PROPOSED LOCAL STRUCTURE PLAN

LOT 18 (NO. 53-61) JAMES STREET AND LOT 137 (NO. 14) SCOTT STREET, GUILDFORD

Project No. 357 **December 2016**

This structure plan is prepared under the provisions of the City of Swan Local Planning Scheme No. 17 District Zoning Scheme.

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

21 March 2017 Date

Signed for and on behalf of the Western Australian Planning Commission:

.....

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

..... Witness

21 March 2017 Date

21 March 2027 Date of Expiry

TABLE OF AMENDMENTS

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

TABLE OF DENSITY PLANS

Density Plan No	Area of density plan application	Date endorsed by WAPC

EXECUTIVE SUMMARY

This Local Structure Plan (LSP) applies to lot 18 (No. 53-61) James Street and lot 137 (No. 14) Scott Street, Guildford. The LSP has been prepared for 8,323sqm of land based on a detailed analysis of the relevant town planning, water management, acoustic, geotechnical, civil engineering as well as design development considerations.

The purpose of the LSP is to provide a framework for future development which is cognisant of site specific constraints (in particular acoustic implications arising from aircraft noise generated from Perth Airport), whilst responding to the site opportunities as well as the strategic vision for the locality as contained under the various State and Local level planning policies.

The proposed LSP presents an opportunity to capitalise on urban infill redevelopment within the Guildford locality which will assist in meeting the forecast housing needs of the City of Swan and the wider North-east sub-region. Whilst promoting urban infill, the LSP seeks to establish residential development which is consistent with the existing housing typology surrounding the subject site in order to maintain and promote the character and amenity of the Guildford locality.

An Indicative Development Plan prepared in association with various supplementary reports as part of the LSP further examines specific acoustic measures as well as servicing and built form considerations which are critical in delivering not only a functional development but also one that meets the principles of character, sense of place, building form and articulation, crime prevention through environmental design, vehicle and pedestrian movement.

Indicative design of the land indicates a yield of 15 single / grouped dwellings. The proposed Residential Density is R20.

Item	Data		Structure Plan Ref (section no.)
Total area covered by the structure plan	8,323sqm		1.0
Area of each land use proposed • Residential	Square metres	Lot yield	
Total estimated lot yield	15		5.0
Estimated number of dwellings	15		5.2
Estimated residential site density	20 dwellings per hectare		5.2
Estimated population	32		5.2
Number of high schools	n/a		n/a
Number of primary schools	n/a		n/a
Estimated area and percentage of public open space given over to: • Regional Open Space • District open space • Neighbourhood parks	 n/a n/a n/a		 n/a n/a n/a

Item	Data	Structure Plan Ref (section no.)
• Local parks	n/a	n/a
Estimated percentage of natural area	n/a	n/a
*Based on Australian Bureau of Statistics (2011) data for Midland-Guildford relating to average household size of 2.1		

Summary Table of Key Statistics & Planning Outcomes

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PART ONE – STATUTORY SECTION

1.0 Local Structure Plan Area

This LSP, also referred to as the James Street Local Structure Plan, shall apply to the subject site being the land contained within the inner edge of the line denoting the LSP boundary as illustrated on the Local Structure Plan Map (Plan 1).

2.0 Local Structure Plan Content

This LSP comprises:

a) Part One – Statutory Section
This section contains the LSP map and statutory planning provisions and requirements.

b) Part Two – Non-statutory (explanatory) Section
This section is to be used as a reference guide to interpret and justify the implementation of Part One.

c) Appendices – Technical reports, supporting plans and maps.

3.0 Interpretation and Scheme Relationship

Unless otherwise specified in this part, the words and expressions used in this LSP shall have the respective meanings given to them in the City of Swan Local Planning Scheme No. 17 (LPS No.17) and/or Schedule 2 Part 1 of the *Planning and Development (Local Planning Schemes) Regulations 2015* (P&D Regs 2015) including any amendments gazetted thereto.

The LSP map is required to be prepared prior to subdivision and/or development of the subject site pursuant to clause 4.2.14 – Residential Development Zone of LPS No. 17. The Plans, Tables and Figures contained in Part One of this LSP outline the framework for future subdivision and/or development applicable within the LSP map area.

Pursuant to Schedule 2 Part 4 of the P &D Regs 2015:

a) 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;

b) Part Two of this LSP and all appendices are to be used as a reference only to clarify and guide interpretation and implementation of Part One.

4.0 Operation

This LSP shall come into operation when it is endorsed by the Western Australian Planning Commission (WAPC).

5.0 Land Use and Subdivision Requirements

5.1 Land Use Permissibility

The LSP map outlines land use and zones applicable within the LSP area. The zones and reserves designated under this LSP apply to the land within it as if the zones and reserves were incorporated into LPS No. 17.

Land use permissibility within the LSP area shall be in accordance with the Residential zone under LPS No. 17.

5.2 Residential

5.2.1 Dwelling Target

Objective: To provide for 'single / grouped dwelling' residential development at a density of R20 within the LSP area. A minimum 15 dwelling target is envisaged for the site.

5.2.2 Density

The LSP map (Plan 1) defines the residential density that applies throughout the LSP / subject site.

5.3 Public Open Space

The LSP does not include any area of public open space. Cash-in-lieu equivalent will be required at subdivision stage.

5.4 Acoustic Specifications

5.4.1 Australian Standard AS2021:2015

All residential development is required to comply with Australian Standard AS2021:2015 (as amended).

5.4.1 Notification on Title

At the subdivision stage, notifications will be placed on titles advising prospective purchasers that the lot(s) are in proximity to Perth Airport and are affected by aircraft noise.

6.0 Development Requirements

6.1 Local Development Plan

A Local Development Plan may be prepared if:

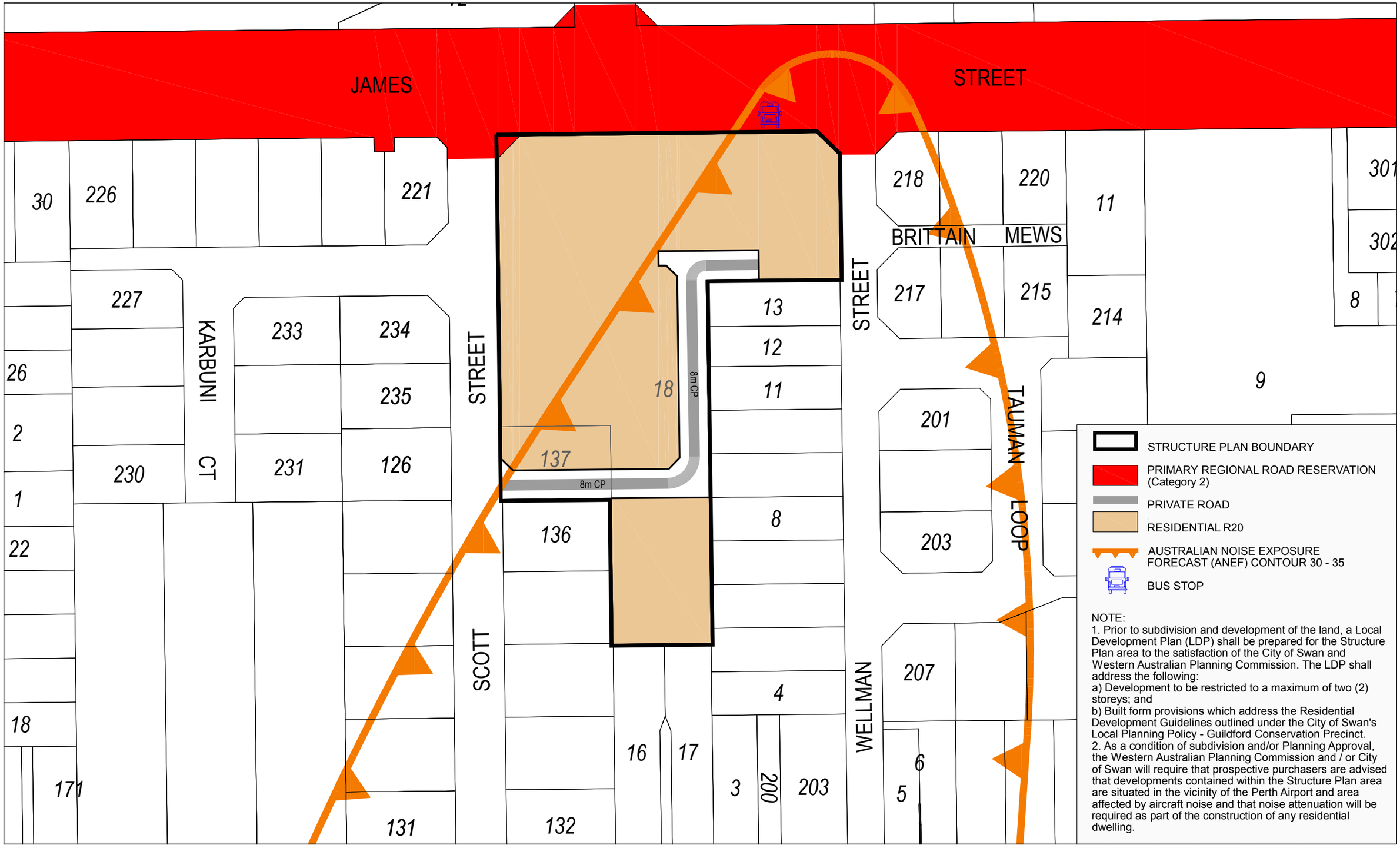
a) The WAPC has identified the preparation of a local development plan as a condition of approval of a plan of subdivision of the area; or
b) A structure plan requires a local development plan to be prepared for the area; or
c) An activity centre plan requires a local development plan to be prepared for the area; or
d) The WAPC and the local government considers that a local development plan is required for the purposes of orderly and proper planning.

A Local Development Plan means a plan setting out specific and detailed guidance for a future development including one or more of the following:

a) *Site and development standards that are to apply to the development; and,*
b) *Specifying exemptions from the requirement to obtain development approval for development in the area to which the plan relates.*

The endorsement of a Local Development Plan for the LSP area will follow pending determination of the LSP. The Local Development Plan will guide the future development of the site and will address the following:

a) Development to be restricted to a maximum of two (2) storeys; and
b) Built form provisions which address the *Residential Development Guidelines* outlined under the City of Swan's *Local Planning Policy – Guildford Conservation Precinct.*



NOTE:
1. Prior to subdivision and development of the land, a Local Development Plan (LDP) shall be prepared for the Structure Plan area to the satisfaction of the City of Swan and Western Australian Planning Commission. The LDP shall address the following:
a) Development to be restricted to a maximum of two (2) storeys; and
b) Built form provisions which address the Residential Development Guidelines outlined under the City of Swan's Local Planning Policy - Guildford Conservation Precinct.
2. As a condition of subdivision and/or Planning Approval, the Western Australian Planning Commission and / or City of Swan will require that prospective purchasers are advised that developments contained within the Structure Plan area are situated in the vicinity of the Perth Airport and area affected by aircraft noise and that noise attenuation will be required as part of the construction of any residential dwelling.

LOCAL STRUCTURE PLAN

LOTS 18 JAMES STREET AND LOT 137 SCOTT STREET
GUILDFORD

Urban Development Institute of Australia WESTERN AUSTRALIA

PIA Planning Institute Australia

CPP CERTIFIED PRACTISING PLANNER

SCALE: 1:1000 @ A3

DATE: 27th FEBRUARY 2017

FILE: 357_27.02.2017.dwg

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PART TWO – EXPLANATORY SECTION

1.0 Planning Background

1.1 Introduction and Purpose

The key objectives of the LSP are as follows:

- To provide a statutory framework to guide the use, subdivision and development of land to create a high quality urban environment.
- To achieve an optimum housing density with an emphasis on achieving consistency with the existing housing typology within the locality.
- Maximise the quality of living of the future residents by facilitating a housing type and density that allows for the creation of dwellings which meet prescribed standards associated with aircraft noise and indoor design noise insulation provisions of AS2021:2015.
- Capitalise on the natural amenity of the area afforded through the established 'Parks and Recreation' and Local Open Space reservations which are located in close proximity to the subject site.

1.2 Land Description

1.2.1 Location

The subject site is located within the suburb of Guildford, within the municipality of the City of Swan.

The subject site is located approximately 13.0 kilometres north-east of the Perth City Centre and less than 3.0 kilometres from the Midland Town Centre which provides a range of services including retail, administrative, service, community and entertainment uses. The subject site has direct frontage onto James Street which runs in an east-west direction linking Guildford Road to the west and intersecting with Great Eastern Highway to the east. The Midland train line operates parallel to James Street in the immediate vicinity of the subject site with the nearest train station being East Guildford Station located approximately 500m north-east of the subject site.

Figure 1 and 2 below illustrates the subject site's location.

Figure 1 – Metropolitan Context (Source: Nearmaps.com)

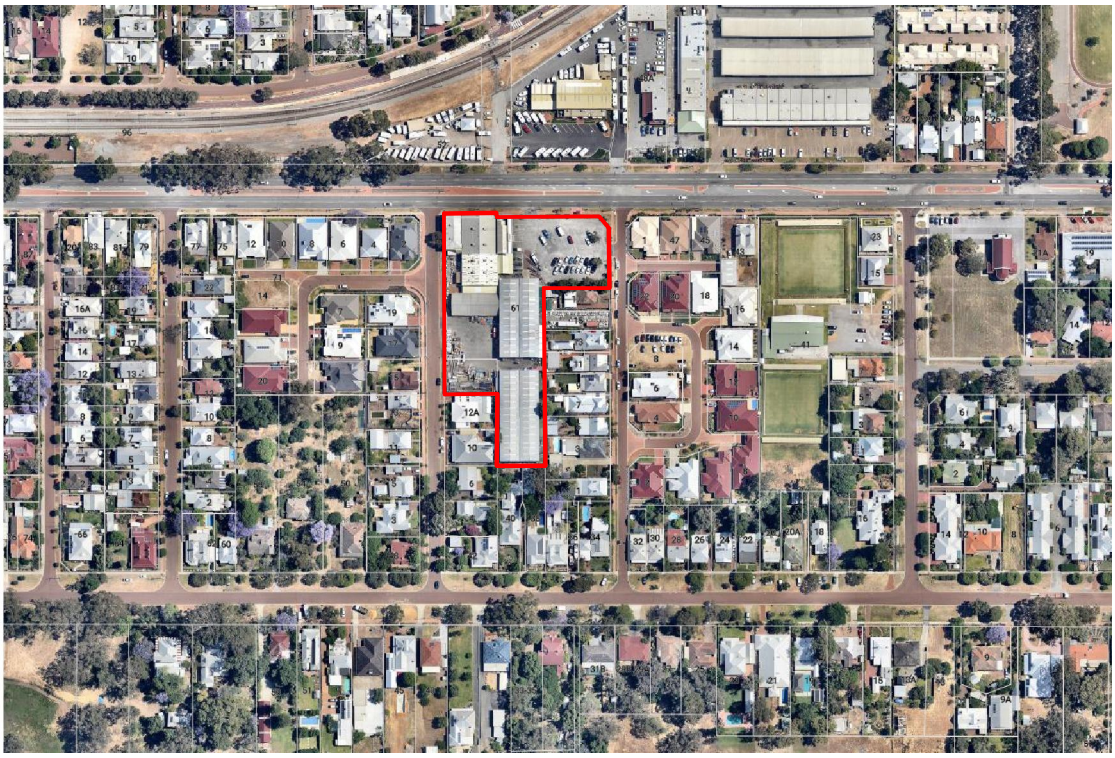


Figure 2 – Local Context (Source: Nearmaps.com)

1.2.2 Area and Land Use

The subject site encompasses a total land area of 8,323sqm comprising 2 separate allotments. The lots are identifiable by its frontage to James Street with Scott Street to the west and Wellman Street to the east framing the respective boundaries. The southern portion of the subject site extends in an irregular manner to abutting residential land uses which are situated to the east and west.

Lot 137 Scott Street and Lot 18 James Street currently operates as a hardware store, commercially identified as Ross's Mitre10 Solutions. The land contains a number of large industrial - warehouse units with an ancillary office, parking and storage areas.

The surrounding locality is characterised by residential developments which make up the bulk of land uses south of James Street. North of James Street immediately opposite the subject site are a range of service commercial and light industrial uses amongst residential uses which otherwise form the bulk of land uses to the north.

1.2.3 Legal Description and Land Ownership

The subject site has a total area of approximately 8,323sqm. The lots forming the LSP area and the respective ownership details and outlined in the Table 2 below.

Lot	No.	Vol / Folio	Land Ownership	Lot Area
137	14	1303 / 22	I.P.E. Packaging Pty Ltd of 11 Kennedy Street, Maylands	607sqm
18	53-61	1623 / 275	I.P.E. Packaging Pty Ltd of 11 Kennedy Street, Maylands	7716sqm

Table 1 – Certificate of Title and Ownership details

1.3 Planning Framework

1.3.1 Metropolitan Region Scheme

The subject site is predominately zoned 'Urban' under the Metropolitan Region Scheme (MRS) with a small north-western portion of Lot 18 affected by the James Street 'Primary Regional Roads' reservation. Figure 3 illustrates the subject site's MRS zoning and reservation.

Figure 3 – Metropolitan Region Scheme Zoning and Reservation

1.3.2 City of Swan Local Planning Scheme No. 17

Under the provisions of the City of Swan Local Planning Scheme No. 17 (LPS No. 17) the subject site is zoned 'Residential Development'. Figure 4 illustrates the subject site's zoning.

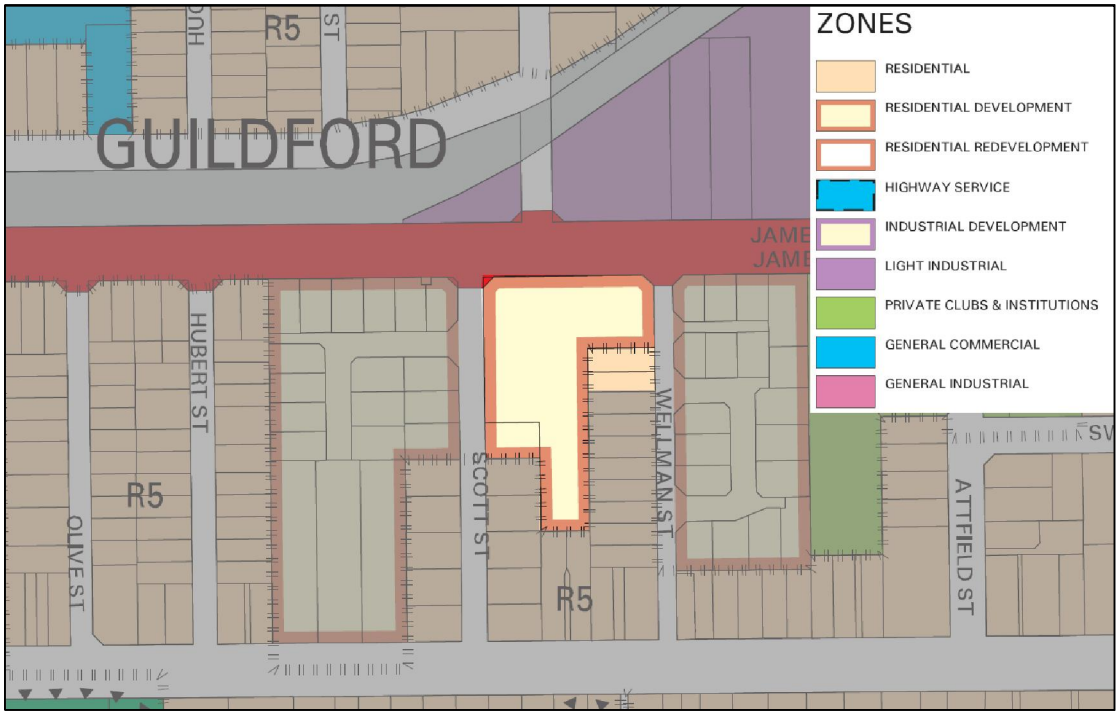


Figure 4 – City of Swan LPS No. 17 Zoning

The objective of these two Zones are as follows:

> *The objectives of the Residential Development Zone are to –*
>
> *a) provide for the coordinated development of future residential areas through the application of a comprehensive plan to guide subdivision and development to be known as a "Structure Plan";*
>
> *b) provide for predominantly residential development, but including also a range of compatible services, consistent with the needs of an integrated neighbourhood, and planned so as to minimise adverse impacts on amenity;*
>
> *c) avoid the development of land for any purposes or at a time when it is likely to compromise development elsewhere in the district or prejudice the future development of land in the Residential Development zone for more appropriate purposes;*
>
> *d) take account of the need to protect the amenity and on-going use of adjacent property owners as well as to provide for the needs of future residents.*

The purpose of this LSP stems from the 'Residential Development' zoning necessitating the submission of a Structure Plan to guide subdivision and development of the subject site

The eastern portion of the subject site is affected by an Australian Noise Exposure Forecast (ANEF) contour range of 30-35 ANEF with the remainder of the subject site subject to a 25-30 ANEF rating. Clause 6.2 of LPS No. 17 requires planning approval for any development considered either 'conditionally acceptable' or 'unacceptable' with respect to the relevant

noise exposure zone as identified within Statement of Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport.

The LSP's compliance with the objectives of LPS No. 17 as well as implications of the ANEF rating are addressed in the succeeding sections.

1.3.3 Regional and Sub-Regional Structure Plan

1.3.3.1 State Planning Strategy 2050

The State Planning Strategy 2050 was prepared by the WAPC and provides a strategic planning response to the challenges that Western Australia is likely to face. It contemplates a future in which high standards of living, improved public health and an excellent quality of life are enjoyed by present and future generations of Western Australians.

The Strategy proposes that diversity, liveability, connectedness and collaboration must be central to the vision of sustained growth and prosperity. It envisages that by 2050, Western Australia will double its current population and will have a diverse range of well-connected and vibrant communities of the highest quality in the world.

The LSP will allow for the future development of under-utilised land for residential purposes which is consistent with the existing housing typology within the surrounding locality. The proposal will also contribute towards the goal to double the State's current population within an area that is highly accessible, well-connected and rich with history and culture dating back to early settlement of the Perth region.

1.3.3.2 Directions 2031 and Beyond – A Spatial Framework for Perth and Peel

Directions 2031 provides the overarching strategic framework for the Perth and Peel Regions. The subject site is within the 'North-east sub-region', which is identified as requiring an additional 258,000 dwellings by 2031, representing a 37% increase on current population levels.

Directions 2031 indicates that there is a need to introduce greater diversity in the new housing market to accommodate families. It seeks a 50% increase in the current average residential density of 10 dwellings per gross urban zoned hectare to 15 dwellings per gross urban hectare of land.

The LSP proposes a density of R20 dwellings per hectare, which will contribute to meeting the forecast housing needs of the City of Swan and wider North-east sub-region.

1.3.3.3 Draft Perth and Peel @ 3.5 Million (2015)

The Draft Perth and Peel @ 3.5 Million brings together the vision encapsulated in Directions 2031 and the State Planning Strategy 2050 into a series of draft planning frameworks, responding to those deepening and emerging challenges, with a unified, long-term growth strategy for land use and infrastructure for the Perth and Peel regions.

The draft frameworks provide guidance on where sustainable development should occur over the next 35 to 40 years to ensure the impact of urban growth on areas of environmental significance is minimised; to protect our heritage; and importantly, to maximise the benefits of available land and existing infrastructure. The draft frameworks identifies that the sprawling nature of Perth through greenfield development, predominantly along the coastline has brought with it a range of complex and interrelated challenges, these including:

- accommodating significant population growth;
- improving current density infill and managing further greenfield development;
- achieving a connected city growth pattern;
- increasing housing diversity and affordability;
- reducing car dependence;
- achieving efficient use of water sources in a drying climate;
- ensuring the regions' environmental assets are protected; and,
- maintaining liveability.

The LSP is situated within the 'North-east Sub-region' (refer Figure 5) which is one of three sub-regions identified which combine with the draft central sub-regional planning framework. The draft framework clearly identifies a focus on urban infill within areas with proximity to high-quality public transport routes or within activity centres and urban corridors. Specifically an infill development target of 47% by 2050 is identified relative to 2014 rates which reached only 28%.

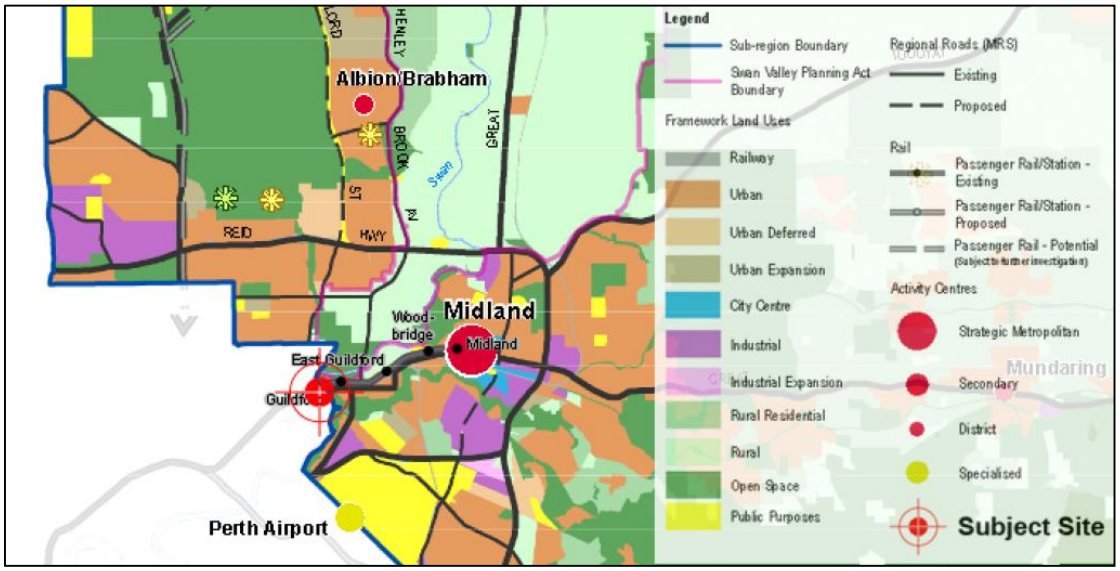


Figure 5 – Extract of Draft Perth and Peel @ 3.5 Million (North-east Sub-regional framework plan)

Based on the urban areas identified in Figure 5, the capacity for additional dwellings and population amounts to approximately 37% in established urban areas as infill development, notably short of the 47% target. The LSP proposes a density of R20 dwellings per hectare, which will contribute to meeting the forecast housing needs of the City of Swan and wider North-east sub-region.

1.3.3.4 Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy (WAPC 2010)

The draft Outer Metropolitan Perth and Peel Sub-regional Strategy forms an integral part of the Directions 2031 vision. It provides information about the levels of expected population growth by local government area and highlights development opportunities and increased densities in greenfield areas throughout the five outer sub-regions of north-west, north-east, south-east and south-west metropolitan Perth and Peel.

The Strategy outlines the North-east sub-region to be anchored by the strategic metropolitan centre that is Midland. The subject site is situated less than 3.0km south-west of the Midland Centre – refer Figure 6.

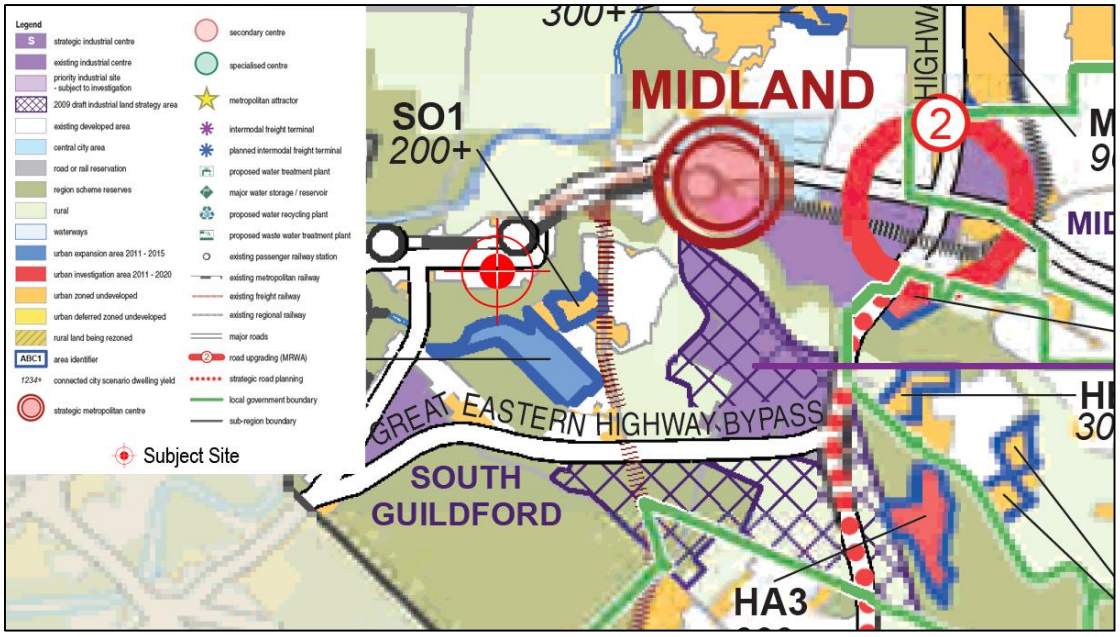


Figure 6 – Extract of Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy

Based on identified infill opportunities, existing urban and urban deferred zoned land and urban expansion and investigation areas, the estimated dwelling supply for the north-east region is expected to range from approximately 43,000 dwellings under the 'business as usual scenario' to approximately 55,000 dwellings under the 'connected city scenario'.

The proposed LSP is intended to facilitate infill residential. Residential development is proposed at a density of R20 which is may facilitate both single house and grouped dwelling forms. The total residential yield is anticipated to be approximately 15 dwellings which will assist in satisfying the dwelling targets prescribed by the Draft Outer Metropolitan Perth and Peel Sub-regional Strategy.

1.3.4 State Government Planning Strategies and Policies

1.3.4.1 Liveable Neighbourhoods

Liveable Neighbourhoods is the State Government's key policy for the design and assessment of structure plans (i.e. LSP). The policy sets out a number of objectives and principle aims to ensure the design and layout of new developments:-

- *Facilitate ease of access, in particular walking and cycling through a network of connected streets that are safe, efficient and pleasant;*
- *Foster a sense of community, place and local identity;*
- *Support an efficient public transport system;*
- *To ensure active street-land use interfaces with building frontages to streets to improve personal safety through increased surveillance and activity;*
- *Conserve and incorporate key environmental areas into designs;*
- *Integrate the design of stormwater management systems; and,*
- *Maximise the use of land for housing.*

The implementation of these elements is fundamental to ensuring structure planning and resultant subdivisions occur in a well-considered and sustainable manner. Application of the Liveable Neighbourhoods principles is therefore relevant to all levels of planning for the site from the proposed LSP through to detailed lot and building design.

Liveable Neighbourhoods specifically seeks densities in new urban areas to be at least 15 dwellings per urban hectare with an average of 22 dwellings per site hectare.

The proposed LSP meets the principle aims of Liveable Neighbourhoods with a particular focus on the following outcomes:

- Maximise a key redevelopment opportunity for residential development which will contribute to meeting the forecast housing needs of the City of Swan and wider North-east sub-region.
- Maintaining and continuing the established built form within the surrounding locality in order to recognise and strengthen community, place and local identity.
- Provide opportunity for additional residential development along an existing pedestrian, cycling and public transport corridor which reduces car dependence.
- Promotes active street-land use interfaces, with building frontages to streets as well as legible and pleasant internal private street networks which improves personal safety.
- Emphasis on supporting sustainable urban development through land efficiency across all elements.

1.3.4.2 Statement of Planning Policy 1 – State Planning Framework Policy (2006)

Statement of Planning Policy 1: State Planning Framework sets out the key principles relating to environment, community, economy, infrastructure and regional development which should guide the way in which future planning decisions are made. It brings together existing State and regional policies and plans which apply to land use and development in Western Australia into a State Planning Framework. It also restates and expands upon the key principles of the State Planning Strategy in planning for sustainable land use and development.

The proposed LSP is consistent with the Policy framework's five (5) key principles which define good decision-making in land use planning and development as detailed below:-

> ***Environment*** – the LSP will deliver a coherent infill redevelopment plan for the locality which will result in delivering a high quality of life for future occupiers which is based on environmentally sustainable principles.

Community – the LSP will assist in delivering a vibrant, safe and community which is cohesive with the surrounding established Guildford locality.

Economy – The LSP will increase the economic foundation for existing businesses within the locality through an increased population base. Furthermore, the LSP will create short term employment opportunities during future planning and construction phases of the site.

Infrastructure – The LSP will promote the better use of existing transport and public utilities such as public bus and rail which in turn improves service delivery to these infrastructure networks to the benefit of the wider community.

Regional Development – The LSP represents orderly and proper planning for the north-east sub-region with respect to its population demands identified in supporting State level planning documents.

1.3.4.3 Statement of Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport (2015)

Statement of Planning Policy No.5.1: Land Use Planning in the Vicinity of Perth Airport (SPP5.1) applies to land within the vicinity of Perth Airport which may be affected by aircraft noise. The objectives of SPP5.1 is to protect Perth Airport from unreasonable encroachment by incompatible (noise-sensitive) development so as to provide for its ongoing development and operation and, minimise the impact of airport operations on existing and future communities with reference to aircraft noise. The system of aircraft noise measurement used in Australia for the purposes of evaluating land use compatibility is known as the Australian Noise Exposure Forecast (ANEF) system.

The subject site is affected by a 20-25 and 25-30 ANEF contour rating as illustrated on the LSP. SPP5.1 imposes various restrictions on zoning or development within the various ANEF contours as illustrated in Table 3 below.

Building type	Forecast noise exposure level (ANEF)			
	less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	25 to 30 ANEF	30 to 35 ANEF
House, home unit, flat, caravan park	Acceptable	Conditionally Acceptable	Unacceptable (Note 4) (Note 5)	Unacceptable (Note 4) (Note 5)
School, university	Acceptable	Conditionally Acceptable	Unacceptable (Note 4) (Note 5)	Unacceptable (Note 4) (Note 5)
Hospital, nursing home	Acceptable	Conditionally Acceptable	Unacceptable (Note 4) (Note 5)	Unacceptable (Note 4) (Note 5)
Hotel, motel, hostel	Acceptable	Acceptable	Conditionally Acceptable	Unacceptable (Note 4) (Note 5)
Public building	Acceptable	Conditionally Acceptable	Conditionally Acceptable	Unacceptable (Note 4) (Note 5)
Commercial building	Acceptable	Acceptable	Conditionally Acceptable	Conditionally Acceptable
Light Industrial	Acceptable	Acceptable	Acceptable	Conditionally Acceptable
Other industrial	Acceptable	Acceptable	Acceptable	Acceptable

Table 2 – Extract of SPP 5.1: Building Site Acceptability Table

Generally, the density of developments should be kept to a minimum under the provisions of SPP5.1 however, possible exceptions are where-

- *A higher density is necessary to facilitate redevelopment or infill development of an existing residential area;*
- *There is a strategic need for more consolidated development;*
- *There is some other public interest reason which justifies the need for higher density coding, and*
- *A higher density would facilitate the concurrent provision of noise insulation in accordance with the indoor design sound levels prescribed in AS 2021.*

The proposed LSP further justifies the proposed density development in this particular instance with regard to the objectives of SPP5.1.

1.3.4.5 Planning Bulletin 79: Designing Out Crime Planning Guidelines (2006)

Crime Prevention Through Environmental Design (CPTED) principles are based on the idea that people's behaviour within the built environment is influenced by the design of that place and that good design can reduce opportunities for antisocial behaviour. The WAPC's 'Designing Out Crime Planning Guidelines' is the quintessential guideline which govern CPTED design for built form and neighbourhood design.

The LSP and Indicative Development Plan which forms part of this LSP report outlines how CPTED principles can be applied.

1.3.5 Local Government Planning Strategies and Policies

1.3.5.1 Urban Housing Strategy – The Greenfields Strategy (2012)

The Urban Housing Strategy was prepared to address future housing needs resulting from rapid population growth with an aim to ensure the long term sustainable future of residential development within the City of Swan. The Strategy has been developed in response to the State Government's Directions 2031 and Beyond report which outlines a potential doubling of the City's population by 2031 with an additional 35,510 dwellings.

Whilst the forecast can be accommodated in the City's expanding urban growth areas, increasing the opportunities for infill development within established areas will provide much-needed housing options for residents who prefer to live in the established areas.

Features of the Infill Strategy include:

- *Increased residential densities surrounding activity centres and locations with good access to public transport, schools, shops and centres of employment.*
- *Facilitating the creation of walkable communities adjacent to transport nodes that will reduce the demand for car based travel, encourage the use of alternative transport modes and provide opportunities for increased social interaction.*
- *Consideration of the community's desire to "age in place" through the provision of increased housing opportunities for older people who wish to remain in their communities.*

- *Encouragement of site assembly to achieve maximum development potential and better built form outcomes.*
- *Design criteria that promote Liveable Neighbourhoods, Transit Oriented Development and designing out crime principles.*
- *Methodology for conversion of Pedestrian Access Ways to trafficable roads, cul-de-sacs or public open spaces.*
- *Identify suitable mechanisms for controlling the built form outcomes in identified infill areas to protect existing residential amenity.*

Whilst the LSP area is identified as remaining as 'Unchanged Urban' (i.e. no density change) – refer Figure 7, this is reflective of the constraint associated with the State Government Policy relating to airport noise rather than any location or infrastructure limitations.

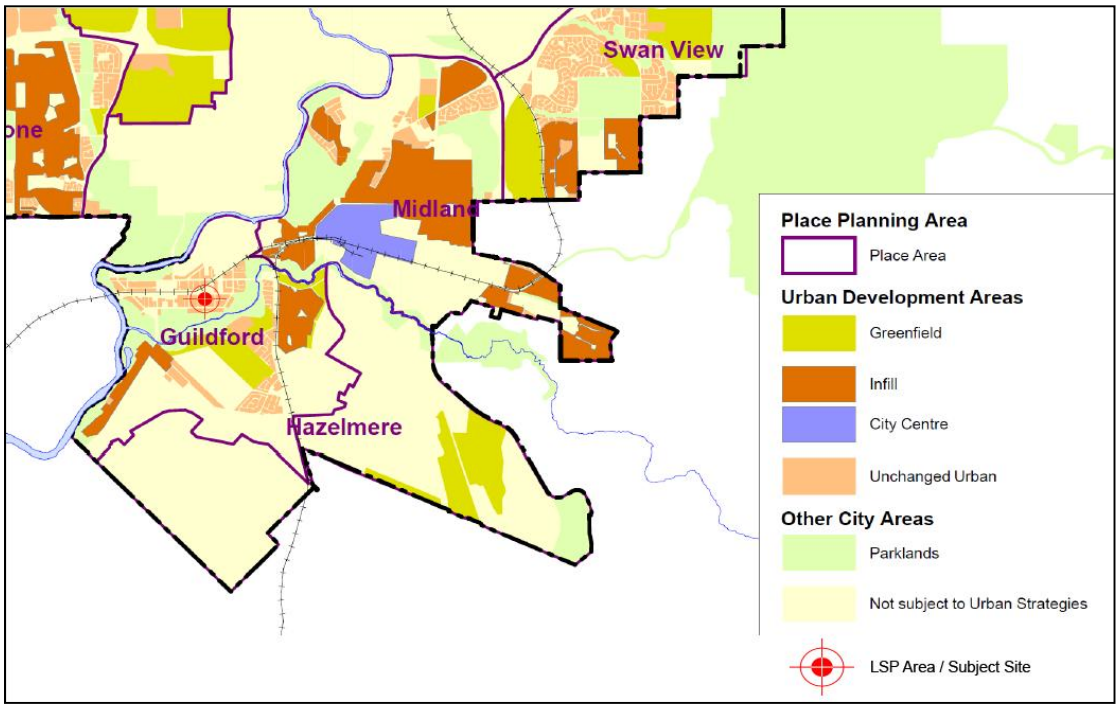


Figure 7 – Urban Housing Strategy Map Extract

Should airport noise implications be overcome, the Guildford locality provides numerous opportunities for infill development as intended for under the Urban Housing Strategy which used the following criteria for identifying suitable sites:

- 800m walkable catchment to activity centres;
- 400m walkable catchments to frequent public transport routes;
- Assessment of the age and condition of housing stock.

As the LSP satisfies the abovementioned site criteria in addition to being able to meet the noise standards of AS2021:2015 (as detailed further in this LSP), it is considered to be suitable for consideration as an infill development area.

1.3.5.2 Local Planning Policy POL-C-102 Urban Growth Policy (2006)

The purpose of the Urban Growth Policy is to set out the City's expectations and guidelines for development in urban growth areas to ensure that population growth in the Swan region contributes to sustainable urban communities. Specifically, it sets out the City's urban growth objectives and priorities to be achieved through Structure Plans, Development Plans, accompanying Management Strategies and Management Plans, Town Planning Scheme and Metropolitan Region Scheme amendments.

Whilst the LSP area is not identified within an 'Urban Growth Corridor', this is considered to be reflective of the constraint associated with SPP5.1 relating to airport noise rather than any location or infrastructure limitations. The Urban Growth Policy otherwise does allow for the consideration of ad-hoc proposals subject to meeting the following criteria:

- *The extent to which the proposal contributes to urban consolidation, infill development or revitalisation of existing urban areas;*
- *The extent to which the proposal comply with the timeframes and planning requirements in the relevant regional planning strategy;*
- *The extent to which the proposal meets the objectives of the relevant regional planning strategies and metropolitan planning strategies; and*
- *The extent to which the proposal meets the Urban Growth Objectives.*

The LSP satisfies the above criteria as further detailed and justified by supporting technical reports – refer Appendices.

1.3.5.3 City of Swan Water Action Plan (2013)

The Water Action Plan is a document containing the actions required for the City to achieve its stated goals in improving corporate and community water management in its local government area. The basis of the Action Plan is the presentation of the water goals and the water actions which form the City's approach to reducing its water consumption and improving water quality. Water sensitive urban design forms a core objective in the Action Plan with regard to structure planning and development.

Accompanying the LSP is a Water Management Requirement report prepared by Calibre Consulting which identifies infrastructure requirements anticipated with the proposed residential densities and land use mix. The Water Management Requirement report does however also suggest optional water management opportunities in the form of internal and external re-use of rainwater, stormwater detention using rain water tanks, grey water re-use and, ground water use for irrigation.

1.3.5.4 Local Planning Policy POL-C-106 Guildford Conservation Precinct

The purpose of the Guildford Conservation Precinct Policy is to conserve and protect the cultural significance of the Guildford Conservation Precinct and to ensure that development can be accommodated within the Precinct without adversely affecting its cultural significance. Specifically, the policy sets out development design guidelines for new residential development within the Precinct. These guidelines specify acceptable development provisions as well as performance criteria with respect to the following:

- *Size or Scale;*
- *Form;*
- *Siting;*
- *Materials and Colours;*
- *Detailing;*
- *Development within the Front/Street Setback Areas; and*
- *Earthworks*

The endorsement of a Local Development Plan for the LSP area will follow pending determination of the LSP and will incorporate built form provisions which address the design guidelines outlines under the local planning policy.

2.0 Site Conditions and Constraints

2.1 Surface and Ground Water

An assessment of the water management requirement has been prepared by Calibre Consulting in support of the proposed LSP to provide clear direction on future water management for the subject site. Typically, there is a requirement for the preparation of a Local Water Management Strategy (LWMS) however advice from the Department of Water indicate that as the site is small and has no water constraints, they would be unlikely to request a LWMS.

2.1.1 General Site Description

Groundwater is generally 6m deep according to the Perth Groundwater Atlas. There may be some short term perching of groundwater above the clay layer, which is generally 0.5 to 1.5m below the surface. Testing of the soil profile to approximately 1.0 – 6.0m recorded no groundwater, suggesting that if there is any perching it is only present for a short period of time.

Based on the findings of the Geotechnical Report, the in situ soils are composed of sand and fill over Clayey Sand/Sandy Clay. Due to the high fines content, the in situ soils are likely to have a low permeability. For this reason, disposal of water using soakwells is not recommended into the in situ soils. Where 1.2m or greater of free draining fill may be used, then soakwells may be possible.

2.1.2 Existing Stormwater Infrastructure

There are a number of existing drainage pits located on the subject land which currently take runoff from hardstand areas. There is no current treatment of this water. The large areas of hardstand and roof mean that the runoff coefficient of the site is likely to be around 0.9 to 1.0.

A portion of the site's water is directed to Scott and Wellman Street. There is an existing road pit on the south western portion of the site (Scott Street) and another in the south eastern portion (Wellman Street). Both streets have an existing pipe drainage network, with this network draining south to Helena Street. This current network may not be capable of taking all flows from the site.

A copy of the water management requirement report is contained within Appendix 1.

2.1.3 Surface Water / Wetlands

A review of the Department of Parks and Wildlife geomorphic wetlands database indicate no wetlands affecting the subject site. The nearest surface water feature existing in the locality is situated south of Helena Street being the Helena River tributary. Areas immediately surrounding the Helena River are identified as having a 'Multiple Use' and 'Conservation' category wetland classification.

2.2 Landform and Soil

A preliminary geotechnical and contamination study for the subject site has been undertaken by Galt Geotechnics Pty Ltd. A copy of the report is contained as Appendix 2.

2.2.1 Geology

The Perth sheet of the 1:50,000 scale Environmental Geology series map indicates that the area is underlain by PEBBLY SILT – strong brown silt with common, fine to occasionally course-grained, subrounded laterite quartz, heavily weathered granite pebble, some fine to medium-grained quartz sand, of alluvial origin.

2.2.2 Subsurface Conditions

Soils appear to be consistent across the subject site with site conditions below the pavement summarised as follows:

- Fill – Limestone and Lateritic Basecourse: Gravelly Sand (SP), fine to course grained, 25% to 30% fine to medium grained gravel, pale yellow / dark grey / brown, very dense, dry, present from below asphaltic concrete pavement, extending to depths of between 0.3m and 0.5m; overlying.
- Sand (SP), fine to course grained, grey to pale grey, generally with some (5% to 10%) low to medium plasticity clay fines, dry, medium dense to very dense, present beneath the basecourse, extending to depths of between 0.5m and 1.5m; overlying
- Clayey Sand / Sandy Clay (SC / CH), fine to coarse grained, 20% to 30% medium to high plasticity clay fines increasing with depth (~50%), grey to brown, very stiff to hard (locally firm to stiff near the top of this layer) locally cemented, dry, locally present beneath the basecourse, extending to the maximum depth of investigation of 6.0m.

2.2.3 Contamination

Soil analytical results reveal heavy metals, pesticides, total recoverable hydrocarbons (TRH) and benzene, toluene, ethylbenzene and xylenes (BTEX) levels to be either below the limit of reporting (LOR) and/or conformed to the adopted criteria.

2.2.4 Acid Sulphate Soils

No Acid Sulphate soil (ASS) testing has been undertaken at the subject site however, the Department of Environment Regulation (DER) mapping indicates no areas of ASS risk in the

immediate locality. The nearest occurrence of ASS is situated south of Helena Street being the area within the Helena River tributary which is identified as having a class 2 – moderate to low risk of ASS occurring within 3.0m of natural soil surface but high to moderate risk of ASS beyond 3.0m of natural soil surface.

2.3 Biodiversity and Natural Area Assets

Given the developed nature of the subject site, there are no flora and fauna constraints which affect the LSP area.

2.4 Bushfire Hazard

Given there are no substantial pockets of vegetation which exists on the subject site, there are negligible bushfire hazards which affect the LSP area.

2.5 Heritage

2.5.1 Local, State and Commonwealth Heritage

The LSP area is not subject to any statutory heritage listing on either the State Heritage register or the City of Swan municipal inventory.

2.5.2 Aboriginal Heritage

A review of the Aboriginal Heritage Online Inquiry System indicates that there are no Registered Aboriginal Sites or associated issues which would preclude redevelopment of the LSP area to occur.

2.6 Context and Other Land Use Constraints

2.6.1 Aircraft Noise

Lloyd George Acoustics Pty Ltd has been engaged to prepare an aircraft noise assessment report to assess the noise impacts affecting the LSP area. A copy of the report is contained as Appendix 3.

As detailed above, the eastern portion of the subject site is affected by an ANEF contour range of 30-35 ANEF with the remainder of the subject site subject to a 25-30 ANEF rating (refer Figure 8).

Figure 8 – LSP Area in relation to ANEF Contours

Site analysis of aircraft noise impacts reveal the following factors:

- Based on 2012 actual aircraft movement data, the site experiences on average more than 100 aircraft events above a noise level of 65dB L_{Amax} per day. This will increase to more than 200 average aircraft movements above a noise level of 65 dB L_{Amax} at ultimate (2059) capacity.
- Noise levels (obtained from the Perth Airport website) from the Runway 03 Departure may be around 80-82 dB L_{Amax} (for 737-800 & 777-300R type aircraft) and of similar noise level for Runway 21 Arrivals. AS201 indicates a noise level of 84 dB L_{Amax} could be experienced from 777 arrival and up to 85 dB L_{Amax} from an A380 departure. Twenty-one aircraft (arriving were measured on site, recording an average level of 79 dB L_{Amax}, with a standard deviation (SD) of 3 dB.
- The operation of the future parallel runway will not have any significant impact on the subject site.

This investigation concludes that the constraints listed above relating to aircraft noise can be appropriately managed through the development of the site under an R20 density. This is further detailed below.

3.0 Land Use and Subdivision Requirements

3.1 Design and Land Use

The proposed LSP provides for the redevelopment of the subject site for the purposes of residential development consistent with the established policy framework for the site and development in the surrounding locality.

The LSP has been designed having regard to existing residential development in the locality and is proposed to be R20 Residential. Development of the site will comprise of single / grouped dwellings which are limited to two storeys in height. The development of the site will address all surrounding public roads and will also incorporate an internal road to service road.

An indicative site layout for the site has been provided in Appendix 4.

An overview of the LSP's key elements is provided in Table 4:

Item	Data
Total area covered by LSP	8,323sqm.
Residential Site Density	R20
Estimated Number of Dwellings	15 single / grouped dwellings.
Estimated Population*	32
*Based on Australian Bureau of Statistics (2011) data for Midland-Guildford relating to average household size of 2.1	

Table 3 – LSP Statistical Overview

3.2 Public Open Space (POS) / Open Space

3.2.1 POS

Liveable Neighbourhoods requires the following in respect to POS:-

- Minimum 10% of a subdivision to be given up for POS;
- Minimum 80% of the total POS required to be unrestricted; and,
- Allowance for up to 20% of the total POS land required to be comprise of restricted use POS.

With regard to LSP's and Outline Development Plans (ODP) recently approved by the City of Swan in the immediate locality, it has been recognised that an adequate amount of POS already exists. This has been specifically recognised as part of ODP No. 127 and 128 which applies to land immediately east and west of the LSP area. As part of these ODP's, the following POS reserves were identified as contributing towards the adequacy of POS in the locality:

- Spring Reserve is located approximately 700 metres to the south-west and comprises of 7,071sqm in area;
- Fauntleroy Park is located approximately 300 metres to the north-east and comprises 13,274sqm;
- Proximity to recreational areas along the foreshores of the Swan River to the north and west and Helena River which is located to the south.

In light of the above, it is not considered necessary to provide additional POS within the proposed LSP.

3.2.2 Open Space

The provision of (landscaped) open spaces within private land is a key element that contributes to streetscapes as well as overall amenity of a locality. Currently, there is a low standard of landscaping within the LSP area with any open areas that exist being limited to bitumised parking areas.

The LSP and Indicative Development Plan (refer Plan 1 / Appendix 4) proposes the creation of new green open spaces through its design layout within street setback and verge areas. Together with consistent street planting along roads surrounding the LSP area, specialised street lighting, footpaths and paving, the overall outcome will create a vibrant and active streetscape that is legible and at an appropriate human scale.

3.3 Residential

The Indicative Development Plan prepared for the LSP indicates a notional yield of 15 dwellings comprising of 'Single Houses' or 'Grouped Dwellings' based on a residential density coding of R20.

The land use / residential density has been proposed in order to create an optimum housing density with an emphasis on achieving consistency with the existing housing typology within the locality while addressing the limitations of SPP5.1.

SPP 5.1 requires, amongst other planning criteria, noise insulation of buildings to be in accordance with the indoor design sound levels prescribed in AS2021:2015. Generally, the density of developments should be kept to a minimum of R12.5 under the provisions of SPP5.1 however, possible exceptions are where -

1. *a higher density is necessary to facilitate redevelopment or infill development of an existing residential area;*
2. *there is a strategic need for more consolidated development;*
3. *public benefits of higher density coding outweigh the negative impacts of exposing additional residents to aircraft noise, and*
4. *a higher density would facilitate the concurrent provision of noise insulation in accordance with the indoor design sound levels prescribed in AS 2021.*

The succeeding sections of the LSP address these factors in further detail.

3.3.1 SPP5.1 Criteria 1 - Need for higher density redevelopment and infill development

As detailed in the succeeding sections of this LSP, the need for infill development has clearly been identified in the City of Swan Urban Housing Strategy as well as State level strategies such as the draft framework for Perth and Peel @ 3.5 million which sets a 47% target for residential growth to occur within established area. This in the case of City of Swan represents 16,690 dwellings based on a total dwelling target of 35,510 by the year 2031. The Urban Housing Strategy has identified an estimated 15,130 additional dwellings can be catered for within the proposed infill areas which is clearly short of the 47% target.

Whilst the LSP area and Guildford locality in general is not identified as an area suitable for infill development primarily due to airport noise limitations, its location as a gateway suburb

between Midland and Perth and its settlement history would otherwise justify infill opportunities to ensure the locality continues to thrive. Realising its infill opportunities is also logical from a provision of infrastructure perspective given services being readily available.

The LSP provides an opportunity for the City to promote an infill redevelopment prospect which will assist in achieving State and Local dwelling targets.

3.3.2 SPP5.1 Criteria 2 - Strategic need for consolidated development

The LSP presents the City with an opportunity to cease an incompatible land use and promote the redevelopment of a consolidated plot of land that is close to one hectare in size. The zoning of the subject site under the provisions of LPS No. 17 as 'Residential Development' requires the application of a comprehensive plan to guide subdivision and development. To this extent, the strategic need for consolidated development has already been identified by the State and Local planning authorities.

3.3.3 SPP5.1 Criteria 3 - Public benefits of higher density coding outweigh the negative impacts of exposing additional residents to aircraft noise

The main demographic, social and economic factors which drive demand of housing types relate to income, housing affordability, household composition and occupancy rates (Source: WAPC Metropolitan Development Program 2005/2006 to 2009-2010). A review of data specifically relating to housing affordability and household composition illustrate that demand for higher density living has been increasing and is estimated to continue along this trend (Urbis, April 2015). Figures 9 and 10 illustrate key factors resulting in this trend.

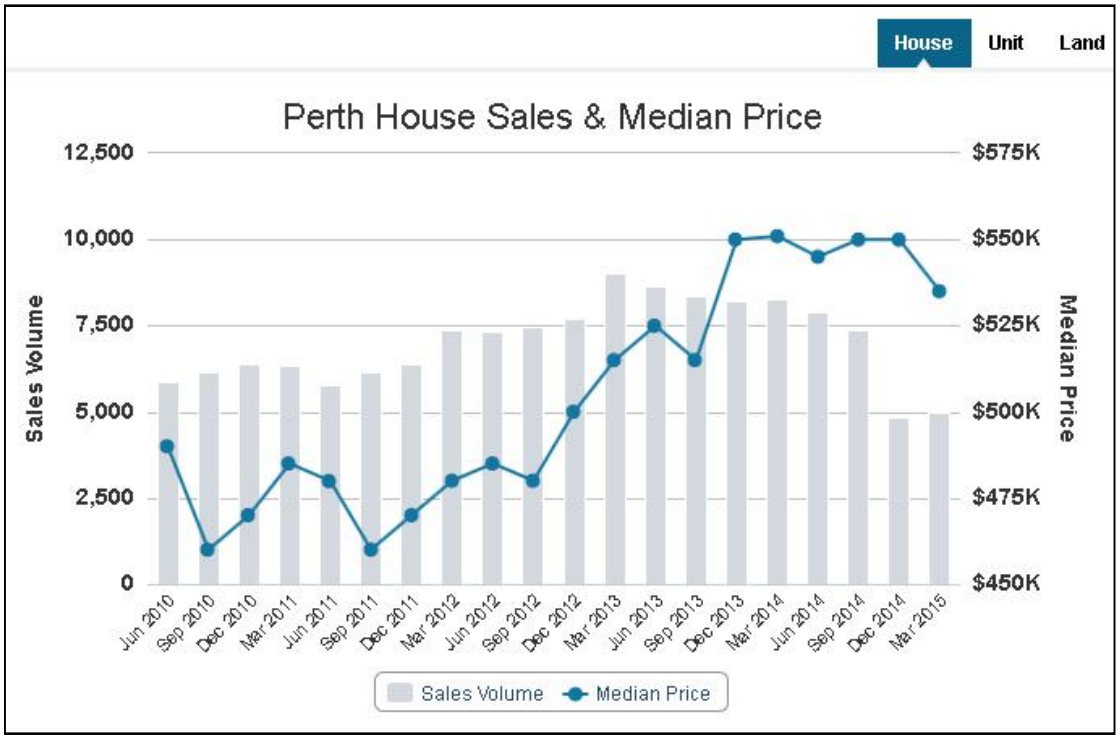


Figure 9 – Perth House Price data (Source: REIWA, April 2015)

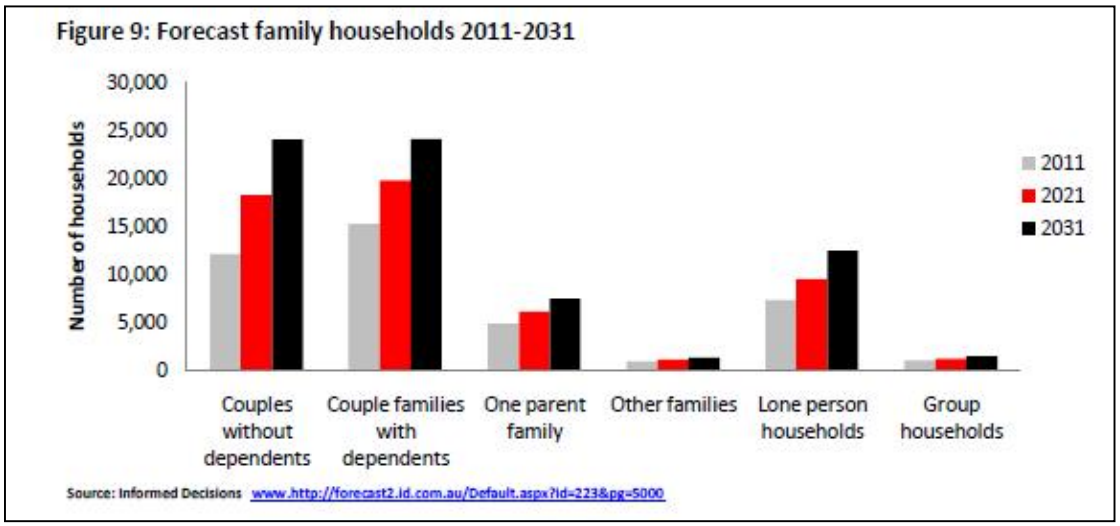


Figure 10 – Forecast housing composition for Midland – Guildford ABS Statistical Area (Source: City of Swan Urban Housing Strategy)

Figure 10 illustrates that the number of lone person households is projected to increase the fastest of all household types, representing an increase between 84% and 123% between 2006 to 2031. In addition, couple families without children are projected to experience the fastest growth of all family types, overtaking couple families with children between 2012 and 2026.

