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Waste Water Utilisation

De Bortoli Wines, Bilbul, NSW

Report Number 24278.97216



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Executive Summary

De Bortoli Wines Pty Limited operates a winery at Bilbul, approximately eight kilometres east of Griffith, in the western Riverina district of southern New South Wales.

EnviroAg Australia Pty Ltd (EnviroAg) has been engaged by De Bortoli Wines Pty Ltd (the Client) to assess and facilitate the approval of proposed changes to their wastewater utilisation area (WWUA) so that the Client can ensure its ongoing environmental sustainability.

EnviroAg has developed the following Waste Water Utilisation Assessment to support their application for the modification of Development Approval (05_0080), and will expand on the original Environmental Assessment completed by E.A. Systems for De Bortoli Wines in 2005.

The original approval included a single utilisation area (Lots 165, 166, 167 and 168 DP751728), and covered approximately 73.2ha. There was also the possibility of an additional and adjacent area (Lots 169, 170 and 171 DP751728), covering approximately 28.6ha, but this was to be a lease arrangement, which did not eventuate.

Due to a gradual accumulation of potassium in the soils at the wastewater utilisation area (WWUA), it has become necessary for De Bortoli Wines to change their wastewater utilisation practices. De Bortoli Wines seek to increase their WWUA and implement a rotation approach.

There will be:

- no change to the wastewater processing capacity of 160ML per annum;
- no change to the treated wastewater storage capacity of 54ML; and,
- in any given year, the area of land used for WWU will not exceed the approved area of 130ha.

The requested change will be to the actual lots approved for use in WWUA rotation, and the use of a five (5) or more year rotation plan.

De Bortoli Wines have a proven record of effective, sustainable farm management, and have undertaken environmental monitoring on the site for over 10 years.

They have previously addressed environmental complaints by re-developing and upgraded their waste water treatment processes and irrigation practices. This has resulted in significant reduction in complaints.

De Bortoli Wines now wish to further improve their waste water management practices by increasing their WWUA and implementing a rotation plan. This will enable them to achieve long term sustainability.

It is recommended that proposed increase in WWUA and implementation of a rotation plan for the management of these area be approved.

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1. Introduction

This report presents details of the proposed revised wastewater utilisation systems for De Bortoli Wines Pty Ltd for their winery at Bilbul, NSW. The EIS submitted for the Development Approval (05_0080) included a single utilisation area (Lots 165, 166, 167 and 168 DP751728), and covered approximately 73.2ha. There was also the possibility of an additional and adjacent area (Lots 169, 170 and 171 DP751728), covering approximately 28.6ha, but this was to be a lease arrangement, which did not eventuate.

Due to a gradual accumulation of potassium in the soils at the wastewater utilisation area (WWUA), it has become necessary for De Bortoli Wines to change their wastewater utilisation practices. As such, they are proposing to gain approval for the use of additional areas to be used in a new WWUA rotation.

De Bortoli Wines are seeking a rotation approach, as there will be;

- no change to the wastewater processing capacity of 160ML per annum;
- no change to the treated wastewater storage capacity of 54ML; and
- in any given year, the area of land used for WWU will not exceed the approved area of 130ha.

The requested change will be to the actual lots approved for use in WWUA rotation, and the use of a five (5) or more year rotation plan.

2. Site Information

Bilbul is located about six kilometres east of the Griffith, in the western Riverina region of southern New South Wales. The site is at a latitude of 34.3°S and longitude of 146.0°E.

2.1 Site Identification

Relevant site details pertaining to the site are presented in Table 1.

Table 1 Site details

Site Address	“De Bortoli Wines”, De Bortoli Road, Bilbul, NSW 2680
Title Details	101//DP751728, 102//DP751728, 107//DP751728, 108//DP751728, 109//DP751728, 110//DP751728, 111//DP751728, 112//DP751728, 113//DP751728, 114//DP751728, 115//DP751728, 116//DP751728, 117//DP751728, 118//DP751728, 120//DP751728, 121//DP751728, 123//DP751728, 124//DP751728, 125//DP751728, 126//DP751728, 140//DP751728, 141//DP751728, 144//DP751728, 145//DP751728, 165//DP751728, 166//DP751728, 167//DP751728, 168//DP751728, 288//DP751728, 533//DP751728, 534//DP751728, 966//DP751728, 86//DP751704, 87//DP751704, 3//DP814081, 3//DP837695, 1//DP1024102, 1//DP1193585, 2//DP1193585
Site Name	De Bortoli Wines, Bilbul
Site Area	~1099 ha
Property Owner	De Bortoli Wines Pty Ltd
Land Use Zoning	IN1 (General Industrial) and RU1 (Rural Residential)
LGA	Griffith City Council

A plan showing the site location and lot boundaries can be seen in Figure 1.



Figure 1 Site location map

3. Wastewater Production and Characteristics

Wineries are significant producers of wastewater. However, the volume and nature of the winery wastewater produced varies between wineries and over the course of a vintage within individual wineries. The factors which affect this variation include, amongst others (Chapman *et al.*, 2001):

- The varieties of grapes crushed;
- The style of wines produced;
- The processing activities undertaken on site (*e.g.* crushing to bottling; crushing to maturation; etc);
- The scale of production;
- The types of production plant used;
- The extent of waste stream separation applied;
- Sources of winery wastewater include (Chapman *et al.*, 2001);
- General cleaning (including floor hosing and washing wastewaters);
- Cleaning of tanks, vats and barrels;
- Filter residues;
- Ion exchanger waste (vastly reduced volumes);
- Cooling tower waste;
- Production wastes (including spills and tank residues); and,
- Any direct (pond related capture) and indirect rainwater ingress into wastewater system.

