Removal of cricket pitch (Concrete pitch in outfield of Diamond 1) • Ability to water infields of diamonds independently of the rest of the fields. Batting cages • 4 cages is ideal (preference is to add 2 to existing 2) but don't rule out converting cricket nets on southern end of playing fields (still allows cricket to train in them) ○ Needs – rubber on side nets, synthetic apron on ground totally to protect from ball damage, nylon drop nets internally to prevent balls ricocheting off support poles Spectator areas • Ideal is behind pitch 1 – good example is Vic Park with aluminium seating provided on 3 tiers • Scorers box at MV should ideally be raised – Wanneroo Giants is best example Dugouts • Vic park recently built example– not suitable – too small • Cladding at MV could be replaced to continue cyclone wire fencing to improve spectator viewing • Club would like some privacy kept for players waiting to bat Lighting • Pitching mound would be ideal to have lighting near it • Batting cages have a level of lighting currently and should be retained if more cages are added Netball area • A synthetic area of a size at least same as baseball diamond (90 feet diamond) would be very good for training particularly in pre-season (lighting will assist and make more useful) Separate office • To provide administration and store important files (during off-season)
Kalamunda United Football Club	• Funding of $60k identified as an election commitment ○ $30k mobile goals, $10k compound fence around netball courts, $20k towards repair of netball court surface

GROUP	OUTCOME

	• Netball courts area – planning was for out of season utilisation of area, i.e. pre-season, 5 a side, out of season clubhouse social area
	  ○ Perfect area with fencing to conduct all junior training there, fenced, security for children etc.
	• Lights
	  ○ utilise in summer 5-8pm
	  ○ current lit area is far too small area for all teams to train, - normal to train 3 teams on 1 pitch area to utilise lights (25-35 players at once)
	  ○ would like pitch 1 as main pitch 100 lux lights to allow matches played under lights
	• Change rooms
	  ○ Currently a home double change room with shared showers that 2 Kalamunda United. teams can use at same time
	  ○ Currently nothing for females or referees, teams changing under trees and toileting in treed areas
	• Office space required for ongoing management / club administration – place to store player records etc.
	• Storage – require more lockable storage
	• Pitches
	  ○ Considered excellent
	• Car park
	  ○ Central area (informal car park off Ridgehill Road) inefficient – often cars backing into trees
	• Netball area
	  ○ $20k of DSR grant was received to make a full sized training pitch area (hard surface)
	  ○ Plan to fit mostly juniors in the area – fenced safe, all in one locale, run a canteen – toilets / change available, good parking parents can sit and watch etc.
	• Numbers – growing, 2018 will see an all abilities team in seniors and juniors added to club
	
	PRIORITIES
	○ Lighting of fields
	○ Netball area use

Kalamunda Archery Club (Kalamunda Governor Stirling Archery Club)	• Approximately 100 members – has remained steady • Additional access for specific events and come and try days (approximately 1400 people mixed ages and genders) • Loss of usage of bush area did influence membership. Lost members who exclusively shot field rounds. • Have been in location for over 30 years. Ideally, access to bush area and indoor facility would assist growth. Lack of facilities restricts training in 2 main disciplines of archery. • Have had issues of double bookings when trying to access main oval of reserve for clout shooting event.

GROUP	OUTCOME
	• Roof is leaking in club house facility – causing flooding during Winter months. • Pedestrian path too narrow for access for people with mobility issues. • Concerns over electrical light cabling. • Would like lease extension to support club spending funds on club house improvements.
Western Australian Christian Football Association Inc.	• Approximately 1500 members, with 450 based at MV Reserve. Play games only at the reserve. • New or upgraded facilities: Increased lighting, more change rooms, office/administration space, increased spectator viewing (grand stand for 200 would be ideal).
Maida Vale Primary School	• School is happy with utilisation of oval adjacent to school. - 300 children approx. every day access at recess and lunch - Athletics carnivals - Sports sessions every day • Oval can be boggy in Winter • Facilities are good • Maida Vale Primary School (MVPS) was the recipient of a 2017 WA Football Commission goal post grant. As part of this we received 2 set of goalposts (8 posts, total cost approx. $2000) that are designed for permanent, in ground use. They have yet to be installed, but the plan is for the school (as a regular user of Maida Vale Reserve) to donate these goal posts to the City of Kalamunda for installation at Maida Vale Reserve. All that we ask is that the posts are relatively accessible for our students to use at recess/lunch breaks and during PE lessons. • Consideration to the installation of jumping pits for Athletics . This has been raised with the City previously, but we ended up installing one pit on the school site. It serves our needs for the time being, but the Reserve would be much more appealing as a venue for school athletics and Little Athletics meets if there was scope to install 2-3 jumping pits. • There is a single netball court and single basketball court on the Maida Vale PS grounds, located on the boundary between the school and reserve. These courts aren't fenced off and are available for use by the general public – typically local residents who also use the Reserve. Consideration towards some funding being distributed to the re-surfacing of the courts through the Master Plan and reconfiguring them into multisport courts would be beneficial. The school would contribute most of the funding towards this, but if there was a small allocation of funds available this would assist.
Brazilian Ju-Jitsu Legion	• Utilise the hall in the Netball Court Pavilion • Book hall through the City • 20 – 25 average per class • Start from 4 years through to adults • Patronage has increased • The facilities are suitable. The club uses mats on the floor that are stored in the store room.

GROUP	OUTCOME
	• Space of hall is good, as the storage space • Council have been flexible and good to deal with in terms of bookings, allowing access to storage and to clean. Following the consultation, the Brazilian Ju-Jitsu Legion no longer hire the pavilion at the Netball Complex. Another user group has hired the space on a regular basis.
Baseball Western Australian	• Kalamunda Rangers currently Division 2 – aspiring to Division 1 Club. • Clubs in Eastern Area: Swan Districts, Gosnells, Roleystone, Kenwick (Juniors only) and Kalamunda. • Lighting: Baseball has high lux requirements for games. Baseball WA do not fixture night games regularly (750 lux for infield, 500 lux for outfield for club competition). All night games currently played at Baseball Park in Thornlie and Wanneroo Giants. • Training lighting (250 lux infield, 150 lux outfield) • Change rooms – should be able to have 20 persons (max). South Perth (Grayden reserve) recently upgraded – 8x6 + wet areas of 3-4 showers (accommodate refs and females). • Dugouts: Do not sink. Recent examples of sunken dugouts result in flooded dugouts. • Most local dugouts at ground level – mesh fence is best to allow air flow and viewing can still occur. • Spectator Viewing – best location for viewing is behind batting and dugouts. Transparent dugouts, elevated area, close to kiosk/bar. • Fly ball protection: Option is to run wire rope from side net to side net across front of net above home plate effectively creating a roof over batter • Ball is considered dead if it hits this net (fielding team don't like it as they could potentially catch a foul ball with that trajectory) • Batting cages need synthetic flooring for boot grip / rubber soles can be used don't need boots with cleats • Wanneroo giants hire their batting cages out $2 a cage per hour to get some type of return on them • Most cages have lights and power accessible for ball machines etc.
Football West	• Ideal change room / pavilion facilities are detailed in the Football West Facilities plan • Football west confirmed recent synthetic pitch installation costs. • Football West is beginning to have involvement with 5 a side / Futsal competitions with a recent MOU with a large private operator signed recently.
Netball WA	• No plans to conduct competition based at the netball courts at Maida Vale Reserve. Netball WA have considered development programs, however the Kalamunda Netball Association operates them. • Netball WA would be disappointed to see courts not available, however no plans for the area specifically.
Tennis West	• 19 courts

GROUP	OUTCOME
	• Disused bay of courts is an injury safety risk facility if played on in current condition. • Suggests that the membership is appropriate for a 4-5 court facility. • City as a whole: o Shire has 61,000 pop o 40 courts overall in shire o 1 court to 1,479 o TW Aim for 1 court per 2,000 o Members in Kalamunda 416 o Members per court 1:12 in City of Kalamunda o TennisWest aim for 1court:20 lit, 1 ct:30 all courts o 67% of courts in City of Kalamunda are lit
Shire of Mundaring	• 4 indoor courts – currently 8 outdoor – will end up being 4 indoor and 8 outdoor, resulting in additional 4 courts overall. • No senior netball or basketball currently in Mundaring • Should be open in a few months but the extra 4 outdoor end of year at best • Planning suggests summer will be full (junior basketball / hockey/netball) and winter has some capacity as currently no winter basketball played • They will probably play seniors in preference to juniors and rotate juniors through the venue and outdoors
City of Swan	• New facility planned for Ellenbrook – 3 court indoor recreation and aquatic stadium. • No planned developments in close proximity to City of Kalamunda
City of Gosnells	• Southern Districts Netball Association in Langford at capacity – has been some previous planning works undertaken for potential move but nothing concrete • Nothing planned at North end of city towards City of Kalamunda– more to the populated areas to the south
City of Armadale	• Long term planning for a regional level facility at Wungong Recreation Reserve. • Focus is on opening of newly redeveloped Armadale Aquatic Centre and strategies to minimise impact on Armadale Arena which are both located in central town site area of City of Armadale. • No facility development is planned that is likely to have any impact on Maida Vale reserve.
Department of Local Government, Sports and Cultural Industries	• An election promise of $60,000 to fund the Kalamunda United Football Club was made: $40k for storage and $20 towards conversion of netball courts to synthetic but dependant on the findings of the Master Plan.