The abovementioned trend combined with housing affordability illustrates a clear public interest towards higher density living and as such, the consideration of residential density above R12.5 is considered appropriate.

In addition to the above, an investigation has been conducted by Mackay UrbanDesign (Appendix 5) which examines the significant redevelopment opportunities within the Guildford area by considering proximity to train stations and regional roads as well as lots sizes and heritage constraints. This investigations concludes that the LSP site is one (1) of only four (4) significant locations for redevelopment opportunities and as such, the LSP presents a limited opportunity to capitalise on intensification through urban infill which will assist in meeting the forecast housing needs of the City of Swan and wider North-east sub-region. The benefits of providing additional housing within such a constrained area in terms of redevelopment opportunities is considered to outweigh the negative impacts of exposing additional residents to aircraft noise.

3.3.4 SPP5.1 Criteria 4 - Compliance with AS2021:2015

As detailed above, Lloyd George Acoustics were engaged to prepare an aircraft noise assessment report to assess the noise impacts affecting the LSP area. Specifically, their engagement related to investigating whether the LSP could result in a built form outcome that meets the standards of AS2021:2015.

Against the provisions of AS2021:2015, noise insulation applied to dwellings should be based on achievement of indoor design sound levels recommended for the particular building type as provided in Table 2-2 of AS2021:2015 (refer Table 5).

Building Type & Activity	Indoor Design Sound Level, dB L_{Amax}
Houses, home units, flats, caravan parks	
Sleeping areas, dedicated lounges	50
Other habitable spaces	55
Bathrooms, toilets, laundries	60

Table 4 – Extract of Table 2-2 Indoor Design Sound Levels for Determination of Aircraft Noise Reduction

Section 2.4 of the Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport, Final Report; February 2004 Western Australian Planning Commission provides a deemed to comply construction package which is designed to provide a 35 dB(A) reduction for sleeping areas and 30dB(A) for living areas. The construction package entails as follows (refer Figure 11):

Openings:	Maximum size of openings (windows and doors) of 20% (of floor area) for sleeping areas and 50% (of floor area) for living areas.
Construction:	Slab-on-ground
Walls:	Double brick cavity (R_w 50)
Roof:	Pitched, minimum 25° slope, masonry tiles or metal sheet with sarking (impervious membrane) over rafters (Total roof/ceiling rating R_w 45).
Ceiling:	Plasterboard 10mm thickness, with ceiling joists separate from roof structure, i.e. not attached to rafters or roof trusses.
Insulation:	Fibrous thermal insulation R2.5 or greater between ceiling joists.
Windows:	Laminated glass 6.38mm or greater with acoustic or resilient flap weather seals to frames (R_w 30).
Doors:	Solid core 40mm or greater with acoustic or resilient flap weather seals to frames. Doors with glass panels are to match the standard for windows above.
Note:	Where air-conditioning or mechanical systems are installed, sound attenuated ducting will be necessary to *limit* noise intrusion.

Figure 11 – Deemed to Comply Construction Package

Based on an external noise level of 85dB $L_{Amax,}$ the aircraft noise reduction achieved through the application of the deemed to comply construction package is calculated to be 52dB L_{Amax} to bedrooms and 55dB L_{Amax} to living areas. The deemed to comply construction package therefore does not achieve the required indoor sound levels of AS2021:2015 for bedrooms (being 50dB L_{Amax}) but does achieve the required standard for living areas (being 55dB L_{Amax}).

As such, the deemed to comply construction standards for bedrooms must be improved to increase the glazing requirements from R_w 30 to R_w 35, in order to achieve 50dB L_{Amax} in bedrooms. This requirement will form of a condition of development approval. No changes are required to the deemed to comply construction standards for living areas.

3.4 Indicative Development Plan

An 'Indicative Development Plan' as shown in Figure 12 / Appendix 4 has been developed by Mackay Urban Design to illustrate the potential outcomes of the LSP. Ultimately, such plan will form the basis of a Local Development Plan prepared in accordance with Part 6 of the P&D Regs 2015.

The Indicative Development Plan illustrates a built form outcome which shows a strong focus on activating public and private streets. Key elements include:

- Maintaining and continuing the residential density and character of the established surrounding locality.
- Ensuring that development incorporates active frontages which address all public and private streets.
- Establishing built form which is limited to two (2) storeys in height and conforms to the provisions of the Guildford Heritage Conservation Precinct.
- Open spaces throughout the site which provide for:
    - Routing of stormwater and other services in a simple and cost effective manner.
    - Separation of dwellings in order to minimise overshadowing impacts.
    - Improve resident amenity by providing outlook to landscaped areas.
    - Facilitate the retention of mature trees that exist on site.
    - Results in the design of an efficient internal driveway and pedestrian movement network that is both legible and satisfies crime prevention through environmental design principles (CPTED).
- Emphasis on providing residential dwellings with a northern aspect to maximise environmentally sensitive design.

Key design elements of the Indicative Development Plan are detailed further below.

Figure 12 – Extract of Indicative Development Plan

3.4.1 Character and Sense of Place

A sense of place for the LSP area will be developed through high quality building, road and landscaping design. Controlled building design, signature streetscapes and landscaped frontages which conforms to the provisions of the Guildford Heritage Conservation Precinct will complement the existing surrounding locality which will all assist in creating a sense of place and visual character.

3.4.2 Building Form

Building form relates to the scale and articulation of buildings and how they relate to the adjacent street, open space and the precinct character. The Indicative Development Plan illustrates a design and massing that is reflective of the surrounding established residential development which respects the existing heritage that is Guildford. Figures 13 to 19 illustrate the subject site and the established character of the locality whilst Figures 20 and 21 illustrate a massing model of the proposal. Further details are contained in Appendix 4 – Indicative Development Plan.

Figure 13 – Existing built form character east of LSP area: corner Brittain Mews and Wellman Street

Figure 14 – Existing built form character east of LSP area: corner Wellman Street and Tauman Loop

Figure 15 – Existing built form character: Wellman Street

Figure 16 – Existing warehouse building on LSP area: incompatible built form and lack of activation of streetscape is evident

Figure 17 – View east down James Street with subject site in foreground: incompatible built form and lack of building articulation and surveillance

Figure 18 – View west down James Street with subject site in foreground: expansive car parking areas associated with existing use does not promote interest or activation at street level

Figure 19 – Massing Model: view of LSP area from north-east

Figure 20 – Massing Model: view of LSP area from south-west

3.4.3 Building Articulation

Articulation in buildings helps to reduce the appearance of building bulk while creating visual interest in the streetscape. It also promotes legibility in the built form.

The Indicative Development Plan illustrates a design which has implemented various aspects associated with this philosophy. Key elements include variations in construction materials,

textures, setbacks, height, detailing, window opening sizes, colours and roof design. Further detailed design considerations can otherwise be contained within a supporting Local Development Plan prepared in accordance with Part 6 of the P & D Regs 2015.

3.4.4 Crime Prevention through Environmental Design

A number of elements of the proposal as illustrated in the Indicative Development Plan aim to encourage a safer built environment which satisfies CPTED principles. Key features include:

- Dwellings to provide surveillance of the public and private streets as well as internal pedestrian access ways.
- Corner buildings to address both street frontages which encourages better surveillance.
- Preventing blank, expansive walls thereby discouraging graffiti and vandalism.

3.5 Movement Network

A Traffic Impact Assessment in support of the LSP and Indicative Development Plan has been prepared by KCTT and is provided at Appendix 6. The purpose of this document is to provide commentary and analysis on the parking requirements and potential traffic and transport impact that the proposed development of this site may have on the surrounding road and transportation networks. This Transport Impact Statement has been completed in accordance with the guidelines as shown in the WAPC Transport Impact Assessment Guidelines – Part 4 (Developments).

The report makes the following conclusions with respect to the LSP / Indicative Development Plan:

- The development is expected to produce an additional 101 vehicles per day and 12 vehicles per hour.
- Public transport access is available on James Street. Bus stop (for Route 36) on both sides of James Street, which is easily accessible via footpaths.
- The nearest bus / train routes are:
    - No 36 - Esplanade Bus-port - Midland Station via James Street.
    - Train - East Guildford Train Station - Stop No 99512.
- The nearest bus / train stops are:
    - Route No 36 – located in front of the subject site on James Street.
    - East Guildford Train Station is approximately 10 minutes walking distance.
- Pedestrian paths on James Street and Fauntleroy Street provide connectivity to the bus and train stops.
- Within a 800 metre radius of the subject site are:
- Perth Bicycle Network (PBN) ”Other Shared Path (Shared by Pedestrian & Cyclists)” routes;
- PBN “Good Road Riding Environment” routes;
- PBN “Bicycle Lanes or Sealed Shoulder Either Side” routes.

3.6 Water Management

As discussed above, advice received from the Department of Water indicate that a LWMS is not required given the site is small and has no water constraints. Nonetheless, Calibre Consulting have prepared a Water Management Requirement report (refer Appendix 1) to provide clear direction on future water management for the subject site.

The following is a summary of the recommended works in relation to water management requirements relating to the LSP area / Indicative Development Plan. Optional water management opportunities are also listed:

Recommended Works

- Calculation of flows off building roofs and direction of flow discharge to be undertaken (1:1, 1:5 and 1:100).
- Calculation of hardstand flows and direction of discharge.
- Location of discharge points from the site.
- Analysis of existing street drainage capacity.
- Location and sizing of treatment structures.
- Location and sizing of detention structures.
- Safe 1:100 ARI overland flow path determination.

Optional Works

- Re-use of rainwater:
    - Internal - there is a possibility of small rainwater tanks taking roof runoff and storing it for nonpotable use within each individual apartment. This would be for toilets and washing machines. Using this option would maximise the use of the available rainwater.
    - External - there is a possibility of capturing roof runoff for external use in gardens however, the system is limited in application due to extended dry periods when there is a need for irrigation and a long winter period of rain when there is no need for irrigation.
- Stormwater detention using rainwater tanks - to increase the viability of rainwater tanks, there is the option to utilise a portion of the tank's capacity for stormwater detention. As the site is unlikely to be able to effectively use soakwells, the use of above ground detention system such as rainwater tanks, with a portion of the tanks set aside for stormwater detention, becomes more viable.
- Greywater re-use - there is the possibility to utilise greywater from each apartment for watering of gardens or potentially non potable internal use. Given the dense nature of this development and the heavier soil types, there is limited scope for reuse within gardens, making this option unlikely to be practical. Internal reuse is likely to be quite expensive, making this option also unlikely to be practical.
- Groundwater use for irrigation - an assessment could be undertaken to determine if there is groundwater available to water the park areas within the development. This will need to consider the depth to a viable aquifer and groundwater allocations available (or tradeable).

3.7 Infrastructure Coordination, Servicing and Staging

Serling Consulting (Australia) Pty Ltd have prepared an Infrastructure Servicing Report in support of the LSP (refer Appendix 7). The key findings are summarised below.

3.7.1 Sewer Reticulation

The Water Corporation have confirmed that there appears to be sufficient capacity within the existing infrastructure to support the previously proposed new R40 zoning (and therefore sufficient for a R20 zoning). It should be noted that the Water Corporation has indicated that they will be undertaking a review of the existing planning scheme for the area and the Water Corporation will need to be contacted prior to development to confirm these requirements.

There are no existing easements over the existing sewers running through Lot 18 however there will be an implied easement and any development would need to take this into account.

3.7.2 Water Reticulation

The Water Corporation have confirmed that there is sufficient capacity to service the previously proposed new R40 zoning (and therefore sufficient for a R20 zoning) and a connection off of James Street, Scott Street or Wellman Street would be acceptable.

3.7.3 Power

Based on the proposed loads and information obtained from Western Power's public Network Capacity Mapping Tool there is sufficient capacity available in the surrounding area to supply an R40 development. On the basis that a decrease in density to R20 will decrease the demand for electricity supply, there is sufficient capacity available to supply the proposed R20 dwelling development.

3.7.4 Communications

The report concludes that a breakdown of the existing telecommunications infrastructure and proposed upgrade requirements which is in support of the previously proposed R40 zoning. On the basis that a decrease in density to R20 will decrease the demand for telecommunications supply, there is sufficient capacity available to supply the proposed R20 dwelling development.

3.7.5 Gas

An ATCO Gas 100mm gas pipeline is available in the fronting road reserve of James Street and a connection to this main should be sufficient to service the proposed development. This will need to be confirmed with ATCO Gas during detailed design.

3.7.6 Stormwater Drainage Requirements

The 1 year, 1 hour year storm event will be required to be retained within the subject landholding while any larger storm events will overflow into the existing drainage infrastructure. It should also be noted that the City of Swan will require the developer to provide a Stormwater Management Plan indicating the stormwater retention capacities for the 1 year, 5 year and 100 year storms as well as overland flow paths for the major storms at

the time of the development application. A site specific infiltration test will be required to inform the drainage design.

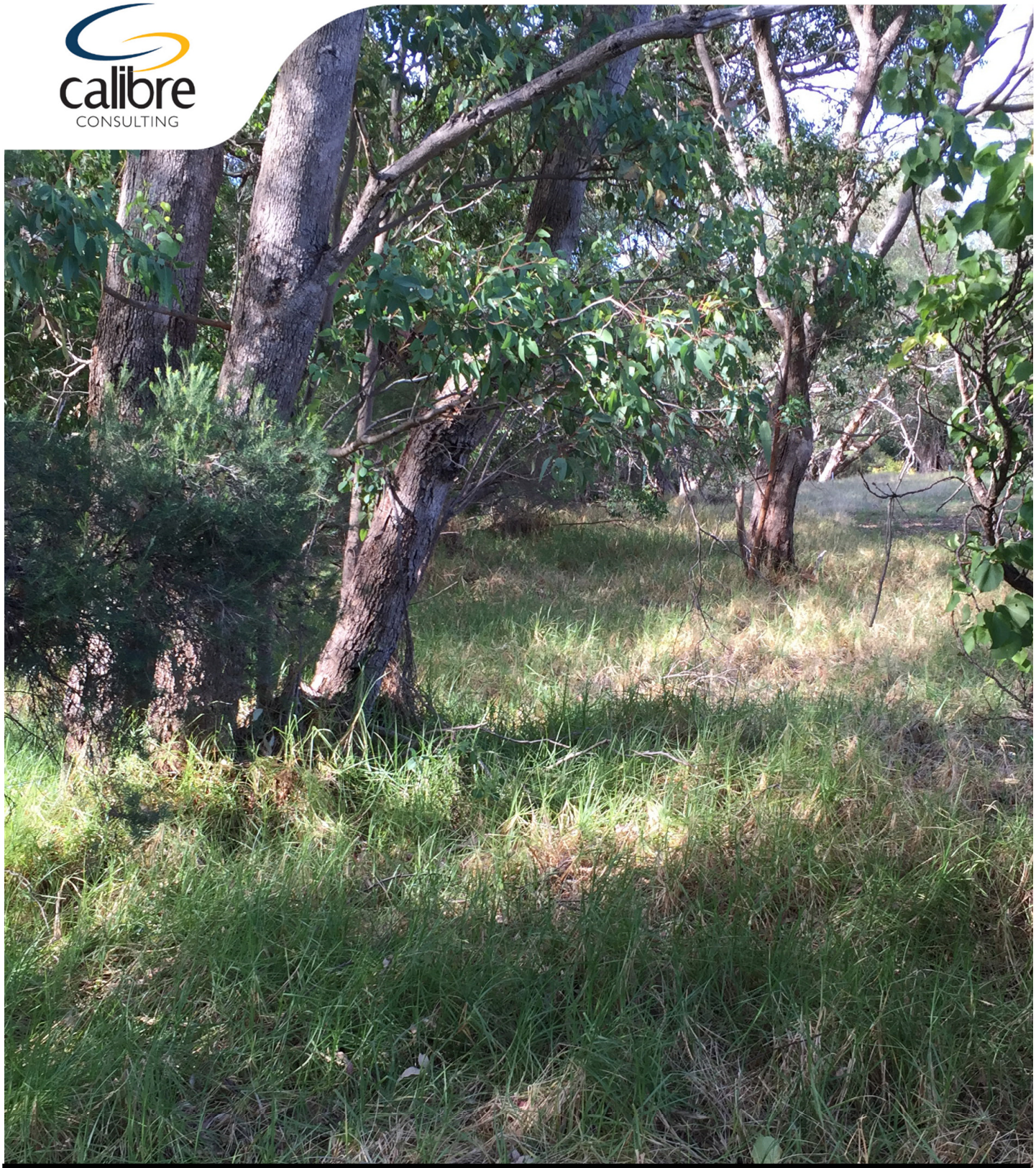
3.7.7 Earthworks

Given that the surface geology is expected to include Guildford clay we would expect there to be a requirement for imported fill to achieve the necessary clearance from the clay layer. The fill level required is determined by the site classification as determined by the geotechnical engineer as a part of the site specific geotechnical report.

3.7.8 Staging

Given the small scale of the development site in the context of typical LSP's and readily available infrastructure connections in the immediate area, it is unlikely that the proposed LSP will require staging.

APPENDIX 1
Water Management Requirement Report



Lot 18 James Street and 137 Scott Street Guildford

Water Management Requirements

Prepared by Calibre Consulting
for Dodd and Dodd Pty Ltd

Version 2 December 2016
16-003817

COMMERCIAL IN CONFIDENCE

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DOCUMENT CONTROL

Issue	Date	Issue Details	Author
1	March 2015	Issue to project team (Project number 14224)	Brendan Oversby
2	December 2016	Revision to reflect changed Density and area	Brendan Oversby

TABLE OF CONTENTS

FIGURES

DEPARTMENT OF WATER ADVICE

CITY OF SWAN ADVICE

1 EXECUTIVE SUMMARY

1.1 GENERAL

This report on the Water Management Requirements for the development of Lot 18 James Street, Lot 12 and 13 Wellman Street and Lot 136 Scott Street, Guildford (the subject land), has been produced to provide clear direction on future water management for the site. It sets out the requirements in relation to onsite water management and how water may be released from the site into the existing road drainage network as part of future development works.

Furthermore, it provides options for consideration in relation to water conservation and water reuse on site.

2 PLANNING SUMMARY

The Subject land is currently undergoing a Structure Planning exercise. The aim of the Structure Planning is to provide support to developing the site for a R20 Multiple Dwelling Development

Normally as part of a Structure Planning process, there is a requirement for a Local Water Management Strategy to be produced. Through negotiations, this strategy will not be required for the subject land. This is outlined further below.

3 SITE DESCRIPTION SUMMARY

The subject land has a combined area of approximately 9219m^2. The site is located south of James Street, west of Wellman Street and east of Scott Street. The southern border of the site adjoins existing residential lots. The subject land area is shown in Appendix 1.

3.1 GENERAL SITE DESCRIPTION

The subject land includes both existing commercial buildings, with associated hardstand/parking areas as well as two residential lots with houses and gardens, drives etc. There is a general slope downward in a south easterly direction across the subject land from approximately 8.5mAHD in the north west corner to 7.5mAHD on the southern tip and 7.2mAHD in the south east corner on Wellman Road.

Groundwater is generally 6m deep according to the Perth Groundwater Atlas. There may be some short term perching of groundwater above the clay layer, which is generally 0.5 to 1.5m below the surface. Testing of the soil profile on 19th November 2014 to approximately 1.0 – 6.0m recorded no groundwater, suggesting that if there is any perching it is only present for a short period of time.

Based on the findings of the Geotechnical Report, the In situ soils are composed of sand and fill over Clayey Sand/Sandy Clay. Due to the high fines content, the in situ soils are likely to have a low permeability. For this reason, disposal of water using soakwells is not recommended into the insitu soils. Where 1.2m or greater of free draining fill may be used, then soakwells may be possible.

3.2 EXISTING STORMWATER INFRASTRUCTURE

There are a number of existing drainage pits located on the subject land which currently take runoff from hardstand areas. There is no current treatment of this water.

The large areas of hardstand and roof areas means that the runoff coefficient of the site is likely to be around 0.9 to 1.0.

A portion of the site's water is directed to Scott and Wellman Street. There is an existing road pit on the south western portion of the site (Scott Street) and another in the south eastern portion (Wellman Street). Both streets have an existing pipe drainage network, with this network draining south to Helena Street. This current network may not be capable of taking all flows from the site.

4 WATER MANAGEMENT REQUIREMENTS

The following is a summary of the requirements that have been set out by the respective authorities in relation to the water management requirements for the development of the subject land.

4.1 CITY OF SWAN ADVICE

The flow off the site will need to consider the actual capacity of the existing drainage system. In principle, the site will be allowed 2 discharge points, 1 on Scott Street and 1 on Wellman Street. These will be 150mm diameter pipe connections. The analysis of the existing road pipe drainage network, and its capacity to take water from the subject land must be provided to the City and include analysis of the 1:1, 1:5 and 1:100 ARI events.
Within the site, water off hardstand areas such as internal roads and parking bay will need to be captured and detained, with flows up to and including the 1:1ARI to be treated. This treatment is to be in bioretention systems or similar
Water off roof areas will need to be captured and detained. There is no need for treatment, as this water is relatively clean
The flow off the site will then be as per the capacity of the two outlets and downstream road drainage network. Some of this water may be infiltrated, provided there is sufficient fill (if used).

A safe passage must be determined for the 1:100ARI event. Flow paths and likely depths through the subject land and onto the street network are to be provided.

4.2 DEPARTMENT OF WATER ADVICE

The Department of Water stated that, as the site is small and has no water constraints, they would be unlikely to request an LWMS. They will leave it to the City of Swan to assess water management for the Site

4.3 RECOMMENDED WORKS TO ACHIEVE THE REQUIREMENTS

Based on the above advice, a drainage analysis will need to be undertaken for the site as part of the detailed design phase. This would include:

- Calculation of flows off building roofs and direction of flow discharge (1:1, 1:5 and 1:100)
- Calculation of hardstand flows and direction of discharge
- Location of discharge points from the site
- Analysis of existing street drainage capacity

- Location and sizing of treatment structures
- Location and sizing of detention structures
- Safe 1:100 ARI overland flow path determination.

This work is to be undertaken within the detailed design phase of the project. This will include liaison with the City in relation to the relevant requirements at that time.

5 OPTIONAL WATER MANAGEMENT OPPORTUNITIES

The following water management options are provided for consideration by the client and project team. These can be explored further, should the client wish to purse any of these options.

5.1 REUSE OF RAINWATER

Internal

There is a possibility of small rainwater tanks taking roof runoff and storing it for non-potable use within each individual apartment. This would be for toilets and washing machines. Using this option would maximise the use of the available rainwater.

External

There is a possibility of capturing roof runoff for external use in gardens. The main issue with this system is that the climate of the subject land is such that there are extended dry periods when there is a need for irrigation and a long winter period of rain when there is no need for irrigation. This makes the use of rainwater tanks rather impractical for garden watering.

5.2 STORMWATER DETENTION USING RAINWATER TANKS.

To increase the viability of rainwater tanks, there is the option to utilise a portion of the tank's capacity for stormwater detention. As the site is unlikely to be able to effectively use soakwells, the use of above ground detention system such as rainwater tanks, with a portion of the tanks set aside for stormwater detention, becomes more viable.

5.3 GREYWATER REUSE

There is the possibility to utilise greywater from each apartment for watering of gardens or potentially non potable internal use. Given the dense nature of this development and the heavier soil types, there is limited scope for reuse within gardens, making this option unlikely to be practical. Internal reuse is likely to be quite expensive, making this option also unlikely to be practical.

5.4 GROUNDWATER USE FOR IRRIGATION

Due to the limited garden areas, it is unlikely that groundwater is a viable irrigation source. Furthermore, all aquifers below the subject land are currently fully allocated, meaning trading would need to be undertaken to secure a viable groundwater resource.

FIGURES

Calibre Consulting (Aust) Pty Ltd
Unit 5, 53 Victoria Street
Bunbury WA 6230
Ph 08 9791 4411
www.calibreconsulting.co

EXISTING SITE

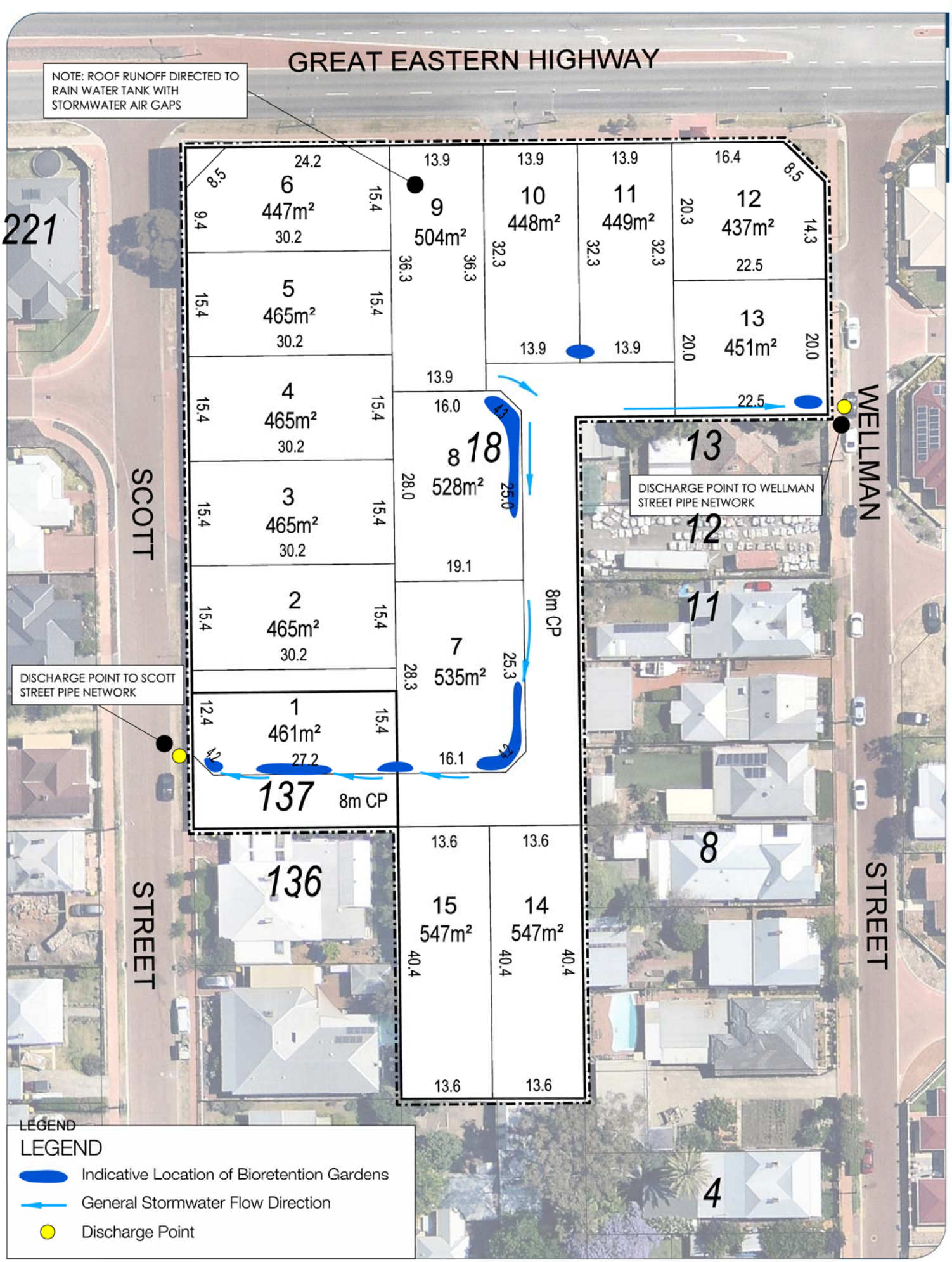
James Street Redevelopment, Guildford

Plan No: 16-003817- MP-01

Date:	06.12.2016
Rev:	Orig
Co-ords:	MGA 50 GDA 94
Aerial:	Nearmap

This plan has been prepared for planning purposes. Areas, contours and dimensions shown are subject to survey.

FIGURE 1



calibre CONSULTING
Calibre Consulting (Aust) Pty Ltd
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Bunbury WA 6230
Ph 08 9791 4411
www.calibreconsulting.co

WATER MANAGEMENT RECOMMENDATIONS

James Street Redevelopment, Guildford

Plan No: 16-003817-MP-02

Date:	06.12.2016
Rev:	ORIGINAL
Scale:	A1 @1:250, A3 @ 1:500
Co-ords:	MGA
Aerial:	Nearmap

This plan has been prepared for planning purposes. Areas, contours and dimensions shown are subject to survey.

FIGURE 2

DEPARTMENT OF WATER ADVICE

Brendan Oversby

From: LYONS Bree <Briony.Lyons@water.wa.gov.au>
Sent: Monday, 19 January 2015 9:17 AM
To: Brendan Oversby
Subject: RE: (14224) Water Management for Scott/James/Wellman St Guildford

Hi Brendan,

As the site is small and has no water constraints, the Department of Water would be unlikely to request an LWMS. As long as the storm water is management appropriately, it is unlikely we would have comment to provide.

Kind regards,

Bree Lyons
A/ Senior Natural Resource Management Officer
Department of Water - Swan Avon Region
7 Ellam St Victoria Park WA 6100
Phone: 08 6250 8035 , Fax :08 62508050
Email: briony.lyons@water.wa.gov.au

Government of Western Australia
Department of Water

From: Brendan Oversby [mailto:Brendan@tme.net.au]
Sent: Friday, 9 January 2015 3:02 PM
To: LYONS Bree
Subject: (14224) Water Management for Scott/James/Wellman St Guildford

Hello Briony

Thank you for your time on the phone this afternoon.
As discussed briefly, I am looking into the water management requirements associated with a site on the corner of Scott Street, James Street and Wellman Street in Guildford (see attached plan).
We have received initial advice from the City of Swan that they will require a Stormwater Management Plan (see attached email). The site has recently been expanded to include Lots 12 and 13 Wellman Street (residential lots) so I am currently following up with the City to check on their new requirements.

I am assuming that the Department of Water will not be requesting a Local Water Management Strategy. I think that a Stormwater Management Plan, to the City's requirements is a suitable level of assessment for this site from a water management point of view.

This is based on the following points:

- this is a brownfield development (currently houses and commercial site, proposed development is townhouses/apartments)
- the site is approx. 0.91ha
- doesn't adjoin any waterways or wetlands
- there is capacity within the existing drainage system
- groundwater is approximately 6m deep
- geotech did not find any contamination issues

Can you please let me know if this assumption is correct,

Happy to discuss this further as required should you have any queries.

Regards

BRENDAN OVERSBY
Senior Sustainability Consultant / Partner
Town Planning Management Engineering

TME Town Planning Management Engineering Pty Ltd
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brendan@tme.net.au
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CITY OF SWAN ADVICE

Brendan Oversby

From: Daniel Beresford <Daniel.Beresford@swan.wa.gov.au>
Sent: Friday, 23 January 2015 3:28 PM
To: Brendan Oversby
Subject: RE: (14224) Water Management for Scott/James/Wellman St Guildford

Hi Bevan,

I just got a response from design. They are happy for you to proceed on that basis as long as what you are proposing is going to work – they will be assessing this further at the DA stage.

Regards,

Daniel Beresford Subdivisions & Drainage Engineer
Asset Management
city of swan
PO Box 196
MIDLAND WA 6936
t 08 9278 9643 **f** 08 9267 9477 **m** 0418 614 166
www.swan.wa.gov.au

From: Brendan Oversby [mailto:Brendan@tme.net.au]
Sent: Friday, 23 January 2015 3:26 PM
To: Daniel Beresford
Cc: Neil Teo
Subject: RE: (14224) Water Management for Scott/James/Wellman St Guildford

Thanks Daniel.
We will proceed on this basis.

I look forward to the advice from the design team in relation to dual outlets.
Kind regards

BRENDAN OVERSBY
Senior Sustainability Consultant / Partner
Town Planning Management Engineering

TME Town Planning Management Engineering Pty Ltd
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brendan@tme.net.au
www.tme.net.au

From: Daniel Beresford [mailto:Daniel.Beresford@swan.wa.gov.au]
Sent: Friday, 23 January 2015 1:20 PM
To: Brendan Oversby
Subject: RE: (14224) Water Management for Scott/James/Wellman St Guildford

Hi Brendan,

Sorry about the delay in response, I have been out of the office for this past week or so. You can proceed based on the previous advice to Aaron. As far as the outlets go I have forwarded this to our design team who will have a look at our most up to date drainage plans and advise on what is going to be most suitable. From what I can see it will be pretty easy to provide outlets either side so it shouldn't be an issue.

There hasn't been a DA submitted for this yet has there? I assume that the lots will be amalgamated first and then a DA will be submitted?

Cheers,

Daniel Beresford Subdivisions & Drainage Engineer
Asset Management
city of swan
PO Box 196
MIDLAND WA 6936
t 08 9278 9643 **f** 08 9267 9477 **m** 0418 614 166
www.swan.wa.gov.au

From: Brendan Oversby [mailto:Brendan@tme.net.au]
Sent: Friday, 9 January 2015 3:01 PM
To: Daniel Beresford
Subject: (14224) Water Management for Scott/James/Wellman St Guildford

Hello Daniel,

Thank you for your time on the phone this afternoon.
As discussed briefly, I am looking into the water management requirements associated with a site on the corner of Scott Street, James Street and Wellman Street (see attached plan). You have previously provided some preliminary advice to Aaron Smith (Serling Consulting) in relation to a portion of the site (eg the hardware commercial area), however the site has been expanded to include Lots 12 and 13 Wellman Street (residential lots). I have attached your correspondence to Aaron.

Based on this initial advice am I correct in assuming the following will be required within the Stormwater Management Plan:

a) As there will be virtually no change in pre and post flow rates, we will instead be working to the capacity of the discharge pipe/s (see point below on the possibility of 2 x 150mm outlet pipes) as outlined by the City.

b) 1:1ARI – volumes of storage required, type of treatment used for non roof run off (as a minimum). I am thinking clean roof runoff can exit untreated into the discharge pipe/s and back up into storage areas if the capacity of the pipes is exceeded. Runoff from internal roads/paving etc would go into bioretention systems or another treatment system and then discharge.
c) 1:5 ARI –storage required to achieve the required discharge rate and indicative location of storage
d) 1:100 ARI – calculation of flow rate post development and delineation of safe flow paths onto road

Due to the inclusion of the two new lots, I would also like to suggest that a second 150mm outlet be provided for drainage (eg one into Scott Street's and one into Wellman Street's existing drainage network). Due to the slope of the block, it will be difficult without significant fill to bring the water from the new area back over to Scott Street. The use of two outlets will also assist with better matching the current discharge catchments from the site, meaning that the current stormwater regime will be maintained.

Happy to discuss this further as required should you have any queries.

Regards

BRENDAN OVERSBY
Senior Sustainability Consultant / Partner
Town Planning Management Engineering

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APPENDIX 2
Geotechnical and Contamination Study

Report on

PRELIMINARY GEOTECHNICAL AND CONTAMINATION STUDY PROPOSED RESIDENTIAL APARTMENTS LOT 18 JAMES STREET, LOT 137 SCOTT STREET AND LOTS 12 & 13 WELLMAN STREET, GUILDFORD

Submitted to:

Dodd & Dodd Pty Ltd
c/- Dynamic Planning and Development
PO Box 688
INGLEWOOD WA 6932

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J1401218 001 R Rev2

28 November 2016

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FIGURES

APPENDICES

1. INTRODUCTION

This revised report presents the outcomes of Galt Geotechnics Pty Ltd (Galt's) preliminary geotechnical and contamination study for the proposed residential apartment blocks at Lot 18 James Street and Lot 137 Scott Street, Guildford ("the site"). The location of the site relative to the surrounding area is shown on Figure 1, Site and Location Plan.

This report supersedes our previous reports (J1401218 001 R Rev0, dated 10 December 2014 and J1401218 001 R Rev1, dated 15 January 2015), and now includes

- commentary on Lots 12 & 13 Wellman Street, Guildford, which are adjacent to the site but were not part of our original investigation; and
- our comments given recent (November 2016) advice that the density and dwelling height will be reduced.

The investigation was requested by Lauren Wallace of Dynamic Planning and authorised by Hugh Bond in a signed Client Authorisation Form dated 20 October 2014.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

LOTS 18 & 137

Based on the supplied information, the site has an irregular shape and covers a total area of 8,323 m^2. It is bordered by James Street to the north, Scott Street to the west and residential houses to the south and east. The site is relatively flat with a surface elevation at about RL 8 m AHD.

There are four warehouse-type commercial buildings with associated parking on the site. The buildings were built at various times between 1953 and 1974. Prior to 1953, we understand the site was used as a salvage yard. The site is now mainly used for laydown and warehousing.

It is understood that the proposed development will comprise a 1 to 2 storey single house/grouped dwellings, with a density coding of R20.

LOTS 12 & 13

A review of publicly available information shows that Lots 12 and 13 abut one another and directly adjoin Lot 18 south of an existing car park in the northeast of Lot 18. Each lot is rectangular in plan. The total plan area of the two lots is 896 m^2. As early as the 1950s there were houses on both lots, however the house on Lot 12 (southern lot) was demolished some time in the late 1960s or early 1970s and the lot has been vacant since. It appears to be used as a hardstand. The original house remains on Lot 13 (northern lot).

Lots 12 and 13 are contiguous with the site but were not investigated at the time of our attendance on site. We assume that these lots will be incorporated into the proposed development, with similar building heights and development density.

3. PROJECT OBJECTIVES

The objectives of the preliminary study were to:

- broadly assess subsurface soil and groundwater conditions across the site including the potential presence of fill;
- provide recommendations on likely suitable footing systems for the proposed development;

- provide preliminary allowable bearing pressure and settlement estimates for shallow foundations;
- provide a preliminary site classification(s) in accordance with AS 2870-2011 "Residential Slabs and Footings";
- assess the appropriate site subsoil class for the site in accordance with AS 1170.4-2007;
- recommend appropriate site preparation procedures including compaction criteria and excavatability;
- provide design parameters for lateral support and retaining walls;
- assess the permeability of the soils at the site for potential on-site disposal of stormwater by infiltration;
- provide a subgrade California bearing ratio (CBR) value for pavement thickness design by others; and
- determine the contamination status of the site as recorded by the Department of Environmental Regulation (DER); and
- assess what additional work is required as part of the planning process.

The objectives were originally to be addressed for the site, however this report has been updated to provide as much information as possible from available data (excluding any intrusive investigation) on Lots 12 & 13.

4. FIELDWORK

Fieldwork was carried out on the site on 19 November 2014 and comprised:

- a site walk-over by geotechnical engineer and environmental scientist;
- cone penetration tests (CPTs) at 5 locations (CPT01 to CPT05) extending to depths of between 3.5 m and 6.0 m;
- hand-augered boreholes at 10 locations (BH01 to BH10), extending to a depths of between 0.4 m and 1.0 m;
- collection of soil samples from all boreholes at 0.5 m intervals; and
- screening of all soil samples with a photoionisation detector (PID).

General

A geotechnical engineer from Galt located the test positions, observed the CPTs, cored through the pavements, drilled the hand auger boreholes, logged the materials encountered in the boreholes, collected samples for possible laboratory testing and performed the PID screening.

The test locations are shown on Figure 1, Site and Location Plan and details are summarised in Table 1, Summary of Tests. Photographs of the site are presented in Appendix A, Site Photographs.

Table 1: Summary of Tests

Test Names	Test Depth (m)	Depth to Groundwater (m)	Reason for Termination	Stratigraphy[1]
CPT01	5.5	D (3.1)[2]	Friction refusal	BASECOURSE overlying SAND overlying Clayey SAND/Sandy CLAY
CPT02	3.4	D (3.3)	Friction refusal	
CPT03	6.0	D (3.2)	Target depth	
CPT04	6.0	D (3.1)	Target depth	
CPT05	5.1	D (3.2)	Friction refusal	
BH01	1.0	GNE	Target depth	BASECOURSE overlying SAND overlying Clayey SAND
BH02	0.7	GNE	Refusal	FILL: SAND overlying Clayey SAND
BH03	1.0	GNE	Target depth	BASECOURSE overlying SAND overlying Clayey SAND
BH04	1.0	GNE	Target depth	BASECOURSE overlying Clayey SAND
BH05	1.0	GNE	Target depth	BASECOURSE overlying SAND/Clayey SAND
BH06	1.0	GNE	Target depth	BASECOURSE overlying SAND overlying Clayey SAND
BH07	1.0	GNE	Target depth	FILL: Gravelly SAND overlying SAND

BH08	0.8	GNE	Refusal	BASECOURSE overlying SAND overlying Clayey SAND
BH09	1.0	GNE	Target depth	
BH10	0.4	GNE	Refusal	Laterite BASECOURSE

Notes
1. Stratigraphy from CPTs is inferred from the Robertson et al (1986) CPT interpretation
2. Dry to recorded depth – collapse occurred below following removal of probe
3. GNE – groundwater not encountered

Cone Penetration Tests

CPTs were undertaken using a 22 tonne truck-mounted CPT rig supplied and operated by Probedrill Pty Ltd. The results of the CPTs are provided in Appendix B, Cone Penetration Test Results along with a method of interpretation proposed by Robertson et al (1986).

Boreholes

The asphaltic concrete pavement at borehole locations was cored with a 100 mm diamond corer. Boreholes were hand-augered using an 80 mm diameter auger. Borehole reports are included in Appendix C, Hand Auger Borehole Reports, along with the method of soil description used on the reports.

5. LABORATORY TESTING

5.1 Geotechnical

Laboratory testing on soil samples was undertaken by Mining & Civil Geotest in their NATA accredited laboratory and comprised determination of:

- particle size distribution on 2 samples; and
- Atterberg limits and linear shrinkage on 2 samples.

Laboratory test results along with the test methods followed are presented in Appendix D, Laboratory Test Results and are summarised in Table 2, Summary of Laboratory Test Results.

Table 2: Summary of Laboratory Test Results

Test ID	Depth (m)	% Gravel	% Sand	% Fines	LL (%)	PI (%)	LS (%)
BH01	0.5 – 1.0	7	53	40	41	21	10.0
CPT02	1.5 – 1.8	5	43	52	63	37	13.0

LL: Liquid Limit PI: Plasticity Index LS: Linear Shrinkage

5.2 Contamination

Laboratory analysis was performed by a NATA-accredited laboratory on selected soil samples and included the following analyses:

- total recoverable hydrocarbons (TRH);
- benzene, toluene, ethylbenzene and xylenes (BTEX);
- heavy metals; and
- pesticides.

6. SITE CONDITIONS

6.1 Geology

The Perth sheet of the 1:50,000 scale Environmental Geology series map indicates that the area is underlain by:

- PEBBLY SILT – strong brown silt with common, fine to occasionally coarse-grained, subrounded laterite quartz, heavily weathered granite pebble, some fine to medium-grained quartz sand, of alluvial origin.

The findings of our investigation are generally in accordance with the geology mapping, with the exception being that the fines content is of a clayey nature.

There is no reason to expect differing underlying geology on Lots 12 & 13.

6.2 Subsurface Conditions

LOTS 18 & 137

Based on the materials encountered within the hand auger boreholes and inferred from the CPTs, the soils appear to be relatively consistent across the site and general site conditions below the pavements can be summarised as:

- FILL - LIMESTONE and LATERITIC BASECOURSE: Gravelly SAND (SP), fine to coarse grained, 25% to 30% fine to medium grained gravel, pale yellow/dark grey/brown, very dense, dry, present from below asphaltic concrete pavement, extending to depths of between 0.3 m and 0.5 m; overlying
- SAND (SP), fine to coarse grained, grey to pale grey, generally with some (5% to 10%) low to medium plasticity clay fines, dry, medium dense to very dense, present beneath the basecourse, extending to depths of between 0.5 m and 1.5 m; overlying
- Clayey SAND/Sandy CLAY (SC/CH), fine to coarse grained, 20% to 30% medium to high plasticity clay fines increasing with depth (~50%), grey to brown, very stiff to hard (locally firm to stiff near the top of this layer), locally cemented, dry, locally present beneath the basecourse, extending to the maximum depth of investigation of 6.0 m.

Note: Soil descriptors (grain size, plasticity, colour and moisture) apply only to the upper 2.0 m of the profile as no sample was recovered below this depth. Material type below this depth is inferred from Robertson et al (1986) CPT interpretation.

LOTS 12 & 13

No intrusive testing was done on Lots 12 & 13. We expect that the subsurface conditions on these lots will be similar to those across the site, with the possible exception of the presence of basecourse, at least on Lot 13 (where a house is still present). A hardstand (probably unsealed) appears to be present across Lot 12, so the subsurface conditions on Lot 12 are likely to be very similar to those across the site.

6.3 Groundwater

The Perth Groundwater Atlas (1997) does not extend to this area. However, from experience on nearby sites, we would expect that a shallow perched water table develops on the near-surface clayey soils during the wetter times of the year.

Groundwater was not encountered within any of the CPT holes due to collapse of the hole following extraction of the probe (maximum depth of collapse was 3.3 m below ground level)

7. GEOTECHNICAL ASSESSMENT

7.1 Preliminary Site Classification

We consider that the site is geotechnically suitable for the proposed residential development. We do not consider that there are any geotechnical reasons that would prevent a different land use on the site (particularly residential uses) compared to the current commercial/industrial type use.

We have assessed the site classification in accordance with AS2870-2011 "Residential Slabs and Footings". We consider a preliminary site classification of "Class S" is applicable for the site, due to the presence of shallow clayey soils across the site. This site classification assumes that appropriate site preparation recommendations outlined in Section 7.5 are undertaken. This site classification also relies on no significant (> 200 mm) cut being carried out resulting in a reduction of the thickness of granular materials overlying clayey deposits. If significant excavation is proposed, this site classification may need to be revised.

Improvement of the site to "Class A" is possible with importation and placement of inert sand fill to produce a total thickness of about 1.8 m of inert fill overlying clayey material below building footprints.

Any fill required to achieve improvement of the site classification should be approved fill in accordance with Section 7.7 and comprise compacted sand (imported fill) above the expansive clayey layers.

We expect that the same recommendations as presented here for the site will be directly applicable to Lots 12 & 13 (however this should be confirmed by supplementary testing, refer to Section 9).

7.2 Site Subsoil Class

We have assessed the site subsoil class in accordance with AS1170.4-2007, "Earthquake Design Actions – Australia". We consider that a site subsoil class of 'Ce' is appropriate for the site. This is based on the presence of very stiff to hard clayey material and the expected depth to rock being less than 60 m.

7.3 Shallow Footings

We consider that shallow pad and strip footings can be used to support the proposed development, provided the site preparation measures detailed in Section 7.5 are followed. Shallow footings may be designed assuming a maximum allowable bearing pressure of up to 200 kPa for footings with a minimum embedment depth of 0.5 m and a minimum plan dimension of 1 m. Settlements of footings will depend on the applied bearing pressures, however large settlements (>20 mm) for any given footing size are not anticipated (including differential settlements).

Code-compliant footings in accordance with AS2870 may also be constructed for residential dwellings.

The site preparation measures outlined in 7.5 must be adopted to use shallow footings.

We must be consulted for further advice on specific structures once details of these are available.

7.4 Earth Retaining Structures

Retaining structures must be designed in accordance with AS 4678-2002 "Earth-Retaining Structures". All retaining walls at the site must be backfilled with free-draining fill, e.g. sand (imported free draining sand fill with less than 5% fines) or 'blue metal' gravel. Such free-draining fill must be used within 500 mm of retaining walls. We do not consider the *in situ* clayey material to be suitable as backfill directly behind retaining walls. Drainage via collector pipework and a discharge point must be installed behind the wall.

For the design of retaining structures, the following parameters are considered appropriate for medium dense compacted sand backfill:

- angle of internal friction, $\phi = 36°$;
- coefficient of active earth pressure $K_a = 0.26$;
- coefficient of passive earth pressure $K_p = 3.85$;
- at rest coefficient of earth pressure $K_0 = 0.41$; and
- bulk density: 18 kN/m^3.

7.5 Site Preparation

The site preparation measures outlined below are aimed at improvement of the site in preparation for construction of structures including on-ground slabs, shallow footings, retaining walls and pavements.

- Remove asphalt, footings, slabs, buried services and any deleterious material from site. Where possible, demolition material should be segregated and all unsuitable / deleterious material removed from site. Inert fill material (e.g. basecourse gravel, concrete rubble smaller than 100 mm, etc) may be stockpiled for re-use as structural fill, subject to inspection and approval by a geotechnical engineer.
- Compact ground surface to achieve the level of compaction specified in Section 7.6 to a minimum depth of 0.9 m below surface.
- Where fill is required to raise site surface levels, approved fill must be used (refer to Section 7.7), placed and compacted in layers of no greater than 300 mm loose thickness.
- Excavate footing trenches and compact the exposed bases to achieve the level of compaction specified in Section 7.6 to a depth of at least 0.9 m below all footings and pavements.

The above are only preliminary site preparation procedures based on limited geotechnical information. The final site procedures are also likely to depend to a large extent on the actual development. Additional geotechnical studies are required to confirm the nature, extent and thickness of the clayey soils present across the site. This information will enable more definitive site preparation procedures to be provided, including a means of dealing with stormwater drainage and seepage into the sand fill on site given the clayey underlying soils.

7.6 Compaction

If approved granular fill is used to build up the site, the material must be compacted using suitable compaction equipment to achieve a dry density ratio (DDR) of at least 95% MMDD (maximum modified dry density) as determined in accordance with AS 1289 5.2.1.

Where sand is used as fill, a Perth sand penetrometer (PSP) may be used for compaction control.

The following minimum PSP blow counts must be met:

- 150 mm-450 mm: 8
- 450 mm-750 mm: 10
- 750 mm-900 mm: 6 (or 750 mm-1050 mm: 12)

Note: Use of the PSP is not appropriate for gravelly soils and where the fines content of the sand exceeds about 5%. In such cases, density testing must be done using a nuclear density gauge in accordance with AS1289.5.8.1-2007. Clayey soils must be compacted to a target dry density ratio of 95% SMDD (standard maximum dry density, AS1289.5.1.1).

Over-excavation and replacement of loose materials must be carried out where the minimum density cannot be achieved.

Fill must be placed in horizontal layers of not greater than 0.3 m loose thickness. Each layer must be compacted by suitable compaction equipment, and carefully controlled to ensure even compaction over the full area and depth of each layer.

TESTING

After compaction, verify that the required level of compaction has been achieved by testing within any fill and to a minimum depth of 0.9 m below foundations:

- on each lift of fill at the rate of 1 test per 500 m^3;
- at each spread footing location (unless footings are in clayey soil);
- at 7.5 m centres below on-ground slabs; and
- at 10 m centres on pavement subgrades.

Testing of clayey or mixed clayey/sandy soils to depth is not possible with the nuclear density gauge. In this instance, a dynamic cone penetrometer may be used. A minimum target blow count of 3 blows/100 mm should be achieved to 0.9 m depth below footings provided that the clayey material is within 2% wet of OMC (optimum moisture content).

7.7 Approved Fill

Imported granular fill must comply with the material requirements as stated in AS 3798-2007, "Guidelines on Earthworks for Commercial and Residential Developments". Sand fill must comprise clean sand that is free of organic matter and have a fines content of less than 5%.

The *in situ* clayey material present at the site is not considered to be suitable for re-use as inert structural fill as it generally contains elevated levels of fines. Re-use is possible if required below any inert layers of sand and gravel. Any organic-rich soil or soil containing significant proportions of fines (material less than 0.075 mm in size) must not be used as structural fill.

Where doubt exists, a geotechnical engineer must be engaged to inspect and approve the use of potential fill materials.

7.8 Excavatability

Generally, excavations are likely to be achieved only to shallow depths (between about 1.5 m and 2.5 m) using conventional excavation equipment (10 tonne to 12 tonne excavator equipped with a toothed bucket). Deeper excavations (into hard Sandy CLAY) are likely to require the use of more powerful excavators (20 tonne to 30 tonne machines equipped with narrow (450 mm to 600 mm wide) toothed rock buckets.

Batters in the clayey soils at the site may be up to 1V:1H for temporary slopes and 1V:2H for permanent slopes. These values are for batters up to 2 m high and without seepage from the face or loading at the crest. Vertical trenching of up to 1 m deep is permissible for service trenches or footing trenches provided man entry is not permitted.

Excavations in sand are particularly prone to instability unless support is provided. Care must be exercised in such excavations and appropriate safety measures adopted where necessary. Excavations must be battered at slopes no steeper than 1V:2H for temporary slopes and 1V:3H for permanent slopes above the water table. Even at these slope angles erosion and rilling may occur.

A geotechnical engineer must be consulted where there is any doubt regarding the stability or safety of unsupported excavations.

7.9 Stormwater Disposal

As the *in situ* soil has a relatively high fines content, it is likely to have a very low permeability. This means that the use of soakwells for the disposal of stormwater is not recommended (unless a significant thickness (say 1.2 m) of permeable sand is placed and compacted). We recommend that stormwater be disposed of either into drainage swales or off-site into the local authority's stormwater drainage subject to their regulations.

7.10 Pavement Design

If subgrades can be kept dry and where adequate site preparation measures have been completed (i.e. pavement subgrades comprise compacted, dry to moist *in situ* clayey material), pavement thickness design may be undertaken assuming a preliminary subgrade California bearing ratio, CBR=10%. However, where the subgrade may become saturated a CBR value of 3% to 4% is expected.

It is likely that sand filling of the site will be done, in which case if at least 0.5 m thickness of sand fill (or limestone/laterite basecourse, such is already present on the site) is present, a design subgrade CBR of 10% may be assumed (although for improved pavement performance, clay subgrades should still be kept as dry as possible, e.g. with subsoil drainage).

8. CONTAMINATION ASSESSMENT

The contamination assessment is limited to Lots 18 & 137. Based on our review of historical aerial photography and associated land uses, there is no reason to expect a significantly different outcome on Lots 12 & 13, depending on whether there are or were any hazardous materials stored on Lot 12 which may affect the soil contamination assessment.

8.1 Soil Sampling Methodology

Soil sampling was conducted in accordance with the following Australian Standards:

- AS4482.1:2005 *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil Part I Non Volatile and Semi Volatile Compounds.*
- AS 4482.2:1999 *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil Part 2 Volatile Compounds.*

Recovery of soil samples was undertaken using a hand auger to 1 m BGL (below ground level). Soil was directly recovered from the boreholes and transferred directly into an appropriately labelled, laboratory supplied soil jar and filled to zero headspace. All samples were stored on ice within an esky, prior to submission to the laboratory for analysis. All soil samples were couriered to the laboratory at the conclusion of the field work, with adequate packing and ice to ensure that they arrived intact and at the appropriate temperature to ensure sample preservation.

In order to determine the vertical extent of contamination, soil samples were collected from multiple depths at each sampling location. Samples were collected from the surface (0.0-0.1 mBGL) and then at 0.5 m intervals, or changes in strata, thereafter. A new pair of nitrile, disposable gloves was used for each sampling interval.

The soil lithology was recorded on a soil borelog sheet. The soil borelogs also record any indications of the presence of contamination, including odour and sheen, the presence of any foreign material or objects, unique sample identifiers, any QA/QC sample details, and the GPS coordinates at the borehole location.

8.2 Contamination Test Results

Criteria for the assessment of soil contamination have been adopted from the National Environmental Protection Council (NEPC) (2013) *National Environmental Protection (Assessment of Site Contamination) Measure* guideline document.

Soil analytical results are presented in Table 3 to Table 5 and are discussed below.

- All metal concentrations across the site where either below the LOR and/or conformed to the adopted criteria.
- All pesticide concentrations across the site where either below the LOR and/or conformed to the adopted criteria.
- All TRH and BTEX concentrations across the site where either below the LOR and/or conformed to the adopted criteria.

