



ONSITE EFFLUENT MANAGEMENT ASSESSMENT



Life City Wollongong

Report no: LC1112NSW

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ABSTRACT / EXECUTIVE SUMMARY

Development: Life City Wollongong

Owners/Developer: Dr M Rashid

Site Location: Between Nolan Street and the F6 Southern Freeway in Berkeley

Site Identification: Lot 2 in DP 249814, Lot 4 in DP 258635, & Lot 2 in DP 534116

Site size: approximately 168,800m²

Soil Type /Structure: Moderately structured Clay Loam

Wastewater Load: 421 Kilolitres (221kL Town Sewer - 200kL Onsite Management)

Constraints: No constraints identified

Proposed Treatment Standard: Tertiary (Wollongong DCP 2009)

Proposed Treatment Plant: Fuji Clean PCN

Proposed Land Application: Surface Irrigation & Sub Surface Drip Irrigation

The proposed site for Life City Wollongong is an irregular shaped, 16.88ha semi rural lot, which is partially cleared and located between Nolan Street and the F6 Southern Freeway in Berkeley. The lot is serviced by town sewage, but as the sewage mains servicing the site may be undersized to accommodate the Life City project, the developer has engaged True Water Australia to prepare an onsite effluent management assessment.

It is proposed that wastewater generated onsite be split between the council sewage system and an onsite sewerage management system. Onsite sewerage management will provide high quality wastewater treatment and ensure safe and sustainable reuse. Packaged treatment plants solutions are considered best industry practice and will manage wastewater flows from individual stages of the development. Land application will be distributed throughout green space, allocated bushland and regeneration areas.

Although the proposed commercial development of the lot and the wastewater flows generated are a consideration when assessing onsite wastewater management, no constraints to onsite wastewater management have been identified. Possible constraints as per the Wollongong DCP and AS/NZS1547:2012 have been assessed for the site and no limitations to effective and sustainable onsite treatment and application of wastewater for the proposed development have been identified.

The recommended Packaged Tertiary Treatment Plant is a Fuji Clean PCN with tertiary treated effluent pumped to a land application area of 6.5ha which will consist of both subsurface and surface irrigation.

EFFLUENT MANAGEMENT OVERVIEW

Table of Contents

Abstract/ Executive Summary

- 1 Introduction**
- 2 Soil Assessment and Properties**
- 3 Desk Top Research**
- 4 Site and Soil Constraints AS/NZS1547:2012**
- 5 Design Flows**
- 6 Treatment System Type**
- 7 Land Application System – Type & Size**
 - 7.1 Sizing of Land Application Area / Wastewater Loading**
 - 7.2 Nutrient Balances**
- 8 Conclusion**
- 9 Appendices**
 - Appendix A – Onsite Sewerage Treatment & Wastewater Reuse**
 - Appendix B – Fuji Clean Commercial PCN Plant**

1 Introduction

This report presents the results of a preliminary wastewater management assessment undertaken by True Water Australia for the proposed Hi-Tech Holistic Cancer & Medical Hospital Facility, to be known as Life City Wollongong.

The objectives of the preliminary assessment are to:

- Assess the viability of onsite sewerage & wastewater management
- Provide onsite sewerage & wastewater treatment recommendations
- Assess the reuse potential of treated wastewater
- Establish the land application area size and location

This report has been prepared to assist the appropriate authorities assess the proposed onsite wastewater management system for Life City Wollongong. This assessment is collated considering all relevant standards and industry best practice. This report is compiled under the guidelines and requirements of:

- i) Wollongong Development Control Plan 2009, Part E– General Controls – Design Controls, Chapter E8: On-site Sewage Management Systems
- ii) AS/NZS 1547:2012 Onsite Domestic Wastewater Management (2012)
- iii) NSW Government Publication “Onsite Sewage Management for Single Households (1996)

(Please Note: although the above standards and guidelines are primarily for domestic wastewater management they are considered conclusive and relevant to the design of commercial and industrial onsite wastewater management systems.)

All tests & evaluations have been completed in accordance with the Australian Standards 1547:2012 “On-site domestic wastewater management” and the NSW Health publication “On-site Sewage Management for Single Households”.

Results and recommendations in this report are based on the information supplied by the client and conditions present at the time of testing. Any changes affecting the proposed land application area or alternate land application area may require a review of this report.

2 Soil Assessment and Properties

The soil assessment undertaken by Coffey Geotechnics is referenced for all soil data. Coffey's Geotechnics excavated twelve test pits at various locations during the Preliminary Geotechnical Assessment. Test pits CTP07 & CTP08 are located closest to the proposed land application area (LAA) and have been selected as most representative of the soil profile surrounding the LAA.