Community Survey –

Available on line through the *engage.kalamunda.wa.gov.au* and via hard copies. (open from 15th January 2018 – 7th March 2018.)

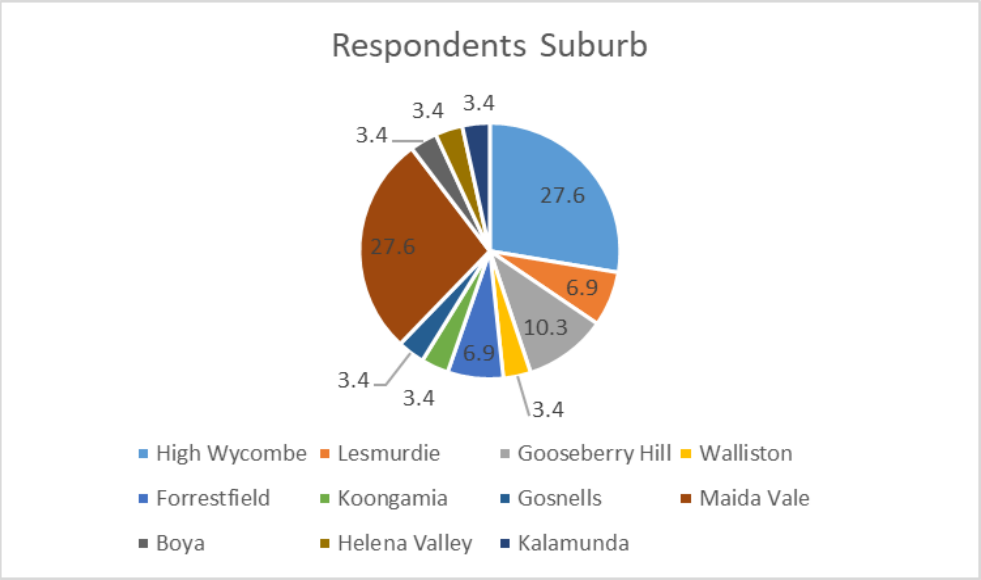
General Information:

29 responses were received for the community survey,

⇒ 23 online responses

⇒ 6 hard copy responses

- 45% of respondents are female, 55% of respondents are male.
- 37.9% of respondents were between 36 – 45 years of age, 27.6% between 26 – 35 years of age, 17.3% between 46 - 55 years of age, 6.9% between 56 - 65 years of age, 6.9% between 66 - 75 years of age, and 3.4% between 16 – 25 years of age.
- 67.8% of respondents drive their car to Maida Vale Reserve, 21.4% walk, 7.2% either walk or drive, and 3.4% cycle. 0% of respondents utilise public transport to access the reserve.
- Respondents were asked to identify which suburb they live. 11 different suburbs were nominated, although the predominant responses were; 27.6% High Wycombe, 27.6% Maida Vale and 10.3% Gooseberry Hill.



- 76% of respondents are very regular users of the reserve, using it either daily, more than twice a week, or weekly. 4% of respondents use the reserve monthly and 12% use the park occasionally (less than once a month).
- 39.2% of respondents utilise the reserve for formal sport, 28.6% for walking and 10.7% for informal active play. 7.1% use the reserve for fitness, with 14.3% listing 'other' as their reason and not providing further detail.
- The most popular times for use is between 5pm and 10pm Monday to Fridays with 44.8% of respondents using at these times, with 20.7% using on weekends between 9am and 5pm. The next most popular times are weekdays from 5am – 9am (17.3%) and weekdays 9am – 5pm (13.8%).

The following summarises responses to what people most like about Maida Vale Reserve:

- Large Green Spaces / Open Spaces
- Great sport playing fields
- Nice grass and well maintained
- Sports
- Bush setting and established trees/natural environment
- Open and peaceful
- Community Use

The following summarises the responses to what people would like to see improved:

- Facilities/buildings
- Toilet and change room facilities
- Parking and lighting
- Playground
- Walking tracks around the reserve
- More sports (i.e. Ladies Netball)
- Better use of underutilised areas (netball and tennis courts)
- Drink Fountains
- Increased protection and preservation of natural areas.
- Incorporate a Leisureplex
- Bins with dog poo bags.

The following summarises the responses to what people would like to see as their top priorities for Maida Vale Reserve:

- Upgrade buildings
- More lighting for playing areas
- Improved parking / improved traffic flow
- Bigger area for children
- Fencing around the ovals to protect children
- Maintain trees and wildlife
- Installation of drink fountains
- Playground improvements
- Walking tracks for dogs
- More community events

Community Drop-In Sessions

- Session 1: 31st January 2018 5:30pm – 7:30pm (11 Attendees)
- Session 2: 17th February 2018 10:00am – 12:00pm (13 Attendees)

Plans of the reserve were displayed with attendees asked to provide what they like about the reserve and what they would like to see improved.

Community Visioning Workshop

- 1st March 2018 5:30pm – 7:30pm (19 Attendees)

Key themes outlined by the community:

CAR PARKING & TRAFFIC	PAVILION / CHANGE ROOMS	SPORTS CLUBS
• Car Parking needs improvement • Car park lighting • Ingress and Egress improvements • Linkages from car parks to sports spaces	• Change Rooms not compliant with current standards • Not enough change rooms to accommodate current competition • Improve spectator viewing to main baseball diamond • Administration areas requested	• Baseball: Improved facilities – diamonds, car parking, change areas, security. • Soccer: change rooms upgrade required, lighting • Archery: Upgrades to amenities buildings • Tennis: Court Maintenance • Cricket: Wicket improvements • Storage: Additional required
LIGHTING (POWER)	**PATHWAYS/LINKAGES**	**OTHER**
• Limited Oval Lighting. Limits use to predominantly day light hours. • 3 power sources to site. Current supply not likely to accommodate any increased load.	• Improve walkways and cycle tracks and linkages	• Some areas of poor drainage on oval • Underutilised facilities (e.g. netball) • Highly valued by community • Skate park location • Playground – location and quality

NBQSS

CITY OF KALAMUNDA

Upgrade of Facilities

at

Ray Owen Reserve, Lesmurdie

Masterplan Cost Indication

Indoor Stadium Extension

3rd May 2018

Refer to Original Masterplan Cost Indication dated 14th May 2014

Neil Butler Quantity Surveying Services
T: 08 9349 7853
M: 0457 977 407
ABN: 730 320 19210

Project:14.09

City of Kalamunda
Upgrade of Facilities at
Ray Owen Reserve, Lesmurdie

Master Plan Costs
3rd May 2018
(Revision -)

SUMMARY

Item	Description of Works	Option 1 - 4 Court Stadium	Option 2 - 2 Court Stadium
1.1	BMX Club		
	BMX Club Building	$ -	$ -
1.2	New Indoor Courts		
	Option 1 - 4 Court Basketball & Netball Stadium (approx 83m x 38m)	$ 4,250,702	
	Option 2 - 2 Court Basketball & Netball Stadium (approx 44m x 38m)		$ 2,477,921
1.3	Administration, Amenities and Storage	$ 826,625	$ 826,625
1.4	Sportsmen's Club Extension	$ -	$ -
1.5	Upgrade External Entrance Area to Stadium	$ 95,000	$ 95,000
1.6	Relocate Playground	$ -	$ -
1.7	Lesmurdie Primary (LPS) Outdoor Courts	$ -	$ -
1.8	New Turf Area	$ -	$ -
1.9	Parking, Driveways, Surrounding Roads	$ -	$ -
1.10	Lighting Upgrades	$ -	$ -
1.11	Power and Water Supply Upgrades	$ -	$ -
1.12	Pathways	$ -	$ -
1.13	Existing Stadium	$ -	$ -
1.14	Enhanced Bushland Protection from BMX Track Runoff	$ -	$ -
	TOTAL CONSTRUCTION COSTS	**$ 5,172,327**	**$ 3,399,546**
2.0	CONTINGENCIES		
	Design contingencies - 10%	$ 517,233	$ 339,955
	Contract contingencies - 5%	$ 284,478	$ 186,975
3.0	HEADWORKS	$ -	$ -
4.0	PROFESSIONAL FEES - 12%	$ 716,885	$ 471,177
5.0	PUBLIC ART - 1%	$ 59,740	$ 39,265
6.0	ESD ALLOWANCES	$ -	$ -
7.0	ESCALATION	$ (135,013)	$ (88,738)
	TOTAL ESTIMATED COMMITMENT	**$ 6,615,649**	**$ 4,348,179**
	Goods & Services Tax (10%)	$ 661,565	$ 434,818
	TOTAL ESTIMATED COMMITMENT (Including GST)	**$ 7,277,214**	**$ 4,782,997**

