



**Lot 101 Teatree Road, Bindoon**

# **Local Water Management Strategy**

**Prepared for  
NXT Global Pty Ltd**

**February 2020**

● people ● planet ● professional

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# Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by NXT Global Pty Ltd to prepare a Local Water Management Strategy (LWMS) to support the Structure Plan application for a tourist resort proposed to be located at Lot 101 (No.777) Teatree Road, Bindoon.

The Structure Plan area applies to a 50 ha portion within Lot 101 which was recently rezoned to Special Use to facilitate development of the land. The resort will incorporate residential resort homes, short-stay villas, serviced apartments and supporting guest facilities.

An integral component of the Structure Plan design process is the consideration of how the development will respond to the water resources onsite including water supply and wastewater disposal, stormwater and groundwater. This LWMS has been prepared in accordance with the Better Urban Water Management Guidelines (WAPC 2008) to demonstrate water is able to be appropriately managed to support the proposed landuse. Table 1 below provides a summary of the site environmental characteristics and proposed water management strategies.

**Table 1: Key Elements of the LWMS**

Site Overview	Description
Location Section 1.1	<ul style="list-style-type: none"> <li>The site is located at Lot 101 (No.777) Teatree Road, Bindoon.</li> <li>Lot 101 (No.777) Teatree Road, Bindoon is located 7.5 km south west of the Bindoon townsite in the Shire of Chittering.</li> <li>The Local Structure Plan (the site) applies to a 50 ha portion within Lot 101 located at the south-west corner of Teatree Road and Brennan Road.</li> </ul>
Proposed Development Section 1.3	<ul style="list-style-type: none"> <li>A tourist resort is proposed which will incorporate residential resort homes, short-stay villas, serviced apartments and supporting guest facilities.</li> </ul>
Existing Landuse Section 2.1	<ul style="list-style-type: none"> <li>The site is covered by native vegetation and does not have an active landuse.</li> </ul>
Topography Section 2.3	<ul style="list-style-type: none"> <li>The site is elevated and located on the western side of a small hill. The topography slopes from east to west with elevations of 190m in the east to 170 m in the west.</li> </ul>
Soil Type Section 2.4	<ul style="list-style-type: none"> <li>Regional soil mapping indicates the site is predominately underlain by pale yellow to yellowish brown sand, maybe gravelly and or weakly clayey below 1m.</li> </ul>
Surface Water Section 2.7	<ul style="list-style-type: none"> <li>There are no watercourses located within the site.</li> <li>A small tributary is located in the north west corner of Lot 101 which flows north into Lennard Brook, located approximately 2 km north of the site and 100 m north of Lot 101.</li> </ul>
Groundwater Section 2.8	<ul style="list-style-type: none"> <li>The groundwater aquifers underlying the site are the Surficial, Mirrabooka, Leederville-Parmelia and Yarragadee North.</li> <li>The Perth Groundwater Map (DWER, 2019e) does not have groundwater contours that extend to the site or adjacent area. A search of Water Information Reporting database (DWER, 2019c) indicates that there are no</li> </ul>

Site Overview	Description
	<p>long-term monitoring bores installed within the surficial aquifer with recent monitoring data within 5 km distance to the site.</p> <ul style="list-style-type: none"> <li>Given the sandy soils at the site and its high elevation relative to the surrounding landscape the depth to groundwater in the surficial aquifer at the site is expected to be high.</li> </ul>
Vegetation Section 2.9	<ul style="list-style-type: none"> <li>A Flora, Vegetation and Fauna Survey was completed at the Site in Spring 2019.</li> <li>Six vegetation types were recorded on the site with the main variation between vegetation types being determined by either a sand or laterite soil type and the age since fire.</li> <li>Vegetation on sandy soils was mostly a <i>Eucalyptus todtiana</i> and <i>Nuytsia floribunda</i> Low Open Woodland in areas that were burnt 6 years previously. In longer unburnt sandy sites <i>Banksia menziesii</i> and <i>B. attenuata</i> were more common in the overstorey. The lateritic soils contained Jarrah and Marri as the dominant tree canopy.</li> <li>The native vegetation is in Pristine condition with very little disturbances and very few weeds.</li> </ul>
Water Servicing Section 3.0	<ul style="list-style-type: none"> <li>Approximately 200,000 kL of potable and up to 100, 000 kL of non-potable water will be required for irrigation.</li> <li>Potable water will be sourced from a combination of options including Water Corporation mains, an independent water service provider and stormwater harvesting (rainwater tanks).</li> <li>Non potable water sources for irrigation will also be sourced from a combination of sources including groundwater, water trading, recycled wastewater and stormwater harvesting.</li> <li>An onsite wastewater treatment plant will be provided to collect and treat wastewater generated on site.</li> </ul>
Water Conservation Strategy Section 4.0	<ul style="list-style-type: none"> <li>Water conservation will be a priority due to the scarcity of water in the area.</li> <li>The development proposes to connect to the Water Corporation's water supply mains.</li> <li>Water efficient fixings and fixtures will be used within the resort</li> <li>Consideration will be given at detailed design stage to use rainwater tanks plumbed into toilets and greywater reuse systems.</li> <li>Streetscapes will be non-irrigated post establishment.</li> <li>Waterwise landscaping and water efficient irrigation systems will be used.</li> <li>Irrigation water for public open space will be harvested from impermeable surfaces throughout the development and recycled wastewater from the onsite wastewater treatment plant.</li> <li>Harvested roof runoff will be stored in underground tank/s or rainwater tanks for later potable and or non-potable purposes.</li> </ul>
Stormwater Management (Section 5.0)	<ul style="list-style-type: none"> <li>All roof runoff from the development is likely to be directed to the underground irrigation tanks or rainwater tanks.</li> <li>If required, runoff generated in the development in events greater than the first 15mm and up to and including a 1 % ARI event will be stored in an above-ground infiltration basin within the Community Open Space.</li> </ul>

Site Overview	Description
Groundwater Management (Section 6.0)	<ul style="list-style-type: none"> <li>• The site has significant clearance to groundwater and is unlikely to impact on groundwater quality or levels.</li> <li>• All road and carpark runoff will be treated prior to infiltration.</li> <li>• Sub soil drainage and fill is not required to provide sufficient clearance to groundwater.</li> </ul>
Future subdivisions and Urban Water Management Plan (Section 7.0)	<ul style="list-style-type: none"> <li>• An Urban Water Management Plan (UWMP) will be prepared to support the subdivision stage of the development. The UWMP will:</li> <li>• Provide detailed engineering designs of proposed water supply, wastewater disposal and stormwater drainage systems.</li> <li>• Confirm the alternate water resources and demonstrate appropriate approvals have been obtained.</li> <li>• Outline water treatment requirements for the irrigation water harvested from roof runoff, wastewater and grey water reuse.</li> <li>• Monitoring requirements including trigger values/actions for water reuse schemes.</li> <li>• Confirm the monitoring, maintenance and funding arrangements to manage all alternate water resources and the onsite wastewater management system.</li> </ul>

## Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Background.....	1
1.2	Planning Context.....	1
1.3	Proposed Development .....	1
1.4	Supporting Studies.....	2
1.5	Guidance and Previous Studies .....	2
1.6	Design Objectives .....	2
<b>2</b>	<b>Existing Environment.....</b>	<b>4</b>
2.1	Site Location and Land Use.....	4
2.2	Climate and Rainfall.....	4
2.3	Topography .....	4
2.4	Geology and Soils.....	5
2.5	Acid Sulfate Soils .....	5
2.6	Contamination .....	5
2.7	Surface Water .....	5
2.8	Groundwater .....	5
2.9	Vegetation .....	6
<b>3</b>	<b>Water Servicing.....</b>	<b>7</b>
3.1	Potable Water Supply and Wastewater Disposal .....	7
3.2	Non-potable Water Supply .....	7
<b>4</b>	<b>Water Conservation Strategy.....</b>	<b>10</b>
4.1	Proposed Strategy .....	10
<b>5</b>	<b>Stormwater Management .....</b>	<b>11</b>
5.1	Existing Surface Water Flows .....	11
5.2	Proposed Stormwater Management .....	11
<b>6</b>	<b>Groundwater Management .....</b>	<b>12</b>
6.1	Groundwater Level.....	12
6.2	Groundwater Quality .....	12
<b>7</b>	<b>Future Subdivision and Urban Water Management Plan (UWMP). 13</b>	
7.1	Detailed design of Stormwater Harvesting System .....	13
7.2	Confirmation of the Alternate Water Resources .....	13
7.3	Implementation of Water Conservation Strategies .....	13
7.4	Detailed Design of the Proposed Stormwater Infrastructures .....	13
7.5	Landscape Plans .....	13
7.6	Monitoring and Maintenance Requirements .....	14
<b>8</b>	<b>Limitations .....</b>	<b>15</b>
<b>9</b>	<b>References .....</b>	<b>16</b>

## List of Tables

Table 1: Key Elements of the LWMS .....	i
Table 2: Design Objectives.....	2
Table 3: Aquifer Allocation Report .....	6

## List of Plates

Plate 1: Average Monthly Rainfall in Bindoon (2000 – 2018) .....	4
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## List of Figures

Figure 1: Site Location
Figure 2: Local Structure Plan
Figure 3: Topography
Figure 4: Soil Landscape Subsystem
Figure 5: Surface Water
Figure 6: Bushfire Prone Area

## List of Appendices

Appendix A AquaFerre (Muchea) Pty Ltd Water Agreement
Appendix B Engineering Servicing Report

# 1 Introduction

## 1.1 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by NXT Global Pty Ltd to prepare a Local Water Management Strategy (LWMS) to support the Structure Plan application for a sustainable integrated tourist resort proposed to be located at Lot 101 (No.777) Tea Tree Road, Bindoon.

The Structure Plan area is located 7.5 km south west of the Bindoon townsite in the Shire of Chittering and applies to a 50 hectare (ha) portion within Lot 101, as shown in Figure 1. The tourist resort will incorporate residential resort homes, short-stay villas and serviced apartments and guest facilities.

## 1.2 Planning Context

Lot 101 Teatree Rd is approximately 475 ha, the Structure Plan area applies to a 50 ha portion of Lot 101 (the site) which was recently rezoned as Special Use under the Shire of Chittering Town Planning Scheme No.6. to facilitate the development of the site. The balance of Lot 101 (425 ha) is included in a Conservation Zone.

The level of details included in a LWMS follows a risk-based approach with greater emphasis on the aspects of water management that are higher risk or more complex. This LWMS has been prepared to detail how all forms of water, including groundwater, stormwater and potable water and will be managed on site in accordance with the Better Urban Water Management guidelines (WAPC, 2008).

## 1.3 Proposed Development

A high-end eco-tourism resort is proposed which adopts innovative design and construction materials and methods. Construction will take place using the NXT™ Building System technology developed by NXT to increase material use efficiency and reduce on-site waste by using prefabricated, standardised and easily integrated building components made from environmentally friendly and recyclable materials. NXT's long-term vision is to be a leading global provider of innovative building solutions used in the development of sustainable buildings, cities and communities and it is envisaged that the proposed eco resort will show case these capabilities.

The proposed Structure Plan shown in Figure 2 includes:

- Residential resort lots (28.4 ha)
- Tourist resort and guest facilities (3.6 ha)
- Bushfire access and internal roads (5.9 ha)
- Wastewater treatment facility (0.1 ha)
- Communal open space (12.0 ha).

## 1.4 Supporting Studies

Environmental and technical studies completed for the site and relevant to this report include:

- Infrastructure Servicing Report (Pritchard Francis, 2019)
- Flora and Fauna (PGV Environmental, 2019).

## 1.5 Guidance and Previous Studies

This report has been prepared in accordance with State Planning Policy 2.9: Water Resources (Government of Western Australia, 2006) and has been developed with reference to the following guidance documents:

- Better Urban Water Management Guidelines (WAPC, 2008)
- Interim: Developing a Local Water Management Strategy (DoW, 2008)
- Western Australian State Water Plan (Government of Western Australia 2007)
- Stormwater Management Manual for Western Australia (DoW 2004-2007)
- Shire of Chittering Local Planning Policy No.6 – Water Supply and Drainage
- Shire of Chittering Local Planning Policy No.16 – Roads and Drainage
- Shire of Chittering Subdivisional Development Guidelines (SoC, 2018) - provides the Shire's requirements on stormwater drainage.

## 1.6 Design Objectives

The design objectives for this site area presented in Table 2.

