

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

Engineering Servicing Report
Project No: 19-240

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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 be 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
Total Daily Energy Demand	4,500kWh/day

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
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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