The significance of the above sources of wastewater varies over a vintage.

In 2016-2017 a total, 114.035 ML of treated municipal supply water provided by Griffith City Council was used in the wine processing plant. The wine processing plant produced 153.08 ML of wastewater that was subsequently held in storage ponds. Of the wastewater produced, a total of 67.93 ML was taken from the storage ponds and sent to the utilisation area for irrigation. Wastewater was diluted with 29.6 ML of fresh irrigation water. All runoff (from irrigation and rainfall) from the irrigation area is captured by the tail water dam.

This monitoring period (2017-2018), 51.43 ML of wastewater was irrigated with 87 ML of channel water and 35.41 ML of tail water was re-irrigated back onto the irrigation area. Therefore, total irrigation water for the 2017-2018 monitoring period was 173.84 ML.

The 5 year mean application rate of waste water is 65.07 ML/year and freshwater is 62.33 ML/year.

The average chemical composition of the wastewater contained within ponds is provided in Table 2.

Average chemical composition of the ditch sections of the wastewater system is provided in Table 3. These data are not statistically different.

Table 2 Average chemical compositions in the wastewater treatment system ponds (2012-2017) (5Yrs)

Analyte	Unit	2012/13	2013/14	2014/15	2015/16	2016-17	Mean
Ammonia as N	mg/L	42.21	60.51	99.1	80.83	70.40	73.41
BOD*	mg/L	2187.22	1840.66	2548.9	4087.72	1,572.88	2571.09
Calcium	mg/L	29.26	27.96	34.4	34.69	28.52	30.72
Chloride	mg/L	187.76	139.61	115.0	147.65	200.38	141.60
COD*	mg/L	3045.17	3047.09	3878.4	4190.78	2,565.15	3430.72
Conductivity	µS/cm	3261.94	3.23	3594.7	3531.36	3,785.06	2215.83
Magnesium	mg/L	25.94	22.63	22.7	27.72	30.53	24.14
Total Nitrogen	mg/L	85.58	95.61	140.7	107.52	105.13	107.73
Nitrate / Nitrite (as N)	mg/L	3.43	4.19	3	0.30	0.94	2
Reactive phosphorus	mg/L	6.15	7.36	8.5	8.26	5.76	7.65
Phosphorous Total	mg/L	11.35	11.95	12.4	10.77	9.68	11.40
pH	pH	6.74	7.20	6.9	6.91	7.72	7.03
Potassium	mg/L	683.86	711.73	663.8	613	695.64	690.74
Sodium	mg/L	86.73	76.66	77.1	121	139.98	94.21
Total Kjeldahl nitrogen	mg/L	82.28	92.75	138.4	114	104.38	107.70

Table 3 Average chemical compositions wastewater irrigation system (2012-2017)

Analyte	Unit	Head ditch 5 Yr Mean	Tail ditch 5 Yr Mean
Ammonia as N	mg/L	25.10	26.99
BOD	mg/L	1446.4	1434.19
Calcium	mg/L	23.73	28.96
Chloride	mg/L	90.70	91.34
COD	mg/L	1322.59	1235
Conductivity	µS/cm	1984.62	1771
Magnesium	mg/L	15.87	21.88
Total Nitrogen	mg/L	56.30	59.41
Nitrate as N	mg/L	5.06	4.72
Reactive phosphorus	mg/L	3.88	3.18
Phosphorous Total	mg/L	6.58	5.82
PH	pH	7.20	7.32
Potassium	mg/L	426.16	612.65
Sodium	mg/L	53.32	56.72
Total Kjeldahl nitrogen	mg/L	51.52	55.01

BOD* = biological oxygen demand, COD* = chemical oxygen demand

4. Treatment and Storage of Wastewater

The De Bortoli waste water treatments systems have undergone significant improvement over time.

Prior to the major expansion of 2005 the waste water systems used a rudimentary system of accumulating all waste waters together, partial stabilization with magnesium hydroxide and then passage to waste water ponds where waters were surface aerated and then evaporated. The system did not work well. Numerous odour complaints were received as a result.

4.1 Original Proposed System - As approved and installed

As part of its expansion in 2005 (EIS, 2005) De Bortoli Wines proposed extensive works including;

- Separation of acid waste waters to recovery systems and thence a separate storage;
- Installation of sediment separation systems;
- Reduction of sodium hydroxide (NaOH) use and replacement with potassium hydroxide (KOH) use for plant cleaning operations. This allowed a change to management of water by reuse on land;
- Replacement of magnesium hydroxide ($Mg(OH)_2$) dosing with lime (calcium carbonate – $CaCO_3$);
- Replacement of surface aeration with subsurface aeration; and,
- Beneficial waste water reuse on land.

A number of these changes were implemented and proved successful in lowering the odour footprint over the vintage period. Significant improvements in amenity and environmental outcomes were achieved.

A diagrammatic flowchart of the proposed process can be seen in Figure 2, with a summary of the details of this system below;

Ion Exchange Wastewater

- Acidic wastewater from the ion exchange column kept separated from the wastewater stream, and stored in a designated storage tank within the wastewater treatment section of the facility;
- Acidic wastewater stream discharged under controlled conditions to ensure that the pH balance is not disrupted significantly; and
- Main point of discharge directly to the lime dosing mixing tank for pH adjustment.

Winery Wastewater

- Wastewater screened utilising a fine contra-shear or run down screen to remove gross solids such as grape marc not previously removed; and
- A balance (or surge) tank incorporated to reduce fluxes of discharges.