**Table 2: Design Objectives**

Element	Principle	Objective
Water conservation strategy	Ensure the efficient use of water resources.	Minimise irrigation requirements for landscaped areas and streetscapes
		Achieve WA State Water Plan targets of potable water consumption
		Minimise external use of potable water
		Collect, reuse and recycle water from various sources to provide for purpose water to support the development
Surface Water Management	Manage catchments to replicate the natural environment and maintain or improve surface water resources.	Collect and reuse stormwater where possible to provide potable and non-potable water source for the development
		Collect, treat and infiltrate minor rainfall events as close to

Element	Principle	Objective
		source as possible to replicate the natural hydrological cycle
		Maintain predevelopment flow paths where possible.
		Implement stormwater management best practice
Groundwater Management	Maintain or improve groundwater quality and resources	Maintain groundwater quality through the use of landscape stormwater features and the use of waterwise and low nutrient requiring landscaping

## 2 Existing Environment

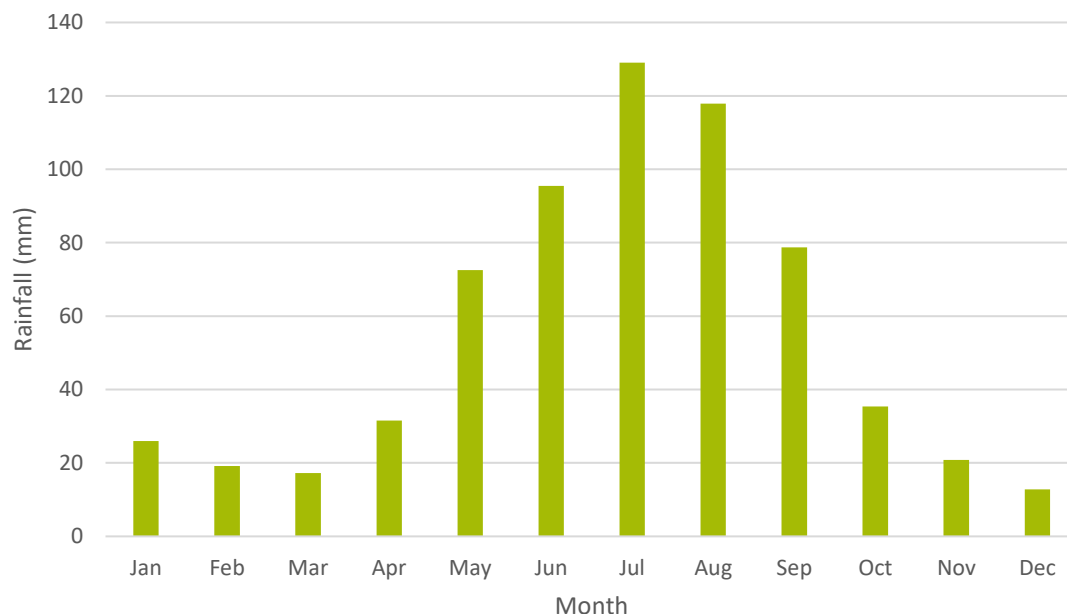
### 2.1 Site Location and Land Use

The site is located 7.5 km south-west of the Bindoon townsite, at the south-west corner of Teatree Road and Brennan Road.

### 2.2 Climate and Rainfall

The site experiences a Mediterranean climate, with cool wet winters from June to August and hot dry summers from December to February.

The closest weather station is Bindoon (BOM Station Number: 9112), located approximately 8.5 km from the site, which has recorded daily rainfall for the period 1952 - 1978 and 2000 - present. The average annual rainfall is approximately 649 mm for the period 2000 – 2018. Average monthly rainfall for this period is plotted in Plate 1.



**Plate 1: Average Monthly Rainfall in Bindoon (2000 – 2018)**

### 2.3 Topography

The northern half of the site, where the resort development is proposed, generally slopes gently towards a water course in the north western corner of the site. The elevation under the development site ranges from 194 m AHD on the eastern boundary to 174 m AHD in the western boundary (Figure 3).

## **2.4 Geology and Soils**

### **2.4.1 Regional Data**

The 1:250 000 regolith map of Western Australia (GeoVIEW WA - Department of Mines, Industry Regulation and Safety, 2019) describes the site as:

- Colluvium: Slope deposits, including colluvium and sheetwash.

The site's western boundary is located on the eastern extent of the 1: 50,000 geology series mapping (GeoVIEW WA - Department of Mines, Industry Regulation and Safety, 2019). This mapping indicates the site is likely to consist of:

- S6: Colluvium soil and undifferentiated sand; and
- LA1 and G2: Laterite massive or pisolitic.

A regional geology map is shown in Figure 6.

## **2.5 Acid Sulfate Soils**

A search of the CSIRO's Australian Soil Resource Information System (ASRIS) database identified the site as having an extremely low probability of the occurrence of Acid Sulfate Soils (ASS).

## **2.6 Contamination**

The Contaminated Site Database (DWER, 2019b) indicates that the site is not currently classified as a contaminated site and no known contaminated sites are located within an 10km radius of the site.

## **2.7 Surface Water**

There are no watercourses located in the LSP. A small water course is located in the north western corner of Lot 101 which flows north into Bindoon Brook. This watercourse is known as Lennard Brook north of the site which changes name to Bindoon Brook near the north west corner of Lot 101 located immediately to the north of the site (Figure 5).

## **2.8 Groundwater**

### **2.8.1 Aquifers**

The Water Register database (DWER, 2019c) indicates that the aquifers underlying the site are: Surficial (Eclipse Hill subarea), Mirrabooka (Southern Scarp Semi-confined), Leederville-Parmelia (Cwalla Confined subarea) and Yarragadee North (Chandala Confined subarea).

An aquifer allocation report requested from DWER in July 2019 indicated that Surficial and Yarragadee aquifers area available for allocation. The Mirrabooka and Leederville-Parmelia aquifers have been fully allocated and committed (see Table 3).

**Table 3: Aquifer Allocation Report**

Aquifer	Allocation Limit (kl)	Allocated Volume (kl)	Remaining Volume (kl)	Allocated and Committed (%)
Surficial	3,000,000	1,374,047	1,625,953	45.80%
Mirrabooka	285,000	1,076,790	-791,790	377.82 %
Leederville-Parmelia	17,617,300	19,817,829	-2,957,084	115.45 %
Yarragadee North	1,050,000	856,000	194,000	81.52 %

The Surficial aquifer is generally a localised, perched aquifer occurring in Cainozoic sediments. The aquifer is generally very thin (3-10 m) and bores constructed in this aquifer may only support isolated small-scale development. An allocation request of the size proposed would need to be supported by a detailed hydrogeological assessment.

The site is not located within a Public Drinking Water Source Area (PDWA) (DWER, 2019d).

### 2.8.2 Groundwater Levels

The Perth Groundwater Map (DWER, 2019e) does not have groundwater contours that extend to the site or adjacent area.

A search of Water Information Reporting database (DWER, 2019c) indicates that there are no long-term monitoring bores installed within the surficial aquifer with recent monitoring data within 5 km distance to the site.

Given the sandy soils at the site and its high elevation relative to the surrounding landscape the depth to groundwater in the surficial aquifer at the site is expected to be high. The static water level recorded during drilling of a private bore at the site within the surficial aquifer was 52 m below ground level.

### 2.8.3 Groundwater Quality

The Perth Groundwater Map (DWER, 2019e) does not have any data on groundwater quality for the site. There is no long-term monitoring bore identified with recent water quality data within 2 km distance to the site (DWER, 2019c). Further groundwater investigations will be required to secure a non-potable water source for irrigation.

## 2.9 Vegetation

A Flora, Vegetation and Fauna Survey was completed at the Site in Spring 2019 (PGV Environmental 2019). Six vegetation types were recorded on the site with the main variation between vegetation types being determined by either a sand or laterite soil type and the age since fire. Vegetation on sandy soils was mostly a *Eucalyptus tottiana* and *Nuytsia floribunda* Low Open Woodland in areas that were burnt 6 years previously. In longer unburnt sandy sites *Banksia menziesii* and *B. attenuata* were more common in the overstorey. The lateritic soils contained Jarrah and Marri as the dominant tree canopy. The native vegetation is in Pristine condition with very little disturbances and very few weeds.

## 3 Water Servicing

### 3.1 Potable Water Supply and Wastewater Disposal

It is estimated that a maximum of 200,000 kL of potable water is required to support the development. It is anticipated that the resort will support a maximum of approximately 850 people at any given time. A range of potable water sources will be considered to service the development including upgrading existing Water Corporation infrastructure to supply additional potable water, sourcing water from an independent water service provider and harvesting rainwater from roofs and storage in underground tanks.

A meeting was held on the 20<sup>th</sup> November 2019 between NXT Pty Ltd and the Water Corporation to discuss the supply of water to the development. It was agreed that the Water Corporation would assess the required upgrades needed to supply water to the development and confirm the available water allocation that can be provided to the site. Preliminary discussions indicate the Water Corporation could provide between 50,000 kL to 70,000 kL of potable water a year.

An independent water service provider, AquaFerre (Muccha) Pty Ltd has also been identified as a potential water supplier for the site. Discussions have been held with Aquaferre to supply approximately 150,000 kilolitres of water per annum to service the proposed tourist development on the subject land. In-principle agreement has been reached, a copy of the water agreement is provided in Appendix A.

An onsite wastewater treatment and disposal system will be constructed, as the Water Corporation's reticulated sewerage network does not service the property. The details of the wastewater treatment unit and disposal area will be provided at subdivision stage in the Urban Water Management Plan. A Site and Soil Assessment will be completed to support the subdivision application. The wastewater land application area will be located in the Community Open Space and will irrigate landscaping and or turf. The Engineering Servicing Report (Pritchard Francis, 2019) provided in Appendix B estimates that the required land application area of the treated wastewater will be 3.4 ha.

### 3.2 Non-potable Water Supply

Depending on the final use of the Community Open Space, up to approximately 100,000 kl of non-potable water may be required for irrigation of landscaping and a golf course. Opportunities to secure non potable water from a number of sources will be investigated following approval of the Structure Plan including groundwater from the Surficial aquifer, trading groundwater from the Leederville or Mirrabooka aquifer from an existing license, recycling treated wastewater from the onsite wastewater treatment plant and stormwater harvesting and storage in rainwater tanks. Further details are provided below.

#### 3.2.1 Groundwater

Groundwater allocation is available in the Surficial aquifer, the Mirrabooka and Leederville aquifers at the site are overallocated. DWER has advised that a groundwater license is unlikely to be granted for these aquifers (*pers comm* G. Simmons DWER 6<sup>th</sup> December 2019). A future groundwater license application to take water from the Surficial aquifer would need to be supported by a detailed H2 Hydrogeological Assessment and exploratory drilling onsite to

demonstrate that groundwater is located in the Surficial aquifer and can sustainably be abstracted at the rates required.

### 3.2.2 Water Trading

The Leederville and Mirrabooka aquifers at the site are fully allocated. In order to access this aquifer a water trade would be required with an existing license holder and approved by DWER.

The Gingin Groundwater Allocation Plan (DWER, 2015) has established three trading zones in for these aquifers. The proposed development is in the southern most zone (Zone 3).

Trading rules have been established to alleviate abstraction pressure in the southern portion of the resource and decrease the risk to groundwater-dependent ecosystems and baseflow in the Gingin Brook. The DWER only supports trades in a northerly direction between zones so within Zone 3 trading may only occur internally.

Bores constructed in this aquifer would support very good yields (up 3000 kL/day) (DoW, 2015) and the aquifer is generally fresh (<1000 mg/L TDS). In addition to obtaining approval for trading, the allocation request would need to be supported by a detailed Hydrogeological Assessment.

The following publications are important considerations for trading:

- Department of Water 2010. Operational policy 5.13 Water Entitlement transactions for Western Australia
- Department of Water 2015. Gingin Groundwater Allocation Plan. Securing Western Australia's water future Water resource allocation and planning report series Report no 53 March 2015.

### 3.2.3 Recycling Treated Wastewater

As discussed in Section 3.1, an onsite wastewater treatment system will be required. The treated wastewater from the system will be used to irrigate landscaping and or turf in the Community Open Space.

### 3.2.4 Stormwater Collection and Reuse

Stormwater harvesting has been proposed as a feasible option to also supply non potable water for irrigation. It is anticipated that all stormwater will be retained on site and stored in rainwater tanks for later use or infiltrated on site through the use of landscaped drainage features.

Assuming the 50 ha development will consist of approximately 50% impervious surfaces, and annual rainfall is 649 mm, there is an opportunity to collect a maximum of 138,000 m<sup>3</sup> of rainfall onsite for later use for potable or non-potable uses (250,000 m<sup>2</sup> x 0.649 x 0.8), assuming 80% of all rainfall is able to be collected from all impervious surfaces and stored on site

The subdivision plan currently includes 46 residential resort villas and 68 short stay villas and serviced apartments. Presuming the roof area within each of the 46 residential resort villas is approximately 300 m<sup>2</sup> and annual rainfall is 649 mm, there is an opportunity to collect up to 175 m<sup>3</sup> of stormwater for irrigation or potable use from the roof area within each lot, which totals 8,225 m<sup>3</sup> of water. To provide potable or fit for purpose water to flush toilets for example, the rainwater tanks will need to be internally plumbed into each residential resort lot to ensure the water is regularly used and storage is available to collect additional water during rainfall events.

The detailed design of collection and storage systems will be confirmed at the subdivision stage of the development and will be included in the future Urban Water Management Plan.