Table 3: Soil Analysis - Heavy Metals

	Aluminium (mg/kg)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium III) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
Residential A (NEPM, 2013)	-	100	20	-	6000	300	40	400	710
Sample ID									
BH01/0.0	<2	37	<0.4	7.8	6.6	44	<0.1	<5	120
BH02/0.0	<2	<10	<0.4	<5	<5	11	<0.1	<5	25
BH03/0.0	3.2	49	<0.4	24	13	45	0.5	5.6	140
BH04/0.0	<2	85	0.5	7.1	24	100	<0.5	<5	360
BH05/0.0	<2	10	<0.4	<5	<5	<5	<0.1	<5	<5
BH06/0.0	<2	23	<0.4	6.4	5.8	20	<0.1	<5	44
BH07/0.0	7.0	10	<0.4	72	<5	33	<0.1	<5	45
BH08/0.0	4.3	<10	<0.4	48	<5	15	<0.1	<5	8.1
BH09/0.0	<2	19	<0.4	6.1	<5	14	<0.1	<5	11

*shading denotes an exceedance

Table 4: Soil Analysis – OC/OP Pesticides

	DDT+DDE+DDD	Aldrin and Dieldrin	Chlordane	Heptachlor	Endrin	Heptachlor	Methoxychlor	Toxaphene	Chlorpyrifos
Residential A (NEPM, 2013)	240	6	50	270	10	6	300	20	160
Sample ID									
BH01/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2
BH02/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2

	DDT+DDE+DDD	Aldrin and Dieldrin	Chlordane	Heptachlor	Endrin	Heptachlor	Methoxychlor	Toxaphene	Chlorpyrifos
Residential A (NEPM, 2013)	240	6	50	270	10	6	300	20	160
Sample ID									
BH03/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2
BH04/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2
BH05/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2
BH06/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2
BH07/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2
BH08/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2
BH09/0.0	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<1	<0.2

Table 5: HSL and ESL (mg/kg) for vapour intrusion in sandy soils (mg/kg)

	C_6-C_{10}	C_{10}-C_{16}	C_{16}-C_{34}	C_{34}-C_{40}	Toluene 0m to <1m sand (mg/kg)	Ethylbenzene 0m to <1m sand (mg/kg)	Xylenes 0m to <1m sand (mg/kg)	Naphthalene 0m to <1m sand (mg/kg)	Benzene 0m to <1m sand (mg/kg)	F1 C6-C10 fine ESL	F2 >C10-C16 fine ESL
Residential A (NEPM, 2013)	-	-	-	-	160	55	40	3	0.5	800	1000
Sample ID											
BH01/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50
BH02/0.0	<20	390	420	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	390
BH03/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50
BH04/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50
BH05/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50
BH06/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50
BH07/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50
BH08/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50
BH09/0.0	<20	<50	<100	<100	<0.1	<0.1	<0.3	<0.5	<0.1	<20	<50

8.3 Discussion

Soil analytical results were below the adopted criteria at all sampling locations across the site indicating that it is likely that the site does not pose a risk to human health or the surrounding environment. It should be noted that we have not made an assessment of groundwater quality beneath the site. As such, no comment can be provided on the suitability of groundwater for a range of uses including drinking and irrigation.

At this stage, there does not appear to be any reason to expect that contamination factors will prevent re-zoning of the site for different uses (including residential uses).

9. ADDITIONAL TESTING

We recommend that additional intrusive testing be done on Lots 12 & 13 prior to any detailed design being carried out, to confirm that the expected subsurface conditions (including contamination status) are in accordance with the recommendations in this report prior to detailed design being carried out. This would include, as a minimum, a site walkover by an environmental scientist and the drilling of a further 3 hand augered boreholes and one CPT across Lots 12 & 13. Further contamination testing would also be required.

We can arrange this testing if required.

10. CLOSURE

We draw your attention to Appendix F of this report, Understanding Your Report. The information provided within is intended to inform you as to what your realistic expectations of this report should be. Guidance is also provided on how to minimise risks associated with groundworks for this project. This information is provided not to reduce the level of responsibility accepted by Galt, but to ensure that all parties who rely on this report are aware of the responsibilities each assumes in so doing.

GALT GEOTECHNICS PTY LTD

Owen Woodland CPEng
Geotechnical Engineer

Brad Palmer
Environmental Scientist

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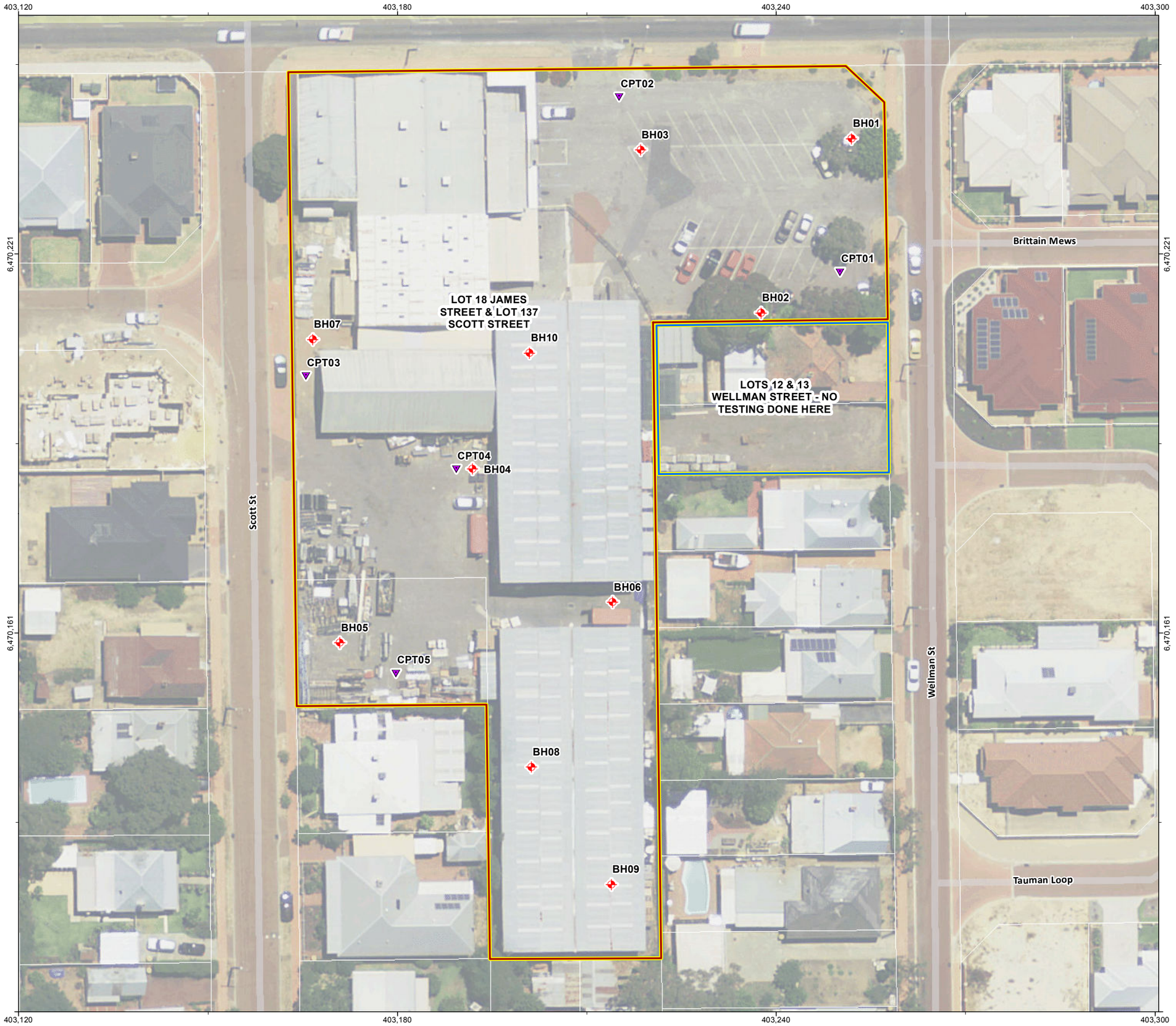
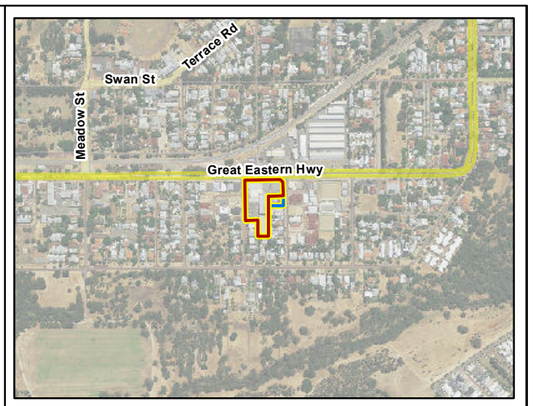
Figures

www.galtgeo.com.au
4/15 Walters Dr, OSBORNE PARK WA 6017

ABN: 64 625 054 729





Legend

- Site Boundary (LOT 18 JAMES ST & LOT 137 SCOTT ST)
- Site Boundary (LOTS 12 & 13 WELLMAN ST)
- Borehole
- Cone Penetration Test

N

0 9.5 19 28.5 38 47.5

Meters

SCALE	1:600 (A3)
DRAWN	JW
DATE DRAWN	13/01/2015
CHECKED	ORW
DATE CHECKED	13/01/2015
PROJECTION	GDA 1994 MGA Zone 50

Galt Geotechnics Pty Ltd
ACN : 138 490 865
Tel : +61 (0)8 6272-0200
Fax : +61 (0)8 9285 8444
Address : U2, 39 Flynn Street, Wembley, WA, 6014

CLIENT	**DODD & DODD PTY LTD**
PROJECT	PROPOSED RESIDENTIAL APARTMENTS
LOCATION	LOT 18 JAMES STREET AND LOT 137 SCOTT STREET GUILDFORD
TITLE	SITE & LOCATION PLAN
Job No	J1401218
Fig No	FIGURE 1
Rev	**A**

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Appendix A: Site Photographs

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Photograph 1: Looking southwest across yard towards CPT04 location

Photograph 2: CPT rig at CPT01 location

Photograph 3: Service locating at CPT01 location

Photograph 4: Looking north from BH09 location

Photograph 5: Looking east across northern carpark towards BH01 location

Photograph 6: Looking south from near BH10

Appendix B: Cone Penetration Test Results

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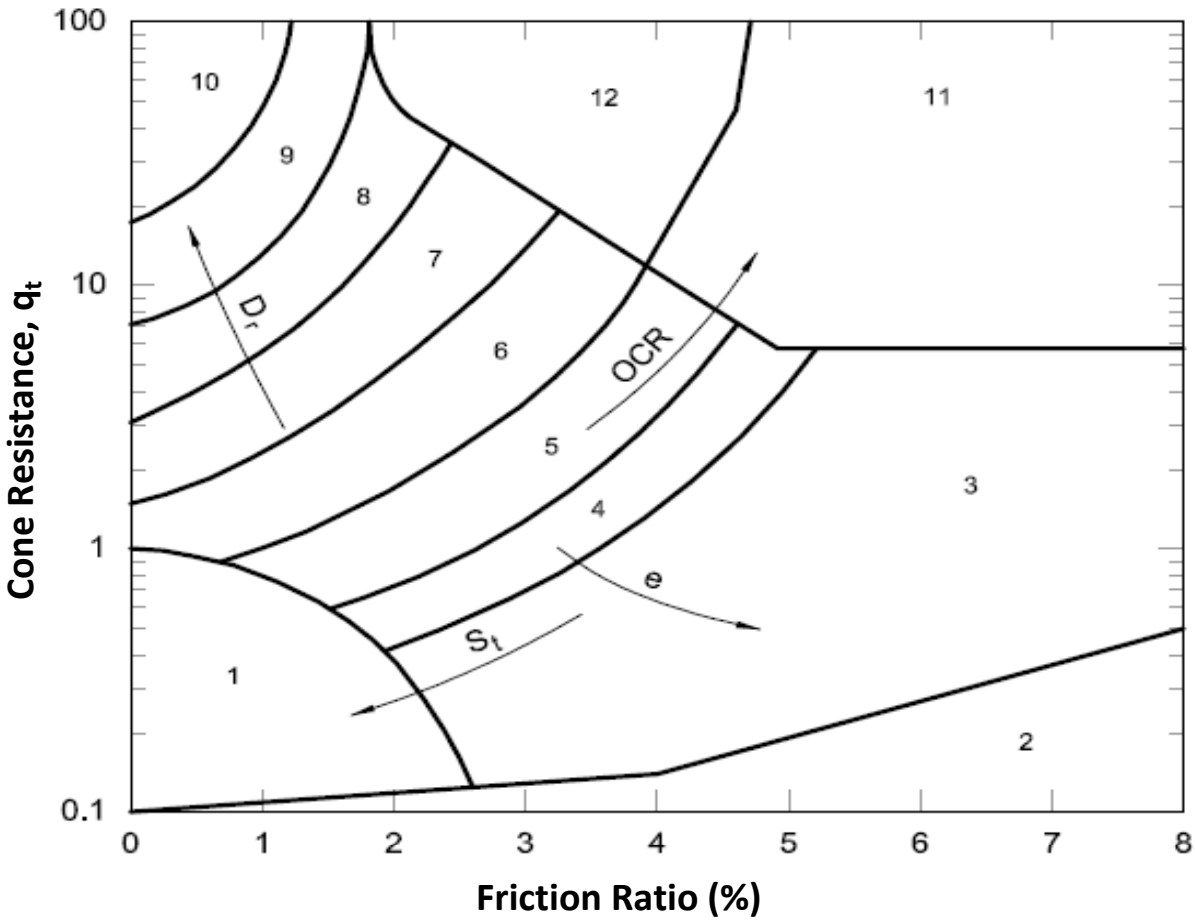


DEFINITIONS

q_t : Cone tip resistance corrected for pore water pressure
S_t : Sensitivity
e : Void ratio
D_r : Relative density
OCR : Overconsolidation ratio
OC : Overconsolidated

SOIL BEHAVIOUR TYPE ZONES

1. Sensitive fine grained
2. Organic material
3. Clay
4. Silty clay to clay
5. Clayey silt to silty clay
6. Sandy silt to clayey silt
7. Silty sand to sandy silt
8. Sand to silty sand
9. Sand
10. Gravelly sand to sand
11. Very stiff fine grained material (OC/cemented)
12. Sand to clayey sand (OC/cemented)

NOTES

A. Some overlap in type zones is expected
B. Local correlations are preferred and may indicate soil type boundaries that are different from those shown above

Reference: Robertson, P.K., Campanella, R.G., Gillespie, D. and Grieg, J. (1986) "Use of Piezometer Cone Data". Proceedings of the ASCE Speciality Conference In Situ '86: Use of In Situ Tests in Geotechnical Engineering, Blacksburg, pp 1263-80, American Society of Civil Engineers (ASCE)

Galt GEOTECHNICS

CONE PENETRATION TESTING (CPT) SOIL TYPE INTERPRETATION

ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Dodd & Dodd Pty Ltd

Date: 19/11/14

PROJECT: Proposed Residential Apartments

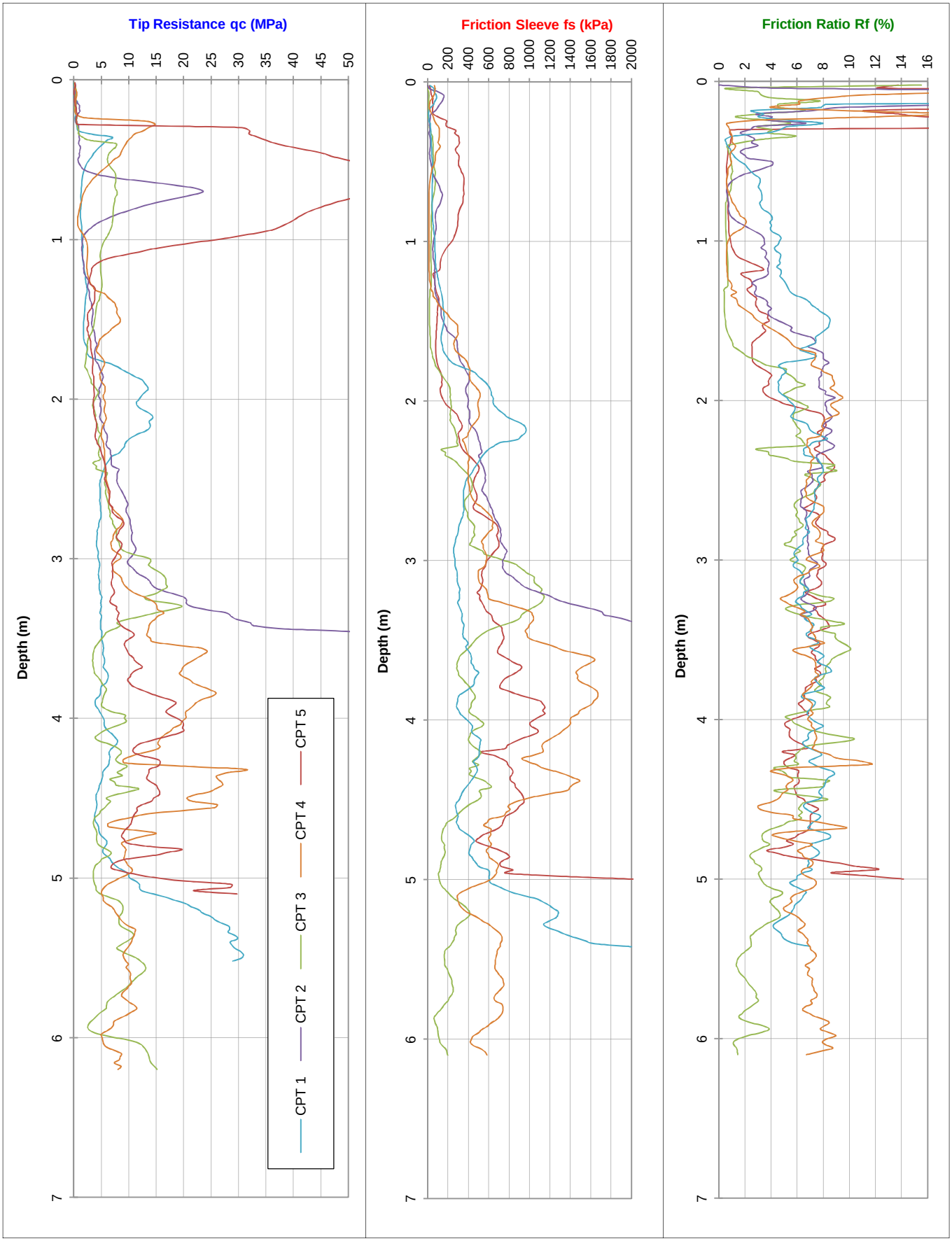
Probe No.: All Data

LOCATION: Lot 18 James Street & Lot 137 Scott Street, Guildford

Job Number: J1401218

RL (m):

Co-ordinates:



PROBEDRILL GEOTECHNICAL SURVEY

Water (m):

Refusal:

Tested in accordance with AS 1289.6.5.1 - 1999 and IRTP 2001 for friction reducer

File:

Cone I.D. :

Dummy probe to (m):

22 tonne truck mounted CPT Rig (Merc)

ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Dodd & Dodd Pty Ltd

Date: Wednesday, 19 November 2014

PROJECT: Proposed Residential Apartments

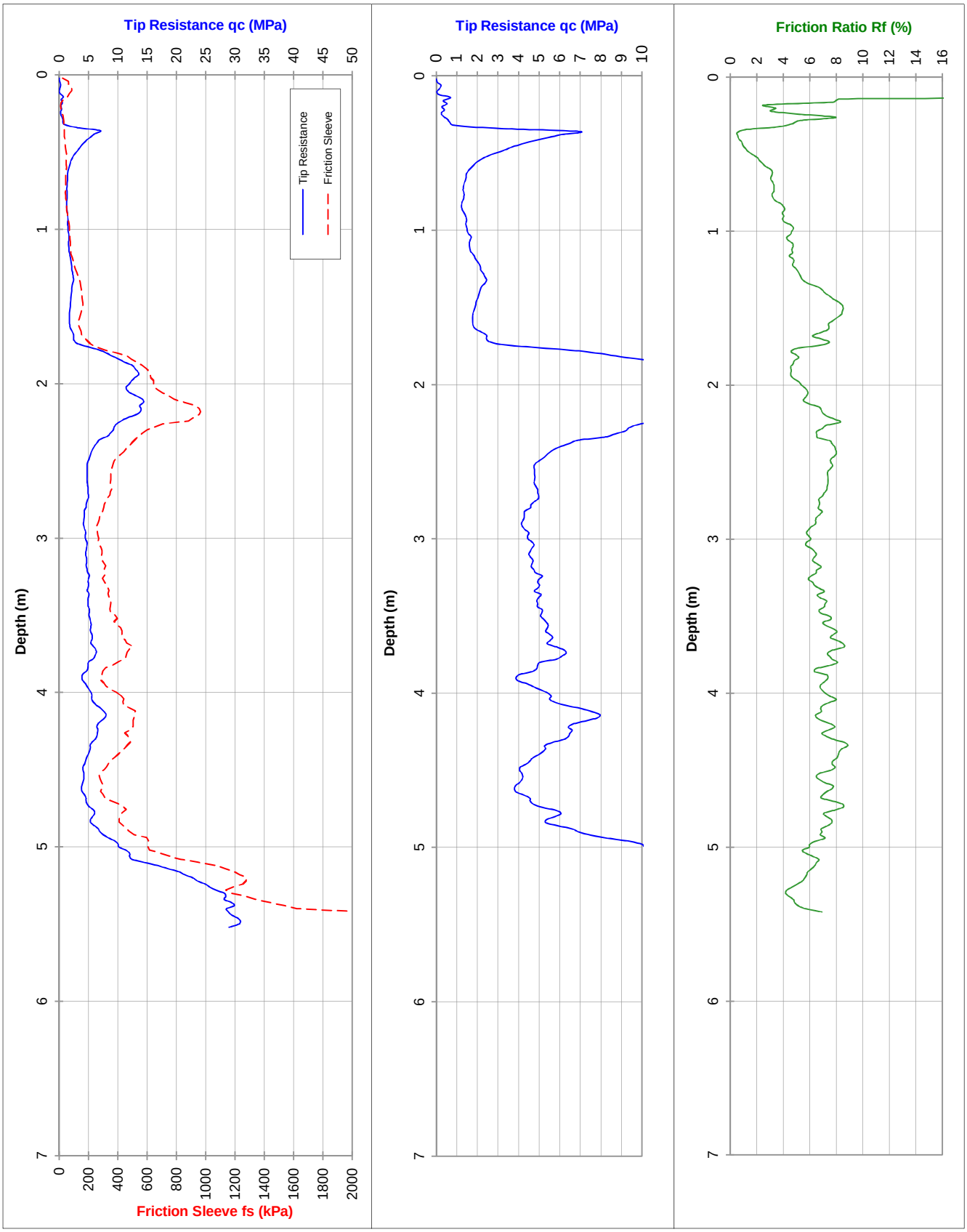
Probe No.: CPT 1

LOCATION: Lot 18 James Street & Lot 137 Scott Street, Guildford

Job Number: J1401218

RL (m):

Co-ordinates:



PROBEDRILL GEOTECHNICAL SURVEY

Water (m): Dry to 3.1

Refusal: 2000kPa

Tested in accordance with AS 1289.6.5.1 - 1999 and IRTP 2001 for friction reducer

File: GL0488G

Cone I.D. : EC28

Dummy probe to (m): 0.3

22 tonne truck mounted CPT Rig (Merc)

ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Dodd & Dodd Pty Ltd

Date: Wednesday, 19 November 2014

PROJECT: Proposed Residential Apartments

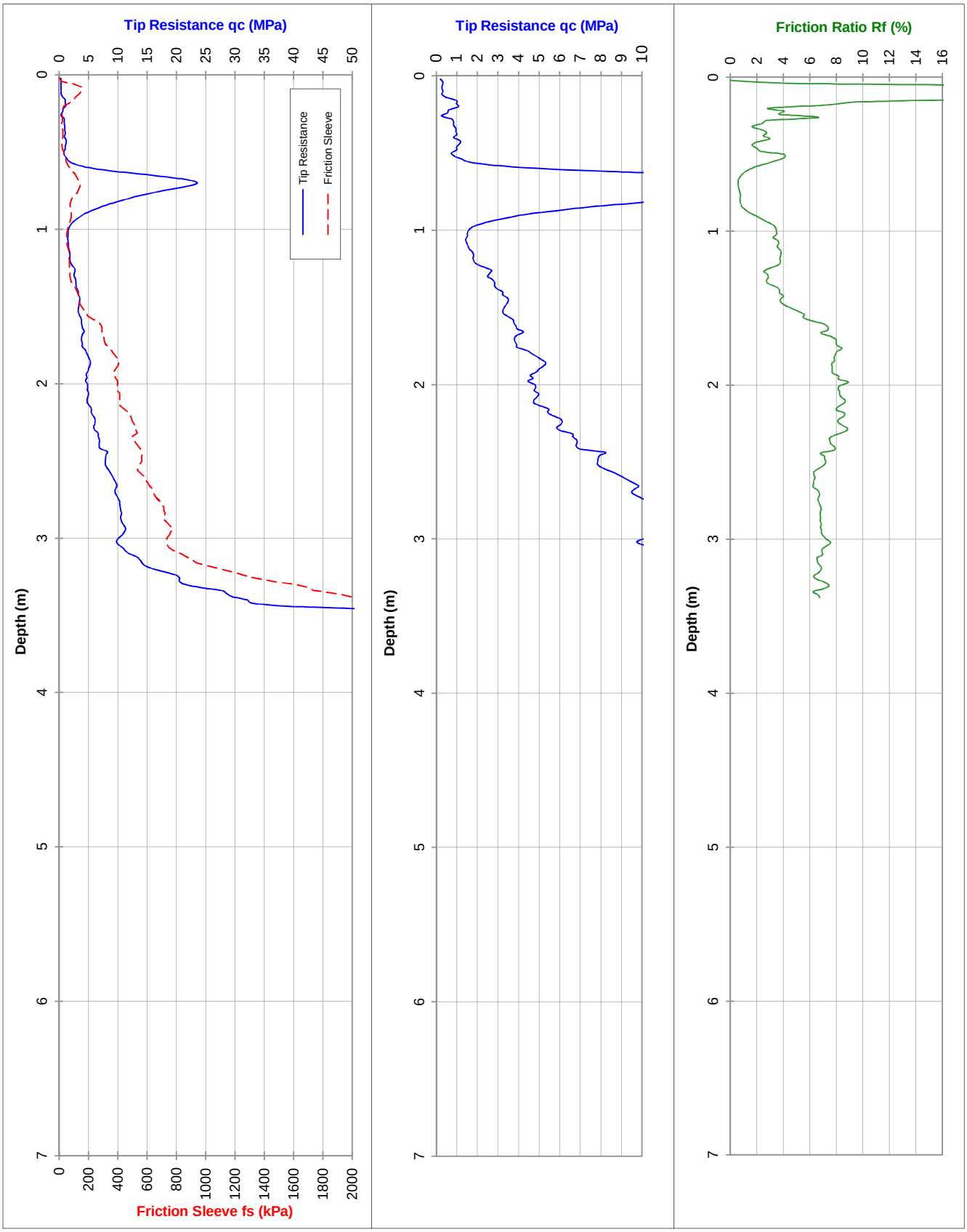
Probe No.: CPT 2

LOCATION: Lot 18 James Street & Lot 137 Scott Street, Guildford

Job Number: J1401218

RL (m):

Co-ordinates:



PROBEDRILL GEOTECHNICAL SURVEY

Water (m): Dry to 3.3

Refusal: 2000kPa Soil Sample (m): 1.5 - 2.0

Tested in accordance with AS 1289.6.5.1 - 1999 and IRTP 2001 for friction reducer

File: GL0487G Cone I.D. : EC28 Dummy probe to (m): 0.5 22 tonne truck mounted CPT Rig (Merc)

ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Dodd & Dodd Pty Ltd

Date: Wednesday, 19 November 2014

PROJECT: Proposed Residential Apartments

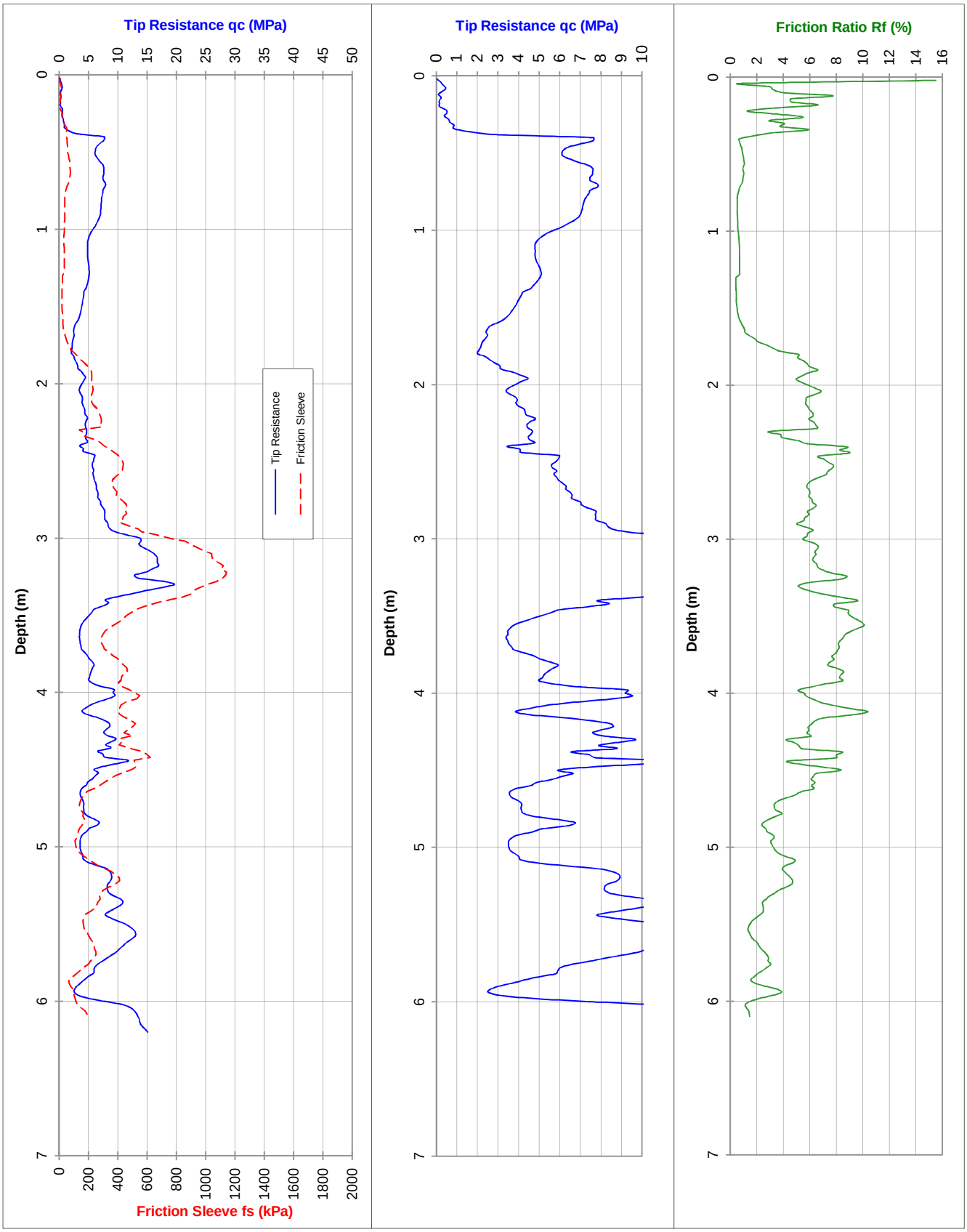
Probe No.: CPT 3

LOCATION: Lot 18 James Street & Lot 137 Scott Street, Guildford

Job Number: J1401218

RL (m):

Co-ordinates:



PROBEDRILL GEOTECHNICAL SURVEY

Water (m): Dry to 3.2

Refusal:

Tested in accordance with AS 1289.6.5.1 - 1999 and IRTP 2001 for friction reducer

File: GL0486G

Cone I.D. : EC28

Dummy probe to (m): 0.4

22 tonne truck mounted CPT Rig (Merc)

ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Dodd & Dodd Pty Ltd

Date: Wednesday, 19 November 2014

PROJECT: Proposed Residential Apartments

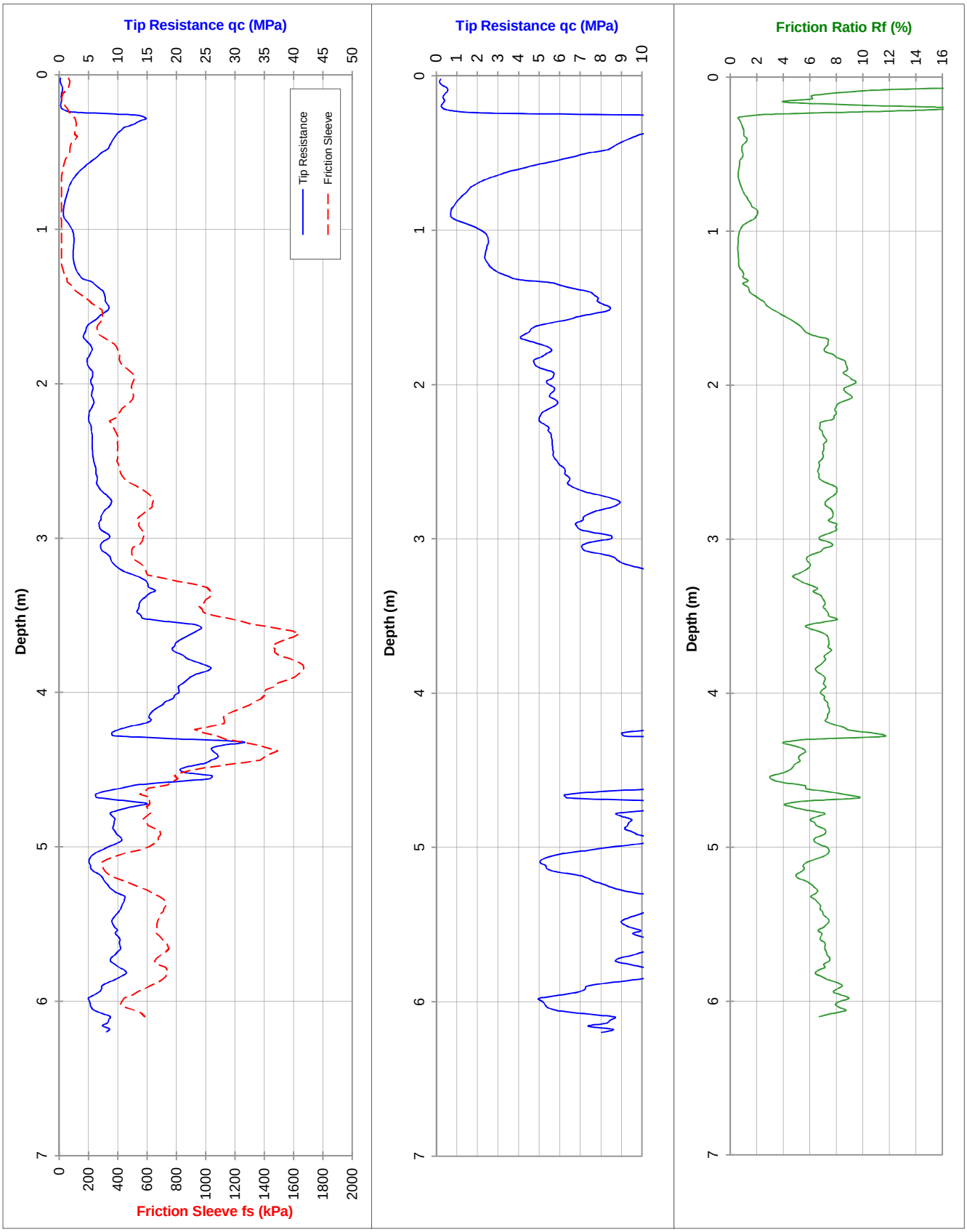
Probe No.: CPT 4

LOCATION: Lot 18 James Street & Lot 137 Scott Street, Guildford

Job Number: J1401218

RL (m):

Co-ordinates:



PROBEDRILL GEOTECHNICAL SURVEY

Water (m): Dry to 3.1

Refusal:

Tested in accordance with AS 1289.6.5.1 - 1999 and IRTP 2001 for friction reducer

File: GL0489G

Cone I.D. : EC28

Dummy probe to (m): 0.3

22 tonne truck mounted CPT Rig (Merc)

ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Dodd & Dodd Pty Ltd

Date: Wednesday, 19 November 2014

PROJECT: Proposed Residential Apartments

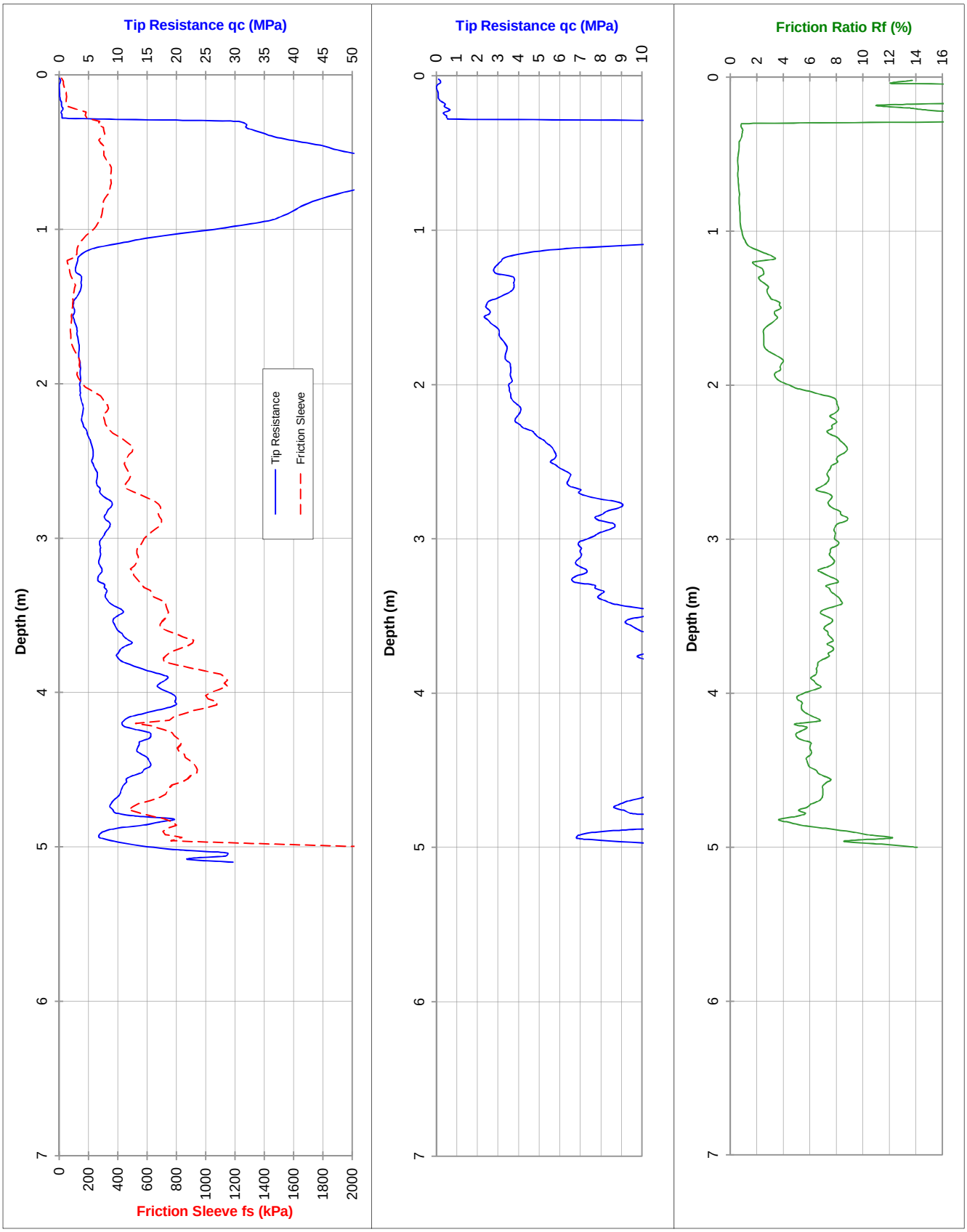
Probe No.: CPT 5

LOCATION: Lot 18 James Street & Lot 137 Scott Street, Guildford

Job Number: J1401218

RL (m):

Co-ordinates:



PROBEDRILL GEOTECHNICAL SURVEY

Water (m): Dry to 3.2

Refusal: 2000kPa

Tested in accordance with AS 1289.6.5.1 - 1999 and IRTP 2001 for friction reducer

File: GL0485G

Cone I.D. : EC28

Dummy probe to (m): 0.3

22 tonne truck mounted CPT Rig (Merc)

Appendix C: Hand Auger Borehole Reports

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ABN: 64 625 054 729

METHOD OF SOIL DESCRIPTION
BOREHOLE AND TEST PIT REPORTS

GRAPHIC LOG & UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) SYMBOLS

Graphic	USCS	Soil Name
		FILL (various types)
		COBBLES
		BOULDERS
	GP	GRAVEL (poorly graded)
	GW	GRAVEL (well graded)
	GC	Clayey GRAVEL
	SP	SAND (poorly graded)
	SW	SAND (well graded)
	SC	Clayey SAND

Graphic	USCS	Soil Name
	SM	Silty SAND
	ML	SILT (low liquid limit)
	MH	SILT (high liquid limit)
	CL	CLAY (low plasticity)
	CI	CLAY (medium plasticity)
	CH	CLAY (high plasticity)
	OL	Organic SILT (low liquid limit)
	OH	Organic SILT (high liquid limit)
	Pt	PEAT

RESISTANCE TO EXCAVATION

Symbol	Term	Description
VE	Very easy	All resistances are relative to the selected method of excavation
E	Easy	
F	Firm	
H	Hard	
VH	Very hard	

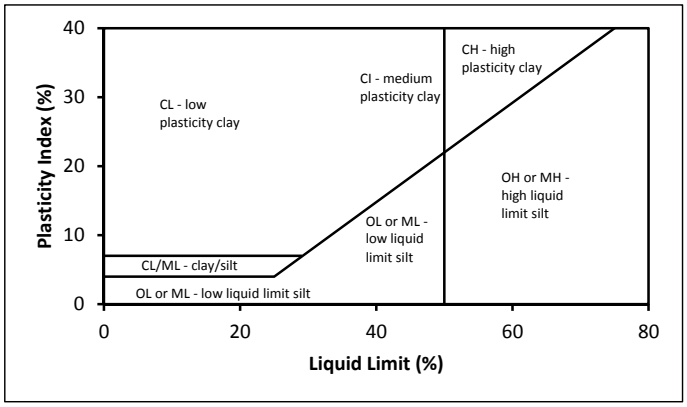
SOIL CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil descriptions are based on AS1726-1993, Appendix A. Material properties are assessed in the field by visual/tactile methods in combination with field testing techniques (where used).

PARTICLE SIZE

Soil Name		Particle Size (mm)
BOULDERS		>200
COBBLES		63 to 200
GRAVEL	Coarse	20 to 63
	Medium	6 to 20
	Fine	2 to 6
SAND	Coarse	0.6 to 2.0
	Medium	0.2 to 0.6
	Fine	0.075 to 0.2
FINES	SILT	0.002 to 0.075
	CLAY	<0.002

PLASTICITY PROPERTIES



MOISTURE CONDITION

AS1726-1993

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays and silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition and may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

CONSISTENCY AND DENSITY

AS1726-1993 and HB160-2006

Symbol	Term	Undrained Shear Strength (kPa)	SPT "N"	DCP blows per 100 mm
VS	Very Soft	0 to 12	0 to 2	<1
S	Soft	12 to 25	2 to 4	<1
F	Firm	25 to 50	4 to 8	1 to 2
St	Stiff	50 to 100	8 to 15	3 to 4
VSt	Very Stiff	100 to 200	15 to 30	5 to 10
H	Hard	>200	>30	>10

Symbol	Term	Density Index (%)	SPT "N"	DCP blows per 100 mm	PSP Blows per 300 mm
VL	Very Loose	<15	0 to 4	<1	0 to 2
L	Loose	15 to 35	4 to 10	1 to 2	2 to 6
MD	Medium Dense	35 to 65	10 to 30	2 to 3	6 to 8
D	Dense	65 to 85	30 to 50	4 to 8	8 to 15
VD	Very Dense	>85	>50	>8	>15

Note: PSP correlations only valid to 450 mm depth

Consistency and density may also be inferred from excavation performance and material behaviour.

EXPLANATORY NOTES TO BE READ WITH BOREHOLE AND TEST PIT REPORTS

METHOD OF DRILLING OR EXCAVATION

AC	Air Core	E	Excavator	PQ3	PQ3 Core Barrel
AD/T	Auger Drilling with TC-Bit	EH	Excavator with Hammer	PT	Push Tube
AD/V	Auger Drilling with V-Bit	HA	Hand Auger	R	Ripper
AT	Air Track	HMLC	HMLC Core Barrel	RR	Rock Roller
B	Bulldozer Blade	HQ3	HQ3 Core Barrel	SON	Sonic Rig
BH	Backhoe Bucket	N	Natural Exposure	SPT	Driven SPT
CT	Cable Tool	NMLC	NMLC Core Barrel	WB	Washbore
DT	Diatube	PP	Push Probe	X	Existing Excavation

SUPPORT

T	Timbering

PENETRATION EFFORT (RELATIVE TO THE EQUIPMENT USED)

VE	Very Easy	E	Easy	F	Firm
H	Hard	VH	Very Hard		

WATER

►	Water Inflow	▼	Water Level
◄	Water Loss (complete)		
◁	Water Loss (partial)		

SAMPLING AND TESTING

B	Bulk Disturbed Sample	P	Piston Sample
BLK	Block Sample	PBT	Plate Bearing Test
C	Core Sample	U	Undisturbed Push-in Sample
CBR	CBR Mould Sample		U50: 50 mm diameter
D	Small Disturbed Sample	SPT	Standard Penetration Test
ES	Environmental Soil Sample		Example: 3, 4, 5 N=9
EW	Environmental Water Sample		3,4,5: Blows per 150 mm
G	Gas Sample		N=9: Blows per 300 mm after
HP	Hand Penetrometer		150 mm seating interval
LB	Large Bulk Disturbed Sample	VS	Vane Shear; P = Peak
M	Mazier Type Sample		R = Remoulded (kPa)
MC	Moisture Content Sample	W	Water Sample

ROCK CORE RECOVERY

TCR = Total Core Recovery (%) $= \frac{CRL}{TCL} \times 100$

SCR = Solid Core Recovery (%) $= \frac{CCR}{TCL} \times 100$

RQD = Rock Quality Designation (%) $= \frac{ALC>100}{TCL} \times 100$

TCL	Length of Core Run
CRL	Recovered Length of Core
CCR	Total Length of Cylindrical Pieces of Core Recovered
ALC>100	Total Length of Axial Lengths of Core Greater than 100 mm Long

HAND AUGER BOREHOLE: BH01

Job Number:	J1401218	**Easting:**	403252 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470239 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0						SP	30 mm ASPHALTIC CONCRETE PAVEMENT: LIMESTONE BASECOURSE (Gravelly SAND), fine to coarse grained, pale yellow, fine to medium grained limestone gravel	D	VD	
	E				ES-BH01/0.30- *BH01-1*				SP	SAND: fine to coarse grained, sub-angular to sub-rounded, brown/pale brown		D	
	F		0.5		ES-BH01/0.50- *BH01-1* B(BH01-01)				SC	Clayey SAND: fine to medium grained, orange-brown, 30-40% medium plasticity fines, trace fine grained iron cemented nodules		F	
			1.0		ES-BH01/1.00- *BH01-1*					Hole terminated at 1.00 m Target depth Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH02

Job Number:	J1401218	**Easting:**	403237 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470212 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0		ES-BH02/0.20-*BH02-1*				SP	FILL: SAND, fine to coarse grained, grey, trace organic fines/rootlets, trace fine grained gravel	D	VD	
	H		0.5		ES-BH02/0.50-*BH02-1*				SC	Clayey SAND: fine to coarse grained, orange-brown, 30-40% low to medium plasticity fines		F - St	
			1.0		ES-BH02/0.70-*BH02-1*					Hole terminated at 0.70 m Refusal on stiff clay Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH03

Job Number:	J1401218	**Easting:**	403218 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470237 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0		ES-BH03/0.30-*BH03-1*				SP	50 mm ASPHALTIC CONCRETE PAVEMENT: BASECOURSE (Gravelly SAND), fine to coarse grained, dark grey/brown, fine grained rounded gravel	D	VD	
	E		0.5		ES-BH03/0.50-*BH03-1*				SP	SAND: fine to coarse grained, pale brown, locally with some low to medium plasticity fines		D	
	F								SC	Clayey SAND: fine to coarse grained, pale brown, 30-40% low to medium plasticity fines		F	
			1.0		ES-BH03/1.00-*BH03-1*					Hole terminated at 1.00 m Target depth Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH04

Job Number:	J1401218	**Easting:**	403192 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470187 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0						SP	30 mm ASPHALTIC CONCRETE PAVEMENT: LIMESTONE BASECOURSE (Gravelly SAND), fine to coarse grained, pale yellow, fine to medium grained limestone gravel	D	VD	
	E				ES-BH04/0.30-*BH04-1*					Clayey SAND: fine to coarse grained, dark grey, 15-20% low plasticity fines			
			0.5		ES-BH04/0.50-*BH04-1*				SC	As above, becoming pale brown		F - St	
	F												
			1.0		ES-BH04/1.00-*BH04-1*					Hole terminated at 1.00 m Target depth Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH05

Job Number:	J1401218	**Easting:**	403171 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470159 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0						SP	20 mm ASPHALTIC CONCRETE PAVEMENT: BASECOURSE (Gravelly SAND), fine to coarse grained, dark grey/brown, fine grained rounded gravel			
									SP	SUBBASE: (Gravelly SAND), fine to coarse grained, pale yellow, fine to medium grained limestone gravel (limestone subbase)		VD	
	F		0.5		ES-BH05/0.50-*BH05-1*				SP-SC	SAND/Clayey SAND: fine to coarse grained, pale brown, 5-15% low to medium plasticity fines, increasing with depth	D	MD - D	
			1.0		ES-BH05/1.00-*BH05-1*					Hole terminated at 1.00 m Target depth Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH06

Job Number:	J1401218	**Easting:**	403214 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470166 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0		ES-BH06/0.30-*BH06-1*				SP	30 mm ASPHALTIC CONCRETE PAVEMENT: BASECOURSE (Gravelly SAND), fine to coarse grained, dark grey/brown, fine grained rounded gravel As above, becoming dark grey	D	VD	
	E		0.5		ES-BH06/0.50-*BH06-1*				SP	SAND: fine to coarse grained, grey, with some low to medium plasticity fines		MD - D	
	F								SC	Clayey SAND: fine to coarse grained, orange-brown, 20-30% low to medium plasticity fines		St	
			1.0		ES-BH06/1.00-*BH06-1*					Hole terminated at 1.00 m Target depth Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH07

Job Number:	J1401218	**Easting:**	403166 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470207 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0		ES-BH07/0.30-*BH07-1*				SP	Gravelly SAND: fine to coarse grained, brown, fine to medium grained, sub-angular to sub-rounded gravel	D	VD	
	E		0.5		ES-BH07/0.50-*BH07-1*				SP	SAND: fine to coarse grained, grey becoming pale grey, with some clay, fines increasing with depth (to approximately 10%)		MD - D	
	F		1.0		ES-BH07/1.00-*BH07-1*					Hole terminated at 1.00 m Target depth Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH08

Job Number:	J1401218	**Easting:**	403201 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470140 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0		ES-BH08/0.30-*BH08-1*					50 mm ASPHALTIC CONCRETE PAVEMENT: BASECOURSE (Gravelly SAND), fine to coarse grained, brown, fine grained rounded gravel	D	VD	
	F		0.5		ES-BH08/0.50-*BH08-1*				SP	SAND: fine to coarse grained, grey, with some low plasticity fines		D	
	H				B(BH08-)				SC	Clayey SAND: fine to coarse grained, 20-30% low plasticity fines		F - St	
			1.0		ES-BH08/0.80-*BH08-1*					Hole terminated at 0.80 m Refusal on stiff clay Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH09

Job Number:	J1401218	**Easting:**	403214 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470121 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0						SP	50 mm ASPHALTIC CONCRETE PAVEMENT: BASECOURSE (Gravelly SAND), fine to coarse grained, brown, fine grained rounded gravel		VD	
					ES-BH09/0.30-*BH09-1*								
	E		0.5		ES-BH09/0.50-*BH09-1*				SP	SAND: fine to coarse grained, grey, with some low plasticity fines	D	D	
	F								SC	Clayey SAND: fine to coarse grained, 20-30% low plasticity fines		F - St	
			1.0		ES-BH09/1.00-*BH09-1*					Hole terminated at 1.00 m Target depth Groundwater not encountered			
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

HAND AUGER BOREHOLE: BH10

Job Number:	J1401218	**Easting:**	403201 m	**Operator:**	JH	**Date:**	19/11/2014
Client:	Dodd and Dodd Pty Ltd	**Northing:**	6470205 m	**Inclination:**	-90°	**Logged:**	JH
Project:	Proposed Residential Apartments	**Datum:**	MGA94 Zone 50			**Checked Date:**	09/12/2014
Location:	Lot 18 James St and Lot 137 Scott St, Guildford					**Checked By:**	ORW

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	H		0.0						SP	50 mm ASPHALTIC CONCRETE PAVEMENT: BASECOURSE (Gravelly SAND), fine to coarse grained, brown, fine grained rounded gravel	D	VD	
			0.5							Hole terminated at 0.40 m Refusal on basecourse Groundwater not encountered			
			1.0										
			1.5										

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Appendix D: Geotechnical Laboratory Results

www.galtgeo.com.au
4/15 Walters Dr, OSBORNE PARK WA 6017
ABN: 64 625 054 729

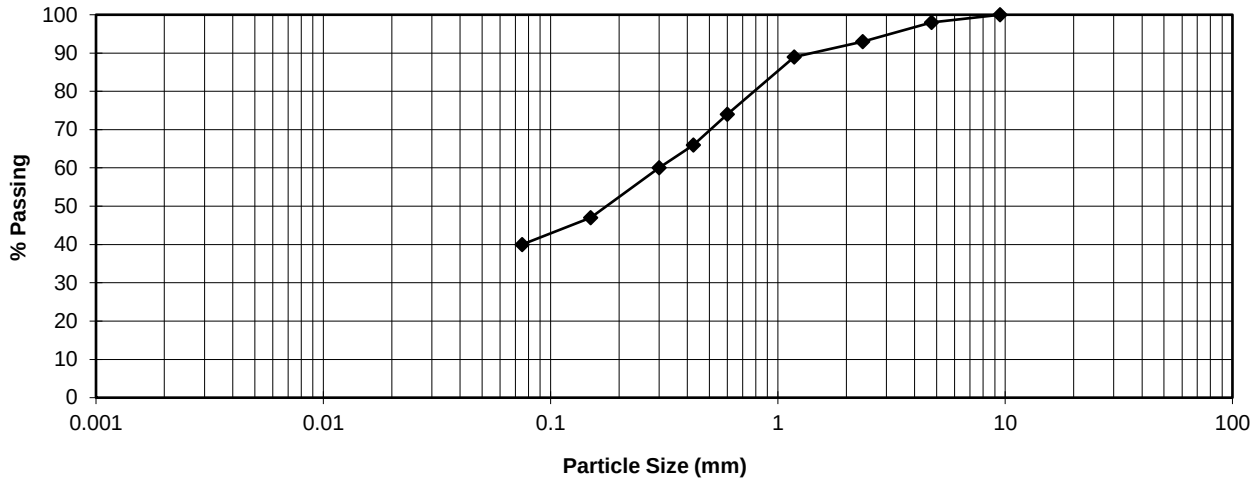
Particle Size Distribution & Plasticity Index tests

Mining & Civil
Geotest Pty Ltd
unit1/1 Pusey Road, Jandakot, WA 6164
Ph (08) 9414 8022 Fax (08) 9414 8011
Email: matt@mcgeotest.com.au

Job No:	60083
Report No:	60083-P14/4703
Sample No:	P14/4703
Issue Date:	25 November 2014

Client: Galt Geotechnics (J1401218)
Project: Proposed Residential Apartments
Location: Lot 18 James Street and Lot 137 Scott Street, Guildford

Sample location: BH01
Sample Depth (m): 0.5 - 1.0



SIEVE ANALYSIS AS 1289.3.6.1

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	
9.5	100
4.75	98
2.36	93
1.18	89
0.600	74
0.425	66
0.300	60
0.150	47
0.075	40

Plasticity index tests
AS 1289

Liquid limit 3.1.1	41	%
Plastic limit 3.2.1	20	%
Plasticity index 3.3.1	21	%
Linear shrinkage 3.4.1	10.0	%

Cracked ☑
Curled ☐

Client Address: 2/39 Flynn Street, Wembley WA

Sampling Procedure: Tested as received

NATA WORLD RECOGNISED ACCREDITATION

Approved signature

Matthew van Herk
AS PSDPI May 2009

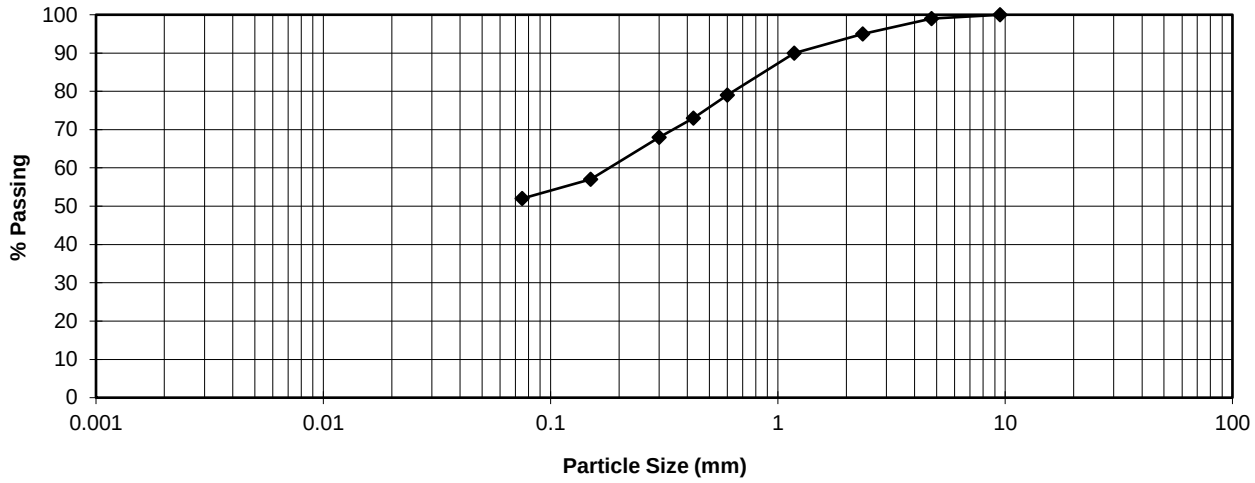
Particle Size Distribution & Plasticity Index tests