Reaction tank (lime dosing)

- Utilising a 60 tonne lime silo, lime doses are delivered to a 'reaction tank', which allows for mixing of the wastewater and the lime product; and
- After the initial reaction of the lime and wastewater it is moved to a 'retention tank' to provide further time for the reaction between the wastewater and lime additions.

Serpentine Solids Settling System

- Post retention, the wastewater passes into a 'serpentine' solids settling system for the removal of any remaining suspended solids;
- The system is two-fold, whereby one side can be non-operational for 'de-sludging' and maintenance, while the other side remains operational, thus maintaining continual operation while cleaning/maintenance is undertaken; and
- The solids can be removed for further processing to reclaim tartaric acid or used as soil ameliorant.

Aerobic pond

- Wastewater then enters the final phase of aerobic treatment;
- The system incorporated three ponds (each 27.8ML) to allow for storage and wet weather storage; and
- The ponds remain aerobic through the use of aerators, operated on an 'as required' basis, based on analyses of wastewater samples from the ponds;

Post treatment wastewater is applied to land for crop growth.

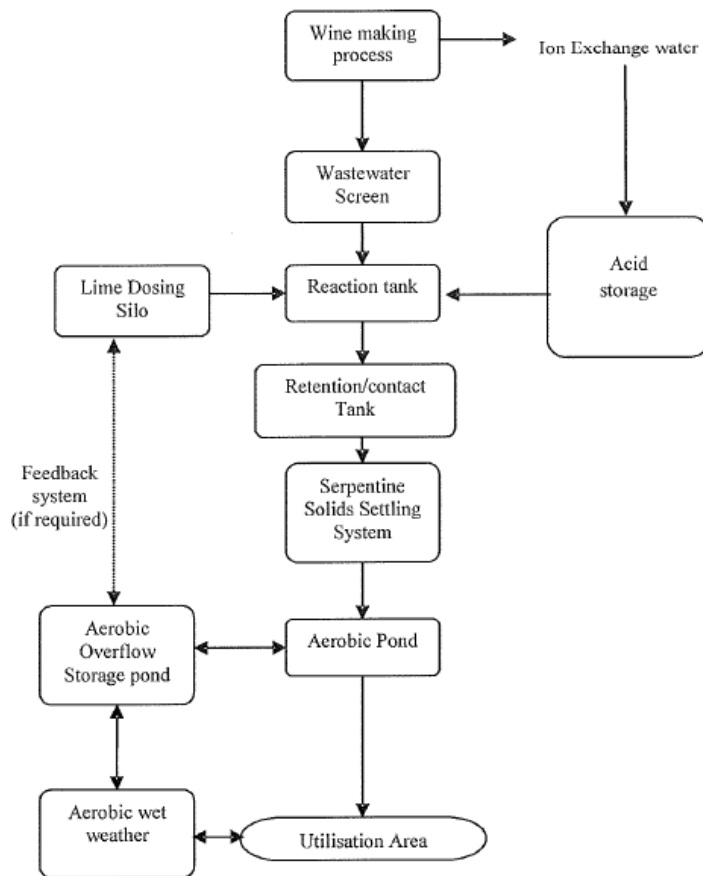


Figure 2 Diagrammatic representation of the approved wastewater treatment system

The site plan for the treatment pond system is shown in Figure 3.

