



Preliminary Effluent Disposal Report

Proposed Re-zoning

Lot 1 DP 120436, Mason Lane
Kurrajong

Our Ref: 20130298

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Appendix A – Proposed Rezoning Layout & Effluent Disposal Areas

Appendix B – Calculations

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1 Introduction

1.1 General

This report has been prepared to detail the results of an investigation and analysis to determine if suitable on-site effluent disposal areas are available for each lot that forms part of the proposed re-zoning at lot 1, DP 120436 Mason Land, Kurrajong.

The report assesses the suitability and provides basic details of the requirements necessary to provide an On-Site Sewerage Management (OSSM) system for each proposed lot to accommodate any future dwelling.

The OSSM systems are to be designed to:

- Treat effluent on-site using a certified method in accordance with Environmental Health Protection Guidelines (DLG 1998) and AS/NZS 1547:2012 (SAI & NZS 2012).
- Comply with the requirements/objectives of the Environmental Health Protection Guidelines (DLG 1998).
- In accordance with "Hawkesbury City Council Development Control Plan Part C, Section 7 – Effluent Disposal" policy.

2 Site Location and Development Proposal

2.1 General

The subject site is known as Lot 1, DP 120436 in the Hawkesbury LGA and has road frontage to Bells Line of Road, Old Bells line of Road and Mason Lane along the northern and western boundaries respectively. The remainder of the boundaries adjoin rural lots.

The property currently has one existing dwelling and shed on the north eastern corner of the site adjacent to Bells Line of Road. The site is well graded, draining to a farm dam roughly located in the centre of the site before continuing onto the neighbouring property to the east of the site. There is also a second smaller farm dam located along the southern boundary of the site.

The site is predominantly cleared with some dense vegetation along the boundary adjacent to Bells Line of Road and adjacent to the large dam in the centre of the site.

The plan of proposed subdivision is attached at Appendix A.

Figure 2.1 below shows the locality of the site.



Figure 2.1: Site Location (SIX Maps 2014)

2.2 Infrastructure

There is no sewer infrastructure in the vicinity of the site, each proposed lot will require its own OSSM system. The existing dwelling has an existing OSSM system in place.

The site is serviced by water, telecommunication and power services.

2.3 Proposed Development

The proposed development consists of eleven (11) lot subdivision with areas ranging between 5,600m² and 1.94ha. Proposed Lot 5 is to retain the existing dwelling while lots 2, 3, 4, 6 to 11 are to be vacant lots each with a 1,024m² potential effluent disposal area.

Lot 1 is to be a community lot to provide a private accessway to each lot.

Further investigation of a suitable existing sewerage system for Lot 5 will be required to be undertaken as part of the future subdivision DA.

To dispose of the effluent generated from Lots 2, 3, 4, 6 to 11, it is proposed to utilise separate effluent disposal areas on each lot with appropriate setbacks provided from boundaries and dense vegetation. The effluent disposal areas will comprise:

- Lot 1: Community lot of private access not required.
- Lot 2: 1,024m²
- Lot 3: 1,024m²
- Lot 4: 1,024m²
- Lot 5: Existing OSSM to be assessed at DA submission stage
- Lot 6: 1,024m²
- Lot 7: 1,024m²
- Lot 8: 1,024m²
- Lot 9: 1,024m²
- Lot 10: 1,024m²
- Lot 11: 1,024m²

The proposed re-zoning and effluent disposal areas are shown on the plan contained in Appendix A.

2.4 Site Assessment

A preliminary site assessment revealed the characteristic soil conditions and general form of the site.

Two soil samples were taken from the site, one in the location of proposed preliminary effluent disposal area on lot 7 and one from the from proposed effluent disposal area on lot 10.

The generalised soil characteristics at proposed Lot 7 included topsoil of approximately 250mm in depth, with a clay loam/light clay earth from 250mm depth and deeper. At proposed lot 10, topsoil was typically in the order of 380mm in depth, transitioning to a clay loam/light clay at a depth of 500mm and deeper.

These results give a soil profile indication, however, detailed soil sampling and testing will need to be carried out at the Subdivision DA stage.