Mining & Civil
Geotest Pty Ltd
unit1/1 Pusey Road, Jandakot, WA 6164
Ph (08) 9414 8022 Fax (08) 9414 8011
Email: matt@mcgeotest.com.au

Job No:	60083
Report No:	60083-P14/4704
Sample No:	P14/4704
Issue Date:	25 November 2014

Client: Galt Geotechnics (J1401218)
Project: Proposed Residential Apartments
Location: Lot 18 James Street and Lot 137 Scott Street, Guildford

Sample location: CPT02
Sample Depth (m): 1.5 - 1.8



SIEVE ANALYSIS AS 1289.3.6.1

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	
9.5	100
4.75	99
2.36	95
1.18	90
0.600	79
0.425	73
0.300	68
0.150	57
0.075	52

Plasticity index tests
AS 1289

Liquid limit 3.1.1	63	%
Plastic limit 3.2.1	26	%
Plasticity index 3.3.1	37	%
Linear shrinkage 3.4.1	13.0	%

Cracked ☑
Curled ☐

Client Address: 2/39 Flynn Street, Wembley WA

Sampling Procedure: Tested as received

NATA WORLD RECOGNISED ACCREDITATION

Approved signature

Matthew van Herk
AS PSDPI May 2009

Appendix E: Contamination Test Results

www.galtgeo.com.au
4/15 Walters Dr, OSBORNE PARK WA 6017
ABN: 64 625 054 729

eurofins | mgt

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Galt Environment P/L
2/39 Flynn St
Wembley
WA 6014

Attention: **Brad Palmer**

Report **440417-S**
Project name DYNAMIC PLANNING SI GUILDFORD
Project ID J1401218
Received Date Nov 28, 2014

Client Sample ID			**BH01/0.0**	**BH02/0.0**	**BH03/0.0**	**BH04/0.0**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**M14-No20728**	**M14-No20729**	**M14-No20730**	**M14-No20731**
Date Sampled			**Nov 19, 2014**	**Nov 19, 2014**	**Nov 19, 2014**	**Nov 19, 2014**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	130	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	570	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	190	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	890	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	68	63	72	74
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	390	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	390	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	420	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05

Client Sample ID Sample Matrix Eurofins | mgt Sample No. Date Sampled Test/Reference	LOR	Unit	BH01/0.0 Soil M14-No20728 Nov 19, 2014	BH02/0.0 Soil M14-No20729 Nov 19, 2014	BH03/0.0 Soil M14-No20730 Nov 19, 2014	BH04/0.0 Soil M14-No20731 Nov 19, 2014
Organochlorine Pesticides						
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Dibutylchlorendate (surr.)	1	%	118	85	114	91
Tetrachloro-m-xylene (surr.)	1	%	122	91	109	95
Organophosphorous Pesticides						
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl azinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Naled	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	114	122	111	107
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	3.2	< 2
Barium	10	mg/kg	37	< 10	49	85
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	0.5
Chromium	5	mg/kg	7.8	< 5	24	7.1
Copper	5	mg/kg	6.6	< 5	13	24
Lead	5	mg/kg	44	11	45	100
Mercury	0.1	mg/kg	< 0.1	< 0.1	0.5	< 0.1
Nickel	5	mg/kg	< 5	< 5	5.6	< 5
Zinc	5	mg/kg	120	25	140	360
% Moisture	0.1	%	5.7	18	12	8.5

Client Sample ID Sample Matrix Eurofins | mgt Sample No. Date Sampled Test/Reference	LOR	Unit	BH05/0.0 Soil M14-No20732 Nov 19, 2014	BH06/0.0 Soil M14-No20733 Nov 19, 2014	BH07/0.0 Soil M14-No20734 Nov 19, 2014	BH08/0.0 Soil M14-No20735 Nov 19, 2014
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	57	74	69	71
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Dibutylchlorendate (surr.)	1	%	79	86	88	98
Tetrachloro-m-xylene (surr.)	1	%	87	90	89	75

Client Sample ID			BH05/0.0	BH06/0.0	BH07/0.0	BH08/0.0
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**M14-No20732**	**M14-No20733**	**M14-No20734**	**M14-No20735**
Date Sampled			**Nov 19, 2014**	**Nov 19, 2014**	**Nov 19, 2014**	**Nov 19, 2014**
Test/Reference	LOR	Unit				
Organophosphorous Pesticides						
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl azinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Naled	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	100	101	99	109
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	7.0	4.3
Barium	10	mg/kg	10	23	10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	< 5	6.4	72	48
Copper	5	mg/kg	< 5	5.8	< 5	< 5
Lead	5	mg/kg	< 5	20	33	15
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5	< 5	< 5
Zinc	5	mg/kg	< 5	44	45	8.1
% Moisture	0.1	%	4.7	6.5	4.8	5.4

Client Sample ID			BH09/0.0
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**M14-No20736**
Date Sampled			**Nov 19, 2014**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	< 50
TRH C29-C36	50	mg/kg	< 50
TRH C10-36 (Total)	50	mg/kg	< 50

Client Sample ID			BH09/0.0
Sample Matrix			Soil
Eurofins | mgt Sample No.			M14-No20736
Date Sampled			Nov 19, 2014
Test/Reference	LOR	Unit	
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	80
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.5	mg/kg	< 0.5
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20
TRH >C10-C16	50	mg/kg	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
Organochlorine Pesticides			
Chlordanes - Total	0.1	mg/kg	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05
a-BHC	0.05	mg/kg	< 0.05
Aldrin	0.05	mg/kg	< 0.05
b-BHC	0.05	mg/kg	< 0.05
d-BHC	0.05	mg/kg	< 0.05
Dieldrin	0.05	mg/kg	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05
Endrin	0.05	mg/kg	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05
Heptachlor	0.05	mg/kg	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05
Toxaphene	1	mg/kg	< 1
Dibutylchlorendate (surr.)	1	%	114
Tetrachloro-m-xylene (surr.)	1	%	80
Organophosphorous Pesticides			
Bolstar	0.2	mg/kg	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2
Demeton-O	0.2	mg/kg	< 0.2
Diazinon	0.2	mg/kg	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2
Disulfoton	0.2	mg/kg	< 0.2
Ethion	0.2	mg/kg	< 0.2
Ethoprop	0.2	mg/kg	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2

Client Sample ID			BH09/0.0
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**M14-No20736**
Date Sampled			**Nov 19, 2014**
Test/Reference	LOR	Unit	
Organophosphorous Pesticides			
Fensulfothion	0.2	mg/kg	< 0.2
Fenthion	0.2	mg/kg	< 0.2
Merphos	0.2	mg/kg	< 0.2
Methyl azinphos	0.2	mg/kg	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2
Mevinphos	0.2	mg/kg	< 0.2
Naled	0.5	mg/kg	< 0.5
Phorate	0.2	mg/kg	< 0.2
Ronnel	0.2	mg/kg	< 0.2
Tokuthion	0.2	mg/kg	< 0.2
Trichloronate	0.2	mg/kg	< 0.2
Triphenylphosphate (surr.)	1	%	98
Heavy Metals			
Arsenic	2	mg/kg	< 2
Barium	10	mg/kg	19
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	6.1
Copper	5	mg/kg	< 5
Lead	5	mg/kg	14
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	< 5
Zinc	5	mg/kg	11
% Moisture	0.1	%	6.5

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Dec 01, 2014	14 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Dec 01, 2014	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
BTEX	Melbourne	Dec 01, 2014	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Organochlorine Pesticides	Melbourne	Dec 01, 2014	14 Day
- Method: USEPA 8081 Organochlorine Pesticides			
Organophosphorous Pesticides	Melbourne	Dec 01, 2014	14 Day
- Method: USEPA 8270 Organophosphorus Pesticides			
Heavy Metals	Melbourne	Dec 01, 2014	180 Day
- Method: USEPA 6010/6020 Heavy Metals			
% Moisture	Melbourne	Nov 28, 2014	14 Day
- Method: Method 102 - ANZECC - % Moisture			

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Project Name: DYNAMIC PLANNING SI GUILDFORD
Project ID: J1401218

Order No.:
Report #: 440417
Phone: 08 6272 0200
Fax: 08 9285 8444

Received: Nov 28, 2014 8:43 AM
Due: Dec 5, 2014
Priority: 5 Day
Contact Name: Brad Palmer

Eurofins | mgt Client Manager: Natalie Krasselt

Sample Detail					% Moisture	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Organochlorine Pesticides	Organophosphorous Pesticides	BTEX	Total Recoverable Hydrocarbons
Laboratory where analysis is conducted																		
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																		
Brisbane Laboratory - NATA Site # 20794																		
External Laboratory																		
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**														
BH01/0.0	Nov 19, 2014		Soil	M14-No20728	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH02/0.0	Nov 19, 2014		Soil	M14-No20729	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH03/0.0	Nov 19, 2014		Soil	M14-No20730	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH04/0.0	Nov 19, 2014		Soil	M14-No20731	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH05/0.0	Nov 19, 2014		Soil	M14-No20732	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH06/0.0	Nov 19, 2014		Soil	M14-No20733	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH07/0.0	Nov 19, 2014		Soil	M14-No20734	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH08/0.0	Nov 19, 2014		Soil	M14-No20735	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BH09/0.0	Nov 19, 2014		Soil	M14-No20736	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH C6-C10 less BTEX (F1)	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Organophosphorous Pesticides							
Bolstar	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos	mg/kg	< 0.2			0.2	Pass	
Demeton-O	mg/kg	< 0.2			0.2	Pass	
Diazinon	mg/kg	< 0.2			0.2	Pass	
Dichlorvos	mg/kg	< 0.2			0.2	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Disulfoton	mg/kg	< 0.2			0.2	Pass	
Ethion	mg/kg	< 0.2			0.2	Pass	
Ethoprop	mg/kg	< 0.2			0.2	Pass	
Fenitrothion	mg/kg	< 0.2			0.2	Pass	
Fensulfothion	mg/kg	< 0.2			0.2	Pass	
Fenthion	mg/kg	< 0.2			0.2	Pass	
Merphos	mg/kg	< 0.2			0.2	Pass	
Methyl azinphos	mg/kg	< 0.2			0.2	Pass	
Methyl parathion	mg/kg	< 0.2			0.2	Pass	
Mevinphos	mg/kg	< 0.2			0.2	Pass	
Naled	mg/kg	< 0.5			0.5	Pass	
Phorate	mg/kg	< 0.2			0.2	Pass	
Ronnel	mg/kg	< 0.2			0.2	Pass	
Tokuthion	mg/kg	< 0.2			0.2	Pass	
Trichloronate	mg/kg	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Barium	mg/kg	< 10			10	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	99			70-130	Pass	
TRH C10-C14	%	129			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	106			70-130	Pass	
Toluene	%	99			70-130	Pass	
Ethylbenzene	%	91			70-130	Pass	
m&p-Xylenes	%	83			70-130	Pass	
Xylenes - Total	%	83			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	75			75-125	Pass	
TRH C6-C10	%	95			70-130	Pass	
TRH >C10-C16	%	126			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
4.4'-DDD	%	78			70-130	Pass	
4.4'-DDE	%	86			70-130	Pass	
4.4'-DDT	%	84			70-130	Pass	
a-BHC	%	97			70-130	Pass	
Aldrin	%	103			70-130	Pass	
b-BHC	%	103			70-130	Pass	
d-BHC	%	102			70-130	Pass	
Dieldrin	%	87			70-130	Pass	
Endosulfan I	%	94			70-130	Pass	
Endosulfan II	%	80			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	%	80			70-130	Pass	
Endrin	%	81			70-130	Pass	
Endrin aldehyde	%	86			70-130	Pass	
Endrin ketone	%	80			70-130	Pass	
g-BHC (Lindane)	%	98			70-130	Pass	
Heptachlor	%	95			70-130	Pass	
Heptachlor epoxide	%	93			70-130	Pass	
Hexachlorobenzene	%	105			70-130	Pass	
Methoxychlor	%	80			70-130	Pass	
LCS - % Recovery							
Organophosphorous Pesticides							
Diazinon	%	111			70-130	Pass	
Ethion	%	103			70-130	Pass	
Fenitrothion	%	74			70-130	Pass	
Methyl parathion	%	95			70-130	Pass	
Mevinphos	%	109			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Barium	%	91			80-120	Pass	
Cadmium	%	107			80-120	Pass	
Chromium	%	114			80-120	Pass	
Copper	%	112			80-120	Pass	
Lead	%	114			80-120	Pass	
Mercury	%	95			75-125	Pass	
Nickel	%	114			80-120	Pass	
Zinc	%	120			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	M14-De02127	NCP	%	88			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	M14-De02127	NCP	%	79			70-130	Pass	
Toluene	M14-De02127	NCP	%	81			70-130	Pass	
Ethylbenzene	M14-De02127	NCP	%	86			70-130	Pass	
m&p-Xylenes	M14-De02127	NCP	%	95			70-130	Pass	
o-Xylene	M14-De02127	NCP	%	93			70-130	Pass	
Xylenes - Total	M14-De02127	NCP	%	94			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	M14-De02127	NCP	%	80			70-130	Pass	
TRH C6-C10	M14-De02127	NCP	%	81			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Barium	M14-No20728	CP	%	100			75-125	Pass	
Cadmium	M14-No20728	CP	%	97			75-125	Pass	
Chromium	M14-No20728	CP	%	99			75-125	Pass	
Copper	M14-No20728	CP	%	107			75-125	Pass	
Lead	M14-No20728	CP	%	97			75-125	Pass	
Mercury	M14-No20728	CP	%	92			70-130	Pass	
Nickel	M14-No20728	CP	%	97			75-125	Pass	
Zinc	M14-De00863	NCP	%	80			75-125	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
4.4'-DDD	M14-No20735	CP	%	118			70-130	Pass	
4.4'-DDE	M14-No20735	CP	%	114			70-130	Pass	
4.4'-DDT	M14-No20735	CP	%	88			70-130	Pass	
a-BHC	M14-No20735	CP	%	71			70-130	Pass	
Aldrin	M14-No20735	CP	%	77			70-130	Pass	
b-BHC	M14-No20735	CP	%	90			70-130	Pass	
d-BHC	M14-No20735	CP	%	83			70-130	Pass	
Dieldrin	M14-No20735	CP	%	86			70-130	Pass	
Endosulfan I	M14-No20735	CP	%	100			70-130	Pass	
Endosulfan II	M14-No20735	CP	%	95			70-130	Pass	
Endosulfan sulphate	M14-No20735	CP	%	116			70-130	Pass	
Endrin	M14-No20735	CP	%	74			70-130	Pass	
Endrin aldehyde	M14-No20735	CP	%	115			70-130	Pass	
Endrin ketone	M14-No20735	CP	%	110			70-130	Pass	
g-BHC (Lindane)	M14-No20735	CP	%	84			70-130	Pass	
Heptachlor	M14-No20735	CP	%	75			70-130	Pass	
Heptachlor epoxide	M14-No20735	CP	%	78			70-130	Pass	
Hexachlorobenzene	M14-No20735	CP	%	89			70-130	Pass	
Methoxychlor	M14-No20735	CP	%	95			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	M14-No20736	CP	%	120			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	M14-No20736	CP	%	117			70-130	Pass	
Spike - % Recovery									
Organophosphorous Pesticides				Result 1					
Diazinon	M14-No20736	CP	%	125			70-130	Pass	
Ethion	M14-No20736	CP	%	121			70-130	Pass	
Fenitrothion	M14-No20736	CP	%	87			70-130	Pass	
Methyl parathion	M14-No20736	CP	%	70			70-130	Pass	
Mevinphos	M14-No20736	CP	%	117			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M14-No20728	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Barium	M14-No20728	CP	mg/kg	37	37	1.0	30%	Pass	
Cadmium	M14-No20728	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M14-No20728	CP	mg/kg	7.8	7.9	1.0	30%	Pass	
Copper	M14-No20728	CP	mg/kg	6.6	6.5	1.0	30%	Pass	
Lead	M14-No20728	CP	mg/kg	44	45	2.0	30%	Pass	
Mercury	M14-No20728	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	M14-No20728	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Zinc	M14-No20728	CP	mg/kg	120	120	3.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M14-No20733	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M14-No20733	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	M14-No20733	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	M14-No20733	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	M14-No20733	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	M14-No20733	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	M14-No20733	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	M14-No20733	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	M14-No20733	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C6-C10 less BTEX (F1)	M14-No20733	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	M14-No20734	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	M14-No20734	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	M14-No20734	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	M14-No20735	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	M14-No20735	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	M14-No20735	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	M14-No20735	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	M14-No20735	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	M14-No20735	CP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Organophosphorous Pesticides				Result 1	Result 2	RPD			
Bolstar	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Demeton-O	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Diazinon	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dichlorvos	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Disulfoton	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethion	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethoprop	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenitrothion	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fensulfothion	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenthion	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Merphos	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Methyl azinphos	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Methyl parathion	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Mevinphos	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Naled	M14-No20735	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Organophosphorous Pesticides				Result 1	Result 2	RPD			
Phorate	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ronnel	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tokuthion	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Trichloronate	M14-No20735	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Natalie Krasselt	Analytical Services Manager
Carroll Lee	Senior Analyst-Organic (VIC)
Carroll Lee	Senior Analyst-Volatile (VIC)
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
National Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

Appendix F: Understanding Your Geotechnical Engineering Report

www.galtgeo.com.au
4/15 Walters Dr, OSBORNE PARK WA 6017
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UNDERSTANDING YOUR GEOTECHNICAL ENGINEERING REPORT

GALT FORM PMP11 Rev1

1. EXPECTATIONS OF A GEOTECHNICAL ENGINEERING REPORT

This document has been prepared to clarify what is and is not provided in your geotechnical report. It is intended to inform you of what your realistic expectations of this report should be and how to manage your risks associated with geotechnical conditions.

Geotechnical engineering is a less exact science than other engineering disciplines. We include this information to help you understand where our responsibilities as geotechnical engineers begin and end, to help the client recognise his responsibilities and risks. You should read and understand this information. Please contact us if you do not understand the report or this explanation. We have extensive experience in a wide variety of geotechnical problems and we can help you to manage your risk.

2. THIS REPORT RELATES TO PROJECT-SPECIFIC CONDITIONS

This report was developed for a unique set of project-specific conditions to meet the needs of the nominated client. It took into account the following :

- The project objectives as we understood them and as described in this report;
- the specific site mentioned in this report; and
- the current and proposed development at the site.

It should not be used for any purpose other than that indicated in the report. You should not rely on this geotechnical report if any of the following conditions apply:

- the report was not written for you;
- the report was not written for the site specific to your development;
- the report was not written for your project (including a development at the correct site but other than that listed in the report); or
- the report was written before significant changes occurred at the site (such as a development or a change in ground conditions).

You should always inform us of changes in the proposed project (including minor changes) and request an assessment of their impact.

Where we are not informed of developments relevant to your geotechnical engineering report, we cannot be held responsible or liable for problems that may arise as a consequence.

Where design is to be carried out by others using information provided by us, we recommend that we be involved in the design process by being engaged for consultation with other members of the design team and by being able to review work produced by other members of the design team which relies on geotechnical information provided in our report.

3. GEOTECHNICAL ENGINEERING LOGS

Our reports often include logs of intrusive and non-intrusive geotechnical investigation techniques. These logs are based on our interpretation of field data and laboratory results. The logs should only be read in conjunction with the report they were issued with and should not be re-drawn for inclusion in other documents not prepared by us.

4. THIRD PARTY RELIANCE

We have prepared this report for use by the client. This report must be regarded as confidential to the client and the client's professional advisors. We do not accept any responsibility for contents of this document from any party other than the nominated client. We take no responsibility for any damages suffered by a third party as a consequence of any decisions or actions they may make based on this report. Any reliance or decisions made by a third party based on this report are the responsibility of the third party and not of us.

5. CHANGE IN SUBSURFACE CONDITIONS

The geotechnical recommendations in this report are based on the ground conditions that existed at the time when the study was undertaken. Changes in ground conditions can occur in numerous ways including as a result of anthropogenic events (such as construction on or adjacent to the site) or natural events (such as floods, groundwater fluctuations or earthquakes). We should be consulted prior to use of this report so that we can comment on its reliability. It is important to note that where ground conditions have changed, additional sampling, testing or analysis may be required to fully assess the changed conditions.

6. SUBSURFACE CONDITIONS DURING CONSTRUCTION

Practical constraints mean that we cannot know every minute detail about the subsurface conditions at a particular site. We use engineering judgement to form an opinion about the subsurface conditions at the site. Some variation to our evaluated conditions is likely and significant variation is possible. Accordingly, our report should not be considered as final as it is developed from engineering judgement and opinion.

The most effective means of dealing with unanticipated ground conditions is to engage us for construction support. We can only finalise our recommendations by observing actual subsurface conditions encountered during construction. We cannot accept liability for a report's recommendations if we cannot observe construction.

7. ENVIRONMENTAL ISSUES

Unless specifically mentioned otherwise in our report, environmental considerations are not included. The investigation techniques used by us in developing our report differ from those for an environmental investigation. Our report was not prepared with environmental considerations in mind and it is the client's responsibility to satisfy himself that environmental considerations have been taken into account for the site. If you require guidance on how to proceed on evaluating environmental risk at the site, we can provide further information and contacts.

UNDERSTANDING YOUR ENVIRONMENTAL REPORT

GALT FORM PMP29 Rev1

1. EXPECTATIONS OF AN ENVIRONMENTAL REPORT

This document has been prepared to clarify what is and is not provided in your environmental report. It is intended to inform you of what your realistic expectations of this report should be and how to manage your risks associated with environmental conditions. You should read and understand this information. Please contact us if you do not understand the report or this explanation. We have extensive experience in a wide variety of environmental problems and we can help you to manage your risk.

2. THIS REPORT RELATES TO PROJECT-SPECIFIC CONDITIONS

This report was developed for a unique set of project-specific conditions to meet the needs of the nominated client. It took into account the following:

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- the specific site mentioned in this report; and
- the current and proposed development at the site.

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- the report was not written for the site specific to your development;
- the report was not written for your project (including a development at the correct site but other than that listed in the report); or
- the report was written before significant changes occurred at the site (such as a development or a change in ground conditions).

You should always inform us of changes in the proposed project (including minor changes) and request an assessment of their impact.

Where we are not informed of developments relevant to your environmental report, we cannot be held responsible or liable for problems that may arise as a consequence.

Where design is to be carried out by others using information provided by us, we recommend that we be involved in the project planning process by being engaged for consultation with members of the project team and by being able to review work produced by other members of the project team which relies on environmental information provided in our report.

3. ENVIRONMENTAL LOGS

Our reports often include logs of intrusive and non-intrusive environmental investigation techniques. These logs are based on our interpretation of field data and laboratory results. The logs should only be read in conjunction with the report they were issued with and should not be re-drawn for inclusion in other documents not prepared by us.

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We have prepared this report for use by the client. This report must be regarded as confidential to the client and the client's professional advisors. We do not accept any responsibility for contents of this document from any party other than the nominated client. We take no responsibility for any damages suffered by a third party as a consequence of any decisions or actions they may make based on this report. Any reliance or decisions made by a third party based on this report are the responsibility of the third party and not of us.

5. CHANGE IN SITE CONDITIONS

The environmental recommendations in this report are based on the site conditions that existed at the time when the study was undertaken. Changes in site conditions can occur in numerous ways including as a result of anthropogenic events (such as potentially contaminating activities or action on or adjacent to the site) or natural events (such as floods, groundwater fluctuations or earthquakes). We should be consulted prior to use of this report so that we can comment on its reliability. It is important to note that where site conditions have changed, additional sampling, testing or analysis may be required to fully characterise the changed conditions.

O:\Administration\Standard Forms and Documents\PMP29 Understanding your Environmental Report.docx

APPENDIX 3
Aircraft Noise Assessment Report

Lloyd George Acoustics
PO Box 717
Hillarys WA 6923
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E: terry@lgacoustics.com.au W: www.lgacoustics.com.au

Aircraft Noise Assessment

Lot 18 (53-61) James Street, Lot 137 (14) Scott Street and Lots 12 & 13 (15 & 17) Wellman Street, Guildford

Reference: 14092943-02c.docx

Prepared for:

Dodd & Dodd Pty Ltd C/- Dynamic Planning and Developments Pty Ltd

Member Firm of Association of Australian Acoustical Consultants

Report: 14092943-02c.docx

Lloyd George Acoustics Pty Ltd

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Prepared By:	Terry George 
Position:	Project Director
Date:	15 January 2017

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Appendices

1 INTRODUCTION

This report considers the implications of aircraft noise to the subject site, being Lot 18 (#53-61) James Street, Lot 137 (#14) Scott Street and Lots 12 & 13 (#15 & 17) Wellman Street, Guildford (refer *Figure 1-1*) and approximately 9000m^2 in size. Most of the site is currently used as a commercial premises, including a hardware store fronting James Street. In accordance with Local Planning Scheme No.17, the majority of the site is zoned residential development with the two lots on Wellman Street being zoned R5 Residential (refer *Figure 1-2*). The proponents of the site are preparing documentation to initiate a Structure Plan to pursue R20 style development.

Figure 1-1 Site Locality

Appendix A provides an indication of the type of development that could potentially occur over the site.

Appendix C contains an explanation of terminology used throughout this report.

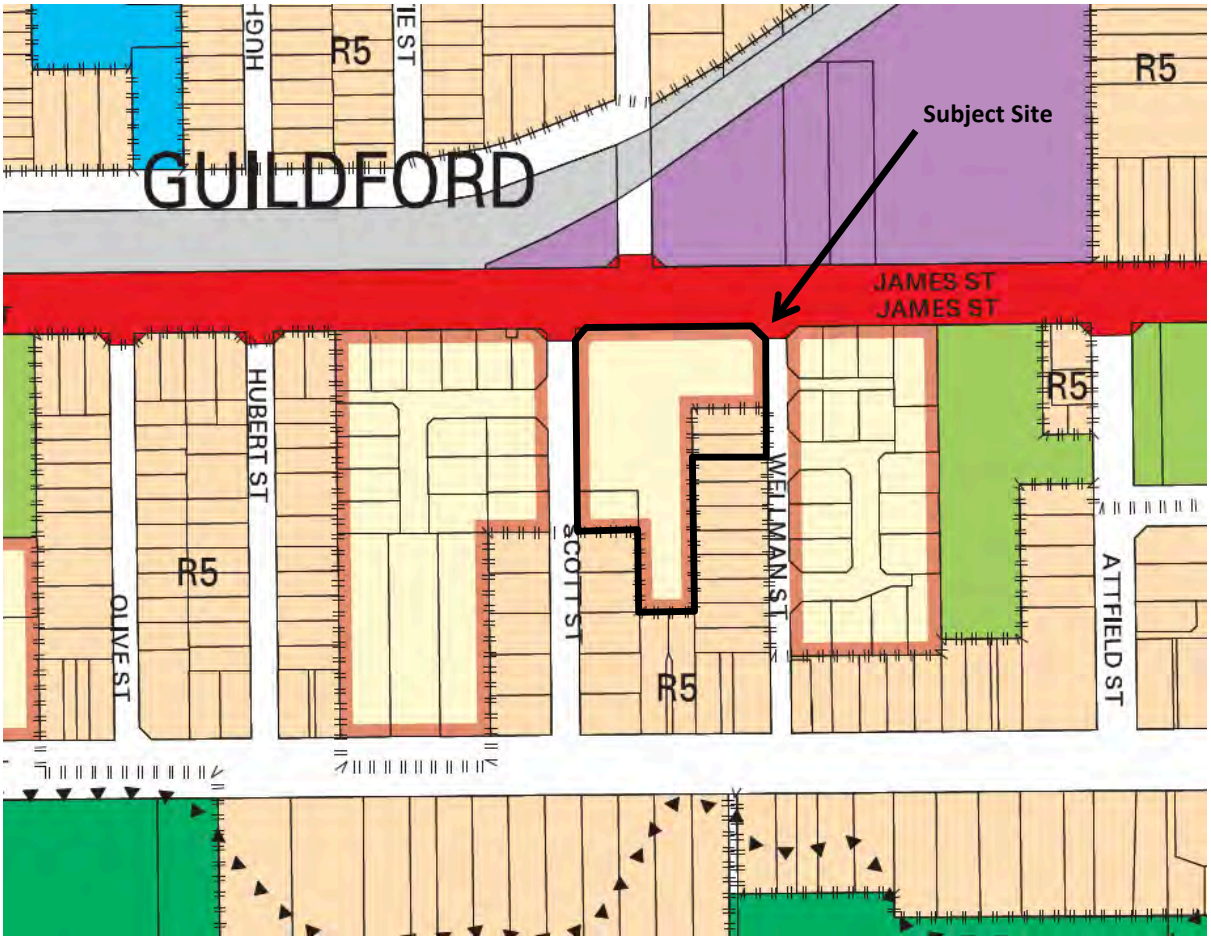

Figure 1-2 Extract of Local Planning Scheme No.17

2 STATE POLICY

The relevant planning policy in Western Australia in relation to aircraft noise is *State Planning Policy 5.1: Land Use Planning in the Vicinity of Perth Airport*; July 2015, Western Australian Planning Commission (hereafter referred to as SPP 5.1). SPP 5.1 defines three zones:

- Areas below 20 ANEF;
- Areas between 20 ANEF and 25 ANEF; and
- Areas above 25 ANEF.

In this instance, the subject site is located in an area above 25 ANEF (refer *Figure 2-1*) and therefore the relevant information in relation to this category is provided herein, noting that the site is located essentially at 30 ANEF.

Figure 2-1 Site Locality in Relation to ANEF Contours

2.1 Zoning

Zoning and associated development control provisions should take into consideration the level of noise exposure forecast for the area and the building site acceptability provided in *Table 2-1*, taken from *Australian Standard 2021:2015 Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*. There is a presumption against zoning, which may permit development involving building types identified as unacceptable.

Whilst in accordance with AS2021:2015 the land is 'unacceptable' for residential use, *Figure 1-2* shows that the site is already zoned for such use. In such cases, the sites are under discretionary controls of the local government.

It is noted that land immediately east (Britain Mews) and west (Howell Court) has relatively new houses constructed, occurring in late 2010.

Table 2-1 Building Site Acceptability Based on ANEF Zones

Building Type	ANEF Zone of Site		
	Acceptable	Conditionally Acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light Industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Notes:

1. The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside but near to the 20 ANEF contour.
2. Within 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate (see also Figure A1 of Appendix A).
3. There will be cases where a building of a particular type will contain spaces used for activities, which would generally be found in a different type of building (e.g. an office in an industrial building). In these cases Table 2.1 should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by Table 3.3.
4. This Standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built-up areas designated as unacceptable, it is recommended that such development should achieve the required ANR determined according to Clause 3.2. For residences, schools, etc., the effect of aircraft noise on outdoor areas associated with the buildings should be considered.
5. In no case should new development take place in greenfield sites deemed unacceptable because such development may impact airport operations.

2.2 Residential Density

SPP 5.1 states that the density of development should generally be limited to R12.5. Possible exceptions are where:

- A higher density is necessary to facilitate redevelopment or infill development of an existing residential area;
- Land is identified as appropriate for more intensive development through strategic planning instruments such as regional or sub-regional structure plan;
- It can be demonstrated that the public benefits of higher density coding outweigh the negative impacts of exposing additional residents to aircraft noise; and
- A higher density would facilitate the concurrent provision of noise insulation in accordance with the indoor design sound levels prescribed in AS2021.

2.3 Subdivision, Strata Subdivision and Development

Relevant to the subject site is that where no density coding or minimum lot size is prescribed for the land, such as in this case, the maximum density should generally be limited to R12.5 except for circumstances as described in *Section 2.2*.

In this case the proponent is looking to have a higher density over the site and as such, the exceptions of *Section 2.2* are to be satisfied. It should be noted that this report does not address the first three bullet points of *Section 2.2*, which will be addressed by Dynamic Planning and Developments, but does examine the last bullet point.

2.4 Noise Insulation

Noise insulation is required as a condition of planning approval for all development involving building types identified as 'unacceptable' with reference to *Table 2-1*.

Where practicable, the standard of insulation required should be based on achievement of indoor design sound levels recommended for the particular building type as provided in AS2021 and shown in *Table 2-2*. For the purposes of SPP 5.1, guidance as to the practicable standard of insulation may be obtained from the Deemed to Comply Noise Insulation Specifications provided in *Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport,* 2004, Western Australian Planning Commission.

Table 2-2 Indoor Design Sound Levels for Determination of Aircraft Noise Reduction*

Building Type & Activity	Indoor Design Sound Level, dB L_{Amax}
Houses, home units, flats, caravan parks	
Sleeping areas, dedicated lounges	50
Other habitable spaces	55
Bathrooms, toilets, laundries	60
Hotels, motels, hostels	
Relaxing, sleeping	55
Social activities	70
Service activities	75
Schools, universities	
Libraries, study areas	50
Teaching areas, assembly areas (see Note 5)	55
Workshops, gymnasia	75
Hospitals, nursing homes	
Wards, theatres, treatment and consulting rooms	50
Laboratories	65
Service areas	75

Building Type & Activity	Indoor Design Sound Level, dB L_{Amax}
Public buildings	
Churches, religious activities	50
Theatres, cinemas, recording studios (see Note 4)	40
Court houses, libraries, galleries	50
Commercial buildings, offices and shops	
Private offices, conference rooms	55
Drafting, open offices	65
Typing, data processing	70
Shops, supermarkets, showrooms	75
Industrial	
Inspection, analysis, precision work	75
Light machinery, assembly, bench work	80

* These indoor design sound levels are not intended to be used for measurement of adequacy of construction. For measurement of the adequacy of construction against aircraft noise intrusion see Appendix D.

Notes:

1. The indoor design sound levels in Column 2 are hypothesized values based on Australian experience. A design sound level is the maximum level (dB(A)) from an aircraft flyover which, when heard inside a building by the average listener, will be judged as not intrusive or annoying by that listener while carrying out the specified activity. Owing to the variability of subjective responses to aircraft noise, these figures will not provide sufficiently low interior noise levels for occupants who have a particular sensitivity to aircraft noise.
2. Some of these levels, because of the short duration of individual aircraft flyovers, exceed some other criteria published by Standards Australia for indoor background noise levels (see AS 2107).
3. The indoor design sound levels are intended for the sole purpose of designing adequate construction against aircraft noise intrusion and are not intended to be used for assessing the effects of noise. Land use planning authorities may have their own internal noise level requirements which may be used in place of the levels above.
4. For opera and concert halls and theatres, and for recording, broadcast and television studios and similar buildings where noise intrusion is unacceptable, specialist acoustic advice should always be obtained.
5. Certain activities in schools may be considered particularly noise sensitive and 50 dB(A) may be a more desirable indoor sound level to select for any teaching areas used for such activities. However, the effect of other noise sources should be considered.
6. The provisions of this Standard relating to different internal design sound levels for different indoor spaces could result in the use of different construction and materials in contiguous spaces, and require the construction of substantial barriers between habitable spaces, e.g. heavy self-closing internal doors, detracting from the amenity of the building. Therefore consideration should be given to a uniform perimeter insulation approach.

SPP 5.1 also notes that closure of windows and other openings to habitable rooms is necessary to achieve the benefits of noise insulation and this may necessitate some form of forced ventilation such as refrigerative air-conditioning. However, the operational management of a building is outside of the ambit of SPP 5.1.

For this site, the Deemed to Comply Specifications will be applied with the results assessed against the *Table 2-2* design sound levels.

2.5 Notification on Title

A notice on title advising of the potential for noise nuisance is to be required. Such wording for notices and memorials would be:

The property is situated in the vicinity of Perth Airport and is currently affected, and will continue to be affected in the future, by aircraft noise. Noise exposure levels are likely to increase in the future as a result of increases in numbers of aircraft using the airport, changes in aircraft type or other operational changes.

3 SITE ANALYSIS

The impact of aircraft noise can be summarised for this site as follows:

- Distances to the 03/21 runway are:
  - DS = 0m;
  - DL = 3,200m; and
  - DT = 6,600m
- Based on 2012 actual aircraft movement data, the site experiences on average more than 100 aircraft events above a noise level of 65 dB L_{Amax} per day. This will increase to more than 200 average aircraft movements above a noise level of 65 dB L_{Amax} at ultimate (2059) capacity;
- Noise levels (obtained from the Perth Airport website) from the Runway 03 departure may be around 80-82 dB L_{Amax} (for 737-800 & 777-300R type aircraft) and of similar noise level for Runway 21 arrivals. AS2021 indicates a noise level of 84 dB L_{Amax} could be experienced from a 777 arrival and up to 85 dB L_{Amax} from an A380 departure. Twenty-one aircraft (arriving) were measured on site, recording an average level of 79 dB L_{Amax}, with a standard deviation (SD) of 3 dB. Note that one aircraft (777-200) measured up to 88 dB L_{Amax}. The spectrum for a typical aircraft at 82 dB L_{Amax} (average + 1SD) is provided in *Figure 3-1*. To be conservative, this has been adjusted by +3 dB, in order to increase the overall level of this particular spectrum to 85 dB L_{Amax};
- The site is located at the 30 ANEF contour (refer *Figure 2-1* and *Appendix B*);
- The operation of the future parallel runway will not have any significant impact on the subject site.

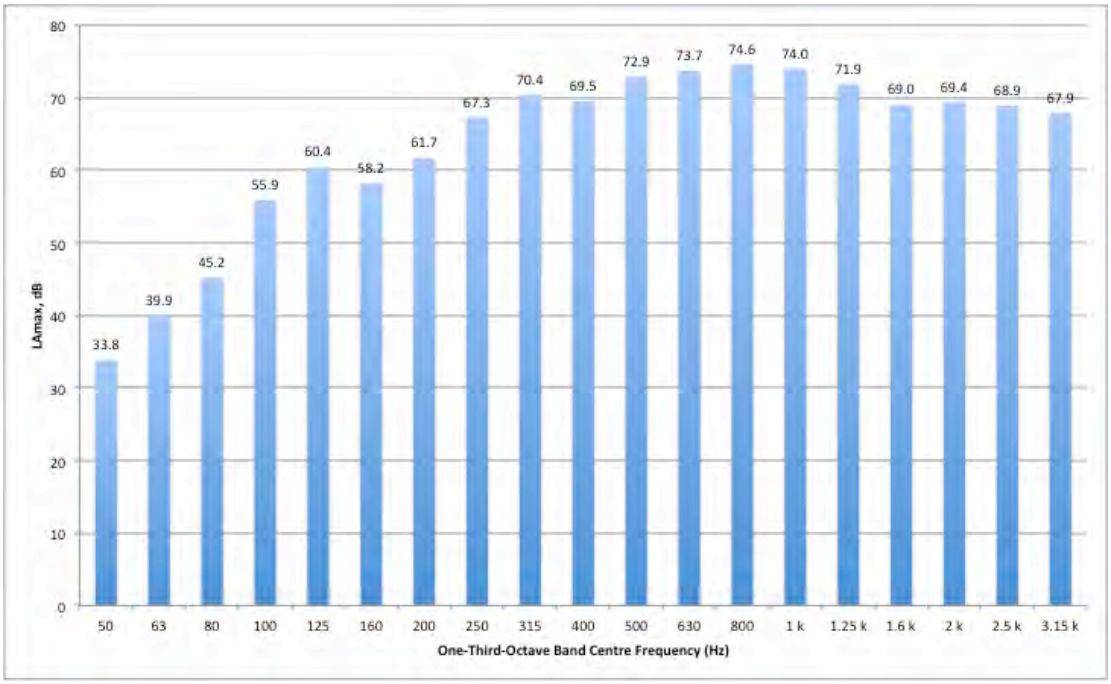

Figure 3-1 Example Noise Level of Aircraft at Site: 82 dB L_{Amax}

4 DEEMED TO COMPLY CALCULATIONS

As discussed in *Section 2.4, Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport,* 2004, Western Australian Planning Commission was produced which provides a deemed to comply construction package where dwellings are approved in areas of higher than 25 ANEF. These construction requirements are:

Openings: Maximum size of openings (windows and doors) of 20% (of floor area) for sleeping areas and 50% (of floor area) for living areas.

Construction: Slab-on-ground

Walls: Double brick cavity (R_w 50)

Roof: Pitched, minimum 25° slope, masonry tiles or metal sheet with sarking (impervious membrane) over rafters (Total roof/ceiling rating R_w 45).

Ceiling: Plasterboard 10mm thickness, with ceiling joists separate from roof structure, i.e. not attached to rafters or roof trusses.

Insulation: Fibrous thermal insulation R2.5 or greater between ceiling joists.

Windows: Laminated glass 6.38mm or greater with acoustic or resilient flap weather seals to frames (R_w 30).

Doors: Solid core 40mm or greater with acoustic or resilient flap weather seals to frames. Doors with glass panels are to match the standard for windows above.

Note: Where air-conditioning or mechanical systems are installed, sound attenuated ducting will be necessary to *limit* noise intrusion.

The deemed to satisfy construction is stated as calculated to provide a 35 dB(A) reduction for sleeping areas and 30 dB(A) for living areas, noting that this is based on overall noise levels only.

Calculations were undertaken on the basis of the above specification, but including the *Figure 3-1* spectra (increased by 3 dB). The results of these calculations were:

- Bedroom floor area of 15m^2, internal noise level calculated to be 52 dB L_{Amax}.
- Living floor area of 25m^2, internal noise level calculated to be 55 dB L_{Amax}.

With an external noise level of 85 dB L_{Amax}, the aircraft noise reduction is calculated to be 33 dB to bedrooms and 30 dB to living areas, noting that this is generally in line with the stated 35 dB and 30 dB reduction for bedrooms and living areas that the construction will achieve. The under-performance to the bedroom however does mean that these do not comply with the indoor design sound levels of AS2021:2015 being 50 dB L_{Amax}, but does comply with the living areas being 55 dB L_{Amax} as the design sound level.

5 DISCUSSION

The subject site is zoned residential but with no coding. SPP 5.1 states the maximum density should generally be limited to R12.5 and that notifications on title and the deemed to comply construction must be implemented. It is noted that land immediately east (Britain Mews) and west (Howell Court) has relatively new houses constructed, occurring in late 2010 and these would be equivalent to an R20 coding.

Based on an external noise level of 85 dB L_{Amax}, the internal noise level under the deemed to comply scenario would be 52 dB L_{Amax} in sleeping areas and 55 dB L_{Amax} in living areas. As such, it is recommended the deemed to comply construction for bedrooms be improved to increase the glazing requirements from R_w 30 to R_w 35, in order to achieve 50 dB L_{Amax} in bedrooms. No changes are required to the living area deemed to satisfy.

As such, the following is recommended to form part of the development conditions:

- All dwellings are to incorporate the deemed to satisfy construction of *Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport*, 2004, modified so that bedroom windows achieve a minimum acoustic performance of R_w 35 (likely requiring 10mm thick glass in awning style frame with acoustic seals). Alternatives to this construction are permissible if supported by a report undertaken by a suitably qualified acoustical consultant (member firm of the Association of Australian Acoustical Consultants).

- A notice on each lot title advising of the potential for nuisance is to be required. Such wording for notices and memorials would be:

  The property is situated in the vicinity of Perth Airport and is currently affected, and will continue to be affected in the future, by aircraft noise. Noise exposure levels are likely to increase in the future as a result of increases in numbers of aircraft using the airport, changes in aircraft type or other operational changes.

Appendix A

INDICATIVE PLANS

R20 Development scenario

Appendix B

PERTH AIRPORT ANEF CONTOURS

AS2021-2000 TABLE 2.1

BUILDING SITE ACCEPTABILITY BASED ON ANEF ZONES

Building Type	ANEF Zone of Site		
	Acceptable	Conditional	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
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Hospital, nursing home	Less than 20 ANEF (Note 1)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light Industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other Industrial	Acceptable in all ANEF zones		

Notes-

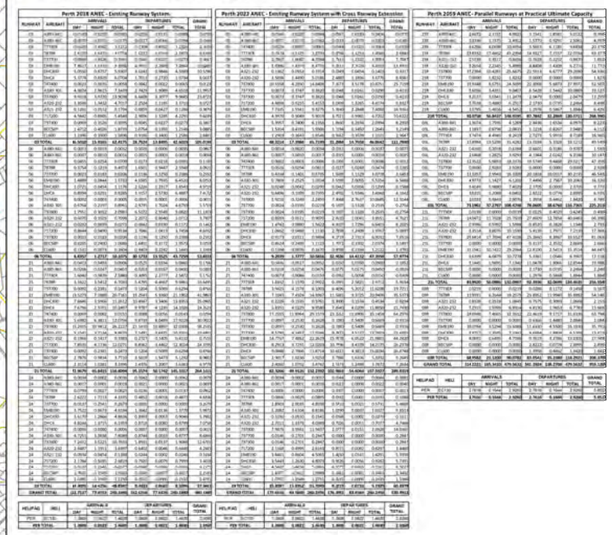
1. The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside but near to the 20 ANEF contour.

2. Within 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate (see also Figure A1 of Appendix A)

3. There will be cases where a building of a particular type will contain spaces used for activities which would generally be found in a different type of building (eg. an office in an industrial building). In those cases Table 2.1 should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by Table 3.3

4. This standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built up areas designated as unacceptable, it is recommended that such development should achieve the required ANR determined according to Clause 3.2. For residences, schools, etc. the effect of aircraft noise on outdoor areas associated with the buildings should be considered.

5. In no case should new development take place in greenfield sites deemed unacceptable because such development may impact airport operations.



NOTES:
1. THE ANEF CONSIDERS THE EFFECTS OF TOPOGRAPHY
2. WHERE FIGURES HAVE BEEN ROUNDED, DISCREPENCIES MAY OCCUR BETWEEN TOTALS AND THE SUMS OF COMPONENT ITEMS
3. THE COORDINATE SYSTEM USED IS WGS84
4. FOR DETAILED INFORMATION ON THE ANEF DEVELOPMENT METHODOLOGY REFER TO ASSOCIATED REPORT
5. THIS ANEF IS FOR LAND USE PLANNING PURPOSES AS DEFINED IN AS 2021. FOR INFORMATION REGARDING IMPLEMENTATION OF LAND USE PLANNING CONTACT THE WESTERN AUSTRALIA DEPARTMENT OF PLANNING
6. DAY IS DEFINED AS 7AM TO 7PM (LOCAL) AND NIGHT AS 7PM TO 7AM (LOCAL)
7. THIS ANEF HAS BEEN PREPARED USING THE INTEGRATED NOISE MODEL PACKAGE (INM 7.0D)

ENDORSEMENT FOR TECHNICAL ACCURACY
ULTIMATE PRACTICAL CAPACITY ANEF

Date: 9.6.2014

Executive General Manager Safety, Environment & Assurance
Airservices Australia, Canberra

The aircraft noise contours of this chart have been calculated using an appropriate modelling process. Airservices Australia has, in accordance with the approved manner of endorsement, considered the physical ultimate capacity of the existing or proposed runway/s in the endorsed process.
The data input and assumptions made in that process are derived in part from external sources. Airservices Australia makes no warranty in respect of this information and excludes all liability for any loss arising from reliance on that information.

LEGEND
- 20 - 25 ANEF
- 25 - 30 ANEF
- 30 - 35 ANEF
- 35 - 40 ANEF
- 40+ ANEF

Airport Runway End Coordinates Location	Latitude	Longitude	Elevation (AHD) (m)
Aerodrome Reference Point (ARP)	-31.940	115.967	16.0
Runway End 03	-31.956	115.960	20.1
Runway End 21	-31.929	115.968	19.2
Runway End 06	-31.941	115.990	17.7
Runway End 24	-31.931	115.979	17.8
Runway End 24 (Extension)	-31.927	115.986	16.3
Helipad	-31.952	115.967	20.0
Runway End 06L	-31.929	115.966	19.5
Runway End 21R	-31.929	115.969	19.7
Runway End 06R	-31.948	115.978	22.5
Runway End 21L	-31.946	115.989	23.1

Coordinate System: WGS 84

MICROSTATION FILE :
N:_NOISE_ANEF_140505 2014 UC ANEF.dgn
DATA SOURCE :
140505 2014 UC ANEF.dgn
ORIGINAL ISSUE
DRAWN : MMW APPROVED: KYM MEYS DATE: 11/06/14

ISS	DRN	AMENDMENTS	APPD	DATE
1	MMW	REVISED SCALE AND NEW SIGNATURE BLOCK	KM	16/05/14
2	MMW	ENDORSED SIGNATURE BLOCK	KM	11/06/14

PERTH AIRPORT MASTER PLAN 2014

ULTIMATE PRACTICAL CAPACITY ANEF

DRAWING No.	SCALE	SHEET	SIZE
FS-9930	1:40,000	1	A1

PERTH AIRPORT

0 400 800 2000 4000 METERS

INDEX CODE

Appendix C

Terminology

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

Australian Noise Exposure Forecast (ANEF)
A single number index for predicting the cumulative exposure to aircraft noise in communities near aerodromes during a specified time period (normally one year).

NOTE: The computation of this index includes—

(a) measurements of aircraft noise (expressed in Effective Perceived Noise Decibels, EPNdB), which take account of the spectral, temporal and spatial aspects of the noise;

(b) estimates and generalizations of aircraft type groups and mix, number of operations, runway utilization, flight paths and operational procedures; and

(c) time of day, i.e. whether daytime (0700 hours to 1900 hours) or evening/night-time (1900 hours to 0700 hours).

This single number index is useful for rating the compatibility of various land uses with respect to aircraft noise. For this purpose, equivalent ANEF values at individual positions around an aerodrome are combined on a map to form ANEF contours.

Acceptable
If from Table 2.1, the building site is classified as 'acceptable', there is usually no need for the building construction to provide protection specifically against aircraft noise. However, it should not be inferred that aircraft noise will be unnoticeable in areas outside the ANEF 20 contour. (See Notes 1, 2 and 3 of Table 2.1.)

Conditionally Acceptable
If from Table 2.1, the building site is classified as 'conditionally acceptable', the maximum aircraft noise levels for the relevant aircraft and the required noise reduction should be determined from the procedure of Clauses 3.1 and 3.2, and the aircraft noise attenuation to be expected from the proposed construction should be determined in accordance with Clause 3.3 (see Notes 1 and 3 of Table 2.1).

Unacceptable
If, from Table 2.1 the building site is classified as 'unacceptable', construction of the proposed building should not normally be considered. Where in the community interest redevelopment is to occur in such areas, e.g. a hotel in the immediate vicinity of an aerodrome, refer to the notes to Table 2.1.

DS
The distance in metres from the building site to the extended runway centerline along the line drawn in Figure 3.1 of AS2021.

DL
The distance in metres from the closer end of the runway to the intersection of the extended runway centre-line and the line drawn Figure 3.1 of AS2021.

DT
The distance in metres from the further end of the runway to the intersection of the runway centre-line and the line drawn Figure 3.1 of AS2021.

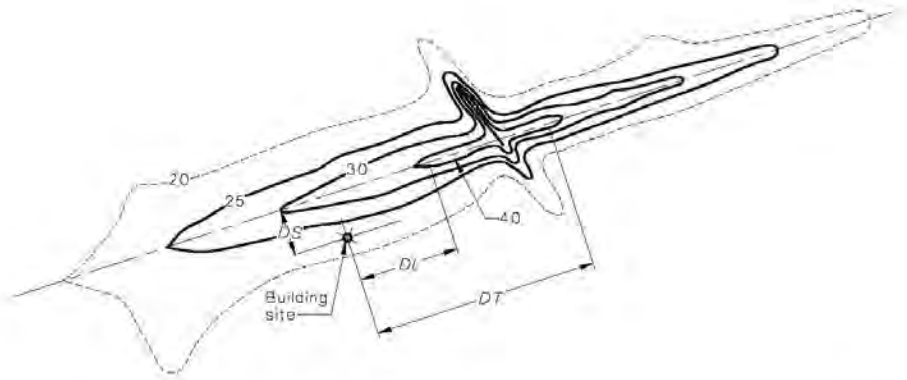


FIGURE 3.1 DETERMINATION OF *DS*, *DL* AND *DT* FOR STRAIGHT FLIGHT PATHS

Decibel (dB)

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

A-Weighting

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

Sound Pressure Level (L_p)

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}

This is the noise level in decibels, obtained using the A frequency weighting and the S time weighting as specified in AS1259.1-1990. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}

This is the noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. This is used when assessing the presence of modulation only.

L_{Amax}

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

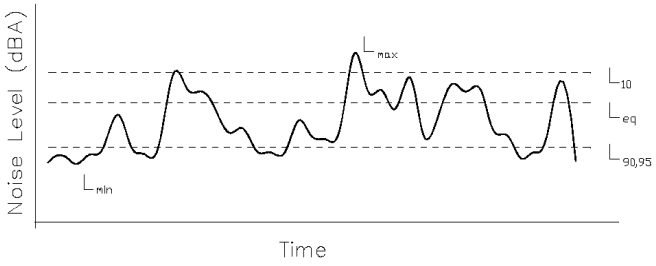
One-Third-Octave Band

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

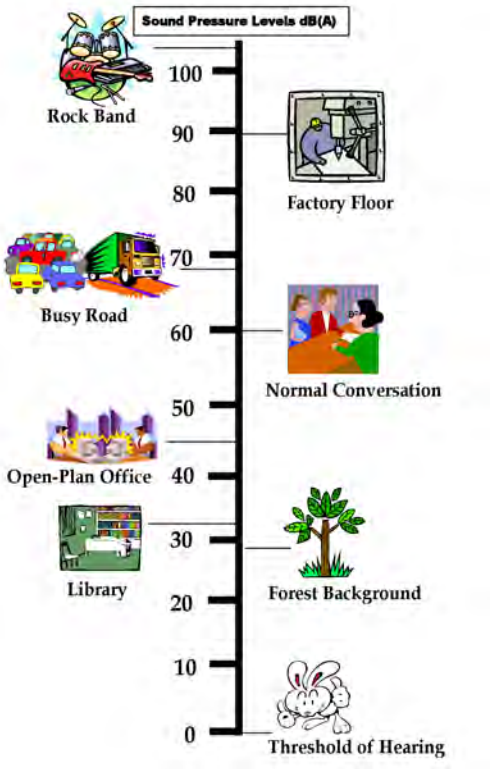
Indoor design sound level

The recommended maximum level in dB(A) inside a building from an aircraft flyover.

Chart of Noise Level Descriptors



Typical Noise Levels



APPENDIX 4
Indicative Development Plan

R20 Development scenario

R20 Development scenario

Built form massing - view from the northeast

R20 Development scenario

Built form massing - view from the northwest

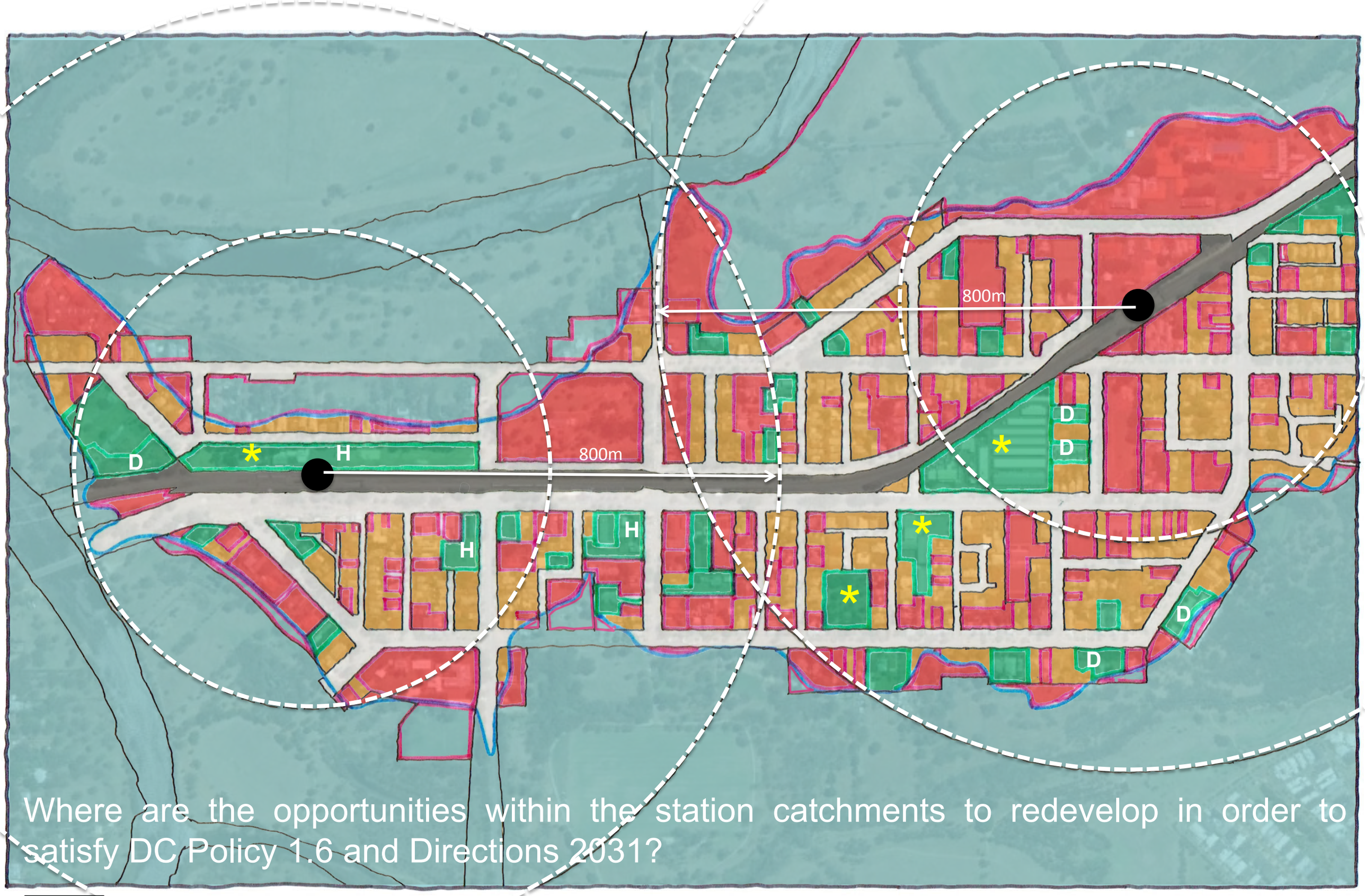
R20 Development scenario

Built form massing - view from the southwest

R20 Development scenario

Built form massing - view from the southeast

APPENDIX 5
Guildford Redevelopment Opportunities



Where are the opportunities within the station catchments to redevelop in order to satisfy DC Policy 1.6 and Directions 2031?