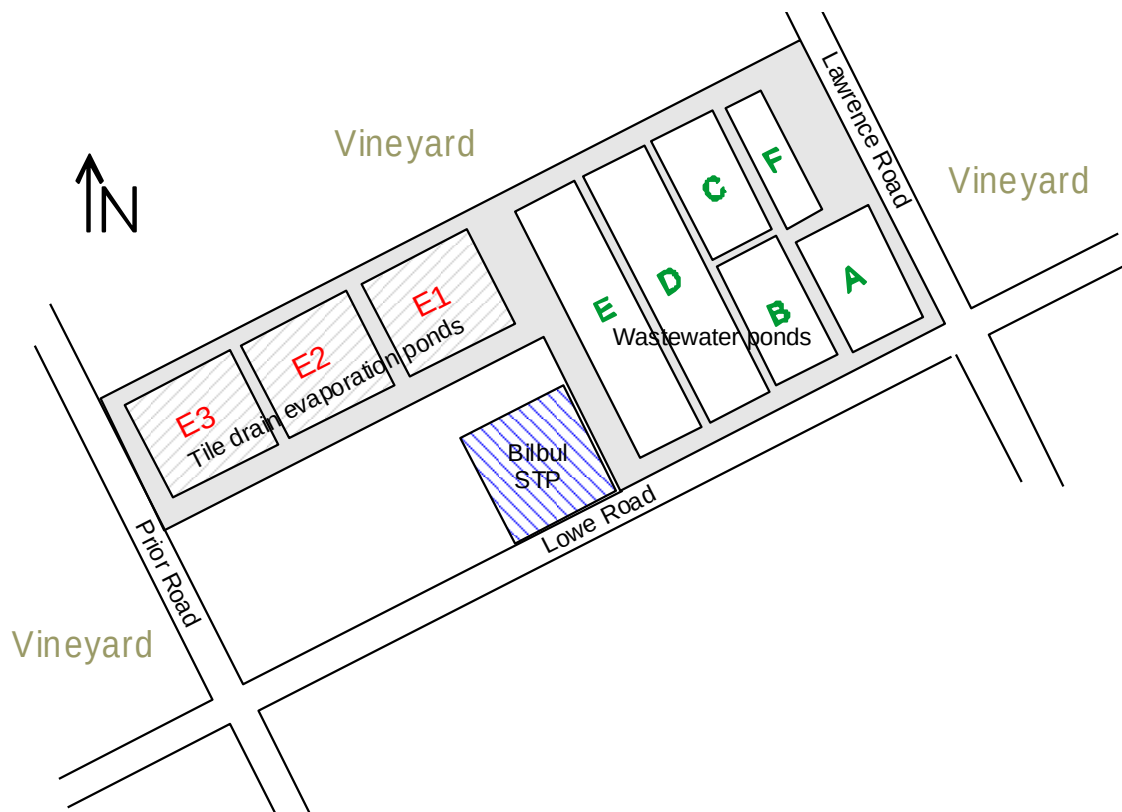


Figure 3 Site plan of the approved wastewater treatment ponds at the Bilbul winery (not to scale)

The primary treatment ponds (A and B) contain wastewater throughout the year. The secondary ponds (C and D) are secondary or post-treatment ponds. Typically, these are used early in the vintage to late in the year, but there may be periods each year where the ponds are not in use. Pond E is intended to store rainfall runoff from relatively 'clean' hard-stand areas of the site and is not normally a source of odour emissions. Pond F is a maturation pond for previously treated domestic wastewater and treated sewage from winery (including public access facilities).

4.2 Current Improved System

Over time De Bortoli Wines has further improved the waste treatment systems. Improvements include;

- Removal of treated sewage (approved by Griffith City Council);
- Improvement in cleaning regimes (less wet cleaning;
- Reduction in the use of acid, through less reliance on ion exchange;
- Research and implementation of a potassium (K) recovery systems;
- Use of NH_4 as a conjunctive stabilizer of waste water pH so that pH is stabilised and the waste water is dosed with fertiliser prior to land application; and
- Improvements in aeration through changes in the type and style of aeration.

A diagrammatic flowchart of the updated process can be seen in Figure 4, and an update plan of the wastewater treatment pond system is presented in Figure 5.

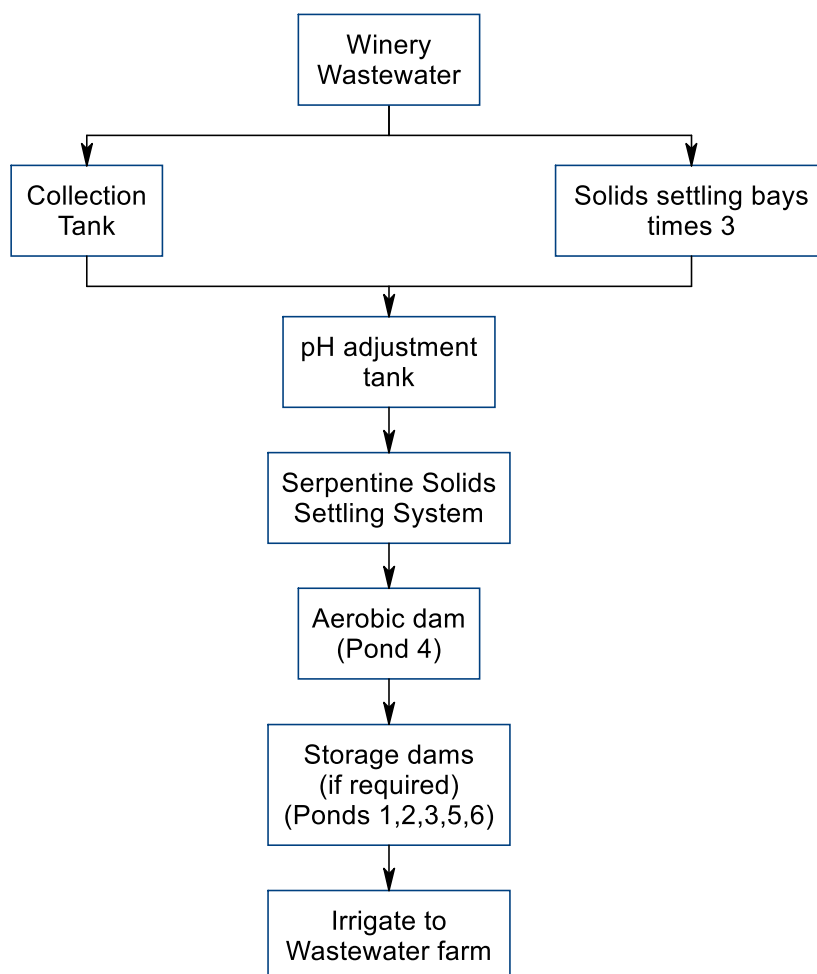


Figure 4 Diagrammatic representation of the current (improved) wastewater treatment system