City of Kalamunda
Upgrade of Facilities at
Ray Owen Reserve, Lesmurdie

Master Plan Costs
3rd May 2018
(Revision -)

DRAWINGS:

The following drawings were used in the preparation of these Master Plan Costs:

Concept Site Master Plan Drg: P14002.SK.01 Rev: -, Scale 1:2500/A3 dated April 2014

Sketch Information provided by ABV dated 12 April 2018

EXCLUSIONS:

The following items have been **specifically excluded** from these Master Plan Costs:

- Headworks
- ESD Costs
- Geotech survey below proposed building
- Upgrade of existing reticulation system to ovals
- New Ministers water and sewer mains to site if required
- Bore and pump
- Holding and Finance charges
- Land costs
- Legal costs
- Computers, printers, facsimile machines etc.
- Escalation beyond May 2018

NOTES:

Please note that this information is for indicative budgeting purposes only and should not be used as the basis for making a financial commitment

Prior to making a financial commitment a detailed budget should be prepared based on input from the architect and the relevant consultants

City of Kalamunda
Upgrade of Facilities at
Ray Owen Reserve, Lesmurdie

Master Plan Costs
3rd May 2018
(Revision -)

Item	Description of Works	Unit	Quantity	Rate	Cost
1.1	**BMX Club**				
	BMX Club Building				
1.1.1	No allowance included for this section of work	Note			$ -
	Sub-Total BMX Club				**$ -**
1.2	**New Indoor Courts**				
	Option 1 - 4 Court Basketball & Netball Stadium (approx 83m x 38m)				
1.2.1	Building structure	m2	3154	$853	$ 2,690,362
1.2.2	Timber sports floor	m2	3154	$175	$ 551,950
1.2.3	Electrical lighting and power	m2	3154	$105	$ 331,170
1.2.4	Fire Services	m2	3154	$10	$ 31,540
1.2.5	Mechanical services	m2	3154	$40	$ 126,160
1.2.6	Large ceiling fan	No	4	$11,000	$ 44,000
1.2.7	Furniture and sports equipment to Stadium	Item			$ 25,000
1.2.8	Remove existing netball courts	Item			$ 29,750
1.2.9	Retaining wall around base of building to raise level to match existing hall level	m	254	$740	$ 187,960
1.2.10	Site preparation - Filling under building - average 1m deep	m3	3480	$25	$ 87,000
1.2.11	Allowance for steps and ramps	Item			$ 20,000
1.2.12	Paving around building	m2	474	$65	$ 30,810
1.2.13	External water services	Item			$ 5,000
1.2.14	External fire services	Item			$ 10,000
1.2.15	External gas services	Item			$ -
1.2.16	External sewer services	Item			$ 30,000
1.2.17	External stormwater services	Item			$ 40,000
1.2.18	External electrical services	Item			$ 10,000
	Sub-Total for Option 1 - 4 Court Stadium	**m2**	**3154**	**$ 1,348**	**$ 4,250,702**

City of Kalamunda
Upgrade of Facilities at
Ray Owen Reserve, Lesmurdie

Master Plan Costs
3rd May 2018
(Revision -)

Item	Description of Works	Unit	Quantity	Rate	Cost
	Option 2 - 2 Court Basketball & Netball Stadium (approx 44m x 38m)				
1.2.19	Building structure	m2	1672	$853	$ 1,426,216
1.2.20	Timber sports floor	m2	1672	$175	$ 292,600
1.2.21	Electrical lighting and power	m2	1672	$105	$ 175,560
1.2.22	Fire Services	m2	1672	$10	$ 16,720
1.2.23	Mechanical services	m2	1672	$40	$ 66,880
1.2.24	Large ceiling fan over	No	2	$11,000	$ 22,000
1.2.25	Remove existing netball courts	Item			$ 29,750
1.2.26	Retaining wall around base of building to raise level to match existing hall level	m	254	$740	$ 187,960
1.2.27	Site preparation - Filling under building - average 1m deep	m3	3480	$25	$ 87,000
1.2.28	Allowance for steps and ramps	Item			$ 20,000
1.2.29	Paving around building	m2	318	$65	$ 20,670
1.2.30	Basecourse and topping to new 2 outdoor courts	m2	1482	$45	$ 66,690
1.2.31	Allowance for basketball/netball equipment	Item			$ 6,000
1.2.32	Fencing and gates to new outdoor courts	m	75	$65	$ 4,875
1.2.33	External water services	Item			$ 5,000
1.2.34	External fire services	Item			$ 10,000
1.2.35	External gas services	Item			$ -
1.2.36	External sewer services	Item			$ -
1.2.37	External stormwater services	Item			$ 30,000
1.2.38	External electrical services	Item			$ 10,000
	Sub-Total for Option 2 - 2 Court Stadium	**m2**	**1560**	**$ 1,588**	**$ 2,477,921**

City of Kalamunda
Upgrade of Facilities at
Ray Owen Reserve, Lesmurdie

Master Plan Costs
3rd May 2018
(Revision -)

Item	Description of Works	Unit	Quantity	Rate	Cost
1.3	**Administration, Amenities and Storage**				
1.3.1	New changerooms	m2	115	$3,000	$ 345,000
1.3.2	Administration offices and storage	m2	50	$2,400	$ 120,000
1.3.3	Storage for basketball and netball	m2	50	$1,800	$ 90,000
1.3.4	Lobby expansion	No	50	$2,200	$ 110,000
1.3.5	Allowance for sundry works to existing building to allow connection between new and existing buildings	Item			$ 50,000
1.3.6	Site preparation - Under building	m2	265	$25	$ 6,625
1.3.7	External water services	Item			$ 5,000
1.3.8	External fire services	Item			$ 5,000
1.3.9	External gas services	Item			$ -
1.3.10	External sewer services	Item			$ 50,000
1.3.11	External stormwater services	Item			$ 20,000
1.3.12	External electrical services	Item			$ 25,000
	Sub-Total for Administration, Amenities and Storage	***m2***	***265***	***$3,119***	***$ 826,625***
1.4	**Sportsmen's Club Extension**				
1.4.1	No allowance included for this section of work	Note			$ -
	Sub-Total for Sportsmen's Club Extension	***m2***			***$ -***
1.5	**Upgrade External Entrance Area to Stadium**				
1.5.1	Allowance to upgrade paving at main entrance	m2	0	$125	$ -
1.5.2	Allowance for landscaping at main entrance	Item			$ 30,000
1.5.3	Allowance for new canopy at main entrance	Item			$ 65,000
	Sub-Total for Upgrade External Entrance Area to Stadium				***$ 95,000***
1.6	**Relocate Playground**				
1.6.1	No allowance included for this section of work	Item			$ -
	Sub-Total for Relocate Playground				***$ -***
1.7	**Lesmurdie Primary (LPS) Outdoor Courts**				
1.7.1	No allowance included for this section of work	Note			$ -
	Lesmurdie Primary (LPS) Outdoor Courts				***$ -***
1.8	**New Turf Area**				
1.8.1	No allowance included for this section of work	Note			$ -
	Sub-Total for New Turf Area				***$ -***
1.9	**Parking, Driveways, Surrounding Roads**				
1.9.1	No allowance included for this section of work	Note			$ -
	Sub-total for Parking, Driveways, Surrounding Roads				***$ -***

City of Kalamunda
Upgrade of Facilities at
Ray Owen Reserve, Lesmurdie

Master Plan Costs
3rd May 2018
(Revision -)