Very unlikely to be redeveloped – constrained by use or heritage.

Unlikely to be redeveloped – constrained by size and would require amalgamation.

Prospect of redevelopment.

H — Prospect of some redevelopment but limited by heritage.

D — Potential for redevelopment but already redeveloped for grouped/ multiple dwellings.

* — Prime opportunities for redevelopment

APPENDIX 6
Traffic Impact Statement

TRANSPORT IMPACT STATEMENT

Lot 18 James Street and Lot 137 Scott Street

Guildford

December 2016

Rev C

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Rev A	12.03.2015	J Davies	C Kleyweg	12.03.2015	Issued for Review
Rev B	28.11.2016	M Kleyweg	M Kleyweg	29.11.2016	Layout amended
Rev C	14.12.2016	M Kleyweg	M Kleyweg	15.11.2016	Layout amended

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Revision	Date of issue	Quantity	Issued to
Rev A	12.03.2015	1 (PDF)	Mr Neil Teo (Dynamic Planning and Developments)
Rev B	29.11.2016	1 (PDF)	Mr Neil Teo, Mr Edward O'Connell (Dynamic Planning and Developments)
Rev C	16.12.2016	1 (PDF)	

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Author	Marina Lipovac Tanaskovic / Katarina Pribakovic / Jelena Simic / Ana Nikolic / Nemanja Marijanovic
Project Manager	Marina Kleyweg
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Name of the Document	Lot 18 James Street and Lot 137 Scott Street, Guildford - Transport Impact Statement
Document Version	KC00274.000_R01_Rev C

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1. Introduction

1.1 Transport Impact Statement Layout

KCTT have been requested to provide a Transport Impact Statement for the proposed development of Lot 18 James Street and Lot 137 Scott Street in Guildford. This Transport Impact Statement has been completed in accordance with the guidelines as shown in the WAPC Transport Impact Assessment Guidelines – Part 4 (Developments).

The purpose of this document is to provide commentary and analysis on the parking requirements and potential traffic and transport impact that the proposed development of this site may have on the surrounding road and transportation networks.

The following is the scope of work in this report: -

Phase 1 – Transport Impact Statement

- Collate all available traffic volumes from Main Roads WA on James Street adjacent to the subject site and confirm other local road volumes with the City of Swan in a 400 metre radius of the subject site.
- Undertake a site visit and review all existing sight distance / road geometry issues which should be considered in the reporting.
- Collate all crash data for roadways and intersections within a 400 metre radius of the subject site.
- Estimate the subject sites' trip generation on the basis of the proposed land-use quantities and areas.
- Provide colour graphics showing the following details overlaid on aerial imagery: -
    - Vehicle turning templates at each of the proposed new access / egress locations for light vehicles.
    - Existing and future traffic volumes and traffic flows. This will be provided on a combined diagram.

This Transport Impact Statement is presented in the following sequence: -

- Section 1 – Introduction

This section provides a brief description on the role of this report in the Development Application process, the general layout of the report and a list of the guidelines and reference documents used in its composition.

- Section 2 – Transport Impact Statement

This section provides research and analysis of the key items required for submission of a Transport Impact Statement for Developments in accordance with the Transport Assessment Guidelines nominated above. In this section, KCTT have examined the following subject areas: -

- Section 2.1 – Outline of the Development Proposal

This section provides a brief description of the proposed land uses, as will be submitted to the City of Swan for this Development Application.

- Section 2.2 – Vehicle Access and Parking

This section provides a detailed description of the parking requirements using the local authority planning scheme provisions and providing a detailed assessment of whether reciprocity of parking requirements are appropriate in this proposal.

- Section 2.3 – Provision for Delivery and Service Vehicles

This section provides a detailed assessment of the requirements for delivery and service vehicles, both within the subject site and at intersections within the surrounding road networks.

- Section 2.4 – Hours of Operation

This section describes the general operating times for the proposed land usage as proposed under this Development Application. This information assists in determining the likely timing of the AM and PM peaks, and therefore the peak impact on the existing and surrounding transportation network. The peak vehicle generation is the key for determining intersection capacities within a road network.

- Section 2.5 – Daily Vehicular Volumes and Vehicular Types

This section provides details on traffic generation rates used to determine daily traffic generation from the proposed development. It also discusses the estimated peak hour traffic as well as the expected predominant type of vehicle which will be accessing the proposed development.

- Section 2.6 – Management of Traffic Generated by the Subject Site

This section summarises the expected traffic generated by the land uses as proposed in the Development Application for the subject site and provides an assessment of the cumulative impact of the existing traffic volumes and the proposed traffic volumes as generated by the development.

- Section 2.7 – Public Transport Access

This section provides a summary of the existing public transportation services available within an 800 metre radius of the subject site and whether any improvements to the network should be considered.

- Section 2.8 – Pedestrian and Cyclist Access

This section provides a summary of the existing pedestrian and cyclist infrastructure available within an 800 metre radius of the subject sites boundaries and whether any improvements to the networks should be considered.

- Section 3 – Transport Impact Statement Checklist

This section provides a concise, tabulated Executive Summary of the detailed information presented in Section 2 of this report. The intention of this checklist is to document the findings of this report, and / or any of the likely transportation / safety issues which should be considered as part of the Development Application submission. This checklist has been developed in accordance with the requirements of the Transport Assessment Guidelines for Developments.

1.2 Notes Pertaining To This Report

This report has been provided as one of the inputs into the overall Development Application submission to the City of Swan for the nominated landholding of Lot 18 James Street and Lot 137 Scott Street, Guildford on behalf of the proponent.

1.3 Available Information and Technical Literature

This section provides a brief description of the inputs used in the compilation of this report: -

- WAPC Transport Impact Assessment Guidelines – Volume 4 Developments
- WAPC Transport Impact Assessment Guidelines – Volume 5 (referenced for PM peak hour and traffic splits)
- WAPC & DoP R-Codes – State Planning Policy 3.1 Residential Design Codes
- NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses)
- 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
- City of Swan's Local Planning Scheme No 17.
- City of Swan's Policy POL-TP-129 Vehicle Parking Standards.

2. Transport Impact Statement

2.1 Outline of the Development Proposal

This Development Application considers the proposed development of Lot 18 James Street and Lot 137 Scott Street in Guildford (under the jurisdiction of the City of Swan).

The current land use is a Hardware Store "Ross's M10 Solutions" with an office, store, depot and parking space on the subject site. There are also storage warehouses on the proposed site. These existing land usages have all been considered in the site's traffic generation, which is outlined in Section 2.5.

The proposed development is a residential land use comprising of 15 single house/grouped dwellings.

Table 1 - Proposed Land Uses within the Development

Lot No	Yield	Land Use	No of Units
Residential House	n/a	Residential	15
Total			**15**

Plans for the proposed development have been provided in Appendix 1 of this report.

2.2 Vehicular Access and Parking

2.2.1 Vehicular Access

The subject site fronts James Street, Scott Street and Wellman Street, with vehicular access from Scott Street and Wellman Street.

James Street is classified as an Urban Highway / Primary Distributor by Main Roads WA and is part of Great Eastern Highway. In the vicinity of the subject site, James Street is a two-way two-lane divided road with a speed limit of 60kph. James Street has a 3.5m wide sealed shoulder on the north side of the road reservation and a 5.0m wide sealed shoulder on the south side of the road reservation with lane widths of 3.5m. Bus service (Route No 36) operates along this street, with the bus stop located at the front of the subject site on James Street. Pedestrian paths are provided on both sides of the road reservation.

In the vicinity of the subject site, **Scott Street** is a two-way one-lane undivided road with a speed limit of 50kph and a 7.0m wide lane. There are no bus services running along this street and pedestrian paths are provided on both sides of the road reservation. The intersection of Scott Street and James Street is a Left-In Left-Out only.

In the vicinity of the subject site, **Wellman Street** is a two-way one-lane undivided road with a speed limit of 50kph, and a 5.5m wide lane. There is no bus service running along this street. Pedestrian paths are provided on the west side of the road reservation.

The table below shows the most recent available traffic data for the surrounding network. The following information has been obtained from Main Roads WA.

Table 2 - Traffic Volumes for Roads Adjacent to the Subject Site

Road Name	Functional Classification / Road Hierarchy	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)	Heavy Vehicle %	Year	Legal Speed Limit
James Street *	Urban Highway / Primary Distributor	West of Johnson Street	32,288	AM 0745 –2,520 PM 1645 - 2,510	n.a.	Nov 2015	60kph
		West of Johnson Street**	30,156**	AM 0800 –2,317 PM 1600– 2,389	n.a.	Nov 2016	
		East of Johnson Street**	37,737**	AM 0800– 2,766 PM 1600– 3,054	n.a.	Nov 2016	
		East of Johnson Street	44,394	AM 0730 - 3,121 PM 1630 - 3,545	n.a.	Nov 2015	
		West of Meadow Street**	34,533**	AM 0700 –2,292 PM 1600 –2,691	n.a.	Nov 2016	
		East of Meadow Street**	27,933**	AM 0700 –1,904 PM 1600 –2,248	n.a.	Nov 2016	
Meadow Street	Urban Local Road / Access Road	North of James Street**	13,714**	AM 0800 - 996 PM 1600 –1,061	n.a.	Nov 2016	50kph
		South of James Street**	3,853**	AM 0800 - 429 PM 1600 –228	n.a.	Nov 2016	50kph
Terrace Road	Significant Urban Local Road / Local Distributor	West of East Street	8,475	AM 0745 - 1,009 PM 1515 - 968	n.a.	May 2011	50kph
Bridge Street	Urban Local Road / Access Road	At Guildford Road Bridge	27,122	AM 1145 –1,943 PM 1530 - 2,306	n.a.	Jan 2016	50kph
Johnson Street	Urban Local Road / Access Road	South of James Street**	19,533**	AM 0800 - 1,299 PM 1630 - 1,603	n.a.	Nov 2016	50kph
East Street	Urban Local Road / Access Road	South of Terrace Road	27,417	AM 0730 –2,235 PM 1515 –2,379	n.a.	Nov 2015	50kph
		South of Water Street	30,084	AM 0730 - 2,424 PM 1515 - 2,456	n.a.	Nov 2015	
Helena Street	Urban Local Road / Access Road	East of Johnson Street	1,563	AM 0745 - 184 PM 1630 - 139	4.0	Oct 2007	50kph

Note - James Street is represented as a part of the national route 94 in MRWA reports.*
*Note** - These traffic counts data are delivered from SCATS*

Formal peak hour data has been recorded and shown in Table 2 for locations on James Street and East Street. An analysis of the available data within 500 metres of the proposed residential development suggests the following peak periods: -

- James Street (east of Meadow Street):
  - AM peak occurs in the period between 07:00 and 08:00. Traffic volumes in the AM peak are approximately 6.82% of total daily volumes;
  - PM peak occurs in the period between 16:00 and 17:00. Traffic volumes in the PM peak are approximately 8.05% of total daily volumes.
- East Street (south of Water Street):
  - AM peak occurs in the period between 07:30 and 08:30. Traffic volumes in the AM peak are approximately 8.06% of total daily volumes;
  - PM peak occurs in the period between 15:15 and 16:15. Traffic volumes in the PM peak are approximately 8.16% of total daily volumes.

2.2.2 Crash Data

The following table shows the crash data from the Main Roads WA database for crashes and incidents for roads adjacent to the subject site between the 1st January 2011 and 31st December 2015.

Table 3 - Crash Data

Road Name	Road Hierarchy	Functional Classification	Speed Limit	Crash Statistics
Great Eastern Highway (James Street) & Bank Street	Urban Highway / Urban Local Road	Primary Distributor/ Access Road	60kph / 50kph	Total of 2 incidents: • 1 PDO Major • 1 PDO Minor MR Type: • 2 Other / Unknown
Great Eastern Highway (James Street) & Fauntleroy Street	Urban Highway / Urban Local Road	Primary Distributor/ Access Road	60kph / 50kph	Total of 1 incidents: • 1 PDO Minor MR Type: • 1 Other / Unknown
Great Eastern Highway (James Street) & Attfield Street	Urban Highway / Urban Local Road	Primary Distributor/ Access Road	60kph / 50kph	Total of 7 incidents: • 1 Hospital • 2 Medical • 3 PDO Major • 1 PDO Minor MR Type: • 1 Involving Overtaking • 6 Other / Unknown
Great Eastern Highway (James Street) & Hubert Street	Urban Highway / Urban Local Road	Primary Distributor/ Access Road	60kph / 50kph	Total of 1 incidents: • 1 PDO Major MR Type: • 1 Involving parking • 3 Other / Unknown
Great Eastern Highway (James Street) & Meadow Street	Urban Highway / Significant Urban Local Road *(north)* / Urban Local Road *(south)*	Primary Distributor/ Local Distributor *(north)* / Access Road *(south)*	60kph / 60kph *(north)* / 50kph *(south)*	Total of 41 incidents: • 1 Hospital • 6 Medical • 14 PDO Major • 20 PDO Minor MR Type: • 4 Involving Overtaking • 37 Other / Unknown
Great Eastern	Urban Highway /	Primary	60kph /	Total of 1 incident:

Highway (James Street) & Olive Street	Urban Local Road	Distributor/ Access Road	50kph	• 1 PDO Minor MR Type: • 1 Other / Unknown
Helena Street & Scott Street	Urban Local Road / Urban Local Road	Access Road / Access Road	50kph / 50kph	Total of 2 incident: • 1 PDO Major • 1 PDO Minor MR Type: • 2 Other / Unknown
Meadow Street & Helena Street	Urban Local Road / Urban Local Road	Access Road / Access Road	50kph / 50kph	Total of 2 incident: • 2 PDO Minor MR Type: • 2 Other / Unknown
Meadow Street & Stirling Street	Significant Urban Local Road / Urban Local Road	Local Distributor / Access Road	60kph / 50kph	Total of 1 incident: • 1 PDO Minor MR Type: • 1 Involving Overtaking
Great Eastern Highway *(James Street)* (11.26 to 12.53)	Urban Highway	Primary Distributor	60kph	Total of 53 incidents: • 1 Hospital • 7 Medical • 26 PDO Major • 19 PDO Minor MR Type: • 19 Involving Overtaking • 1 Involving Parking • 1 involving Pedestrian • 6 Entering / Leaving Driveway • 25 Other / Unknown
Hubert Street (0.00 to 0.24)	Urban Local Road	Access Road	50 kph	Total of 3 incidents: • 3 PDO Major MR Type: • 3 Involving Parking
Meadow Street (0.00 to 0.59)	Urban Local Road	Access Road	60kph	Total of 23 incidents: • 2 Hospital • 3 Medical • 13 PDO Major • 5 PDO Minor MR Type: • 1 Involving Overtaking • 1 Involving Parking • 1 Involving Pedestrian • 19 Other / Unknown
Helena Street (0.00 to 0.84)	Urban Local Road	Access Road	50kph	Total of 1 incidents: • 1 PDO Minor MR Type: • 1 Other / Unknown

KCTT have reviewed extensively the crash data above. We have reviewed the likelihood of incidents at the intersection of Great Eastern Highway (James Street) & Meadow Street and Great Eastern Highway (James Street) SLK [11.26 to 12.53].

Intersection of Great Eastern Highway (James Street) & Meadow Street

- Killed and Serious Injury (KSI) Crashes (Fatality + Hospital) = 1 per every 5 years;
- All Crashes = 41 per every 5 years.

Main Roads WA uses a criterion called Crash Rate / MVKT (million vehicle kilometres travelled). The calculations for MVKT are shown below: -

Intersection of Great Eastern Highway (James Street) & Meadow Street

- Approximately 40,000 VPD
- VKT (5 year period) = 40,000 * 365 * 5 years * 0.4km = 29.2 MVKT
- KSI Crash Rate = 1 per 29.2 MVKT = 0.034
- All other crash Rate = 40 per 29.2 MVKT = 1.369

Therefore, the crash rate at the intersection of Great Eastern Highway (James Street) & Meadow Street is 40 incidents per 29.2 million kilometres travelled or equivalent to an incident rate of 1.369 crashes / MVKT. This rate of crashes is therefore lower than the network average of 7.16 crashes / MVKT over the 5 year period.

The crash rate for KSI crashes at the intersection of Great Eastern Highway (James Street) & Meadow Street is 1 incident recorded in the 5 year period per 29.2 million kilometres travelled or equivalent to an incident rate of 0.034 crashes / MVKT. This crash rate is lower than the network average of 0.31 over the 5 years.

Great Eastern Highway (James Street) SLK [11.26 to 12.53]

- Killed and Serious Injury (KSI) Crashes (Fatality + Hospital) = 1 per every 5 years;
- All Crashes = 53 per every 5 years.

Main Roads WA uses a criterion called Crash Rate / MVKT (million vehicle kilometres travelled). The calculations for MVKT are shown below: -

Great Eastern Highway (James Street) SLK [11.26 to 12.53]

- Approximately 35,000 VPD
- VKT (5 year period) = 35,000 * 365 * 5 years * 1.27km = 81.121 MVKT
- KSI Crash Rate = 1 per 81.121 MVKT = 0.012
- All other crash Rate = 53 per 81.121 MVKT = 0.653

Therefore, the crash rate at Great Eastern Highway (James Street) SLK [11.26 to 12.53] is 53 incidents per 81.121 million kilometres travelled or equivalent to an incident rate of 0.012 crashes / MVKT. This rate of crashes is therefore lower than the network average of 3.29 crashes / MVKT over the 5 year period.

The crash rate for KSI crashes at Great Eastern Highway (James Street) SLK [11.26 to 12.53]is 1 incident recorded in the 5 year period per 81.121 million kilometres travelled or equivalent to an incident rate of 0.653 crashes / MVKT. This crash rate is lower than the network average of 0.91 over the 5 years.

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.

Based on the comparative analysis, KCTT believe that the locations surrounding the proposed development does not raise any outstanding safety concerns.

2.2.3 Vehicle Parking Requirements

The City of Swan Local Planning Scheme No 17 and Policy POL-TP-129 Vehicle Parking Standards stipulate that parking provisions for residential developments should be made in accordance with the Residential Design Codes of Western Australia.

KCTT believe that every house will have their own garage, providing parking for the owner in the garage and visitors in front of garage.

2.2.4 Bicycle Parking

Given that City of Swan does not offer ratios for residential parking requirements for the land uses proposed within the development, the rates could be provided by the Residential Design Codes.

It is likely assumed that the residents of the house will be able to store their bicycles and equipment within their respective houses as well as being able to utilise their own personal showers. KCTT believe that there is no need for additional bicycle parking requirements.

2.2.5 ACROD Parking

Not Applicable for this Development.

2.3 Provision for Delivery and Service Vehicles

The provision required for delivery and service vehicles for residential development (low to medium density scale developments) is likely to be minimal above that which is provided for within the road reservation, through good road design in accordance with Liveable Neighbourhoods and the requirements of the City of Swan.

It is expected that delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking spaces given that they can operate safely within the road reserve.

Service vehicles can navigate internal roadway. The vehicle will make a three point turn in order to exit the development in forward gear.

The turning templates for the service vehicles can be seen in Appendix 3.

2.4 Hours of Operation

This category is not applicable for the residential development. The peak trip generations from a residential development are likely to be between 07:30 - 08:30 for the morning and between 16:00 - 17:00 for the evening peak. This will mainly occur as a result of the residents travelling to and from work.

The analysis of traffic volumes data obtained from the MRWA on the November 2016 for James Street (east of Meadow Street) and on the November 2015 for East Street (south of Water Street) shows that the morning peak is in the period between 07:30 and 08:30 and in the afternoon peak period in the period between 15:15 and 16:15.

The expected peak operating times for the proposed development will coincide with the AM peak times for traffic on James Street, and partial coincide with the PM peak times.

2.5 Daily Vehicular Volumes and Vehicular Types

The WAPC Transport Assessment Guidelines for Developments offers the following AM / PM peak vehicle trip generation rates for the proposed residential land use in this development: -

- **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.

The WAPC Transport Assessment Guidelines does not offer daily vehicle trip generation rates for the land uses proposed within the development. The NSW RTA Guide to Traffic Generating Developments suggests developments of this type in Sydney tend to generate between 4 and 5 vehicular trips per dwelling for medium to high density developments. In Perth, the Department of Planning and Infrastructure conducted a series of studies in the late 1990's / early 2000's which showed that higher density dwellings tended to average closer to 5.5 vehicle trips per day. These studies assumed that anywhere between 50% and 70% of commuters were travelling to the work by car as a driver. KCTT propose to use an average VPD of 6.7 vehicular trips per day per residence for R15 to R30.

Also, the following rates are sourced from the NSW RTA Guide to Traffic Generating Developments: -

- **Warehouses -** Daily vehicle trips is 4 per 100m^2 gross floor area, morning peak hour vehicle trips is 0.5 per 100m^2 gross floor area

Table 4 - Trip Generation

Land Use Type	WAPC Transport Assessment Guidelines for Developments / NSW RTA Guide To Traffic Generating Developments Requirement	Yield	Daily Traffic Generation	PM Peak Hour Traffic Generation
Existing Land Uses				
Retail / Warehouses*	4 vehicular trips per 100m^2 of GFA (Peak 0.5 per 100m^2 of GFA)	3,600m^2 GFA	144 VPD	18 VPH
Existing Traffic Volumes			**144 VPD**	**18 VPH**
Proposed Land Uses				
Residential Units	6.7 vehicle trips per unit (Peak 0.8 vehicle trips per unit)	15 houses	101 VPD	12 VPH

Proposed Traffic Volumes	**101 VPD**	**12 VPH**
Additional Traffic Volumes	**-43 VPD**	**-6 VPH**

Note the areas for the storage warehouses were quantified from aerial imagery.*

In summary, we believe the subject site (Lot 18 James Street and Lot 137 Scott Street in Guildford) will have a moderate impact on the external road network as the trip generation rates shown in the peak are in line with the WAPC Requirements for a Transport Impact Statement (Volume 1, Figure 2), but also the proposed traffic will be approximately 43 vehicular movements per day (and 6 vehicular movements per hour in the peak hour) less than existing vehicular movements per day (and hour).

2.6 Management of Traffic Generated by the Subject Site

The subject site fronts James Street, Scott Street and Wellman Street. James Street is an Urban Highway / Primary Distributor with more than 35,000 vehicles per day. Access / egress will be from Scott Street and Wellman Street. Both streets provide connectivity to James Street to the south and Helena Street to the north. The current layout of the streets will provide full vehicle movements to and from the development except for the intersection of Scott Street and James Street, which is Left-In Left-Out only.

As shown in Section 2.5 of this report, the total development is expected to generate approximately **101** vehicular movements per day with a forecasted impact of around **12** vehicular movements per hour in the peak hour. The proposed development will generate approximately **43** vehicular movements per day less than existing vehicular movements per day. Also, the proposed impact would be around **6** vehicular movements per hour in the peak hour less than existing vehicular movements per hour.

2.6.1 Traffic Flow

Based on the analysis of employment opportunities, location of schools, shopping centres and preferred locations for social and recreational activities and the proposed designated access/egress points to the site, we believe the generated traffic from the development would be distributed onto the adjacent road network as follows:

100% in development is 101 VPD and 12 VPH:-

- **According to layout 14 VPD and 2 VPH** from the proposed development are expected to be to access / egress onto Wellman Street;
    - 90% (13 VPD / 2 VPH) to the north via Wellman Street to James Street:
        - 40% (5 VPD / 1 VPH) to the east via James Street to East Street;
        - 60% (8 VPD / 1 VPH) to the west via James Street;
    - 10% (1 VPD / 1 VPH)to the south via Wellman Street to Helena Street west direction;
- **According to layout 87 VPD and 10 VPH** from the proposed development are expected to access / egress onto Scott Street;
    - 60% (52 VPD / 6 VPH) to the north via Scott Street to James Street:
    - 40% (35 VPD / 4VPH) to the south via Scott Street to Helena Street west direction;

The estimated traffic flow is expected to be equal for both inwards and outwards directions on the access/egress points. It has been assumed that approximately 99% of all generated vehicles would be light vehicles.

The PM Peak traffic is expected to be between 16:00 - 17:00, with an in-bound to out-bound flow ratio of 67% to 33% for the residential land use, in accordance with statistics quoted in the Western Australian Planning Commission's Transport Assessment Guidelines for Developments – Volume 5 (Technical Appendix).

2.6.2 Road Safety

We have reviewed the intersection location in accordance with two of the criteria outlined below: -

- Approach Sight Distance (ASD)
- Safe Intersection Sight Distance (SISD)

The following table provides volumes for ASD and SISD in accordance with AustRoads Part 4A Table 3.1 Approach Site Distance (ASD) and corresponding minimum crest vertical curve size for sealed roads (S<L) (page 18)) and with AustRoads Part 4A Table 3.2 Safe Intersection Sight Distance (SISD) and corresponding minimum crest vertical curve size for sealed roads (S<L) (page 21)).

Table 5 - Required Approach Site Distance (ASD) and Safe Intersection Sight Distance (SISD) Volumes

	Speed Limit (kph)	Design speed (kph)	Reaction Time (s)	Approach Site Distance (m)	Safe Intersection Sight Distance (m)
James Street	60	70	2.0	**92.0**	**151.0**
Wellman Street	50	60	2.0	**73.0**	**123.0**
Scott Street	50	60	2.0	**73.0**	**123.0**

A site visit was conducted in order to assess the current sight distances for the proposed development. This allowed a comparison to be made against the recommendations of Austroad's and the existing situation.

Wellman Street and Scott Street – Access / Egress to / from houses

Two houses have proposed access/egress points on to Wellman Street and six houses have proposed access/egress points on to Scott Street. It is expected that the operation speed for vehicles manoeuvring the corners of the intersections of Wellman Street & James Street and Scott Street & James Street will be approximately 20 km/h therefore the requirements at 60kph are not applicable. The houses that would be located the closest to the intersection of Wellman Street & James Street and Scott Street & James Street could have some safety issues, with a 20m distance to the intersection. However, it is expected that vehicles entering/leaving a driveway would operate with a speed lower than 10 km/h. The intersection of Scott Street & James Street operates as a left-in left-out.

Scott Street – South Access / Egress

The proposed southern access onto Scott Street from the development will be operated as a full movement intersection and has the following characteristics:

- A SISD from the South of 120 metres; and
- A SISD from the North of 100 metres, which extends to the end of Scott Street.

Whilst the existing SISD's are both less than the required value, this is due to the intersections of Scott Street with James Street and Helena Street being closer than the required SISD distance from the proposed access / egress. It is expected that the operation speed for vehicles manoeuvring the corners will be approximately 20 km/hr

therefore the requirements at 60kph are not applicable; however, the offset for the intersections are sufficient for a calculation at 20kph. This yields a required sight distance of 35 metres.

It was observed on site that a tree has the potential to partially obscure vision of oncoming northbound traffic during egress. This is located on the verge, to the south of the access /egress point and is shown below in **Error! Reference source not found.**.

Figure 1 - Tree on Scott Street Obscuring SISD Vision

As a result, KCTT believe that for the road safety of this Access / Egress point to be satisfied, either the removal or frequent trimming of this tree would need to be undertaken. It should be noted the tree is a deciduous one, so there are some differences to the appearance of the tree depending on the season.

James Street – Wellman Street

The intersection between James Street and Wellman Street has:

- A SISD from the West of over 200 metres; and
- A SISD from the East of 100 metres.

The street trees below in Figure 2 also offers partial obstruction to the visibility of oncoming traffic in the westbound lane in James Street. We recommend the lower portion of this tree to be trimmed to a minimum height of 1.2 metres from ground level to maintain good visibility.

Figure 2 - Trees on James Street Obscuring SISD Vision

As a result of this, KCTT believe that for the minimum sight distances of this Access / Egress point to be satisfied, the trimming of these trees would need to be undertaken.

James Street – Scott Street

The intersection between James Street and Scott Street is operated as a Left-In Left-Out Only and has a SISD from the East of 175 metres.

As a result of this, KCTT believe that the minimum sight distances including ASD for this intersection are satisfied.

2.7 Public Transport Access

The bus service, Route No 36, operates along James Street, with a bus station directly in the front of the proposed development. This bus route provides connectivity to Midland Station (Train and Bus Transfer) with the following details:

- Bus Route No 36 - Perth / Midland Station via Great Eastern Highway (James Street), with 11 minute intervals on working days in the peak hour; 1 hour intervals on Saturdays; and 2 hour intervals on Sundays and public holidays;

East Guildford Train Station is also within 10 minutes walking distance from the subject area. East Guildford Train Station belongs to the Midland Line (Zone 2) connecting the area with the Perth CBD (Perth Underground Station) - Stop No 99512.

2.8 Pedestrian and Cyclist Access

The following is a list of the major cyclist infrastructure (Perth Bicycle Network) within an 800 metre radius of the subject site:

- Stirling Street is classified as Principal Shared Path (PSP)
- Meadow Street (north from James Street) and Great Eastern Highway are classified as PBN "Other Shared Path (Shared by Pedestrian & Cyclists)" routes;
- Helena Street, Market Street, Hill Street, Victoria Street, Swan Street (east of Waylen Street), Waylen Street (South of Swan Street), Swan Street East, Allpike Street, Stirling Street and East Street are all classified as PBN "Good Road Riding Environment" routes;
- James Street (east from Bridge Street and west from Johnson Street), Swan Street (East of meadow street West) and Terrace Road (west of Allpike Street) are classified as "Bicycle Lanes or Sealed Shoulder Either Side" route.

Bicycle lockers, shelters and parking spaces are provided in James Street.

3. Transport Impact Statement Checklist for a Development Site

The following is the summary / checklist for a Transport Impact Statement as shown in the Department for Planning and Infrastructure's Transport Assessment Guidelines – Part 4.

Item	Status	Comments/Proposals
Proposed development		
Proposed land uses	Y	Proposed Residential Land Use
Existing land uses	Y	The following land uses exist on the subject site: • Hardware Store "Ross's M10 Solutions" with an office, store, depot and parking space • Storage warehouses
Context with surrounds	Y	Complementary
Vehicular access and parking		
Access arrangements	Y	The subject site fronts James Street, Scott Street and Wellman Street. Vehicular access will be from Scott Street and Wellman Street.
Public, private, disabled parking set down / pick up	Y	KCTT believe that every house will have their own garage, providing parking for the owner in the garage and visitors in front of garage.
Service vehicles (non-residential) N/A		
Access arrangements	N/A	n/a
On / off-site loading facilities	N/A	n/a
Service vehicles (residential)		
Rubbish collection and emergency vehicle access	Y	It is expected that delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking spaces given that they can operate safely within the road reserve.
Hours of operation (non-residential only)	N/A	N/A
Traffic volumes		
Daily or peak traffic volumes	Y	The development is expected to produce 101 VPD and 12 VPH. Refer to Section 2.5
Type of vehicles (eg cars, trucks)	Y	Predominantly light vehicles and small service vehicles.
Traffic management on frontage streets		
Public transport access	Y	Public transport access is available on James Street. Bus stop (for Route 36) on both sides of James Street, which is easily accessible via footpaths.
Nearest bus/train routes	Y	Bus Route: • No 36 - Esplanade Busport - Midland Station via James Street Train stop:

		• East Guildford Train Station - Stop No 99512 Refer to Section 2.7.
Nearest bus stops/train stations	Y	The bus stop (for bus route No 36) is in the front of the subject site in James Street. East Guildford Train Station is approximately 10 minutes walking distance from the subject area
Pedestrian / cycle links to bus stops/train station	Y	Pedestrian paths on James Street and Fauntleroy Street provide connectivity to the above mentioned bus and train stops. Within a 800 metre radius of the subject site: • PBN "Other Shared Path (Shared by Pedestrian & Cyclists)" routes; • PBN "Good Road Riding Environment" routes; • PBN "Bicycle Lanes or Sealed Shoulder Either Side" routes.
Pedestrian access/facilities		
Existing pedestrian facilities within the development (if any)	N	No existing facilities within the subject site.
Proposed pedestrian facilities within development	N	No proposed pedestrian facilities within the subject site.
Existing pedestrian facilities on surrounding roads	Y	Pedestrian facilities exist on James Street. These are interlinked with pedestrian paths on the surrounding / connecting streets.
Proposals to improve pedestrian access	N	The development does not propose any further modifications to the existing pedestrian network.
Cycle access/facilities		
Existing cycle facilities within the development (if any)	N	No existing facilities within the subject site.
Proposed cycle facilities within development	N	No proposed facilities within the subject site.
Existing cycle facilities on surrounding roads	Y	• Stirling Street is classified as Principal Shared Path (PSP); • Meadow Street (north from James Street) and Great Eastern Highway are classified as PBN "Other Shared Path (Shared by Pedestrian & Cyclists)" routes; • Helena Street, Market Street, Hill Street, Victoria Street, Swan Street (east of Waylen Street), Waylen Street (South of Swan Street), Swan Street East, Allpike Street, Stirling Street and East Street are all classified as PBN "Good Road Riding Environment" routes; • James Street (east from Bridge Street and west from Johnson Street), Swan Street (East of meadow street West) and Terrace Road (west of Allpike Street) are classified as"Bicycle Lanes or Sealed Shoulder Either Side" route.

Proposals to improve cycle access	N	The development does not propose any further modifications to the existing cycling network.
Site specific issues		
Identify issues	Y	1. Provision of sufficient parking bays to cater for the requirements of the development. 2. Impact on the surrounding network. 3. Vehicle turning templates for the proposed access / egress locations for light and service vehicles. 4. Ensure that sight distances are appropriate
Remedial measures	Y	1. KCTT believe that every house will have their own garage, providing parking for the owner in the garage and visitors in front of garage. 2. The subject site will have moderate impact of **101 VPD** and **12VPH** on the external road network. The proposed traffic will be approximately 43 vehicular movements per day less than existing vehicular movements per day. Also, the proposed impact would be around 6 vehicular movements per hour in the peak hour less than existing vehicular movements per hour. 3. Main access / egress radiuse from the street should be designed in accordance with Appendix 3, and to be confirmed at detailed civil design of development 4. Sight distances have been checked and verified with a sight visit. Required remedial actions have been outlined in Section 2.6.2

Appendix 1

The layout of the proposed development

R20 Development scenario

Site plan

R20 Development scenario

Built form massing - view from the northeast

R20 Development scenario

Built form massing - view from the northwest

R20 Development scenario

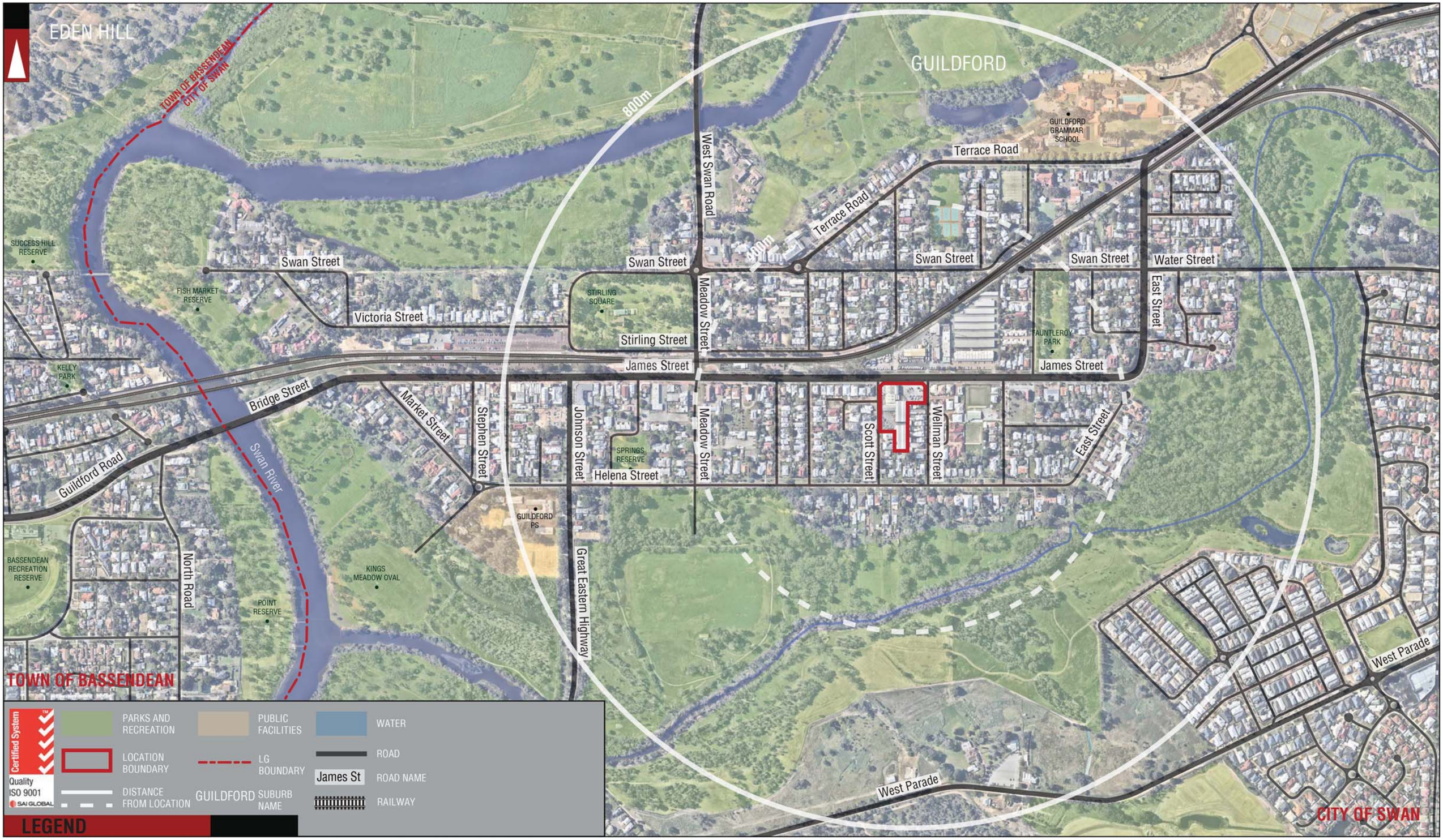
Built form massing - view from the southwest

R20 Development scenario

Built form massing - view from the southeast

Appendix 2

Transport Planning and Traffic Plans



C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	04-03-2015	ISSUED FOR REVIEW
No	DATE	AMENDMENT

PROJECT:
LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD

TITLE:
LOCALITY PLAN - 800M RADIUS

DRAWING NUMBER:
KC00274.000_S01

DRAWN BY:
K.P.

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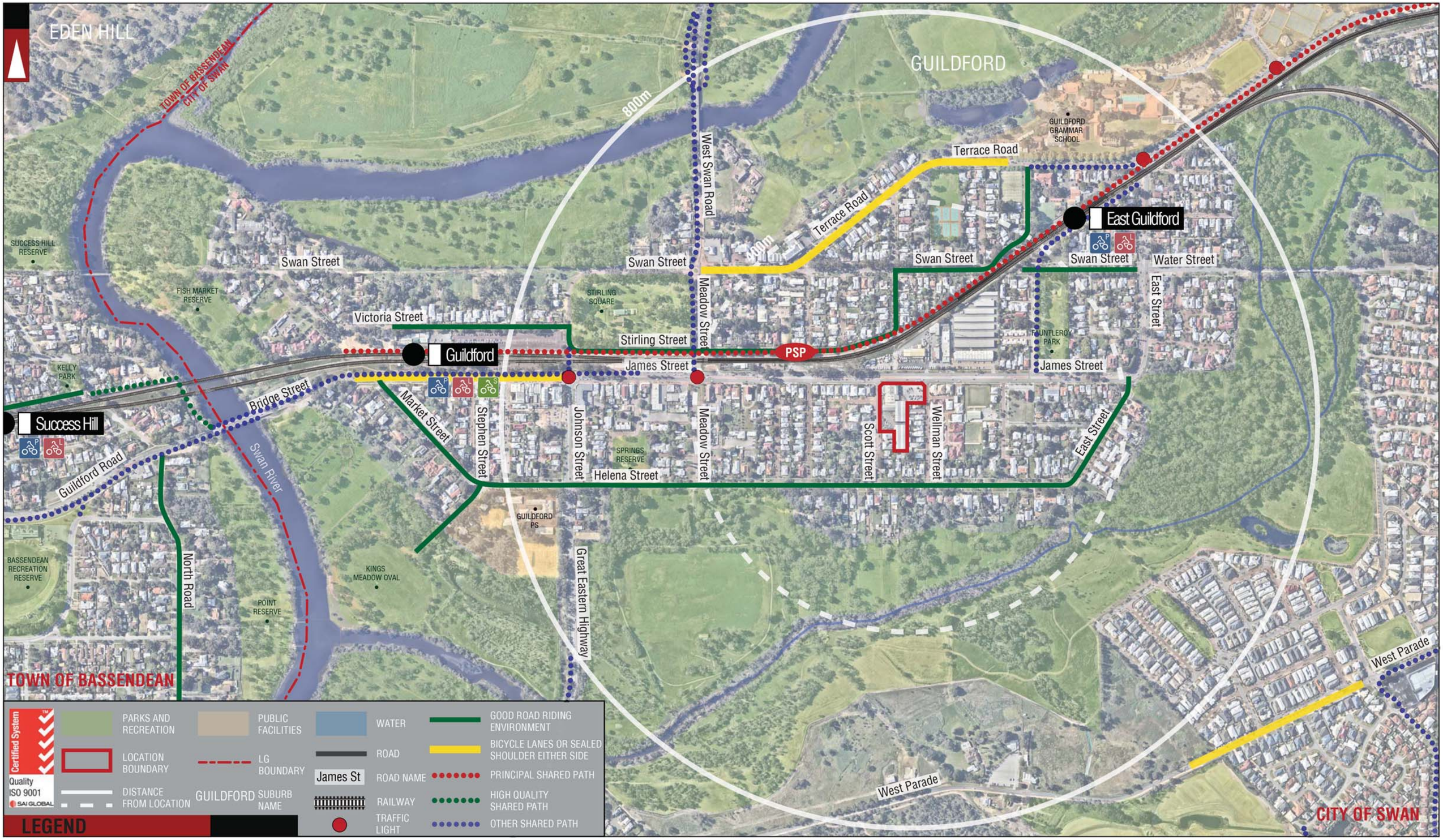

No	DATE	AMENDMENT
C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	04-03-2015	ISSUED FOR REVIEW

PROJECT: LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD

TITLE: BICYCLE NETWORK PLAN - 800M RADIUS

DRAWING NUMBER: KC00274.000_S02

DRAWN BY: K.P.

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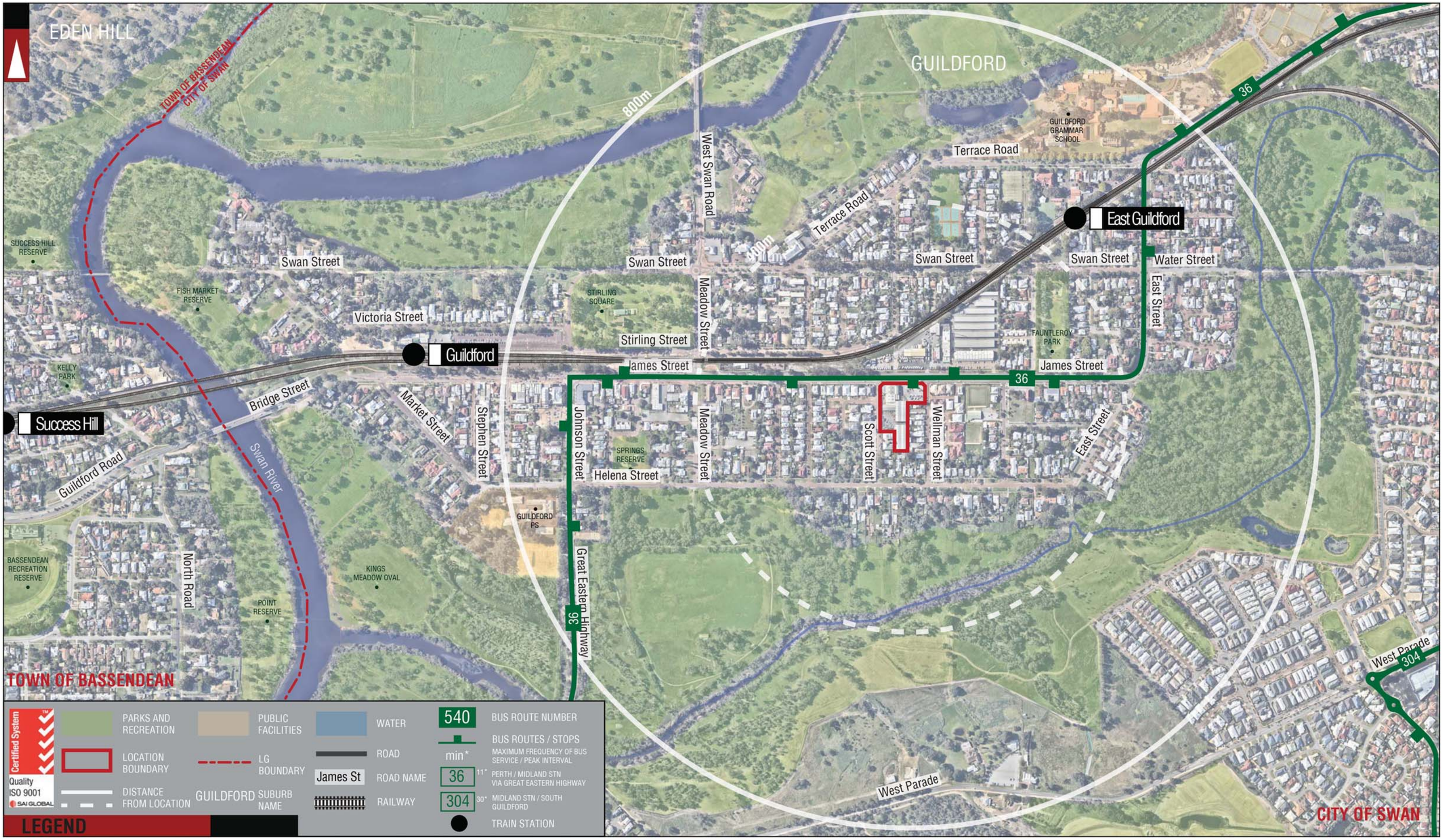

No	DATE	AMENDMENT
C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	04-03-2015	ISSUED FOR REVIEW

PROJECT: LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD

TITLE: PUBLIC TRANSPORT PLAN - 800M RADIUS

DRAWING NUMBER: KC00274.000_S03

DRAWN BY: K.P.

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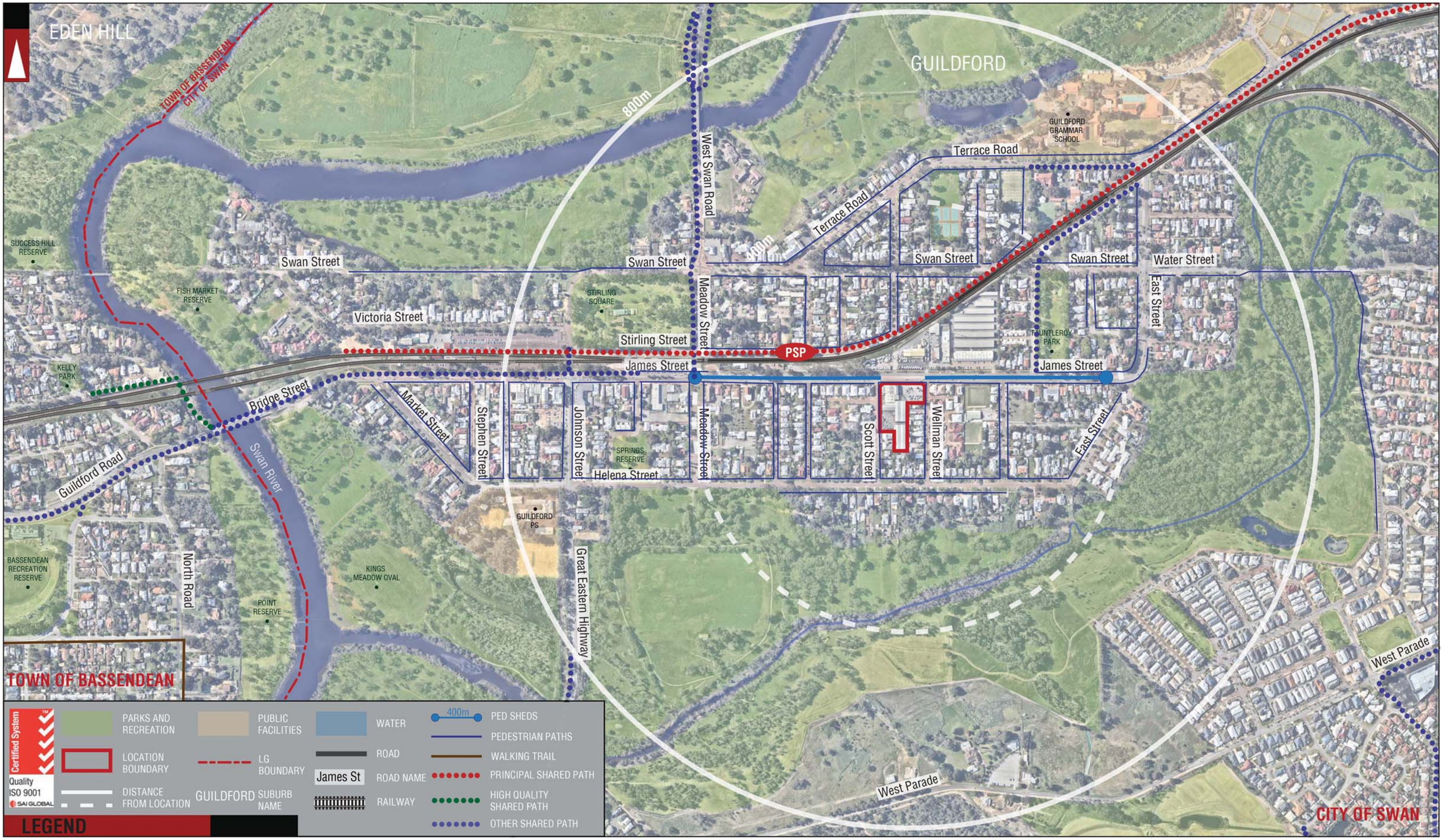

C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	04-03-2015	ISSUED FOR REVIEW
No	DATE	AMENDMENT

PROJECT:
LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD

TITLE:
PEDESTRIAN PATHS PLAN - 800M RADIUS

DRAWING NUMBER:
KC00274.000_S04

DRAWN BY:
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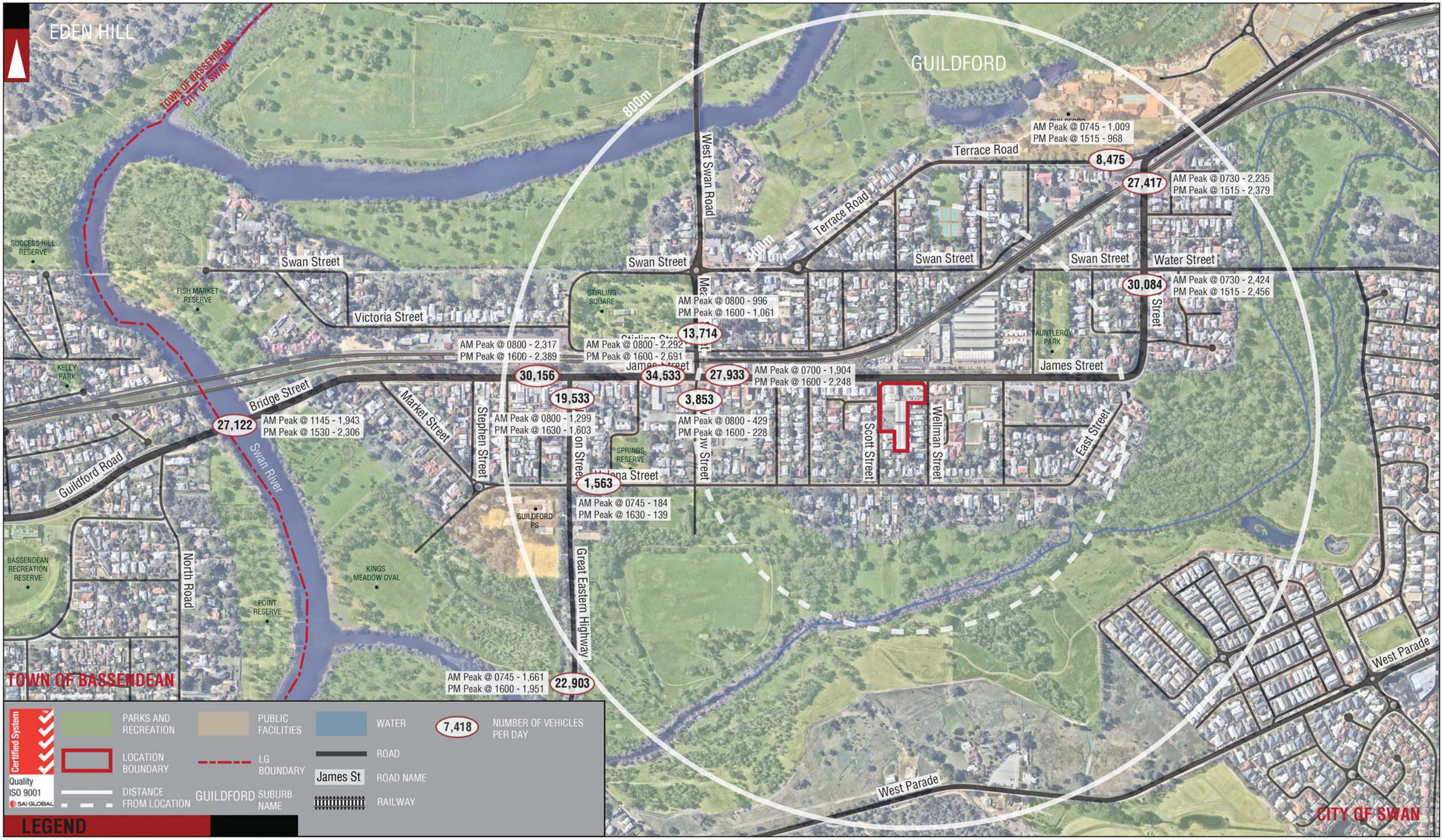

C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	04-03-2015	ISSUED FOR REVIEW
No	DATE	AMENDMENT

PROJECT:
LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD

TITLE:
EXISTING TRAFFIC COUNTS - 800M RADIUS

DRAWING NUMBER:
KC00274.000_S05

DRAWN BY:
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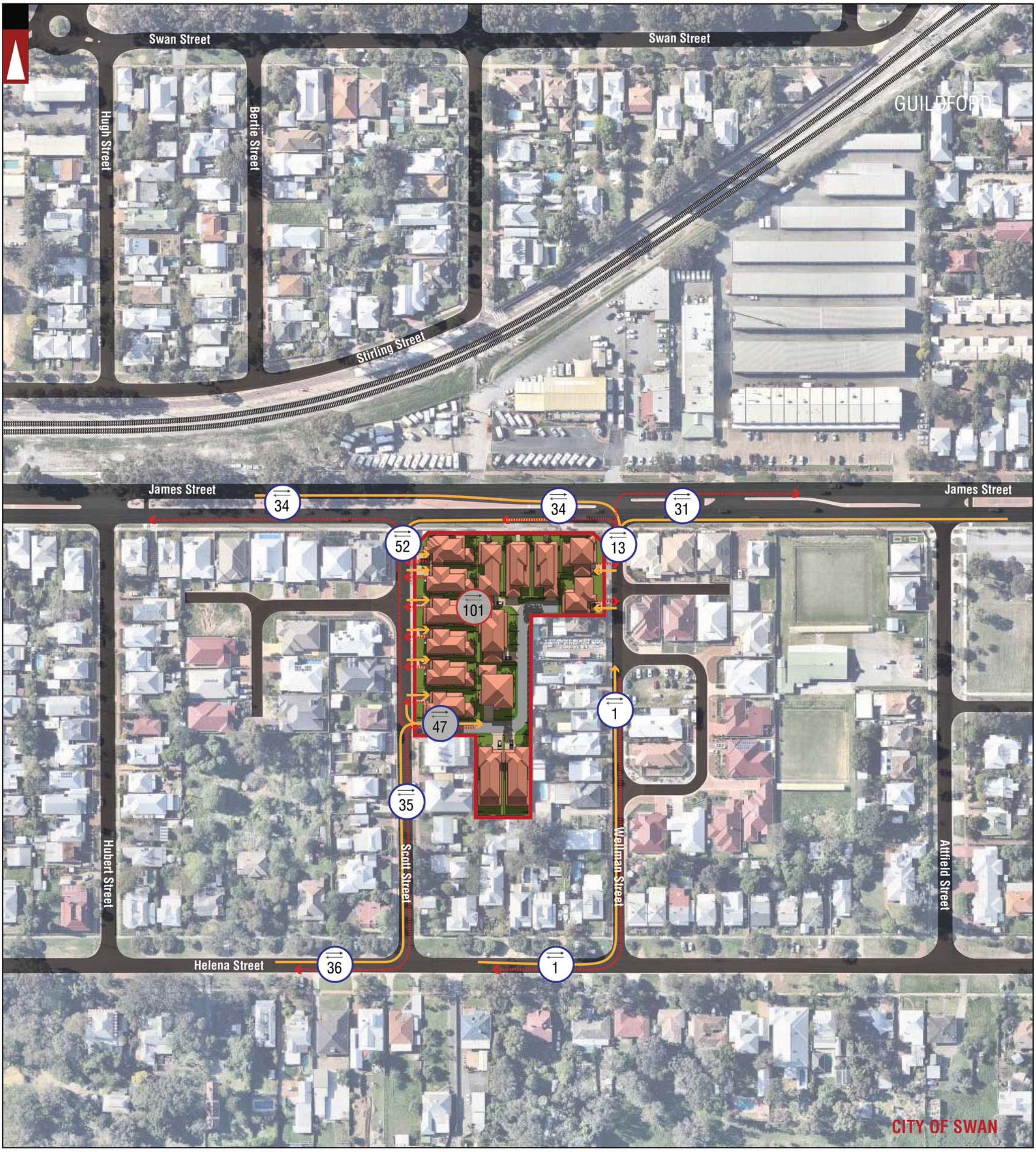

PARKS AND RECREATION

WATERWAYS

PUBLIC PURPOSE

LOCATION BOUNDARY

GUILDFORD LOCAL GOVERNMENT NAME

ROAD (VARIED WITH ROAD WIDTH)

James St ROAD NAME

RAILWAY

330 TOTAL EXPECTED TRAFFIC GENERATION FROM THE SUBJECT SITE

330 TOTAL EXPECTED TRAFFIC GENERATION FROM THE SUBJECT SITE ON THE ACCESS / EGRESS POINTS

330 TOTAL EXPECTED TRAFFIC GENERATION FROM THE SUBJECT SITE ON THE SPECIFIC SECTION OF ROAD - **IN AND OUT DIRECTION**

TRAFFIC FLOW IN DIRECTION

TRAFFIC FLOW OUT DIRECTION

NOTE:
EXPECTED TRAFFIC THE PROPOSED DEVELOPMENT WILL GENERATE IS 43VPD LESS THAN THE TRAFFIC GENERATED BY THE EXISTING LAND USE ON THE SUBJECT SITE.