## 4 Water Conservation Strategy

### 4.1 Proposed Strategy

Due to water scarcity at the site, the conservation of water for both potable and non-potable uses will be a focus of the development. As a minimum the following water conservation strategy will be adopted:

- The development will aim to connect to the Water Corporations water supply mains. The Water Corporation is currently reviewing their existing infrastructure, groundwater allocation and upgrades required to service this development for potable water supply
- The use of waterwise landscaping and efficient irrigation design: The site contains mature vegetation which can be retained where possible to reduce the need to establish newly planted vegetation which requires higher rates of irrigation to become established. The irrigation design for the Community Open Space and streetscape landscaping will incorporate high quality irrigation system design to ensure the amount of water applied is appropriate to plant and soil requirements, the timing of irrigation is matched to suit plant and weather conditions, and water is applied uniformly and effectively
- Landscaping in streetscapes will be non-irrigated post establishment
- Groundwater will be used as the water source for irrigation where possible to reduce potable water consumption. A H2 Hydrogeological Assessment and onsite exploratory drilling will be completed to assist with securing a groundwater license for the Surficial aquifer
- The use of water efficient fixtures and fittings will be used throughout the development. Water efficient shower heads and tap fittings are already mandated as part of the Building Code of Australia (ABCB, 2011)
- Educational material and signage throughout the development will be required to inform guests of the water shortage and need to conserve water where possible
- Opportunities to install rainwater tanks throughout the development which are internally plumbed and grey water reuse systems for irrigation will be investigated at the detailed design stage
- Harvested roof runoff will be stored in an underground tank/s or in rainwater tanks at each of the residential resort lots.

## 5 Stormwater Management

### 5.1 Existing Surface Water Flows

A review of DWER Hydrographic Catchments – Sub catchments database showed that Lot 101 is located in two catchments: the northern section is located within the Gingin Brook Molecap Hill Sub catchment, and the southern section is in the Chandala Brook Tiwest Rainway Bridge Sub catchment.

The site is mostly located in the northern section, and stormwater flows to a north-west direction towards a minor, non-perennial watercourse at the northwest corner of the site, and then joins Bindoon Brook.

### 5.2 Proposed Stormwater Management

Design of the stormwater management systems will be in accordance with urban water best practice. As utilising stormwater for potable use is a focus of the development there is unlikely to be a significant increase in stormwater runoff post development.

The Better Urban Water Management guidelines (WAPC, 2008) outlines the guiding principles and design criteria to support water quantity management, where the underlying principle is to maintain pre-development peak flows and surface water quality, within the post development environment. Due to the site's elevation and sandy nature, the infiltration at source of stormwater will not be restricted.

The following principles will be implemented in the stormwater management design where required:

- The first 15 mm of rainfall will be contained onsite as close to source as possible
- The 20% to 1% AEP event will be contained within the road reserve with a minimum 300 mm freeboard to finished floor levels
- Flow discharge from the development will be dissipated in such a manner as to prevent scour or other adverse impacts adjacent to the development envelope
- A stormwater basin will be located in the Community Open Space, if required to detain peak flows leaving the site in the 1% AEP event to predevelopment conditions.

The following principles will be adhered to in the development of stormwater management structures with respect to stormwater quality:

- Appropriate structural and non-structural measures will be incorporated where required, to minimise the transportation of sediment and nutrients offsite
- Bio-retention systems will be used to manage water quality where required.

## **6 Groundwater Management**

### **6.1 Groundwater Level**

Due to the sites clearance to groundwater being greater than 20m, the development is unlikely to have an impact on groundwater levels or quality. An onsite groundwater monitoring program has not been completed and is not considered necessary post development due to the site's significant clearance to groundwater.

Sub soil drainage will not be required. Earth works will be required to create flat building envelopes only, additional fill is not required to provide sufficient clearance to peak groundwater levels.

### **6.2 Groundwater Quality**

The objective for groundwater management is to ensure that the groundwater quality associated with the site is not negatively impacted.

The two key strategies include retention of existing vegetation where possible and the infiltration of the first 15 mm of rainfall at source where possible.

Other key strategies for managing groundwater quality at the site include:

- Maximising native vegetation within landscaped areas
- Fertiliser and pesticide use will be matched to plant growth requirements through effective management and maximising the retention of native vegetation.

## **7 Future Subdivision and Urban Water Management Plan (UWMP)**

The requirement to undertake more detailed water management plans is generally required as a condition of subdivision. The development of any future UWMP(s) should follow the guidance provided in *UWMPs: Guidelines for Preparing Plans and for Complying with Subdivision Conditions* (DoW, 2008b).

While strategies have been provided within this D/LWMS to address planning for water management within the site, future subdivision designs and the associated UWMP(s) will provide and clarify the details not provided within this D/LWMS. The main areas to be included within future UWMP(s) are detailed below.

### **7.1 Detailed design of Stormwater Harvesting System**

All future UWMP(s) will need to provide the details of the proposed stormwater harvesting system if required. The detailed design should at least include but is not limit to: roof collection system and devices, underground pipe and irrigation/reuse tank design, details of filtration unit and treatment unit, details of underground cells receiving overflow from irrigation tanks, and detailed design of irrigation devices (pumps, pipes and sprinklers).

### **7.2 Confirmation of the Alternate Water Resources**

The LWMS proposed other options for non-potable water supply, such as recycled wastewater and grey water reuse for irrigation. The proposal highly depends on the land use feasibility and detailed design of the subdivision. All future UWMP(s) will need to confirm any alternate water resources and provide details on how the alternate water resource will be used and managed.

Any additional approvals required from the Department of Health will need to be completed and discussed in the UWMP.

### **7.3 Implementation of Water Conservation Strategies**

As the non-potable water supply is limited on this site, the LWMS has proposed to harvest roof runoff for the POS irrigation, which is the major use of non-potable water. Water conservation also relies on other measures such as water efficient appliances and waterwise gardens. The details of these measures should be provided in the future UWMPs.

### **7.4 Detailed Design of the Proposed Stormwater Infrastructures**

All future UWMP(s) will need to provide the detailed engineering and construction details, and exact locations of any stormwater management structures. Future UWMPs should also confirm the contributing catchments to the study area.

### **7.5 Landscape Plans**

Detailed landscape plans for all streetscape landscaping and of the Community Open Space will be prepared to detail the type and style of landscaping to be used, including plant species and densities.

## **7.6 Monitoring and Maintenance Requirements**

The onsite wastewater management system and some of the alternate water resources including the use of rainwater tanks/underground storage will require ongoing maintenance and monitoring. It is therefore expected that the future UWMP(s) will provide details of the actions, timing, locations, responsibilities and funding arrangements. It is anticipated that consultation with relevant authorities including the Shire of Chittering, Department of Health and DWER will be undertaken for any specific requirements.

## 8 Limitations

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

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

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

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

Subject to the terms of the contract between the Client and 360 Environmental Pty Ltd, copying, reproducing, disclosing or disseminating parts of this report is prohibited (except to the extent required by law) unless the report is produced in its entirety including this page, without the prior written consent of 360 Environmental Pty Ltd.

## 9 References

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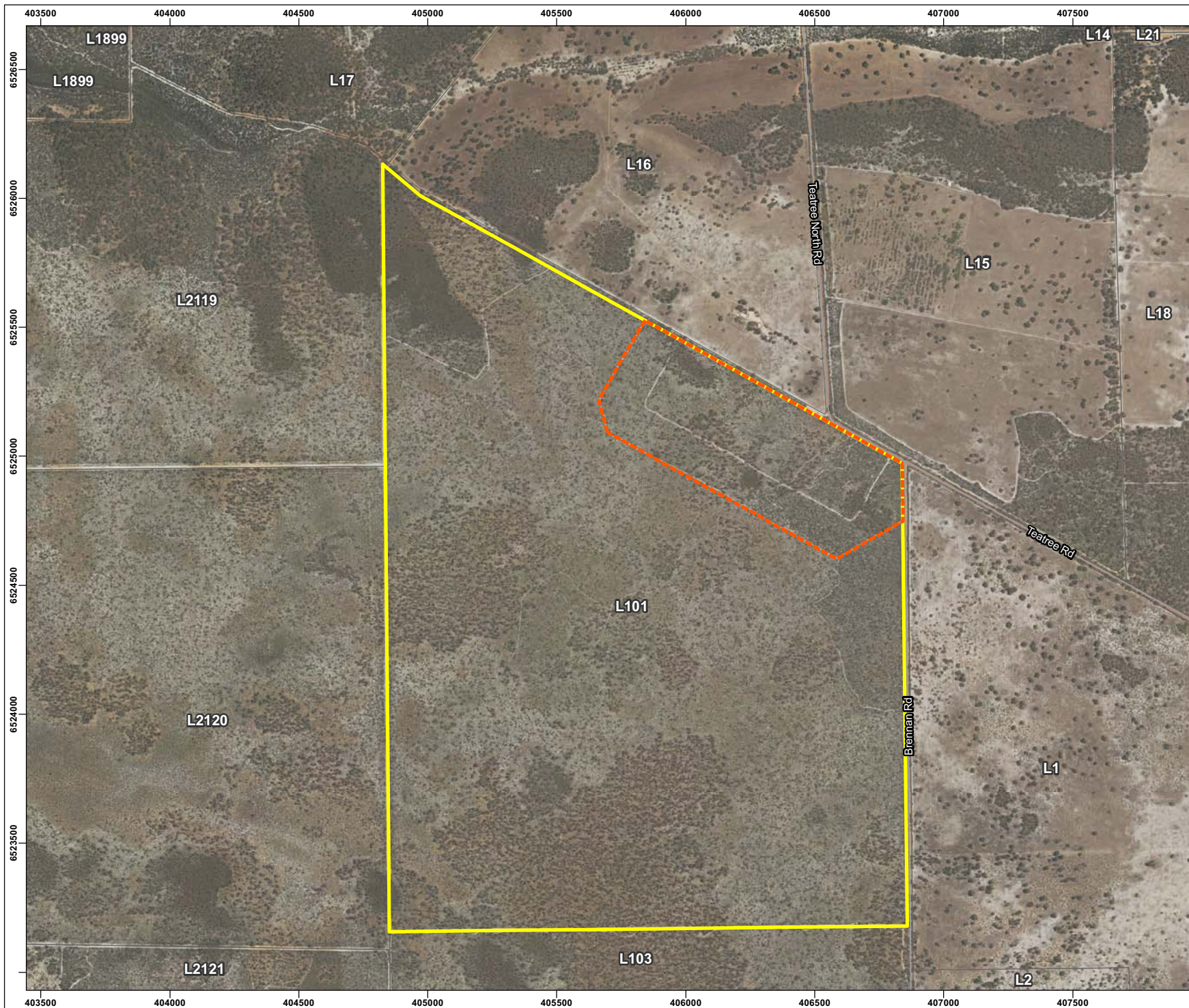
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# Figures

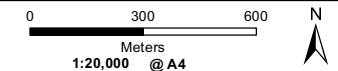


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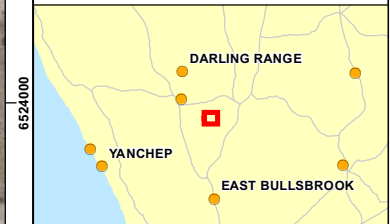
- Lot 101 Boundary
- Local Structure Plan Boundary
- Lot Boundaries
- Local Road

NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS  
 - LOCALITY MAP SOURCED LANDGATE 2017  
 - OTHER DATA SOURCED LANDGATE 2018  
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## LOCALITY MAP