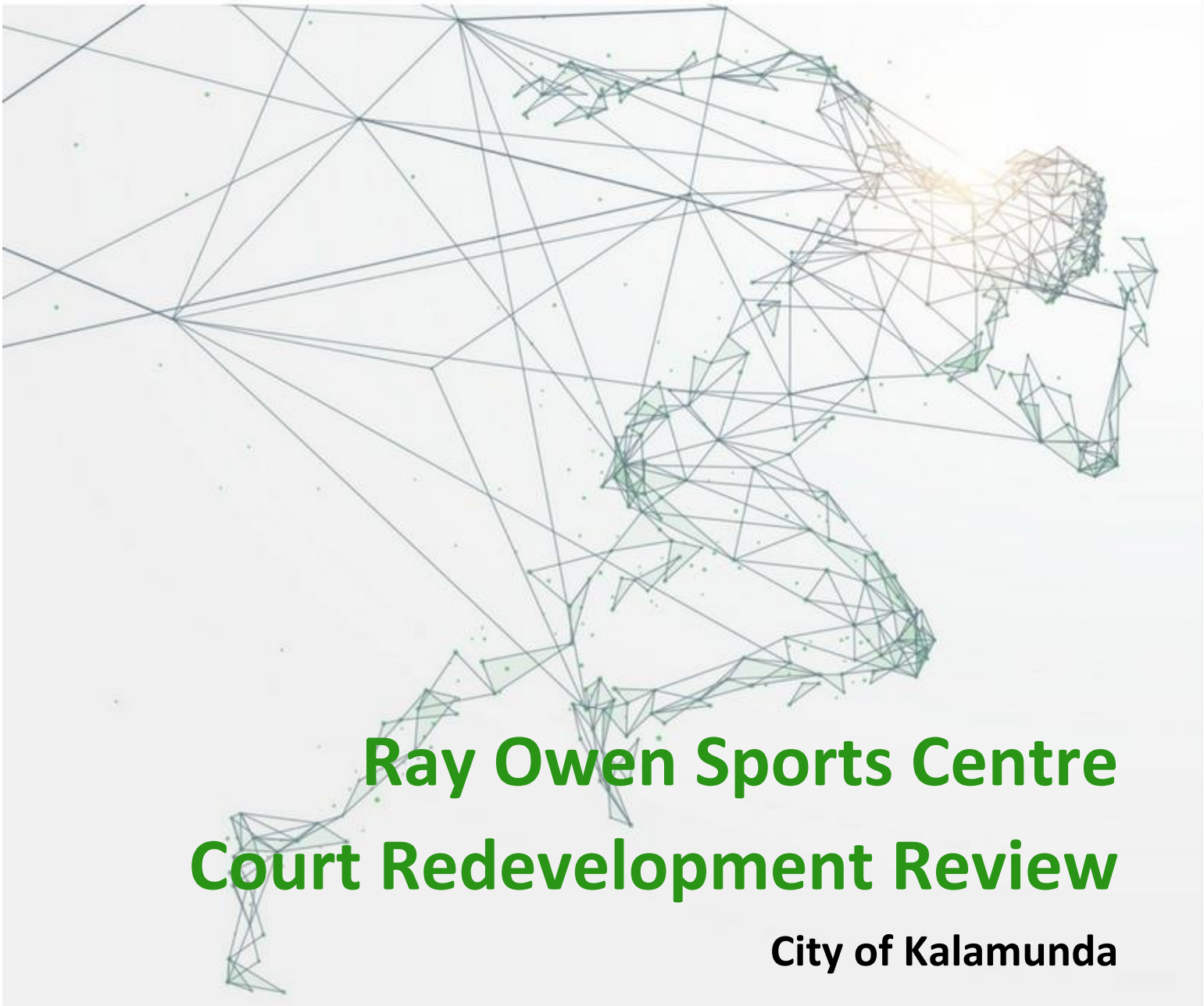
Item	Description of Works	Unit	Quantity	Rate	Cost
1.10	**Lighting Upgrades**				
1.10.1	No allowance included for this section of work	Item			
	Sub-Total - Lighting Upgrades			***$***	***-***
1.11	**Power and Water Supply Upgrades**				
1.11.1	No allowance included for this section of work	Note			
	Sub-Total - Power and Water Supply Upgrades			***$***	***-***
1.12	**Pathways**				
1.12.1	No allowance included for this section of work			$	-
	Sub-total for Pathways			***$***	***-***
1.13	**Existing Stadium**				
1.13.1	No allowance included for this section of work	Note		$	-
	Sub-Total - Existing Stadium			***$***	***-***
1.14	**Enhanced Bushland Protection from BMX Track Runoff**				
1.14.1	No allowance included for this section of work	Note		$	-
	Sub-total for Enhanced Bushland Protection from BMX Track Runoff			***$***	***-***
	TOTAL CONSTRUCTION COSTS - Excluding Option 1 - 4 Court Stadium			***$***	***5,172,327***
2.0	**CONTINGENCIES**				
2.1	Allowance for design contingencies	Item	10%	$	517,233
2.2	Allowance for contract contingencies	Item	5%	$	284,478
	Sub-total for Contingencies			***$***	***801,711***
3.0	**HEADWORKS**				
3.1	Allowance for Water Corporation Headworks	Item		Excluded	
3.2	Allowance for Western Power Headworks	Item		Excluded	
3.3	Allowance for Telstra Headworks	Item		Excluded	
	Sub-total for Headworks			***$***	***-***
4.0	**PROFESSIONAL FEES**				
4.1	Allowance for professional fees comprising full service	Item	12%	$	716,885
	Sub-total for Professional Fees			***$***	***716,885***

City of Kalamunda
Upgrade of Facilities at
Ray Owen Reserve, Lesmurdie

Master Plan Costs
3rd May 2018
(Revision -)

Item	Description of Works	Unit	Quantity	Rate	Cost
5.0	**PUBLIC ART**				
5.1	Allowance for Public Art (% of Total construction Costs plus Contingencies)	Item	1.00%		$ 59,740
		Sub-total for Escalation			***$ 59,740***
6.0	**ESD ALLOWANCES**				
6.1	Allowance for ESD (% of Total Construction Costs plus Contingencies)	Item	0.00%		Excluded
		Sub-total for Escalation			***$ -***
7.0	**ESCALATION**				
7.1	Allowance for escalation in costs between May 2014 and May 2018 based on the AIQS Construction Cost Index Forecast May 2014 = 182.0 May 2018 = 178.2	Item	-2.00%		$ (135,013)
		Sub-total for Escalation			***$ (135,013)***
	TOTAL ESTIMATED COMMITMENT - Excluding Option 1 - 4 Court Stadium				**$ 6,615,649**
	Goods & Services Tax (10%)				$ 661,565
	TOTAL ESTIMATED COMMITMENT (Including GST) - Excluding Option 1 - 4 Court Stadium				**$ 7,277,214**

A BALANCED VIEW
LEISURE CONSULTANCY SERVICES



Ray Owen Sports Centre Court Redevelopment Review

City of Kalamunda

Draft Report June 2018

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CONTENTS

1 INTRODUCTION

ABV was engaged by the City of Kalamunda to undertake a review of previous recommendations for the indoor court development for the Ray Owen Sports Centre.

The original Ray Owen Reserve Master Plan (ABV 2014/15) development recommended that additional courts would likely be required into the future to accommodate the growing basketball, netball and general programs offered at the centre. Options of a 2 or 4 court development were considered within the report.

Key user groups of the facility are requesting a 4 court development. The City would like an analysis undertaken on this request.

This report undertakes a current situational analysis and compares with the previous report findings to identify the appropriate level of development required.

Neil Butler Quantity Surveying has provided updated cost estimates for the proposed developments.

Ray Owen Sports Centre

The aerial picture depicts the existing sports centre and highlights the potential development location on existing 4 netball courts.

2 ENVIRONMENTAL SCAN

There are a number of factors which impact on demand for facilities. An environmental scan of key factors that could impact the Ray Owen development has been undertaken and follows.

2.1 DEMOGRAPHIC REVIEW

Population

In planning for sport and recreation infrastructure, it is important to understand the demographics of the area to provide insights into understanding the likely key areas of demand and potential future need.

In 2016, the City of Kalamunda had an Estimated Resident Population of 59,349 as of the 30th June 2016. The place of usual residence is a count of every person in Australia on Census night, based on where they normally live. The Estimated Resident Population is an estimate of the population that factors in an estimate of those missed in the Census and those who were overseas on Census night. It is usually higher than the Census count, and is updated annually after the Census.

The Table below provides a snapshot of the City population compared with WA overall.

City of Kalamunda Demographic Overview

Category	City of Kalamunda	WA	Difference of Kalamunda LGA from WA
Population (2016 Census)	57,449	2,474,410	
Males	49.5%	50%	-0.5%
Females	50.5%	50%	+0.5%
Aboriginal and/or Torres Strait Islander Population	1.8%	3.1%	-1.3%
Born in Australia	64.9%	60.3%	+4.6%
Overseas Born	35.1%	39.7%	-4.6%
Median Age	39	36	+3 years
Median Income per person ($ weekly)	$732	$724	-1.1%
Median Income per household ($ weekly)	$1,661	$1,595	+4%
Couple family with children	45.9%	45.3%	+0.6%
Couple family without children	38.8%	38.5%	+0.3%
Number of dwellings	21,734		
Occupied private dwellings	92.6%	89.4%	
Index of Relative Socio-Economic Advantage and Disadvantage* [1]	85th percentile		

Compared to other Australian LGA's, the City of Kalamunda ranks in the 85th Percentile (1 being the least advantaged, 100 being the most advantaged).