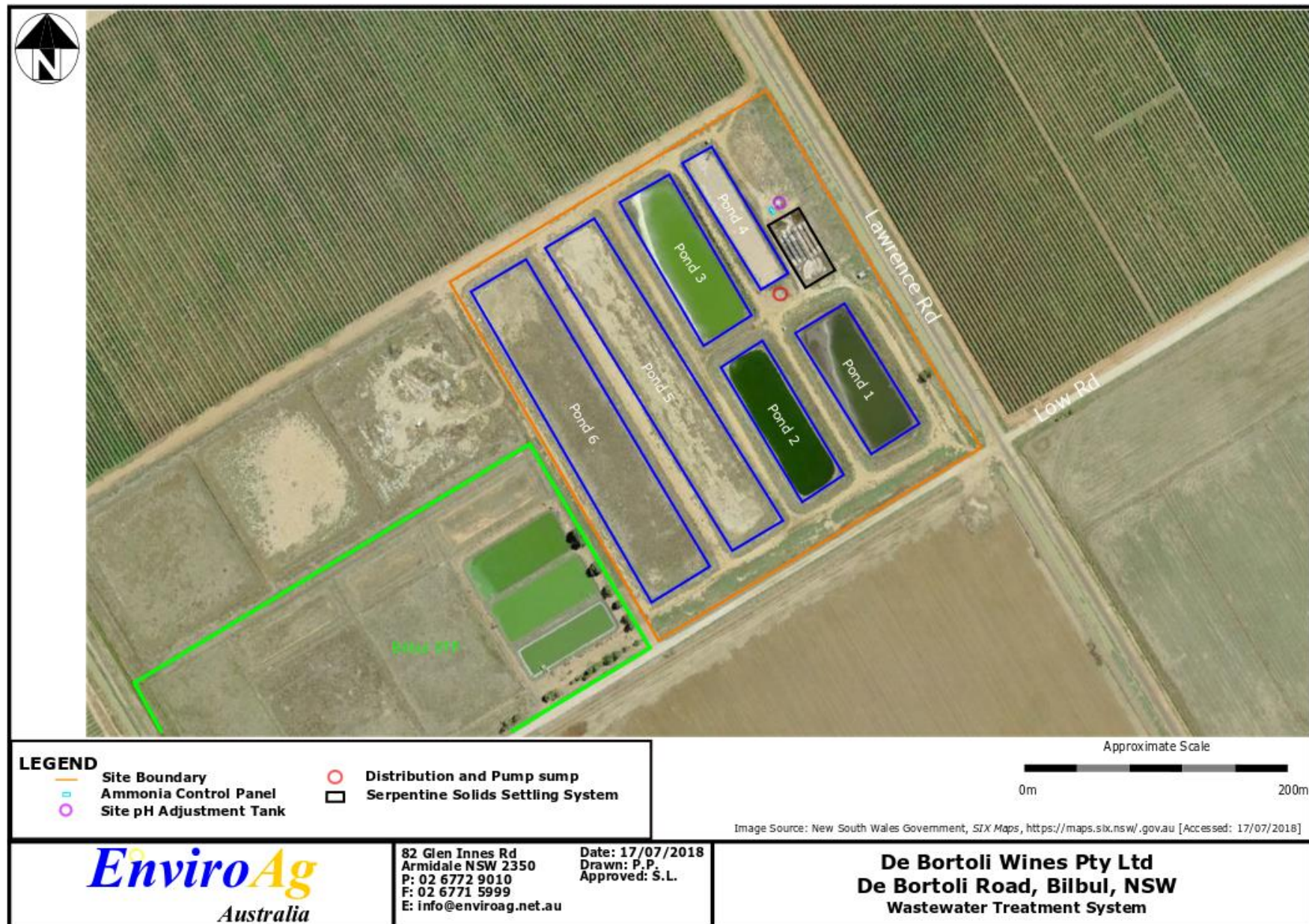


Figure 5 Site plan of the current (improved) wastewater treatment ponds at the Bilbul winery

5. Utilisation of Wastewater

It was proposed in the original EIS (2005), that wastewater from the winery would be processed in the treatment system and then piped to the WWUA, where it would be applied using flood irrigation.

5.1 Irrigation Areas

The original WWUA was to have been four lots ((Lots 165, 166, 167, and 168 DP 751728) owned by De Bortoli Wines, and an additional three lots (Lots 169, 170 and 171 DP 751728) of leased land. This lease arrangement was never entered into, and as such only the four lots owned by De Bortoli have been utilised to date (See Figure 6 below).

Annual soil testing has demonstrated that there has been a gradual increase in potassium levels in the WWUA over the past 12 years. As such it is recommended that De Bortoli's seek alternate and expanded WWUAs and develop a rotation, allowing unused zones to be rested. During the resting period cropping practices would continue with fresh water irrigation. Soil nutrient levels would be monitored and managed, reducing the levels of nutrients, particularly potassium, to the point where the zone may again be utilised for wastewater irrigation.