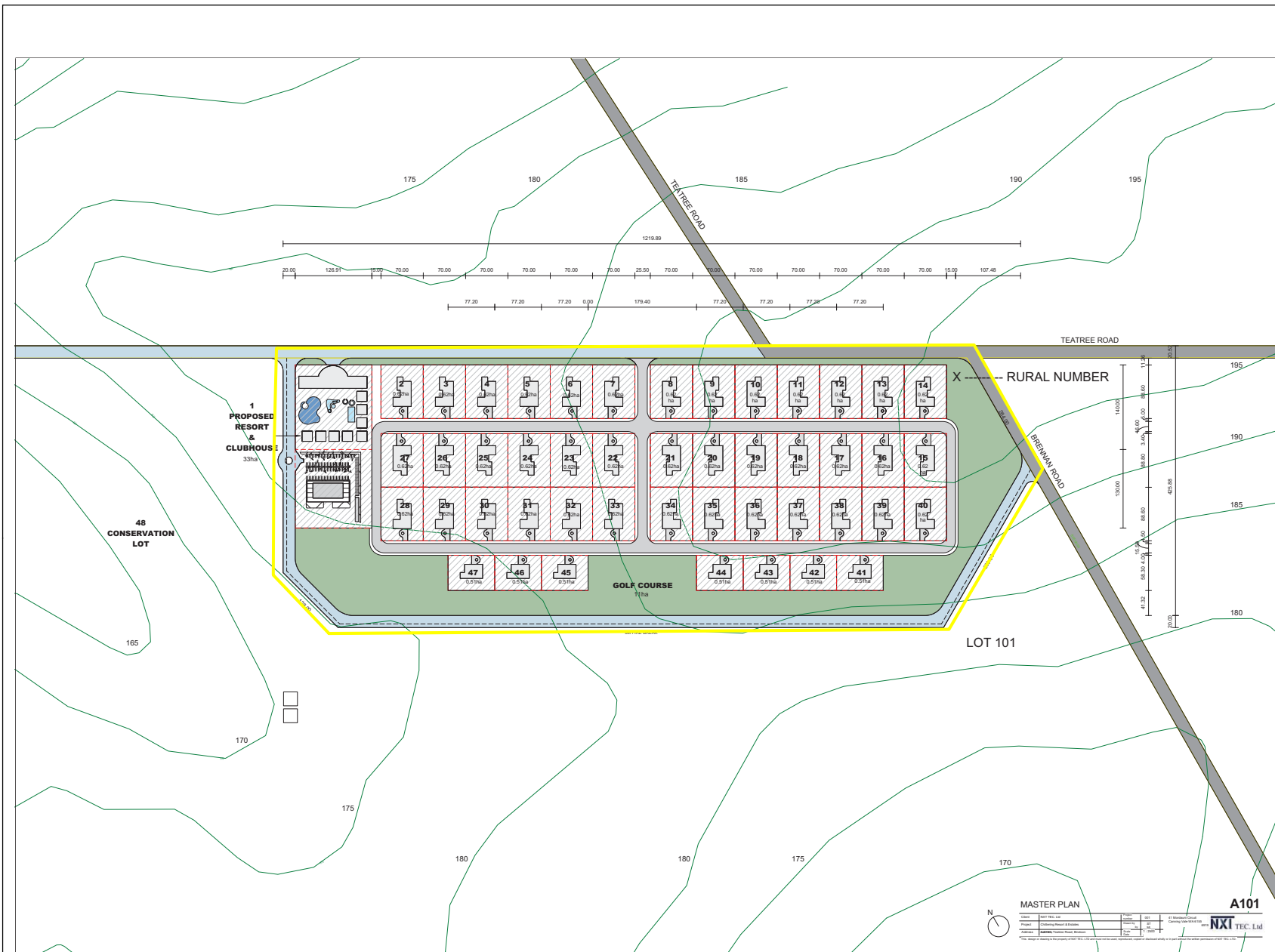
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PROJECT ID 3437		DATE 28/11/2019	
HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50			
CREATED LF	CHECKED LP	APPROVED KL	REVISION 0

**NXT Global Pty Ltd**

**Local Water Management  
Strategy**

**Figure 1  
Site Location**



- Legend**
- Indicative Site Boundary
  - ASSET PROTECTION ZONE
  - PROPOSED NEW PUBLIC ROAD

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS  
- LOCALITY MAP SOURCED LANDGATE 2017  
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Not To Scale

#### LOCALITY MAP



<b>PROJECT ID</b> 3437	<b>DATE</b> 11/11/2019
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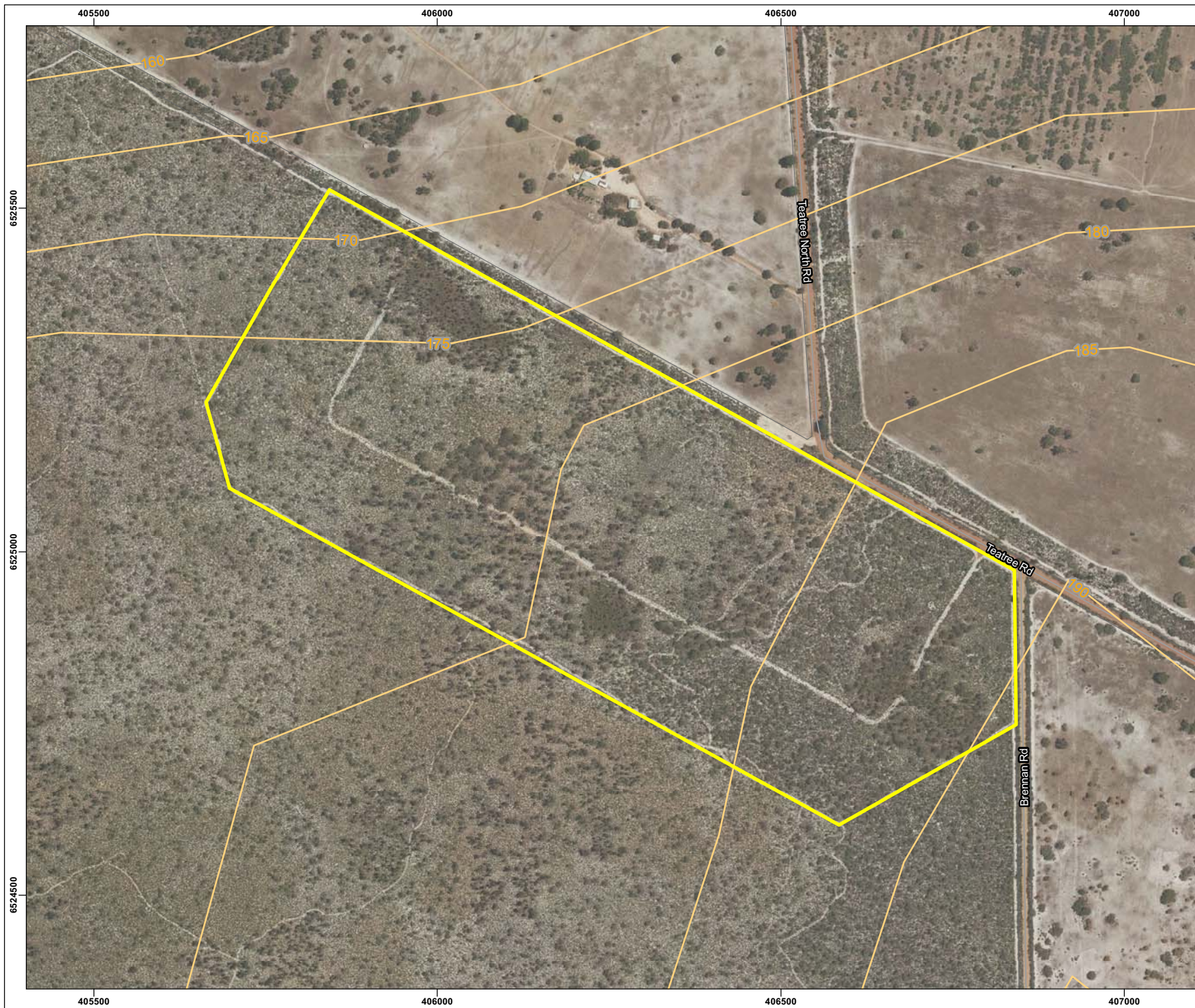
**HORIZONTAL DATUM AND PROJECTION**  
GDA 1994 MGA Zone 50

<b>CREATED</b> LF	<b>CHECKED</b> LP	<b>APPROVED</b> KL	<b>REVISION</b> 0
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**NXT Global Pty Ltd**

**Local Water Management Strategy**

**Figure 2**  
**Local Structure Plan**



**Legend**

- Site Boundary
- Lot Boundaries
- Local Road
- Contours 5m Interval

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

<b>PROJECT ID</b> 3435	<b>DATE</b> 28/11/2019
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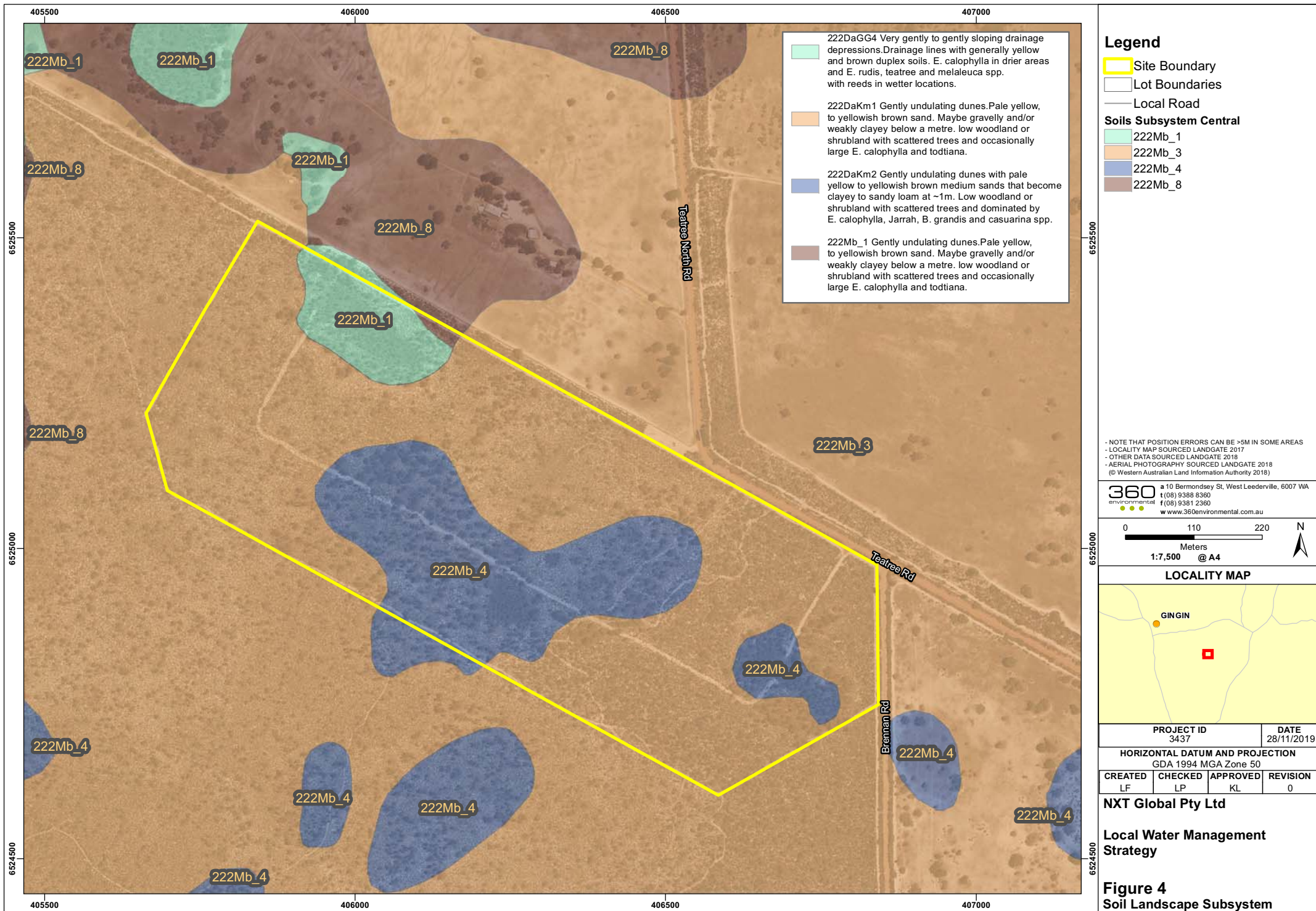
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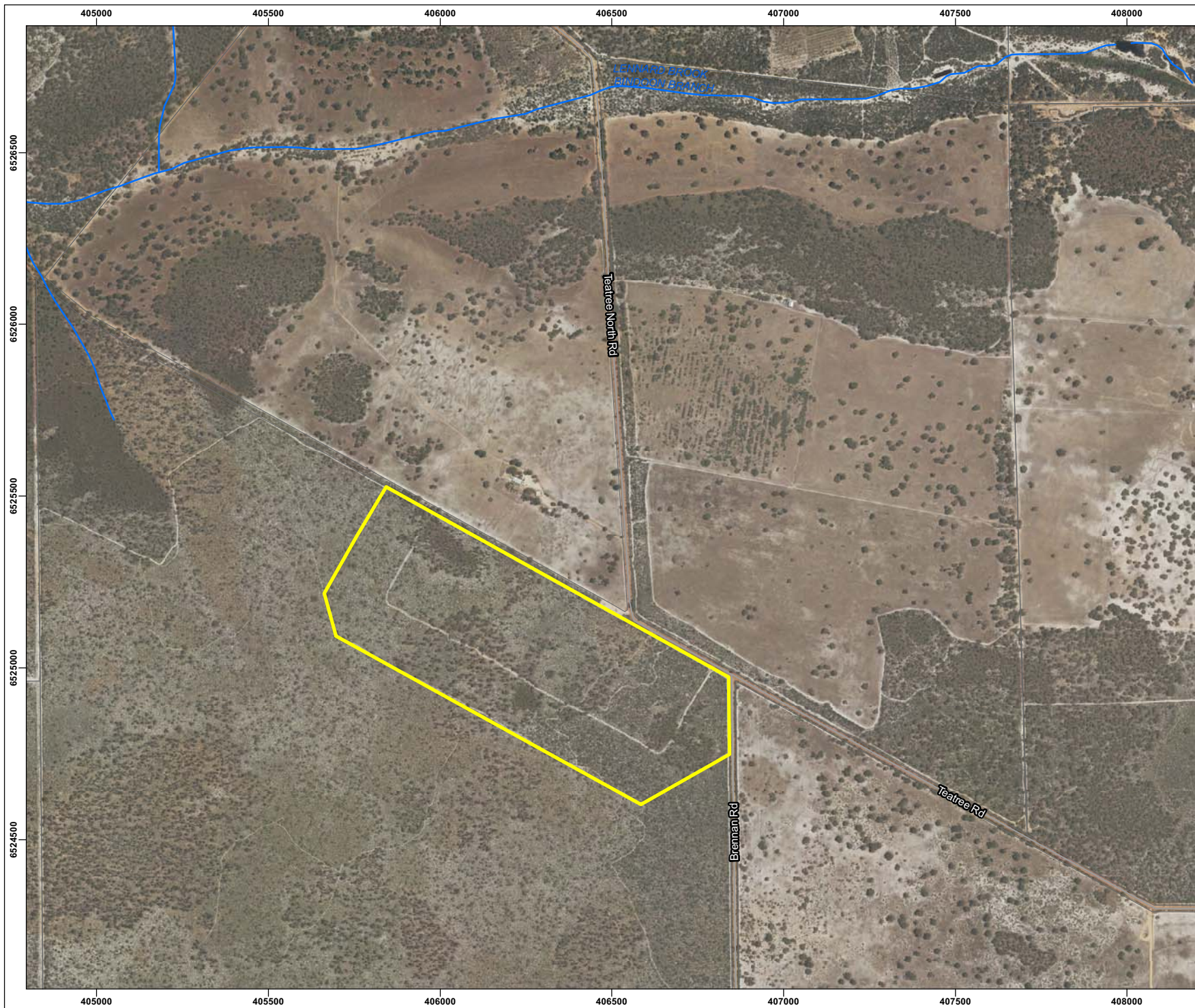
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**NXT Global Pty Ltd**

