GEOLYSE

EFFLUENT REUSE SCHEME
OBERON GOLF COURSE
WORKING DRAFT ONLY

PREPARED FOR
OBERON COUNCIL

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DRAFT

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Introduction

1.1 BACKGROUND

Oberon is located on the western edge of the Blue Mountains in the Central Tablelands of New South Wales. It is situated 54 km south-east of Bathurst and 178 km west of Sydney, at 1,100 m above sea-level.

It is within the Macquarie catchment. The town has a population of 2,700 people.

The Oberon Sewage Treatment Plant (STP) is located to the south east of the town Treated effluent is discharged to the Fish River. The STP is licensed by the Environment Protection Agency (EPA).

Oberon Council proposes to reuse treated effluent for irrigation of the Oberon Golf Course. This will involve construction of a pump station and a pipeline from the sewage treatment plant to the golf course.

By implementing this scheme Oberon Council would reduce water drawn from the Oberon Dam thereby helping to secure the town's water needs.

1.2 REPORT STRUCTURE

This report represents the Working Draft of a Review of Environmental Factors (REF).

It is comprised of the following sections:

Section 2 Describes the Oberon Sewage Treatment Plant and the effluent resource.

Section 3 Describes the Gold Course and existing irrigation practice and infrastructure.

Section 4 Describes the reuse scheme, including delivery infrastructure and demand.

Section 5 Starts to identify environmental impacts.

Section 6 Identifies statutory planning considerations.

Effluent Resource

2.1 QUALITY

2.1.1 POLLUTANTS

The treatment process at the Oberon STP consists of sedimentation, trickling filter, two digestors, clarification tank and ponds providing a 15 day holding period. This constitutes a tertiary level of treatment.

The Oberon STP is a licensed premise pursuant to the *Protection of the Environment Operations Act 1997* and operates under an Environment Protection Licence (EPL:1644). The EPL restricts discharge unless treatment through screening, degritting and primary sedimentation.

Effluent quality monitoring is required as follows.

Table 2.1 – Effluent Quality Monitoring

Pollutant	Unit of Measure	Frequency	Sampling Method
Biochemical oxygen demand	Milligrams per litre	Once a month (min of 4 weeks)	Grab sample
Faecal Coliforms	Colony forming units per 100 millilitres	Once a month (min of 4 weeks)	Grab sample
Nitrogen (ammonia)	Milligrams per litre	Once a month (min of 4 weeks)	Grab sample
Nitrogen (total)	Milligrams per litre	Once a month (min of 4 weeks)	Grab sample
Oil and Grease	Milligrams per litre	Once a month (min of 4 weeks)	Grab sample
Phosphorus (total)	Milligrams per litre	Once a month (min of 4 weeks)	Grab sample
Total suspended solids	Milligrams per litre	Once a month (min of 4 weeks)	Grab sample
pH	pH	Once a month (min of 4 weeks)	Grab sample

Source: EPL:1644, Condition M2.1

Concentration limits specified for the above pollutants are as follows.

Table 2.2 – Concentration Limits

Pollutant	Units of Measure	50 percentile concentration limit	80 percentile concentration limit	90 percentile concentration limit	100 percentile concentration limit
Oil and Grease	Milligrams per litre	-	-	-	10
pH	pH	-	-	-	6.5-8.5
Nitrogen (total)	Milligrams per litre	-	-	15	20
Phosphorus (total)	Milligrams per litre	-	-	1	2
Faecal Coliforms	Colony forming units per 100 millilitres	-	200	-	600
Total suspended solids	Milligrams per litre	20	-	25	30
Biochemical oxygen demand	Milligrams per litre	15	-	20	30

Source: EPL:1644, Condition L3

2.1.2 DISINFECTION

Council maintain that disinfection is achieved by the 15 day holding period in the ponds: achieving a faecal coliform count of <200 cfu/100ml.