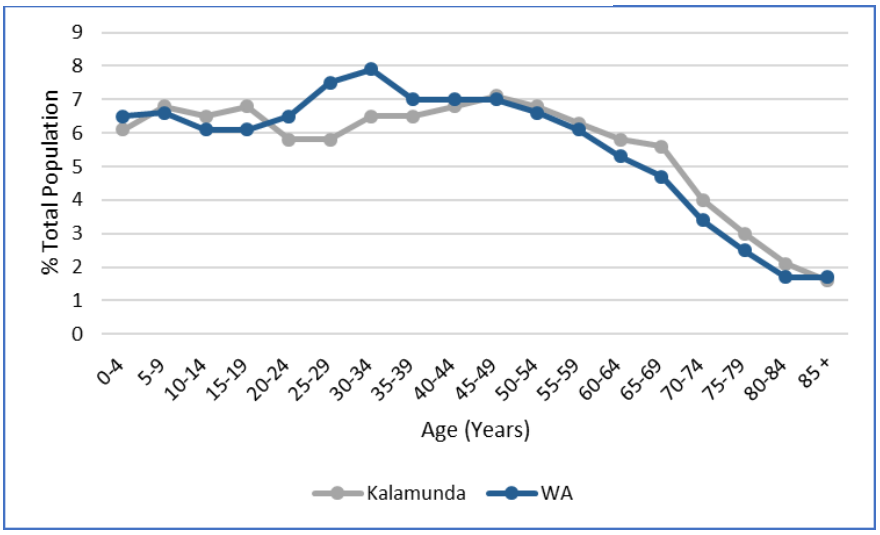
Source: Australian Bureau of Statistics, Census of Population and Housing, 2016.

1. Socio-Economic Indexes for Areas (SEIFA), ABS, 2011

Age Structure

The Figure below highlights age structure for the City of Kalamunda for the 2016 Census.

City of Kalamunda Age Distribution Profile



Source: Australian Bureau of Statistics, Census of Population and Housing, 2016

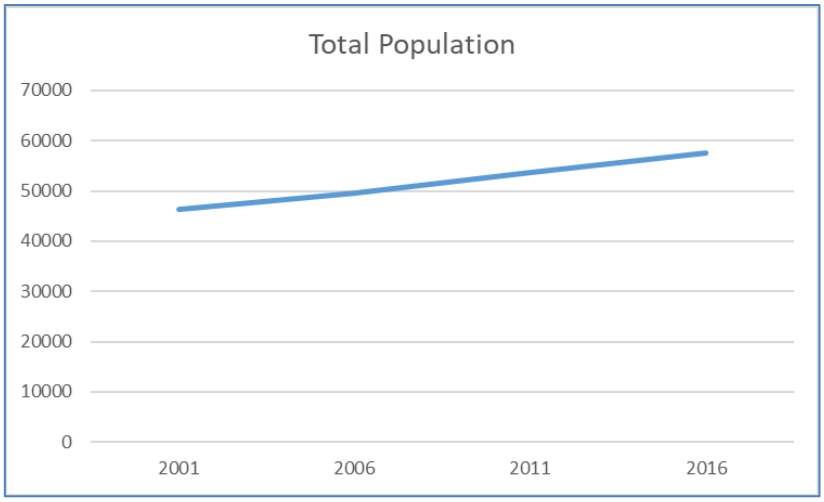
Since the previous Census report the median age for the City's population has increased by 1 year to 39. There is a peak age grouping around 30-40 years of age.

Population Growth

The table and figure below provide an overview of the change in population from the 2001 Census information through to the 2016 Census. It indicates that during this period the Shire had population growth of approximately 24% in a consistent manner.

Census Year	2001	2006	% Change	2011	% Change	2016	% Change
0-4 year	2,746	2,950	7.43	3,430	16.27	3,523	2.71
5-14 years	7,263	7,033	-3.17	7,155	1.73	7,653	6.96
15-24 years	6,968	7,008	0.57	7,383	5.35	7,221	-2.19
25-54 years	21,906	20,221	-7.69	21,202	4.85	22,733	7.22
55-64 years	4,764	6,315	32.56	6,933	9.79	6,914	-0.27
65 years and over	4,903	5,939	21.13	7,454	25.51	9,413	26.28
City of Kalamunda	**46,244**	**49,534**	**7.11**	**53,568**	**8.14**	**57,449**	**7.24**

Actual Population Growth 2001 – 2016



Projected Future Population Growth

The population forecast figures below have been obtained from the City of Kalamunda forecast.id portal.

Projected Population Change 2016-2036, City of Kalamunda

Age (Years)	2016	%	2026	%	2036	%	Number Change 2016-2036
0 to 4	3,764	6.3	4,169	6.2	4,638	6.1	874
5 to 9	4,034	6.8	4,350	6.4	4,697	6.2	663
10 to 14	3,831	6.5	4,520	6.7	4,935	6.5	1,104
15 to 19	4,007	6.8	4,541	6.7	4,998	6.6	991
20 to 24	3,610	6.1	3,819	5.7	4,514	5.9	904
25 to 29	3,699	6.2	3,682	5.5	4,273	5.6	574
30 to 34	3,983	6.7	3,943	5.8	4,416	5.8	433
35 to 39	3,864	6.5	4,482	6.6	4,893	6.4	1,029
40 to 44	4,028	6.8	4,696	7.0	5,075	6.7	1,047
45 to 49	4,152	7.0	4,448	6.6	5,022	6.6	870
50 to 54	3,977	6.7	4,212	6.2	4,806	6.3	829
55 to 59	3,651	6.2	4,045	6.0	4,399	5.8	748
60 to 64	3,338	5.6	3,802	5.6	4,087	5.4	749
65 to 69	3,264	5.5	3,464	5.1	3,840	5.0	576
70 to 74	2,325	3.9	3,139	4.6	3,599	4.7	1,274
75 to 79	1,720	2.9	2,816	4.2	3,144	4.1	1,424
80 to 84	1,195	2.0	1,769	2.6	2,432	3.2	1,237
85 and over	898	1.5	1,638	2.4	2,410	3.2	1,512
Total	**59,340**	**100**	**67,535**	**100**	**76,179**	**100**	**16,838**

Shading: Key Club Sport Playing Demographics

Source: http://forecast.id.com.au/kalamunda/population-age-structure.

Observations

The total population of the City of Kalamunda is forecast to grow by over 28% over the next 20 years, adding over 16,800 new persons to the area. The data in the table above reveals that future population growth is unevenly distributed and may have implications for organised sports participation over the next decade (as per below).

The key findings are:

- There is growth anticipated in the high junior sports participation age bracket of 5-19 year olds (averaging approximately 6% in each age group overall, representing almost 3,000 new persons over the 20 year period). Increased demand for junior sports facilities are therefore likely to continue to grow.
- The shaded area on the above table indicates the predominant age groups for club sport participation. This category shows consistent and steady growth over the 20 year period, indicating consistent demand for sporting facilities such as indoor courts.

2.2 INDOOR COURTS IN REGION

A review was undertaken of other indoor venues that accommodate indoor basketball/netball associations. As association netball is still primarily played outdoors, the majority of facilities analysed are basketball association venues. Details on court capacity, management, and facility plans were sought. The following information was revealed:

Court Capacity

Lack of court capacity is an issue that has spread to almost all basketball association venues in the Perth Metropolitan area.

The Basketball WA Strategic Facilities Plan and Netball WA Strategic Plans were completed in 2015. The following outlines the report outcomes:

Basketball

- There are 53 basketball associations throughout the state affiliated to Basketball WA and there are 14 associations / clubs that compete in the State Basketball League Competition.
- Basketball is a game principally played indoors on wooden sprung floors. In the Metropolitan area in particular, demand for access to basketball courts for training purposes is high and as a result teams use whatever court access times are available, whereas in regional areas training and competition tends to be conducted Monday to Friday with the weekends kept free for other activities.
- Many local governments operate their own casual play for basketball. This will not be recognised by Basketball WA within their recorded participation figures. Often, casual play facilitated by local governments will attract participation away from associations by those people who wish to participate outside of a formal membership structure
- The likely future growth for basketball will focus on enhancing and extending indoor provision

Netball

- Netball WA's priority development areas within the Metropolitan Region are their Coastal region (which includes the Cities of Fremantle, Cockburn and Rockingham), northern metropolitan corridor (Cities of Joondalup and Wanneroo), Urban Growth Corridor (City of Swan and areas of the City of Kalamunda) and south of the river in the Perth Metropolitan region.
- Netball in WA is traditionally a winter sport and played outdoors for 20 weeks of the year with the majority of games played on a Saturday.
- The competition structure is generally facilitated by the associations of Netball WA.
- The associations have varying control over their facilities. Depending on the level of control exercised by each association, this invariably impacts on the extent of developmental programs which can be facilitated (i.e. greater control by each association generally results in a greater capacity to develop these programs).