3 Effluent Disposal Concept

3.1 Site Assessment

A Site assessment rating for the on-site system has been undertaken and is shown below in Table 3.1.

Table 3.1 – Site Assessment – Rating for On-Site Systems

Site Feature	Limitation	Rating	Comments
Flood Potential	Above 1 in 20 year flood	Minor	Low - Preliminary Effluent Disposal Areas are located well above the 1 in 100yr ARI flood levels
Exposure	Exposure – High sun and wind	Minor	Low
Slope %	Subsurface irrigation land 10-20%	Moderate - Major	10-15%
Landform	Hill Crests and convex side slopes	Minor	Low
Run On and U/S Seepage	Non to Low	Minor to Moderate	Low
Erosion Potential	Disturbed ground has erosion potential	Moderate	Low provided any disturbed areas are to be stabilised during building/construction and grassed immediately on completion.
Site Drainage	Site is well drained	Minor	Low
Fill	None	Minor	Low
Buffer Distance	Refer section 3.3	Minor	Low
Land Area	Refer section 3.3	Minor	Low
Rock Outcrops	None	Minor	Low

A detailed soil assessment rating for on-site systems will be required to be undertaken at the Subdivision DA stage. However, based on preliminary site observations it is believed that an appropriate aerated wastewater treatment systems for each lot will be possible for the proposed re-zoning layout.

3.2 Wastewater Management

Based on the site assessment findings each proposed lot was assessed to determine whether there was appropriate area available to effectively dispose of wastewater in accordance with AS/NZS 1547:2000 On-site domestic wastewater management.

The aerated wastewater treatment systems would need to be sized to cater for a household of up to 10 persons. Any future proposed dwelling on the lots would need to be assessed in accordance with the BASIX requirements and accordingly will be fitted with water saving devices consistent with the requirements which will assist in limiting discharge to the wastewater system.

All wastewater is to be collected from any future proposed dwelling will need to be treated on site.

3.3 Design Calculations

3.3.1 Introduction

The following design calculations are based on Appendix 4.2D of AS/NZS 1547:2000

3.3.2 Wastewater Flows

It is assumed that any future proposed dwelling contains four bedrooms and is therefore capable of accommodating eight people.

The daily flow rate per person has been determined using Appendix 4.2D of AS/NZS 1547:2000. This was found to be 115 Litres/Person/day.

Therefore the daily design wastewater flows are:

$$Q_{\text{waste_water}} = 115 \times EP = 115 \times 8 = 920 \text{ Litres/day}$$

3.3.3 Treatment Facility

Future proposed treatment facilities will be aerated wastewater treatment systems with surface irrigation. Whilst the specific system model will be selected when the application is lodged for approval, the model will be selected from the list of accredited systems published by the NSW Department of Health.

The majority of these accredited systems have a well capacity of approximately 7000 litres and are suitable for a dwelling housing a maximum of ten (10) persons.

The treated effluent from these systems as described in AS/NZS 1547:2000 is suitable for re-use for garden purposes by way of above ground irrigation, surface drip irrigation or sub surface irrigation installed at a depth of 100mm.

The majority of the accredited systems provide the following effluent quality:

BOD ₅	less than 30mg/L
Suspended Solid	less than 45mg/L
Thermotolerant Coliforms	less than 100cfu/100ml
Free residual chlorine	greater than 0.2 and less than 2.0 mg/L

3.3.4 Irrigation Requirements

As stated above the soil is a clay loam/light clay material. Assuming the worst case scenario, being the light clay, the following soil characteristics are applicable for the design of the irrigation area:

Indicative Permeability (K _{sat})	approx 0.09m/d
Design Irrigation Rate (DIR) (mm/week)	20
Indicative Drainage Class	Poorly Drained

The irrigation area therefore will need to be:

$$DIA = \frac{Q_{\text{waste_water}}}{DIR}$$

Where DIR is 20 mm per week and Q_{waste_water} is 920 litres per day
Therefore the DIA is:

$$DIA = \frac{Q_{waste_water}}{DIR} = \frac{920 \times 7}{20} = 322.0m^2$$

This results in a minimum required irrigation area of 322 square metres.