2.1.3 RESULTS

Data on monthly effluent quality provided by Council for the reporting period 1 April 2009 to 31 March 2010 is provided below.

Table 2.3 – Council's Quality Data (April 09 – March 2010)

	Minimum	Mean	Maximum
Faecal coliforms (cfu/100ml)	0	24	200
pH	7.4	8	9.2
TSS (mg/L)	1	3.7	7
BOD (mg/L)	2	2.2	3
Oil & Grease (mg/L)	2	2	2
Nitrogen (mg/L)	2.5	9.3	18
Phosphorus (mg/L)	0.13	0.43	0.82

Source: Oberon Council

Data available on metals within the treated effluent is restricted to a single sample from May 2007. The results, compared against the relevant trigger values for metals in irrigation effluent for long term use on all soil types (up to 100 years), as specified within the *Guidelines*, are summarised below.

Table 2.4 – Metals – Trigger Values

Metal	Trigger Concentration (mg/L)	Known Concentration (mg/L)
Aluminium	5.0	no data
Arsenic	0.1	<0.001
Berylium	0.1	no data
Cadmium	0.01	<0.0001
Chromium VI	0.1	<0.001
Cobalt	0.05	no data
Copper	0.2	0.014
Iron	0.2	<0.05
Lead	2	<0.001
Lithium	2.5	no data
Manganese	0.2	no data
Mercury	0.002	no data
Molybdenum	0.01	no data
Nickel	0.2	0.003
Selenium	0.02	no data
Zinc	2.0	0.047

Source: Guidelines, Table 3.3 & ALS

2.1.4 STRENGTH

The treated effluent from the STP is of low strength. Concentrations for key constituents to satisfy the Department of Environment and Conservation's low strength effluent classification are detailed below. Also listed are the maximum concentrations of constituents over the 2009-2010 reporting period (with the exception of salt)

Table 2.5 – Effluent Strength

Constituent	Low Strength Threshold	Maximum Concentration Recorded (2009-2010)
Total Nitrogen	<50 mg/L	18
Total Phosphorous	<10 mg/L	0.82
Biological Oxygen Demand	<40 mg/L	3
Total Dissolved Solids	<600 mg/L	587
The TDS is based on a single sample from May 2007 that recorded an Electrical Conductivity of 917µS/cm: equating to a TDS equivalent of 587 mg/L.		

Source: Guidelines, Table 3.1 & Council

2.1.5 GUIDELINES

Considerations relevant to ascertaining the sustainability of an effluent reuse scheme include effluent quality criteria recommended in the Department of Environment and Conservation's (2004) *Guidelines for the Reuse of Effluent by Irrigation* (hereafter referred to as the *Guidelines*).

The *Guidelines* list the minimum treatment, disinfection and irrigation requirements when using treated effluent. As proposed, the type of reuse is classified as urban (non potable) – municipal with uncontrolled public access (i.e. irrigation of an open space/park/sportsground).

Table 2.6 – Treatment and Disinfection Requirements

Type of Reuse	Level of Treatment	Effluent Quality[1]	Effluent Monitoring[2]	Controls
Municipal with uncontrolled public access	Tertiary and Pathogen Reduction(5)	pH 6.5-8.5 [7] ≤2 NTU(9)	pH weekly BOD weekly Turbidity continuous	Application rates limited to protect groundwater quality.
Irrigation open spaces, parks, sportsgrounds, dust suppression, construction sites		1 mg/L C12 residual[10] or equivalent level of pathogen reduction	With disinfection system e.g. $C1_2$ Disinfections systems daily[6]	Salinity should be considered for irrigation
		Thermotolerant coliforms[3] <10 cfu/100mL [4]	Thermotolerant coliforms[3] weekly	

Table 2.6 – Treatment and Disinfection Requirements

Type of Reuse	Level of Treatment	Effluent Quality[1]	Effluent Monitoring[2]	Controls