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	12-03-2015	ISSUED FOR REVIEW

PROJECT:
LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD

TITLE:
TRAFFIC FLOW DIAGRAM

DRAWING NUMBER:
KC00274.000_S06

DRAWN BY:
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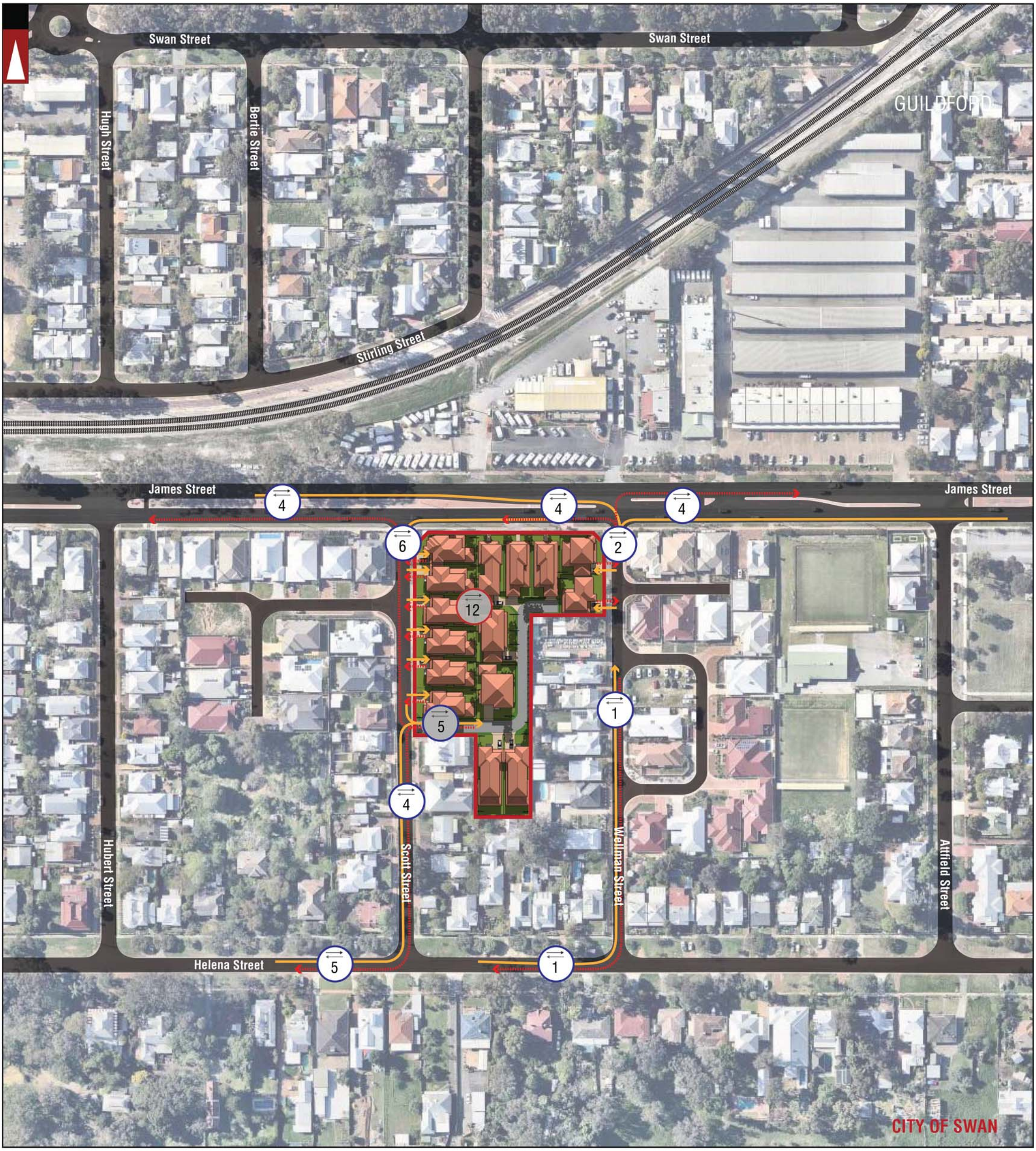

PARKS AND RECREATION

WATERWAYS

PUBLIC PURPOSE

LOCATION BOUNDARY

GUILDFORD LOCAL GOVERNMENT NAME

ROAD (VARIED WITH ROAD WIDTH)

James St ROAD NAME

RAILWAY

330 TOTAL EXPECTED TRAFFIC GENERATION FROM THE SUBJECT SITE

330 TOTAL EXPECTED TRAFFIC GENERATION FROM THE SUBJECT SITE ON THE ACCESS / EGRESS POINTS

330 TOTAL EXPECTED TRAFFIC GENERATION FROM THE SUBJECT SITE ON THE SPECIFIC SECTION OF ROAD - **IN AND OUT DIRECTION**

TRAFFIC FLOW IN DIRECTION

TRAFFIC FLOW OUT DIRECTION

NOTE:
EXPECTED TRAFFIC THE PROPOSED DEVELOPMENT WILL GENERATE IS 6VPH LESS THAN THE TRAFFIC GENERATED BY THE EXISTING LAND USE ON THE SUBJECT SITE.

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	12-03-2015	ISSUED FOR REVIEW

PROJECT:
LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD

TITLE:
TRAFFIC FLOW DIAGRAM - AM / PM PEAK

DRAWING NUMBER:
KC00274.000_S07

DRAWN BY:
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Appendix 3

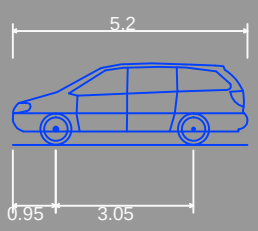
Vehicle Turning Circle Plans

James Street

Wellman Street

Scott Street

KCTT: Recommended kerb radii - R3m



Passenger vehicle (5.2 m)	
Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	1.804m
Min Body Ground Clearance	0.295m
Track Width	1.840m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	6.300m

Wheel Path (Forward)

Vehicle Chasis Envelope (Forward)

Wheel Path (Reverse)

Vehicle Chasis Envelope (Reverse)

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LEGEND

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A	03-03-2015	ISSUED FOR REVIEW

PROJECT:
Lot 18 James Street & Lot 137 Scott Street, Guildford

TITLE:
Vehicle Turning Circle Plan - Passenger Vehicle (5.2m)

DRAWING NUMBER:
KC00274.000_S20

DRAWN BY:
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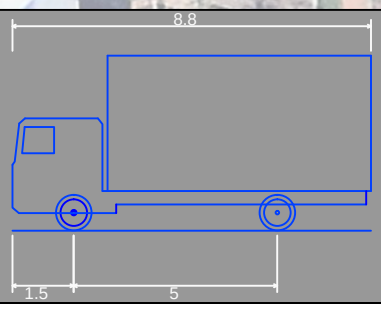
James Street

Wellman Street

Scott Street

KCTT: Recommended kerb radii - R3m



Service Vehicle (8.8 m)	
Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.427m
Track Width	2.500m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	12.500m

- Wheel Path (Forward)
- Vehicle Chasis Envelope (Forward)
- Wheel Path (Reverse)
- Vehicle Chasis Envelope (Reverse)

Certified System Quality ISO 9001 SAI GLOBAL

LEGEND

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C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	03-03-2015	ISSUED FOR REVIEW

PROJECT:
Lot 18 James Street & Lot 137 Scott Street, Guildford

TITLE:
Vehicle Turning Circle Plan - Service Vehicle (8.8m) - Inbound

DRAWING NUMBER:
KC00274.000_S21a

DRAWN BY:
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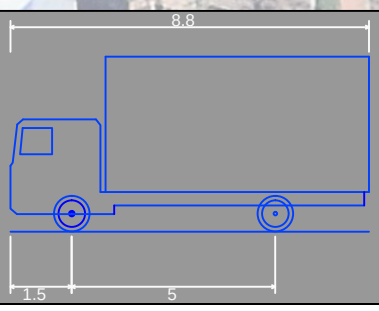
James Street

Wellman Street

Scott Street

KCTT: Recommended kerb radii - R3m



Service Vehicle (8.8 m)	
Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.427m
Track Width	2.500m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	12.500m

Wheel Path (Forward)

Vehicle Chasis Envelope (Forward)

Wheel Path (Reverse)

Vehicle Chasis Envelope (Reverse)

Certified System Quality ISO 9001 SAI GLOBAL

LEGEND

NO	DATE	AMENDMENT
C	14-12-2016	PROPOSED LAYOUT AMENDED
B	28-11-2016	PROPOSED LAYOUT AMENDED
A	03-03-2015	ISSUED FOR REVIEW

PROJECT:
Lot 18 James Street & Lot 137 Scott Street, Guildford

TITLE:
Vehicle Turning Circle Plan - Service Vehicle (8.8m) - Outbound

DRAWING NUMBER:
KC00274.000_S21b

DRAWN BY:
N.M.

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APPENDIX 7
Infrastructure Servicing Report

Lot 18 James Street & Lot 137 Scott Street,
Guildford, Western Australia

Infrastructure Servicing Report

Dynamic Planning and
Development

Our Ref: SC00158.100

December, 2016

SERLING CONSULTING

INNOVATIVE ENGINEERING SOLUTIONS

Lot 18 James Street and Lot 137 Scott Street,

GUILDFORD, WESTERN AUSTRALIA

Dynamic Planning & Development

Our Ref: SC00158.100

Infrastructure Servicing Report

FINAL

December, 2016

Serling Consulting (Australia) Pty Ltd
ABN 15 162 648 222
Unit 1 61 Guthrie Street,
Osborne Park WA 6017
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INNOVATIVE ENGINEERING SOLUTIONS

SERLING CONSULTING

Contents

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A	10/12/2014	G. Alexander	G. Alexander	10/12/2014	Draft
0	05/01/2015	G. Alexander	G. Alexander	05/01/2015	Final
1	01/12/2016	C. Kirk	G. Alexander	01/12/2016	Final
2	02/12/2016	C. Kirk	G. Alexander	02/12/2016	Final

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Author:	Aaron Smith / Calvin Kirk
Project Manager:	Gil Alexander
Name of Organisation:	Dynamic Planning and Development Pty Ltd
Name of project:	Lot 18 James Street & Lot 137 Scott Street, Guildford
Name of document:	R01as Lot 18 James Street & Lot 137 Scott Street, Guildford ISR
Document version:	Final
Project number:	SC00158.100

1. Introduction

1.1 Report Layout and General Advice

Serling Consulting is providing this preliminary infrastructure assessment and civil engineering feasibility for the development of the landholdings at Lot 18 James Street and Lot 137 Scott Street, Guildford, on behalf of Dynamic Planning and Development (DPD). Information provided by DPD indicates that the subject landholding is to be rezoned to a R20 coding and yield approximately 15 dwellings spread in a 1-2 storey single house / grouped dwelling development and this forms the basis of the engineering infrastructure assessment as requested by the client.

Revision 0 of this report was previously provided to support a R30 / R40 coded development. After submission of the Local Structure Plan pertaining to this development and subsequent discussions with the Western Australian Planning Commission, the planned coding of the development has been redesigned to suit a R20 zoning. This report has been revised to suit the new R20 zoning proposal.

The report includes an assessment of the following: -

- Review all available topographical, hydrological, geotechnical and environmental information relevant to the landholding;
- Review all current available servicing planning from the relevant servicing authorities with regards to the applicability of the servicing strategies for the proposed development layouts. Where no such planning is available, we have provided commentary based on our expectations for services infrastructure based on our experience; and
- Identify likely requirements for importation of fill across the development zone.

The report is laid out as follows: -

- Section 1 Introduction - Report Layout and General Advice
- Section 2 Existing Major Infrastructure & Potential Major Infrastructure Requirements
- Section 3 Conclusion, Perceived Risks & Potential Risk Mitigation Strategies

The infrastructure advice provided in this report is preliminary in nature only and subject to change as the development conditions are ratified through the planning and implementation phases of the project. We have discussed the upgrade requirements for the subject site in terms of major infrastructure requirements, including: -

- **Sewer** – requirements for any external upgrade of services, and infrastructure required within the subject site for development of land for residential purposes;
- **Water** – as above for sewer infrastructure;
- **Power** – closest possible location for connection of services, Western Power Feasibility Study;

- **Gas** – expected connection points, provisional sum allocation for connection and extension of external gas supplies to the subject site;
- **Telecoms** – expected connection point and external connection of services;
- **Roads** – No consideration for the construction of internal roads has been made although it is not considered a risk item;
- **Stormwater** – general requirements for conveyance of internal road drainage
- **Groundwater** – general discussion on groundwater and site soil conditions from the Perth Groundwater Atlas Maps; and
- **Siteworks** – general discussion on the likely clearing requirements, and any site specific earth working requirements including discussion regarding the likely requirements for site retaining walls.

1.2 Notes Pertaining To This Report

This report has been provided as an input to the overall due diligence concerning the expected infrastructure requirements and the expected engineering issues for mitigation for the development of the aforementioned landholding. This report will be utilised by the DPD and the stakeholder team to determine the suitability of development at the subject site.

This study has been completed as a desktop analysis, prior to the commencement of any level of engineering design.

The following key point should be considered in the usage of this report: -

- Some feedback has been sought from the various regulatory authorities, however the information received from those authorities is subject to change upon formal application.

1.3 Basis For Forming the Report (Available Information, Reasoning, Literature)

- **Dial Before You Dig Information Received** - Serling Consulting have requested existing infrastructure locations and information through the Dial Before You Dig service. This information is provided in **Appendix E** – Relevant Data from DBYD (Dial Before You Dig).
- **Aerial Imagery (Satellite Photography)** – Serling Consulting have reviewed aerial imagery of the site to determine the vegetation coverage of the area proposed for development and to determine the extent of buildings and stockpiles over the landholdings requiring demolition and / or remediation.
- **Perth Groundwater Atlas** – Serling Consulting have requested landfall geology, groundwater levels and soil conditions for the subject landholding though the Department of Water's Perth Groundwater Atlas.
- **Site Visit –** A site visit conducted by Serling Consulting.

1.4 Location and Description of the Landholding

Lot 18 James Street and Lot 137 Scott Street, Guildford is located on James Street, Guildford and is bounded by James Street to the north, Scott Street to the west and Wellman Street to

the east. The subject landholding is expected to provide 15 dwellings based on the proposed Structure Plan pursuing a R20 zoning.

Using aerial imagery available from Google Earth and the information obtained by Serling Consulting during a site visit, the site has an existing home and hardware store in operation. This however will be demolished when the land is developed. (Refer to **Appendix A**).

2. Existing Infrastructure & Proposed Requirements

This section documents the locations of existing major services infrastructure pertinent to the re-development of the subject landholding, or which needs to be considered due to the proposed works.

Existing services are in immediate proximity of the subject landholdings. These are detailed in the following sections: -

- Section 2.1 Existing Sewerage System & Proposed Requirements
- Section 2.2 Existing Water System & Proposed Requirements
- Section 2.3 Existing Electricity Supply & Proposed Requirements
- Section 2.4 Existing Telecommunications Supply & Proposed Requirements
- Section 2.5 Existing Gas Supply & Proposed Requirements
- Section 2.6 Stormwater Drainage Considerations

2.1 Existing Sewerage System & Proposed Requirements

The following information has been obtained through a review of existing services information available through the Dial Before You Dig and Water Corporation ESINet systems (Refer **Appendix E**): -

- 2 x 150mm-diameter VC sewer mains running through Lot 18 and gravitate towards Wellman Street;
- 150mm-diameter PVC-U sewer main in Wellman Street;
- 450-mm diameter RCPL sewer pressure main in James Street; and
- 460mm-diameter RC sewer main in Helena Street.

Currently there are eight existing DN100 junctions servicing Lot 18 James Street and one existing junction servicing Lot 18 Scott Street from the existing 150mm-diameter VC sewers running through Lot 18. As a minimum Serling Consulting would expect that these existing junctions will need to be amalgamated to a single DN150 junction in order to accommodate the proposed 15 dwelling development.

The Water Corporation's assumes a R20 minimum coding in this area in their wastewater planning, therefore wastewater flows from the proposed R20 development will conform to previous Water Corporation planning assumptions.

The Water Corporation also noted that all the junctions would need to be amalgamated into one connection point as noted by above. Refer to **Appendix B – Water Corporation Correspondence** for more information.

There are no existing easements over the existing sewers running through Lot 18 however there will be an implied easement and any development would need to take this into account.

2.2 Existing Water Supply & Proposed Requirements

The following information has been obtained by a dial before you dig request (Refer to **Appendix E**): -

- 205mm-diameter cast iron water main in James Street;
- 305mm-diameter cast iron water main in James Street;
- 100mm-diameter cast iron water main in Scott Street;
- 100mm-diameter cast iron water main in Wellman Street;
- 100mm-diameter cast iron water main in Helena Street; and
- 100mm-diameter cast iron water main in Karbuni Court.

Currently there are two existing water connections servicing Lot 18 James Street from the 205mm-diameter water main in James Street as well as single services servicing Lot 137 Scott Street from the fronting water mains. The existing connections would need to be combined into a single larger meter at the time of development should the subject landholdings be amalgamated and additional headworks payments to the Water Corporation will be required for the larger meter. It is likely however that the existing 205mm-diameter main in James Street should be sufficient to service the subject landholdings.

The Water Corporation has confirmed that there is sufficient capacity to service previously proposed R40 zoning (and therefore sufficient for a R20 zoning) and a connection off of James Street, Scott Street or Wellman Street would be acceptable.

2.3 Existing Electricity Supply & Proposed Requirements

Refer to 3E Consulting Engineers Servicing report in **Appendix D** for a detailed breakdown of the existing electrical infrastructure and proposed upgrade requirements which would be required for an R40 development. Based on the proposed loads and information obtained from Western Power's public Network Capacity Mapping Tool by 3E Consulting Engineers there is sufficient capacity available in the surrounding area to supply the proposed R20 / 15 dwelling development given the sufficient capacity to supply the R40 development. i.e. the decrease in density to a R20 development will decrease the proposed demand calculated in 3E's report.

2.4 Existing Telecommunications Supply & Proposed Requirements

Refer to 3E Consulting Engineers Servicing report in **Appendix D** for a detailed breakdown of the existing telecommunications infrastructure and proposed upgrade requirements. As commented in the previous section, 3E's Servicing Report was produced to support the R40 zoning submission. Again, a decrease in density to R20 will decrease the assumed demand on the system.

2.5 Existing Gas Supply & Proposed Requirements

The following information has been obtained by a dial before you dig request (Refer to **Appendix E**): -

- 100mm-diameter PVC medium pressure gas reticulation main in James Street;
- 50mm-diameter PVC medium pressure gas reticulation main in Scott Street;
- 80mm-diameter PVC medium pressure gas reticulation main in Wellman Street; and

- 100mm-diameter PVC medium pressure gas reticulation main in Helena Street.

An ATCO Gas 100mm gas pipeline is available in the fronting road reserve of James Street and a connection to this main should be sufficient to service the proposed development (Refer to **Appendix E**). This will need to be confirmed with ATCO Gas during detailed design.

2.6 Stormwater Drainage Considerations

Based on the correspondence with the City of Swan, Serling Consulting expects that the 1 year, 1 hour year storm event will be required to be retained within the subject landholding while any larger storm events will overflow into the existing drainage infrastructure. This can be accomplished through the use of underground storage such as soak wells or Stormtech systems. It should also be noted that the City of Swan will require the developer to provide a Stormwater Management Plan indicating the stormwater retention capacities for the 1 year, 5 year and 100 year storms as well as overland flow paths for the major storms. Refer to **Appendix C** – City of Swan Correspondence for more information. It is recommended that a site specific infiltration tests be undertaken to inform the drainage design.

Groundwater Maps (Perth Groundwater Atlas)

Groundwater is expected to be around 6 metres deep according to the Perth Groundwater Atlas. **Appendix F** shows the nearest Groundwater level at RL1.0, with the existing surface level contours varying from RL7.0 to RL7.5 AHD across the subject landholdings (Refer to **Appendix G**). It is our recommendation that a site specific geotechnical assessment be conducted to determine the actual groundwater level.

Surface Geology (Perth Groundwater Atlas)

The subject landholding is expected to feature Guildford Clay with alluvium featuring clay, loam, sand and gravel. (Refer to **Appendix F**).

This advice however is general in nature and should be followed up by a detailed geotechnical report by a suitably qualified consultant.

Generalised Groundwater Salinity (Perth Groundwater Atlas)

The generalised salinity measure is expected to be in the range of 1,500 to 3,000 mg/L TDS. This is not expected to have any impact on development. The groundwater is unsuitable for garden bore use (Refer to **Appendix F**).

Earthworks (TME LiDAR Contours)

The existing surface level contours vary, from RL7.0 to RL7.5 AHD across the subject landholdings (Refer to **Appendix G**). Given the surface geology is expected to include Guildford clay we would expect there to be a requirement for imported fill to achieve the necessary clearance from the clay layer. The fill level required is determined by the site classification as determined by the geotechnical engineer as a part of the site specific geotechnical report. Typically for a Class S site a minimum clearance to the clay layer of 1.2m would be required and for a Class A site a clearance of around 1.8m would be required.

Risk of Shallow Acid Sulphate Soils (Perth Groundwater Atlas)

Perth Groundwater Atlas indicates that the subject landholding has no known risk of acid sulphate soils (Refer to **Appendix F**). This advice however is general in nature and should be followed up by a detailed geotechnical report by a suitably qualified consultant.

Previous Site Uses

The subject landholdings currently has a home and hardware store with existing buildings including show room and storehouses which would need to be demolished by a licensed contractor prior to being developed. There are no previous site uses that would preclude the subject landholdings from being developed.

3. Conclusion, Perceived Risks, Opportunities & Mitigation Strategies

Serling Consulting have completed a preliminary engineering infrastructure assessment of the nominated landholding bounded by the fronting road reserves of James Street, Scott Street and Wellman Street. This section highlights the key items to be considered in this development, if the development was to be considered in isolation of other landholdings in the area: -

- Sewer Reticulation

The Water Corporation have confirmed that there appears to be sufficient capacity within the existing infrastructure to support the proposed R20 zoning.

There are no existing easements over the existing sewers running through Lot 18 however there will be an implied easement and any development would need to take this into account.

- Water Reticulation

The Water Corporation have confirmed that there is sufficient capacity to service the proposed R20 zoning and a connection off of James Street, Scott Street or Wellman Street would be acceptable.

- Power

Based on the proposed loads and information obtained from Western Power's public Network Capacity Mapping Tool by 3E Consulting Engineers there is sufficient capacity available in the surrounding area to supply the proposed R20 / 15 dwelling development.

- Communications

Telstra are the Service Provider of Last Resort and as the proposed development is less than 100 dwellings NBN Co. will not service the landholding until the brownfields rollout reaches Guildford and there is no existing timeframe for when this will happen. A connection through the existing Telstra Copper Network should not pose any issues.

- Gas

An ATCO Gas 100mm gas pipeline is available in the fronting side of the James Street road reserve and a connection to this main should be sufficient to service the proposed development.

- Stormwater Drainage Requirements

The 1 year, 1 hour year storm event will be required to be retained within the subject landholding while any larger storm events will overflow into the existing drainage infrastructure. It should also be noted that the City of Swan will require the developer to provide a Stormwater Management Plan indicating the stormwater retention capacities for the 1 year, 5 year and 100 year storms as well as overland flow paths for the major storms at the

time of the development application. A site specific infiltration test will be required to inform the drainage design.

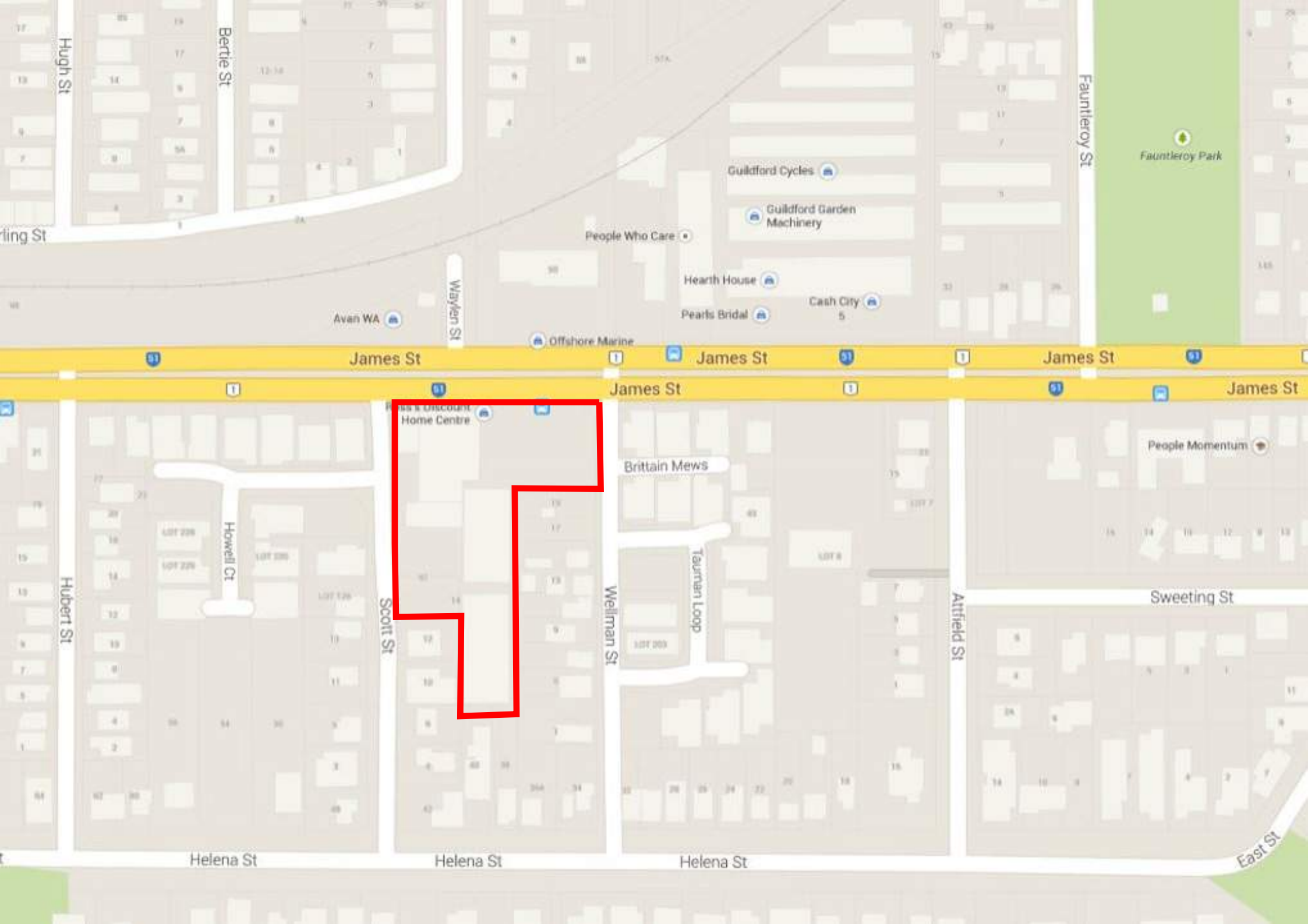
- Earthworks

Given that the surface geology is expected to include Guildford clay we would expect there to be a requirement for imported fill to achieve the necessary clearance from the clay layer. The fill level required is determined by the site classification as determined by the geotechnical engineer as a part of the site specific geotechnical report.

- Previous Site Uses

There are no expected contaminated site issues due to the previous site uses however this will need to be confirmed with a suitably qualified consultant.

Appendix A Arial Photograph


Hugh St
Bertie St
Fauntleroy St
Fauntleroy Park
Guildford Cycles
Guildford Garden Machinery
People Who Care
Hearth House
Cash City
Pearls Bridal
Avan WA
Wayfen St
Offshore Marine
James St
James St
James St
James St
James St
Ross's Discount Home Centre
People Momentum
Brittain Mews
Howell Ct
Taurman Loop
Hubert St
Scott St
Wellman St
Attfield St
Sweeting St
Helena St
Helena St
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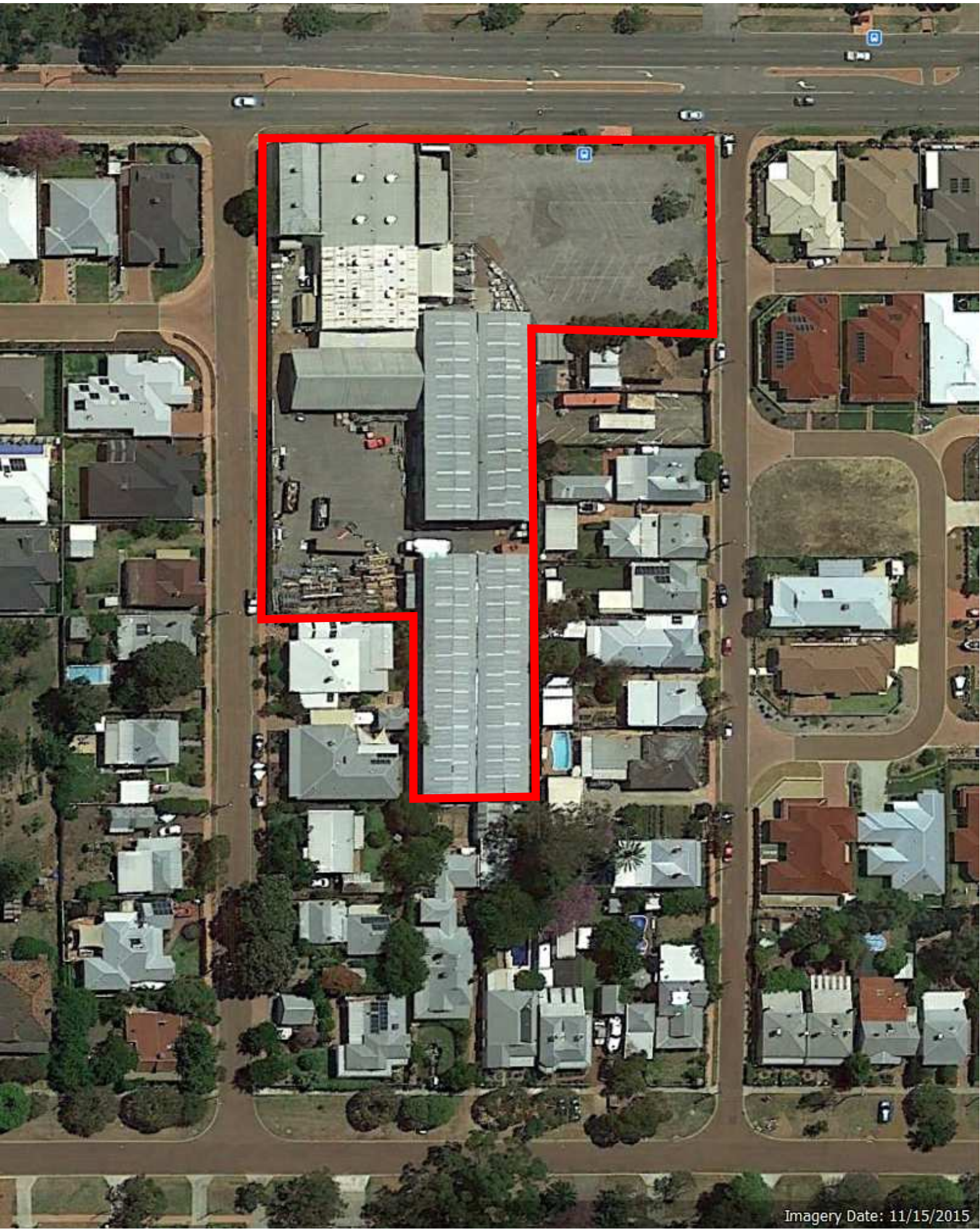
East St


Imagery Date: 11/15/2015

Appendix B Water Corporation Correspondence

Richard Bargerbos

From: Brett Coombes <Brett.Coombes@watercorporation.com.au>
Sent: Thursday, 1 December 2016 10:55 AM
To: Richard Bargerbos
Subject: RE: 90 04245 27 6 - 59 JAMES ST GUILDFORD LOT 18

Richard,

As discussed with you over the phone, the Water Corporation's wastewater planning for this part of the Guildford SD assumes R20 as a minimum density. The ww flows arising from the proposal should therefore concur with the flows assumed in our planning.

There have not been any recent changes or reviews to this portion of the Guildford SD planning. The planning review referred to in my earlier email to Aaron centred on land further to the north-east near the boundary between the Guildford SD and the Midlands SD and did not cover the central parts of Guildford.

Regards

Brett Coombes
Senior Urban Planner
Assets Planning Group
Water Corporation
***T:** (08) 9420 3165*

From: Richard Bargerbos [mailto:rbargerbos@serling.com.au]
Sent: Tuesday, 29 November 2016 3:15 PM
To: Brett Coombes
Cc: Calvin Kirk; G Alexander
Subject: RE: 90 04245 27 6 - 59 JAMES ST GUILDFORD LOT 18

Hi Brett.

Serling Consulting is currently revising an Infrastructure Servicing Report originally completed in November 2014. As part of our work, Aaron Smith was in contact with you regarding the proposed rezoning of the above site to R40 (Correspondence attached in the email thread below).

WAPC denied the proposed Local Structure Plan and the R40 zoning for the site. Through a SAT appeal, WAPC has expressed that they'd consider the LSP if the zoning was reduced to R20. Subsequently Serling has been asked to revise our servicing report to support a R20 zoned development.

Obviously if Aaron's conclusions below were sufficient for a R40 development, they'd still be sufficient for the decreased demand for the revised R20 development.

I'm just looking to confirm that there's been no further review of the WC planning in the area between Nov 14 and now. Aaron made the comment previously that –

'*The Water Corporation will be undertaking a review of the existing planning for Guildford in the near future but at this time there no firm dates for when this will occur.*'

Has this review taken place for the Guildford SD planning over the last two years? If not, do you still support the calculations and conclusions made by Aaron previously?

Please call on the number below if you'd like to discuss.

Kind regards,

Richard Bargerbos
Civil Designer
Serling Consulting (Australia) Pty Ltd
Tel: +61 8 6500 8808

From: Brett Coombes [mailto:Brett.Coombes@watercorporation.com.au]
Sent: Friday, 5 December 2014 3:44 PM
To: Aaron Smith <asmith@serling.com.au>
Subject: RE: 90 04245 27 6 - 59 JAMES ST GUILDFORD LOT 18

Hi Aaron,

I agree and concur with your advice and conclusions.

The Water Corporation will review the Guildford SD planning when there is sufficient information to do so and subject to resources. The Midland SD planning is more urgent and will be undertaken some time in 2015.

Regards

Brett Coombes
Senior Town Planner
Water Corporation

T: (08) 9420 3165 | **F:** (08) 9420 3193

From: Aaron Smith [mailto:asmith@serling.com.au]
Sent: Friday, 5 December 2014 11:02 AM
To: Brett Coombes
Cc: Gilbert Alexander; neil.teo@dynamicplanning.net.au
Subject: RE: 90 04245 27 6 - 59 JAMES ST GUILDFORD LOT 18

Hi Brett,

As per our discussion yesterday could you please confirm the following items.

- At the time of development the multiple junctions servicing the subject landholdings will need to be rationalised.
- Based on our discussion, the proposed new zoning of R40 for the landholding (8,256m^2) would produce a sewer design flow of 0.344 L/s while the existing landholdings currently produce a design flow of 0.173 L/s based on the existing zoning and as indicated by yourself. This is an increase of 0.171 L/s and assuming a SDF of 0.947 L/s running through the 150VC pipe and discharging into the 450 RC pipe in Helena Street based on the sub-catchment area indicated in the attached image (45,104256m^2 @ R15) we would not expect that the proposed new zoning to exceed the maximum sewer design flow though the existing infrastructure.
- The Water Corporation will be undertaking a review of the existing planning for Guildford in the near future but at this time there no firm dates for when this will occur.

Thanks for your assistance on this.

Regards,

Aaron Smith

Civil Engineer
Serling Consulting (Australia) Pty Ltd
Unit 1/ 61 Guthrie Street,
Osborne Park, WA 6017
Tel: 6500 8888
Mobile: 0424 319 116
Email: asmith@serling.com.au
Web: www.serling.com.au

From: Brett Coombes [mailto:Brett.Coombes@watercorporation.com.au]
Sent: Thursday, 27 November 2014 12:05 PM
To: Aaron Smith
Subject: FW: 90 04245 27 6 - 59 JAMES ST GUILDFORD LOT 18
Importance: High

Hi Aaron,

I'm just curious if you received any automated response when you submitted your query via our on-line Servicing Query form? Usually you would get a return message saying it had been successfully submitted and that we aim to respond within a couple of weeks. I am keen to know if our on-line response works properly.

In future, please feel free to come back through me or anyone else in Land Planning, rather than having to go through the customer centre in Balcatta. Just e-mail me directly, or send a quick message through LandPlanning@watercorporation.com.au and someone will respond.

Your question about servicing capacity for Lot 18 and 137 James/Scott Sts Guildford is not easy to answer in much detail at this early stage of the proposal. If/when the project moves forward beyond rezoning, ODP/Structure Planning and then through subdivision/strata to building stage, the hydraulic engineers on the project would provide estimated water demand and wastewater flow information to our Building Services as part of the building application submitted through the on-line Buildernet system. Reticulation connection/s and any upgrade requirements would be advised at that stage.

I can comment at a preliminary planning level that some provision has been made for servicing this land in the Corporation's overall sewer planning. The planning for this part of

the Guildford Sewer District is attached below for your use and reference. For the most part, much of Guildford is developed with low density, single residential development (R5) in view of the aircraft noise restrictions that affect the area. Some provision has been made in the planning for a limited amount of higher density R30 and R40 development in some sub-catchments.

For this sub-catchment (9022) the maximum development density has been assumed as R15. The sewer planning land use base (1997) assumed this site is zoned "Commercial" with wastewater flows equivalent to R15 residential development. The receiving 150VC sewers (that flow southwards to the DN450 collector sewer on Helena St) are laid at around 1:200, which would limit their allowable flow to a maximum of 6L/s. The long-term planning for this sub-catchment assumes a maximum SDF of 5.3L/s. It is not clear whether the existing 150 sewer serving this area will be able to manage to increased flows arising from this site. The planning for this part of Guildford SD will need to be revised and adjusted once the final yield is known for this and other redevelopment sites in Guildford. The revision of the planning will identify any system bottlenecks and capacity upgrades.

There are 205 (southern frontage) and 305 (northern frontage) cast iron water distribution mains along James Street and a comprehensive system of mostly 100 retic throughout Guildford. Redevelopment of this site should be able to be served from the existing reticulation on Scott St, Wellman St, and/or James St. The site already has two water service connections (meters) on James Street. Service connection points and meters will need to be rationalised, replaced and upgraded as necessary depending on the final dwelling and subdivision and development pattern. You would be better placed to make your own engineering judgement on the preferred water servicing arrangement.

Regards

Brett Coombes
Senior Town Planner
Water Corporation
T: (08) 9420 3165 | **F:** (08) 9420 3193

From: Chris White
Sent: Tuesday, 25 November 2014 4:15 PM
To: Land Planning
Subject: 90 04245 27 6 - 59 JAMES ST GUILDFORD LOT 18
Importance: High

Hi Team,

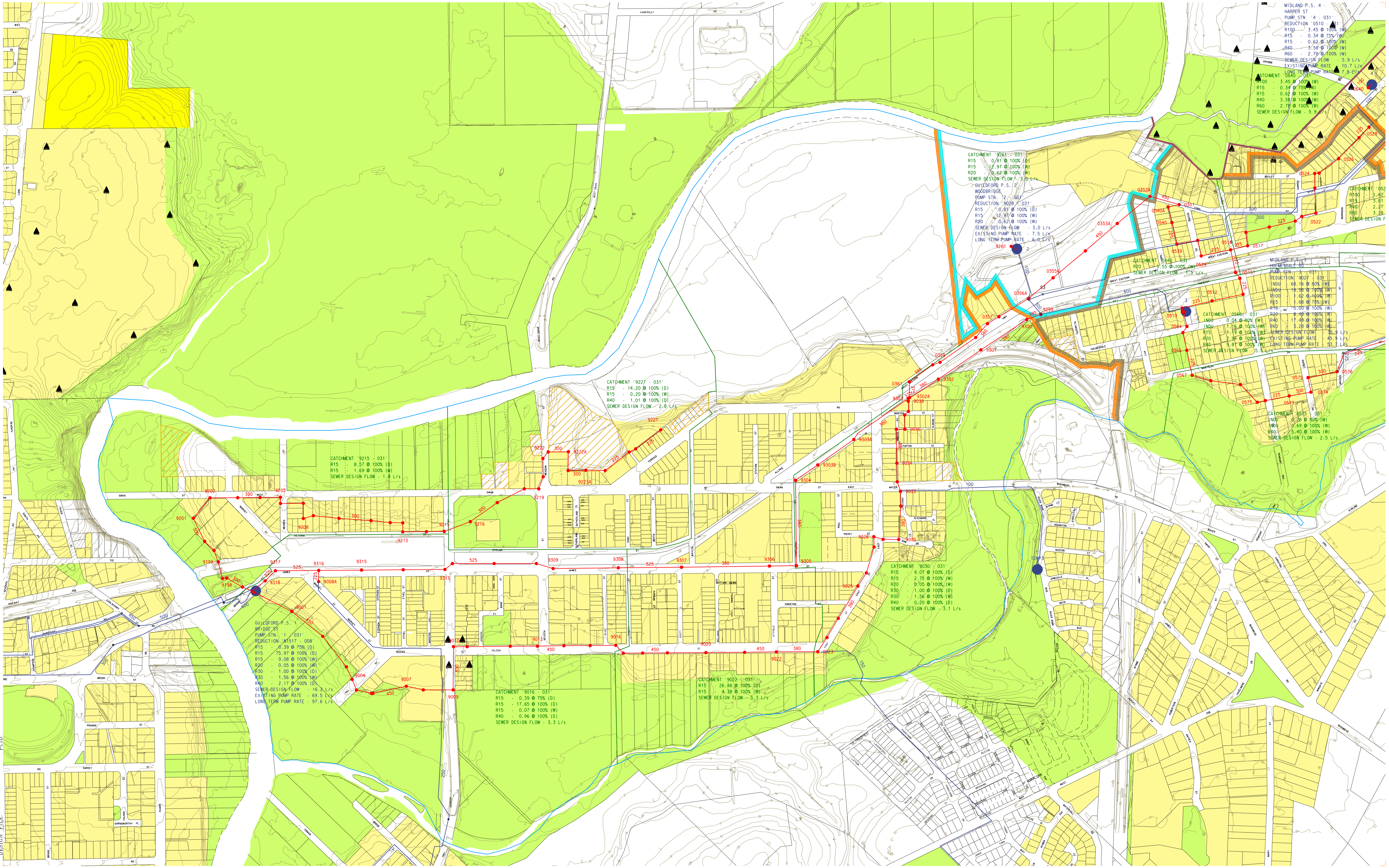
Aaron has sent through a land planning advice form last week, he is advising he hasn't received any contact in regards to the request, is it possible that you can contact Aaron on 65008888 in regards to the property 90 04245 27 6 - 59 JAMES ST GUILDFORD LOT 18 he has queries in regards to rezoning of property and servicing requirements for the property.

Regards

Chris White
Customer Contact Representative
Customer Centre
Customer and Community Group
Water Corporation
T: (08) 9273 4135 | **F:** (08) 9423 7920

240 Balcatta Rd, Balcatta WA 6021
PO Box 1542, Osborne Park, WA 6916

www.watercorporation.com.au



THE INFORMATION ON THIS PLAN IS BASED ON THE BEST DATA AVAILABLE AT DATE OF PRINTING AND IS SUBJECT TO ONGOING REVIEW AND AMENDMENT. NO RESPONSIBILITY IS ACCEPTED BY THE WATER CORPORATION FOR ACCURACY OF DATA SUPPLIED BY EXTERNAL AGENCIES.

PCID:

DESIGN FILE:

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

SEWER DISTRICT NUMBER
CATCHMENT NODE
CATCHMENT '7001 - 121'
R15 - 108.4 @75% (W)
GROSS AREA (ha)
'R' CODE ZONING
% OF LAND DEVELOPMENT
(W) - WET CONDITIONS
(D) - DRY CONDITIONS

SEWER DESIGN FLOW = 1.5 x AVERAGE DAILY FLOW RATE

SHEET INDEX

1 2

WATER CORPORATION

ISSUED WITH THE AUTHORITY OF THE MANAGER
INFRASTRUCTURE PLANNING BRANCH
629 NEWCASTLE STREET, LEEDERVILLE 6007
WESTERN AUSTRALIA.
TELEPHONE (08) 9420 2420, FAX (08) 9420 3179

WASTEWATER SCHEME PLANNING SERIES

GUILDFORD - SD031
CONCEPTUAL PLANNING
LONG TERM SCHEME: SHEET 1 OF 2

PLANNING BY	COMPILED BY	ACCEPTED BY	
R. APPOLONI	P. MANNING	R. APPOLONI	
SCALE 1:5000	VERSION 11 SEPTEMBER 1997	FILE NO. 0243 - 01	A1

Appendix C City of Swan Correspondence

Aaron Smith

From: Daniel Beresford <Daniel.Beresford@swan.wa.gov.au>
Sent: Friday, 14 November 2014 10:17 AM
To: Aaron Smith
Cc: neil.teo@dynamicplanning.net.au; Gilbert Alexander; Yoon-Kah Wong
Subject: RE: Lot 18 (53-61) James Street and Lot 137 (14) Scott Street, Guildford

Hi Aaron,

As indicated, soakwells will not work on this property due to the clay surface geology. You will need to prepare a stormwater management plan showing how you will handle 1 year, 5 year and 100 year storms. At the very least you will need to provide retention capacity on site for a 1 year 1 hour (16mm) storm event. The maximum sized pipe you can have connected into our system is 150mm; the idea is that for minor storm events the water will flow straight into our system; when the 150mm pipe becomes overloaded, the system will back up and fill up the storage provided on site. For major storms you need to demonstrate a safe overland flowpath onto the road.

I hope this information is of some help.

Regards,

Daniel Beresford Subdivisions & Drainage Engineer
Asset Management
city of swan
PO Box 196
MIDLAND WA 6936
t 08 9278 9643 **f** 08 9267 9477 **m** 0418 614 166
www.swan.wa.gov.au

BEFORE PRINTING THIS E-MAIL
please consider the environment

From: Aaron Smith [mailto:asmith@serling.com.au]
Sent: Thursday, 13 November 2014 1:58 PM
To: Daniel Beresford
Cc: neil.teo@dynamicplanning.net.au; Gilbert Alexander; Yoon-Kah Wong
Subject: Lot 18 (53-61) James Street and Lot 137 (14) Scott Street, Guildford

Hi Daniel,

We have been asked to complete a servicing report to help initiate a proposed structure plan to support the redevelopment of the existing hardware store at Lot 18 (53-61) James Street and Lot 137 (14) Scott Street,

Guildford (image below) to 70 apartment (R30/ R40 zoning)style dwellings spread in a 2-3 week storey walk up fashion.

Are you able to shed any light on what your requirements in terms of drainage/ infrastructure upgrades would be required should this redevelopment proceed. My understanding is that the surface geology would be a Guildford Clay and that lot connections would be required for the drainage. I have attached a copy of the drainage information I got through DBYD for your information as well.

Any information you could give me would be greatly appreciated. Please feel free to contact me should you have any other questions.

Regards,

Aaron Smith

Civil Engineer
Serling Consulting (Australia) Pty Ltd
Unit 1/ 61 Guthrie Street,
Osborne Park, WA 6017
Tel: (08) 6500 8888
Direct: (08) 6500 8803
Mobile: 0424 319 116
Email: asmith@serling.com.au
Web: www.serling.com.au

SERLING CONSULTING
INNOVATIVE ENGINEERING SOLUTIONS

Appendix D 3E Consulting Engineers Power and Communications Feasibility Study

PROJECT:

LOT 18 JAMES STREET & LOT 137 SCOTT STREET, GUILDFORD
RESIDENTIAL DEVELOPMENT

SERVICING REPORT FOR:

SITE ELECTRICAL AND COMMUNICATION SERVICES

DOCUMENT NO: 3E14176GN-R-01

CIVIL ENGINEERS:

Serling Consulting (Australia) Pty Ltd

DOCUMENT PREPARED BY:

3E Consulting Engineers Pty Ltd
Tel: +61 8 6314 9000
Fax: +61 8 9325 3351

Document History and Status

Revision	Date issued	Author	Reviewed by	Approved by	Revision Description
1	02/12/2014	VH & BB	JH	DLJ	For Information

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Revision	Copy no	Quantity	Issued to
1	Digital PDF	1	Serling Consulting (Australia) Pty Ltd

SECTION 1 INTRODUCTION

1.1 BASIS OF SERVICING ESTIMATES

We understand that the site is planned to comprise of two-three storey multiple dwelling development comprising of approximately 70 residential units. The preliminary yield has been based on the information provided in Dynamic Planning and Developments RFQ Documents.

SECTION 2 ELECTRICAL SERVICES

2.1 EXISTING POWER NETWORK DISTRIBUTION

The existing Western Power (WP) distribution infrastructure in the vicinity of the site comprises of a 22kV three phase underground & overhead aerial High Voltage (HV) and Low Voltage (LV) network.

To the west of Scott Street, HV aerials exist along the southern side of James Street. To the east of Scott Street, HV aerials exist along the northern side of James Street. The HV aerials are tied together via underground HV cable, with the HV network supplying a 500kVA pad-mounted transformer located approximately 17m west off the James Street and Scott Street intersection and a 300kVA transformer north of the development site.

LV aerials can be located on both the northern and southern side of James Street and on the western side of Scott Street & Wellman Street. Underground LV cables exist on the western side of Scott Street, southern side of James Street and the eastern side of Wellman Street. The underground LV cables emanate from the 500kVA pad-mounted transformer.

Some limited information on the capacity of the local zone substation can be determined from Western Power's public Network Capacity Mapping Tool (NCMT). Currently there is in excess of 10-15MVA capacity in the area. Within the next ten years, this is expected to diminish to 5-10MVA, suggesting that there is minimal expected growth in the area. From information available, it appears that there is little significant risk of cost or timing effects on this project from a network capacity point of view.

Please refer to attached extract of DFIS (Distribution Facilities Information System) plans.

2.2 LIKELY LOAD

For the 70 residential units, we estimate an After Diversity Maximum Demand (ADMD) via AS3000 method of 450A/phase.

No special loads have been considered in this preliminary load calculation.

2.3 LIKELY POWER SUPPLY SCENARIO

WP requires that all new developments are to be serviced by underground three phase power. WP also require any existing HV and LV aerials adjacent to the land being subdivided to be undergrounded and any existing consumers affected will have to have their consumer mains reconnected to the network.

In a multi-dwelling residential development, this is implemented by WP owned and maintained URD 3-phase direct buried underground cabling from a spare way at the transformer LV frame to a uni-pillar serving the site. Where loads exceed 250A/phase, the customer's main switchboard has to be contiguous to the substation. That is a transformer is to be either located on the lot itself or on the adjacent lot along the shared common boundary.

Based on the estimated load for the site, the proposed development will require a new WP transformer site to be installed on the development site as the existing adjacent network will not have the capacity nor comply with the supply arrangement requirements.

The likely scenario to service the proposed 70 residential unit apartment would require Western Power to cut in and out of the existing underground HV cable which will terminate to new HV (2+1) Ring Main Unit (RMU) on site. The HV switchgear will then supply a 630kVA transformer to the service the development. A land requirement (to be confirmed with WP) of approximately 6200mm(W) x 4000mm(D) will need to be extended as part of road reserve for the installation of this new substation.

The new WP owned and maintained transformer and HV RMU are approximately 1.6m in height. The buildings MSB must be installed contiguous to this transformer site, with a direct Customer owned LV Consumer Main cable connecting the MSB to the transformer's LV frame. Buildings must meet minimum fire separation from the substation units of 6m, or include fire rated walls to meet WP requirements.

The removal of the overhead aerials adjacent to the site is likely not required if internal designs permits. Further discussions with WP are required to determine the extent of aerial removal.

All internal power reticulation will be private and installed to WAER, AS3000 requirements and WP's WADCM.

2.4 POWER SUPPLY TIMELINES

Western Power will neither reserve capacity nor guarantee supply to this development without a formal request being lodged. A Design Quotation Application (DQA) must be prepared and submitted to Western Power for the design and construction of the proposed development to commence.

From the date of DQA submission it takes 6-8 weeks for an estimated quote. From that point a design fee is payable to move to the Design and Firm Quote stage. From the date of payment of the design fee, it takes another 8-12 weeks for final quote/design. Once the final quote is paid, it takes roughly 12-14 weeks before work commences.

With works being proposed along James Street road reserve which is of the authority of Mains Road WA (MRWA), the above advised timeframes may blow out due to MRWA's lengthy approval process for works on and in the vicinity of their roads.

To avoid any project delays, it is highly advised that a Design Quotation Application (DQA) is prepared and submitted to Western Power as soon as possible.

SECTION 3 COMMUNICATION SERVICES

3.1 EXISTING NETWORK

Telstra Assets
Land adjacent to the proposed development is currently serviced off the Bassendean Exchange, approximately 3Km route length to the west. It would appear that both the mains and distribution networks are on the same alignment with multiple conduits installed on James St between Scott and Wellman St. Old earthenware conduits are installed on the route but the utilisation is unknown, although we would expect that there would only be limited spare capacity remaining. It is likely that substantial spare copper cable would be available on the route but only Telstra could comment although whether or not sufficient range would exist for 70 dwellings. Optical fibre also exists on James St with further capacity available over the railway line on Stirling St. Substantial spare conduit capacity also exists on Stirling St, should new fibre cable need to be hauled. The existing network would easily support telephony and is within transmission limits of ADSL broadband, should ports be available at Bassendean exchange. Telstra 4G mobile coverage is available at the site supporting download speeds from 2 to 50 Mbps.

Optus Assets
Optus have fibre installed on Stirling St over the other side of the railway line but not on James St, so development of the site would not affect Optus assets.

Nextgen Assets
Nextgen have fibre installed on Meadow St, some 400m to the west, in which case there would be no impact on the proposed development.

NBN Co Assets
It is likely that NBN Co have fibre assets in the vicinity but no details of the route nor size are available.

3.2 FUTURE NBN COMMUNICATIONS

For the land being redeveloped, under the Fibre Deployment Act, Developers have the responsibility to provide fibre ready pit and pipe at their expense, regardless of the Infrastructure Provider of Last Resort (IPOLR). Being < 100 dwellings this project does not fall within NBN Co's normal IPOLR responsibilities and thus would normally be a Telstra responsibility, unless NBN Co found it commercial to service. Given that NBN Co have yet to rollout Brownfields fibre to the Guildford area and have yet specify its Brownfields Rollout technology or programme for the area we could expect the Fibre to the Node (FTTN) would be the technology of choice. The Brownfields rollout is not scheduled for Guildford in the next 18 months. NBN Co may consider accepting this project for Fibre to the Premises (FTTP) but this would need to be tested with NBN Co's assessment team. NBN Co are developing two products

that could permit fibre to be delivered to the development, Fibre on Demand and Co-Funded Fibre, should the developer be interested in making a capital contribution to the cost of FTTP.