3.3.5 Nitrogen Loading Requirements

The On-site Sewage Management for Single Households (OSMSH) manual provides the total area for nitrogen removal as:

$$A = \frac{TN \times Q_{waste_water}}{Ln}$$

where TN= total nitrogen concentration of the treated wastewater;

Q_{waste_water} is the daily outflow from the system, calculated above at 920 litres/day

Ln is the critical loading rate for nitrogen (25 mg/m²/d)

The NSW Health accredited AWTS report nitrogen concentrations in effluent of between 22 and 27 mg/l. Therefore, the area required for nitrogen removal is:

$$\begin{aligned} A &= \frac{27 \times 920}{25} \\ &= 994sq.m \end{aligned}$$

Therefore the irrigation area required to support nitrogen removal would be 994 square metres.

3.3.6 Phosphorous Loading Requirements

The OSMSH manual recommends that phosphorous sorption be considered over a period of 50 years without leaching occurring. The manual further details that the phosphorous removal capacity is a combination of both soil adsorption and plant uptake.

The area required for phosphorous removal is therefore given by:

$$A = P_{generated} / (P_{adsorbed} + P_{uptake})$$

The manual provides a typical sorption capacity of phosphorous of 6000 kg/ha and states that sorption by the soil is expected to occur up to about 25 to 50% of the capacity. Using a value of 35%, then $P_{adsorbed}$ is given by:

$$\begin{aligned} P_{adsorbed} &= 600 \times .35 \\ &= 2100 \text{ kg/ha} \\ &= 0.21 \text{ kg/m}^2 \end{aligned}$$

Using a typical value for the critical phosphorous loading rate of 3mg/m²/day, P_{uptake} over a period of 50 years is given by

$$\begin{aligned} P_{uptake} &= 3 \times 365 \times 50 \\ &= 54\,750 \text{ mg/m}^2 \\ &= 0.055 \text{ kg/m}^2 \end{aligned}$$

The manual uses a typical total phosphorous concentration in the system effluent of 12mg/l, however systems such as the Taylex one tank system suggest a TP concentration of 2.49mg/l in the effluent. For the purposes of this calculation, a conservative value of 10mg/l will be used.

The $P_{\text{generated}}$ over a period of 50 years is given by:

$$\begin{aligned}P_{\text{generated}} &= 10 \times 1000 \times 365 \times 50 \\&= 182.5 \times 10^6 \text{ mg} \\&= 182.5 \text{ kg.}\end{aligned}$$

Therefore, the area required is given by:

$$\begin{aligned}A &= P_{\text{generated}} / (P_{\text{adsorbed}} + P_{\text{uptake}}) \\&= 182.5 / (0.21 + 0.055) \\&= 689 \text{ m}^2\end{aligned}$$

Therefore the critical nutrient in determining the required irrigation area is nitrogen, which requires an area of 994 square metres.

3.3.7 Wet Weather Storage Requirements

A water balance calculation was undertaken to determine the amount of wet weather storage required in the system. The calculations used rainfall and evaporation data for Richmond obtained from the Bureau of Meteorology and assumed an irrigation area of 1000 square metres. The method suggested in the OSMSH manual was followed to prepare the water balance calculations.

A total wet weather storage of 3.1 cubic metres was determined from the calculations. This volume of storage will be required to be provided within any proposed future system which will have a capacity of approximately 7,000 litres.

The water balance calculations are shown in Appendix B and the proposed irrigation areas determined from the above calculations is shown on the proposed subdivision layout plan in Appendix A.

3.4 On Site Sewerage Management System

The On-Site Sewerage Management System proposed at the subdivision DA stage will need to be an aerated wastewater treatment system to comply with the items outlined in Sections above.

It should also be noted that the Environment and Health Guidelines (1998) states that "soils with a phosphorus sorption capacity of over 6000 kilograms per hectare (calculated to a depth of 1 metre) should not be limiting for irrigation areas." Geotechnical testing will be required to confirm soil absorption rates within in those stated in the guidelines.

Preliminary calculations carried out indicate an area of 994m² required for effluent disposal for each lot.

The various calculations were undertaken in accordance with the Environment and Health Guidelines (1998) and other relevant industry standards.