NTU = Nephelometric turbidity unit
CFU = Colony forming units

1. Effluent quality refers to its quality following treatment and appropriate for a particular application and prior to mixing with receiving water. The guideline levels apply to the treated effluent feeding into the reticulation system, after the point of treatment of disinfection. The effluent should not degrade in quality while it is being stored or while travelling through a reticulation system. Chlorine may need to be added as a primary or secondary disinfectant to allow for a residual disinfection.
2. Monitoring demonstrates effluent water quality at the point of supply rather than at the treatment plant. In most cases this will be the point of entry to the reticulation system or other suitable representative samplings location.
3. Thermotolerant coliforms: A subset of coliforms found in the intestinal tract of humans and other warm blooded animals which can ferment lactose at 44° to 44.5° to produce acid and gas. These are as indicators of faecal pollution. They are also known as faecal coliforms and consist chiefly of *E.coli.*
4. Median Value. Refer to statistical treatment of date in ARMCANZ, ANZECC & NHMRC (2000) or future updates
5. Pathogen reduction beyond secondary treatment may be accomplished by disinfection (eg. Chlorine) or by detention (eg. Ponds and lagoons). Systems using detention only do not provide reduction of thermotolerant coliform counts to <10 per 100 mL and are unsuitable as the sole means of pathogen reduction for high contact uses.
6. Disinfection systems refer to chlorination, ultraviolet irradiation or other disinfection systems. Monitoring requirements may include checking chlorine residual or operation checking of UV equipment. Monitoring frequency for pond and lagoon systems will be site-specific and dependant on factors such as detention time.
7. 90% compliance for samples.
9. Limit met prior to disinfection. 24 hour mean value. 5 NTU maximum value not to be exceeded.
10. Total Chlorine Residual after a minimum contact time of 30 minutes.

Source: Guidelines, Appendix 1, Table A1.

Pathogen reduction is required, and proposed, on the basis of uncontrolled public access.

2.2 QUANTITY

The Oberon STP is considered, from a regulatory perspective, a small plant (i.e. <10000 ML per year).

The EPL 1644 caps discharge of treated effluent into Fish River at a maximum of 3,000 kL/day, and 1,000 ML/year.

Council is required to monitor discharge daily and this monitoring confirms that the STP has an average outflow of 1,000 kL per day.

Re-use Site

3.1 GOLF COURSE

The proposed reuse scheme involves irrigation of Oberon Golf Course (hereafter the course).

The 18 hole course is bounded by Bell, North, Bligh and Ross Streets to the north, and Links Close to the north east. On the west it is bound by cleared farming land and on the east by densely vegetated woodlands. To the south of the course is Oberon Dam. The north of the site is bounded by a ridge so the site has no catchment area beyond its own boundary. The site slopes from north to south.

The course occupies approximately 43 ha in total, although only approximately 22.4 ha will be irrigated.

The greens are planted with creeping bent grass and the tees and fairways are mixed lawn grass, containing couch grass, fescue and ryegrass.

Creeping bent grass, couch grass, fescue and ryegrass are all highly tolerant to salinity.

The Department of Environment and Conservation's (2004) *Guidelines for the Reuse of Effluent by Irrigation* states that highly tolerant crops can tolerate water of high salinity with EC of 2.9 – 5.2 dS/m.

3.2 EXISTING IRRIGATION SYSTEM

3.2.1 STORAGE

The course has three storage tanks, each of 120kL capacity. Two of these tanks are located at the top of the course at the north-eastern corner; the third is located in the middle of the course. This third tank is gravity fed from the top two.

The tanks are currently supplied with raw water from Oberon Dam and bore water from the on-site licensed bore.

3.2.2 WATERING REGIME

It is understood that the course has an automatic sprinkler system for the greens. It operates nightly (8.00 pm to 8.00 am) from October to April. It operates on a deep watering schedule, irrigating 9 greens per night successively, with an average application rate of 10.5 mm/hr.