- Many local governments will operate their own casual play for netball. This will not be recognised by Netball WA within their recorded participation figures. Often, casual play facilitated by local governments will attract participation away from associations by those people who wish to participate outside of a formal league structure.
- The likely future growth of netball will need to maintain extensive single location outdoor court facilities with future growth being a mixture of indoor and outdoor provision in growth areas and where resources permit.

Both the Basketball WA Strategic Facilities Plan and the Netball WA Strategic Facilities Plan highlight the potential for expanded court facilities at the Ray Owen Sports Centre.

Basketball WA

Basketball WA (BWA) consultation reveals that the same issues as in 2014 still exist. The lack of court availability is a big issue for the sport. Key issues and consideration from BWA's perspective include;

- Basketball numbers in Metropolitan regions is growing.
    - Most Associations are reporting they have stopped advertising for players as they are unable to accommodate them.
- Future development from BWAs perspective is identified in north eastern areas primarily – Whiteman park area and Ellenbrook in particular.
    - BWA is aware of proposed stadium planning in Canning, Cockburn and Lakeside centres
- Mundaring has a junior association with 1,500 players. This association is not seeking an SBL licence but potentially could participate in the WABL level competitions into the future.
- BWA is supportive of new facility expansion to accommodate growing need.
    - A 6-8 court facility in metropolitan area is identified as being preferred level of facility to enable a sustainable operation (Ray Owen Sports Centre is currently a 6 court stadium, however it is one of the few in Perth that is shared by 2 sports).
    - BWA has no funding ability for facility development but can endorse priority projects from the sports perspective in funding applications such as CSRFF.
- The Eastern Suns is considered to service the north eastern corridor for Association basketball and BWA is supportive of the Ray Owen facility expansion.

Sporting Trends

As noted in 2014 the following observations are still relevant in 2018 at Ray Owen Sports Centre and for basketball in metropolitan area in general;

- Players, both children and adults, are being turned away from joining competitions at many venues across Perth and unable find court space to train – whether at the home facility or at a satellite venue (i.e. recreation centre or school) because all peak hours on indoor courts are being utilised, whether for basketball, netball or other indoor activities.
- The overall lack of facilities is likely due in part to the lack of indoor court facilities built in the past decade until recent additions at Warwick and Mandurah were built.
- Demand is continuing to grow – possibly ahead of population growth, due to recent developments in the sport such as Australians drafted into the USA's NBA receiving media attention, Australians featuring in recent NBA championships, success of National teams on the world scene and the Perth Wildcats enjoying continued success and drawing capacity crowds at the Perth Arena.

Netball - another trend that is and will continue to add to demand for indoor courts is for netball competition to move indoors. Already netball social competitions are played extensively indoors; however, most associations in Perth and around Australia still have traditional association competition played outdoors on a weekend. KDNA is one of a few that do have indoor netball, and it is known that it is a major attractor of participants to their association. The state netball centre is now open and provides indoor facilities for high levels of netball to be played indoors. These factors continue to add to participant expectations throughout the levels of competition.

- In addition to enabling play out of the elements, the sprung wooden floors are highly sought after, as it places significantly less stress on the players' feet and knees. Anecdotal evidence suggests that if netball associations were to move indoors, many ex-players would consider playing again due to the more favourable playing conditions.
    - There is a growing trend of players continuing in the sport at older ages.

Futsal (5 a side soccer) – Football West are the governing body for Futsal in WA. They have recently signed a MOU with a futsal operator endorsing their facilities and competitions which is an indication that the sport is growing and gaining credibility in its competitive form. There is considerable growth in futsal and 5 a side soccer occurring currently. Futsal is likely to be included in the upcoming Facilities Planning Strategy that Football West is undertaking soon.

- Indoor sprung stadiums are ideal facilities for futsal and pressure to accommodate competitions is likely to grow in the short term. Willetton's expansion funding stated that its success was partly due to the planned multisport role it would be providing with netball, badminton and soccer named.

Facility Expansion Plans

A number of Perth Metropolitan venues that host association basketball are at various stages of planning or development for expansion.

Facility	Courts Planned / Constructed	Status
Warwick Leisure Centre	4 courts	Completed 2016 and in use (now 8 court venue)
Willetton Basketball Stadium	4 courts	Feasibility completed. Funding of $11.5M obtained (will become 8 court venue).
Joondalup Arena	4 courts	Open 2017 (Wanneroo Wolves State League venue added 4 courts to the existing 3 of Arena = 7 court venue)
Mandurah Recreation and Aquatic Centre	2 courts	Completed 2017 and in use (6 court venue with long term plans for another 2 courts)

In addition to those facilities listed above that specifically host association basketball, the following additional Local Government indoor courts are built or in planning stage:

Facility	Courts Planned / Constructed	Status
Mundaring Recreation Centre	4 courts	Delayed opening – was due for completion in April 2018. Have in the short term replaced existing outdoor courts, although planning is underway to provide an additional 8 outdoor courts to the facility.
City of Swan	6 courts (TBC)	Currently in design development. Likely location Whiteman Park.
City of Armadale	3 – 4 courts	In long term planning. Potential for indoor court development at Wungong Regional Park.

Possible Impact on Ray Owen Sports Centre

The two closest LGA facilities to the City of Kalamunda that are being built and considering development of additional indoor courts are the City of Canning (Willetton) and the Shire of Mundaring. An updated 2018 analysis of KDNA and KDBA membership demographics reveals that only 3% of KDNA members and 5% (down from 8% in 2014) of KDBA members originate from these LGA areas. Therefore it is likely that only a small impact would be felt even if a significant proportion of these members utilise the proposed facilities as they account for a very small proportion of KDBA and KDNA total membership.

The Mundaring Arena has the greatest potential to impact on Ray Owen Sports Centre operations due to its relatively close proximity. It offers 4 indoor courts and will also offer 8 outdoor courts (originally the venue had just 8 outdoor courts). There will be a period of time when only 4 outdoor courts will be available due to construction and earthworks.

The Junior Basketball in Mundaring at the existing venue has approximately 1,500 members and the other sports of indoor hockey, indoor soccer and junior netball will utilise the 4 court facility virtually to capacity from opening (Manager of Recreation Shire of Mundaring).The use of outdoor courts is planned to complement the competitions and be primarily used for training.

Further assessment of the impact this facility may have on Ray Owen Sports Centre can be made after a period of time operating.

3 COURTS UTILISATION

Current Court Utilisation

The typical weekly utilisation graph in annual summary form for the 2017 year shows that further increases in hours of utilisation of the Ray Owen indoor courts has occurred since 2013. The 2013 and 2017 utilisation summary tables are shown on the pages 13 and 14.

The increase in hours utilised is generally across the board with increased weeks of the year when the utilisation is higher and increases for Tuesdays, Saturdays and Sundays specifically. It should be noted that Monday to Thursdays are largely operating consistently at capacity the majority of weeks, therefore the stadium is virtually at full capacity in these prime times (noting slightly lower utilisation during weeks for finals, school holidays and grading).

The following information indicates the change in team numbers between 2013 and 2017 for the KDBA and KDNA.

KDBA has the following seasons / competitions;

- January – July Season
- August – December Season
- March – September: West Australian Basketball League (WABL) representatives, 15 junior teams
- State Basketball League (SBL) March to September: 5 senior teams

KDBA reports the following changes in team numbers from 2013 – 2017 seasons.

KDBA BASKETBALL COMPETITION TEAMS

Category	2013	2017	Variance
SUB JUNIORS	24	47	23
JUNIORS	86	92	6
SENIORS	88	64	-24
Total	**198**	**203**	**5**

As can be seen from the table above, there has been a reduction in domestic competition senior teams over the period and an increase in junior teams. The KDBA also has representative teams in WABL and SBL competitions.

The basketball team numbers have not had capacity to increase in peak season due to virtually being at full capacity in 2013.

In this period of time, hours and expenses for satellite court training hours has approximately doubled which indicates increased pressure for teams wishing to train (which is consistent with there being more junior teams participating).

KDNA reports the following changes in team numbers from 2013 – 2017 seasons.

KDNA COMPETITION TEAM NUMBER COMPARISON

Competition	2013	2017	Variance
Tuesday RONA	64	84	20
Tuesday Spring	8	22	14
Friday KDNA	28	21	-7
Friday Spring	0	20	20
Saturday Spring	33	52	19
Saturday KDNA	158	188	30
Total	**291**	**387**	**96**

As can be seen from the table above the main season (winter competitions labelled as RONA, KDNA) growth in team numbers has been experienced in the 4 year period. This places demand on indoor courts and outdoor courts for training. Overall the KDNA has experienced growth from 291 teams to 387 in that period of time, a 33% growth.