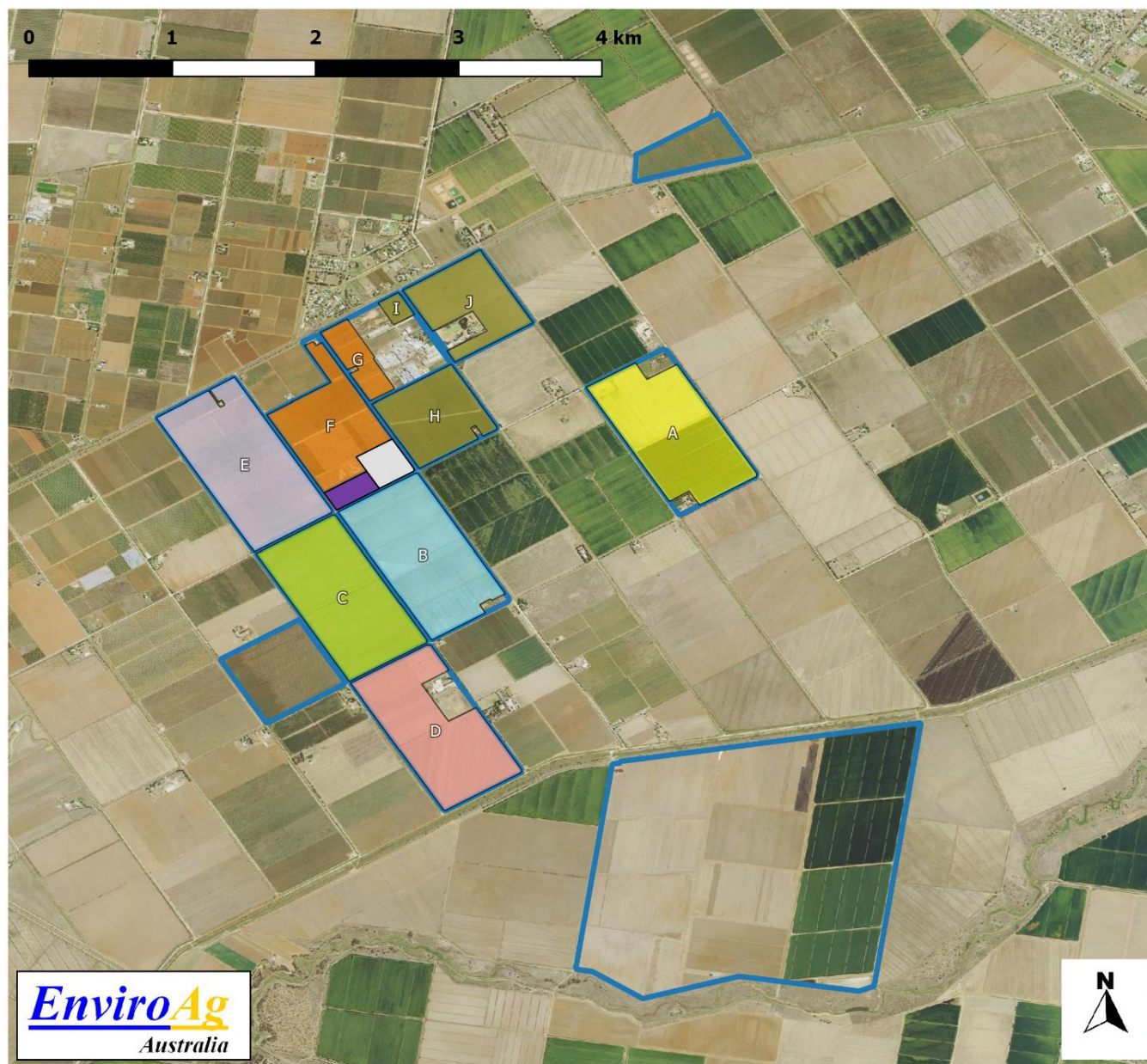
The current and proposed lots that will make up the WWUA rotation are presented in Table 4 and their locations can be seen in Figure 7.

Table 4 WW irrigation areas and lot numbers

Areas/Zones	Area (ha)	Lots
Existing		
Rotation A	73.2	165//DP751728, 166//DP751728, 167//DP751728, 168//DP751728
Proposed		
Rotation B	77.9	123//DP751728, 124//DP751728, 125//DP751728, 126//DP751728
Rotation C	79.3	111//DP751728, 112//DP751728, 113//DP751728, 114//DP751728 1//DP1193585, 2//DP1193585
Rotation D	71.3	107//DP751728, 108//DP751728, 109//DP751728, 110//DP751728
Additional (if required)		
Rotation E	83.2	115//DP751728, 116//DP751728, 117//DP751728, 118//DP751728
Rotation F/G	62.2	F: (48.4) 3//DP837695 120//DP751728, 121//DP751728, 966//DP751728 G: (13.8) 1//DP1024102 (partial)
Rotation H/I/J	91.5	H: (49.7) 140//DP751728, 141//DP751728 I: (3.5) 1//DP1024102 (partial) J: (38.3) 144//DP751728, 145//DP751728 (partial)
Total Area	538.6	



Figure 6 Current irrigation area



ESTD 1928
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Legend

- DBW Holdings
- WW Management Area
- Bilbul Sewage Treatment Work

Rotation Zones

- A
- B
- C
- D
- E
- F/G
- H/I/J

Drawing: Waste Water Utilisation Areas
Project Number: 24278
Drafted By: Peter Pearson
Version: Rev C
Date: 20th June 2018

Checked By: Simon Lott
Date: 20th June 2018

Basemap: NSW Spatial Services - Spatial Information Exchange (SIX) 2018

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Figure 7 Proposed wastewater utilisation areas rotation plan

5.2 Tail-Water Controls

It is proposed that the following changes/additions be made to manage tailwaters in the WWUA (refer to Figure 9);

- expansion of the tailwater dam at the northern end of Zone A, on Lowe Road;
- creation of a small tailwater dam at the northern end of Zone B;
- creation of a tailwater dam at the northern end of Zone E;
- expansion of the stormwater detention dam between Zone G and H to include tail waters;
- installation of a static pumps at;
 - corner of Lowe Rd and Chauncy Rd in Lot 168//DP751728;
 - corner Lowe Rd and Lawrence Rd in Lot 123//DP751728;
 - corner of Prior Rd and Burley Griffin Way; and,
- implementation of a return pump system through the common mainline(s) using a manifold.

The static pump and return systems will allow better control of the wastewater. Additionally, in the should a pollution event occur, it will allow for the control and management of such an event, returning wastewater to the large tailwater dams, or even to the holding ponds in the Wastewater management area (See Figure 8 for a representation of the Waste Water flow).