On days of extremely high temperatures the greens are also watered by hand throughout the day to prevent them burning. The greens have an average area of 440m^2, with a total green area across the course of approx 8,000m^2.

The fairways and tees are irrigated with a manual system (when sufficient water is available) with a single fairway watered during the day. The fairways have an average area of 12,000 m^2; with a total area across the course of approx. 216,000 m^2.

3.3 HISTORICAL DEMAND

Based on preliminary consultations, it is understood that the course can consume 30 ML of water a year (between October and April inclusive. i.e. 7 months) when available (non drought conditions).

Historically, 15 ML/year has been raw water sourced from Oberon Dam, and 15 ML/year has been sourced from an existing bore.

With the extended drought, extraction from Oberon Dam was restricted for many years and the bore had also often run dry half way through the watering season.

Reuse Scheme

4.1 OBJECTIVES

The objectives of the effluent reuse scheme are to:

- protect water quality in Oberon Dam;
- improve the recreational amenity of Oberon Golf Course;
- reduce the demand on potable water supplies;
- reduce discharge of effluent to the Fish River;
- safeguard public health; and
- monitor environmental effects.

4.2 INFRASTRUCTURE

Infrastructure associated with the reuse scheme would include the following:

- Disinfection unit – provide a residual chlorine level of one milligram per litre to meet Environment Protection Authority (EPA) disinfection requirements for uncontrolled use of the treated effluent.
- Pump station – deliver treated effluent through the reticulation system;
- Pipeline to the existing storage tanks at the Golf Course

4.3 POTENTIAL DEMAND

4.3.1 ASSUMPTIONS

A daily water balance model prepared to establish potential demand on effluent adopted the following assumptions.

Greens

- Irrigation of 10 mm/hr for 1.33 hours each green.
- Nine (9) greens irrigated per night.
- Each nine (9) green group is watered on alternate nights.
- Irrigation occurs October - April (inclusive)
- Each green is 440 m^2.

Fairways

- Irrigation 10 mm over two (2) fairways each day in rotation if soil moisture < 15mm and adequate volume in tanks.
- Irrigation occurs October - April (inclusive)
- Average fairway is 12,000 m^2.

4.3.2 DEMAND

Table 4.1 – Effluent Demand

Golf Course	Total Application (ML/yr)	Average Application (ML/ha/yr)
Greens	11.22	14.16
Fairways	39.22	1.81
Total	**50.4**	

Total average effluent use at the Golf Course could be in the order of 50.4 ML/yr.

4.4 SUPPLY

The STP has an average outflow of 1,000 kL per day (365 ML/yr): well in excess of the course demand.

Therefore whilst 100% of demand would be able to be met, the reuse of treated effluent from Oberon Sewage Treatment Plant on the Oberon Golf Course will constitute a partial reuse scheme: approximately 14%. Effluent will only be pumped as needed to the Golf Course.

Figure 1 below shows the monthly effluent generation from the STP, and the portion of that which would be provided (on average) to the Golf Course.