Satellite Court Utilisation

Currently the KDBA report utilising the Hartfield Park Recreation Centre courts when they are available at suitable times (some availability at $48/hr after the centres local competition games are finished). They also utilise some school facilities and report spending approximately $15,230 on external court hire p.a.

Schools

The KDBA has identified schools with courts which receive use by clubs/teams for training some of which coordinated by KDBA. Many of these schools utilise Ray Owen Sports Centre for their indoor sports courts needs and teams from the schools participate in KDBA competitions. The KDBA has noted their availability and comment on standard of facilities below. It is interesting to note that many have increased their own school use and some have reduced availability in recent times further adding to shortage of courts in the region.

Secondary Schools

- Mazenod College – 1 indoor court (have 26 teams in KDBA). Need extra training courts.
- St Brigids College – **Indoor court converted to Performing Arts Centre**. 2 external courts 8-10 teams in comp season 1 only
- Lesmurdie High School – 1 indoor court (length is not to regulation) and used by school. Occasional external use after hours for under 14 and younger.
- Kalamunda High School – 1 indoor court - occasional external use in late afternoon. Not suitable for over 14's
- Carmel Adventist College – 1 large indoor court with rubber flooring used by Carmel teams to train. 6-8 teams
- Darling Range Sports College – good indoor air conditioned court avail for $64.00per hour. Used about 12 hours/week for WABL/SBL training (**maybe reduced availability as school embarks on basketball speciality program and increased demand for Ray Owen Sports Stadium as numbers increase)**

Primary Schools

- Kalamunda Christian School - 1 court indoor small and used by the 8 teams from the school. Have used in the past - **no longer available as they need it.**
- Walliston – outdoor courts for school use
- Falls Road – outdoor courts for school use
- Sanderson Road – substandard outdoor court fenced and locked. Part of Masterplan
- Kalamunda Primary – outdoor old courts school use only
- Marys Mount – two reasonable outdoor courts locked
- Gooseberry Hill – four reasonable outdoor courts school use only
- Maida Vale – outdoor school use only
- Wattle Grove –new courts school use by KDBA teams from the school.

Demand Not Accomodated

Both associations report being unable to accommodate all teams, groups and individuals that wish to utilise the Stadium. KDNA are now also hiring Maida Vale outdoor netball courts for 21.5 hours per week.

The KDNA Usage of Ray Owen Sports Centre Venue 2017 tables indicate that during the In-season period (April to November) a considerable amount of players have been unable to be accomodated - in the order of 600, discounting carnival/event demand. The season November to March is less affected with approximately 150 people affected;

Activities Turned Away (Number of Individuals)	**type**	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Combined**
Training	Juniors	80	80	80	80	80		50	450
Team Participation	Jnr/Snr	0	50	0	0	0	100		150
Event Hire Carnival	Jnr/Snr	0	0	0	0	0	500	500	1000
									0
	Totals Daily	**80**	**130**	**80**	**80**	**80**	**600**	**550**	**1,600**

(April to November)

Activities Turned Away (Number of Individuals)	**type**	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Combined**
Training	Juniors	0	0	0	0	0	0	100	100
Team Participation	Jnr/Snr	0	50	0	0	0	0	0	50
Event Hire Carnival	Jnr/Snr	0	0	0	0	0	0	0	0
									0
	Totals Daily	**0**	**50**	**0**	**0**	**0**	**0**	**100**	**150**

(November to March)

2013 Ray Owen Sports Centre Court Annual Utilisation Summary

Month	Week Ending	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
January	5/01/2013							
	12/01/2013							
	19/01/2013							
	26/01/2013							
February	2/02/2013							
	9/02/2013							
	16/02/2013							
	23/02/2013							
March	2/03/2013							
	9/03/2013							
	16/03/2013							
	23/03/2013							
	30/03/2013							
April	6/04/2013							
	13/04/2013							
	20/04/2013							
	27/04/2013							
May	4/05/2013							
	11/05/2013							
	18/05/2013							
	25/05/2013							
June	1/06/2013							
	8/06/2013							
	15/06/2013							
	22/06/2013							
	29/06/2013							
July	6/07/2013							
	13/07/2013							
	20/07/2013							
	27/07/2013							
August	3/08/2013							
	10/08/2013							
	17/08/2013							
	24/08/2013							
	31/08/2013							
September	7/09/2013							
	14/09/2013							
	21/09/2013							
	28/09/2013							
October	5/10/2013							
	12/10/2013							
	19/10/2013							
	26/10/2013							
November	2/11/2013							
	9/11/2013							
	16/11/2013							
	23/11/2013							
	30/11/2013							
December	7/12/2013							
	14/12/2013							
	21/12/2013							
	28/12/2013							

Peak Hour Usage

0-24%
25-49%
50-74%
75-95%
96%+

Peak Times

Mon to Fri 4pm - 10pm (36 court hours available per day: 6 courts @ 6 hours each)

Saturday 8am - 10pm (84 court hours available each Saturday: 6 courts @ 14 hours each)

Sunday 8am - 5pm (54 court hours available each Sunday: 6 courts @ 9 hours each)

2017 Ray Owen Sports Centre Annual Usage

Month	Week End	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Jan	8/01/2017							
	15/01/2017							
	22/01/2017							
	29/01/2017							
Feb	5/02/2017			Schools				
	12/02/2017			Schools				
	19/02/2017							
	26/02/2017			Schools				
Mar	5/03/2017				Schools			
	12/03/2017							
	19/03/2017							
	26/03/2017							
Apr	2/04/2017			Schools				
	9/04/2017		Carnival					
	16/04/2017							
	23/04/2017	Holidays	Holidays	Holidays	Holidays	Holidays		
	30/04/2017			Schools				
May	7/05/2017							
	14/05/2017		Carnival					
	21/05/2017		Carnival					
	29/05/2017		Carnival	Schools				
Jun	4/06/2017							
	11/06/2017							
	19/06/2017							
	26/06/2017			Schools				
July	2/07/2017				Carnival			
	9/07/2017							
	17/07/2017	Holidays	Holidays	Holidays	Holidays	Holidays		
	23/07/2017			Schools				
	30/07/2017							
Aug	6/08/2017							
	13/08/2017				Carnival			
	20/08/2017				Carnival			
	27/08/2017							
Sep	3/09/2017							
	10/09/2017			Carnival				
	17/09/2017			Carnival				
	24/09/2017			Schools				
Oct	1/10/2017							
	8/10/2017	Holidays	Holidays	Holidays	Holidays	Holidays		
	15/10/2017			Schools				
	22/10/2017			Schools				
	29/10/2017							
Nov	5/11/2017							
	12/11/2018							
	19/10/2017							
	26/10/2017							
Dec	3/12/2017							
	10/12/2017							
	17/10/2017							
	24/12/2017							
	31/12/2017							

4 ANALYSIS

Potential demand for facilities is subject to many variables including;

- External competition (other suitable facilities)
- Availability and proximity of other suitable facilities
- Standard of facilities expected
- Trends in sports
- Price points for participation
- Quality of coaching, referees, management

Factors supporting the development of a 4 court extension (as opposed to a 2 court extension) to Ray Owen Sports Centre include the following listed below. Where estimates and base information is available, basic calculations have been extrapolated to provide an indication on utilisation;

- Level of demand
    - Current level of teams/organisations wanting to utilise the courts but can't for training purposes (actual approaches to the stadium management)
        - KDNA estimate 600 people per week in peak season are being turned away (not including carnivals). Estimating how many court hours this may add up to, the assumption that there are 8 persons average per team, equates to 75 teams. 75 teams playing against each other equates to 37 games of approximately 1 hour duration (or 2 teams training for 1 hour sharing a court). This equals 37 hours per week of utilisation in peak season. This is equivalent of all 4 new courts being fully utilised Monday to Friday (4-10pm) and almost fully utilised Sunday (8am-3pm) for 6 months.

          The other 6 months of the year the utilisation is calculated at 25% of this demand based on 150 persons being turned away (as opposed to 600 in-season).
        - KDNA estimate Carnival event hire is also regularly turned away due to lack of court availability on week-ends in season.
        - KDBA basketball teams that currently cant gain access to indoor courts for training purposes.

          A demand for training comparison can be made with the majority of sports that run club competition. They have teams that train at least 1 time per week on the facility that they play their competition on (e.g. AFL, Soccer, Rugby, Bowls, Tennis etc.). It is estimated that there are currently in the order of 30 junior teams (out of 86) and at least 10 senior teams participating in KDBA competitions that have expressed desire to train but can not access indoor courts for that training. This training demand equates to 20 hours of court time demand based on the following assumptions;
            - 30 junior and 10 senior current teams training 1 hour per week
            - Each team could conservatively train on a half court if required
        - "Organic" demand from increased population within the City and the rapidly growing surrounding areas. Whilst this growth is gradual in nature, the 20 year scenario presents the following;
            - 16,838 new people by 2036
            - City of Kalamunda basketball participation rate of 1.9% (Identified 2014 Ray Owen Master Plan) equates to 319 new players. This will result in 45 new teams (7 players per team) which is 22 games or approximate 22 hours of court use per week.