**Local Water Management Strategy**

**Figure 3  
Topography**

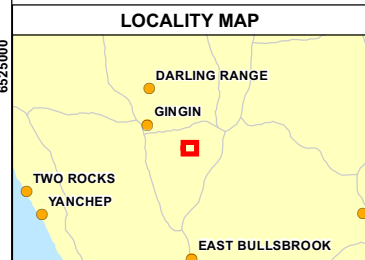
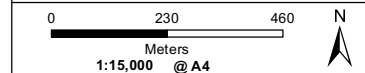




- Legend**
- Site Boundary
  - Lot Boundaries
  - Local Road
  - Watercourse - minor

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS  
- LOCALITY MAP SOURCED LANDGATE 2017  
- OTHER DATA SOURCED LANDGATE 2018  
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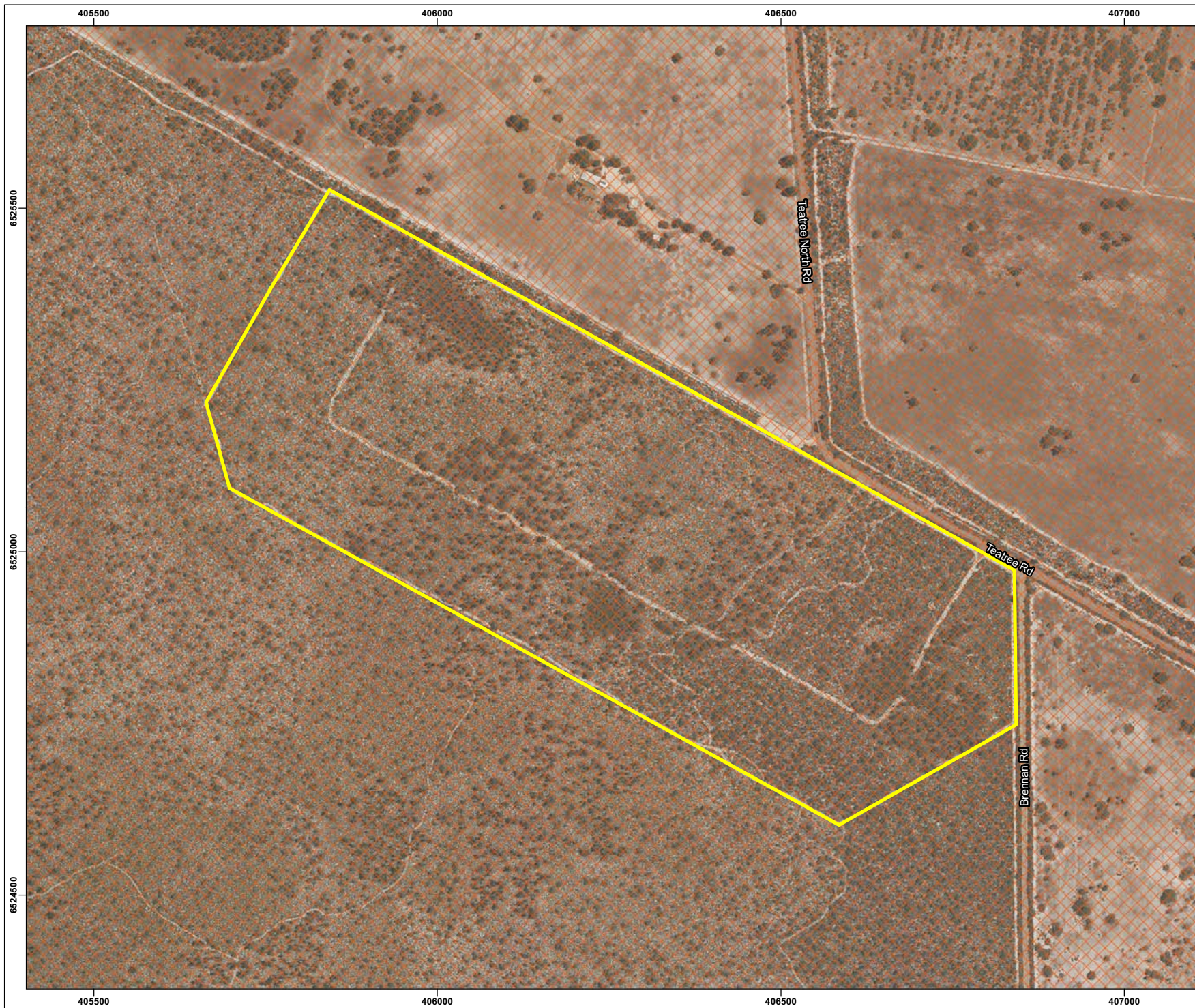


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**NXT Global Pty Ltd**

**Local Water Management  
Strategy**

**Figure 5  
Surface Water**

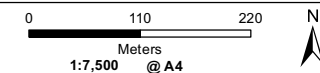


## Legend

-  Site Boundary
-  Lot Boundaries
-  Local Road
-  Bushfire Prone Areas

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



PROJECT ID	DATE
3437	28/11/2019

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GDA 1994 MGA Zone 50	

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**NXT Global Pty Ltd**

**Local Water Management  
Strategy**

**Figure 6  
Bushfire Prone Area**

# Appendices

# **Appendix A AquaFerre (Muchea) Pty Ltd Water Agreement**

Email [Natasha.diciano@nxt-tec.com](mailto:Natasha.diciano@nxt-tec.com)

Pages 6

19 December 2019

Ms N Di Ciano  
Chairman & Managing Director  
NXT TEC Ltd  
41 Mordaunt Circuit  
Canning Vale WA 6155

Dear Natasha

### **Water for Your Chittering Project**

We refer to your enquiries to Aqua Ferre (Mucnea) Pty Ltd trading as Mucnea Water (**Mucnea Water**) regarding the availability of water for your major development project at west Chittering. You have advised that you require approximately 150 ML of potable water.

You have requested an acknowledgement from Mucnea Water that we are willing to sell or supply this water volume to you and confirm that we have agreed the principles of an agreement with you for so doing. Under the agreement from Mucnea Water we confirm that we have the right to take the water previously licensed to Lennard Brook Farming Pty Ltd (**LBF**) and currently held by Water Corporation, which will be transferred to us upon issue of our Economic Regulation Authority (**ERA**) Water Services Licence. We provide this letter of confirmation to you in support of your planning submission to the Western Australian Planning Commission and confirm that we approve the release of this letter to them and are happy to confirm our option agreement with you.

## **1 Mucnea Water**

Mucnea Water was established to be an independent water service provider following approaches by property development groups seeking water services in the Chittering–Mucnea region. Mucnea Water is proposing to build and operate a potable water supply system at Reserve Road, Chittering (as shown in Figure 1).

The proposed water treatment plant would be operated as a constant flow rate to promote a stable process with the intention of producing reliable potable water that meets the Australian Drinking Water Guidelines.

Figure 1 below broadly shows the Precinct 3 development (outlined in red) to the south of Harvis Capital Pty Ltd's (**Harvis**) proposed Mucnea Employment Node (**MEN**) (Phase 1) development (outlined in yellow) and Mucnea Water's proposed water facility to the north.

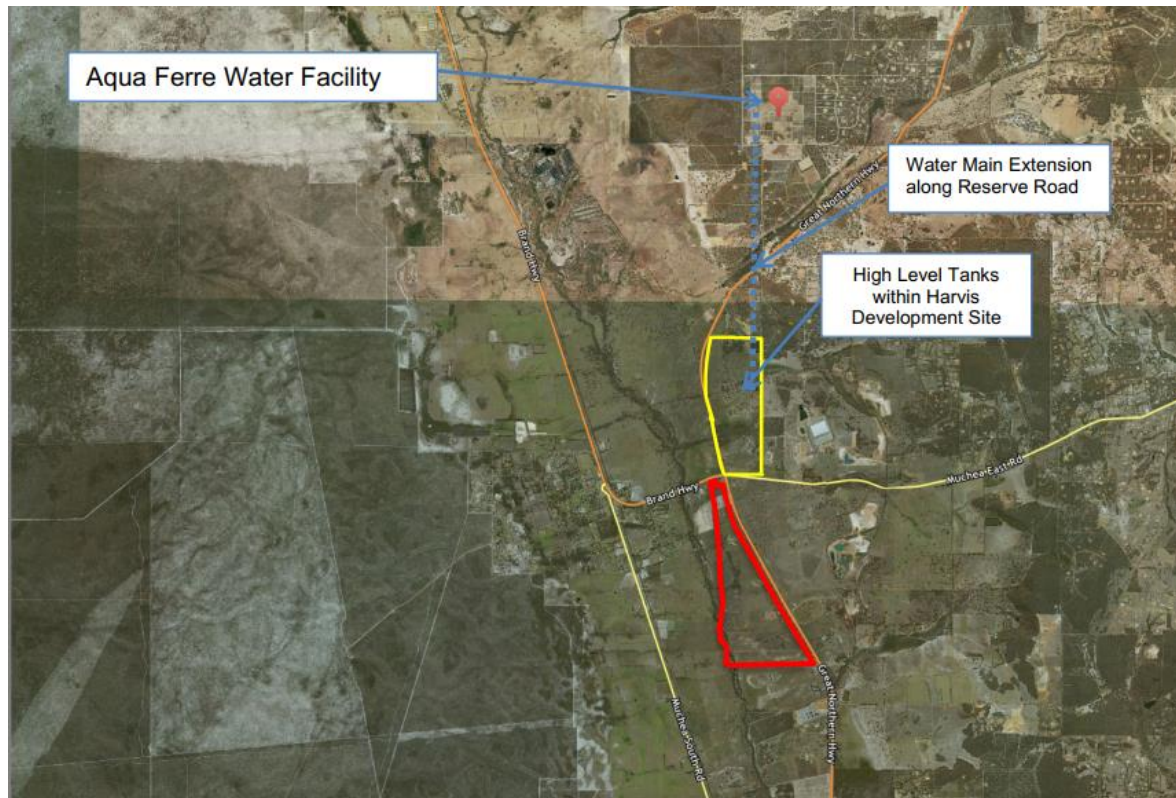


Figure 1: Development boundaries

## 1.1 Water entitlement

The Reserve Road (Chittering) property currently has a total water entitlement or allocation (licence to abstract water from an artesian aquifer) of 288,800 kL per annum. The developer of the Reserve Road residential development, Riverside Investments (WA) No 2 Pty Ltd, has transferred the Water Licence GWL 59907(3) to the Water Corporation to enable the licence to be changed from an agricultural extraction to a public water supply. It is intended that this water entitlement will be transferred to Muckea Water when a Water Services Licence has been granted (expected early 2020).