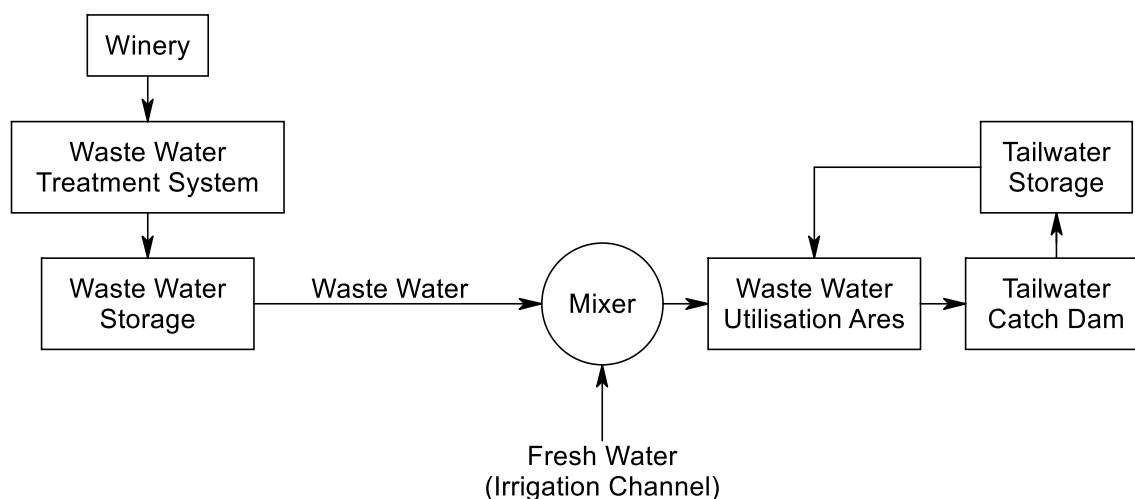


Figure 8 Waste Water Flow Diagram

Tailwater (catch) dams will be designed with capacities sufficient to handle up to 25mm of rainfall (or irrigation) across the entire catchment area that they are servicing. An estimate of the required capacities are presented in Table 5.

Table 5 Proposed maximum capacities of catch dams

Catchment Area Zones	Area (ha)	Storage Capacities (ML)	Notes
A	73.2	18.3	Current catch dam (to be expanded for storage)
B, C, D	228.5	57.125	New dam (End of Zone B)
E, F, G	145.4	36.35	Proposed dam (End of Zone E)
H, I, J	91.5	22.875	Current stormwater dam (NW of winery)

5.3 Wastewater Irrigation Management

A site suitability assessment has been undertaken for the additional proposed zones that would make up the new WWUA rotation plan. Details of this assessment can be found in 24278.95196_Land Capability Assessment_Rev0. The report finds that the land is suitable and has few limitations.

6. Wastewater Utilisation Rotation Plan

To improve environmental sustainability, De Bortoli Wines are proposing to make two changes to their WW management processes. The changes are to;

- increase the number of lots within their WWUA; and,
- implement a rotation system whereby the area being used will be rotated every five (5) or more years. This will allow for areas to be rested once the soils in that area reach their capacity of potassium.

Figure 7 shows the proposed footprint and rotation for the expansion of the WWUA and the lots covered by each rotation area are listed in Table 4. This is a change in lot numbers from those approved in section 3.21 of the original consent.

While this will increase the overall WWUA to 538.6 hectares, at no time will any area greater than 92 hectares be utilised. This is well below original DA consent's approved area for irrigation of treated waste water which is 130 hectares.

The actual volume of waste water being produced will not change.

6.1 Rotation Management

Each zone in the rotation plan would be utilised for wastewater irrigation for a minimum of 5 years. At the end of that time, Potassium levels in the soil will be assessed and, if required, the zone will be rested. Should a zone be rested, wastewater irrigation will progress to the next zone.

Rotation will progress from Zone A through to Zone D. After that it is expected that Zone A will be suitable for the utilisation of wastewater again. Should this not be the case, Zones E, F/G and H/I/J will be considered.

6.2 Additional Infrastructure

To support the new WWUA rotation additional infrastructure, including pipework and pumps, will be required. Table 6 summaries the additional infrastructure that will be needed, and Figure 9 presents a concept plan.

Table 6 Summary of additional infrastructure

Type of Infrastructure	Notes
Pipework	New wastewater pipes; • along Lot 123//DP751728, adjacent to Lowe Rd • along Lots 140 and 141//DP751728, adjacent to De Bortoli Rd • along Lots 123, 124, 125 and 126//DP751728, adjacent to Prior Rd • along parts of Lots 123//DP751728 and 111//DP751728, adjacent to Hamilton Road, and crossing under Prior Rd • through parts of Lots 107, 108, 109 and 110//DP751728, crossing under Hamilton Rd from Lot 111//DP751728 • along the south and west sides of Lot 121//DP751728, crossing under Prior Rd and then along the east side of Lots 117 and 118//DP751728.
Drains under channels (Inverts)	New inverts under the road; • under Prior Rd near its intersection with Lowe Rd • under Hamilton Rd near its intersection with Fallon Rd • under Prior Rd near its intersection with Burley Griffin Way • under De Bortoli Rd near its intersection with Burley Griffin Way

Pumps	New pumps installed; • corner of Lowe Rd and Chauncy Rd in Lot 168//DP751728 • corner Lowe Rd and Lawrence Rd in Lot 123//DP751728 • corner of Prior Rd and Burley Griffin Way
Mixer Points	New mixing points; • midway along Lot 140//DP751728, adjacent to Lowe Rd • midway along Lot 111//DP751728, adjacent to Hamilton Rd • midway along Lot 126//DP751728, adjacent to Hamilton Rd • on Lot 107//DP751728 at the corner of Prior Rd and Mirrool Branch Canal Rd
Tailwater Dams	• The existing tailwater dam at the northern end of Zone A will be expanded. • A new tailwater dam will be installed at the northern end of Zone B. • A new tailwater dam will be installed at the northern end of Zone E.