Based on a preliminary assessment and our experience the site is considered to be suitable for onsite disposal of the effluent generated by future dwellings within the recommended preliminary effluent disposal areas indicated in Appendix A.

However a detailed soil assessment will be required to be undertaken at the subdivision DA stage to confirm the exact sizing and location of the effluent disposal areas.

3.5 Available Effluent Disposal Area and Buffer Distances

As outlined in Section 2.3, the available disposal area for each of the proposed lots has been calculated as:

- Lot 1: Community lot of private access not required.
- Lot 2: 1,024m²
- Lot 3: 1,024m²
- Lot 4: 1,024m²
- Lot 5: Existing OSSM to be assessed at DA submission stage
- Lot 6: 1,024m²
- Lot 7: 1,024m²
- Lot 8: 1,024m²
- Lot 9: 1,024m²
- Lot 10: 1,024m²
- Lot 11: 1,024m²

Taking setbacks and other site constraints into consideration, areas in excess of 1,024m² for each proposed lot are available.

The recommended buffer distances for surface irrigation are listed below together with the provided distances.

- 40m to farm dams, intermittent waterways and drainage channels
- 6m if area upgrade and 3m if area downgrade of driveways and property boundaries.
- 15m to dwellings
- 6m to swimming pools

Verification/clarification of the distances of the effluent disposal areas from the permanent and intermittent waterways will be required during further investigation and design of effluent disposal areas at the subdivision DA stage. This preliminary assessment suggests that the effluent disposal areas should be possible without a detrimental impact subject to further investigation and design.

4 Conclusion

From the preliminary assessment of on-site effluent disposal for the proposed re-zoning, each lot is considered suitable to the effective dispose of effluent using an aerated wastewater treatment system with surface irrigation serving a maximum number of 10 persons, without having detrimental impact on the environment provided:

- The disposal area required for each proposed lot will be approximately 994m² while a provision of over 1,024m² has been allowed for.
- A total wet weather storage of 3.1 cubic metres will be required to be provided within any proposed future system which will have a capacity of approximately 7,000 litres.
- The model of the system to be installed will be selected from the list of accredited units provided by the New South Wales Department of Health.
- Any system will need to be installed, operated and maintained in accordance with the manufacturer's instructions and the Council conditions of approval.
- Buffers and setbacks have been checked and maintained generally in accordance with aforementioned on-site effluent disposal policies.

The clarifications noted above will be required to be confirmed as part of a more detailed Effluent Disposal investigation at the Subdivision DA stage and can be conditioned for as part of any development consent issued.

APPENDIX A

Proposed Rezoning Layout & Effluent Disposal Areas

APPENDIX B
Calculations

Water Balance Calculations

Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Days in month	31	28	31	30	31	30	31	31	30	31	30	31
Precipitation	(mm/month) 75.6	78.4	74.8	45.2	29.4	32.6	24.4	21.2	30.3	53	61.8	56.2
Evaporation	(mm/month) 192	149	134	100	65	51	73	97	127	165	179	226
Crop Factor	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Inputs												
Precipitation	(mm/month) 75.6	78.4	74.8	45.2	29.4	32.6	24.4	21.2	30.3	53.0	61.8	56.2
Effluent Irrigation	(mm/month) 28.5	25.8	28.5	27.6	28.5	27.6	28.5	28.5	27.6	28.5	27.6	28.5
Total Inputs	(mm/month) 104.1	104.2	103.3	72.8	57.9	60.2	52.9	49.7	57.9	81.5	89.4	84.7
Outputs												
Evapotranspiration	(mm/month) 134.4	104.3	93.8	70.0	45.5	35.7	51.1	67.9	88.9	115.5	125.3	158.2
Percolation	(mm/month) 22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	22.1	21.4	22.1
Total Outputs	(mm/month) 156.5	124.3	115.9	91.4	67.6	57.1	73.2	90.0	110.3	137.6	146.7	180.3
Summary												
Storage	(mm/month) -52.4	-20.1	-12.6	-18.6	-9.7	3.1	-20.3	-40.3	-52.4	-56.1	-57.3	-95.6
Cumulative Storage	(mm) 0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Storage												
Depth	3.1 mm											
Volume	3.1 cu.m											