According to Coffey Geotechnics, a layer of topsoil 200mm to 300mm deep and consisting of highly structured sandy clays overlies a residual subsoil of sandy clay to a depth of 1.0m to 1.2metres. Both soil layers display a gravel content considered desirable for wastewater dispersal. Sandstone was encountered in both test pits and pits were terminated at near refusal, however the depth of the refusal was of sufficient depth to ensure no impact on the application of treated wastewater.

For purpose of wastewater management assessment soils are best described as moderately structured light clays. As per AS/NZS1547: 2012 this soil category is attributed a DIR of 3mm.

3 Desktop Research

Results of Desktop Research

Address	Warwick Street, Berkeley
Lot & DP	Lot 2 in DP 249814, Lot 4 in DP 258635, & Lot 2 in DP 534116
Owner / Developer	Dr M Rashid
Location	34.43S, 150.89E
Block Size	168,800m ²
Block Shape	Irregular Triangular
Existing Land Use	Vacant
Proposed Land Use	Hi-Tech Holistic Cancer & Medical Hospital Facility
Boundaries	Residential / Motorway
Geology	Coffey Geotechnics - GEOTWOLL03229AB-AA
Climate Data (Bureau of Meteorology) Port Kembla BSL Central Lab	Mean Rainfall 1278.6mm per annum Mean temperatures: Max 21 °C, Min 14.4 °C
Waterway / Gully	>40m
Registered Bores	Several >300m
Acid Sulphate Soils	Unlikely
Potential for Flooding	Unlikely
Constraints	None identified from desktop research
Considerations	Wastewater Load and peak flows
Land form	Linear planar
Slope at LAA	~5% with undulation
Aspect	South
Vegetation	Grass, trees, some bare areas
Exposure	LAA open to sun and wind – some shading from trees.
Surface Rock	No
Fill	Yes
Erosion	Not evident
Upslope Seepage	Possible
Drainage indicators	Dry surface, no pooling or wet spots
Ground water	Not encountered in borehole to depth of 1.5 m
Buffers & reserve area	Limited area available

4 Site and Soil Constraints AS/NZS1547:2000

With reference to the results of desktop research, and soil analysis, the following table lists and assesses the risk of each of the possible design constraints identified in AS/NZS 1547:2012 Table K2 as well as citing the requirements of the Wollongong DCP.

Site or soil constraint AS/NZ1547:2012 - Wollongong DCP	Assessment of possible constraint	Risk
Small lot size Risk - Insufficient land area for the ESD area and buffer requirements	Lot size > 1ha,	Low
Steep slope Risk - Average land slope greater than 20%	Slope in LAA ~5%	Low
Slope instability Risk - Site within an area subject to slope instability	As above	Low
Shallow soil Risk - Soil depth to bedrock or hardpan less than 0.5 metres;	Soil depth > 1.5m	None
Very shallow soil over bedrock Risk - Soil depth to bedrock or hardpan less than 0.5 metres	Soil depth > 1.5m	None
Seasonal water logging over perched water tables Risk - Poorly drained or waterlogged sites;	No water in boreholes to 1.5m	None
Shallow permanent water table Risk - Depth of soil to watertable less than 0.5 metres;	No water in boreholes to 1.5m	None
Ground water quality risk (cat. 1 & 2 soil)	Category 4-5 Soils	None
Soils with low permeability (cat. 5 & 6) - Poorly drained or waterlogged sites	Category 4-5 Soils	Moderate
Dispersive or Sodic Soils	Not Tested	Moderate
Cold or Wet Climate	Warm climate. Not wet (precipitation < evaporation)	None
Hot or Dry Climate	Warm climate. Mean rainfall > 1000mm per annum	None
Soil Salinity	Not tested	None
Acid Sulphate Soils	See Coffey Geotechnics - GEOTWOLL03229AB-AA	None
Susceptible ecological area or water bodies down slope Risk - Environmentally sensitive areas	See Environment Management Plan	None
Periodic inundation /flooding - Land within the 1 in 100 year flood level	N/A	None
Highly disturbed area or fill - 20 % of EAF area covered in rocks / outcrops larger than 0.2 metres	Not in LAA. Fill area to rear.	None
Subdivision / Multi-lot	N/A	NA
Commercial or Industrial site	Yes	Moderate

With reference to AS/NZS1547:2012, possible modifications to mitigate site and soil constraints, specifically the wastewater load / lot size include secondary / tertiary treatment and an appropriately sized land application area.

5 Design Flows

The projected Peak daily flow for Life City Wollongong is 421Kilolitres. The wastewater stream will be directed to two treatment processes, town sewer and onsite management. Roughly half of the wastewater will be managed by town sewer and half by onsite treatment. The division of flows between facilities will reduce loads on the town sewer mains and reduce medical contaminants to managed onsite systems.