3.3 TELSTRA – PROPOSED COMMUNICATIONS

Assuming NBN Co would not accept this project for FTTP, Telstra would be the IPOLR. However, Telstra only have a universal Service Obligation to provide telephony services to such a development and if broadband were required that would have to be provided at commercial rates, unless it were economical for Telstra to do so from within existing spare capacity. Telstra would not be in a position to offer its FTTP product to this area, since we understand it is not within a 1Km annulus of an existing Velocity Estate. Therefore Telstra would most likely service this development with copper, from its nearest pillar on the corner of Meadow and James Sts, approximately 400m to the west. If the development were to be built or survey strata, Telstra would take ownership of the internal pit and pipe assets within the development but would require an exclusive use network to haul copper cable. Telstra would only accept ownership of the assets up to the Network Boundary Point, which could be single or multiple points, depending on the number of rooflines on the site.

3.4 RELOCATION OF EXISTING NETWORK

Based on DBYD we would expect that no relocation of existing networks would be required, either internal or external to the development.

SECTION 4 BUDGET ESTIMATES

4.1 ELECTRICAL SERVICES

For multi-residential developments, the Network Augmented Costs for new customer connections are calculated accordance with Western Power's Distribution Low Voltage Connection Headworks Scheme (DLVCHS). The DLVCSH provides a charge on the basis of requested capacity (kVA).

Our very early pre-design, pre-DQA order of probable cost estimates for the provision of an electrical supply point only is $140,000.

4.2 COMMUNICATION SERVICES

The cost for pit and pipe design and construction would be of the order indicated below:

	$K
Third Party construct (For NBN Co or Telstra) – Pit and Pipe – Extend network to nearest Telstra network and service internally	**30**

4.3 QUALIFICATIONS AND EXCLUSIONS

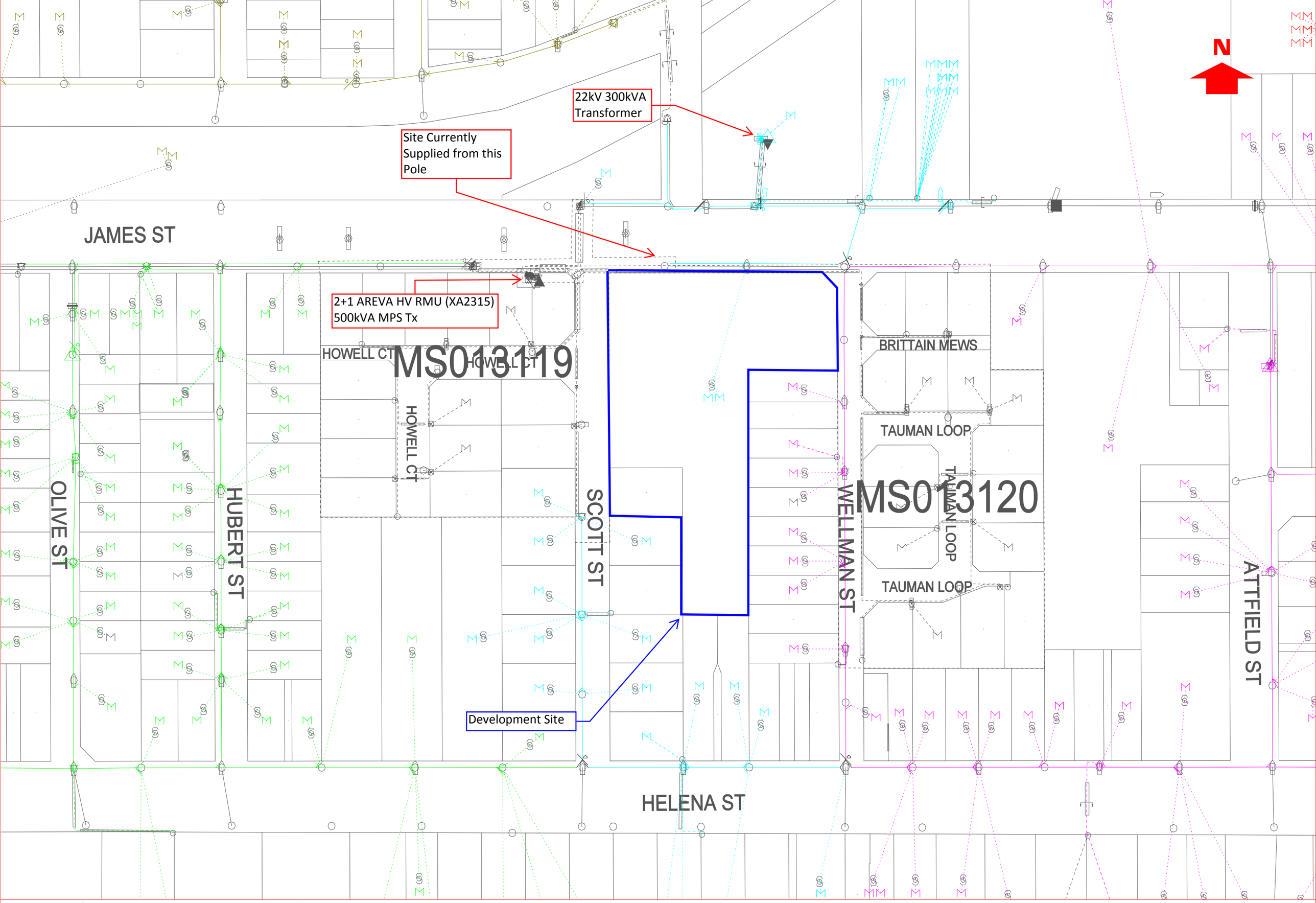
4.3.1 ELECTRICAL SERVICES COST ASSUMPTIONS AND EXCLUSIONS

This cost estimate excludes design fees, internal power reticulation infrastructure and assumes that there are no capacity issues resulting in no major HV upgrade works are required at the Zone Substation such as installation of a new 400HV dedicated feeder cable to the proposed development. A preliminary feasibility study can also be requested from Western Power at a cost of $755 (Inc. GST). This study will provide feedback on what reinforcement works are required and estimated costs of these works.

More detailed cost estimates can be created once detailed design is complete.

4.3.2 COMMUNICATION SERVICES COST ASSUMPTIONS AND EXCLUSIONS

- An open trench is available for installation of pit and pipe
- New network for the redevelopment be installed on the 0.9m alignment on public land
- Existing streets are not to be widened and levels on adjacent streets are not altered by > 100mm
- Pathways are made available within multi storey buildings for communications cables

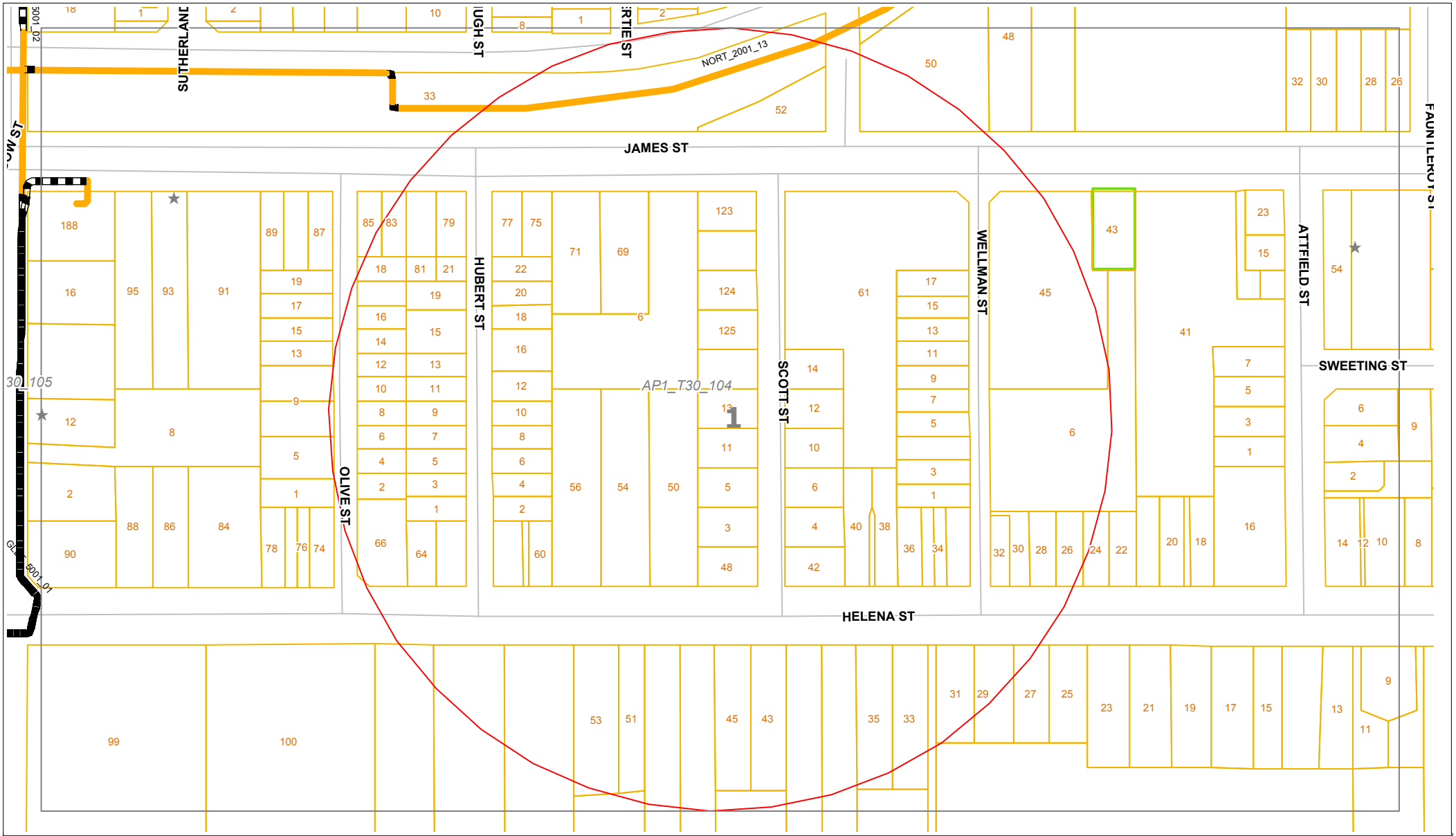

22kV 300kVA
Transformer
Site Currently
Supplied from this
Pole
2+1 AREVA HV RMU (XA2315)
500kVA MPS Tx
Development Site
N
JAMES ST
HOWELL CT
HOWELL CT
HOWELL CT
MS013119
BRITTAIN MEWS
TAUMAN LOOP
TAUMAN LOOP
TAUMAN LOOP
MS013120
OLIVE ST
HUBERT ST
SCOTT ST
WELLMAN ST
ATTFIELD ST
HELENA ST

WELLMAN
SCOTT
TAUMAN LOOP
BRITTAIN MEWS
LOOP
ST
CT

Sequence Number: 42814869

Date Generated: 28/11/2014

For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208



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nextgen GROUP

LEGEND

Digsite		Assets	
Point		Cable	
Line		3rd Party Duct	
Area		Marker Post	

Appendix E Dial Before You Dig Information

Job No 11581719

Phone: 1100
www.1100.com.au

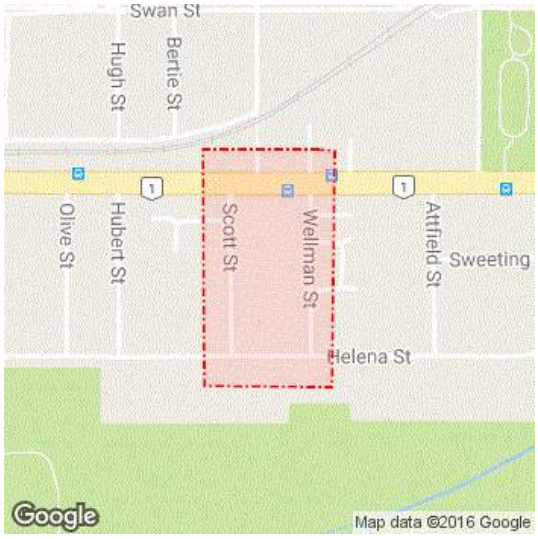
Caller Details

Contact: Mr Richard Bargerbos
Company: Serling Consulting
Address: Guthrie Street
Osborne Park WA 6017

Caller Id: 1538046 **Phone:** 08 6500 8808
Mobile: Not Supplied **Fax:** Not Supplied
Email: rbargerbos@serling.com.au

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: james st
Working on Behalf of:
Private

Enquiry Date:	Start Date:	End Date:
29/11/2016	03/12/2016	04/12/2016

Address:
Wellman Street
Guildford WA 6055

Job Purpose: Excavation
Onsite Activity: Manual Excavation
Location of Workplace: Private Property
Location in Road: Not Supplied

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
Not Supplied

Your Responsibilities and Duty of Care

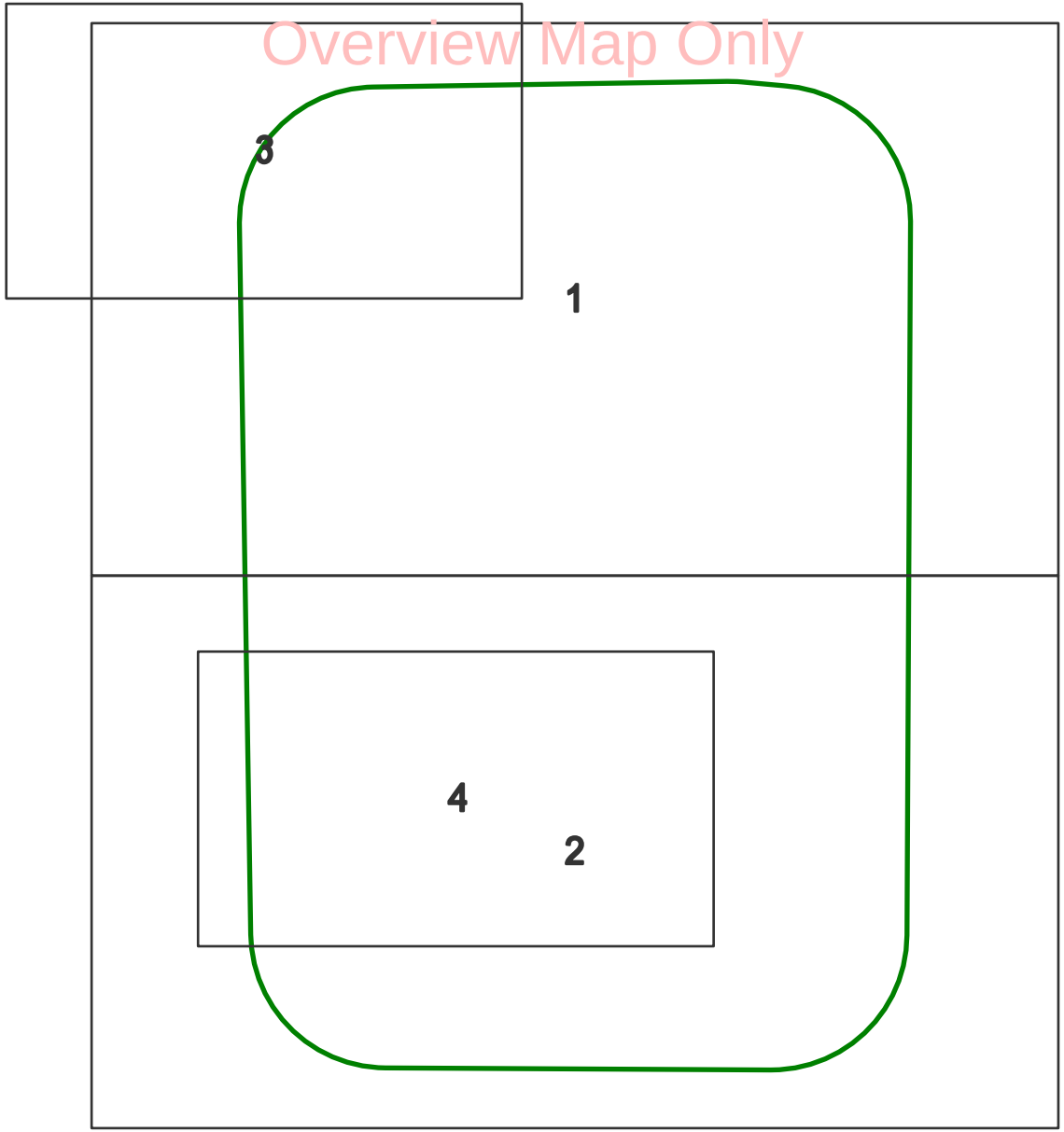
- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at **www.1100.com.au**
- **For more information on safe excavation practices, visit www.1100.com.au**

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
# Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
57400374	ATCO Gas Australia	131352	NOTIFIED
57400371	City of Swan	0892789664	NOTIFIED
57400376	Nextgen, NCC - WA	1800032532	NOTIFIED
57400373	Optus and/or Uecomm, WA	1800505777	NOTIFIED
57400372	Telstra, WA	1800653935	NOTIFIED
57400375	Water Corporation WA	0894248115	NOTIFIED
57400370	Western Power	1300769345	NOTIFIED

END OF UTILITIES LIST



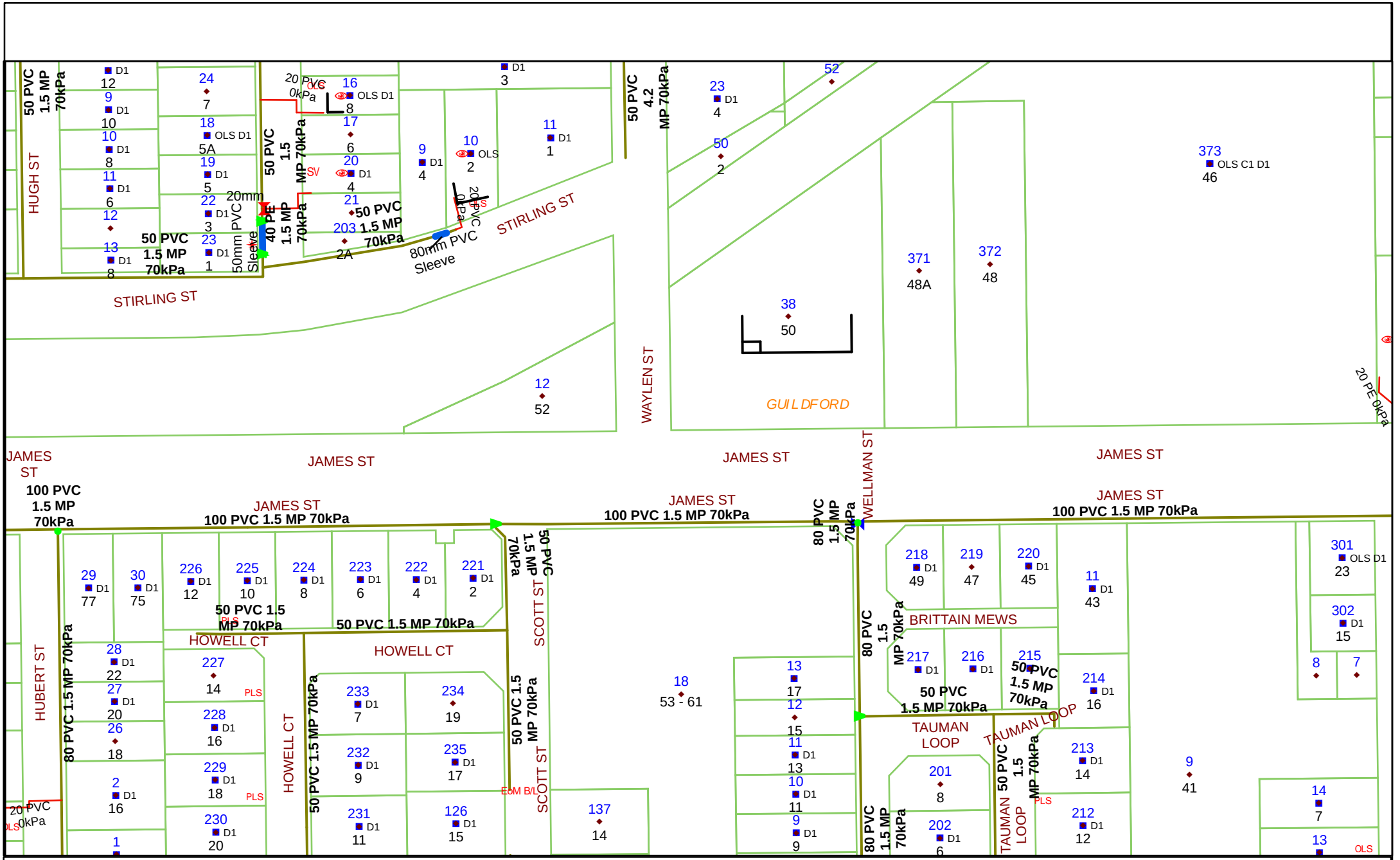
Sequence No: 57400374 Map Tile: Scale: 1:3129

Job No: 11581719 Date:29/11/2016 Location: Wellman Street, Guildford 6055

N
W E
S

ATCO Gas AUSTRALIA

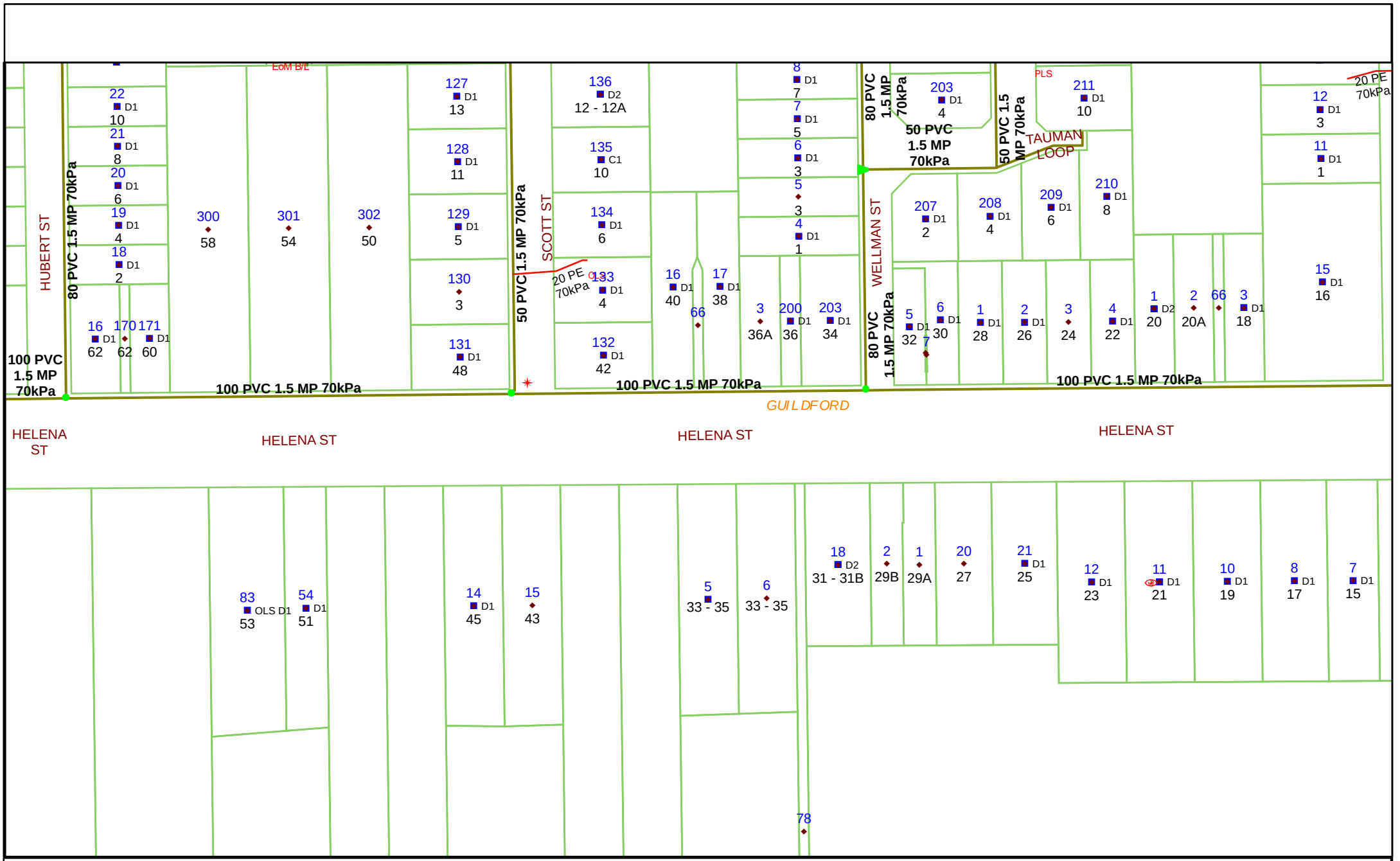
Please read all **warnings**, conditions and information on the attached "Underground Asset Details" information sheet. This plan is issued subject to that information and those conditions and **warnings** (including, but not limited to, the "NO HOT WORKS" warning). Plans are current for only **30 days** from date of request, indicative only and not warranted to be accurate. It is your responsibility to carefully locate underground assets and follow safe work practises and procedures (eg pot-holing). ATCO Gas Australia will seek compensation for damage caused to assets.



Sequence No: 57400374 Map Tile: 1 Scale: 1:1500

Job No: 11581719 Date:29/11/2016 Location: Wellman Street, Guildford 6055

Please read all **warnings**, conditions and information on the attached "Underground Asset Details" information sheet. This plan is issued subject to that information and those conditions and **warnings** (including, but not limited to, the "NO HOT WORKS" warning). Plans are current for only **30 days** from date of request, indicative only and not warranted to be accurate. It is your responsibility to carefully locate underground assets and follow safe work practises and procedures (eg pot-holing). ATCO Gas Australia will seek compensation for damage caused to assets.



Sequence No: 57400374 | Map Tile: 2 | Scale: 1:1500

Job No: 11581719 | Date:29/11/2016 | Location: Wellman Street, Guildford 6055

N W E S

ATCO Gas AUSTRALIA

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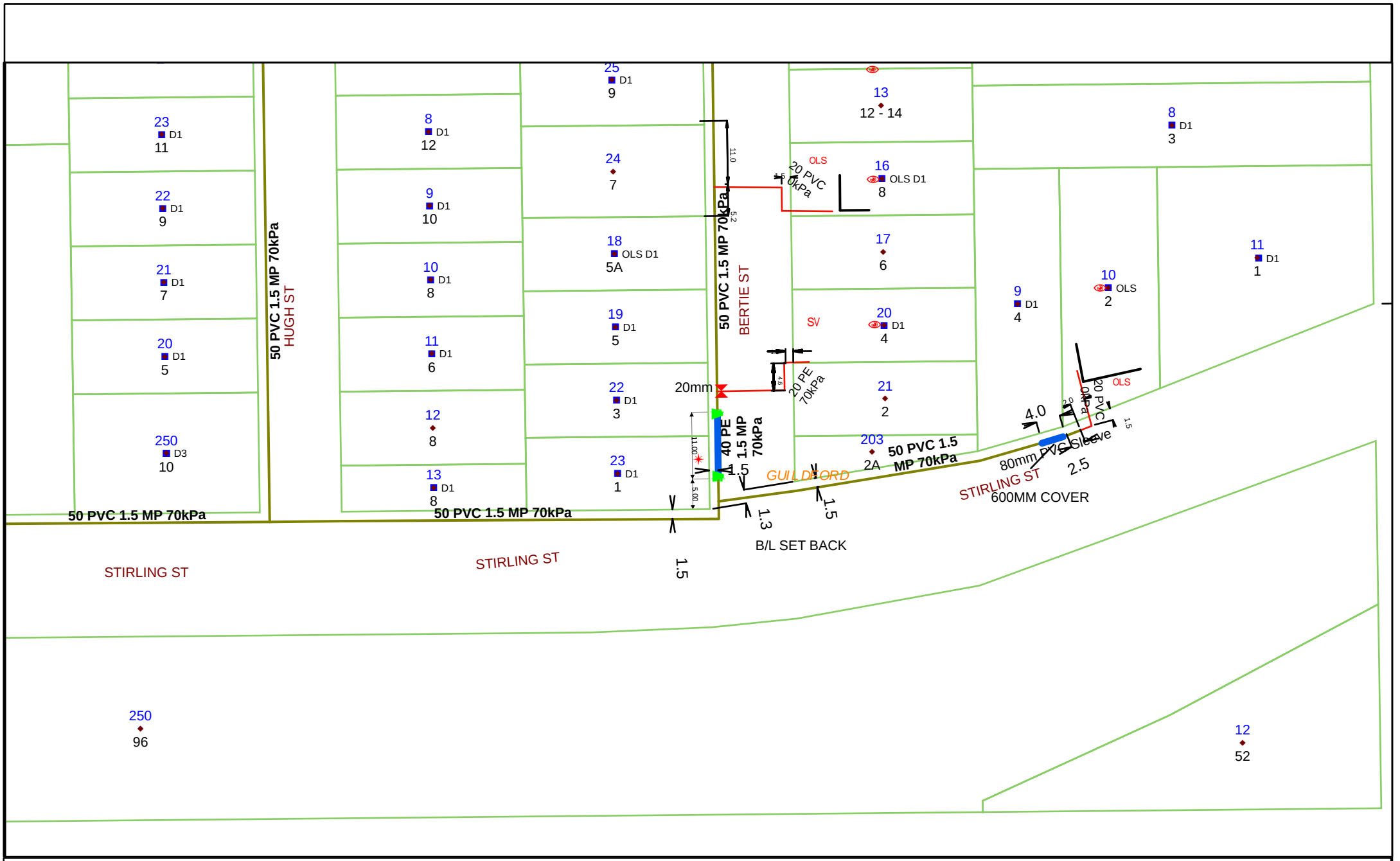

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Job No: 11581719 | Date:29/11/2016 | Location: Wellman Street, Guildford 6055

N W E S

ATCO Gas AUSTRALIA

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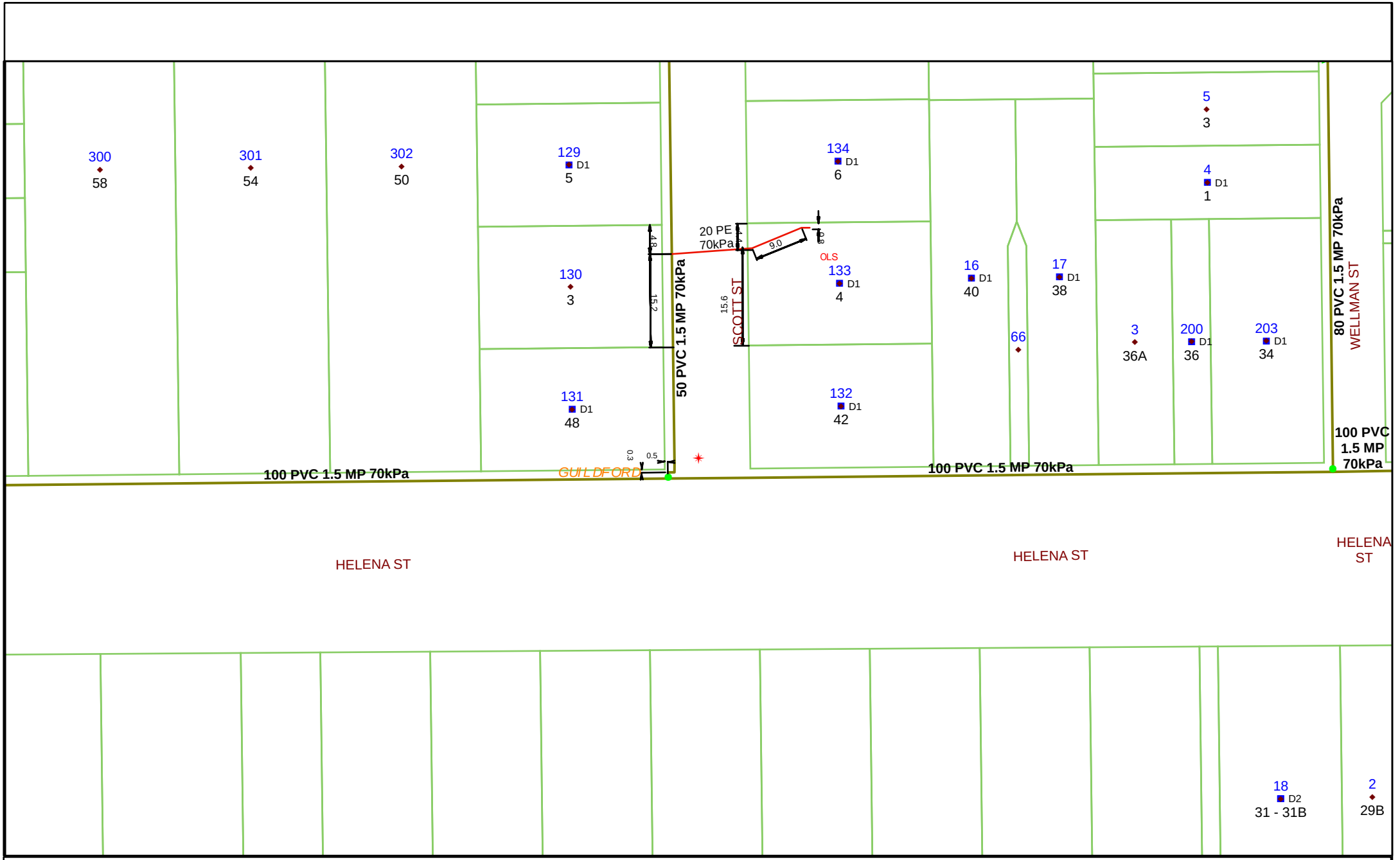

Sequence No: 57400374 Map Tile: 4 Scale: 1:800

Job No: 11581719 Date:29/11/2016 Location: Wellman Street, Guildford 6055

N W E S

ATCO Gas AUSTRALIA

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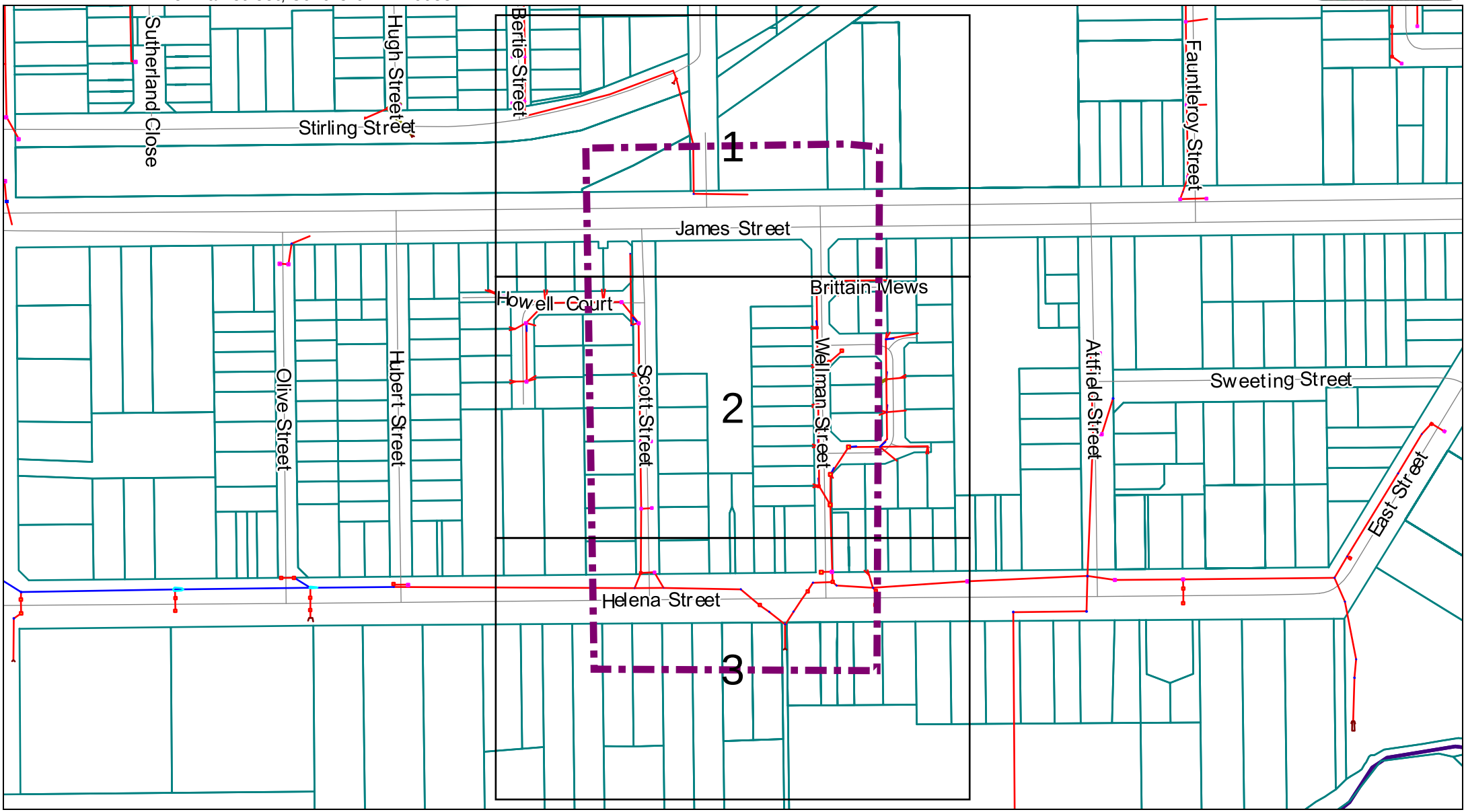
City of Swan – Assets Impacted

Location Address: Wellman Street, Guildford WA 6055



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Job Number: 11581719

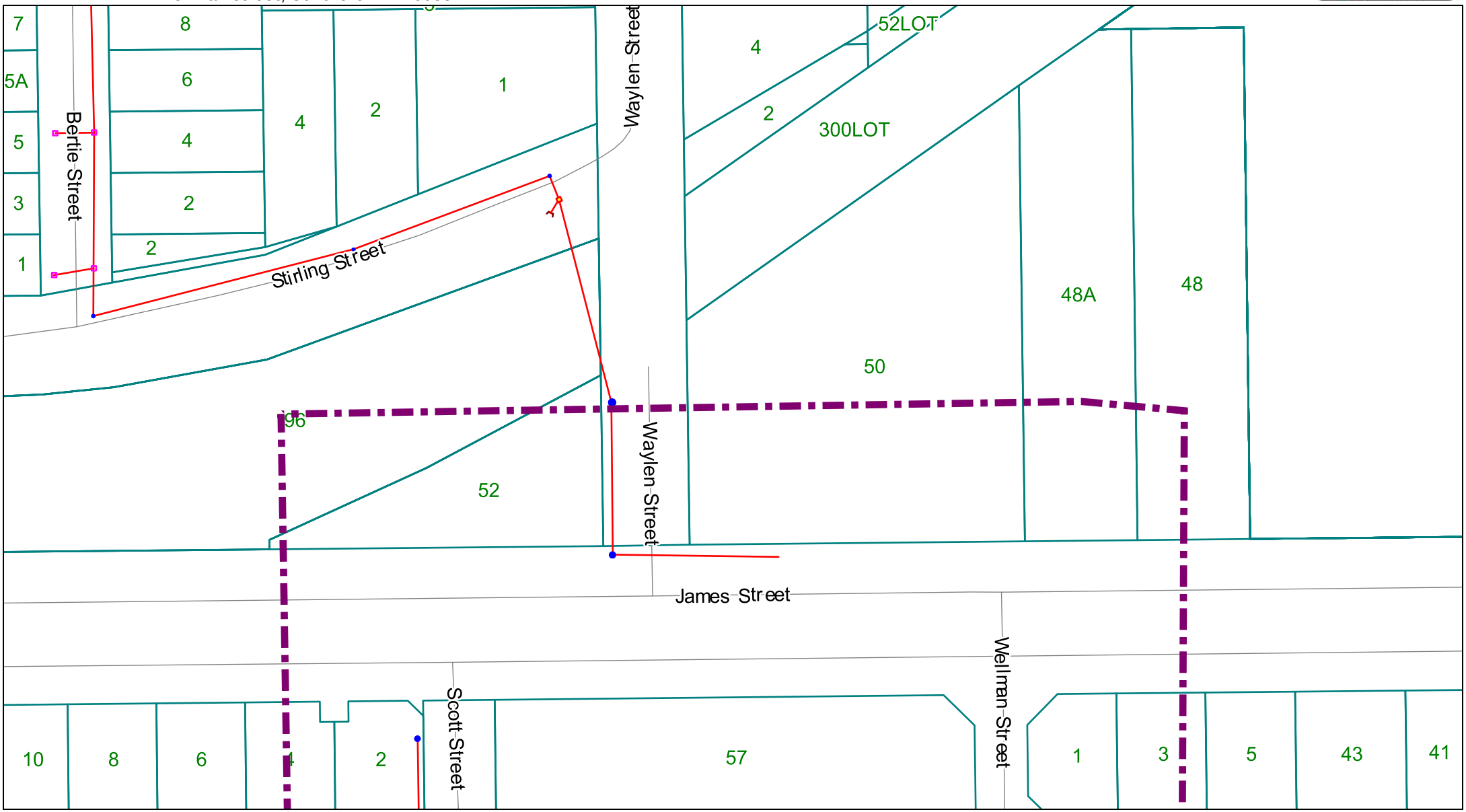
Scale: 1:3075 Overview
Date Generated: 29/11/2016

Legend

Pipe
Subsoil Pipe
Fibre Optic Pipe
Fibre Optic Pit
Gully
Reticulation
Special Projects
Manhole/Junction Pit
Side Entry Pit
Combined Side Entry Pit
Bubble Up Pit
Gross Pollutant Trap
Table Drain
Headwall
Water Corporation Drain

City of Swan – Assets Impacted

Location Address: Wellman Street, Guildford WA 6055



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Job Number: 11581719 **Date Generated:** 29/11/2016

Legend

Pipe
Subsoil Pipe
Fibre Optic Pipe
Fibre Optic Pit
Gully
Reticulation
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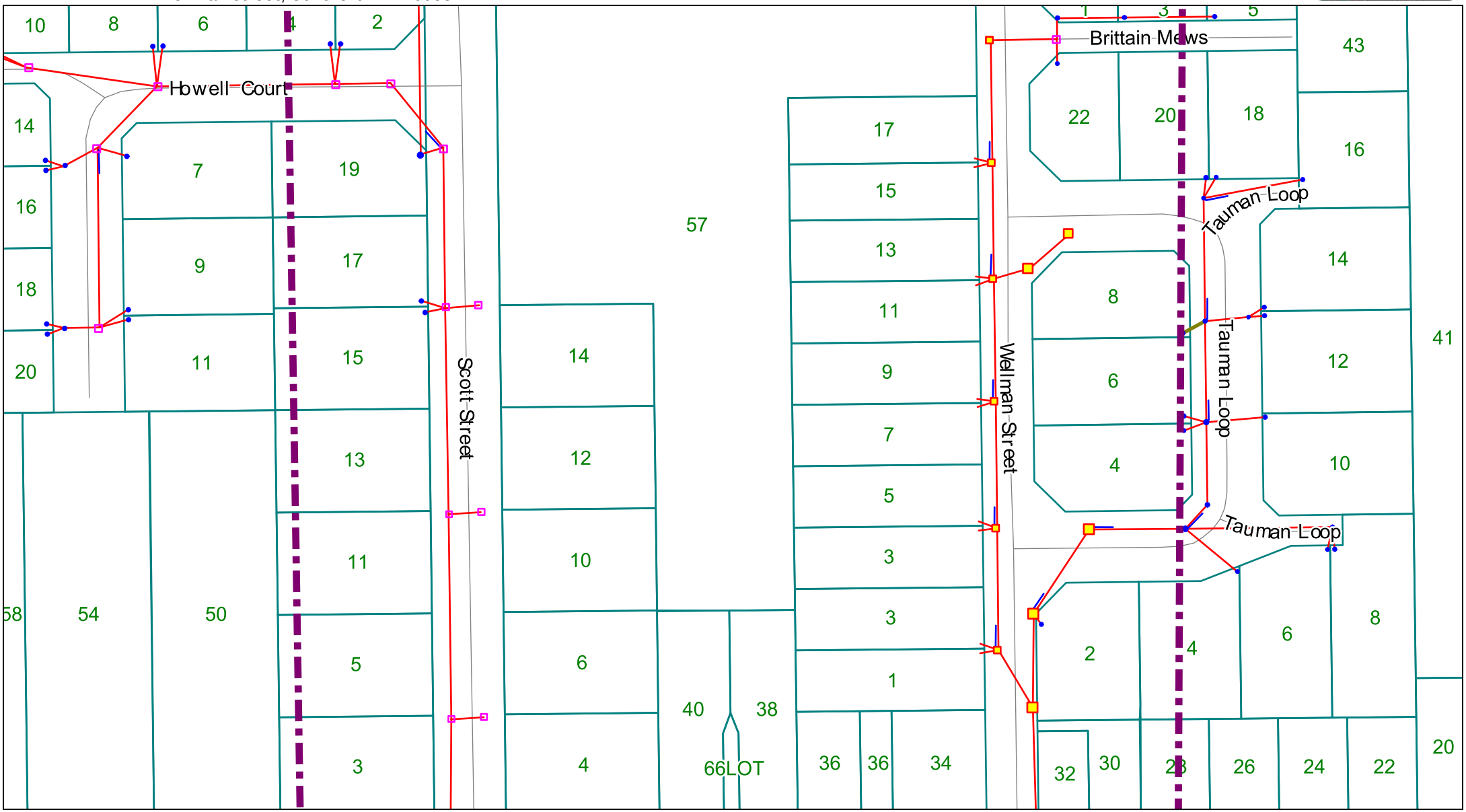
City of Swan – Assets Impacted

Location Address: Wellman Street, Guildford WA 6055



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Job Number: 11581719 **Date Generated:** 29/11/2016

Legend

Pipe
Subsoil Pipe
Fibre Optic Pipe
Fibre Optic Pit
Gully
Reticulation
Special Projects
Manhole/Junction Pit
Side Entry Pit
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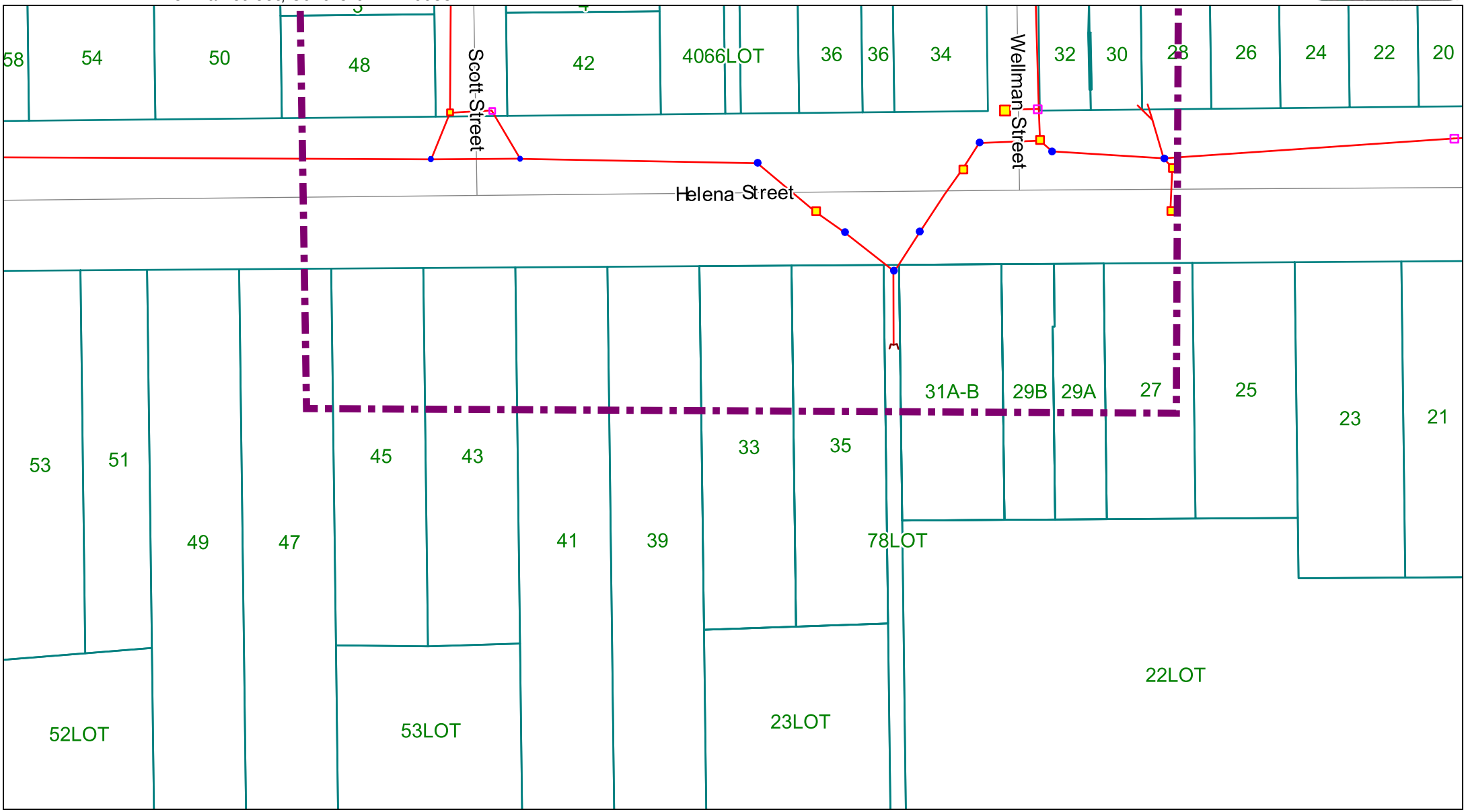
Table Drain
Headwall
Water Corporation Drain

City of Swan – Assets Impacted

Location Address: Wellman Street, Guildford WA 6055



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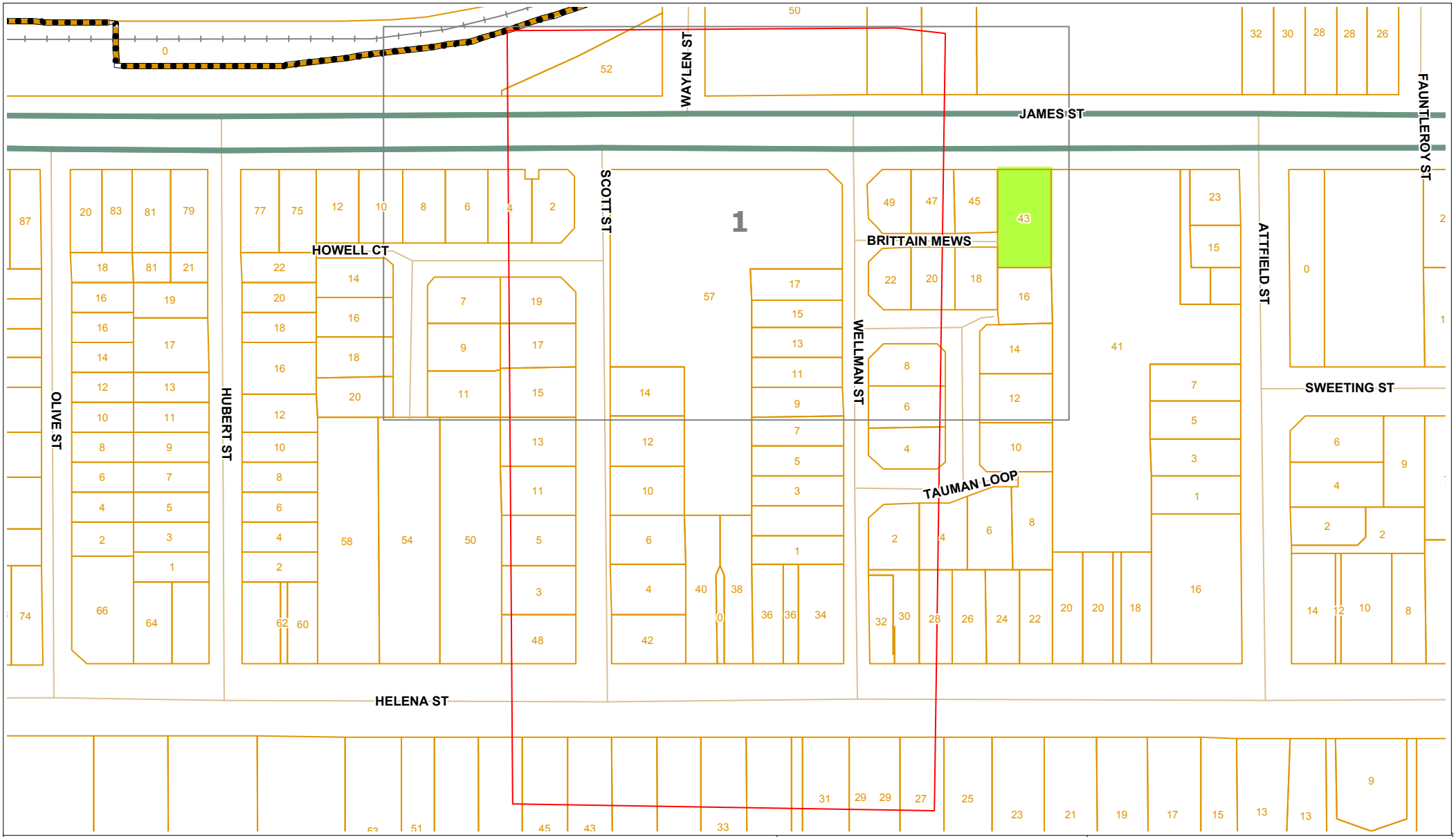
Job Number: 11581719 **Date Generated:** 29/11/2016

Disclaimer: The City of Swan cautions that, while every care is taken to provide a useful guide in this plan, the accuracy, reliability and completeness of the data presented cannot be guaranteed. Exact positions of any assets shown on this map report should be confirmed on site, and inquiries made with respect to assets on City of Swan land that may not be indicated, but are present. Please refer to the accompanying letter for further details.