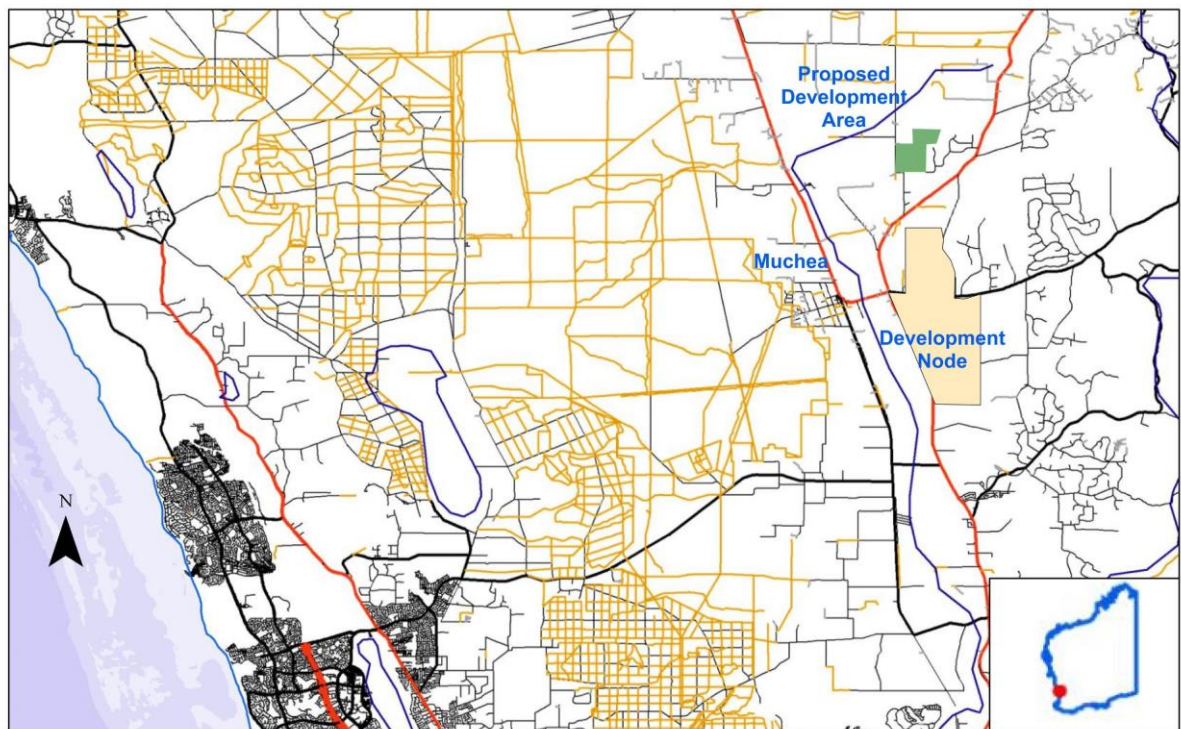
Muckea Water has similar entitlement rights to a further 362,900 kL per annum licence, originally GWL 102502(4) which is now part of GWL 65011. This is the licence previously held by LBF.

In total, it is intended that Muckea Water will have access to 651,700 kL of water per annum.

There is an existing production bore located within the Reserve Road development that was previously used for wildflower irrigation, where the proposed potable water treatment plant will be located.

## 1.2 Existing water supply commitments

Muckea Water intends supplying approximately 153 ML of treated potable water to the residential development at Reserve Road, Chittering, and to a commercial/industrial development at the adjacent MEN (northern Precinct 1 only). It is intended that a further 75 ML will be set aside for future demand across these two developments.



**Figure 2 Location of Reserve Road residential development and MEN**

The new Reserve Road rural living allotment development is located 8 kilometres north east of the Muchea town site and 80 kilometres north of the Perth central business district. It is also in close proximity (4 kilometres) to the proposed MEN on the eastern side of Great Northern Highway. The development is in accordance with the Shire of Chittering's planning scheme (2004). The Reserve Road development covers an area of approximately 160 hectares and involves the creation of approximately 238 rural residential allotments in progressive stages. It is a requirement of the development approval that potable reticulated water is available.



Figure 3: Contour map (5m contour lines) of the Harvis MEN development showing ephemeral swale

Phase 1 of the MEN development is being undertaken by development group Harvis. The Harvis development is located on the northern end of the proposed MEN. The site is slightly undulating with an ephemeral swale running through the development (Figure 3). The development is well placed and has been planned around the proposed Perth Darwin Highway.

It is the intention of the MEN development that these lots also have a reticulated water resource. Currently, the area does not have a public water supply scheme. Muchea Water has lodged its application for a Water Services Licence to ERA.

It is proposed that the water supply for the Harvis MEN development will have a standalone delivery and network system, to ensure that the demand of both systems can meet peak demand and firefighting requirements.

After treatment, it is intended that the water required for the Harvis MEN site will be delivered to a 500kL holding tank with aeration. Water would be reticulated to customers using a standard, continually pressurised water reticulation network. The piping would follow the general topography and alignment of the development streets and will have 600mm coverage.

## **2 NXT Development Requirement**

You have advised that the intention is that the Project, the subject of the structure plan you are submitting, would require 150 ML of reticulated water provided by a licensed water provider.

Based on your advice of estimated water usage, Muchea Water will have capacity under its entitlements to meet the demand of the subject land. This is not an undertaking to commit an allocation of water, or to supply water, to NXT. Any such arrangements will be the subject to final commercial negotiation, and exercise of the option we are granting to you.

## **3 Disclaimer**

This letter incorporates information available to Muchea Water up to that date of this letter only. It excludes consideration of any information arising, or event occurring, after that date which may impact opinions expressed or statements made by Muchea Water in this letter.

Muchea Water has prepared this letter for the sole benefit of NXT (**Instructing Party**) for inclusion within a rezoning application and structure plan (**Purpose**) and not for any other purpose or use. To the extent permitted by applicable law, Muchea Water expressly disclaims all liability, whether direct or indirect:

- to the Instructing Party, which may arise in connection with any reliance or purported reliance on this letter for any purpose other than the Purpose
- to any other person, which may arise in connection with any reliance or purported reliance on this letter for any purpose whatsoever (including the Purpose).

All statements and opinions contained in or associated with this letter are made on the basis of information supplied to Muchea Water as at the date of this letter, and upon which Muchea Water has relied. To the extent permitted by applicable law, Muchea Water expressly disclaims any liability, whether direct or indirect, which may arise in connection with any errors or omissions in this letter arising from information provided to Muchea Water by the Instructing Party or by any other person.

Achievement of any proposed or intended events or circumstances described in this letter will depend, among other things, on the actions of others, over which Muchea Water has no control. To the extent permitted by applicable law, Muchea Water expressly disclaims any liability, whether direct or indirect, which may arise in connection with the delay in, or failure to occur of, any proposed or intended events or circumstances described in this letter.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Peter Fogarty', with a stylized flourish at the end.

**Peter Fogarty**  
Director

## **Appendix B**

# **Engineering Servicing Report**

# Portion of Lot 101 (No. 777) Teatree Road, Bindoon

Engineering Servicing Report  
Project No: 19-240

## Table of Contents

1	Introduction .....	3
2	Site Description .....	3
2.1	Geology .....	4
2.2	Topography .....	4
2.3	Groundwater Levels .....	4
2.4	Earthworks and Retaining .....	4
3	Infrastructure .....	4
3.1	Stormwater Drainage .....	4
3.2	Sewerage Reticulation.....	5
3.3	Water Reticulation .....	6
3.4	Local Authority Requirements.....	6
3.5	Gas Supply .....	6
3.6	Electrical Supply.....	6
3.7	Communications .....	8
4	Conclusion .....	9

Appendix One: Local Structure Plan

Appendix Two: Waste Water Treatment Preliminary Design

Appendix Three: Water Corporation – Bindoon Water Supply Planning

Appendix Four: Power Extension Requirements

Appendix Five: Communication Extension Requirements

Revision	Description	Author	Date
0	Draft Issued for coordination	Mark Riddell	5 December 2019
1	Draft Issued for final coordination	Mark Riddell	10 December 2019
2	Issued for Structure Planning	Mark Riddell	19 December 2019



## 1 Introduction

At the request of NXT Global Pty Ltd, this Engineering Servicing Report has been prepared in support of structure planning over the north east portion of Lot 101 (No. 777) Teatree Road, Bindoon.

Information provided in the report presents a servicing strategy based on a structure plan layout provided by Stewart Urban Planning. This plan can be found in Appendix One.

In order to complete this assessment, Pritchard Francis acquired specific advice for power and communication servicing from 3E Consulting Engineers Pty Ltd and their information is included in this report. The report also references preliminary discussions with all Service Authorities regarding their assets and ability to service the site.

## 2 Site Description

The structure plan area is located 7.5 kilometres west-south-west of Bindoon townsite in the Shire of Chittering. The site is approximately 60 km north-north-east of Perth, Western Australia. The nearest intersection to the development is the T junction of Teatree Road and Brennan Road with the subject site located to the West of Brennan Road as shown in figure one below. The site is currently covered in native bushland.



Figure 1 – Subject Site

The structure plan area is noted as 50 Ha with the proposed breakdown of land use anticipated as per the below:

■ Residential Resort Lots	28.40 hectares
■ Tourist Resort and Guest Facilities	03.60 hectares
■ Internal Roads	05.00 hectares
■ Bushfire Access Roads	01.00 hectares
■ Communal Open Space (COS)	12.00 hectares
– Waste Water Treatment Facility	00.10 hectares
– Land Application Area (Primary)	03.40 hectares
– Stormwater Retention Facility	01.00 hectares
– Unencumbered COS	07.50 hectares



The estimated number of accommodation units is:

■ Residential Resort Villas	46
■ Short Stay Villas and Serviced Apartments	68

## 2.1 Geology

The site is on the Mogumber System which are located on gently undulating plateau made up of colluvium from weathered sandstone. The unit is made up of gentle to moderate sloping sandplain, varying from pale to yellow clayey sand with gravel and laterised ridges (DPIRD, 2019).

The soils mapped on the site are:

- Mogumber 1 Subsystem (222Mb\_1) which are undulating broad crests and very gentle upper slopes (<10%) with common lateritic duricrust outcrop and shallow gravelly sands;
- Mogumber 3 Subsystem (222Mb\_3) which are gently inclined undulating slopes and minor drainage head-waters consisting of deep grey siliceous or bleached sand; and
- Mogumber 4 Subsystem (222Mb\_4) which are gently to moderately inclined slopes (<10%) with shallow gravelly sands and few areas of lateritic outcrop (DPIRD, 2019).

## 2.2 Topography

The topography is undulating in height ranging in levels from 176 m AHD in the South Western Corner of the site rising to 196 m AHD in the North Eastern corner of the site. Whilst grades will vary based on localised high and lows the average grade across this site is less than 2 %.

## 2.3 Groundwater Levels

There is very limited groundwater data available for the site. The Perth Groundwater Atlas coverage doesn't include the subject site, so inference needs to be made from existing Department of Water and Environmental Regulation bores in the area. Unfortunately, there are not any bores within a 5 km radius of the site for measurement.

Given the noted sandy soils on the site and its high elevation relative to the surrounding landscape the depth to groundwater is expected to be high. The static water level recorded during drilling of a private bore on the site within the surficial aquifer was 52 m below ground level.

## 2.4 Earthworks and Retaining

Bulk earthworks over the site isn't expected to be required because of the nature of the development, soil conditions, vegetation coverage and separation to groundwater. Detailed earthworks will be required to set road levels and building pads for the works. Along with this, detailed earthworks will be used to set landscaping features through the communal open space.

Opportunities for cut to fill will be investigated on site where possible however there may be the requirement for import fill should design levels need to be increased.

## 3 Infrastructure

### 3.1 Stormwater Drainage

It is anticipated that all stormwater will be retained and disposed of onsite through an integrated approach of infiltration through landscaped areas, in line with the principles of Water Sensitive Urban Design, as well as harvesting from roof drainage for rain water tanks for potable and irrigation use. Where treatment areas are required for stormwater runoff, they will be placed in the 12 Ha allocated for communal open space.

Water recycling will be an important part of the management of the site and is further discussed in the Local Water Management Strategy prepared by 360Environmental Pty Ltd.



Further geotechnical reporting will be required to confirm the suitability and permeability of detailed areas on site for disposal, however regional mapping as well as site inspection suggests this will be possible. The structure plan mapping shows there will be the ability to provide appropriate separation from the proposed waste water treatment facility that will be required for the site as well.

Preliminary sizing for road runoff and building runoff for a 1% annual exceedance probability suggests a 0.8 Ha area 300 mm deep would be required to treat stormwater to predevelopment levels if not harvested for reuse. This will be spread throughout the development.

### 3.2 Sewerage Reticulation

There is currently no sewer reticulation that services the site. From discussions with the Water Corporation this will not be feasible for the development and as such alternative means will be required for sewerage disposal. Under the State Sewerage Policy for Western Australia the site is best classified as a survey strata or strata lot for an approved group dwelling, commercial or industrial development outside the drinking water source areas.

We can confirm the waste water treatment facility will be owned and operated by a single person or entity contracted to provide an acceptable maintenance program for the system and disposal area. It is anticipated there will be one communal WWTF for the site.

Site Requirements for Disposal (Schedule 2):

- Site and soil investigations will be completed to AS/NZS 1547 *On site domestic wastewater* management as part of the development approval. Based on desktop investigation into the soil type noted in section 2.1, site topography noted in section 2.2 and depth to ground water noted in section 2.3 it is anticipated a soil category type 1 will be appropriate.
- Land application area is calculated as 600 people on site at any one time (70% occupancy as per the water demand calculations).
- Primary treatment for disposal.
- Land application area = 600 people x 150 L/person/day x 0.377 (hydraulic conversion factor) = 3.393 Ha.

This area will be found within the 12 Ha of communal open space in which the WWTF is positioned.

Should primary treatment not be suitable for land use amenity reasons, secondary treatment will be employed to reduce this application area required. This equates to a 1.8 Ha requirement.

The proponent has initiated discussion with a supplier of a waste water treatment facility including preliminary sizing should secondary treatment be required. An approximate location has been shown on the structure plan mapping along with schematic infrastructure requirements which can found in appendix 2. The intended application area of the treated effluent will be to a portion of the 12 Ha communal open space on the southern side of the development.