As with existing WWUA management;

- The pipelines would be installed so that they are 600-750 mm below the Murrumbidgee Irrigation channels. They would be poly sleeved under the channels and for one metre either side of the channel to mitigate the potential for seepage of wastewater into the channels;
- It is proposed that the tailwater dam at Lot 168//DP751728 be expanded. Additional, tailwater storage dams will be constructed at the northern end of Zone C (Lot 114//DP751728), and at the northern end of Zone E (Lot 118//DP751728). These would function to collect tailwater runoff for reuse. No water would be discharged into the Murrumbidgee Irrigation channels.

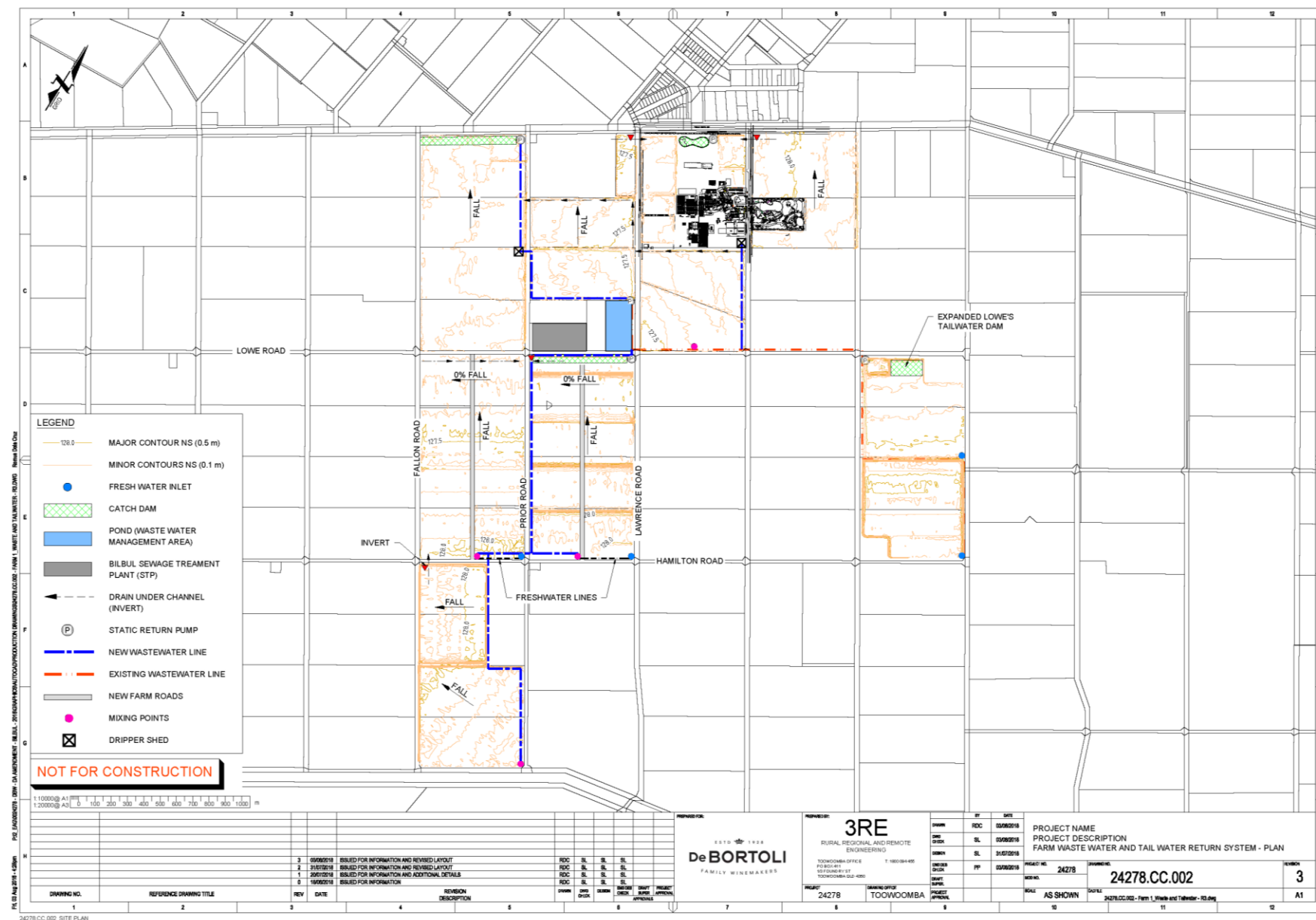


Figure 9 Additional Infrastructure Concept Plan

7. Summary and Recommendations

De Bortoli Wines have a proven record of effective and sustainable farm management. They have undertaken environmental monitoring on the site for over 10 years. Managing the site in a sustainable way, and even making improvements, during this time.

Early methods for treatment and utilisation of waste waters were less effective and resulted in numerous odour complaints. To address these issues, they re-developed and upgraded their waste water treatment processed and irrigation practices. This has resulted in significant reduction in complaints.

De Bortoli Wines now wish to further improve their waste water management practices by increasing their WWUA and implementing a rotation plan that will allow for long term sustainability.

It is recommended that proposed increase in WWUA and implementation of a rotation plan for the management of these area be approved.

8. References

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