Assuming 30% of teams wished to train weekly (on half court) this would also add another 7.5 hours demand for training court time.

- City of Kalamunda netball participation rate of 2.7% (Identified 2014 Ray Owen Master Plan) =454 new players. This equates to 56 new teams (8 players per team) which is 28 games or approximate 28 hours of court use per week (not including training times for 56 new teams).

- Increased teams participating in competitions
  - Currently the KDBA has 8 teams on byes each week that could be playing regularly with increased capacity.(increased utilisation would equate to increased capacity allowing extra teams to play and competitions being of an even number of teams)
  - New teams / individuals wishing to join competitions that cannot be accommodated. (this statistic has not been kept)
  - Basketball WA advise that there is potential for new age groups to be offered in WABL competitions (ie current age groups 12,14,16 with potential for 12,13,14,15 etc. which would provide increased demand on courts with more representative teams and training needs.
  - Basketball WA advise there is possibility of a “Metro league” being developed that is a representative team competition expansion catering for extended pathway development as it would sit under current WABL standard. This would further create demand for competition and training court utilisation per week.
  - Netball WA expect that increased demand for their Fast 5 competition will continue to expand in coming years.

- Current utilisation of external courts that would be transferred to expanded facility
  - The KDBA report spending approximately $15,230 on external court hire for training. (Divided by an average court hire rate of $60 per hour this equates to approximately 254 hours of utilisation that could be transferred to the expanded venue. This equates to 5.3 hours use per week over a year.
  - Current team utilisation of substandard outdoor courts for training (such as many of the poor quality courts at schools) – majority have preference to train in facility where games are played. (this figure is unknown)
  - The KDNA report hiring the Maida Vale netball courts for 21.5 hours a week ($8 per court, per hour) to enable clubs wishing to train at Ray Owen Reserve netball / basketball courts some training access. This training is required during the season and equates to expenditure for teams and the Association of $172 per week x a 15 week season = $2,580.
  - With a proposed expansion accommodated on 4 existing outdoor netball courts, current netball utilisation of those 4 outdoor courts would be transferred directly into the indoor courts (when other available outdoor courts are unable to be utilised). This means that some of the hours of availability of new courts would automatically be taken up by the existing netball utilisation. In this scenario there is a need to transfer the existing lighting of 4 outdoor courts to the next 4 outdoor courts to enable continued night time training to occur (otherwise there is a loss of capacity for netball as these 4 outdoor courts are currently heavily and exclusively utilised by netball).

- Potential users of facilities if court availability was increased and communicated
  - Basketball, Netball and other sports such as Indoor Soccer and potentially Indoor Hockey, games and training.
  - Basketball and Netball new competitions / grades could be introduced by the associations providing increased opportunities (including specific programs such as the Westrise inclusive program and competitions for inclusive intergenerational, multi-cultural groups).
  - 10 courts would provide increased ability to hold large carnivals and competitions which it currently cannot accommodate (i.e. under age state and national carnivals, specialist groups carnivals etc.)

- KDBA and KDNA ability to financially sustain capital expenditure contribution.
  - Whilst it is beyond the scope of this review, the associations have been clear in their self-assessment of revenue generation from a 2 court extension not being sufficient to support a business model whereby they service a sizeable loan for capital contribution.
  - Further investigation on the potential funding model for a redeveloped facility would need to be undertaken as part of a Ray Owen Sports Centre extension feasibility study.

5 COURT EXTENSION COST ESTIMATES

Neil Butler Cost Estimator was engaged to undertake a "refresh" of court expansion estimates presented in 2014 as part of the Ray Owen Master Plan.

The cost estimates are based on the facility needs identified within the original 4 court option concept plan. Therefore the estimates are considered to be high level magnitude of costs and would be further refined once a detailed design process was entered into.

During discussions with the KDBA and KDNA an improved 4 court option design to that proposed in 2014 was adopted as the basis for new cost estimates. The new design provides the following key advantages over previous concept;

- Improved access and linkage to the outdoor netball courts via an internal ramp between the proposed new indoor courts. The new courts would be connected to existing building via internal ramping (Note that detailed design will confirm ramping levels meet standards).
- Reduced requirement for fill based on a lower level for the new courts (previously an average of 3m of fill to a new requirement of an average 1 m).

Other changes to the proposed building from the previous 2014 cost estimates include;

- Courts building is not a shed style structure, it is now a more traditional stadium building with solid masonry walls to 2.4m height and steel framed walls above.
- Changeroom / WC requirements have been kept the same as the 2014 report at a 115m2 area. It is possible that this area may have alternative solutions such as potential reconfiguration of existing Changeroom / WC areas to accommodate specific building code needs for the increased building and accommodation numbers. (The detailed design stage of facility redevelopment will qualify this need and find suitable solutions).
- Reduction of storage area from 100m2 to 50m2. This is based on the previous estimates allocation being based on 4 user groups (including football and cricket).

It is interesting to note that the AIQS Construction Cost Index Forecast (CCIF) indicates a drop in building costs between May 2014 and April 2018.

The following table is the summary of cost estimates for both a 4 court and 2 court extension. The full Cost Estimates document can be seen as Appendix 1 to this report.

SUMMARY

Item	Description of Works	Option 1 - 4 Court Stadium	Option 2 - 2 Court Stadium
1.1	BMX Club		
	BMX Club Building	$ -	$ -
1.2	New Indoor Courts		
	Option 1 - 4 Court Basketball & Netball Stadium (approx 83m x 38m)	$ 4,250,702	
	Option 2 - 2 Court Basketball & Netball Stadium (approx 44m x 38m)		$ 2,477,921
1.3	Administration, Amenities and Storage	$ 826,625	$ 826,625
1.4	Sportsmen's Club Extension	$ -	$ -
1.5	Upgrade External Entrance Area to Stadium	$ 95,000	$ 95,000
1.6	Relocate Playground	$ -	$ -
1.7	Lesmurdie Primary (LPS) Outdoor Courts	$ -	$ -
1.8	New Turf Area	$ -	$ -
1.9	Parking, Driveways, Surrounding Roads	$ -	$ -
1.10	Lighting Upgrades	$ -	$ -
1.11	Power and Water Supply Upgrades	$ -	$ -
1.12	Pathways	$ -	$ -
1.13	Existing Stadium	$ -	$ -
1.14	Enhanced Bushland Protection from BMX Track Runoff	$ -	$ -
	TOTAL CONSTRUCTION COSTS	**$ 5,172,327**	**$ 3,399,546**
2.0	CONTINGENCIES		
	Design contingencies - 10%	$ 517,233	$ 339,955
	Contract contingencies - 5%	$ 284,478	$ 186,975
3.0	HEADWORKS	$ -	$ -
4.0	PROFESSIONAL FEES - 12%	$ 716,885	$ 471,177
5.0	PUBLIC ART - 1%	$ 59,740	$ 39,265
6.0	ESD ALLOWANCES	$ -	$ -
7.0	ESCALATION	$ (135,013)	$ (88,738)
	TOTAL ESTIMATED COMMITMENT	**$ 6,615,649**	**$ 4,348,179**
	Goods & Services Tax (10%)	$ 661,565	$ 434,818
	TOTAL ESTIMATED COMMITMENT (Including GST)	**$ 7,277,214**	**$ 4,782,997**

6 RECOMMENDATION

Since the original 2014/15 Ray Owen Reserve Master Plan there continues to be a need for the extension of the Ray Owen Sports Centre Courts to accommodate the growing demands of the key user groups and surrounding Kalamunda community.

A decision to build a 2 or 4 court extension to the Ray Owen Sports Centre to accommodate that need and allow for increased community indoor sports capacity requires a 4 court solution.

The analysis of available data within the scope of this report identifies factors that indicate considerable demand for additional indoor courts at Ray Owen Sports Centre;

- Extremely high utilisation of existing facilities
- Existing association utilisation of satellite facilities
- Estimates of people turned away from using the Ray Owen Sports Centre court facilities
- Potential programming opportunties for existing sports
- Trends in existing sports and potential demand growth from Futsal indoor soccer amongst other sports
- Organic growth in the relevant sports participation from population growth

It is recommended that the City of Kalamunda undertake a feasibility study, concept design and cost estimates for a 4 court extension to the Ray Owen Sports Centre.

7 APPENDICES

Appendix 1 - Ray Owen Sports Centre Cost Estimates 2018 Update

(Separate electronic attachment)