The proposed system approach to wastewater generation, treatment and recycling will be undertaken with a whole of system approach to mitigate risks of fugitive nutrients through effective Environmental Management Plan:

- Environmental risk assessment as a requirement of the risk management framework of the AGWR,
- A soil and groundwater quality monitoring program,
- Full nutrient balances developed that demonstrate effective and sustainable Nitrogen & Phosphorus management,
- Supply chain assessment of nutrient inputs, for example the selection and use of low phosphorous cleaning agents.

The application of the treated effluent is an important part of the water management strategy as described in the LWMS and reduces the water load on potable and groundwater sources.



### 3.3 Water Reticulation

Preliminary water demand modelling for the development has been undertaken by the Developer and can be found in the LWMS. This indicates a potable demand of 200,000 KL / Annum with a total demand of 300,000 KL / Annum, which includes water for the 12 Ha of communal open space.

Existing Water Corporation mapping shows that the subject site currently sits outside the Water Corporation allocated service area. This service area is shown in Appendix 3.

Through discussions with the Water Corporation and an independent water provider Lennards Brook Farming Pty Ltd (LBF), there is excess water allocation available in the Bindoon Area that could service the development. Initial discussions have taken place with the Water Corporation to provide an assessment of an amount that could be made available including any infrastructure upgrade requirements to service the site. We understand upgrade requirements at minimum would include a single feed supply main back to the existing Water Corporation bores located at west of the Bindoon townsite (shown in Appendix 3) and for the Developer to enter into an agreement with the Water Corporation. The amount able to be provided by the Water Corporation is estimated in the order of 50,000 – 70,000 KL per annum.

As well as the Water Corporation supply the intent is that the Developer acquires further allocation from LBF up to 150,000 KL per annum maximum. In-principle agreement has been reached and a formal agreement is being prepared to give effect to the proposed transfer of the groundwater allocation, subject to all necessary approvals pursuant to the Rights in Water and Irrigation Act. It is anticipated that potable water demand is complimented by rainwater and stormwater harvesting onsite and water recycling where possible including using treated waste water for irrigation to reduce the potable water load. This is best summarised in the LWMS.

### 3.4 Local Authority Requirements

A cross over to this development will be in line with the Shire of Chittering requirements and will suit the existing speed zone along Teatree Road. Requirements for lighting and road upgrades will be assessed as part of detailed design and future traffic assessment. It is anticipated that at minimum a sealed road for the length of the boundary fronting Teatree Road will be required. This is reflected on the Local Structure Plan.

Infrastructure internal to the site will be designed in line with best practice with reference to the Australian and IPWEA standards in order to facilitate commercial access including refuse trucks from the Shire.

### 3.5 Gas Supply

There is currently no ATCO gas reticulation available in Teatree or Brennan Road and is outside the future service area.

Gas supply for the development, should it be required, will be in the form of individual user tanks or commercial bullets located on the site adjacent to commercial buildings. A service agreement will be entered into with a nominated supplier. Service roads and access will take into consideration supply and access requirements in this regard.

### 3.6 Electrical Supply

There is currently no existing Western Power (WP) distribution infrastructure in the vicinity of the site. The closest Western Power network comprises of a 22kV three phase underground High Voltage (HV) and Low Voltage (LV) network located approximately 3kms (as the crow flies) east of the development site. This can be seen from mapping in appendix 4.

Information on the capacity of the local zone substation can be determined from Western Power's public Network Capacity Mapping Tool (NCMT). The zone substation that appears to supply the HV network closest to the subject site is the Muchea zone substation, which is located Byrne Road, Muchea approximately 17.8km southwest of the development site as the crow flies or approximately 37kms of HV cabling. Currently there is in excess of 25-30MVA capacity in the zone substation. Within the next fifteen years, this is expected to diminish to 20-25MVA, suggesting that there is little growth predicted in the area.



### 3.6.1 Anticipated Load Requirements

We understand that the development will consist of 46 short stay accommodation units with a Resort space housing 8 villas, clubhouse and a hotel of 60 units with communal facilities. We estimate an After Diversity Maximum Demand (ADMD) of 700A/phase 3 phase based on AS3000 method for nondomestic electrical installations. More certainty to the required power supply requirements can be determined once detailed design of the site is available.

#### *DAILY CONSUMPTION RATES FOR RENEWABLE ENERGY SYSTEM*

The approximate daily energy consumption rates have been calculated. These values have been utilised to determine the proposed solar power supply arrangement in the below sections.

Short Stay Residence (46)	18kWh/day
Villas (8)	28kWh/day
Hotel Rooms	10kWh/day
Clubhouse	250kWh/day
Communal Area	1000kWh/day
<b>Total Daily Energy Demand</b>	<b>4,500kWh/day</b>

Calculation Assumptions:

- 1) Full Occupancy of Site.
- 2) Winter Sun energy (Standard for Perth is 4.4PSH, can reduce to 3PSH).
- 3) Residential Accommodation/Restaurant Load Diversity will be assumed.
- 4) 30% of the energy usage will be in the evening.

### 3.6.2 Site Supply Infrastructure

WP requires that all new developments are to be serviced by underground three phase power however where the development site is located more than one kilometre to the nearest three phase HV network, single phase may be permitted. Given the estimated power requirements to the site however, a single-phase supply will not suffice for the proposed development.

In a tourist accommodation type 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 uni-pillars serving each site on the general basis of one uni-pillar per commercial lot. Where loads exceed 250A/phase, the customer's main switchboard has to be contiguous to the substation.

To service the proposed development, a new Western Power owned substation will need to be installed on the site. The substation shall consist of a HV switchgear unit (2+1) and one new 630kVA transformer, providing a capacity of 827A/phase. The substation will need to be connected in line with the closest HV feeder line, and as such one HV feeder cable will emanate from the substation to the existing line located approximately 3km east as the crow flies. The substation site would be best placed central to the significant power loads and therefore the ideal location would be in the vicinity of the proposed clubhouse.

### 3.6.3 Renewable Power Systems

The Integration of renewable energy systems to minimise on site energy use is a favourable solution for most developments that use energy during the day. When the development sites are remote, there is the additional benefit



of off-setting any network connection headworks charges. Depending on how far the development is from the network, it may be financially beneficial to go complete off grid.

Both Western Power and Horizon Power, for remote customers are creating stand-alone systems for energy supply. The cost of a full stand-alone system can be considerable considering the load/usage on site, thus the integration of diesel backups. Solar PV that is installed can be utilised to off-set day time energy usage, with any surplus energy being stored within onsite battery storage systems. Any additional excess energy that cannot be utilised on site would generally go to waste. Instead of curtailing the energy output of the Solar PV systems, we can use some of the excess for water heating or bore pumps. During the winter months any energy shortfall can be fed by diesel. No network connection would be required in this instance. That is, with no network connection, no energy or connection charges, the developer will only need to consider the costs of the overall capital outlay.

The Solar PV has a usage life of approximately 25 years, with Battery systems at 10+ years. Maintenance costs are to be factored in, with the cost of replacing batteries at the end of life, being 20% of the full battery cost.

Based on the daily consumption rates estimated in the above sections, the alternative power arrangement shall consist of a 2MW Solar PV system, 1.3MWh of battery storage and backup diesel generators for essential services in the event of partial system failure. Solar PV to be installed on the roof of every structure on site, plus a portion in the form of a solar farm to overall generate approximately 6MWh of solar energy per day. Load modelling would need to be completed during detailed design to optimise the system size. The above system would generate significantly more energy required during summer period and to the site requirements during the winter period.

#### **3.6.4 Internal Electrical Infrastructure**

All internal reticulation will be private and installed to WP WADCM, WAER and AS3000 requirements. It shall be owned and maintained by the managing Body Corporate.

The private network will consist of a Site Main Switchboard fed by the Western Power point of supply, from which feeder cable circuits will emanate. The cables will be laid in the common property roadways. They shall supply multiple Distribution Boards (DBs), strategically distributed through the site. Given the size of the site, significant feeder cables will be required to supply these DBs. From the DBs, circuits to supply pillars on the accommodation lots will emanate. Circuits to supply the communal facilities will also be required.

Roadway lighting is recommended but optional. The lighting could be provided in the form of pole top lights complying with road lighting standards (AS1158) or bollard lights providing flag lighting only.

#### **3.7 Communications**

Telstra currently have a 10 pair direct buried cable adjacent to the proposed development on Teatree Rd, which contains one spare pair and is therefore totally inadequate for the development. Other developments in the area are serviced by a CMUX and ISAM Tophat, on Cockatoo Rd, which would likely have some spare capacity or could be upgraded to provide additional capacity, for voice or broadband. Note that Telstra are not prevented from competing with NBN Co, for the provision of broadband infrastructure in non-Fixed Line Footprint portion, of rural areas. Existing infrastructure can be found in Appendix 5.

Both Telstra 3G and 4G mobile coverage is available to the area but is on the limit of reception, which could be enhanced by the use of external antennae.

##### **3.7.1 Developer Responsibilities for Telecommunications**

Developers usually have two responsibilities in regard to telecommunications for new developments. Firstly, to provide fibre ready pit and pipe, a legal obligation, under the Telecommunications Act 1997. The fibre ready obligation applies where the intent is to sell or lease land. Secondly, to provide telecommunications services, as it does for other utilities, which is an obligation under the Federal Government's Fibre in New Developments policy.



### 3.7.2 Proposed Communications Networks

Since the proposed Eco Village, Hotel, Short Stay accommodation and Clubhouse fall within the NBN Co Satellite Footprint, NBN Co are the Infrastructure Provider of Last Resort. However, NBN Co may consider extending its Fixed Wireless Footprint, to cover the development which would be much more appropriate than a satellite solution. We would recommend making an approach to NBN Co, if and when an infrastructure application is lodged with NBN Co, to have the footprint reclassified. The Developer could also approach other service providers of satellite or voice services, but none are likely to be more economical than the NBN Co Satellite network, Sky Muster. If NBN Co decided to retain the Satellite Footprint classification or change to the Fixed Wireless Footprint, there would be no cost to the Developer for the provision of broadband infrastructure. However, the Developer could apply under the Technology Choice Programme, to upgrade from Satellite to Fixed Wireless, in which case there may be a charge for such an upgrade. Seeking to have the footprint changed, at NBN Co cost, due to a reclassification, is the preferred option.

Given that Satellite broadband infrastructure is currently available, home owners only need to apply to their Retail Service Provider of choice, for service. Satellite speeds up to 25 Mbps downstream and 5 Mbps upstream are available, but vary, depend on loading of the satellite network. NBN Co offer two plans to retailers, the standard plan (where all traffic is metered) and a Plus plan where some traffic is unmetered. NBN Co's basic satellite service is designed for the residential market and the Developer should note that voice calls and data transmission are affected by latency of up to 700 m sec, which affects voice quality and delays broadband data transmission. The maximum data allowance is 150 GB/month each for peak and off-peak. In 2020, NBN Co will be offering a business grade service, which would be more applicable in terms of performance, speed and reliability, for the commercial component of the development. Speeds up to 50/13 Mbps are likely to be offered with committed Information Rates (CIR). To the best of our knowledge there would likewise be no Developer infrastructure costs for this new service, with only standard retail service charges applying.

Telstra are the IPoLR for voice infrastructure, unless NBN Co decided to reclassify the development to be within the Fixed Line Footprint, a reclassification which is highly unlikely. However, about 4 km of pit and pipe head works would be required to reach Telstra multiplexing equipment on Cockatoo Rd. In addition, Telstra copper cable would need to be extended from the corner of Teatree and Cockatoo Rds.

Neither NBN Co nor Telstra service short stay accommodation in full but would usually provide a minimal network for the Hotel, Clubhouse, with services made available to villas on demand. However, if the Developer so wanted and was prepared to pay for the ongoing costs of servicing short stay accommodation in full, we expect that both telecommunications carriers would be open to giving full servicing consideration.

## 4 Conclusion

Pritchard Francis have been commissioned by NXT Global Pty Ltd to review engineering servicing requirements for a portion of Lot 101 (No. 777) Teatree Road, Bindoon.

The key issue on the site is the ability to source water and how it is best managed. What we have shown is that there are a number of water source options that will be progressed to supply the development. This will include potable water from the Water Corporation, extra groundwater allocation for the site as well rain harvesting and the recycling of waste water. We don't foresee water supply being an issue for the development.

Other key services including underground power and communications are available however will require extensions along Teatree Road to service the site. These should be undertaken with the appropriate timing and due diligence to facilitate construction.

Based on all the items above, Pritchard Francis Pty Ltd believes that the proposed structure plan area is capable of being serviced with all essential services and with careful consideration in detailed design will result in a high-quality development.