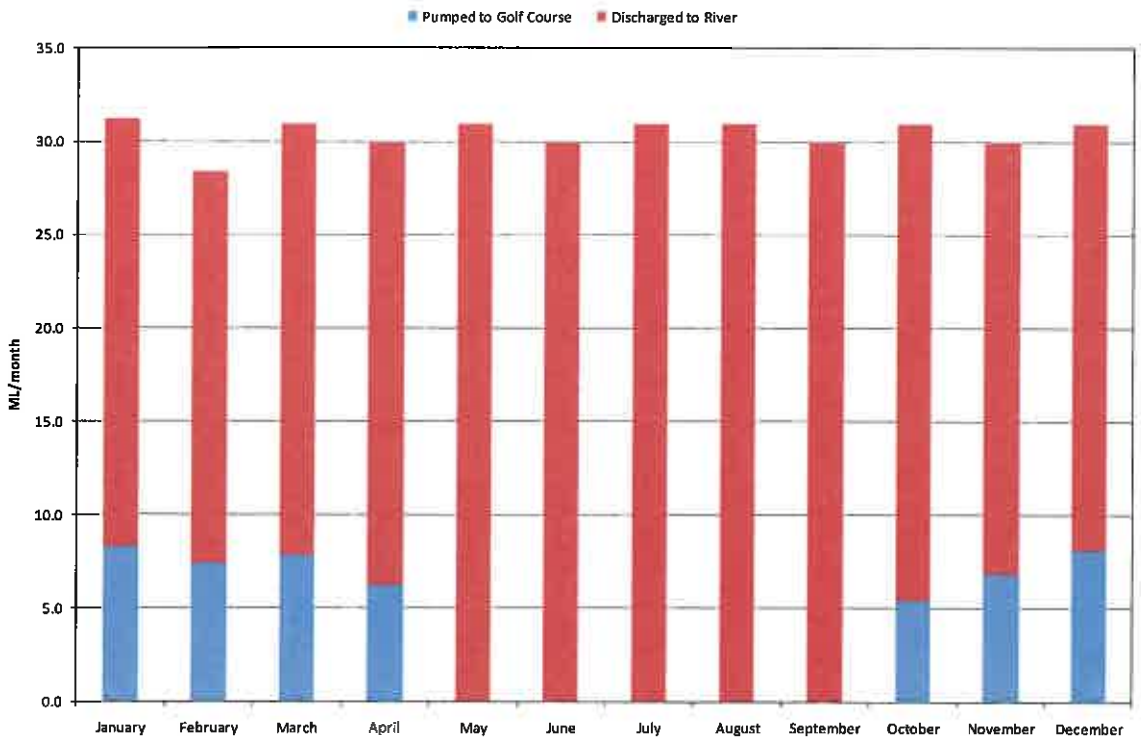

Figure 1: Golf Course Demand

Environmental Impacts

5.1 WATER QUALITY

5.1.1 SURFACE WATER
5.1.2 GROUNDWATER

5.2 PUBLIC HEALTH

5.3 SOILS

A soils investigation has been prepared by EnviroWest Consulting.

A copy of this report is provided in full in **Appendix A**.

5.4 ODOUR

5.5 NOISE

5.6 BIODIVERSITY

5.7 HERITAGE

5.8 VISUAL AMENITY

Statutory Planning

6.1 DETERMINATION

To be determined by Council – although expected the scheme constitutes an activity that is assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* and does not require Development Consent; but rather a determination by Council.

6.2 LICENCES & APPROVALS

Pending consultation with other state Government agencies, the following are likely to be raised:

6.2.1 ENVIRONMENTAL PROTECTION LICENCE

The scheme will require securing a variation to the existing Environment Protection Licence from the EPA, pursuant to the *Protection of the Environment Operations Act 1997*.

6.2.2 CONTROLLED ACTIVITY APPROVAL

Notwithstanding that the works entail disturbance to 'waterland', as they are to be undertaken by Council, a Controlled Activity Approvals (CAA) under the *Water Management Act 2000* will not be required.

However, the NSW Office of Water will expect that the works are undertaken consistent with requirements and practices associated with CAA.

6.2.3 SEWERAGE WORK APPROVAL

As the activity entails the provision of treated sewage effluent to a third party (i.e. the Golf Course), a s.60 approval will need to be secured from the NSW Office of Water under the *Local Government Act, 1993*.

This can be a major undertaking and the requirements to secure the s.60 approval can entail comprehensive and protected negotiations about risk management.

6.2.4 DREDGING/RECLAMATION

It is possible (although unlikely) that running the pipeline under Fish River may require a dredging permit from NSW Fisheries under the *Fisheries Management Act 1994*.

References

Department of Environment and Conservation (2004) *Environmental Guidelines: Use of Effluent by Irrigation*