Legend

Pipe
Subsoil Pipe
Fibre Optic Pipe
Fibre Optic Pit
Gully
Reticulation
Special Projects
Manhole/Junction Pit
Side Entry Pit
Combined Side Entry Pit
Bubble Up Pit
Gross Pollutant Trap
Table Drain
Headwall
Water Corporation Drain



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Date: 29/11/2016

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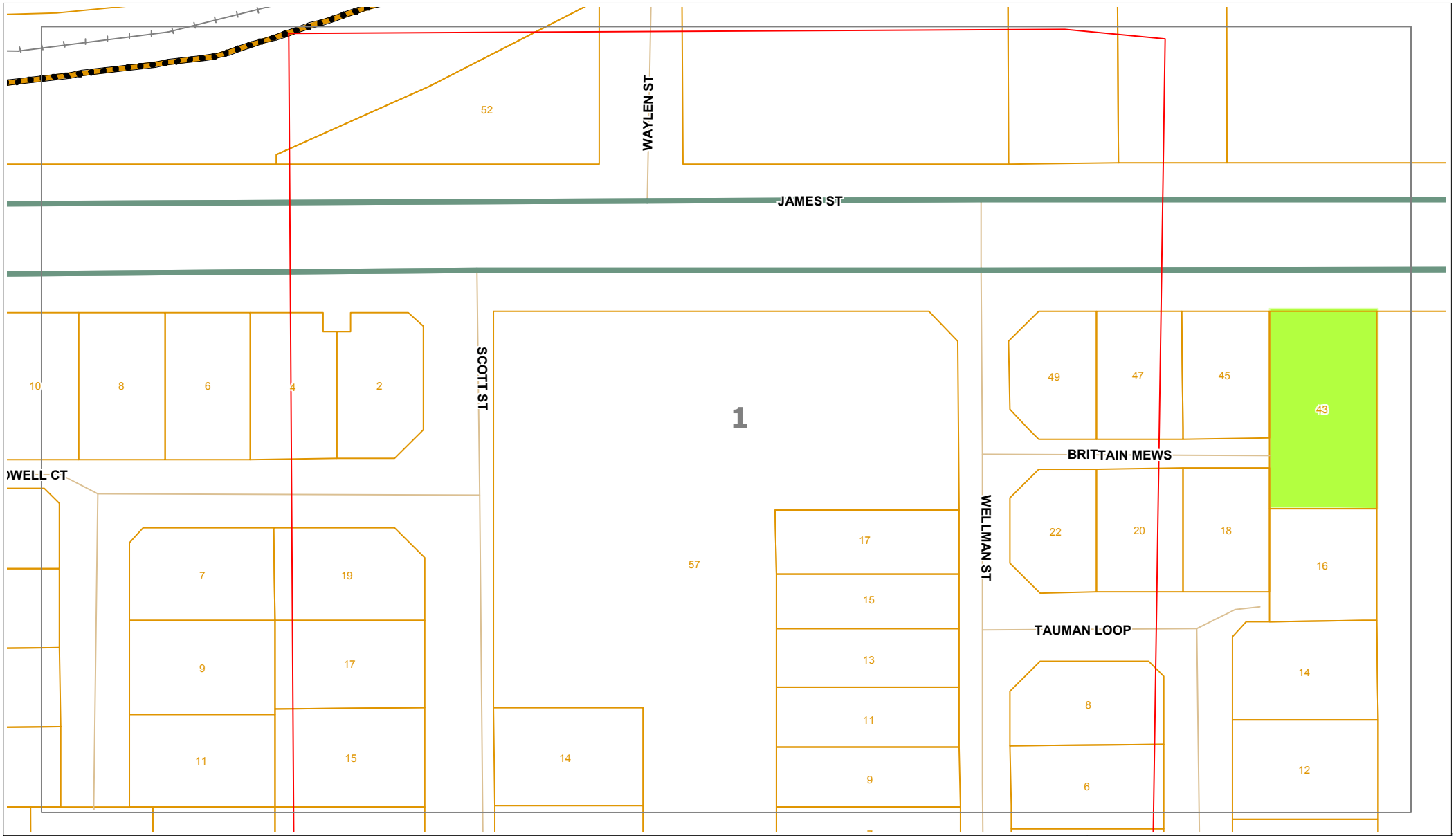
nextgen GROUP

LEGEND

Digsite		Assets	
Point		Cable	
Line		3rd Party Duct	
Area		Marker Post	



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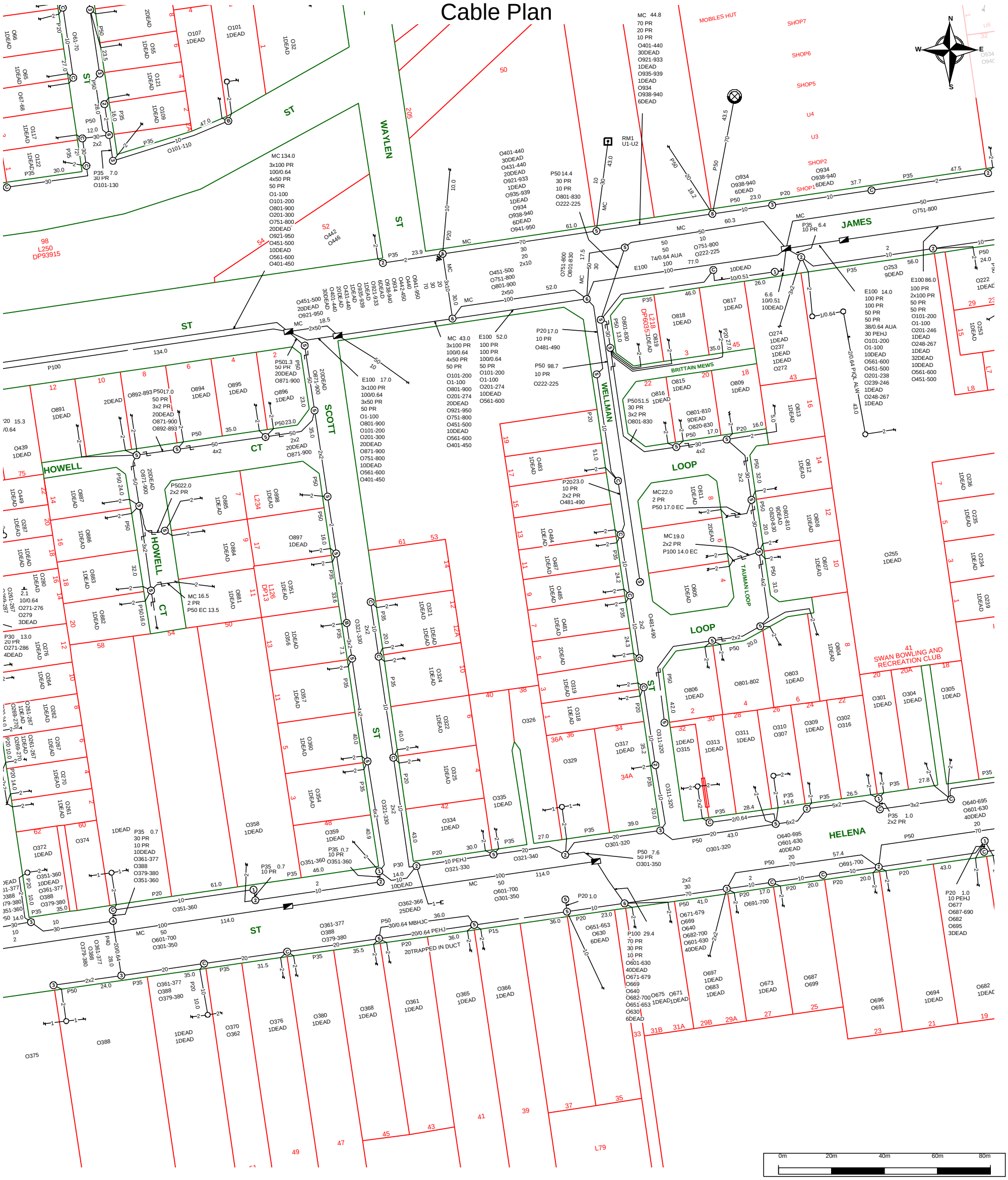
nextgen GROUP

LEGEND

Digsite		Assets	
Point		Cable	
Line		3rd Party Duct	
Area		Marker Post	

Cable Plan



For all Telstra DBYD plan enquiries -
email - Telstra.Plans@team.telstra.com
For urgent onsite contact only - ph 1800 653 935 (bus hrs)

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

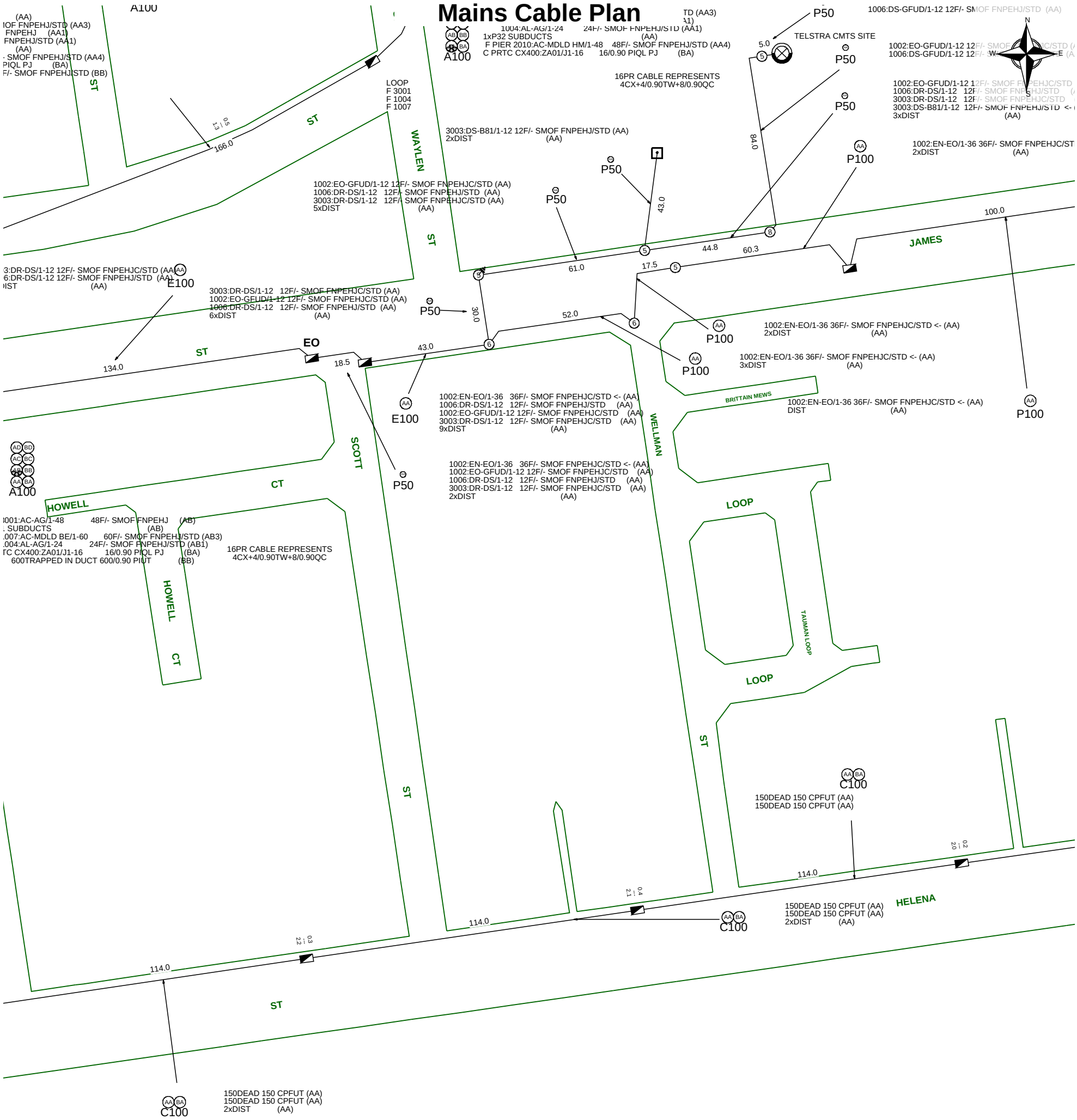
Generated On 29/11/2016 19:02:58

Sequence Number: 57400372

CAUTION: Critical Network Route in plot area.
DO NOT PROCEED with any excavation prior to seeking advice from Telstra Plan Services on : 1800 653 935

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

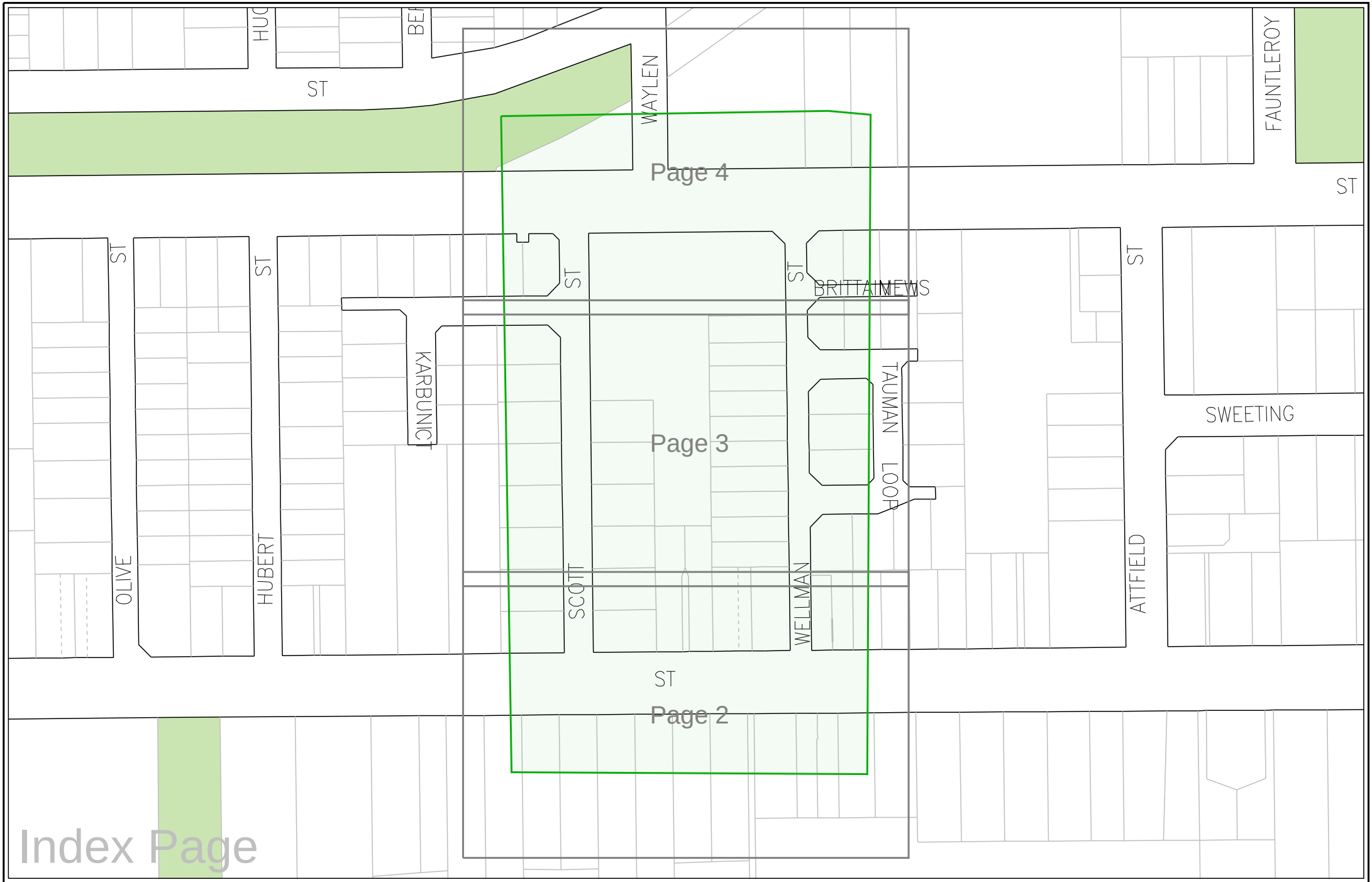
Mains Cable Plan



Telstra	For all Telstra DBYD plan enquiries - email - Telstra.Plans@team.telstra.com For urgent onsite contact only - ph 1800 653 935 (bus hrs)
TELSTRA CORPORATION LIMITED A.C.N. 051 775 556	
Generated On 29/11/2016 19:03:06	

Sequence Number: 57400372

CAUTION: Critical Network Route in plot area.
DO NOT PROCEED with any excavation prior to seeking advice from Telstra Plan Services on : 1800 653 935



WATER CORPORATION

Scale: ***1:2284***

Sequence No: **57400375**

Print Date: 29/11/2016 Page: 1 of 4

Water

WARNING - CRITICAL PIPELINE
Refer to Information Brochure Damage **Prevention** and ***Legend for details***

Scale: 1:750 Centre Point: 115.976°, -31.902°

Sequence No: 57400375

Print Date: 29/11/2016 Page: 2 of 4

Water

WARNING - CRITICAL PIPELINE
Refer to ***Information Brochure Damage Prevention*** and ***Legend*** for details

WATER CORPORATION

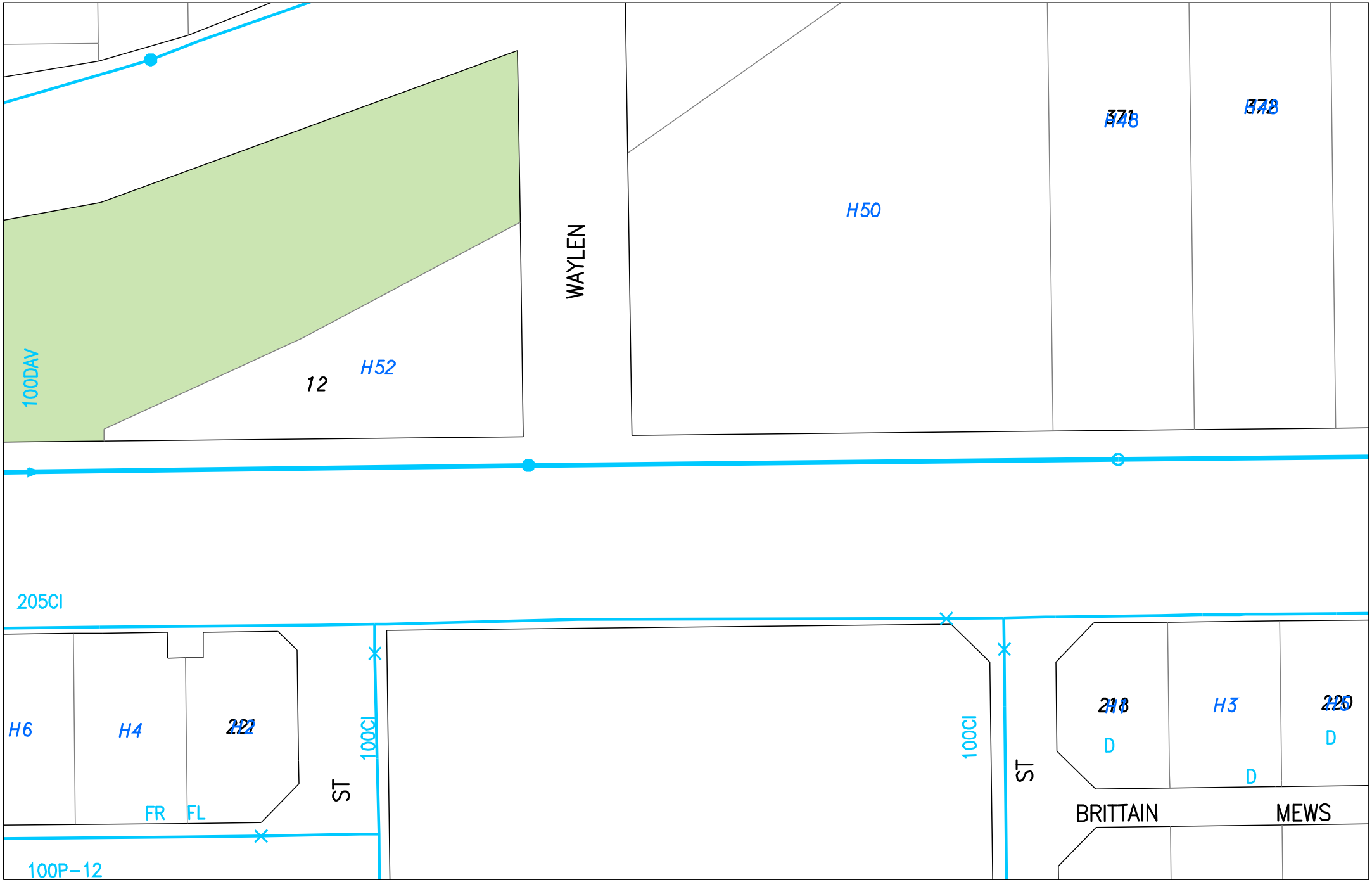
Scale: 1:750 Centre Point: 115.976°, -31.900°

Sequence No: 57400375

Print Date: 29/11/2016 Page: 3 of 4

Water

WARNING - CRITICAL PIPELINE
Refer to ***Information Brochure Damage Prevention*** and ***Legend*** for details



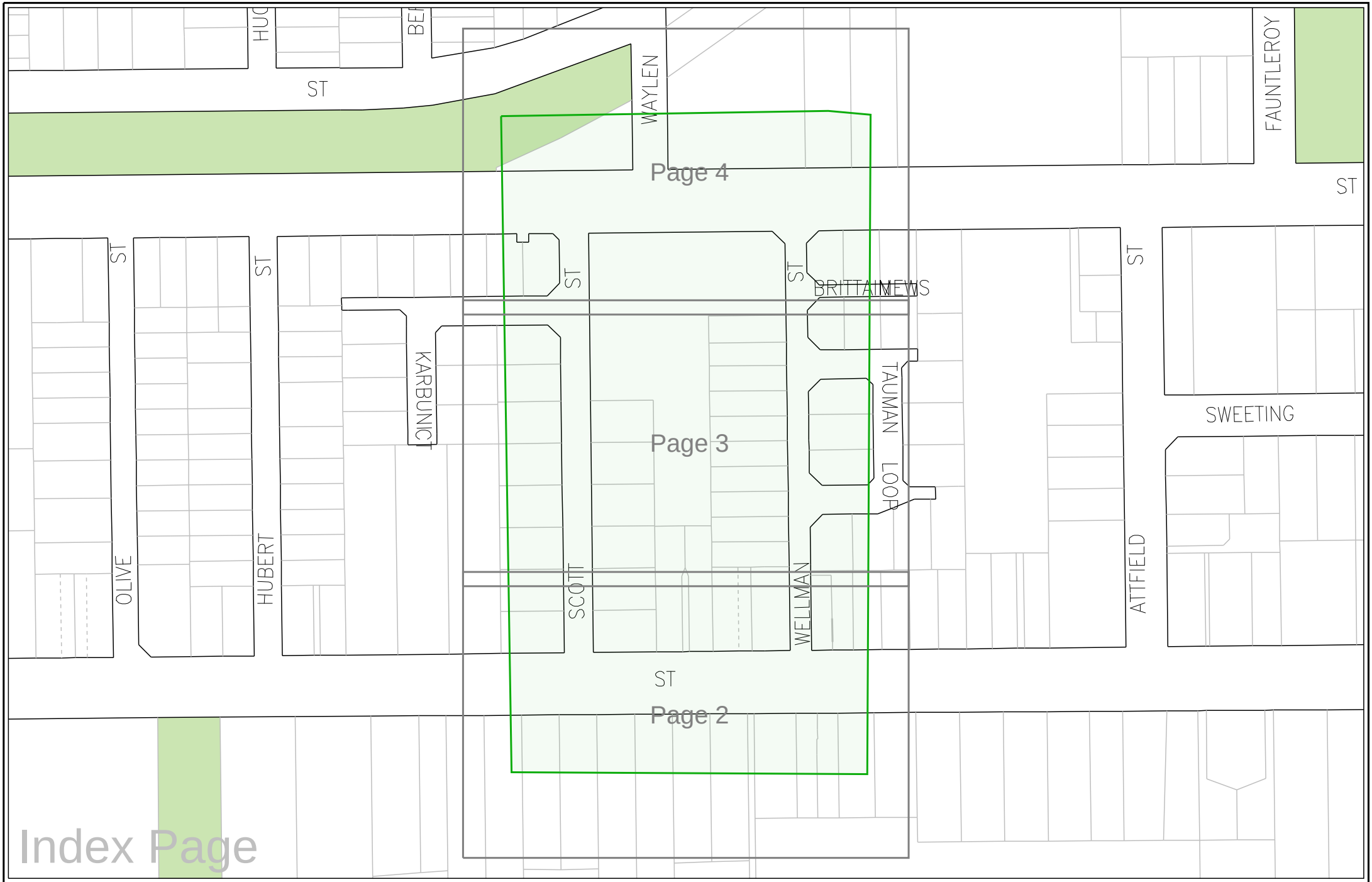
Scale: 1:750 Centre Point: 115.976°, -31.899°

Sequence No: 57400375

Print Date: 29/11/2016 Page: 4 of 4

Water

WARNING - CRITICAL PIPELINE
Refer to ***Information Brochure Damage Prevention*** and ***Legend*** for details



WATER CORPORATION

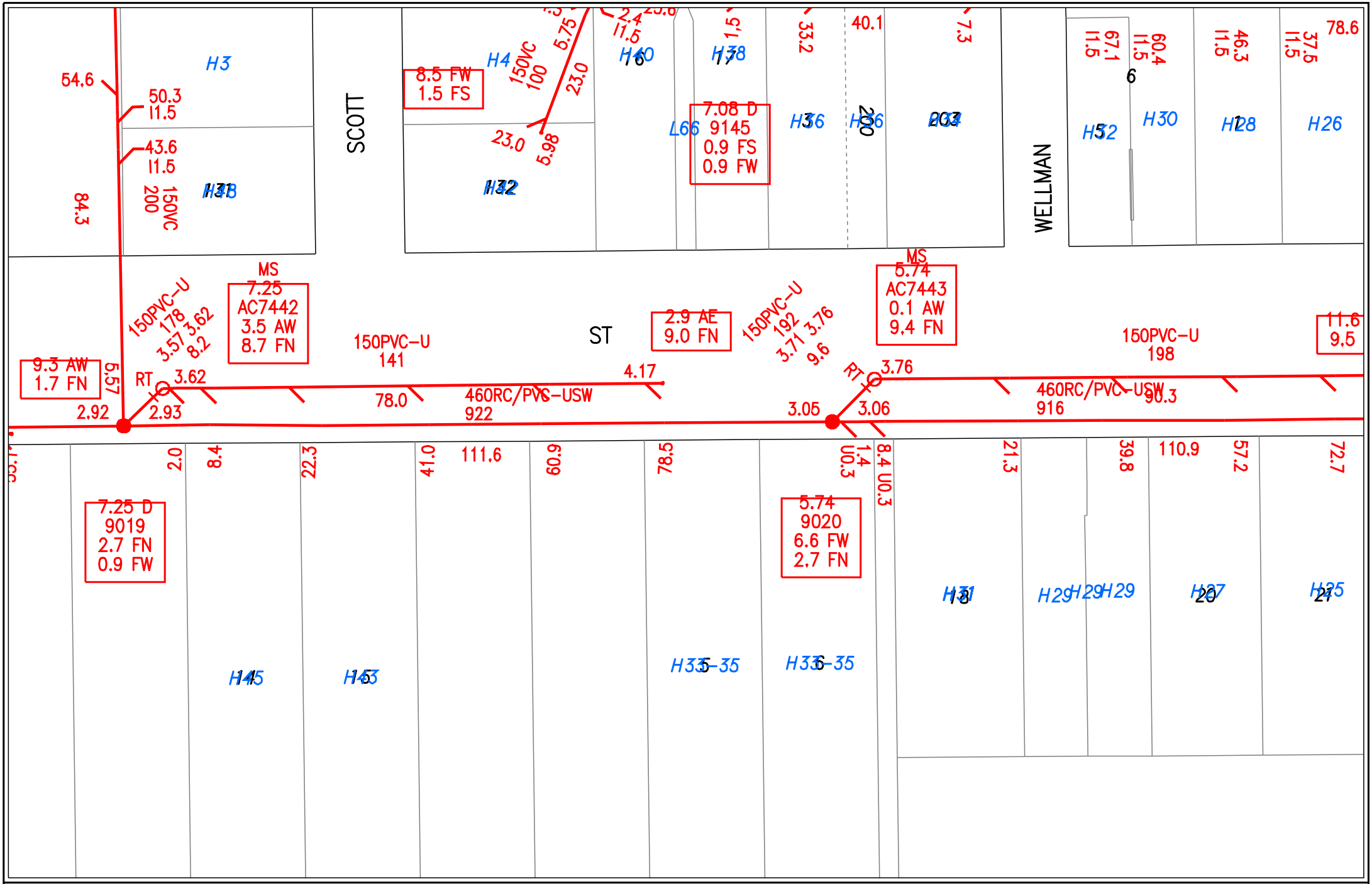
Scale: 1:2284

Sequence No: **57400375**

Print Date: 29/11/2016 Page: 1 of 4

N

Sewer

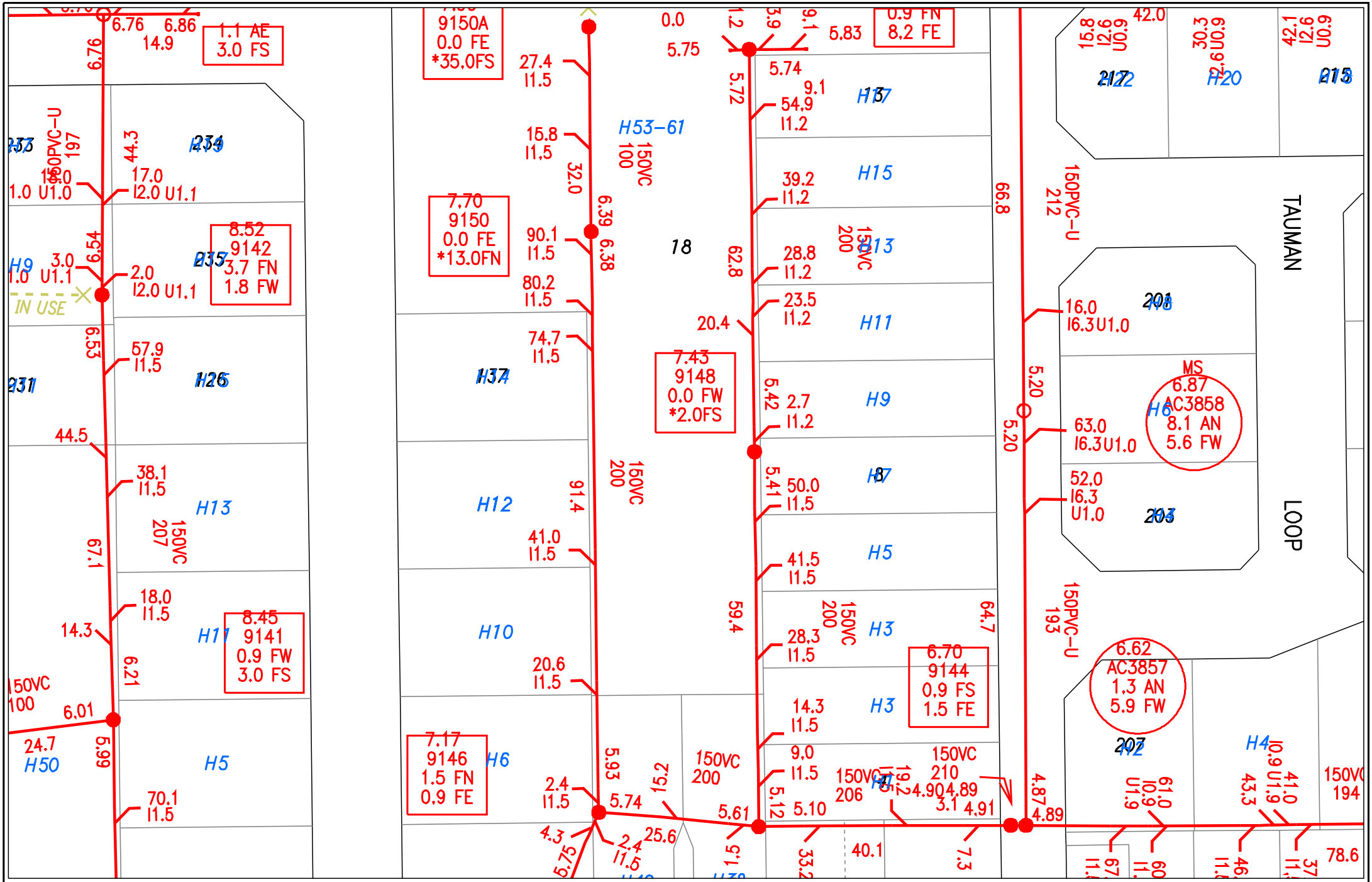


Scale: 1:750 Centre Point: 115.976°, -31.902°

Sequence No: 57400375

Print Date: 29/11/2016 Page: 2 of 4

Sewer



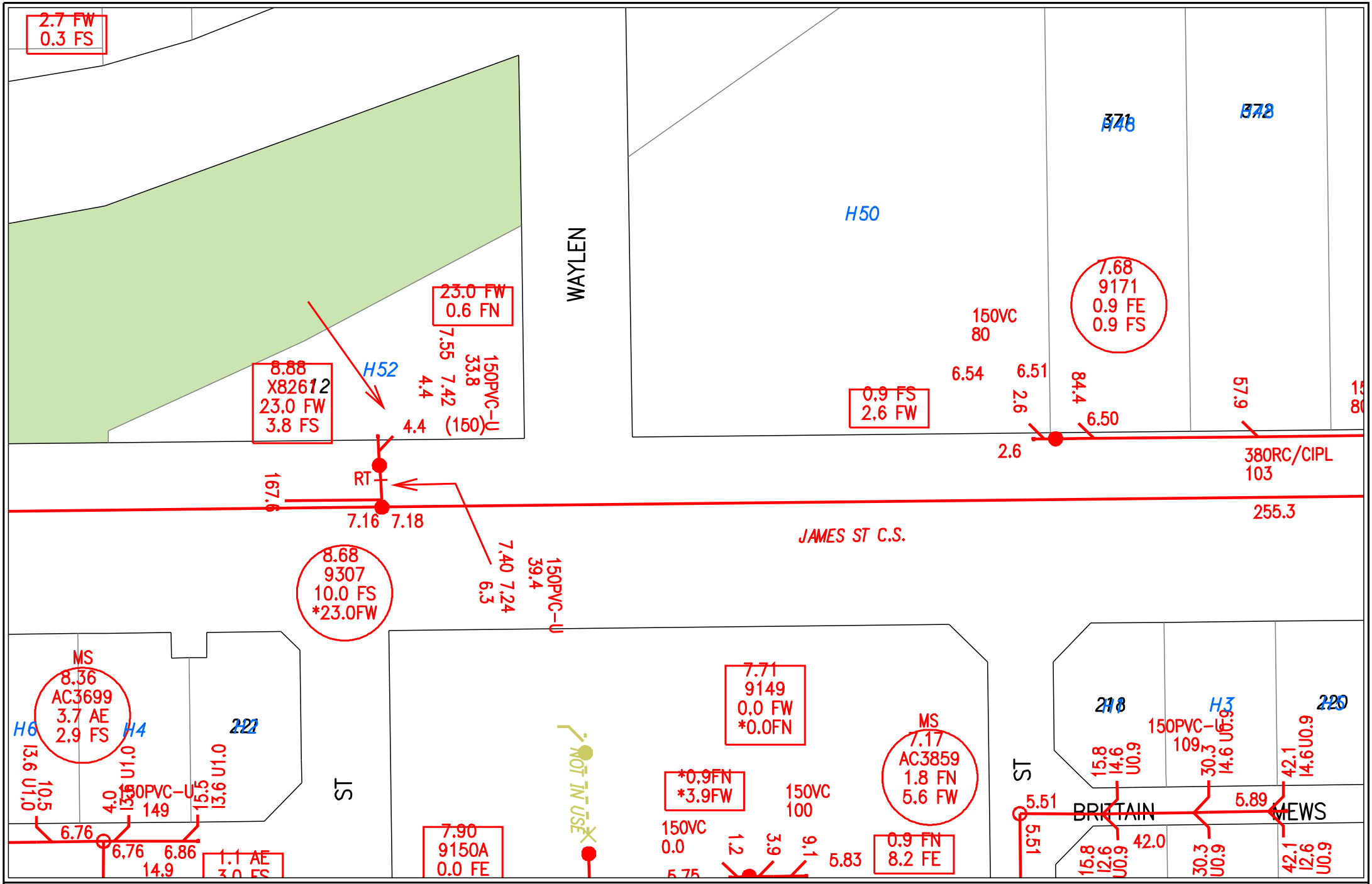
WATER CORPORATION

Scale: 1:750 Centre Point: 115.976°, -31.900°

Sequence No: 57400375

Print Date: 29/11/2016 Page: 3 of 4

Sewer

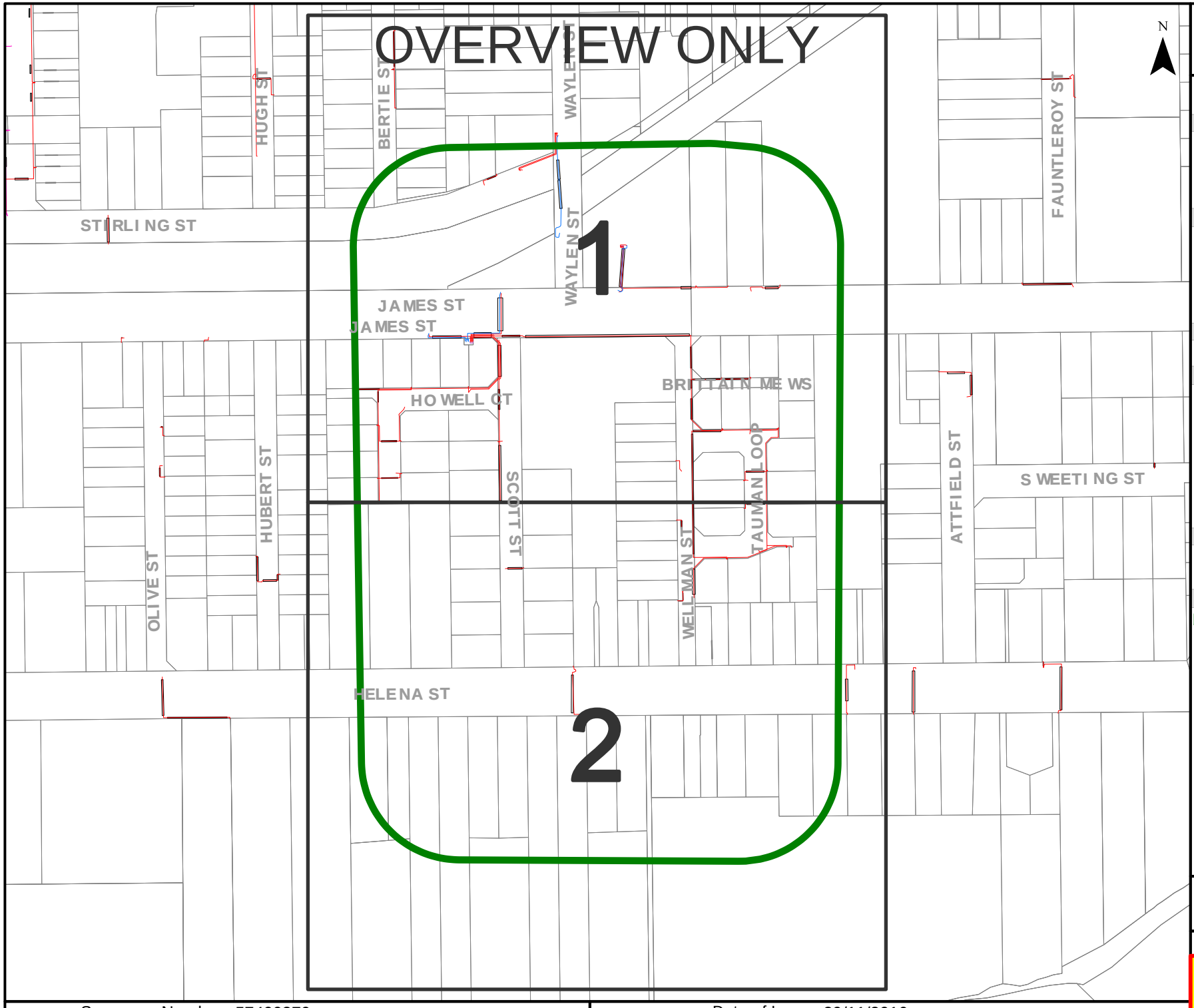


Scale: 1:750 Centre Point: 115.976°, -31.899°

Sequence No: 57400375

Print Date: 29/11/2016 Page: 4 of 4

Sewer



westernpower

UNDERGROUND LEGEND

Structures

- Pillar
- Metal Pole
- Transformer Site
- UG Crossing *
- Ring Main Unit
- LV Distribution Frame

Distribution Cables

- High Voltage Cable (1kV - 33kV)
- Low Voltage Cable (< 1kV)
- Street Light Circuit (< 1kV)
- Street Light Pilot (< 1kV)
- Earth Wire

Cable Pole Terminations

- HV Termination
- LV Termination

Proposed Construction Assets

- Design Area *
- High Voltage Underground Cable
- Low Voltage Underground Cable
- Metal Pole
- Pillar
- Transformer site
- HV Termination
- LV Termination

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

*** Please refer to coversheet**

Privately owned cables NOT SHOWN (including house services)

This map is INDICATIVE ONLY. Hand exposure via pothole method is MANDATORY.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

A4	Scale : 1:3075

WARNING! Look out for overhead power lines

Sequence Number: 57400370

Date of Issue: 29/11/2016

westernpower

UNDERGROUND LEGEND

Structures

- Pillar
- Metal Pole
- Transformer Site
- UG Crossing *
- Ring Main Unit
- LV Distribution Frame

Distribution Cables

- High Voltage Cable (1kV - 33kV)
- Low Voltage Cable (< 1kV)
- Street Light Circuit (< 1kV)
- Street Light Pilot (< 1kV)
- Earth Wire

Cable Pole Terminations

- HV Termination
- LV Termination

Proposed Construction Assets

- Design Area *
- High Voltage Underground Cable
- Low Voltage Underground Cable
- Metal Pole
- Pillar
- Transformer site
- HV Termination
- LV Termination

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

*** Please refer to coversheet**

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This map is INDICATIVE ONLY. Hand exposure via pothole method is MANDATORY.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

A4 | Scale : 1:1500

WARNING! Look out for overhead power lines

Sequence Number: 57400370

Date of Issue: 29/11/2016

UNDERGROUND LEGEND

Structures

- Pillar
- Metal Pole
- Transformer Site
- UG Crossing *
- Ring Main Unit
- LV Distribution Frame

Distribution Cables

- High Voltage Cable (1kV - 33kV)
- Low Voltage Cable (< 1kV)
- Street Light Circuit (< 1kV)
- Street Light Pilot (< 1kV)
- Earth Wire

Cable Pole Terminations

- HV Termination
- LV Termination

Proposed Construction Assets

- Design Area *
- High Voltage Underground Cable
- Low Voltage Underground Cable
- Metal Pole
- Pillar
- Transformer site
- HV Termination
- LV Termination

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

*** Please refer to coversheet**

Privately owned cables NOT SHOWN (including house services)

This map is INDICATIVE ONLY. Hand exposure via pothole method is MANDATORY.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

A4	Scale : 1:1500

WARNING! Look out for overhead power lines

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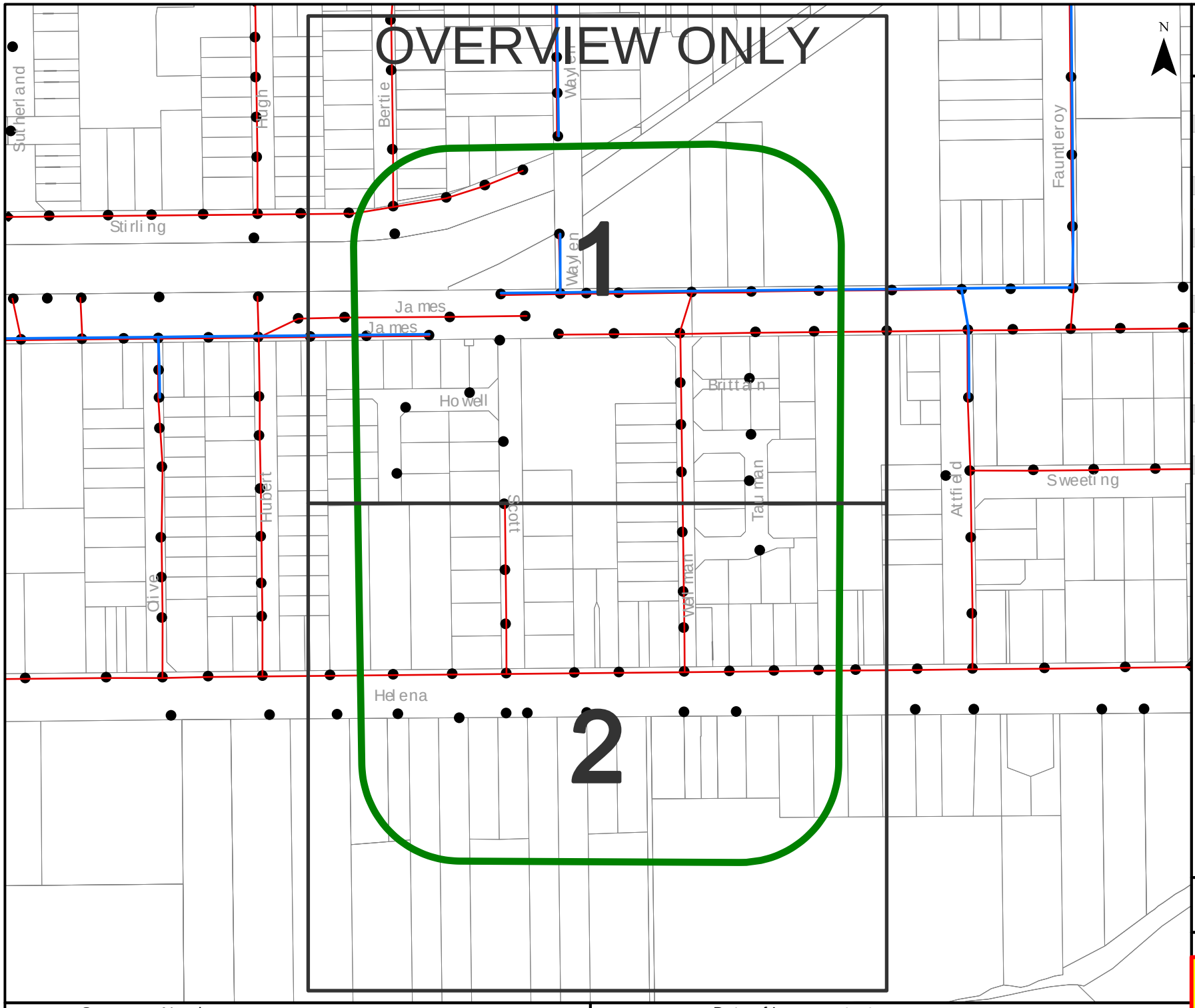
Date of Issue: 29/11/2016



westernpower

OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

*** Please refer to coversheet**

Privately owned cables NOT SHOWN (including house services)

This map is INDICATIVE ONLY. Check that you have enough clearance from the DANGER ZONES near overhead powerlines.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

A4	Scale : 1:3075

WARNING! Look out for overhead power lines

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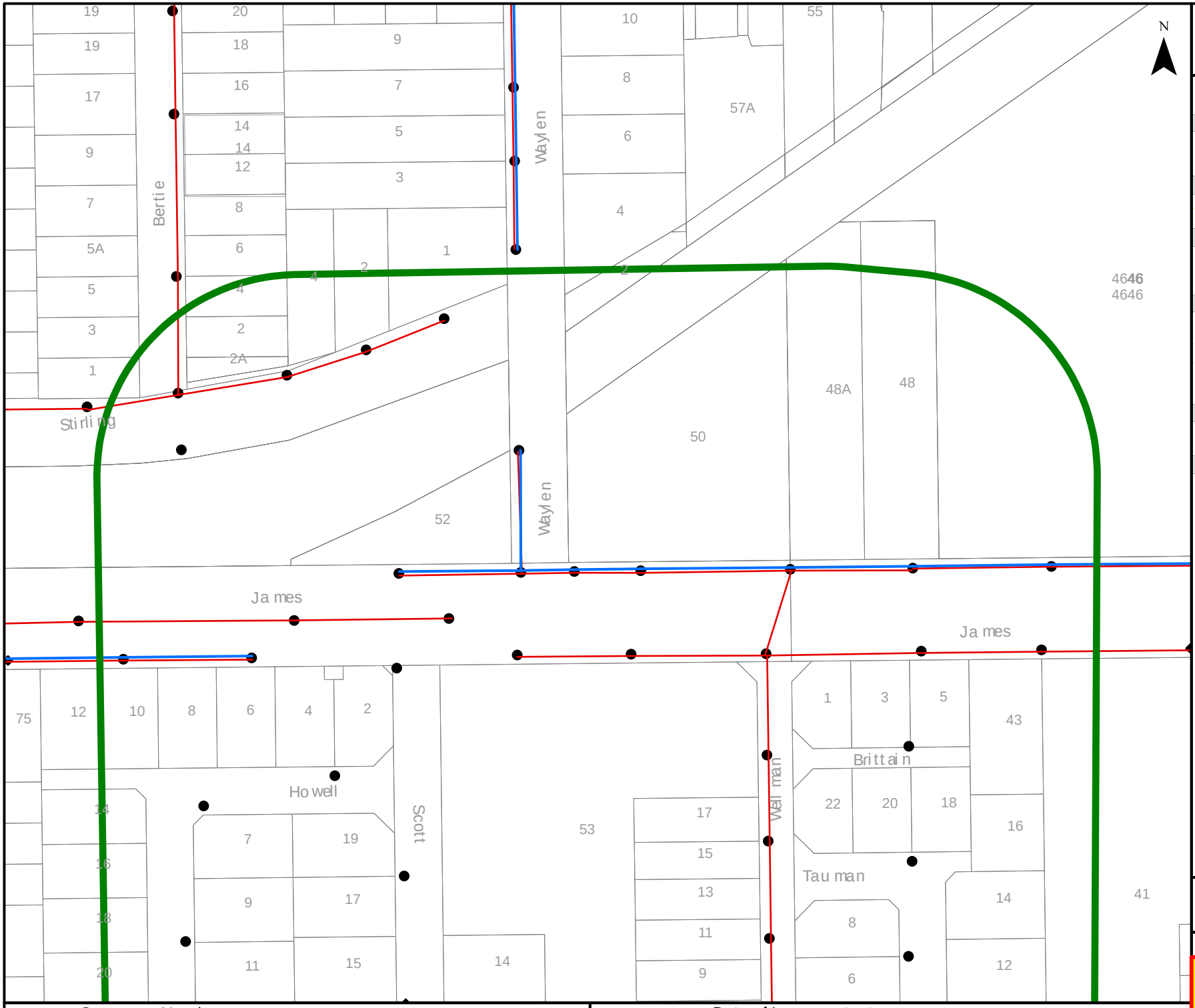
Date of Issue: 29/11/2016



westernpower

OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

*** Please refer to coversheet**

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OVERHEAD LEGEND

Structures

- Power Pole
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- Overhead Pilot Cable

Feature

- Area of Interest

*** Please refer to coversheet**

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Information valid for 30 days from date of issue

A4	Scale : 1:1500

WARNING! Look out for overhead power lines

Sequence Number: 57400370

Date of Issue: 29/11/2016

Appendix F Perth Groundwater Atlas Information

Items of Interest

Groundwater Salinity - TDS in mg/L	1500 - 3000
Surface Geology type	Guildford Clay: alluvium (clay, loam, sand and gravel)
Iron Staining Risk	Low risk
Garden Bore Suitability	Unsuitable
Acid Sulfate class	No known risk

Acid Sulfate Soils
Class 1 : High risk of ASS or PASS <3m from soil surface
Class 2 : Moderate to low risk of shallow ASS or PASS; Generally at >3m depth
Class 3 : Low to nil risk of shallow ASS or PASS; Generally at >3m depth

Public Drinking Water Source Areas (PDWSA)
Protection Area-P1 : Areas defined to ensure that there is no degradation of the water source.
Protection Area-P2 : Areas defined to ensure that there is no increased risk of pollution to the water source.
Protection Area-P3 : Areas defined to manage the risk of pollution to the water source.
Protection Area-NA : Not asssigned.

Groundwater Salinity
0 – 500 mg/L : Fresh
501 – 1000 mg /L: Marginal
1001 – 5000 mg/L: Brackish
> 5000 mg/L : Saline

Garden Bore Suitability
Suitable : Use of groundwater for domestic irrigation supported in preference to scheme water
Unsuitable : Additional domestic garden bores not supported as water quantity or quality may not be appropriate

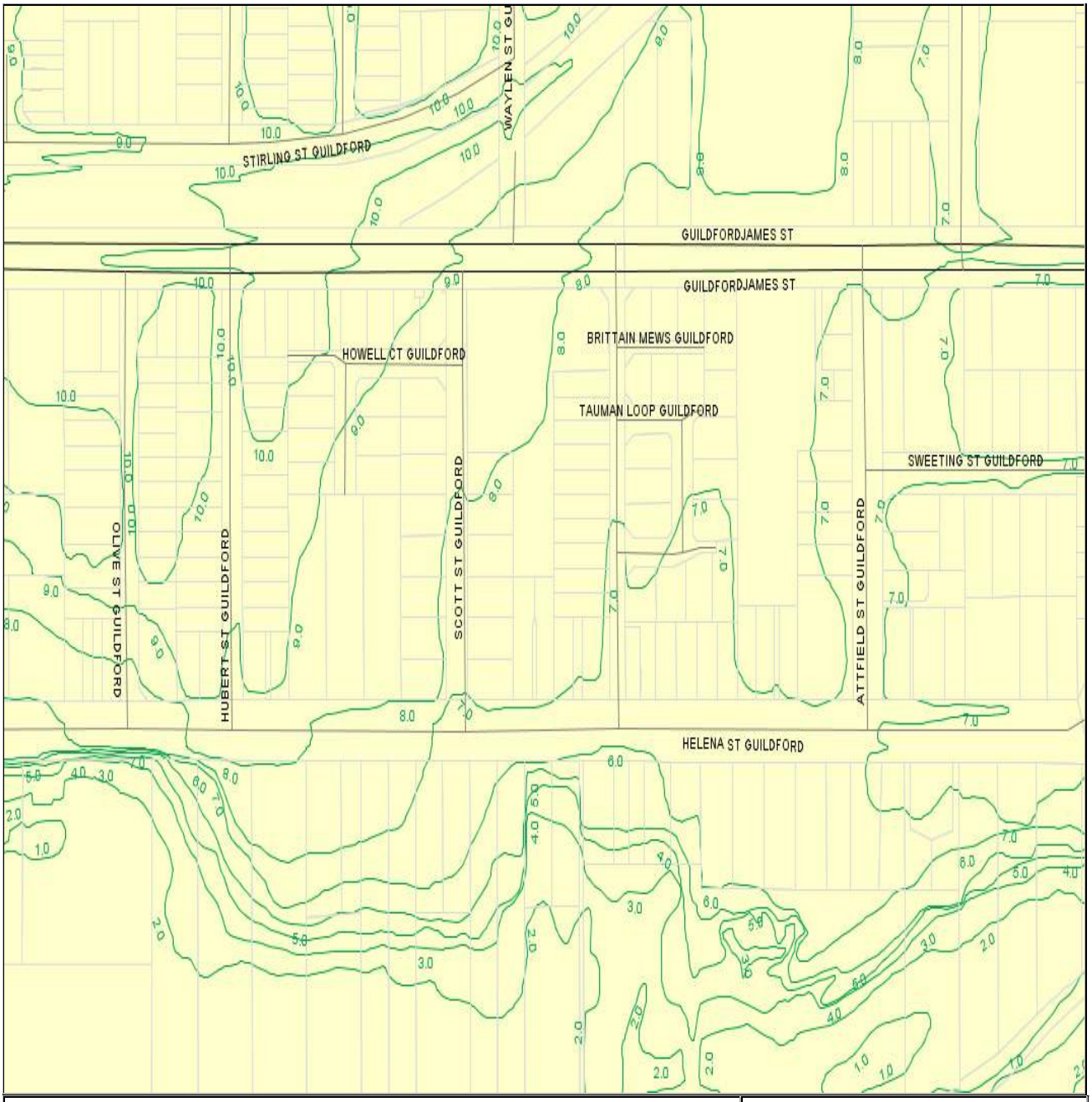
To view the Department's policy on Garden Bores, click here.

Iron Staining Risk
High risk : areas delineated as having an elevated iron / manganese staining risk
Low risk : areas low in iron concentration, away from present or past wetlands with neutral to alkaline pH

For further information contact the Department of Water Groundwater Information Line on (08)6364 6565 or email : groundwater@water.wa.gov.au

Department of Water
Government of Western Australia

Perth Groundwater Atlas



LEGEND

PLANNING AND CADASTRE
Cadastre - DLI
- Freehold
- Crown Reserve
- State Forest
- Marine Park
- Crown Lease
- Lease / Reserve
- Lease on State Forest
- Lease on Marine Park
- Public Roads
- Unallocated Crown Land
- Water

GEOSCIENTIFIC INFORMATION
Acid Sulfate - DoE
- High
- Medium
- Low

- Darling Scarp- DoE
- GW contours, May 2003 - DoE
- GW contours, Historical max - DoE

GEOSCIENTIFIC INFORMATION
Groundwater Salinity - DoE
TDS Level (mg/L)
- 0 - 500
- 500 - 1000
- 1000 - 1500
- 1500 - 3000
- 3000 - 7000
- Unknown

Groundwater Risk - DoE
- Iron staining risk
- Development risk
- Low risk

- Surface Geology - DoE
- Base Superficial Formations - DoE
- WIN Groundwater Sites - DoE

ENVIRONMENT
PDWSA - DOE
- Policy Use - P1
- Policy Use - P2
- Policy Use - P3
- Policy Use - not assigned

INLAND WATERS
- Hydrography - DoE

Geomorphic Wetlands - DoE
- Conservation
- Resource Enhancement
- Multiple Use
- No longer a wetland
- Not Assessed

ELEVATION
- Contours 1m / 5m - DLI

UTILITIES AND COMMS
- Drains - WC

TRANSPORTATION
- Roads - DLI, GMD

LOCATION
- Streetsmart Grid - DLI
- Localities - DLI

N

100 m
Approx. when reproduced at A4
Geocentric Datum of Australia 1994

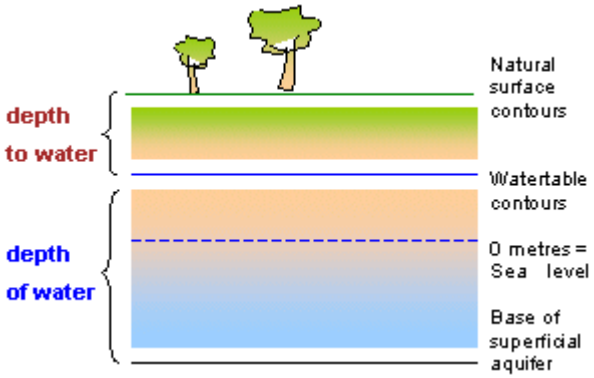
Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.

Created at 16:07 on 16 Sep 2014

Contact: Groundwater Information Line
Phone: (08) 6364 6565
Email: groundwater@water.wa.gov.au

Depth to water: 7.0 metres*

Depth of water: 16.0 metres



The above figures were calculated from the following values which were extracted from the three surfaces at location 115.97629 degrees East and 31.89972 degrees South **

Levels relative to ground level

Watertable:	7.0 metres
Base of Aquifer:	23.0 metres

Levels relative to AHD (Australian Height Datum)

Natural Surface Level:	8.0 metres
Watertable Level:	1.0 metres
Base of Aquifer Level:	-15.0 metres

* Estimates may fluctuate between 0.5 and 3m due to seasonal variation. Under normal circumstances, a garden bore will be drilled to a depth 10 metres below the watertable. Add 10 m to the depth-to-groundwater to estimate the drilling depth.

Groundwater level contours are estimated based on recorded groundwater levels measured in May of 2003 (end of summer). Because of changes in groundwater and natural surface levels that can occur over time it should be clearly understood that the Department of Water is not in a position to guarantee the accuracy of the data.

The Perth Groundwater Atlas is not suitable for calculating the depth of water bodies such as rivers or lakes.

For further information contact the Department of Water Groundwater Information Line on (08) 6364 6565 or email : groundwater@water.wa.gov.au

** The map data currently displayed by the Groundwater Atlas is in the GDA94 datum.

Appendix G LiDAR Contours with Aerial

Town Planning Management Engineering

Bunbury
Level 1, Unit 5, 53 Victoria St
Bunbury WA 6230
Ph: (08) 9791 4411

Perth
15E Plaza 817, 817 Beeliar Dr
Cockburn Central WA 6164
Ph: (08) 9417 7079

Margaret River
Unit 1/34 Station Rd
Margaret River WA 6285
Ph: (08) 9757 3256

Great Southern
PO Box 114
Woodanilling WA 6316
Ph: (08) 9823 1009

Project ***Lot 18 James St and Lot 137 Scott St, Guildford, WA***

Title **LiDAR Contours with Aerial**

Original Size	Map Ref.	Produced by	Produced on
A3	14224 -P - 01	BM	14/11/14

1:1,000

0 12.5 25 50 75 100 m