## Appendices

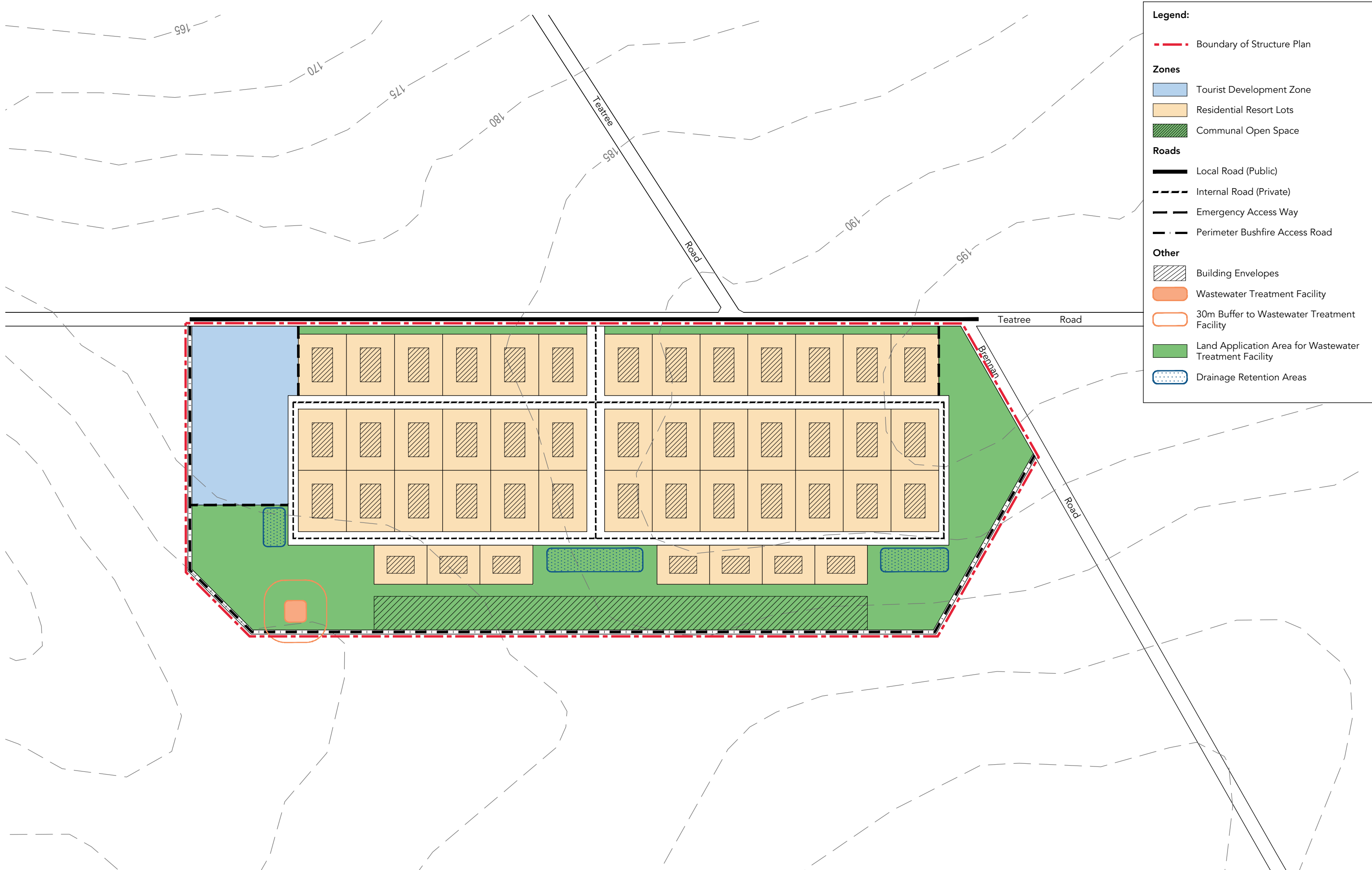
Appendix One:	Local Structure Plan
Appendix Two:	Waste Water Treatment Preliminary Design
Appendix Three:	Water Corporation – Bindoon Water Supply Planning
Appendix Four:	Power Extension Requirements
Appendix Five:	Communication Extension Requirements



Appendix One:

Local Structure Plan





**Legend:**

--- Boundary of Structure Plan

**Zones**

- Tourist Development Zone
- Residential Resort Lots
- Communal Open Space

**Roads**

- Local Road (Public)
- Internal Road (Private)
- Emergency Access Way
- Perimeter Bushfire Access Road

**Other**

- Building Envelopes
- Wastewater Treatment Facility
- 30m Buffer to Wastewater Treatment Facility
- Land Application Area for Wastewater Treatment Facility
- Drainage Retention Areas

# Local Structure Plan

Portion of Lot 101 (No.777)  
Tea Tree Road, Bindoon



Drawing Number: 01  
Revision: A  
Projection: MGA50  
Scale: 1:5,000 @ A3

Project:  
Job Reference:  
Date:

Local Structure Plan  
0072  
16 December 2019



## Appendix Two:

## Waste Water Treatment Preliminary Design





## Appendix Three:

## Water Corporation – Bindoon Water Supply Planning



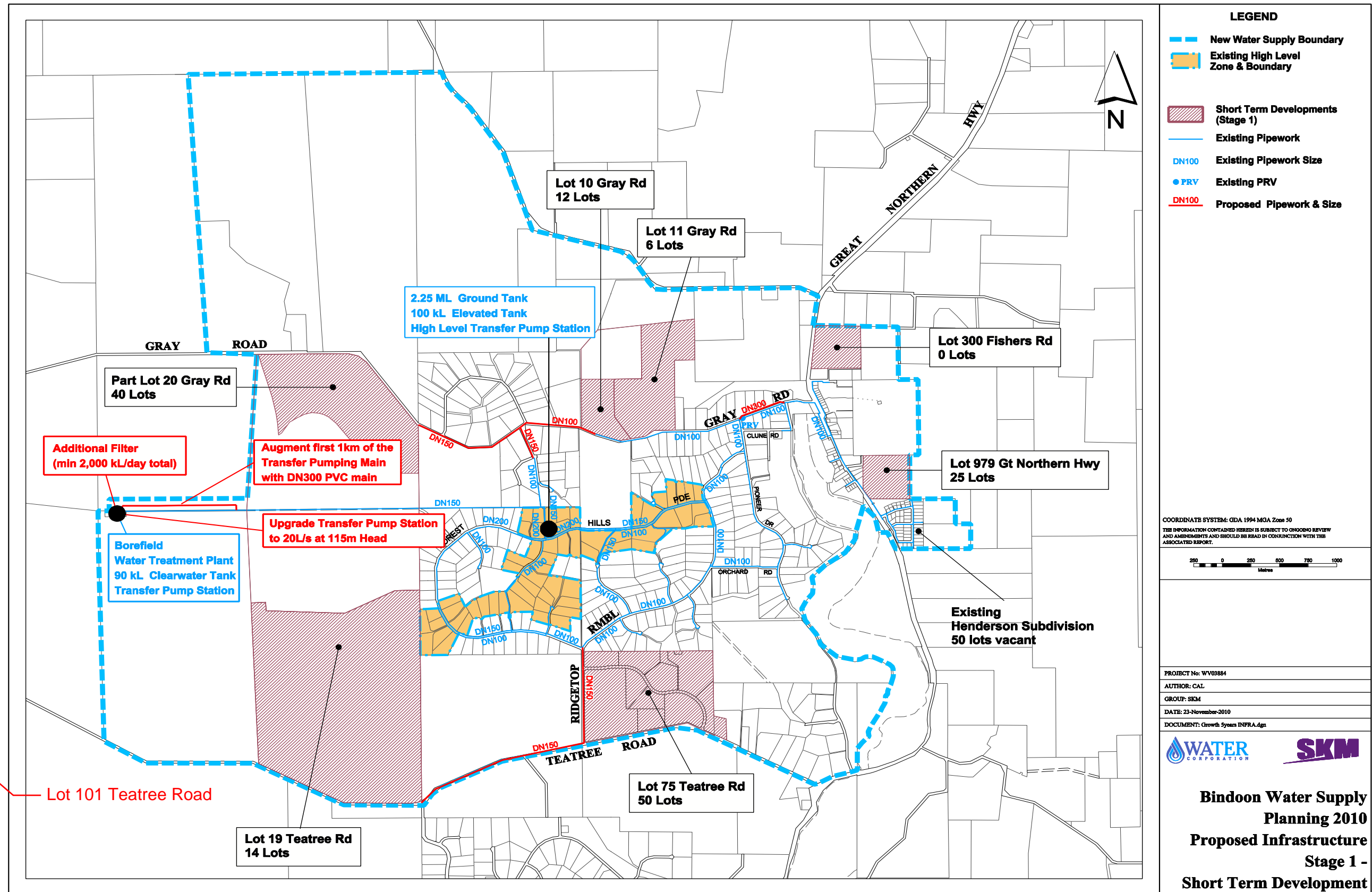


Figure 1 Existing water supply system and the proposed upgrades

System Planning: Bindoon Water Supply 2010

Date: 09 December 2010

PM-#4244669-v1-Midwest\_Region\_-Bindoon\_Water\_Supply\_-PC269\_-Existing\_System\_Capability\_Assessment\_-Planning\_Report\_2010-Rev\_B\_Final.DOC

WV03884-REP-002-Rev B

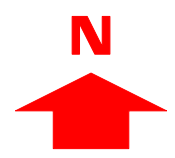
© Water Corporation

## Appendix Four:

## Power Extension Requirements



TEE TREE RD



Lot 101

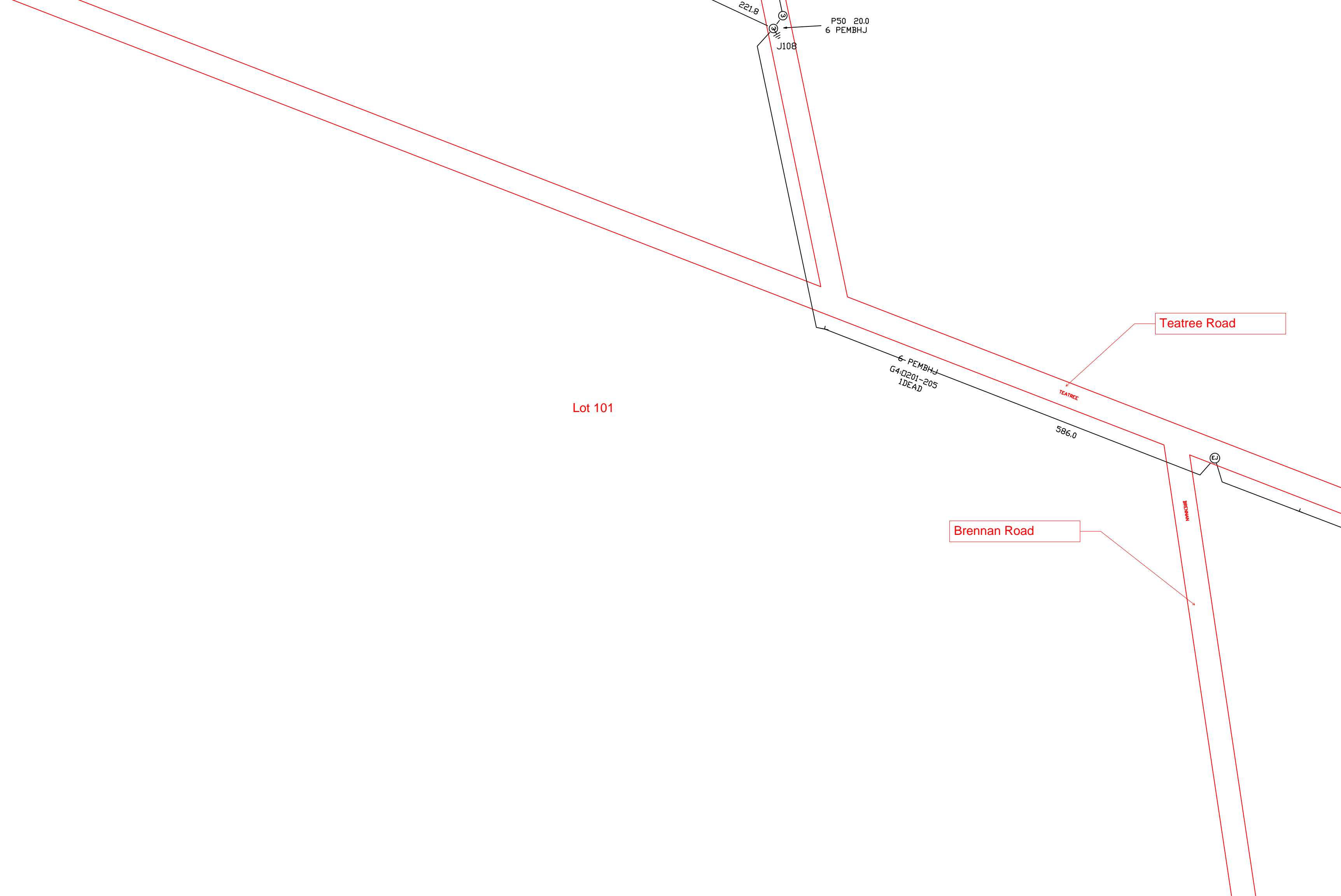
3,339.83 m

TEE TREE RD

## Appendix Five:

## Communication Extension Requirements





Lot 101

Teatree Road

Brennan Road

J108

P50 20.0  
6 PEMBHI

221.8

6 PEMBHI  
G4:0201-205  
1DEAD

586.0

TEATREE

BRENAN

EJ

# 360

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