Wastewater from the four buildings in the north of the development, the Healthcare Technical High School, the Medical Centre, Day Surgery & Child Care Centre, and the Hi Tech Holistic Cancer and Medical Hospital will be directed to the town sewer. These buildings will have an estimated flow of 221 kilolitres. This will effectively halve the volume of wastewater treated onsite, and, as these three buildings provide health care services any possible issues associated with chemicals or pharmaceuticals will be negated.

Wastewater generated by the group of buildings in the south of the development shall be directed to advanced packaged treatment plants. These treatment plants shall complement the staging of the development and provide tertiary treatment of wastewater. Tertiary treated wastewater will then be managed throughout the site for irrigation purposes.

The Design Flow Rate for the Onsite Wastewater Management for Life City Wollongong is 200kilolitres per day.

6 Treatment System

The Wollongong Development Control Plan 2009, Part E– General Controls – Design Controls, Chapter E8: On-site Sewage Management Systems, states that wastewater for commercial applications must be treated to a minimum tertiary standard. The required parameters are:

- Maximum BOD5 of 10 mg/L;
- 10 mg/L suspended solids;
- 5 mg/L total nitrogen;
- 3mg/L total phosphorus; and
- 10 colony forming units/100mL faecal coliforms.

The treatment of wastewater to tertiary standard must be achieved effectively, reliably and sustainably. The coupling of components and technologies from various manufactures can be costly and in many cases is proven to be both expensive to operate and prone to failure. The use of an advanced packaged treatment plant is recommended to negate any issues associated with non parent technologies.

The use of an advanced packaged treatment plant ensures the treatment process employed for the treatment of wastewater is consistent, tried and tested. True Water Australia has undertaken a review of the world's leading package treatment plant manufacturers. Product history, scale of manufacture, longevity, ongoing management costs, simplicity, efficiency and efficacy of the treatment process and other factors have been assessed.

Due to strict environmental regulations and an extremely competitive market, Japan's packaged treatment plants are the world's most highly developed. True Water Australia recommends the use of a treatment plant from Japan's leading manufacturer, Fuji Clean. After assessing all aspects of a treatment plant function and operation in both Australia and internationally, True Water Australia recommend the Fuji Clean PCN as the most suitable treatment plant for the Life City Wollongong development.

7 Land Application System - Type and Size

Given design flow and soil constraints, the recommended land application system is pressurized irrigation.

The following sustainability cut-off values for performance parameters are to be used in calculations as per the Wollongong DCP:

- Effluent Runoff 0 mm/year
- Effluent Drainage (increase above background) 260 mm/year
- Nitrogen Export 1 kg/year
- Phosphorus Export 1 kg/year
- P-Sorption Capacity (minimum years) 50 years
- All other assumptions used in the calculations should be stated, such as effluent quantity and effluent quality parameters.

7.1 Sizing of Land Application Area / Wastewater Loading

AS/NZS 1547:2012 Irrigation Area Sizing

Design flow rate = 200,000 litres per day

Design Irrigation rate = 3 mm/day (Table M1)

Irrigation area = 6.6 hectares

7.2 Nutrient Balances

The following calculations demonstrate that excess nutrient would be adequately adsorbed or utilised wholly within the property and within the proposed land application area.

Total Nitrogen = 5 mg/litre

Total Flow = 200 kL

Total Nitrogen = 1 kg/day

Yearly Nitrogen = 365 kg/year

Plant uptake (native grasses) = 300 kg/ha/yr

Required LAA = 1.22 hectares

Phosphorus loading rate = 3 mg/litre

Total Flow = 200 kL

Total Phosphorus = 0.6 kg/day

Total Phosphorus = 219 kg/year

Average P sorption for category 5 soils = 5000 kg/ha/50 yr

Required LAA = 2.19 hectares

It should be noted that with the ban of Phosphorus in washing products by 2014 the current Phosphorus loading rate can be expected to be reduced by up to 35% over the 50 years of the calculation.

An approximate area of 8 hectares is available for the land application of tertiary treated effluent via irrigation. The most limiting factor for land application is the hydraulic wastewater load and will require 6.6 hectares for disposal. An excess of 1.4 hectares is available for future or extended use. As the wastewater is tertiary treated, nutrient loads are not limiting with both calculations showing the application of treated wastewater can be managed for well in excess of 100 years.

8.0 Conclusion

Onsite wastewater management can be achieved affordably and sustainably. Tertiary treatment is required to address public health and safety requirements as well as satisfy the requirements of the Local Regulatory Authority.

Onsite Wastewater Management through tertiary treatment and irrigation of wastewater will address questions relating to the sizing of the sewer mains and the ability for the town sewer to manage the loads created by the development. Added benefits of onsite wastewater management include 100% reuse of the water resource and a reduction of water discharged from the Wollongong Treatment Plant.

Appendix A – Onsite Sewerage Treatment & Wastewater Reuse

Appendix B – Fuji Clean Commercial PCN Plant